

Moscow City Council



Regular Meeting ~Agenda~

Laurie M. Hopkins
City Clerk

www.ci.moscow.id.us

208.883.7015

**Monday
February 7, 2022**

7:00 PM

**Council Chambers
206 E. Third St.**

The Moscow Mayor, City Council and Staff welcome you to tonight's meeting. This meeting is open to the public. Attendees are subject to any protocols established by Governor Little's Stay Healthy Guidelines of the Idaho Rebounds Plan. We appreciate and encourage public participation. For regular agenda items, an opportunity for public comment is sometimes provided after the staff report. However, the formality of procedures varies with the purpose and subject of the agenda item; therefore, the Mayor may exercise discretion in deciding when to allow public comment during the course of the proceedings and limitations may be placed on the time allowed for comments. Citizens wishing to comment on business that is not on the agenda will be provided the opportunity to do so during the public comment item on the agenda. If you plan to address the Council, you will find a list of "Tips for Addressing the Council" in the door pocket outside the City Council Chambers. Please note that Moscow City Council meetings are televised, videotaped and/or recorded. Links to view the City Council meeting live can be found on the City website, YouTube, Facebook and Spectrum Cable 1301. Thank you for your interest in City government.

PLEDGE OF ALLEGIANCE

CONSENT AGENDA

1. All Consent Items (ACTION ITEM)

A. Approval of Moscow City Council January 18, 2022 Minutes - Laurie M. Hopkins

B. Idaho Commission on the Arts (ICA) Arts Education Annual Project Grant Application - Megan Cherry

The Arts Department seeks approval to apply for an annual grant administered by the Idaho Commission on the Arts (ICA). The Arts Education Annual Project is a grant program that supports activities that unite education and the arts. These grant funds will sustain the MAC and Arts Department's MACTivities Toolbox program, which is part of the MAC's fulfillment of the arts education component of their mission. The Toolbox program was initiated during the early days of the 2020 pandemic as a way to support arts education while maintaining social distance. The Toolboxes contain art supplies and National Core Arts Standards-aligned curriculum designed to serve ages 5 - 13+. The Arts Department successfully applied for funding through this grant program in 2021, and funds received in July 2021 were held back to support the program in FY22. The fourth edition of the program is currently in development, with a fifth edition slated to be produced by the end of June 2022. If received, this grant funding would represent off-setting revenue for operations in FY23. The grant request, if approved, will be for \$2500, and the program requires a 1:1 match.

ACTION: Ratify approval and submission of the Arts Education Annual Project grant application for the current cycle.

REGULAR AGENDA

2. Staff Recognition Report - Bill Belknap

3. Mayors Appointments (ACTION ITEM)

4. Public Comment and Mayor's Response Period (limit 15 minutes)

5. Citizen Commission Report - Moscow Arts Commission - Megan Cherry/Lauren McCleary

6. Amendment to Title 11, Chapter 2 of Moscow City Code (ACTION ITEM) - Cody Riddle

Staff has prepared a draft amendment to City Code to address the use of E-bikes, E-scooters and similar devices on the City's streets, sidewalks and pathways in anticipation of the likely increased use. Additionally, Staff has prepared a draft license agreement for shared mobility providers that would regulate their operations and standards of performance. Both the code amendment and license agreement were reviewed and previously recommended for approval by the Transportation Commission. The Administrative Committee recommended approval of both documents on January 24, 2022. Staff will present the final ordinance for the Council's consideration.

PROPOSED ACTIONS: Approve the Ordinance under suspension of the rules requiring three complete and separate readings and that it be read by title and published by summary; or consider the Ordinance on first reading and that it be read by title; or reject the Ordinance; or take other action deemed appropriate.

7. Emergency Radio Professional Services Agreement – Bill Belknap

In 2015, the City Council identified the City's emergency radio communications system's deficiencies as a Tier 1 major challenge for the City. The City's current communication system has only one channel and three repeaters for an area of less than seven square miles. Because repeaters aren't trunked or coordinated, officers must hunt for channels to locate the appropriate repeater to transmit calls, which places officers at risk. Officers currently experience a 5-10% transmittal failure due to dead zones throughout the patrol area, resulting in delayed notification and delayed officer response, both of which have escalated risk to citizens, officers and property. Overall, the ability to quickly intervene has declined as the communication system has deteriorated and calls for service have increased.

The City has commissioned several studies, including a needs assessment, radio coverage assessments, as well as an implementation plan and cost estimate. The current estimate for the project is \$3.4 Million, including the installation of a new simulcast system backbone and the replacement of all existing mobile and handheld radios. The City has accumulated funding for the project and is ready to begin the final design and construction of the communication network. The attached professional services agreement covers the design, FCC licensing, cost estimation, system procurement, and acceptance testing of a new VHF simulcast system and microwave radio interconnect system for the City of Moscow Public Safety radio system. It is anticipated that it will take approximately 24 months to complete the project.

PROPOSED ACTIONS: Approve the proposed Professional Services Agreement with Hatfield & Dawson Consulting Engineers; or take other action deemed appropriate.

8. Economic Development Administration Sixth Street Bridge Disaster Recovery Grant Agreement - Bill Belknap

After the Sixth Street Bridge was damaged by flooding events in 2019, the City applied for a disaster recovery grant administered by the Economic Development Administration (EDA) to assist with funding the construction of a new Sixth Street bridge over Paradise Creek near Mountain View Road. On January 12, 2022, EDA announced the grant award in the amount of \$955,000 for the project. The new 24-foot, single-span bridge will replace the existing culvert system and will include sidewalks, bike lanes, and be elevated to reduce future flooding in the area. This EDA grant, to be matched with \$515,000 from the City and project construction is anticipated to begin this summer and be completed by the end of 2022.

PROPOSED ACTIONS: Ratify acceptance of the grant award in the amount of \$955,000 and approve the associated Council Resolution; or take other action as deemed appropriate.

REPORTS

City Council

Mayor

Staff

ADJOURN TO EXECUTIVE SESSION PER IDAHO CODE 74-206 (1)(F) - THE MEETING WILL NOT RECONVENE.

NOTICE: Moscow City Council and committee meetings are televised, videotaped and/or recorded. Individuals attending the meeting who require special assistance to accommodate physical, hearing, or other impairments, please contact the City Clerk, at (208) 883-7015 or TDD 883-7019, as soon as possible so that arrangements may be made.

Moscow City Council



Regular Meeting ~Minutes~

Laurie M. Hopkins
City Clerk

www.ci.moscow.id.us

208.883.7015

**Tuesday
January 18, 2022**

7:00 PM

**Council Chambers
206 E. Third St.**

The meeting was called to order at 7:00 p.m.

PRESENT: Gina Taruscio, Sandra Kelly, Maureen Laflin, Anne Zabala, Julia Parker

ABSENT: Mayor Art Bettge, Hailey Lewis

STAFF: Bill Belknap, Mia Bautista, Cody Riddle, Mike Ray, Megan Cherry, Taylor Riedner

PLEDGE OF ALLEGIANCE

Maureen Laflin led the Pledge of Allegiance.

Kelly announced that the Council will not have an executive session at the end of the meeting.

CONSENT AGENDA

1. All Consent Items (ACTION ITEM)

A. Approval of Moscow City Council January 3, 2022 Minutes - Laurie M. Hopkins

B. Disbursement Report December 2021 - Sarah Banks

Staff presented the December 2021 Accounts Payable Report to the Public Works/Finance Committee on January 10, 2022. The Committee received the report and approved the disbursements as presented.

ACTION: Receive the Disbursements Report for the month of December 2021.

C. First Quarter Financial Report October 1, 2021 to December 31, 2021 for FY2022 - Sarah Banks

Staff presented the financial report for the first quarter of Fiscal Year 2022 to the Public Works / Finance Committee on January 10, 2022. The Committee received the report.

ACTION: Receive the FY2022 First Quarter Report.

D. Transportation Alternatives Program (TAP) Grant Application #1 - Nate Suhr / Alisa Anderson

The City of Moscow staff have identified the area of Mountain View Road from 'F' Street to Slonaker Drive as an excellent candidate for a Transportation Alternatives Program (TAP) grant. The current scope of the project includes the installation of approximately 1,600 LF of curb & gutter, green strip, and sidewalk on the west side of Mountain View Road from 'F' Street to Slonaker Drive. The proposed improvements would close the second largest gap in the Mountain View pedestrian corridor and connect two existing pieces of pedestrian infrastructure, creating an additional north-south pathway for non-motorized road users. This was reviewed by Public Works/Finance Committee at its meeting on January 10, 2022 and recommended for approval.

ACTION: Authorize City staff to submit a Transportation Alternatives Program Grant request of \$500,000 with total project costs not to exceed \$865,000.

E. Transportation Alternatives Program (TAP) Grant Application #2 - Nate Suhr / Alisa Anderson

The City of Moscow staff have identified the area of Mountain View Road from Joseph Street to Heron's Hideout as an excellent candidate for a Transportation Alternatives Program (TAP) grant. The current scope of the project includes the installation of approximately 900 feet of curb, gutter and sidewalk on both sides of Mountain View Road, the installation of a pedestrian warning beacon where Paradise Path meets Mountain View Road and 900 feet of sidewalk along the Latah Fairgrounds access road. This corridor will connect to the south end of the Mountain View road project that is scheduled to be completed in Fall of 2022 and will close a gap in the pedestrian infrastructure between Joseph Street and White Avenue. Closing that gap will create a 1.2 mile long continuous pedestrian pathway on Mountain View Road from 'F' Street to White Avenue and will expand the north-south pathway options for non-motorized users. The maximum grant request is \$500,000 and the current project costs are estimated at approximately \$845,000. This was reviewed by Public Works/Finance Committee at its meeting on January 10, 2022 and recommended for approval.

ACTION: Authorize City staff to submit a Transportation Alternatives Program request of \$500,000 with total project costs not to exceed \$845,000.

F. Request for Support and Financial Participation for Park Improvements to Virgil Phillips Farm Park - David Schott

In partnership with the Friends of Phillips Farm, Latah County is preparing an application to the Idaho Department of Parks and Recreation's Recreational Trails Program in the amount of \$63,000 to complete trail improvements at the park. These improvements include maps and signage, weed treatment, and general access and amenity upgrades. Specifically, adding directional and informational signage along all trails, including an overlook sign at the top of the hill. Installing additional signage and protective plexiglass to complete the newly built kiosks that will be completed by Spring 2022. Improving access to the park, its trails, and its amenities by upgrading trash bins with animal-proof garbage enclosures, treating weeds along trails, and installing a new dock and safety ramp at the trailhead pond. Finally, increasing and improving parking capacity and conditions by installing permeable pavement for the upper parking lot to include 6 parking spots. Latah County is seeking the City's support for the project and has requested the City of Moscow to contribute \$5,000 in cash matching funds. This was reviewed by the Public Works/Finance Committee on January 10, 2022 and recommended for approval.

ACTION: Approve park improvements and financial participation of \$5,000 in grant matching funds.

G. Idaho Commission on the Arts Grant Applications Public Programs in the Arts - Megan Cherry

The Arts Department seeks approval to apply for an annual grant administered by the Idaho Commission on the Arts (ICA). The Public Programs in the Arts (PPA) grant program is intended to provide general operating support for arts organizations in Idaho. These funds will represent off-setting revenue in the production of Arts Department events including Entertainment in the Park and Artwalk. If the application is successful, funds are typically available at the end of the City of Moscow's FY22, and would be held back for use in FY23. This was reviewed by the Public Works/Finance Committee on January 10, 2022 and recommended for approval.

ACTION: Approve the Public Programs in the Arts (PPA) grant application for the current cycle.

Zabala moved and Laflin seconded to approve the consent agenda as presented. Roll Call Vote: Ayes: Unanimous. Nays: None. Abstentions: None. Motion carried.

REGULAR AGENDA

2. Staff Recognition Report - Bill Belknap

None offered.

3. Mayor's Appointments (ACTION ITEM)

Council President Kelly proposed the following appointments for Council consideration: Kathryn Bonzo and Erica Wagner to the Moscow Arts Commission; Lysa Salsbury to the Human Rights Commission; Sophie Gilbert and Olivia Pat-Nano Wiebe to the Sustainable Environment Commission; and Tim Kinkeade to the Board of Adjustment. Taruscio moved and Laflin seconded approval of the appointments. Roll Call Vote: Ayes: Unanimous. Nays: None. Abstentions: None. Motion carried.

4. Public Comment and Mayor's Response Period (limit 15 minutes)

Kathryn Bonzo (Moscow) provided an update on the Trex plastic film collection that started 4 years ago when China had discontinued their collection. So far this year, the Moscow school district has collected over 5,000 pounds.

5. PUBLIC HEARING: 1825 N Polk Street Ext. Annexation, Comprehensive Plan Land Use Designation, and Zoning Designation (ACTION ITEM) - Mike Ray

The applicant, Gary Peterson, is proposing to rezone and retain the existing Comprehensive Plan land use designation for a 10,091 square foot property proposed to be annexed into the City of Moscow and located at 1825 North Polk Street Extension. The current Comprehensive Plan Land Use Designation is Suburban Residential and the applicant is proposing to retain that designation. The zoning on the subject property is currently Agriculture Forestry (AF) and the proposal is to rezone to the Multiple Family Residential (R-4) Zone. The City of Moscow Planning and Zoning Commission conducted a public hearing for the proposed Comprehensive Plan land use designation and rezone on December 8, 2021 and recommended approval with no conditions.

PROPOSED ACTIONS: Conduct the public hearing upon the annexation, Comprehensive Plan land use designation, and zoning designation and upon consideration of any testimony presented:

1. Approve the Annexation Ordinance under suspension of the rule requiring three complete and separate readings and that it be read by title and published by summary; or consider the Annexation Ordinance on first reading; or reject the Annexation Ordinance; or take such other action deemed appropriate.
2. If the Annexation Ordinance is approved, approve the proposed Comprehensive Plan Land Use Designation Resolution and adopt the Planning and Zoning Commission Reasoned Statement of Relevant Criteria; or reject the proposed Comprehensive Plan Land Use Designation Resolution and direct staff to prepare a Reasoned Statement of Relevant Criteria; or take such other action deemed appropriate.
3. If the Annexation Ordinance is approved and the Comprehensive Plan Land Use Designation Resolution is approved, approve the proposed Zoning Ordinance under suspension of the rules requiring three complete and separate readings and that it be read by title and published by summary and adopt the Planning and Zoning Commission Reasoned Statement of Relevant Criteria; or consider the Zoning Ordinance on first reading; or reject the Zoning Ordinance and direct staff to prepare a Reasoned Statement of Relevant Criteria; or take such other action deemed appropriate.

Ray introduced the item as written above and described the location.

Council President Kelly opened the public hearing at 7:11 p.m. Hearing no testimony, Council Member Kelly closed the public hearing at 7:11 p.m.

Having no questions, Parker moved, Zabala seconded, to approve the proposed Zoning Ordinance under suspension of the rules requiring three complete and separate readings and that it be read by title and

published by summary and adopt the Planning and Zoning Commission Reasoned Statement of Relevant Criteria. Roll Call Vote: Ayes: Unanimous. Nays: None. Abstentions: None. Motion carried.

Councilmember Kelly read Ordinance 2022-02 by Title:

AN ORDINANCE OF THE CITY OF MOSCOW, A MUNICIPAL CORPORATION OF THE STATE OF IDAHO; PROVIDING THAT LAND DESCRIBED IN SECTION 1 OF THIS ORDINANCE, AND GENERALLY SHOWN ON EXHIBIT “A” ATTACHED HERETO AND INCORPORATED HEREIN BY THIS REFERENCE, BE ANNEXED TO THE CITY OF MOSCOW; PROVIDING THAT THE PROVISIONS OF THIS ORDINANCE BE DEEMED SEVERABLE; PROVIDING FOR THIS ORDINANCE TO BE IN FULL FORCE AND EFFECT FROM AND AFTER PASSAGE, APPROVAL, AND PUBLICATION ACCORDING TO LAW.

Taruscio moved and Laflin seconded to approve the proposed Comprehensive Plan Land Use Designation Resolution and adopt the Planning and Zoning Commission Reasoned Statement of Relevant Criteria. Roll Call Vote: Ayes: Unanimous. Nays: None. Abstentions: None. Motion carried.

Taruscio moved, Zabala seconded to approve the proposed Zoning Ordinance under suspension of the rules requiring three complete and separate readings and that it be read by title and published by summary and adopt the Planning and Zoning Commission Reasoned Statement of Relevant Criteria. Roll Call Vote: Ayes: Unanimous. Nays: None. Abstentions: None. Motion carried.

Council President Kelly read Ordinance 2022-03 by title:

AN ORDINANCE OF THE CITY OF MOSCOW, IDAHO, A MUNICIPAL CORPORATION OF THE STATE OF IDAHO; PROVIDING FOR THE ZONING OF A TEN THOUSAND NINETY-ONE (10,091) SQUARE FOOT PROPERTY, DESCRIBED IN SECTION 1 AS MULTIPLE FAMILY RESIDENTIAL (R-4); PROVIDING THAT THE PROVISIONS OF THIS ORDINANCE BE DEEMED SEVERABLE; PROVIDING FOR THIS ORDINANCE TO BE IN FULL FORCE AND EFFECT FROM AND AFTER ITS PASSAGE, APPROVAL AND PUBLICATION ACCORDING TO LAW.

REPORTS

City Council

Moscow Pathways Commission – Zabala reported the Commission has scheduled their bike tour for May 21, 2022 and the first pedestrian tour in September.

Fair and Affordable Housing Commission – Parker said the Commission’s survey on affordable housing is almost complete. Palouse Prairie Charter school sixth graders will be presenting the impacts of lack of housing.

Sustainable Environment Commission – Parker reported the Commission is finishing up their description and duties in the brochures.

Moscow Arts Commission – Laflin said the Commission is still working on the Becker Memorial art and will be personally inviting artists.

Transportation Commission – Laflin reported the commission provided project updates and February 2nd is National Walk to School Day.

Moscow Tree Commission – Taruscio said the Commission is yet to meet so there are no updates.

Palouse Basin Aquifer Committee – Taruscio said the Executive Director recently left so they are in a transition period.

Human Rights Commission – Kelly said the Commission and Latah County hosted a MLK Breakfast and reported on upcoming presentations. The commission will also look into education opportunities for anti-Semitism events that are going on in the Pacific Northwest.

Mayor

No report.

Staff

No report.

~~**ADJOURN TO EXECUTIVE SESSION PER IDAHO CODE 74-206 (1)(F) THE MEETING WILL NOT RECONVENE.**~~

It was moved, seconded and mutually agreed upon to adjourn at 7:25 p.m.

Art Bettge, Mayor

ATTEST:

Laurie M. Hopkins, City Clerk

COMMITTEE STAFF REPORT

DATE: Monday, February 7, 2022



RESPONSIBLE STAFF

Megan Cherry, Arts Program Manager

ADDITIONAL PRESENTER(S)

OTHER RESOURCES

AGENDA ITEM TITLE

Idaho Commission on the Arts (ICA) Arts Education Annual Project Grant Application - Megan Cherry

DESCRIPTION

The Arts Department seeks approval to apply for an annual grant administered by the Idaho Commission on the Arts (ICA). The Arts Education Annual Project is a grant program that supports activities that unite education and the arts. These grant funds will sustain the MAC and Arts Department's MACTivities Toolbox program, which is part of the MAC's fulfillment of the arts education component of their mission. The Toolbox program was initiated during the early days of the 2020 pandemic as a way to support arts education while maintaining social distance. The Toolboxes contain art supplies and National Core Arts Standards-aligned curriculum designed to serve ages 5 - 13+. The Arts Department successfully applied for funding through this grant program in 2021, and funds received in July 2021 were held back to support the program in FY22. The fourth edition of the program is currently in development, with a fifth edition slated to be produced by the end of June 2022. If received, this grant funding would represent off-setting revenue for operations in FY23. The grant request, if approved, will be for \$2500, and the program requires a 1:1 match.

STAFF RECOMMENDATION

Ratify approval and submission of the Arts Education Annual Project grant application for the current cycle.

PROPOSED ACTIONS

PROPOSED ACTIONS: Ratify approval and submission of the Arts Education Annual Project grant application for the current cycle.

FISCAL IMPACT

These grant funds will offset the costs of producing the MACTivities Toolbox in FY23.

PERSONNEL IMPACT

Staff time will be needed to complete the grant application, and if funding is received, to implement the program and submit final reporting.

ATTACHMENTS

1. 2023_ICA_Arts Education_Grant Program Description
2. 2023_ICA_Arts Education_Evaluation Rubric

Opportunities

Current Applications

Any previously created applications, for this opportunity, appear below. To start a new application for this opportunity, Click the Start a New Application link or to copy data from an old application, click on the Copy Existing Application link.

ID	Application Title	Status
No existing applications		

Opportunity Details

[Copy Existing Application](#) | [Start a New Application](#)

04801-Arts Education Annual Project - FY 2023

Arts Education Annual Projects

Application Deadline: 01/31/2022 11:59 PM

Award Amount Range: \$1,000.00 - \$15,000.00

Project Start Date: 07/01/2022

Project End Date: 06/30/2023

Award Announcement Date:

Program Officer: Michael Faison

Phone: 208-334-2119 x

Email: michael.faison@arts.idaho.gov

Description

Description

Purpose

This annual grant opportunity supports activities that unite effective practices in education and in the arts, enriching teaching and learning opportunities for K-12 students.

Process

Applications are adjudicated by a panel of community arts professionals. Award amounts depend on panel scores and available funds and may be less than the amount requested. A final report is due July 31 to remain eligible for future funding.

Grant amount

The grant requires a 1:1 match with cash or in-kind donations, and funds up to 50% of projected expenses. Maximum request is \$15,000.

Eligibility and Restrictions

- Applicant must be a nonprofit, IRS tax exempt 501(c)(3) organization or be represented by applying through a fiscal agent; or a unit of local, county, tribal, or state government, including schools and school districts
- Nonprofit organizations (and fiscal agents) must have been in operation in Idaho for at least one year and have a valid 501(c)(3) Determination Letter with an effective date at least 1 year prior to the grant application deadline date
- Applicant must compensate professional artists and administrators
- Applicant must have submitted all final reports for past Commission grants

Narrative questions

- 1) Briefly describe the organization's or school's educational mission and the project or activities for which funds are sought.
- 2) What student NEEDS will be addressed by this project?
 - Describe the population expected to benefit from the project. Specify the number of participants and, if applicable, how they will be chosen.
 - Identify important student learning needs that this project will address.
 - Describe your systems, practices, and actions that encourage participation of diverse members of your community and individuals with disabilities, including activities designed to minimize barriers to participation.
- 3) IMPACT – How will the project contribute to what students will know and be able to do in the arts? Reference your response to the National Core Arts Standards: nationalartsstandards.org.
 - Identify the Artistic Process and Essential Question from the National Core Arts Standards that will focus student learning.

- Specify up to three discipline-specific knowledge and skill standards (eg. VA:Cr1.2PKa) that students will know and be able to do in the arts as an outcome of your planned activities or experiences. Please provide the full statement(s).

4) Describe how EVIDENCE of student learning will be captured, documented, and shared.

- What assessment tools will be used to determine if the identified standards are understood and/or applied in the student work?
- Describe how evidence of student learning will be documented and shared with wider audiences such as peers, parents, funders, school personnel, or other stakeholders.

5) Describe the project activities in detail.

- Identify which individual artists, performing groups, educators, or consultants will be involved, including their roles, qualifications, and responsibilities.
- What activities will build student interest and curiosity before the project begins?
- Describe a clear sequence of activities that will deepen students' interests, skills, and understanding to achieve the project's identified outcomes.
- How will students be guided in responding to/reflecting on their work or the work of others?

Budget

Applicant must submit a budget form.

Required Attachments

- List of key personnel
- Résumés for key personnel. ICA Teaching Artist résumés may be omitted
- Three letters of support
- Work samples, if applicable, ICA Teaching Artist work samples not required (*show the quality of art or services and must be from the last five years*)
- Support materials (*confirm the narrative by providing key evidence, recommended materials include schedules, lesson plans, and letters of support*)

Evaluation Criteria

[Download the evaluation rubric for this grant category.](#)

ARTS EDUCATION PROJECT**Evaluation Form**

EDUCATIONAL/ARTISTIC MERIT	5	4	3	2	1
The proposal identifies an Essential Question that will focus student learning					
Outcomes identify specific knowledge and skills that students will master.					
Activities are appropriate to deepen student's skills and understanding.					
Assessment is designed to determine if outcomes are understood and applied.					
Personnel involved (artists, consultants, teachers) are highly qualified.					
Support materials are high quality, aligned, and appropriate.					

Clarifying Comments or Questions:

Total

PLANNING, IMPLEMENTATION and EVALUATION	5	4	3	2	1
Outcomes reflect the identified needs of learners.					
The project description is clear and complete.					
Learning activities are clearly sequenced.					
Activities are designed to achieve project's identified outcomes.					
Evidence of student learning will be documented and shared.					
Evaluation findings inform ongoing planning and program refinement.					

Clarifying Comments or Questions:

Total

MANAGEMENT	5	4	3	2	1
The budget is complete, clear, and aligns with the narrative.					
Support is broad-based, including public and private sources.					
Roles and responsibilities of collaborating parties are identified and defined.					
Plan for communication with all parties is evident.					

Clarifying Comments or Questions:

Total

COMMUNITY INVOLVEMENT and ACCESS	5	4	3	2	1
Planning includes broad-based participation (teachers, parents, administrators).					
Plan includes appropriate publicity and community involvement.					
Plan includes accommodations for persons with disabilities.					
Plan includes efforts to identify and include underserved populations.					

Clarifying Comments or Questions:

Total

CITY COUNCIL STAFF REPORT

DATE: Monday, February 7, 2022



AGENDA ITEM TITLE

Amendment to Title 11, Chapter 2 of Moscow City Code (ACTION ITEM) - Cody Riddle

RESPONSIBLE STAFF

Cody Riddle, Deputy City Supervisor

REVIEWED BY

Transportation Commission and Administrative Committee

ADDITIONAL PRESENTER(S)

OTHER RESOURCES

DESCRIPTION

The City continues to see interest in the deployment of shared mobility devices. Staff previously prepared a draft amendment to the City Code to address the use of E-bikes, E-scooters and similar devices on the streets, sidewalks and pathways in anticipation of the likely increased use. Staff also prepared a draft license agreement for shared mobility providers that would regulate their operations and standards of performance. Both the amendment and agreement were reviewed and recommended for approval by the Transportation Commission in the spring of 2021. Similarly, the Administrative Committee recommended approval of both documents on July 12, 2021. The original proposal was not presented to City Council due to continued discussions with shared mobility providers.

Staff have continued to communicate with service providers interested in the deployment of e-assist devices. The University of Idaho has also been approached, and has indicated general support for accommodating the deployment, including on campus. During discussions with the shared mobility companies, staff shared concerns regarding potential conflicts with pedestrians in the downtown area and proposed reducing the speed limit to as low as six miles per hour (6 MPH) with the providers. The companies voiced concern about the proposed restriction due to safety concerns for riders using the devices on roadways. Staff is now proposing establishing a "dismount" or "no ride" zone for e-assist devices in the downtown area. This would restrict the use of these devices on sidewalks where the potential for conflict is greatest. In other areas of the City, they could be operated on sidewalks as detailed in the draft ordinance.

Staff presented the updated draft ordinance and agreement to the Administrative Committee on January 24, 2022. The Committee was supportive of both, and recommended approval of the ordinance with the "dismount zone". Staff will be seeking Council action on the ordinance only. It includes an effective date of June 1, 2022 for the dismount zone provision. This will allow City Staff adequate time to install appropriate signage to regulate this provision.

Staff will return to Council for approval of any signed license agreement entered into with mobility providers at a future date.

STAFF RECOMMENDATION

Approve the Ordinance under suspension of the rules requiring three complete and separate readings and that it be read by title and published by summary.

PROPOSED ACTIONS

PROPOSED ACTIONS: Approve the Ordinance under suspension of the rules requiring three complete and separate readings and that it be read by title and published by summary; or consider the Ordinance on first reading and that it be read by title; or reject the Ordinance; or take other action deemed appropriate.

FISCAL IMPACT

PERSONNEL IMPACT

ATTACHMENTS

1. Proposed Ordinance (PDF)
2. Resolution 2022-__ Shared Mobility Dismount Zone_final

ORDINANCE NO. 2022 -

AN ORDINANCE OF THE CITY OF MOSCOW, IDAHO, A MUNICIPAL CORPORATION OF THE STATE OF IDAHO; PROVIDING FOR THE AMENDMENT OF MOSCOW CITY CODE TITLE 11, CHAPTER 2, RELATING TO WALKWAYS AND BIKE PATHS; PROVIDING FOR THE REGULATION OF ELECTRIC POWER-ASSISTED BICYCLES, SCOOTERS, AND BOARDS; PROVIDING FOR THE REGULATION OF SHARED MOBILITY PROGRAMS; PROVIDING THAT THE PROVISIONS OF THIS ORDINANCE BE DEEMED SEVERABLE; AND PROVIDING FOR THIS ORDINANCE TO BE IN FULL FORCE AND EFFECT FROM THE DATE OF ITS PASSAGE, APPROVAL AND PUBLICATION ACCORDING TO LAW.

WHEREAS; Title 11, Chapter 2 of Moscow City Code establishes the purpose, definitions, and uses of Moscow Bike Paths and Walkways; and

WHEREAS, the Moscow Transportation Commission has completed a review of the chapter and has found it necessary to amend the Chapter to add regulations for Electric Power-Assisted Bicycles (E-bikes), Scooters (E-scooters), and Boards (E-boards) and have made such recommendation to the City Council; and

WHEREAS, the Moscow City Council has reviewed the recommendations of the Commission and concur with the proposed amendments;

NOW, THEREFORE, BE IT ORDAINED BY THE MAYOR AND COUNCIL OF THE CITY OF MOSCOW, IDAHO, AS FOLLOWS:

SECTION 1: All matters stated above are found to be true and correct and are incorporated herein by reference as if copied in their entirety and shall be adopted with the following sections of this Ordinance.

SECTION 2: That Moscow City Code Title 11, Chapter 2 be amended as follows:

~~WALKWAYS AND BIKE PATHS~~

~~Sec. 2-1: Purpose~~

~~Sec. 2-2: Definitions~~

~~Sec. 2-3: Bike Path and Walkway Map~~

~~Sec. 2-4: Restrictions on Use~~

~~Sec. 2-5: Exemptions~~

~~Sec. 2-6: Notice of Restriction~~

~~Sec. 2-7: Penalties~~

~~Sec. 2-1. — Purpose.~~

~~—The purpose of this Chapter is to promote public safety by regulating the use of motorized vehicles on bike paths and pedestrian walkways within the City.~~

~~Sec. 2-2. — Definitions.~~

~~—Except as hereinafter provided the definitions for terms contained herein as adopted under Idaho Code 49-101 through 49-124 shall be used.~~

~~A. *Bike Route.* Any area on a public street designated for bicycle use.~~

~~B. *Restricted Bike Paths and Pedestrian Walkways.* Paved pathways designated primarily for pedestrian and/or bicycle use and specifically designated as such on the City Bike Paths and Pedestrian Walkways map, and any revision thereto.~~

~~Sec. 2-3. — Bike Path and Walkway Map.~~

~~—A map of the City designated "Bike Paths and Pedestrian Walkways" and dated February 5, 1991, is hereby adopted and incorporated herein. Three (3) copies of this map shall be available for viewing by the public at the office of the Clerk. The Council may, from time to time, adopt revisions of this map by resolution.~~

~~Sec. 2-4. — Restrictions on Use.~~

~~—It is hereby declared to be unlawful for any person to operate or permit to be present a motorized vehicle upon any restricted bike path or pedestrian walkway identified pursuant to this Chapter.~~

~~(Ord. 2001-14, 08/20/2001)~~

~~Sec. 2-5. — Exemptions.~~

~~—A person is exempt from the restrictions of this Chapter where the operator of a motorized vehicle has displayed in the vehicle a permit to allow such person to operate a motorized vehicle on the restricted bike path or pedestrian walkway or has such written permission from the City, or the owner of the property if the restricted bike path or pedestrian walkway is on property not owned by the City. Emergency police and fire vehicles are exempted from restrictions in this Chapter. A motorized wheelchair or similar conveyance operated by a disabled person is also exempted from this Chapter~~

~~Sec. 2-6. — Notice of Restriction.~~

~~—All restricted bike paths and pedestrian walkways shall post notice of the restrictions in this Chapter. Pedestrians shall have the right of way over all but emergency vehicles.~~

~~Sec. 2-7. — Penalties.~~

~~Any person violating any of the provisions of this Chapter shall be guilty of a misdemeanor and, upon conviction thereof in a court of competent jurisdiction, shall be punished pursuant to this Code and the Idaho Code.~~

BICYCLES, E-BIKES, E-SCOOTERS, AND E-BOARDS

Sec. 2-1: Purpose

Sec. 2-2: Definitions

Sec. 2-3: General Standards

Sec. 2-4: Riding on Roadways

Sec. 2-5: Riding on Sidewalks

Sec. 2-6: Riding on Non-Motorized Pathways

Sec. 2-7: Bicycle, E-Bike, E-Scooter, and E-Board Parking

Sec. 2-8: Tampering Prohibited

Sec. 2-9: Abandonment

Sec. 2-10: Shared Mobility Programs

Sec. 2-11: Enforcement Agency

Sec. 2-12: Penalties

Sec. 2-1. Purpose

The purpose of this Chapter is to promote public safety by regulating the use of motorized vehicles, bicycles, E-bikes, E-scooters, and E-boards on roadways, bike lanes, sidewalks and non-motorized pathways within the City.

Sec. 2-2. Definitions

For the purposes of this chapter, the following terms, phrases, words, and derivations shall have the meaning given herein.

- A. Abandonment: A bicycle, E-bike, E-scooter, E-board, or any part thereof, that is left or remains unattended or unused in a public place for seventy-two (72) consecutive hours or longer after it is tagged with a notice of intention to abate.
- B. Bicycle: Every vehicle having two (2) tandem wheels, or two (2) parallel wheels and one forward wheel, any two (2) of which are not less than twelve inches (12") in diameter, that is designed to be operated from a seated position, propelled exclusively by human power upon which any person may ride, except scooters and similar devices.
- C. Bike Lane: A portion of a roadway designated for preferential or exclusive use by bicycles, E-bikes, E-scooters, or E-boards that is distinguished from that portion of the roadway to be used by motor vehicles by a painted strip and other pavement markings.
- D. Non-Motorized Pathway: A completely separate right-of-way posted and designated primarily for use by bicycles, E-bikes, E-scooters, E-boards, or pedestrians, including but not limited to the Paradise Path, Latah Trail, and Chipman Trail, University of Idaho Pedestrian Walkways and similar non-motorized pathways.
- E. Electric Power-Assisted Bicycle (E-bike): A vehicle having two (2) tandem wheels or two (2) parallel wheels and one forward wheel, any two (2) of which are not less than twelve inches (12") in diameter, that is designed to be operated from a seated position, by human power with the assistance of an electric motor. The device may be designed to also be powered by human propulsion. An E-bike is not a motor vehicle for purposes of this chapter.
- F. Electric Power-Assisted Boards (E-board): A wheeled device that has a floorboard, that is designed to be stood upon when riding, and is powered by an electric motor. The device may be designed to also be powered by human propulsion. An E-board is not a motor vehicle for purposes of this chapter.
- G. Electric Power-Assisted Scooter (E-scooter): A wheeled device that has handlebars, has a floorboard that is designed to be stood upon when riding, and is powered by an electric motor. The device may be designed to also be powered by human propulsion. An E-scooter is not a motor vehicle for purposes of this chapter.
- H. Obstructive Bicycle, E-bike, E-scooter, or E-board: Any bicycle, E-bike, E-scooter, E-board, or any part thereof, left in a public place that obstructs or impedes vehicular or pedestrian traffic.
- I. Operator: A person in exclusive control of a bicycle, E-bike, E-scooter or E-board and using the device.

- J. Station-based Shared Mobility Program: A system of self-service bicycles, E-bikes, E-scooters, E-boards or any combination thereof, for hire, operated by a station-based shared mobility program operator, which requires a bicycle rack and/or a bicycle, E-bike, E-scooter, or E-board sharing station.
- K. Stationless Shared Mobility Program: A system of self-service bicycles, E-bikes, E-scooters, E-boards, or any combination thereof, for hire, operated by a stationless shared mobility program operator, which does not require a bicycle rack or a bicycle, E-bike, E-scooter, or E-board sharing station.

Sec 2-3. General Standards.

- A. Every person, regardless of age, who operates a bicycle, E-bike, E-scooter, or E-board upon a roadway, public parking lot, sidewalk, bike path, bike lane or other public vehicular right-of-way in the City of Moscow ("City") shall be granted the same rights and shall be subject to the same responsibilities applicable to a motor vehicle operator by the laws of the State of Idaho, and the provisions of this title not in conflict with and as authorized under title 49 of the Idaho Code.
- B. All operators of bicycles, E-bikes, E-scooters and E-boards are expected to operate the devices in a safe manner as approved by the manufacturer.
- C. Exemption: Any peace officer as defined in Idaho Code, operating a bicycle, E-bike, E-scooter, or E-board in the course and scope of his/her official duties is exempt from the requirements of this chapter.

Sec. 2-4. Riding on Roadways.

- A. No person shall operate a bicycle, E-bike, E-scooter, or E-board on a roadway against the flow of motorized vehicular traffic, except where permitted by official signs or pavement markings.
- B. Every person operating a bicycle, E-bike, E-scooter, or E-board upon a two-way roadway is entitled to use the lane appropriate for the intended destination, including the right-hand lane. The bicycle, E-bike, E-scooter, or E-board rider shall proceed in the same direction of travel as other vehicles authorized to use that lane. On one-way roadways a bicycle, E-bike, E-scooter, or E-board may be operated in any existing lane.
- C. Wherever a bike lane is present upon a roadway, the operator of a bicycle, E-bike, E-scooter, or E-board shall use that lane and shall not use the roadway; except that the operator shall not be required to use or remain in a bike lane:
 - 1. When the lane is of insufficient width to permit safe bicycle, E-bike, E-scooter, or E-board operation; or
 - 2. When the condition of the pavement, or the presence of water, dirt, glass or other foreign objects upon the pavement prevents safe bicycle, E-bike, E-scooter, or E-board operation in the lane; or
 - 3. When moving into position to make a right or left turn; or
 - 4. When an opening car door or other obstruction in an adjacent parking lane requires movement out of the lane.
- D. The operator of a bicycle, E-bike, E-scooter, or E-board traveling at a rate of speed that delays a vehicle or vehicles following in the same lane shall be required, when it is unlawful or unsafe for the following vehicle to pass, to move as far to the right of the traveled roadway, or to the left where the bicycle, E-bike, E-scooter, or E-board is in the left lane of a one-way roadway,

as is safe under the conditions then existing; provided, however, that when the operator is within fifty feet (50') of an intersection, the operator shall not be required to move to the right or left until he/she has moved through the intersection.

- E. No person operating a bicycle, E-bike, E-scooter, or E-board may attach themselves or such bicycle or device to a moving motorized vehicle.
- F. Reckless or Inattentive Operation. A person who operates a bicycle, E-bike, E-scooter, or E-board on any public property or private property open to public use in an inattentive, reckless or careless manner, in light of the circumstances then existing, or without due caution and circumspection, or at such speed or in any other manner as to endanger or be likely to endanger any person or property shall be guilty of reckless or inattentive operation, which shall be a misdemeanor.

Sec. 2-5. Riding on Sidewalks.

- A. A bicycle, E-bike, E-scooter, or E-board may be operated upon a sidewalk and upon and within a crosswalk, except where prohibited by official traffic control devices, or when the number of pedestrians using the sidewalk renders riding on the sidewalk unsafe because of the risk of colliding with pedestrians, in which case the operator of a bicycle, E-bike, E-scooter, or E-board must dismount and walk the bicycle or device to an area where safe riding may resume.
- B. Any operator of a bicycle, E-bike, E-scooter, or E-board riding upon a sidewalk, or across a roadway upon and within a crosswalk, shall not exceed a speed of ten miles per hour (10 MPH) and shall yield the right-of-way to any pedestrian.
- C. Any operator of a bicycle, E-bike, E-scooter, or E-board riding on the sidewalk shall not suddenly leave a curb or other place of safety and move into the path of a vehicle that is so close as to constitute an immediate hazard.
- D. E-bikes, E-scooters, and E-boards are prohibited from operating on sidewalks within the downtown area, which is delineated on the "Dismount Zone" map as adopted by City Council by resolution, effective June 1, 2022. Copies of this map are available for viewing at the office of the City Clerk. The Council may, from time to time, adopt revisions of the Dismount Zone map by resolution.

Sec. 2-6. Riding on Non-Motorized Pathways.

- A. It is hereby declared to be unlawful for any person to operate or permit to be present a motorized vehicle upon any posted non-motorized pathway. A person is exempt from this restriction where the operator of a motorized vehicle has displayed in the vehicle a permit to allow such person to operate a motorized vehicle on the restricted bike path or pedestrian walkway, has written permission from the City, or has written permission from the owner of the property if the restricted bike path or pedestrian walkway is on property not owned by the City. Emergency police, fire, and EMS vehicles are exempted from restrictions in this Chapter. Motorized wheelchairs or similar conveyances operated by a disabled person shall also be exempted from this prohibition.
- B. Any operator of a bicycle, E-bike, E-scooter, or E-board riding upon a non-motorized pathway shall not exceed a speed of fifteen miles per hour (15 MPH) unless otherwise posted.
- C. Any operator of a bicycle, E-bike, E-scooter, or E-board riding upon a non-motorized pathway shall yield the right-of-way to any pedestrian.

Sec. 2-7. Bicycle, E-bike E-scooter, and E-board Parking.

Bicycles, E-bikes, E-scooters, or E-boards shall not be parked in such a manner as to obstruct or impede the movement of pedestrians, motor vehicles or other bicycles, E-bikes, E-scooters, or E-boards or to cause damage to trees, shrubs or other living plants.

Sec. 2-8. Tampering Prohibited.

It shall be unlawful for any person to tamper with, destroy, mutilate or alter any license receipt or license issued under the provisions of this Chapter. It shall be unlawful for any person to remove, destroy, mutilate or in any way alter or tamper with any license plate, sticker, or marking issued under the provisions of this Chapter.

Sec. 2-9. Abandonment and Right to Impound.

It shall be unlawful for any person to abandon a bicycle, E-bike, E-scooter, or E-board. The City shall have the right to impound and retain possession of any bicycle, E-bike, E-scooter, or E-board found to have been abandoned and dispose of the property pursuant to Idaho Code 55-403 and pursuant to the City's surplus policy. The City shall have the right to impound any bicycle, E-bike, E-scooter, or E-board that is found to be in violation of the provisions of this Chapter and may retain possession of such bicycle, E-bike, E-scooter or E-board until the provisions of this Chapter are complied with. A fee for impoundment and storage may be charged to the bicycle, E-bike, E-scooter, or E-board owner. The fee shall be set from time to time by resolution of the Council.

Sec. 2-10. Shared Mobility Programs.

- A. Application and License Agreement Required. Businesses, corporations, organizations, or individuals that provide stationless and station-based shared mobility programs are required to have a business license, insurance, and submit an application with the City, which includes the execution of a license agreement prior to deployment of any devices. Any deployment of bicycles, E-bikes, E-scooters, or E-boards prior to following the application, permitting and licensing process and receiving approval by the City to deploy such devices may result in misdemeanor charges and impoundment of devices deployed.
- B. Manufacturers and distributors of E-bikes, E-scooters and E-boards shall apply a label in legible type, that is permanently affixed in a prominent location, to each E-bike, E-scooter and E-board. The label shall contain the classification number, top assisted speed, motor wattage, and shall be printed in arial font in at least 9-point type.
- C. Every shared mobility program wishing to do business in the City shall obtain and retain a Shared Mobility business license prior to such program's operation in the City. Such license shall be issued annually. Failure to hold a current shared mobility program business license, or to renew an expired license within ten (10) days after its expiration, shall result in the immediate impounding of all shared mobility bicycles, E-bikes, E-scooters and E-boards until such license deficiency is remedied. The shared mobility program shall be liable for the daily expense of impounding the bicycles and devices until the license is renewed or the sale of the impounded bicycles and devices by the City.
- D. City may limit the maximum number of bicycles, E-bikes, E-scooters and E-boards that are deployed within City limits by a shared mobility program through a resolution.

Sec. 2-11. Enforcement Agency.

The Chief of Police or the Chief's designee shall be granted the authority to enforce and carry out the provisions of this Chapter.

Sec. 2-12. Penalties.

Any person violating any of the provisions of this Chapter, unless a specific penalty is proscribed, shall be guilty of an infraction and, upon conviction thereof in a court of competent jurisdiction, shall be punished pursuant to this Code and the Idaho Code.

SECTION 3: SEVERABILITY. Provisions of this Ordinance shall be deemed severable and the invalidity of any provision of this Ordinance shall not affect the validity of remaining provisions which can be given effect without the invalid provision. The remaining sections of Title 11 shall be in full force and effect.

SECTION 4: EFFECT ON OTHER ORDINANCES. Where the definitions contained in this Ordinance are in conflict with relevant portions of the City of Moscow, Idaho, Municipal Code, the definitions contained within those portions of the Moscow Municipal Code will be unaffected until such time, if any, as they are amended to be consistent with this Ordinance.

SECTION 5: ENFORCEMENT. The adoption of this Ordinance shall not, in any manner, affect any prosecution for violation of any other ordinance committed prior to the effective date of this Ordinance or be construed as a waiver of any license or penalty due under any other ordinance, or in any manner affect the validity of any action heretofore taken by the City of Moscow City Council, or the validity of any such action to be taken upon matters pending before the City Council on the effective date of this Ordinance.

SECTION 6: EFFECTIVE DATE. This Ordinance shall be effective upon its passage, approval, and publication according to law.

PASSED on Motion by the Following Vote:

	Aye	Nay	Abstain	Absent
Hailey Lewis	_____	_____	_____	_____
Gina Taruscio	_____	_____	_____	_____
Sandra Kelly	_____	_____	_____	_____
Maureen Laflin	_____	_____	_____	_____
Anne Zabala	_____	_____	_____	_____
Julia Parker	_____	_____	_____	_____

ADOPTED by the City Council of the City of Moscow, Idaho and **APPROVED** by the Mayor of the City of Moscow, this ____ day of February, 2022.

Art Bettge, Mayor

CERTIFICATION and ATTESTATION. I hereby certify that the above is a true copy of an Ordinance passed at a regular meeting of the City Council, City of Moscow, held on the ____ day of _____, 2022.

Laurie M. Hopkins, City Clerk

RESOLUTION NO. 2022 – ____

A RESOLUTION OF THE CITY OF MOSCOW, IDAHO, A MUNICIPAL CORPORATION OF THE STATE OF IDAHO; PROVIDING FOR THE ADOPTION OF A MAP DISPLAYING THE BOUNDARIES OF THE DISMOUNT ZONE; PROVIDING FOR THE PROHIBITION OF ELECTRIC ASSIST BIKES, SCOOTERS AND BOARDS FROM OPERATING ON SIDEWALKS IN A SPECIFIED AREA WITHIN DOWNTOWN; PROVIDING THIS RESOLUTION TO BE EFFECTIVE ON JUNE 1, 2022.

WHEREAS, the Amended Title 11, Chapter 2 was approved and adopted by the Mayor and City Council of the City of Moscow as Ordinance 2022-__ on February 7, 2022; and

WHEREAS, Council wishes to provide for the prohibition of electric assist bikes, scooters and boards from operating on sidewalks in specified areas within downtown which shall be depicted on a “Dismount Zone” map as authorized by Section 2-5 D. of the new Title 11, Chapter 2;

NOW, THEREFORE, BE IT RESOLVED by the Mayor and City Council of the City of Moscow, Idaho as follows:

Section 1: All matters stated above are found to be true and correct and are incorporated herein by reference as if copied in their entirety and shall be adopted with the following sections of this Resolution.

Section 2: Attachment A shall be the approved map displaying the boundaries of the “Dismount Zone” as authorized by Moscow City Code Title 11, Chapter 2, Section 2.5.D effective until amended or revised by Resolution.

Section 3: That this Resolution shall become effective on June 1, 2022.

PASSED on Motion by the Following Vote:

	Aye	Nay	Abstain	Absent
Hailey Lewis	_____	_____	_____	_____
Gina Taruscio	_____	_____	_____	_____
Sandra Kelly	_____	_____	_____	_____
Maureen Laflin	_____	_____	_____	_____
Anne Zabala	_____	_____	_____	_____
Julia Parker	_____	_____	_____	_____

ADOPTED by the City Council of the City of Moscow, Idaho and **APPROVED** by the Mayor of the City of Moscow, this ____ day of _____, 2022.

Art Bettge, Mayor

CERTIFICATION and ATTESTATION. I hereby certify that the above is a true copy of a Resolution passed at a regular meeting of the City Council, City of Moscow, held on _____ and attest to the Mayor's signature.

Laurie M. Hopkins, City Clerk

DRAFT

DISMOUNT ZONE

Effective June 1, 2022



CITY COUNCIL STAFF REPORT

DATE: Monday, February 7, 2022



AGENDA ITEM TITLE

Emergency Radio Professional Services Agreement – Bill Belknap

RESPONSIBLE STAFF

Bill Belknap, Deputy City Supervisor - Community Planning and Design

REVIEWED BY

ADDITIONAL PRESENTER(S)

OTHER RESOURCES

DESCRIPTION

In 2015, the City Council identified the City's emergency radio communications system's deficiencies as a Tier 1 major challenge for the City. The City's current communication system has only one channel and three repeaters for an area of less than seven square miles. Because repeaters aren't trunked or coordinated, officers must hunt for channels to locate the appropriate repeater to transmit calls, which places officers at risk. Officers currently experience a 5-10% transmittal failure due to dead zones throughout the patrol area, resulting in delayed notification and delayed officer response, both of which have escalated risk to citizens, officers and property. Overall, the ability to quickly intervene has declined as the communication system has deteriorated and calls for service have increased.

The City has commissioned several studies, including a needs assessment, radio coverage assessments, as well as an implementation plan and cost estimate. The current estimate for the project is \$3.4 Million, including the installation of a new simulcast system backbone and the replacement of all existing mobile and handheld radios. The City has accumulated funding for the project and is ready to begin the final design and construction of the communication network. The attached professional services agreement covers the design, FCC licensing, cost estimation, system procurement, and acceptance testing of a new VHF simulcast system and microwave radio interconnect system for the City of Moscow Public Safety radio system. It is anticipated that it will take approximately 24 months to complete the project.

STAFF RECOMMENDATION

Approve the proposed Professional Services Agreement with Hatfield & Dawson Consulting Engineers.

PROPOSED ACTIONS

PROPOSED ACTIONS: Approve the proposed Professional Services Agreement with Hatfield & Dawson Consulting Engineers; or take other action deemed appropriate.

FISCAL IMPACT

PERSONNEL IMPACT

ATTACHMENTS

1. Hatfield and Dawson Professional Services Agreement

**AGREEMENT FOR PROFESSIONAL SERVICES
FOR CITY OF MOSCOW VHF EMERGENCY RADIO SYSTEM DESIGN, LICENSING
AND IMPLEMENTATION BETWEEN CITY OF MOSCOW, IDAHO AND
HATFIELD & DAWSON CONSULTING ENGINEERS**

THIS AGREEMENT FOR PROFESSIONAL SERVICES FOR CITY OF MOSCOW VHF EMERGENCY RADIO SYSTEM DESIGN, LICENSING AND IMPLEMENTATION (hereinafter “Agreement”), is made and entered into this ____ day of _____, 2022, by and between City of Moscow, Idaho, a municipal corporation of the State of Idaho, 206 East Third Street, Moscow, Idaho, 83843 (hereinafter “CITY”), and Hatfield & Dawson Consulting Engineers, a corporation of the State of Washington, licensed to conduct business in the State of Idaho, with offices located at 9500 Greenwood Avenue North, Seattle, Washington, 98103 (hereinafter “CONSULTANT”).

WITNESSETH:

WHEREAS, CITY intends to design, license, construct and activate a new emergency radio communications system pursuant to the Scope of Work (hereinafter the “Project”); and

WHEREAS, CITY requires the services of a duly qualified design professional to perform the services required by this Agreement; and

WHEREAS, CONSULTANT warrants that it is fully licensed, qualified, and willing to perform the services required by this Agreement and that it has reviewed and is aware of CITY's plans with respect to the Project; and

WHEREAS, CITY desires to engage CONSULTANT to provide industry standard services necessary to complete the Project;

NOW, THEREFORE, it is agreed, for and in consideration of the mutual covenants and promises between the Parties hereto, as follows:

SECTION 1: THE PROJECT

This Agreement is for professional services for the design, FCC licensing, cost estimation, system procurement, and acceptance testing of a new VHF simulcast system and microwave radio interconnect system for the City of Moscow Public Safety radio system. The proposed system is anticipated to include all elements as detailed in the System Alternatives Report from Hatfield & Dawson, Dated January 25, 2021, as modified to include the Well 10 repeater site in lieu of the Theophilus Tower repeater site (Attachment “A”), and the implementation of four voting receiver sites as shown in the Well 10 coverage map report (Attachment “B”).

SECTION 2: SCOPE OF WORK

CONSULTANT shall furnish services for the Project as outlined in Attachment “C” (Scope of Work City of Moscow VHF Emergency Radio System Design and Implementation) of this Agreement, which is adopted and incorporated herein.

SECTION 3: COMPENSATION

The total cost to CITY for Consulting Services for the Project, as described in Section 1 and 2, shall be an amount not to exceed Forty-Eight Thousand Dollars (\$48,000.00) for work performed by CONSULTANT as shown in Attachment “D” (Compensation for Services) of this Agreement.

SECTION 4: CONSULTANT RESPONSIBILITIES

CONSULTANT shall complete the entire work on Project. Such work shall be conducted in a good and workmanlike manner which meets or exceeds industry standards.

CONSULTANT shall release all rights to the Project after receipt of the final payment.

CONSULTANT shall not use or sell the work created pursuant to this Agreement, without express written authorization by CITY.

CONSULTANT shall release any Copyright rights to the work created for the Project, at no additional cost to CITY.

SECTION 5: CITY RESPONSIBILITIES

CITY shall make available to CONSULTANT all technical data of record in CITY’s possession required by CONSULTANT relating to this Project.

SECTION 6: PROJECT SCHEDULE

CONSULTANT shall achieve final completion of the Project in accordance with the Project Schedule as detailed in Attachment “E” (Project Schedule of Performance) of this Agreement. In the event of unavoidable delays beyond CONSULTANT’s control, CONSULTANT, upon concurrence of CITY, shall be granted a reasonable extension. The length of extensions due to such delays shall be as determined by CITY. CITY shall be notified of such delays or potential delays within two (2) working days of CONSULTANT’s knowledge of such delays.

SECTION 7: INDEPENDENT CONTRACTOR

CITY and CONSULTANT hereto warrant by their signatures that no employer/employee relationship is established between CITY and CONSULTANT by the terms of this Agreement. It is understood by the Parties hereto that CONSULTANT is an independent contractor and, as such, neither it nor its employees, if any, are employees of CITY for purposes of tax, retirement system, or social security (FICA) withholding.

SECTION 8: TERMINATION

A. Termination of Agreement

This Agreement may be terminated by CONSULTANT upon thirty (30) days’ written notice, should CITY fail to substantially perform in accordance with its terms through no fault of CONSULTANT. CITY may terminate this Agreement with thirty (30) days’ written notice without cause and without further liability to CONSULTANT, except as designated by this Section. In the event of termination, CONSULTANT shall be paid for services performed to termination date, including direct expenses and a pro rata share of the fees based upon work completed. All Deliverables, whether partially or fully completed, related to the Project, produced by CONSULTANT as part of Project services, shall become the property of, and shall be surrendered to CITY at or before such termination and prior to payment. However,

CITY agrees that all Deliverables provided or prepared by CONSULTANT are intended for the purposes of this Agreement only and any reuse or modification of the Deliverables by CITY or others for any other project or purpose shall be at CITY's or other's sole risk and without liability to CONSULTANT. CONSULTANT may retain copies of all Deliverables for its records.

B. Termination of the Project

If any portion of the Project covered by this Agreement shall be suspended, abated, abandoned or terminated, CITY shall pay CONSULTANT for the services rendered to the date of such suspended, abated, abandoned or terminated work; the payment to be based, insofar as possible, on the amounts established in this Agreement or, where this Agreement cannot be applied, the payment shall be based upon a reasonable estimate as mutually agreed upon between the Parties as to the percentage of the work completed.

SECTION 9: INSURANCE AND LIABILITY

A. Consultant's Professional Liability Insurance

In performance of professional services, CONSULTANT will use that degree of care and skill ordinarily exercised under similar circumstances by members of the consulting profession; and no warranty, either expressed or implied, is made in connection with rendering CONSULTANT's services. Should CONSULTANT or any of CONSULTANT's agents or employees be found to have been negligent in the performance of professional services from which CITY sustains damage, CONSULTANT has obtained Professional Liability Insurance in the amount of One Million Dollars (\$1,000,000), and said insurance shall be held active for a two (2) year (minimum) period from the date of completion of the Project. CITY shall receive notice of any pending termination of said insurance within five (5) days of first notice to CONSULTANT.

B. Consultant's Additional Insurance

CONSULTANT shall maintain automobile insurance and statutory workers' compensation insurance coverage, employer's liability, and comprehensive general liability insurance coverage. The comprehensive general liability insurance shall have a minimum limit of Five Hundred Thousand Dollars (\$500,000) per claim and One Million Dollars (\$1,000,000) aggregate, and CONSULTANT shall cause CITY to be named as an additional insured under said policy.

C. Indemnification

CONSULTANT agrees, to the fullest extent permitted by law, to indemnify and hold harmless CITY against damages, liability and costs arising from the negligent acts of CONSULTANT in the performance of professional services under this Agreement, to the extent that CONSULTANT is responsible for such damages, liabilities and costs on a comparative basis of fault and responsibility between CONSULTANT and CITY. CONSULTANT shall not be obligated to indemnify CITY for CITY's own negligence.

SECTION 10: CONFLICT OF INTEREST

CONSULTANT covenants that it presently has no interest and will not acquire any interest, direct or indirect, in the Project which would conflict in any manner or degree with the performance of services hereunder. CONSULTANT further covenants that, in performing this Agreement, it will

employ no person who has any such interest. Should any conflict of interest arise during the performance of this Agreement, CONSULTANT shall immediately disclose such conflict to CITY.

SECTION 11: ENTIRE AGREEMENT, MODIFICATION AND ASSIGNABILITY

This Agreement, and the exhibits hereto, contain the entire Agreement between the Parties concerning the Project, and no statements, promises, or inducements made by either Party, or agents of either Party, are valid or binding unless contained herein. This Agreement may not be enlarged, modified, or altered except upon written agreement signed by the Parties hereto. CONSULTANT shall not subcontract, transfer, sell, or assign its rights (including the right to compensation) or duties arising hereunder without the prior written consent and express authorization of CITY. Any such subcontractor or assignee shall be bound by all of the terms and conditions of this Agreement as if named specifically herein.

SECTION 12: LICENSES AND ADHERENCE TO LAW REQUIRED

CONSULTANT represents that it possesses the skill and experience necessary and all licenses required to perform the services under this Agreement. CONSULTANT further agrees to comply with all applicable federal, state and local statutes and regulations in the performance of the services hereunder and such laws and regulations are hereby made a part of this Agreement and shall be adhered to at all times. Violation of any of these statutes and/or regulations by CONSULTANT shall be deemed material and shall subject CONSULTANT to termination of this Agreement for cause. No pleas of misunderstanding or ignorance on the part of CONSULTANT will, in any way, serve to modify the provisions of this requirement. CONSULTANT and its surety shall defend, hold harmless, and indemnify CITY and its employees, agents, and representatives, against any claim or liability arising from or based on the violation of any such laws, codes, ordinances, or regulations, whether by CONSULTANT, CONSULTANT's officers, agents, employees, or its subcontractors. CONSULTANT certifies it is not currently engaged in, and will not for the duration of the Agreement engage in, a boycott of goods and services from Israel or territories under its control. Failure to comply with Idaho Code §67-2346 will result in this Agreement being void as against public policy.

SECTION 13: NON-DISCRIMINATION

It is illegal under the U.S. Federal law to discriminate against an employee, either intentionally or through disparate impact, on account of race, color, gender, religion, sex (including pregnancy), national origin, physical or mental disability, age, marital or familial status, sexual orientation, and gender expression or identity. CONSULTANT shall not discriminate against any employee or applicant for employment. CONSULTANT's action under this Section shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. CONSULTANT agrees to post in conspicuous places, available to employees and other applicants for employment, notices setting forth the provisions of this Non-Discrimination Section.

SECTION 14: LEGAL FEES

In the event either Party incurs legal expenses to enforce the terms and conditions of this Agreement, the prevailing Party is entitled to recover attorney's fees and other costs and expenses, whether the same are incurred with or without suit.

SECTION 15: JURISDICTION, VENUE AND NON-WAIVER

It is agreed that this Agreement shall be construed under and governed by the laws of the State of Idaho. In the event of litigation concerning it, it is agreed that proper venue shall be the District Court of the Second Judicial District of the State of Idaho, in and for the County of Latah. Failure of either Party to exercise any of the rights under this Agreement, or breach thereof, shall not be deemed to be a waiver of such right or a waiver of any subsequent breach.

SECTION 16: BINDING ON SUCCESSORS

CITY and CONSULTANT each bind themselves, their partners, successors, assigns, and legal representatives to the other Party to this Agreement and to the partner, successors, assigns and legal representatives of such other Party with respect to all covenants of this Agreement.

SECTION 17: NOTICES AND COMMUNICATION

Any and all notices required to be given by either of the Parties hereto, unless otherwise stated in this Agreement, shall be in writing and be deemed communicated when mailed in the United States mail, certified, return receipt requested, addressed as follows:

CONSULTANT

Hatfield & Dawson Engineers
9500 Greenwood Ave. N
Seattle, Washington, 98103
(206) 783-9151

CITY

City of Moscow, Idaho
City Supervisor
206 East Third Street
P O Box 9203
Moscow, ID 83843
(208) 883-7011

Either Party may change their address for the purpose of this paragraph by giving written notice of such change to the other in the manner herein provided.

CITY shall designate a representative authorized to act on behalf of CITY. The authorized representative shall examine the documents of the work as necessary, and shall render decisions related thereto in a timely manner so as to avoid unreasonable delays.

SECTION 18: NON-APPROPRIATION

This Agreement is contingent upon CITY receiving the necessary funding to fulfill the obligations of CITY. While the CITY shall exercise good faith, in the event that such funding is not received or appropriated, then, and in that event, CITY's obligations under this Agreement shall cease and each Party shall be released from further performance under this Agreement without any liability to the other Party.

SECTION 19: APPROVAL REQUIRED AND SEVERABILITY

This Agreement shall not become effective or binding until approved by the City of Moscow. If any part of this Agreement is held to be invalid or unenforceable, such holding will not affect the validity or enforceability of any other parts of this Agreement as long as the remainder of the Agreement is reasonably capable of completion.

IN WITNESS WHEREOF, said CONSULTANT and CITY have caused this Agreement to be executed on the day and year first above written.

Hatfield & Dawson

City of Moscow, Idaho

Art Bettge, Mayor

Laurie M. Hopkins, City Clerk

ACKNOWLEDGMENT

On this ____ day of _____, 2022, before me, a Notary Public in and for said State, appeared _____, known to me to be the person named above and acknowledged that he executed the foregoing as the duly authorized representative of Hatfield & Dawson Consulting Engineers

PROFESSIONAL SERVICES AGREEMENT CITY AND HATFIELD & DAWSON CONSULTING ENGINEERS
VHF EMERGENCY RADIO SYSTEM DESIGN, LICENSING AND IMPLEMENTATION

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SYSTEM ALTERNATIVES REPORT RADIO SYSTEM UPGRADE PROJECT

PREPARED FOR:



Hatfield & Dawson Consulting Engineers
January 25, 2021

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Table of Contents

1. Executive Summary.....	1
A. VHF Conventional Simulcast System.....	1
1. Moscow Mountain	1
2. Theophilus Tower (University Of Idaho Campus).....	1
3. KUID-TV Site On Paradise Ridge.	1
B. 700 MHz Trunked System Alternatives	2
1. Moscow Mountain	2
2. Theophilus Tower (University Of Idaho Campus).....	2
3. KUID-TV Site On Paradise Ridge.	2
C. Recommendations	5
2. Introduction.....	6
A. VHF Conventional Simulcast System.....	6
4. Moscow Mountain	6
5. Theophilus Tower (University Of Idaho Campus).....	6
6. KUID-TV Site On Paradise Ridge.	6
B. 700 MHz Trunked System Alternatives	7
7. Moscow Mountain	7
8. Theophilus Tower (University Of Idaho Campus).....	7
9. KUID-TV Site On Paradise Ridge.	7
3. Coverage Requirements And Coverage & Reliability Standards	11
A. Coverage Requirements	11
B. Proposed Coverage And Reliability Standards	13
1. Tsb-88 – Lmr Industry Guidelines For Coverage Prediction And Verification ..	13
2. Delivered Audio Quality (DAQ).....	13
3. Proposed Daq Objectives	14
4. Time And Location Variability.....	15
5. Received Signal Strength For “Desirable” Coverage (DAQ 3.4; 95% Probability) – VHF System.....	15
6. Additional Margin Required For 95% Probability For DAQ 3.4.....	16

7. Received Signal Strength For “Minimally Acceptable” Coverage (DAQ 3.0; 90% Probability) – VHF System.....	17
8. Additional Margin Required For 90% Probability For DAQ 3.0.....	18
9. Received Signal Strength For “Desirable” Coverage (DAQ 3.4; 95% Probability) – 700 MHz System	18
10. Additional Margin Required For 95% Probability For DAQ 3.4	20
11. Received Signal Strength For “Minimally Acceptable” Coverage (DAQ 3.0; 90% Probability) – 700 MHz System.....	20
12. Additional Margin Required For 90% Probability For DAQ 3.0	21
13. Proposed Coverage Standards.....	22
14. Outbound And Inbound Coverage	22
4. FCC Licensing Analysis For Proposed New Frequencies For Simulcast Systems .	23
A. Interference Analysis – Existing Moscow Fire Department Primary Dispatch Repeater Input Channel (151.1300 MHz)	23
B. Continued Use Of 151.1300 MHz In The Proposed City Of Moscow VHF System	28
C. Contour Overlap Criteria For FCC Licensing Of VHF Analog Narrowband Systems	29
D. Contour Maps For Proposed New Frequencies	30
E. City Of Moscow VHF Simulcast System – New Tac Repeater Input And Output Frequencies And New Fire Dispatch Repeater Input Frequency	31
F. Proposed New City Of Moscow VHF Frequencies	32
5. Proposed Configuration Of VHF Simulcast System.....	48
A. VHF Simulcast System – Configuration Of Channels	48
B. VHF Transmitter Combiner, Receiver Multicoupler And Antenna Systems.....	51
C. VHF System Console Interface	52
D. VHF System Simulcast And Receiver Voting Equipment Configuration.....	52
E. VHF Backup Power Systems	53
F. VHF Coverage Prediction Maps	53
1. VHF Coverage Map Signal Power/Color Key	53
2. VHF Analog Narrowband Coverage Maps	55
3. Talk-Out (Outbound) Maps	56
4. VHF Talk-In (Inbound) Maps	56

5.	VHF Simulcast Delay Spread Maps	57
6.	VHF Simulcast Coverage Reliability Maps	57
7.	City Of Moscow VHF Simulcast System Maps	58
6.	Proposed Configuration Of 700 MHz Simulcast System	76
A.	Console Interface With Whitcom Dispatch Center	77
B.	Availability Of 700 MHz Channels	77
C.	700 MHz System Capacity	77
D.	Transmitter Combining, Receiver Multicoupler And Antenna Systems	78
E.	Backup Power Systems	78
F.	700 MHz Coverage Prediction Maps	78
G.	700 MHz Coverage Map Signal Power/Color Key	79
H.	700 MHz P25 Phase 1 Coverage Maps	81
I.	700 MHz Talk-Out (Outbound) Maps	81
J.	700 MHz Talk-In (Inbound) Maps	81
K.	700 MHz Simulcast Delay Spread Maps	82
L.	700 MHz Simulcast Coverage Reliability Maps	83
M.	City Of Moscow 700 MHz Simulcast System Maps	83
7.	Microwave Interconnect System	101
8.	Proposed VHF Simulcast System Cost Estimate	105
9.	Proposed Stand-Alone 700 MHz Simulcast System Cost Estimate	109
10.	Proposed City Of Moscow/ Idaho 700 MHz Public Safety Radio Network 700 MHz Simulcast System Cost Estimate	111
11.	VHF Single Band Subscriber Units (Mobile And Portable Radios)	113
12.	700/800 MHz/VHF Dual Band Subscriber Units (Mobile And Portable Radios)	114
13.	Comparison Of Alternatives	115
A.	VHF Conventional Simulcast System	115
1.	Advantages - VHF System	115
2.	Disadvantages - VHF System	116
B.	700 MHz Systems (Both Alternatives)	118
1.	Advantages – 700 MHz Systems (Both Alternatives)	118
2.	Disadvantages – 700 MHz Systems (Both Alternatives)	119
C.	700 MHz Systems (Stand-Alone System)	119

1. Advantages – 700 MHz Stand-Alone System	119
2. Disadvantages – 700 MHz Stand-Alone System.....	119
D. 700 MHz System – “Shared System” (With Idaho 700 MHz Public Safety Radio Network	120
1. Advantages – 700 MHz “Shared System” (With Idaho 700 MHz Public Safety Radio Network)	120
2. Disadvantages – 700 MHz “Shared System” (With Idaho 700 MHz Public Safety Radio Network)	120
14. RECOMMENDATIONS	120

APPENDICES

APPENDIX 1 – BASIS AND DERIVATION OF RECEIVED SIGNAL POWER AND BER REQUIREMENTS

APPENDIX 2 - PATH ANALYSIS AND INTERFERING SIGNAL LEVEL CALCULATIONS FOR CO-CHANNEL INTERFERING SIGNALS ON MFD PRIMARY DISPATCH REPEATER INPUT CHANNEL (151.1300 MHz)

APPENDIX 3 – VHF TRANSMITTER COMBINER AND RECEIVER MULTICOUPLER SYSTEMS

APPENDIX 4 – REGION 12 700 MHz CHANNEL LIST FOR LATAH COUNTY

APPENDIX 5 – MICROWAVE SYSTEM PATH PROFILES AND RELIABILITY CALCULATIONS

APPENDIX 6 – COST ESTIMATES FOR PROPOSED VHF AND 700 MHz SYSTEM ALTERNATIVES

APPENDIX 7 - SUBSCRIBER EQUIPMENT & SYSTEM MAINTENANCE REQUIREMENTS AND P25 COMPLIANCE ANALYSIS & COSTS

APPENDIX 8 – LICENSED AND QUASI-LICENSED MICROWAVE RADIO SYSTEMS

1. EXECUTIVE SUMMARY

This System Alternatives Report contains an analysis of alternatives for upgrades and improvements to the City of Moscow Police Department, Fire Department and Public Works radio systems. The alternatives described and analyzed in the report include:

A. VHF Conventional Simulcast System

Continuing operation in the VHF frequency band in conventional mode along with implementation of a 3-site simulcast system with conventional channels for Moscow Police Department, Moscow Fire Department and the City of Moscow Public Works Department. The VHF simulcast system would use base station repeater sites at the following locations:

1. Moscow Mountain
2. Theophilus Tower (University of Idaho Campus)
3. KUID-TV site on Paradise Ridge.

In addition to the base station repeater sites, two voting receiver sites would be used to improve in-building inbound (portable radio-to-base station) coverage within the City of Moscow, one at the Northwest Water Tower and the other at the Vista Water Tank.

This system would maintain existing coverage beyond the boundaries of the City of Moscow

The proposed VHF system would include two new shared repeated tactical repeater channels and a replacement repeater input channel for the Moscow Fire Department dispatch channel repeater (the existing channel is subject to extensive co-channel interference that degrades its performance).

As described in the Needs Assessment Report (also prepared by Hatfield & Dawson as part of the scope for this project), Moscow Fire Department had requested four VHF tactical channels and Moscow Police Department had requested one VHF tactical channel, for a total of five new tactical channels that would have been added to the VHF system if the additional VHF channels were available. However, after a thorough search of the VHF frequency band for available channels that could be licensed at the three sites in the system, only two pairs of channels that could be used for repeated tactical channels were found. The VHF frequency band is very congested, even in more rural areas, and

it was not possible to provide any additional frequencies that could be used for additional tactical channel repeaters.

The VHF system would employ existing single band mobile and portable radios, which would be replaced with new single-band radios over time (many of the existing radios used in the City of Moscow radio systems are no longer supported by the equipment manufacturers).

The new VHF system would incorporate a new interconnect system consisting of both fiber and microwave links, as described in detail in this report. The interconnect system would provide connections to the repeater sites, the voting receiver sites and the Whitcom dispatch center.

B. 700 MHz Trunked System Alternatives

Migration to a 700 MHz Project 25 trunked radio system along with implementation of a 3-site simulcast system for Moscow Police Department, Moscow Fire Department and the City of Moscow Public Works Department. The 700 MHz simulcast system would use base station repeater sites at the following locations:

1. Moscow Mountain
2. Theophilus Tower (University of Idaho Campus)
3. KUID-TV site on Paradise Ridge.

The proposed 700 MHz system would use 5 voice channels plus a control channel, which would provide sufficient capacity for both primary dispatch talkgroups and multiple tactical talkgroups for MPD and MFD, as well as a primary talkgroup for Public Works and a separate talkgroup for traffic control and other non-dispatch communications.

The 700 MHz system would employ dual-band mobile and portable radio equipment in order to maintain the existing VHF communications capabilities required for interoperability with other surrounding jurisdictions, which will continue to operate in the VHF frequency band. As described in detail in the report, there are dual-band 700 MHz/VHF P25 trunked radios available from multiple manufacturers.

Two alternatives for implementation of the 700 MHz radio system are analyzed in the report:

- A stand-alone 700 MHz system, including a new master site (system core).
- A 700 MHz sub-system operating on the Idaho 700 MHz Public Safety Radio Network. This system configuration would use the existing State of Idaho system master site (system core), and would allow seamless interoperable communications with State and Federal agencies. Operation in this system would require a monthly per-radio Subscriber Fee to cover the costs of system maintenance and upgrades.

The new 700 MHz system would incorporate a new interconnect system consisting of new microwave links, as described in detail in this report. The interconnect system would provide connections to the repeater sites, and the Whitcom dispatch center. A separate microwave link over the State of Idaho Microwave Radio System would provide the connection from the City of Moscow system back to the Idaho 700 MHz Public Safety Radio Network master site (system core) in Ada County.

This report includes an initial analysis of both coverage requirements and the coverage and reliability standards that provide the basis for the coverage analysis shown in the VHF and 700 MHz coverage maps that are included in the report.

The report also includes the results of a detailed VHF frequency search for additional available VHF channels to provide for the capacity needs identified in the Needs Assessment Report, and the frequency coordination and licensing details for five new VHF frequencies proposed for use in the new VHF radio system.

The estimated capital and recurring costs of each system alternative are summarized below with the alternatives ordered from lowest cost to highest cost:

VHF Conventional Simulcast System (Assuming ODU 600 Microwave System)

Capital Costs				\$1,932,500
Recurring O&M Costs				\$1,869,000
System Lifecycle Costs (Capital Costs + Recurring O&M Costs)				\$3,801,500

700 MHz Trunked Simulcast System (Shared System – with Idaho 700 MHz Public Safety Radio Network)

Capital Costs				\$3,697,133
Recurring O&M Costs				\$2,277,200
System Lifecycle Costs (Capital Costs + Recurring O&M Costs)				\$5,974,333

700 MHz Trunked Simulcast System (Stand-Alone System)

Capital Costs				\$4,447,133
Recurring O&M Costs				\$4,763,300
System Lifecycle Costs (Capital Costs + Recurring O&M Costs)				\$9,210,433

Subscriber units for both the VHF alternative and the 700 MHz alternatives are available from multiple manufacturers. The 700 MHz alternative use dual-band 700/800 MHz/VHF radios (which are significantly more expensive than single-band radios) in order to maintain existing interoperability with agencies in adjacent jurisdictions. Estimated cost ranges for the replacement of existing City of Moscow subscriber units (mobile and portable radios, many of which are well beyond their “end-of-life” dates) are shown below:

VHF Simulcast System Alternative – Conventional Single-Band Mobile and Portable Radio Costs

Radio Type	Quantity	Low End Cost	High End Cost
Intrinsically Safe Portable Radio (FIRE)	150	\$ 249,150	\$ 422,018
Non-Intrinsically Safe Portable Radio	73	\$ 82,654	\$ 166,761
Mobile Radio	98	\$ 211,375	\$ 330,873
Totals	321	\$ 543,179	\$ 919,651

700 MHz Simulcast System Alternatives – Trunked Dual-Band Mobile and Portable Radio Costs

Radio Type	Quantity	Low End Cost	High End Cost
Intrinsically Safe Portable Radio	150	\$ 648,000	\$ 1,275,083
Non-Intrinsically Safe Portable Radio	73	\$ 280,320	\$ 577,908
Mobile Radio	98	\$ 194,040	\$ 745,446
Totals	321	\$ 1,122,360	\$ 2,598,437

(The subscriber unit replacement costs are identical for both 700 MHz alternatives.)

C. Recommendations

If funding of the “shared system” 700 MHz system alternative does not appear to be feasible, then the proposed VHF conventional system alternative is recommended.

Because the implementation of either of the system alternatives described in the report will take a significant period of time, the replacement of the existing Moscow Fire Department’s repeater input channel with the new channel described the report should be performed as a first step (irrespective of the long-term system alternative being implemented) in order to eliminate the existing degradation of MFD’s coverage caused by co-channel interference.

If it is possible to obtain funding for the 700 MHz “shared system” alternative, which uses the master site on the existing Idaho 700 MHz Public Safety Radio Network, then this is the recommended alternative.

This alternative provides long-term protection against degradation of coverage that is likely to result from increasing noise levels in the VHF band, as well as the potential for interference from co-channel stations that may be coordinated and licensed in the future. It also provides the increased radio traffic capacity that comes along with a trunked radio system and it provides increased interoperability with state and federal agencies compared to the VHF conventional system alternative.

If funding of the “shared system” 700 MHz system alternative does not appear to be financially feasible, then the proposed VHF conventional system alternative should be implemented. Although the proposed VHF system does not provide all of the additional capacity requested by MFD and MPD, it does provide two additional repeated tactical channels that can be used on a “shared” basis and assigned by dispatch as needed. The risk of long-term coverage degradation due to noise and interference in the VHF band and the potential for future co-channel interference is offset somewhat by the system design and by the selection of repeater input frequencies for the proposed system.

Because the implementation of either of the system alternatives described above will take a significant period of time, the replacement of the existing Moscow Fire Department’s repeater input channel with the new channel described above in this report should be performed as a first step (irrespective of the long-term system alternative being implemented) in order to eliminate the existing degradation of MFD’s coverage caused by co-channel interference.

2. INTRODUCTION

This System Alternatives Report contains an analysis of alternatives for upgrades and improvements to the City of Moscow Police Department, Fire Department and Public Works radio systems. The alternatives described and analyzed in the report include:

A. VHF Conventional Simulcast System

Continuing operation in the VHF frequency band in conventional mode along with implementation of a 3-site simulcast system with conventional channels for Moscow Police Department, Moscow Fire Department and the City of Moscow Public Works Department. The VHF simulcast system would use base station repeater sites at the following locations:

4. Moscow Mountain
5. Theophilus Tower (University of Idaho Campus)
6. KUID-TV site on Paradise Ridge.

In addition to the base station repeater sites, two voting receiver sites would be used to improve in-building inbound (portable radio-to-base station) coverage within the City of Moscow, one at the Northwest Water Tower and the other at the Vista Water Tank.

This system would maintain existing coverage beyond the boundaries of the City of Moscow

The proposed VHF system would include two new shared repeated tactical repeater channels and a replacement repeater input channel for the Moscow Fire Department dispatch channel repeater (the existing channel is subject to extensive co-channel interference that degrades its performance).

As described in the Needs Assessment Report (also prepared by Hatfield & Dawson as part of the scope for this project), Moscow Fire Department had requested four VHF tactical channels and Moscow Police Department had requested one VHF tactical channel, for a total of five new tactical channels that would have been added to the VHF system if the additional VHF channels were available. However, after a thorough search of the VHF frequency band for available channels that could be licensed at the three sites in the system, only two pairs of channels that could be used for repeated tactical channels were found. The VHF frequency band is very congested, even in more rural areas, and

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The VHF system would employ existing single band mobile and portable radios, which would be replaced with new single-band radios over time (many of the existing radios used in the City of Moscow radio systems are no longer supported by the equipment manufacturers).

The new VHF system would incorporate a new interconnect system consisting of both fiber and microwave links, as described in detail in this report. The interconnect system would provide connections to the repeater sites, the voting receiver sites and the Whitcom dispatch center.

B. 700 MHz Trunked System Alternatives

Migration to a 700 MHz Project 25 trunked radio system along with implementation of a 3-site simulcast system for Moscow Police Department, Moscow Fire Department and the City of Moscow Public Works Department. The 700 MHz simulcast system would use base station repeater sites at the following locations:

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8. Theophilus Tower (University of Idaho Campus)
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The proposed 700 MHz system would use 5 voice channels plus a control channel, which would provide sufficient capacity for both primary dispatch talkgroups and multiple tactical talkgroups for MPD and MFD, as well as a primary talkgroup for Public Works and a separate talkgroup for traffic control and other non-dispatch communications.

The 700 MHz system would employ dual-band mobile and portable radio equipment in order to maintain the existing VHF communications capabilities required for interoperability with other surrounding jurisdictions, which will continue to operate in the VHF frequency band. As described in detail in the report, there are dual-band 700 MHz/VHF P25 trunked radios available from multiple manufacturers.

Two alternatives for implementation of the 700 MHz radio system are analyzed in the report:

- A stand-alone 700 MHz system, including a new master site (system core).
- A 700 MHz sub-system operating on the Idaho 700 MHz Public Safety Radio Network. This system configuration would use the existing State of Idaho system master site (system core), and would allow seamless interoperable communications with State and Federal agencies. Operation in this system would require a monthly per-radio Subscriber Fee to cover the costs of system maintenance and upgrades.

The new 700 MHz system would incorporate a new interconnect system consisting of new microwave links, as described in detail in this report. The interconnect system would provide connections to the repeater sites, and the Whitcom dispatch center. A separate microwave link over the State of Idaho Microwave Radio System would provide the connection from the City of Moscow system back to the Idaho 700 MHz Public Safety Radio Network master site (system core) in Ada County.

This report includes an initial analysis of both coverage requirements and the coverage and reliability standards that provide the basis for the coverage analysis shown in the VHF and 700 MHz coverage maps that are included in the report.

The report also includes the results of a detailed VHF frequency search for additional available VHF channels to provide for the capacity needs identified in the Needs Assessment Report, and the frequency coordination and licensing details for five new VHF frequencies proposed for use in the new VHF radio system.

The estimated capital and recurring costs of each system alternative are summarized below with the alternatives ordered from lowest cost to highest cost:

VHF Conventional Simulcast System (Assuming ODU 600 Microwave System)

Capital Costs				\$1,932,500
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Subscriber units for both the VHF alternative and the 700 MHz alternatives are available from multiple manufacturers. The 700 MHz alternative use dual-band 700/800 MHz/VHF radios (which are significantly more expensive than single-band radios) in order to maintain existing interoperability with agencies in adjacent jurisdictions. Estimated cost ranges for the replacement of existing City of Moscow subscriber units (mobile and portable radios, many of which are well beyond their “end-of-life” dates) are shown below:

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Mobile Radio	98	\$ 194,040	\$ 745,446
Totals	321	\$ 1,122,360	\$ 2,598,437

(The subscriber unit replacement costs are identical for both 700 MHz alternatives.)

The report concludes with an analysis of the advantages and disadvantages of each system alternative and a recommendation for the implementation of the “shared system” 700 MHz alternative, if that is economically feasible.

If funding of the “shared system” 700 MHz system alternative does not appear to be feasible, then the proposed VHF conventional system alternative is recommended.

Because the implementation of either of the system alternatives described in this report will take a significant period of time, the replacement of the existing Moscow Fire Department’s repeater input channel with the new channel described the report should be performed as a first step (irrespective of the long-term system alternative being implemented) in order to eliminate the existing degradation of MFD’s coverage caused by co-channel interference.

3. COVERAGE REQUIREMENTS AND COVERAGE & RELIABILITY STANDARDS

This section of the System Alternatives Report provides a description of the coverage requirements and the coverage and reliability standards used in the evaluation of coverage for the radio systems performed as part of the City of Moscow Radio Systems Upgrade Project.

A. COVERAGE REQUIREMENTS

The primary service area for City of Moscow radio systems is defined by the city boundaries shown in Figure 1 below and in the VHF and 700 MHz coverage maps contained in this report. In addition to coverage within the City of Moscow, Moscow Fire Department requires coverage for paramedic units in the rural areas of Latah County outside of the City of Moscow. The goal for this rural coverage is, at a minimum, the maintenance of the coverage now provided by the existing VHF repeater site on Moscow Mountain (as described in the Needs Assessment Report).

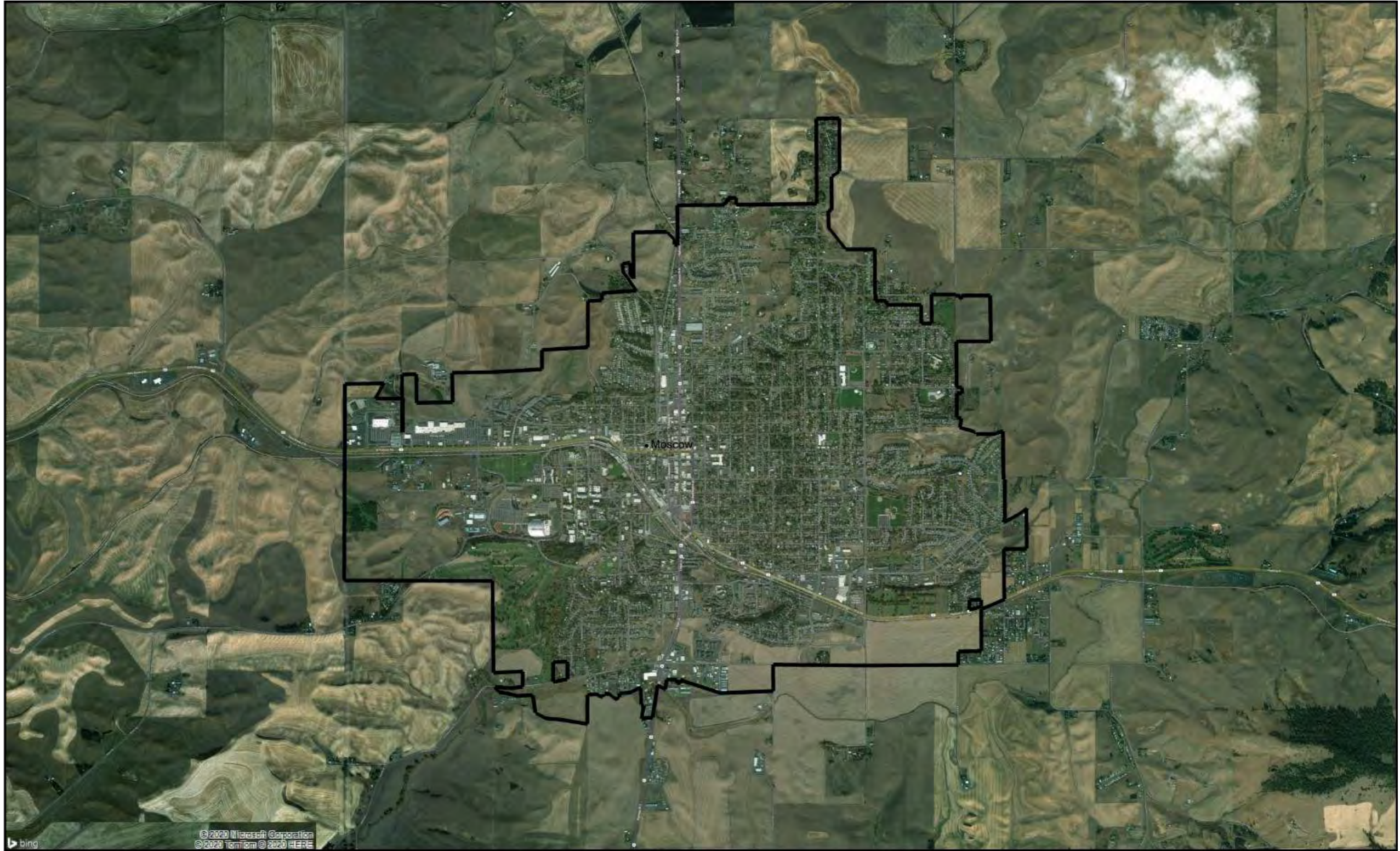


Figure 1 - Map Showing City of Moscow Coverage Area Boundaries

B. PROPOSED COVERAGE AND RELIABILITY STANDARDS

The coverage and reliability standards shown in this report are based on analysis techniques and contained in TIA/EIA TSB-88 guidelines and on coverage and reliability standards adopted by other state and County agencies that have constructed either statewide radio systems, countywide radio systems or regional radio systems similar to the City of Moscow system.

1. TSB-88 – LMR Industry Guidelines for Coverage Prediction and Verification

TSB-88¹ is a suite of industry-consensus documents that provide guidelines for implementation, performance predictions and performance verification measurements for public safety land mobile (“LMR”) radio systems. Although the TSB-88 documents have been developed (and continue to be developed) using many of the same processes used to develop standards documents for the LMR industry, they are not standards documents per se. However, they provide well-established and well-documented guidelines for the design and performance evaluation of public safety land mobile radio systems.

2. Delivered Audio Quality (DAQ)

Delivered Audio Quality (DAQ) is the most common signal quality measure in both narrowband analog and P25 Public Safety radio systems. DAQ levels provide descriptions of the intelligibility of the audio heard over a mobile or portable radio (or at a dispatch position). DAQ incorporates the effects of multipath fading and is meant to define audio quality in a signal fading environment, whereas the older SINAD circuit merit number was based on a static measurement and did not include the effects of fading. The DAQ definitions shown below are taken from Table 3 of TSB-88.1-D².

DAQ	Definition
1	Unusable. Speech present but not understandable.
2	Speech understandable with considerable effort. Requires frequent repetition due to noise or distortion.

¹ The relevant document for the purposes of coverage predictions and the definition of coverage and reliability standards is:

TSB-88.1-D, TIA TELECOMMUNICATIONS SYSTEMS BULLETIN; Part 1 – Recommended Methods for Technology Independent Performance Modeling; April 2012

² *Ibid.*

3	Speech understandable with slight effort. Requires occasional repetition due to noise or distortion.
3.4	Speech understandable without repetition. Some noise or distortion present.
4	Speech easily understandable. Little noise or distortion.
4.5	Speech easily understandable. Rare noise or distortion.
5	Perfect. No distortion or noise discernible.

Table 1 – DAQ Definitions from Table 3 of TSB-88.1-D

Note 3 in Table 3 of TSB-88.1-D states that “Non public safety CPC specifications would normally request a DAQ of 3, while Federal Government agencies commonly use a DAQ of 3.4 at the boundary of a protected service area.”

For public safety systems, the objective most consistently described in public safety LMR industry documents is DAQ 3.4 over the system’s service area.

Note 3 also points out that DAQ 3.4 for an analog or digital system corresponds to approximately 20 dB SINAD (Signal-to-Interference and Distortion ratio) for an analog system, which is a high-quality analog audio signal.

3. Proposed DAQ Objectives

For the analysis and evaluation of coverage for the City of Moscow radio systems in this project, an objective of DAQ 3.4 will be adopted for “desirable” coverage and an objective of DAQ 3.0 will be adopted for “minimally acceptable” coverage.

4. Time and Location Variability

Definitions of system reliability requirements in typical specifications for public safety radio systems often include both time and location variability in relation to coverage and reliability standards (% of time and % of locations). Time variability is typically not a significant issue with respect to public safety land mobile radio systems because the paths between a given base station transmitter and remote receiver locations are usually relatively short. To the extent that it has any impact on system performance, time variability is taken into account by the use of “faded sensitivity” values required to provide a given Delivered Audio Quality (DAQ). The faded sensitivity values and BER percentages from TSB-88 account for the short-term fading of the radio system in a multipath environment, which is the primary manifestation of time variability in a land mobile radio system.

5. Received Signal Strength for “Desirable” Coverage (DAQ 3.4; 95% Probability) – VHF System

A DAQ value of 3.4 is the basis for the standard for “desirable” coverage for the City of Moscow VHF system described above in this report. The median received signal power level at a mobile radio or a portable radio or a base station receiver to achieve this DAQ criterion is shown in Table 2 through Table 4 below.

The received signal power values shown in the tables below do not include the impact of internal vehicle RF noise, vehicle subsystem RF noise or ambient RF noise, all of which may cause the required received signal power to increase by the amount the noise increases the effective noise floor of the receiver (in dB) relative to the values shown below.

In general, the coverage degradation caused by these noise sources is incorporated into the coverage propagation predictions separately from the received signal power requirements shown in the tables below.

The impact of multipath propagation is also not included in these calculations because it is very difficult to predict or model effectively, although it is possible to make multipath measurements during coverage testing that can be used to adjust the location variability standard deviation for a given area. That adjustment in turn will have an impact on the received signal power levels required to produce a given DAQ. For the coverage predictions shown in this report, a “typical” standard deviation value (5.6 dB based on the characteristics of the terrain and land use and land cover in City of Moscow) has been assumed. We have found that this value produces prediction results that correspond well to coverage testing results for both VHF and 700 MHz systems.

The Noise Figure (NF) values shown in Table 2 through Table 12 below have been derived from the 12 dB SINAD Static Sensitivity (Cs/N) for each radio model and frequency band and the Equivalent Noise Bandwidth (“ENBW”) for each modulation type. The ENBW values assumed for each modulation type for the NF calculation are shown in Table 2 of Appendix 1.

Narrowband Analog Operation - APX 6500 Mobile Radio - VHF C4FM Modulation (IMBE Vocoder) 12.5 kHz BW		
Nominal Static Receiver Sensitivity (12 dB SINAD)	-119.0 dBm	Motorola APX 6000 Specifications - No Preamp
Static C _s /N Ratio for 12 dB SINAD	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	9.5 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-128.5 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.4	26 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.4	-102.5 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 2 - RSSI Requirements for DAQ 3.4 - VHF Mobile Radio

Narrowband Analog Operation - APX 6000 Portable Radio - VHF C4FM (IMBE Vocoder) 12.5 kHz BW		
Nominal Static Receiver Sensitivity (12 dB SINAD)	-122.4 dBm	Motorola APX 6000 Specifications
Static C _s /N Ratio for 12 dB SINAD	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	7.7 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-130.1 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.4	26 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.4	-104.1 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 3 - RSSI Requirements for DAQ 3.4 - VHF Portable Radio

Narrowband Analog Operation - GTR8000 Base Station Radio - VHF C4FM (IMBE Vocoder) 12.5 kHz BW		
Nominal Static Receiver Sensitivity (12 dB SINAD)	-119.0 dBm	Motorola GTR8000 Specifications
Static C _s /N Ratio for 12 dB SINAD	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	9.5 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-128.5 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.4	26 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.4	-102.5 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 4 - RSSI Requirements for DAQ 3.4 - VHF Base Station Radio

6. Additional Margin Required for 95% Probability for DAQ 3.4

For analog narrowband modulation and a 95% probability of receiving a signal level at least high enough to provide DAQ 3.4 performance within a prediction tile, and an assumed location variability standard deviation of 5.6 dB, the additional received signal power margin required (above the median values shown below) is 9.2 dB.

This additional margin increases the required received signal level for a 95% probability of achieving DAQ 3.4 to -93.3 dBm for mobile radios and base stations and to -94.9 dBm for portable radios.

7. Received Signal Strength for “Minimally Acceptable” Coverage (DAQ 3.0; 90% Probability) – VHF System

A DAQ value of 3.0 is the basis for the standard for “minimally acceptable” coverage for the City of Moscow VHF system as described above in this report. The median received signal power level required at a mobile radio or a portable radio or a base station receiver to achieve the DAQ criterion is shown in Table 5 through Table 7 below.

The effects of RF noise and multipath described above in the section covering “desirable” coverage will be incorporated into the coverage predictions for “minimally acceptable” coverage as described in that section, above.

The Noise Figure (NF) values shown in Table 5 through Table 7 below have been derived from the 12 dB SINAD Static Sensitivity (C_s/N) for each radio model and frequency band and the Equivalent Noise Bandwidth (“ENBW”) for each modulation type (as described in detail in Appendix 1). The ENBW values assumed for each modulation type for the NF calculation are shown in Table 2 of Appendix 1.

Narrowband Analog Operation - APX 6500 Mobile Radio - VHF		
C4FM Modulation (IMBE Vocoder) 12.5 kHz BW		
Nominal Static Receiver Sensitivity (12 dB SINAD)	-119.0 dBm	Motorola APX 6500 Specifications - No Preamp
Static C _s /N Ratio for 12 dB SINAD	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	9.5 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-128.5 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.0	23 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.0	-105.5 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 5 - RSSI Requirements for DAQ 3.0 - VHF Mobile Radio

Narrowband Analog Operation - APX 6000 Portable Radio - VHF		
C4FM (IMBE Vocoder) 12.5 kHz BW		
Nominal Static Receiver Sensitivity (12 dB SINAD)	-122.4 dBm	Motorola APX 7000 Specifications
Static C _s /N Ratio for 12 dB SINAD	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	7.7 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-130.1 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.0	23 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.0	-107.1 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 6 - RSSI Requirements for DAQ 3.0 - VHF Portable Radio

Narrowband Analog Operation - GTR8000 Base Station Radio - VHF		
C4FM (IMBE Vocoder) 12.5 kHz BW		
Nominal Static Receiver Sensitivity (12 dB SINAD)	-119.0 dBm	Motorola GTR8000 Specifications
Static C _s /N Ratio for 12 dB SINAD	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	9.5 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-128.5 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.0	23 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.0	-105.5 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 7 - RSSI Requirements for DAQ 3.0 - VHF Base Station Radio

8. Additional Margin Required for 90% Probability for DAQ 3.0

For analog narrowband modulation and a 90% probability of receiving a signal level at least high enough to provide DAQ 3.0 performance within a prediction tile, and an assumed location variability standard deviation of 5.6 dB, the additional received signal power margin required (above the median values shown below) is 7.2 dB.

This additional margin increases the required received signal level for a 90% probability of achieving DAQ 3.0 to -98.3 dBm for mobile radios and base stations and to -99.9 dBm for portable radios.

9. Received Signal Strength for “Desirable” Coverage (DAQ 3.4; 95% Probability) – 700 MHz System

A DAQ value of 3.4 is the basis for the standard for “desirable” coverage for the City of Moscow 700 MHz system described above in this report. The median

received signal power level at a mobile radio or a portable radio or a base station receiver to achieve this DAQ criterion is shown in Table 8 through Table 10 below.

The received signal power values shown in the tables below do not include the impact of internal vehicle RF noise, vehicle subsystem RF noise or ambient RF noise, all of which may cause the required received signal power to increase by the amount the noise increases the effective noise floor of the receiver (in dB) relative to the values shown below.

In general, the coverage degradation caused by these noise sources is incorporated into the coverage propagation predictions separately from the received signal power requirements shown in the tables below.

The impact of multipath propagation is also not included in these calculations because it is very difficult to predict or model effectively, although it is possible to make multipath measurements during coverage testing that can be used to adjust the location variability standard deviation for a given area. That adjustment in turn will have an impact on the received signal power levels required to produce a given DAQ. For the coverage predictions shown in this report, a “typical” standard deviation value (5.6 dB based on the characteristics of the terrain and land use and land cover in City of Moscow) has been assumed. We have found that this value produces prediction results that correspond well to coverage testing results for both VHF and 700 MHz systems.

The Noise Figure (NF) values shown in Table 8 through Table 10 below have been derived from the 12 dB SINAD Static Sensitivity (C_s/N) for each radio model and frequency band and the Equivalent Noise Bandwidth (“ENBW”) for each modulation type.

P25 Phase 1 Operation - APX 7500 Mobile Radio - 700 MHz		
LSM Modulation - AMBE +2 Vocoder - 12.5 kHz BW		
Nominal Static Receiver Sensitivity (5% BER)	-120.5 dBm	Motorola APX 7500 Specifications - No Preamp
Static C _s /N Ratio for 5.0% Bit Error Rate (BER)	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	7.4 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-127.9 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.4 (2.0% BER)	17.0 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.4	-110.9 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 8 - RSSI Requirements for DAQ 3.4 - 700 MHz Mobile Radio

P25 Phase 1 Operation - APX 7000 Portable Radio - 700 MHz		
LSM Modulation - AMBE +2 Vocoder - 12.5 kHz BW		
Nominal Static Receiver Sensitivity (5% BER)	-119.0 dBm	Motorola APX 7000 Specifications
Static C _s /N Ratio for 5.0% Bit Error Rate (BER)	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	7.6 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-126.6 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.4 (2.0% BER)	17.0 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.4	-109.6 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 9 - RSSI Requirements for DAQ 3.4 - 700 MHz Portable Radio

P25 Phase 1 Operation - GTR8000 Base Station Radio with TTA - 700 MHz		
WCQPSK Modulation - AMBE +2 Vocoder - 12.5 kHz BW		
Nominal Static Receiver Sensitivity (5% BER)	-124.7 dBm	Typical Motorola Setup for 700 MHz TTA System
Static C _s /N Ratio for 5.0% Bit Error Rate (BER)	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	4.2 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-128.9 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.4 (2.0% BER)	16.8 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.4	-112.1 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 10 - RSSI Requirements for DAQ 3.4 - 700 MHz Base Station Radio

10. Additional Margin Required for 95% Probability for DAQ 3.4

For LSM modulation and a 95% probability of receiving a signal level at least high enough to provide DAQ 3.4 performance within a prediction tile, and an assumed location variability standard deviation of 5.6 dB, the additional received signal power margin required (above the median values shown below) is 9.2 dB.

This additional margin increases the required received signal level for a 95% probability of achieving DAQ 3.4 to -101.7 dBm for mobile radios, -100.4 dBm for portable radios and -102.9 dBm for base station radios.

11. Received Signal Strength for “Minimally Acceptable” Coverage (DAQ 3.0; 90% Probability) – 700 MHz System

A DAQ value of 3.0 is the basis for the standard for “minimally acceptable” coverage for the City of Moscow VHF system as described above in this report. The median received signal power level required at a mobile radio or a portable radio or a base station receiver to achieve the DAQ criterion is shown in Table 5 through Table 7 below.

The effects of RF noise and multipath described above in the section covering “desirable” coverage will be incorporated into the coverage predictions for “minimally acceptable” coverage as described in that section, above.

The Noise Figure (NF) values shown in Table 11 through Table 13 below have been derived from the 12 dB SINAD Static Sensitivity (C_s/N) for each radio model and frequency band and the Equivalent Noise Bandwidth (“ENBW”) for each modulation type.

P25 Phase 1 Operation - APX 7500 Mobile Radio - 700 MHz		
LSM Modulation - AMBE +2 Vocoder - 12.5 kHz BW		
Nominal Static Receiver Sensitivity (5% BER)	-120.5 dBm	Motorola APX 7500 Specifications - No Preamp
Static C_s/N Ratio for 5.0% Bit Error Rate (BER)	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	7.4 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-127.9 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.0 (2.6% BER)	15.7 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.0	-112.2 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 11 - RSSI Requirements for DAQ 3.0 - 700 MHz Mobile Radio

P25 Phase 1 Operation - APX 7000 Portable Radio - 700 MHz		
LSM Modulation - AMBE +2 Vocoder - 12.5 kHz BW		
Nominal Static Receiver Sensitivity (5% BER)	-119.0 dBm	Motorola APX 7000 Specifications
Static C_s/N Ratio for 5.0% Bit Error Rate (BER)	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	7.6 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-126.6 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.0 (2.6% BER)	15.7 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.0	-110.9 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 12 - RSSI Requirements for DAQ 3.0 - 700 MHz Portable Radio

P25 Phase 1 Operation - GTR8000 Base Station Radio with TTA - 700 MHz		
WCQPSK Modulation - AMBE +2 Vocoder - 12.5 kHz BW		
Nominal Static Receiver Sensitivity (5% BER)	-124.7 dBm	Typical Motorola Setup for 700 MHz TTA System
Static C_s/N Ratio for 5.0% Bit Error Rate (BER)	7.6 dB	TSB-88 - Table A1 (See Appendix 1)
Receiver Noise Figure (NF)	4.2 dB	See discussion for derivation of NF
Receiver Internal Noise Level	-128.9 dBm	5% BER Static Sensitivity (dBm) - Noise Figure (dB)
Faded C/I+N Ratio (dB) for DAQ 3.0 (2.6% BER)	15.4 dB	TSB-88 - Table A1
Calculated Received Signal Power for DAQ 3.0	-113.5 dBm	Internal Noise Level + Faded C/I+N Ratio

Table 13 - RSSI Requirements for DAQ 3.0 - 700 MHz Base Station Radio

12. Additional Margin Required for 90% Probability for DAQ 3.0

For C4FM modulation and a 90% probability of receiving a signal level at least high enough to provide DAQ 3.0 performance within a prediction tile, and an assumed

location variability standard deviation of 5.6 dB, the additional received signal power margin required (above the median values shown below) is 7.2 dB.

This additional margin increases the required received signal level for a 90% probability of achieving DAQ 3.4 to -105.0 dBm for mobile radios, -103.7 dBm for portable radios and -106.3 dBm for base station radios.

13. Proposed Coverage Standards

The coverage standard for “desired” coverage for the City of Moscow systems would state that each of the coverage prediction pixels that has a predicted signal power greater than or equal to the DAQ 3.4 value has a 95% probability of achieving a DAQ of 3.4 for a mobile or portable radio operating within the area represented by the pixel.

The coverage and reliability standard for “minimally acceptable” coverage and reliability for the City of Moscow systems would state that each of the coverage prediction pixels that has a predicted signal power greater than or equal to the DAQ 3.0 value has a 90% probability of achieving a DAQ of 3.0 for a mobile or portable radio operating within the area represented by the pixel.

14. Outbound and Inbound Coverage

Because the required RSSI signal levels are different for outbound (base station-to-mobile radio) and inbound (mobile radio-to-base station) outbound and inbound coverage is shown on separate coverage prediction maps in this report. Coverage predictions for outbound signals are based on the received signal levels shown above for portable and mobile radios, while coverage predictions for inbound signals are based on the received signal levels shown above for base station radios.

4. FCC LICENSING ANALYSIS FOR PROPOSED NEW FREQUENCIES FOR SIMULCAST SYSTEMS

The following sections describe the FCC licensing analysis performed as part of the search for new VHF channels for use in the City of Moscow radio systems. The repeater input and repeater output channels listed below are the only channels from the Public Safety Pool (§90.20 of Subpart B of Part 90 of the FCC's Rules) of frequencies that appear to be feasible for coordination and licensing at the radio sites and mobile radio service areas proposed for the City of Moscow VHF conventional radio system described below in this report, based on an extensive search of the entire Public Safety VHF frequency band shown in §90.20.

As shown in Table 14 below, the new VHF frequencies consist of two repeater output channels, two repeater input channels (two repeated channel pairs to be used as Tactical Channels), and one additional repeater input frequency to be used to replace the existing repeater input channel for the Moscow Fire Department main dispatch repeater (the existing repeater input channel on 151.1300 MHz is seriously degraded by co-channel interference, as described above in this report).

City of Moscow VHF Simulcast TX Channels	
153.8000	MFD Main Dispatch Channel - TX
154.8900	MFD TAC Channel #1 - TX
154.4450	MPD Main Dispatch Channel - TX
151.2575	Shared TAC Channel #1 - TX
154.9575	Shared TAC Channel #2 - TX
City of Moscow VHF Simulcast RX Channels	
156.0975	MFD Main Dispatch Channel - RX
159.0000	MFD TAC Channel #1 - RX
158.9850	MPD Main Dispatch Channel - RX
159.2400	Shared TAC Channel #1 - RX
155.8875	Shared TAC Channel #2 - RX

Table 14 – Proposed VHF TX and RX Frequencies & Channel Assignments

In the event that the City of Moscow continues to operate primarily in the VHF frequency band, rather than migrating to operation in the 700 MHz band, these frequencies should be coordinated and licensed so that they can be incorporated into the VHF simulcast system described in this report as one of the system alternatives.

A. INTERFERENCE ANALYSIS – EXISTING MOSCOW FIRE DEPARTMENT PRIMARY DISPATCH REPEATER INPUT CHANNEL (151.1300 MHz)

The existing repeater input channel for the Moscow Fire Department primary dispatch repeater on Moscow Mountain is reported to be subject to intermittent interference which seriously degrades the ability of radio users on the channel to communicate back to dispatch over the Moscow Mountain repeater.

The likely cause of this interference is direct interference from one or more co-channel stations licensed for base station (FB) or repeater (FB2) operation at elevated sites that have line-of-sight propagation paths to the Moscow Mountain repeater site. The co-channel interfering signals from these stations degrade the sensitivity of the MFD receiver on Moscow Mountain, thereby reducing the effective coverage area provided by the repeater.

This degradation especially impacts the performance of mobile or portable radios in areas where coverage is already somewhat marginal, but it can also affect radios operating in areas where coverage is normally adequate in the absence of the interference. Because the Moscow Mountain repeater receiver uses a different CTCSS tone than the co-channel interfering transmitters, these interfering transmissions are normally not heard on the dispatch channel unless a MFD radio has already “opened” the receiver by making a transmission (CTCSS tones are used to prevent a repeater receiver from “hearing” and rebroadcasting undesired co-channel signals).

Although the CTCSS tone prevents the co-channel interfering signals from being heard on the channel much of the time, it does not prevent these signals from degrading the reception of an incoming MFD call whenever the interfering calls and the desired calls occur simultaneously.

Table 15 below shows the co-channel station licensed within 300 kilometers (186 miles) of the Moscow Mountain site.

System Alternatives Report – Radio Systems Upgrade Project City of Moscow, Idaho

January 25, 2021

151.1300 MHz - Moscow Fire Department Primary Dispatch Channel Repeater Input Frequency															
Co-Channel Stations															
Callsign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km	
KCS544				MOSCOW, CITY OF	151.1300	40	46-43-23.6 N	116-58-55.6 W	2.0	787	789	MO	PW	0.0	
WNDZ708				COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	110	45-53-09.5 N	119-20-54.1 W	2.0	199	201	MO	PW	204.7	
WNDZ708				COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	110	45-45-27.5 N	120-15-28.2 W	2.0	490	492	MO	PW	274.5	
WNDZ708				COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	110	46-05-14.5 N	119-07-40.0 W	2.0	613	615	MO	PW	179.5	
WNDZ708	WA	Klickitat	Klickitat	COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	175	45-45-27.5 N	120-15-28.2 W	12.0	533	545	FX1	PW	274.5	
WPJQ308	WA	Wellpinit	Stevens	SPOKANE TRIBE OF INDIANS	151.1300	38	47-56-20.6 N	117-47-38.9 W	4.0	944	948	FB2	PW	148.5	
WPKL751	MT			BEAVERHEAD, COUNTY OF	151.1150	110	45-37-21.7 N	113-41-34.2 W	2.0	2106	2108	MO	PW	281.9	
WPKL751	MT	Wisdom	Beaverhead	BEAVERHEAD, COUNTY OF	151.1150	300	45-37-21.7 N	113-41-34.2 W	6.0	2108	2114	FB2	PW	281.9	
WPKL862	WA		Douglas	BALLARD SERVICES INC	151.1300	80	47-27-59.5 N	120-18-04.3 W	2.0	253	255	MO	PW	265.2	
WPKL862	WA	EAST WENATCHEE	Douglas	BALLARD SERVICES INC	151.1300	26	47-30-32.5 N	120-14-27.3 W	19.0	1097	1116	FB	PW	262.3	
WPKL862	WA	EAST WENATCHEE	Douglas	BALLARD SERVICES INC	151.1300	80	47-26-06.5 N	120-17-38.3 W	15.0	244	259	FB	PW	263.7	
WPKL862	WA	WENATCHEE	Chelan	BALLARD SERVICES INC	151.1300	80	47-26-22.5 N	120-19-21.3 W	12.0	202	214	FB	PW	265.9	
WPWL606	OR	Boardman	Morrow	COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	30	45-52-44.7 N	119-40-13.0 W	16.7	80	96.7	FXO	PW	227.4	
WPWL606	WA	Roosevelt	Klickitat	COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	30	45-45-29.4 N	120-15-38.0 W	35.0	505	540	FXO	PW	274.7	
WPWL606	WA	Umatilla	Benton	COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	30	45-58-48.3 N	119-17-50.8 W	19.8	353	372.8	FXO	PW	196.4	
WQMI713	OR	Pendleton	Umatilla	COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	60	45-35-57.5 N	118-31-22.9 W	30.0	1179	1209	FXO	PW	172.6	
WQMI713	WA	Patterson	Klickitat	COLUMBIA RIVER INTER-TRIBAL FISHERIES ENFORCEMENT	151.1300	60	45-51-19.3 N	119-54-37.6 W	30.0	316	346	FXO	PW	245.4	

Table 15 – Co-Channel Stations on 151.1300 MHz

The map in Figure 2 below shows the locations of these co-channel stations, along with their 37 dBμ/m protected service contours and their 19 dBμ/m interfering contours. The map also shows the mobile radio service area for the Moscow Fire Department primary dispatch repeater, which is defined as a 32 km radius circle around 1312 White Avenue in Moscow. As shown in the map in Figure 2, there is no overlap between any of the 19 dBμ/m interfering contours and the MFD mobile service area, so it is clear that the frequency was originally coordinated in compliance with the rules and policies used by the frequency coordinators for frequency assignments in the VHF frequency band.

However, these rules and policies do not always eliminate the potential for interference on VHF channels, which are defined as “shared channels” under the FCC’s rules in the majority of cases (the only facilities in the VHF band that are licensed on an “exclusive use” basis are FB8 trunked repeater channels, and those channels are subject to strict rules prohibited contour overlap both to incumbent stations from proposed stations and to proposed stations from incumbent stations).

There are cases (such as this one) in which transmitter facilities are licensed at high elevation sites that have unobstructed line-of-sight paths to the high elevation sites where repeater receivers that serve the area around the site

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho**

January 25, 2021

are set up to receive signals from mobile radios in that service area. In these circumstances, it is possible for the co-channel signals from the transmitter to degrade the performance of the receiver, as described above.

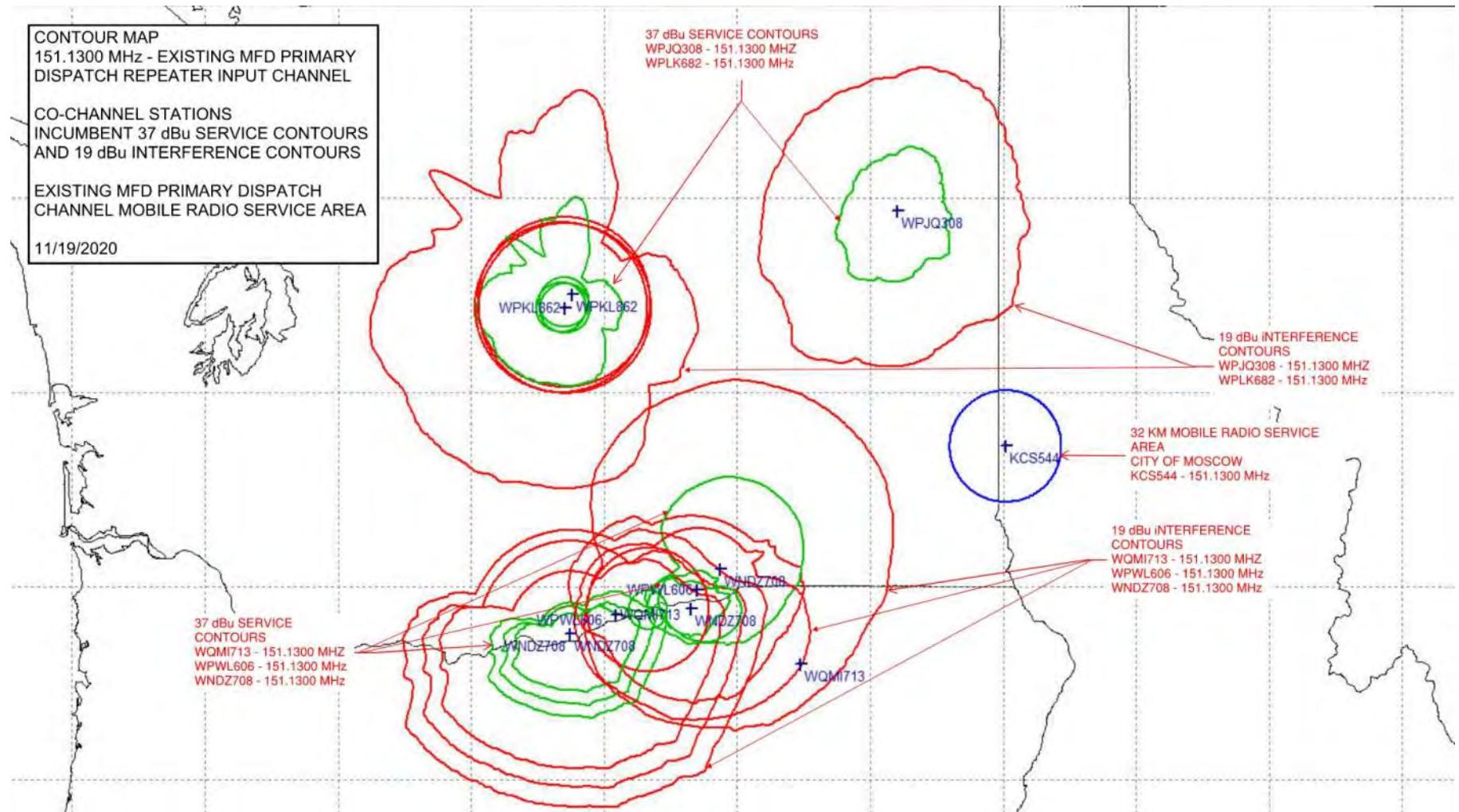


Figure 2 – Existing Licensed Stations and Contours – 151.1300 MHz

Appendix 2 contains detailed analyses of the propagation paths between the transmitter sites of the three co-channel stations most likely to cause interference to the MFD main dispatch repeater receiver and the receiver site on Moscow Mountain. The three co-channel stations shown in this analysis are:

- The FB2 (fixed repeater) operation of WPJQ308 on Wellprint Mountain in Ferry County, Washington.
- The FX1 (fixed control station) operation of WND2708 in Klickitat in Klickitat County, Washington.
- The FB (fixed base station) operation of WPKL682 in East Wenatchee, Douglas County, Washington.

All three of these facilities operate at relatively high elevation sites, but all three of the sites are far enough away from Moscow Mountain that the effect of the curvature of the earth affects the propagation paths from the sites to Moscow Mountain and none of them have line-of-sight paths to the MFD receiver location at the Moscow Mountain site.

However, the diffraction losses caused by terrain and earth curvature are low enough for all three of the paths analyzed in Appendix 2 to produce co-channel signals at Moscow Mountain strong enough to degrade the performance of the MFD receiver at that site. The predicted interfering signal levels from the three stations show above at the MFD Moscow Mountain repeater receiver are shown below (details of the calculations are shown in Appendix 2):

- WPJQ308: -74.9 dBm
- WND2708: -120.5 dBm
- WPKL682: -110.8 dBm

The extent of the degradation caused by the co-channel stations varies among the three stations, with two of them having the potential to degrade only relatively weak MFD desired signals. However, the co-channel interfering signals from WPJQ308 are predicted to be strong enough to negatively affect reception of even relatively strong signals from MFD mobile and portable radios. WPJQ308 is likely to be the primary source of the existing interference experienced by MFD radio users operating on the MFD primary dispatch channel.

The best long-term solution to resolve this interference issue is to replace the existing MFD repeater input channel on 151.1300 MHz with a different channel that is not likely to receive co-channel interference strong enough to degrade the performance of the MFD repeater receiver on Moscow Mountain (or at the other sites used in the proposed 3-site VHF simulcast system described in this report). A suitable replacement frequency is described below in the following section of this report.

B. Continued Use of 151.1300 MHz in the Proposed City of Moscow VHF System

Even though 151.1300 MHz is not suitable as a repeater input frequency at a high elevation site in the City of Moscow system, it could still be used as a simplex “talk-around” tactical channel, since it is already licensed for use in mobile and portable radios within the City of Moscow radio service area. A receiver at the proposed Theophilus Tower site could be added to the proposed VHF simulcast system to allow the Whitcom dispatch center to monitor and record that frequency. The Theophilus Tower site is low enough that the potential for interference the co-channel stations described above is lower than it is at a high site, and if occasional instances of interference were to occur, they would only affect the received signal at the Whitcom dispatch signal, and not the signals heard by simplex users with mobile or portable radios.

**C. CONTOUR OVERLAP CRITERIA FOR FCC LICENSING OF VHF
ANALOG NARROWBAND SYSTEMS**

Table 16 below shows the field strength contours used to produce contour overlap studies for new applications submitted to the Public Safety and Industrial Business frequency coordinators. The table reflects a consensus agreement among all of the frequency coordinators, and also reflects the increase in the complexity of the frequency coordination with the rise of multiple digital modulation formats that must coexist with each other and with narrowband analog modulation. As shown in the table, the protected contour for incumbent licensees is the 37 dB μ V/m F(50,50) contour for VHF stations, and the F(50,10) interference contour varies with the emission designators (which reflect digital and analog modulation types) used by the incumbent licensee and the proposed new application. (The source of this table is the UTC Journal, Special Edition 2013, published by the Utilities Telecom Council, which is one of the Industrial/Business frequency coordinators. The table is included in the coordination manual used by the Public Safety Communications Council, which embodies the consensus agreement among public safety frequency coordinators with respect to frequency coordination procedures used by all coordinators).

As shown in Table 16, the interfering contour 7.5 kHz spaced stations with 11K0XXX emission designators (12.5 kHz narrowband analog emissions, where XXX indicates the modulation type—voice or data) is the 44 dB μ V/m (F50:10) contour. If there are digital emission designators on the incumbent license in addition to the narrowband analog emission designators, the interfering contour has a higher value, as shown in the table. The vast majority of the VHF systems in the area surrounding Whitman County remain analog narrowband systems with 11K0XX emission designators, so the contour overlap maps shown in this report have assumed a 44 dB μ V/m(F50:10) interfering contour 7.5 kHz spaced (adjacent channel) stations.

Both analog and digital systems must still meet the co-channel protection requirements which prohibit the overlap of the proposed 19 dB μ V/m F (50:10) interference contour and the incumbent 39 dB μ V/m F(50:50) protected service contour. F(50:50) and F(50:10) reflect the statistics used to calculate the contour distances for the protected and interfering contour: 50% location variability & 50% time variability is used for the protected contour and 50% location variability & 10% time variability is used for the interfering contour.

Table 1. Adjacent Channel Derated Interference Contour Values				
If the proposed operation is any narrowband (7k, 8k, or 11k), the F(50,10) interfering contour values are:				
Incumbent type	against a	6.25 adjacent (as above)	7.5 kHz adjacent (as above)	12.5 kHz adjacent (as above)
4K00 (NXDN)		49	57	coordination not required
7K60 (DMR 2/TDMA)		36	42	coordination not required
8K10/8K30 (P25 and wide NXDN)		41	48	coordination not required
11K0-11K3 (analog) with other lines for digital emissions on the same frequency, i.e., 4K00, 7K60, 8K10, 8K30, etc.		41	48	coordination not required
11K0-11K3 (analog - with NO other digital emissions on the license)		36	44	coordination not required
22K0 (TETRA)		21	19	38

Table 16 - Narrowband Analog and Digital Adjacent Channel Interference Contour Values

D. CONTOUR MAPS FOR PROPOSED NEW FREQUENCIES

The following sections describe the new VHF channels proposed for use in the proposed City of Moscow VHF simulcast system. Each channel is described in terms of its proposed use (repeater output, repeater input, or repeated TAC channel), its frequency, the class of station to which the frequency is normally assigned, the certified frequency coordinator for the frequency, and any specific assignment limitations noted in §90.20 (c) of the FCC's Rules. A list of the public safety frequency coordinators, taken from the FCC's Rules, is shown below.

§90.20 (2)(i) The letter symbol(s) listed in the Coordinator column of the frequency table in paragraph (c)(3) of this section specifies the frequency coordinator(s) for each frequency as follows:

PF—Fire Coordinator

PH—Highway Maintenance Coordinator

PM—Emergency Medical Coordinator

PO—Forestry-Conservation Coordinator

PP—Police Coordinator

PS—Special Emergency Coordinator

PX—Any Public Safety Coordinator, except the Special Emergency Coordinator

Following the descriptive heading for each frequency is a description of the co-channel and 7.5 kHz adjacent channel incumbent licenses for which there is potential for overlap of service and interference contours with the proposed City of Moscow simulcast system, and a contour map demonstrating that the frequency can be used in the City of Moscow system without the potential for prohibited interference to the incumbent stations.

For each frequency, the contour overlap map that follows the description of the co-channel and adjacent channel circumstances and incumbent licensees. For co-channel circumstances, the maps show the 37 dB μ V/m protected contours (GREEN) and the 19 dB μ V/m interference contours (RED). For 7.5 kHz adjacent channel circumstances, the maps show the 37 dB μ V/m protected contours (GREEN) and the 44 dB μ V/m interference contours (VIOLET).

The ComStudy 2.2 files used to generate the contour overlap will be provided with this report so that they can be submitted to the frequency coordinator to support the City of Moscow's FCC license applications for the new frequencies.

E. CITY OF MOSCOW VHF SIMULCAST SYSTEM – NEW TAC REPEATER INPUT AND OUTPUT FREQUENCIES AND NEW FIRE DISPATCH REPEATER INPUT FREQUENCY

The following sections describe the frequencies proposed for new repeater input and output frequencies for two new shared Tactical Channels that would become part of the proposed City of Moscow VHF 3-site simulcast system, as well as an additional repeater input channel that would replace the repeater input channel for existing Moscow Fire Department main dispatch repeater on Moscow Mountain (the existing input frequency, 151.13 MHz, is subject to serious ongoing degradation due to co-channel interference, as described above in this report).

F. PROPOSED NEW CITY OF MOSCOW VHF FREQUENCIES

New Shared TAC1 Repeater Output Channel: 151.2575 MHz – PO – Notes 27 & 28 in §90.20(c)

Pertinent Portion of Note 27: In the 150-170 MHz band, licensees as of August 18, 1995 who operate systems that are 2.5 kHz removed from regularly assignable frequencies may continue to operate on a secondary, non-interference basis after August 1, 2003. [This provision has no likely impact of the proposed operation on 151.2575 MHz in the City of Moscow system.]

Note 28 applies only to the use of this frequency in Puerto Rico and the U.S. Virgin Islands.

There are no co-channel incumbent stations licensed within 200 kilometers (125 miles) of the Moscow Mountain site, which is the worst-case repeater site for the purposes of contour overlap analysis for the new City of Moscow VHF simulcast system.

Both the proposed City of Moscow facilities and the incumbent 7.5 kHz-spaced licenses within 200 kilometers of Moscow Mountain are shown below in Table 17.

151.2575 MHz - 7.5 KHz Adjacent Channel Stations														
Call Sign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km
KNDV366				Washington State Dept of Natural Resources	151.2500	50	48-17-03.6 N	117-34-19.8 W	2	1757	1759	MO	PW	116.81
KNFJ401				Washington State Dept of Natural Resources	151.2500	50	46-18-02.5 N	117-52-33.7 W	2	939	941	MO	PW	136.46
KUID-DT Site				City of Moscow (PROPOSED)	151.2575	28.8	46-40-54.0 N	116-58-17.0 W	24	1085	1109		PW	15.2
KXU243	MT	PLAINS	SANDERS	DNRC State of Montana	151.2650	100	47-28-28.7 N	114-53-58.4 W	10	748.6	758.6	FB	PW	152.52
Moscow Mountain				City of Moscow (PROPOSED)	151.2575	13.1	46-48-41.6 N	116-54-33.6 W	20	1277	1297		PW	0
Theophilus Tower				City of Moscow (PROPOSED)	151.2575	100	46-43-51.1 N	117-00-50.7 W	46	777	823		PW	12.02
WNVH522				Washington State Dept of Natural Resources	151.2650	100	47-50-15.4 N	118-17-30.5 W	2	780	782	MO	PW	118.15
WNVH522	WA	Colville Reservation	FERRY	Washington State Dept of Natural Resources	151.2650	50	47-54-40.6 N	118-26-39.0 W	2	1243	1245	MO	PW	132.06

Table 17 – 151.2575 MHz – Existing 7.5 kHz-Spaced Licensed and Proposed Facilities

The pertinent 7.5 kHz adjacent channel incumbent stations are shown in the contour map in Figure 2 below. As shown in that map, there is no prohibited overlap between the 37 dBμV/m protected service contours of the incumbent stations and the 44 dBμV/m 7.5 kHz adjacent channel interference contours produced by the proposed City of Moscow VHF simulcast system with sites at Moscow Mountain, Theophilus Tower and the KUID-TV site on Paradise Ridge.

As shown in the map in Figure 3, there is no overlap between the proposed 44 dBμV/m contours from the City of Moscow simulcast system and the 37 dBμV/m contours of the 7.5 kHz-spaced stations listed in Table 17 above.

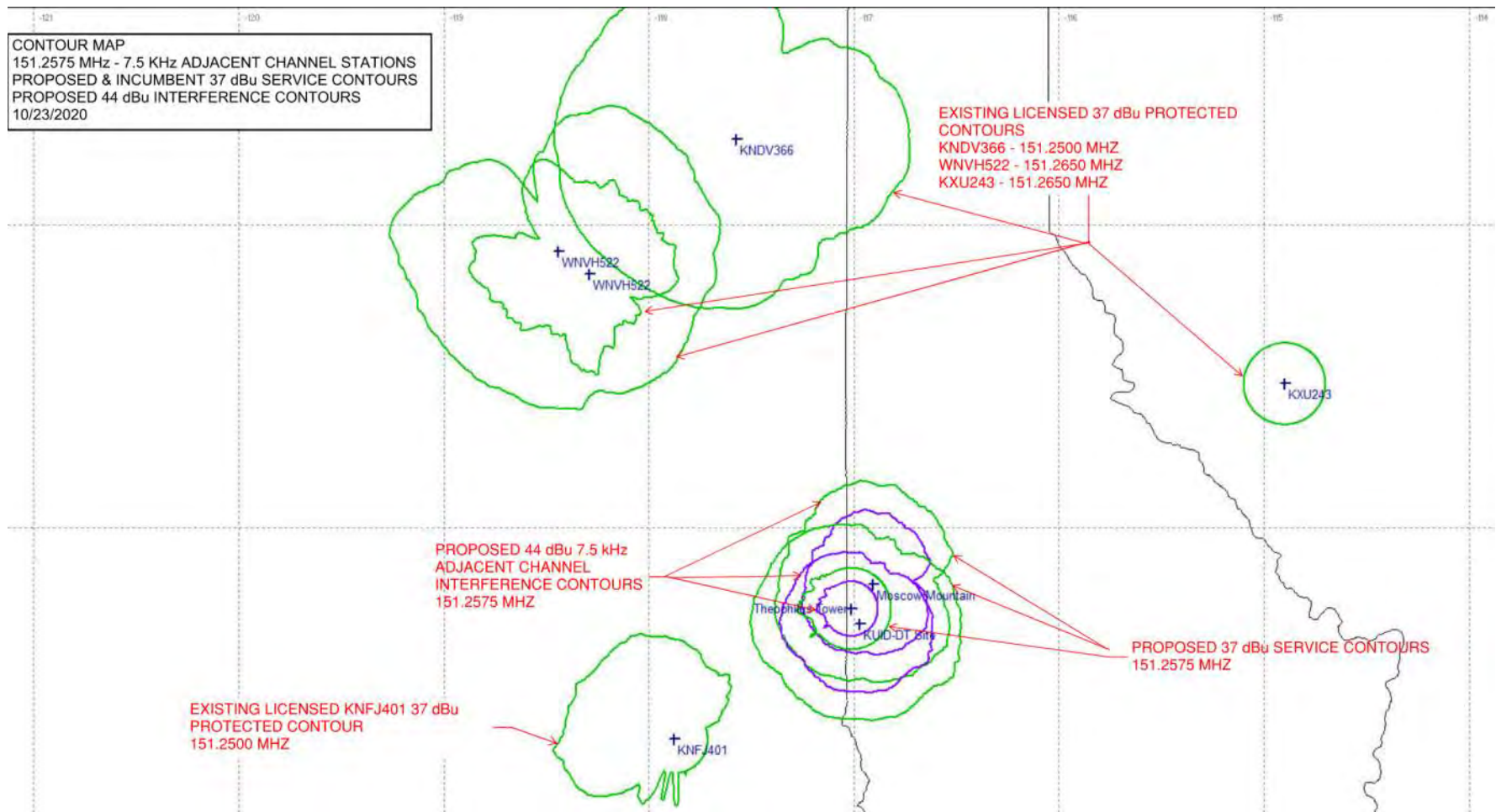


Figure 3 – 7.5 kHz Adjacent Channel Contour Overlap Map – 151.2575 MHz (37 dBμV/m Contours = GREEN & 44 dBμV/m Contours = VIOLET)

New Shared TAC1 Repeater Input Channel: 155.8875 MHz – PX – Note 27 in §90.20(c)

Pertinent Portion of Note 27: In the 150-170 MHz band, licensees as of August 18, 1995 who operate systems that are 2.5 kHz removed from regularly assignable frequencies may continue to operate on a secondary, non-interference basis after August 1, 2003. [This provision has no likely impact of the proposed operation on 155.8875 MHz in the City of Moscow system.]

There are no co-channel incumbent stations licensed within 200 kilometers (125 miles) of the Moscow Mountain site, which is the worst-case repeater site for the purposes of contour overlap analysis for the new City of Moscow VHF simulcast system.

Both the proposed City of Moscow facilities and the incumbent 7.5 kHz-spaced licenses within 200 kilometers of Moscow Mountain are shown below in Table 18.

155.8875 MHz - 7.5 KHz Adjacent Channel Stations															
Call Sign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km	
KDU616	OR	MILTON FREEWATER	UMATILLA	MILTON FREEWATER, CITY OF	155.8800	110	45-55-23.5 N	118-23-35.9 W	21	398	419	FB	PW	150.97	
KLE739	WA	SPOKANE	SPOKANE	SPOKANE, CITY OF	155.8950	100	47-38-08.6 N	117-24-42.8 W	26	694	720	FB	PW	99.22	
KM3726	OR	MILTON FREEWATER	UMATILLA	MILTON FREEWATER, CITY OF	155.8800	110	45-55-23.5 N	118-23-35.9 W	2	399	401	MO	PW	150.97	
KNDR636				CHEWELAH, CITY OF	155.8800	10	48-16-40.6 N	117-42-24.9 W	2	510	512	MO	PW	173.74	
KNJH233				State of Idaho	155.8950	40	46-29-25.7 N	116-15-33.5 W	2	367	369	MO	PW	61.24	
KNJH233	ID	OROFINO	CLEARWATER	State of Idaho	155.8950	40	46-29-25.7 N	116-15-33.5 W	13	354	367	FB	PW	61.24	
KWO331				CHENEY, CITY OF	155.8800	10	47-29-39.6 N	117-34-58.7 W	2	747	749	MO	PW	91.5	
KWO331	WA	CHENEY	SPOKANE	CHENEY, CITY OF	155.8800	145	47-29-39.6 N	117-34-58.7 W	18	759	777	FB	PW	91.5	
MOBILE - KHJH233				Proposed	155.8875	100	46-41-05.3 N	116-39-19.1 W	2	598	600	??	??	23.99	
MOBILE - WNZF355				Proposed	155.8875	100	46-36-18.8 N	117-00-16.8 W	2	821	823	??	??	24.07	
MOBILE - WPRH350				Proposed	155.8875	100	47-01-41.1 N	116-56-36.0 W	2	856	858	??	??	24.21	
WNRV489				PASCO, CITY OF	155.8800	15	46-16-29.5 N	119-10-04.0 W	2	157	159	MO	PW	183.22	
WNZF355				ASOTIN, COUNTY LANDFILL	155.8950	25	46-23-00.6 N	117-06-58.6 W	2	373	375	MO	PW	50.16	
WNZF355	WA	ASOTIN	ASOTIN	ASOTIN, COUNTY LANDFILL	155.8950	25	46-23-00.6 N	117-06-58.6 W	5	366	371	FB	PW	50.16	
WPGN805	ID	KEUTERVILLE	IDAHO	State of Idaho	155.8800	17.3	46-04-04.6 N	116-27-56.5 W	22	1722.6	1744.6	FX1	PW	89.41	
WPRH350				State of Idaho	155.8800	35	47-37-23.6 N	116-59-15.7 W	2	1574	1576	MO	PW	90.43	
WQCG504				PLAINS-PARADISE RURAL FIRE DISTRICT	155.8950	40	47-27-48.2 N	114-53-17.1 W	2	753	755	MO	PW	169.6	
WQCG504	MT	PLAINS	SANDERS	PLAINS-PARADISE RURAL FIRE DISTRICT	155.8950	50	47-27-48.2 N	114-53-17.1 W	10.6	754	764.6	FB	PW	169.6	
WQHJ818	MT	ALBERTON	MISSOULA	MISSOULA, COUNTY OF	155.8800	22	47-01-41.9 N	114-28-11.5 W	40	1770	1810	FB2	YW	187.38	
WQPX285	ID	Priest River	BONNER	BONNER, COUNTY OF	155.8950	33	48-10-52.2 N	116-55-07.5 W	16.3	660.5	676.8	FB2	PW	152.28	
WQVB308				WALLA WALLA COUNTY FIRE DISTRICT 4	155.8950	5	46-05-14.6 N	118-17-05.0 W	2	357	359	MO	PW	132.85	
WQVB308				WALLA WALLA COUNTY FIRE DISTRICT 4	155.8950	110	46-05-14.6 N	118-17-05.0 W	2	357	359	MO	PW	132.85	
WQVB308	WA	WALLA WALLA	WALLA WALLA	WALLA WALLA COUNTY FIRE DISTRICT 4	155.8950	50	46-05-14.6 N	118-17-05.0 W	18	362	380	FB	PW	132.85	
WXU639	ID	OROFINO	CLEARWATER	State of Idaho	155.8800	30	46-29-25.7 N	116-15-33.5 W	13	354	367	FB	PW	61.24	

Table 18 – 155.8875 MHz – Existing 7.5 kHz-Spaced Licensed and Proposed Facilities

The pertinent 7.5 kHz adjacent channel incumbent stations are shown in the contour map in Figure 4 below. As shown in that map, there is no prohibited overlap between the 37 dB μ V/m protected service contours of the incumbent stations and the 44 dB μ V/m 7.5 kHz adjacent channel interference contours produced by worst-case mobile radios operating at the proposed 24 kilometer service area radius (centered on Moscow Mountain) along the site-to-site radials for the three closest 7.5 kHz adjacent channel stations: WPRH350, WXU639 and WNZF355 (since this is a repeater input frequency, it will be licensed for operation with mobile radios and fixed control stations, rather than for base station repeater facilities).

As shown in the map in Figure 4, there is no overlap between the proposed 44 dB μ V/m contours from the City of Moscow worst-case mobile radios and the 37 dB μ V/m contours of the 7.5 kHz-spaced stations listed in Table 18 above.

January 25, 2021



New Shared TAC2 Repeater Output Channel: 154.9575 MHz – PP – Notes 27 in §90.20(c)

Pertinent Portion of Note 27: *In the 150-170 MHz band, licensees as of August 18, 1995 who operate systems that are 2.5 kHz removed from regularly assignable frequencies may continue to operate on a secondary, non-interference basis after August 1, 2003. [This provision has no likely impact of the proposed operation on 151.2575 MHz in the City of Moscow system.]*

There are no co-channel incumbent stations licensed within 200 kilometers (125 miles) of the Moscow Mountain site, which is the worst-case repeater site for the purposes of contour overlap analysis for the new City of Moscow VHF simulcast system.

Both the proposed City of Moscow facilities and the incumbent 7.5 kHz-spaced licenses within 200 kilometers of Moscow Mountain are shown below in Table 19.

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho**

January 25, 2021

154.9575 MHz - 7.5 KHz Adjacent Channel Licensees														
Call Sign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km
KCA204				LINCOLN, COUNTY OF	154.9500	110	47-42-40.6 N	117-51-34.8 W	2	859	861	MO	PW	123.20
KCA204	WA	DAVENPORT	LINCOLN	LINCOLN, COUNTY OF	154.9500	120	47-39-23.6 N	118-08-47.9 W	27	732	759	FB	PW	132.68
KNIZ417				ADAMS, COUNTY OF	154.9650	100	47-03-19.6 N	118-11-39.9 W	2	586	588	MO	PW	101.55
KNIZ417				ADAMS, COUNTY OF	154.9650	100	47-07-14.5 N	118-23-33.9 W	2	545	547	MO	PW	118.01
KNIZ417	WA	OTHELLO	ADAMS	ADAMS, COUNTY OF	154.9650	200	46-49-44.5 N	119-09-49.0 W	17	341	358	FX1	PW	172.04
KNIZ417	WA	RITZVILLE	ADAMS	ADAMS, COUNTY OF	154.9650	200	47-07-14.5 N	118-23-33.9 W	24	564	588	FX1	PW	118.01
KOI388	WA	OTHELLO	ADAMS	OTHELLO, CITY OF	154.9500	220	46-49-44.5 N	119-09-49.0 W	27	341	368	FX	PW	172.04
KUID-DT SITE					154.9575	28.8	46-40-54.0 N	116-58-17.0 W	24	1085	1109		PW	15.20
KUO928	WA	OTHELLO	ADAMS	ADAMS, COUNTY OF	154.9500	316	46-49-44.5 N	119-09-49.0 W	17	341	358	FX1	PW	172.04
KUO928	WA	RITZVILLE	ADAMS	ADAMS, COUNTY OF	154.9500	316	47-07-14.5 N	118-23-33.9 W	55	564	619	FX1	PW	118.01
Moscow Mountain				City of Moscow	154.9575	13.1	46-48-41.6 N	116-54-33.6 W	20	1277	1297		PW	0.00
Theophilus Tower				City of Moscow	154.9575	100	46-43-51.1 N	117-00-50.7 W	46	777	823		PW	12.02
WPIT540				City of Richland	154.9500	70	46-15-46.0 N	119-18-58.0 W	2	166	168	MO	PW	194.45
WPIT540	WA	KENNEWICK	BENTON	City of Richland	154.9500	184	46-15-46.0 N	119-18-58.0 W	37	166	203	FX1	PW	194.45
WPLD240				BONNER, COUNTY OF	154.9650	90	48-16-21.7 N	116-32-50.7 W	2	634	636	MO	PW	164.72
WPLD240	ID	SANDPOINT	BONNER	BONNER, COUNTY OF	154.9650	120	48-16-21.7 N	116-32-50.7 W	15	634	649	FB	PW	164.72
WPLD240	ID	SANDPOINT	BONNER	BONNER, COUNTY OF	154.9650	135	48-18-33.7 N	116-33-27.7 W	11	650	661	FB	PW	168.62
WQGX779	MT	PLAINS	SANDERS	Sanders, County of	154.9500	8.2	47-22-21.7 N	114-51-37.4 W	30	2064	2094	FB2	YW	167.61
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	5	47-17-12.7 N	115-02-59.0 W	2	1334	1336	MO	PW	150.87
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	5	47-22-39.3 N	115-20-53.9 W	2	931	933	MO	PW	134.19
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	5	47-27-15.0 N	115-20-15.9 W	2	1528	1530	MO	PW	139.00
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	5	47-27-15.0 N	115-39-33.0 W	2	1848	1850	MO	PW	118.74
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-27-15.0 N	115-20-15.9 W	2	1528	1530	MO	PW	139.00
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-22-39.3 N	115-20-53.9 W	2	931	933	MO	PW	134.19
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-17-12.7 N	115-02-59.0 W	2	1334	1336	MO	PW	150.87
WQLA661				WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-27-15.0 N	115-39-33.0 W	2	1848	1850	MO	PW	118.74
WQLA661	MT	DE BORGIA	MINERAL	WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-27-15.0 N	115-20-15.9 W	20	940	960	FB2	PW	139.00
WQLA661	MT	HAUGEN	MINERAL	WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-22-39.3 N	115-20-53.9 W	20	1164	1184	FB2	PW	134.19
WQLA661	MT	SOHON	MINERAL	WEST END VOLUNTEER FIRE DISTRICT	154.9650	20	47-27-15.0 N	115-39-33.0 W	20	1852	1872	FB2	PW	118.74
WQLA661	MT	ST REGIS	MINERAL	WEST END VOLUNTEER FIRE DISTRICT	154.9650	178	47-17-12.7 N	115-02-59.0 W	20	1305	1325	FB2	PW	150.87
WQLK580				LINCOLN, COUNTY OF	154.9500	100	47-53-17.6 N	118-01-26.5 W	2	942	944	MO	PW	146.36
WQWL990				PECK, CITY OF	154.9650	50	46-28-24.5 N	116-25-22.4 W	2	326	328	MO	PW	52.91
WQWL990	ID	PECK	NEZ PERCE	PECK, CITY OF	154.9650	50	46-28-24.5 N	116-25-22.4 W	12.2	329	341.2	FB	PW	52.91

Table 19 – 154.9575 MHz – Existing 7.5 kHz-Spaced Licensed and Proposed Facilities

System Alternatives Report – Radio Systems Upgrade Project City of Moscow, Idaho

January 25, 2021

The pertinent 7.5 kHz adjacent channel incumbent stations are shown in the contour maps in Figure 5 and Figure 6 below. As shown in that map, there is no prohibited overlap between the 37 dB μ V/m protected service contours of the incumbent stations and the 44 dB μ V/m 7.5 kHz adjacent channel interference contours produced by the proposed City of Moscow VHF simulcast system with sites at Moscow Mountain, Theophilus Tower and the KUID-TV site on Paradise Ridge.

As shown in the map in Figure 5 and Figure 6, there is no overlap between the proposed 44 dB μ V/m contours from the City of Moscow simulcast system and the 37 dB μ V/m contours of the 7.5 kHz-spaced stations listed in Table 19 above.

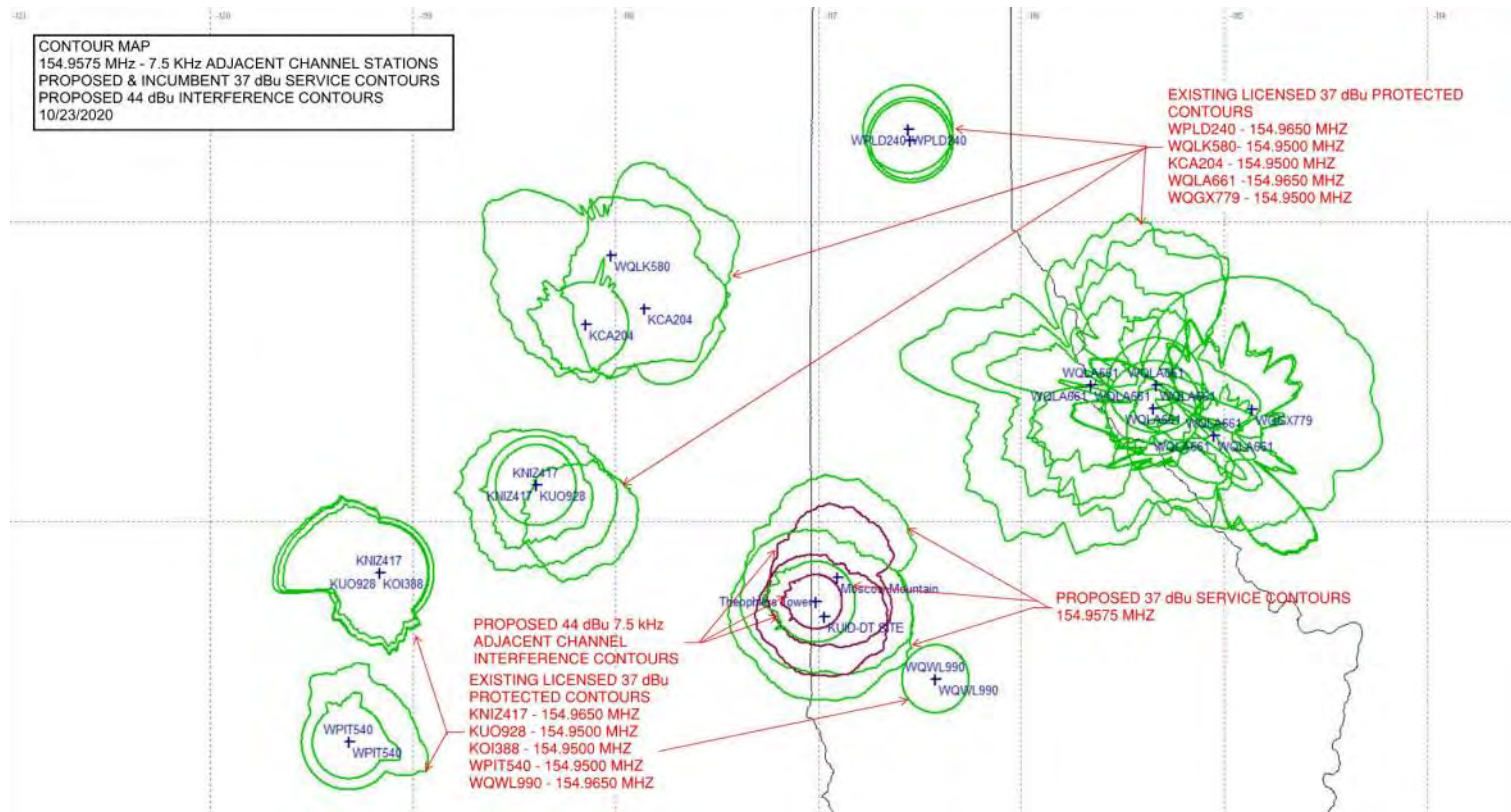
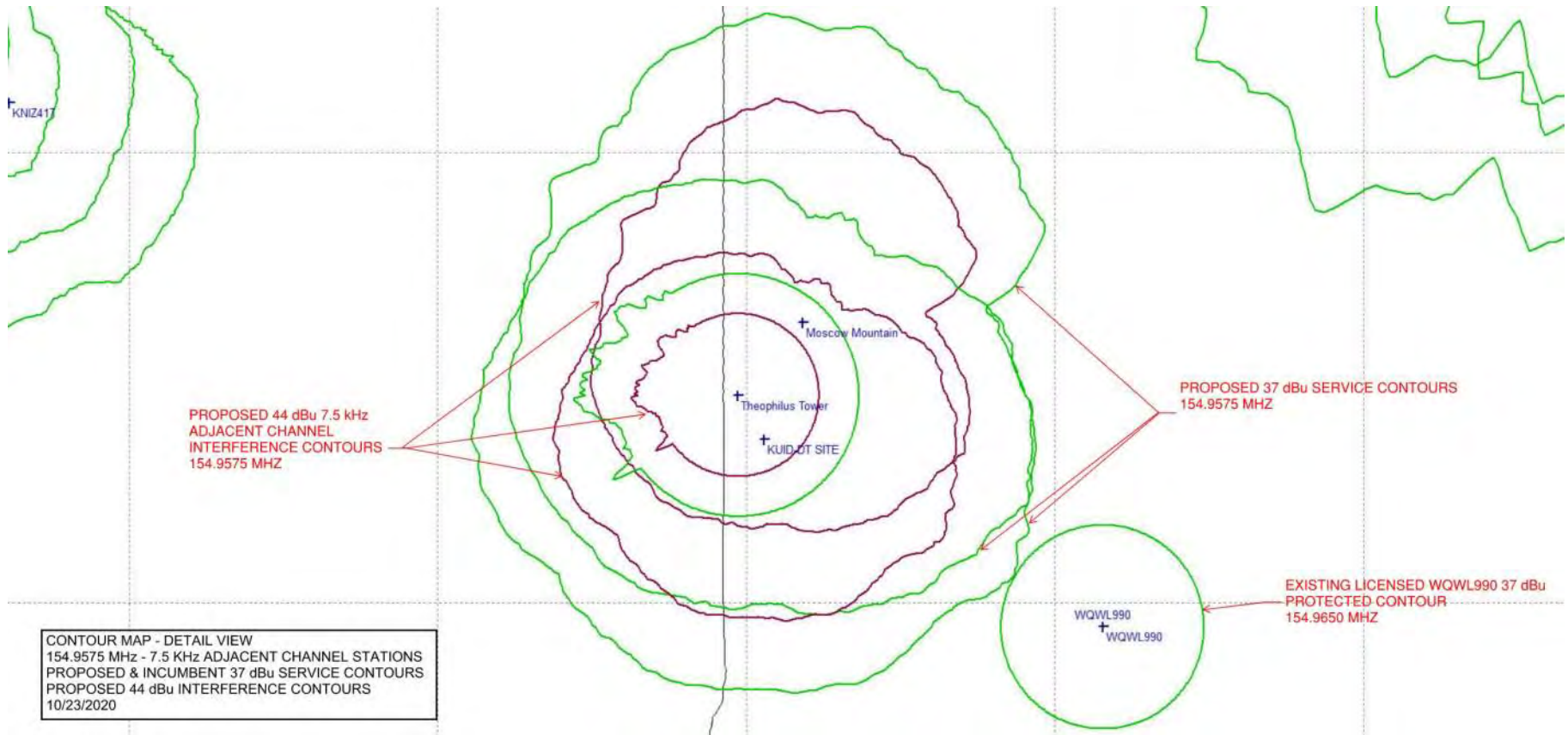


Figure 5 – 7.5 kHz Adjacent Channel Contour Overlap Map – 154.9575 MHz (37 dB μ V/m Contours = GREEN & 44 dB μ V/m Contours = VIOLET)

A contour map showing the detail of the lack of contour overlap with WALW990, licensed to the City of Peck, Idaho, is shown below in Figure 6.



**Figure 6 – 7.5 kHz Adjacent Channel Contour Overlap Map – WALW990 Detail – 154.9575 MHz (37 dBμV/m
Contours = GREEN & 44 dBμV/m Contours = VIOLET)**

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho**

January 25, 2021

New Shared TAC2 Repeater Input Channel: 159.2400 MHz – PO – Note 46 in §90.20(c)

Note 46: This frequency is limited to a maximum power of 20 watts. [This provision will require the output power from the mobile radios operating on this repeater input channel to be set to 20 Watts. This should not be a significant issue for mobile radio inbound (mobile-to-base station) coverage on this channel.]

Both the proposed City of Moscow facilities and the incumbent Co-Channel and 7.5 kHz-spaced licenses within 200 kilometers of Moscow Mountain are shown below in Table 20.

159.2400 MHz - Co-Channel & 7.5 KHz Adjacent Channel Stations														
Call Sign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km
KUID-DT Site				City of Moscow - Proposed	159.2400	25	46-40-54.0 N	116-58-17.0 W	24	1085	1109		PW	15.2
Mobile 1 - WRAP586				City of Moscow - Proposed	159.2400	20	46-40-33.2 N	117-09-06.9 W	2	811	813		PW	23.9
Mobile 2 - WPCZ396				City of Moscow - Proposed	150.0000	20	46-36-06.1 N	116-57-28.6 W	2	870	872		PW	23.62
Moscow Mountain				City of Moscow - Proposed	159.2400	23	46-48-41.6 N	116-54-33.6 W	20	1277	1297		PW	0
Theophilus Tower				City of Moscow - Proposed	159.2400	100	46-43-51.1 N	117-00-50.7 W	46	777	823		PW	12.02
WNVH522	WA	Davenport	LINCOLN	Washington State Dept of Natural Resources	159.24	100	47-50-15.4 N	118-17-30.5 W	22	782.1	804.1	FB2	PW	154.71
WPZC396	OR	ENTERPRISE	WALLOWA	State of Idaho	159.2325	30	45-56-11.0 N	116-56-03.3 W	18	1571	1589	FB2	PW	97.3
WRAP586	WA		WALLA WALLA	COLUMBIA-WALLA WALLA COUNTY FIRE DISTRICT #2	159.24	50	46-16-46.0 N	118-09-12.7 W	2	500	502	MO	PW	112.28
WRAP586	WA	WAITSBURG	WALLA WALLA	COLUMBIA-WALLA WALLA COUNTY FIRE DISTRICT #2	159.24	100	46-16-46.0 N	118-09-12.7 W	36.6	500	536.6	FB2	PW	112.28

Table 20 – 159.2400 MHz – Existing Co-Channel and 7.5 kHz-Spaced Licensed and Proposed Facilities

The pertinent Co-Channel and 7.5 kHz adjacent channel incumbent stations are shown in the contour map in Figure 7 below. As shown in that map, there is no prohibited overlap between the 37 dBμV/m protected service contours of the incumbent stations and the 19 dBμV/m Co-Channel or 44 dBμV/m 7.5 kHz adjacent channel interference contours produced by worst-case mobile radios operating at the proposed 24 kilometer service area radius (centered on Moscow Mountain) along the site-to-site radials for the closest Co-Channel and 7.5 kHz adjacent channel stations: WRAP586 and WPZC396 (since this is a repeater input frequency, it will be licensed for operation with mobile radios and fixed control stations, rather than for base station repeater facilities).

As shown in the map in Figure 7, there is no overlap between the proposed 19 dBμV/m Co-Channel and 44 dBμV/m 7.5 kHz Adjacent Channel contours from the City of Moscow worst-case mobile radios and the 37 dBμV/m protected service contours of the Co-Channel and 7.5 kHz-spaced stations listed in Table 20 above.

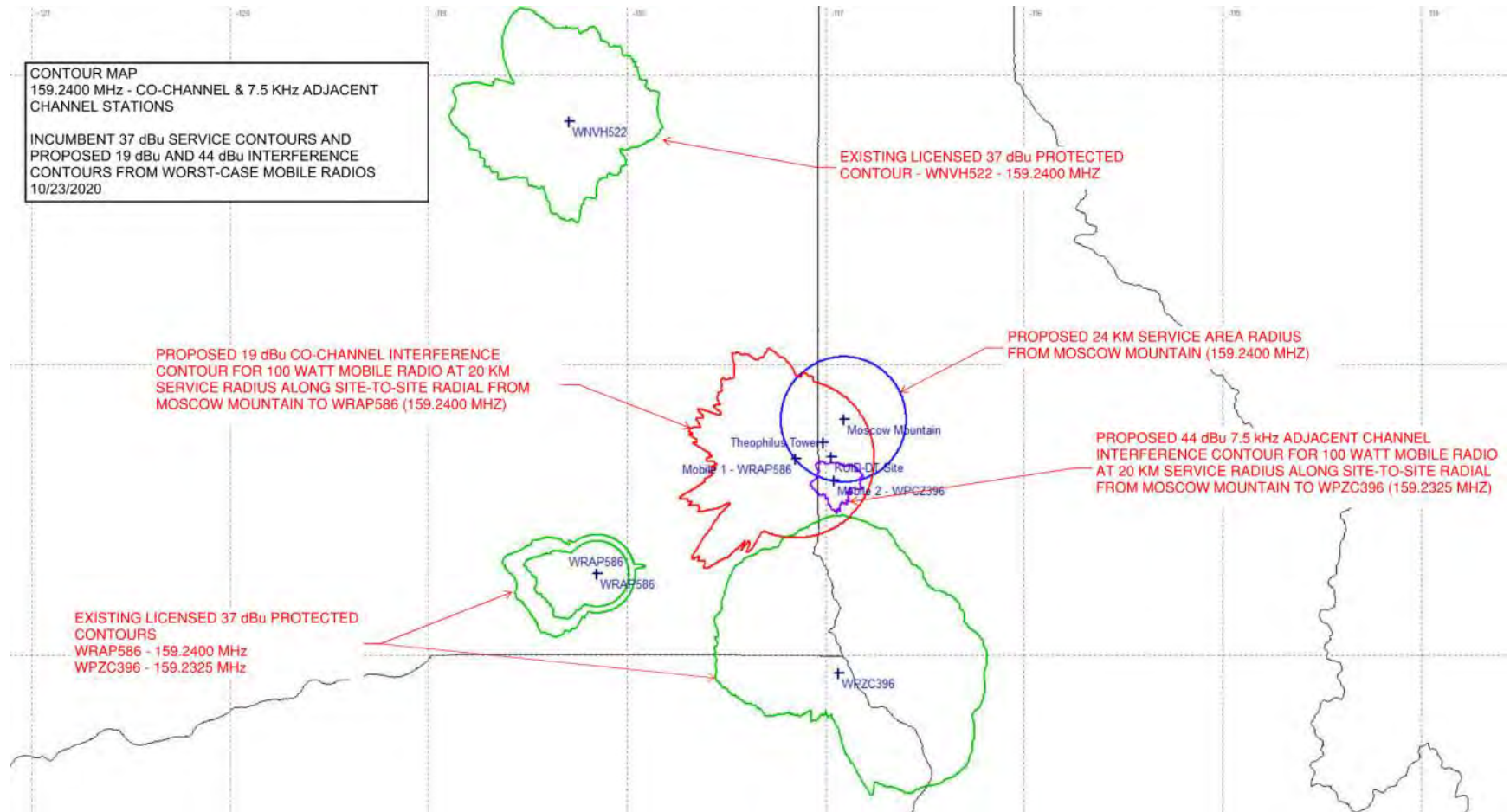


Figure 7 – Co-Channel & 7.5 kHz Adjacent Channel Contour Overlap Map – 159.2400 MHz (37 dB μ V/m Contours = GREEN, 19 dB μ V/m Contours = RED & 44 dB μ V/m Contours = VIOLET)

Replacement Input Channel for Existing Fire Dispatch Repeater 1: 156.0975 MHz – PP – Note 27 in §90.20(c)

Pertinent Portion of Note 27: *In the 150-170 MHz band, licensees as of August 18, 1995 who operate systems that are 2.5 kHz removed from regularly assignable frequencies may continue to operate on a secondary, non-interference basis after August 1, 2003.* [This provision has no likely impact of the proposed operation on 151.2575 MHz in the City of Moscow system.]

This frequency replaces the existing repeater input channel used for the MFD primary dispatch channel pair (the existing repeater input frequency is 151.1300 MHz, as described above in the section that describes the interference issues associated with this frequency).

There are no co-channel incumbent stations licensed within 200 kilometers (125 miles) of the Moscow Mountain site, which is the worst-case repeater site for the purposes of contour overlap analysis for the new City of Moscow VHF simulcast system.

Both the proposed City of Moscow facilities and the incumbent 7.5 kHz-spaced licenses within 200 kilometers of Moscow Mountain are shown below in Table 21.

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho**

January 25, 2021

156.0975 MHz - 7.5 KHz Adjacent Channel Stations														
Call Sign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km
MOBILE - WPKA236				City of Moscow - Proposed Mobile at 32 km Radius on site-to-site Radial to WPKA236	156.0975	100	47-05-55.3 N	116-56-39.1 W	2	852	854	MO	PW	32.00
MOBILE - WPTI540				City of Moscow - Proposed Mobile at 32 km Radius on site-to-site Radial to WPTI540	156.0975	100	46-40-06.3 N	117-16-12.0 W	2	1069	1071	MO	PW	32.00
MOBILE - WNPT689				City of Moscow - Proposed Mobile at 32 km Radius on site-to-site Radial to WNPT689	156.0975	100	46-54-34.0 N	116-30-54.3 W	2			MO	PW	32.00
WNAL585				WILBUR, CITY OF	156.1050	80	47-45-09.5 N	118-40-22.0 W	2	687	689	MO	PW	169.55
WNAL585	WA	WILBUR	LINCOLN	WILBUR, CITY OF	156.1050	80	47-45-09.5 N	118-40-22.0 W	14	663	677	FB	PW	169.55
WNPT689				Mineral County Sheriff's Office	156.0900	220	47-11-34.7 N	114-53-15.5 W	2	832	834	MO	PW	159.5
WPIT540				City of Richland	156.0900	70	46-15-46.0 N	119-18-58.0 W	2	166	168	MO	PW	194.45
WPIT540	WA	KENNEWICK	BENTON	City of Richland	156.0900	184	46-10-28.5 N	119-09-06.0 W	11	311	322	FB2	PW	186.15
WPKA236				HAUSER, CITY OF	156.0900	40	47-46-04.6 N	116-59-18.7 W	2	707	709	MO	PW	106.5
WPKA236	ID	HAUSER	KOOTENAI	HAUSER, CITY OF	156.0900	40	47-46-04.6 N	116-59-18.7 W	8	789	797	FB2	PW	106.5
WPQB240				SPIRIT LAKE FIRE PROTECTION DISTRICT	156.1050	5	48-00-58.9 N	116-58-48.7 W	2	700	702	MO	PW	134.06
WPQB240				SPIRIT LAKE FIRE PROTECTION DISTRICT	156.1050	5	47-57-54.5 N	116-52-01.0 W	2	783	785	MO	PW	128.29
WPQB240				SPIRIT LAKE FIRE PROTECTION DISTRICT	156.1050	5	48-03-00.7 N	116-51-00.4 W	2	707	709	MO	PW	137.78
WPQB240	ID	BLANCHARD	BONNER	SPIRIT LAKE FIRE PROTECTION DISTRICT	156.1050	15	48-00-58.9 N	116-58-48.7 W	18.3	700	718.3	FB2	PW	134.06
WPQB240	ID	SPIRIT LAKE	KOOTENAI	SPIRIT LAKE FIRE PROTECTION DISTRICT	156.1050	5	47-57-54.5 N	116-52-01.0 W	30.5	785	815.5	FB2	PW	128.29
WPQB240	ID	SPIRIT LAKE	KOOTENAI	SPIRIT LAKE FIRE PROTECTION DISTRICT	156.1050	10	48-03-00.7 N	116-51-00.4 W	15.2	709	724.2	FB2	PW	137.78
WPPTD944	WA	CHEWELAH	STEVENS	FERRY, COUNTY OF	156.0900	6.7	48-10-53.0 N	117-59-21.0 W	12	1770	1782	FB2	PW	172.67

Table 21 – 156.0975 MHz – Existing 7.5 kHz-Spaced Licensed and Proposed Facilities

The pertinent Co-Channel and 7.5 kHz adjacent channel incumbent stations are shown in the contour map in Figure 8 below. As shown in that map, there is no prohibited overlap between the 37 dBμV/m protected service contours of the incumbent stations and the 44 dBμV/m 7.5 kHz adjacent channel interference contours produced by worst-case mobile radios operating at the proposed 32 kilometer service area radius (centered on Moscow Mountain) along the site-to-site radials for the closest Co-Channel and 7.5 kHz adjacent channel stations: WPKA236, WPTI540 and WNPT689 (since this is a repeater input frequency, it will be licensed for operation with mobile radios and fixed control stations, rather than for base station repeater facilities).

As shown in the map in Figure 8, there is no overlap between the proposed 44 dBμV/m 7.5 kHz Adjacent Channel contours from the City of Moscow worst-case mobile radios and the 37 dBμV/m protected service contours of the 7.5 kHz-spaced stations listed in Table 21 above.

January 25, 2021

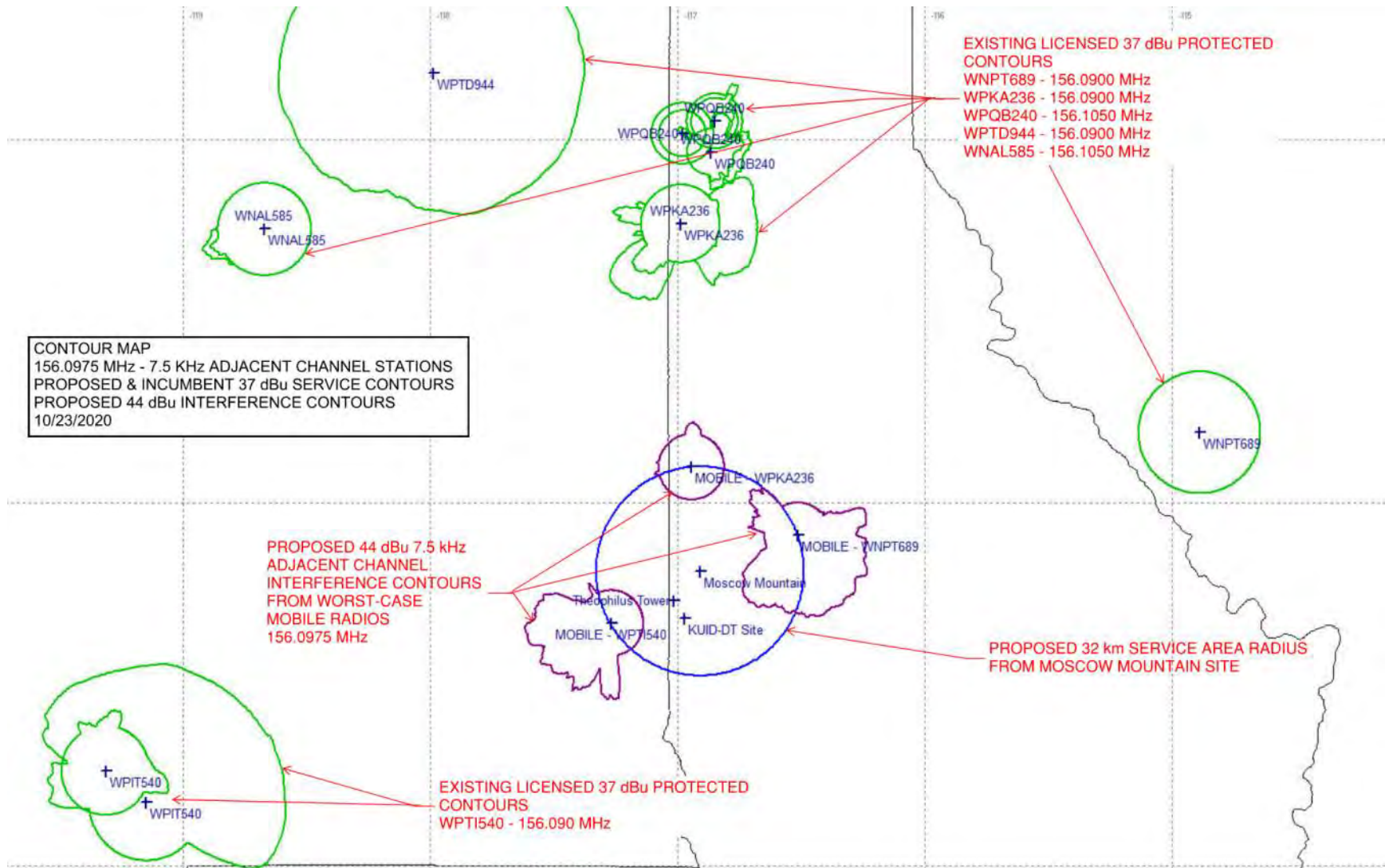


Figure 8 – 7.5 kHz Adjacent Channel Contour Overlap Map – 156.0975 MHz (37 dB μ V/m Contours = GREEN & 44 dB μ V/m Contours = VIOLET)

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho**

January 25, 2021

Existing Fire Dispatch Repeater #2 Output Channel (KCS544): 154.8900 MHz – PP – No Notes in §90.20(c)

This frequency is currently used as the existing MFD Repeater #2 repeater output channel at the Moscow Mountain site.

The co-channel incumbent stations and 7.5 kHz adjacent channel stations licensed within 200 kilometers (125 miles) of the Theophilus Tower site, which is the central site in the proposed City of Moscow VHF simulcast system, are shown in Table 22 below.

The proposed City of Moscow facilities are also shown below in Table 22.

154.8900 MHz - Co-Channel & 7.5 KHz Adjacent Channel Licensees														
Call Sign	State	City	County	Licensee	Freq	ERP_w	Lat	Lon	AGL_m	GL_m	AMSL_m	Class	Serv	Distance_km
KCS544 - Existing	ID	MOSCOW	LATAH	MOSCOW, CITY OF	154.8900	7.2	46-48-41.6 N	116-54-33.6 W	11	1413	1424	FB2	PW	12.02
KCS544 - Proposed	ID	MOSCOW	LATAH	MOSCOW, CITY OF	154.8900	13.1	46-48-41.6 N	116-54-33.6 W	11	1413	1424	FB2	PW	12.02
KFB871	WA	CONNELL	FRANKLIN	CONNELL, CITY OF	154.8900	100	46-39-41.5 N	118-51-24.0 W	12.5	266	278.5	FB	PW	141.15
KUID-DT Site		MOSCOW	LATAH	City of Moscow - Proposed	154.8900	28.8	46-40-54.0 N	116-58-17.0 W	24	1085	1109		??	6.37
Theophilus Tower		MOSCOW	LATAH	City of Moscow - Proposed	154.8900	100	46-43-51.1 N	117-00-50.7 W	46	777	823		??	0.00
WPBK234	WA		FRANKLIN	FRANKLIN, COUNTY OF	154.8900	100	46-28-02.5 N	119-11-19.1 W	2	279	281	MO	PW	169.18
WPBK234	WA	Connell	FRANKLIN	FRANKLIN, COUNTY OF	154.8900	100	46-40-40.5 N	118-53-27.0 W	2	341	343	MO	PW	143.65
WPBK234	WA	KENNEWICK	BENTON	FRANKLIN, COUNTY OF	154.8900	5	46-06-12.8 N	119-07-43.6 W	2	667	669	MO	PW	176.9
WQLC650				FRANKLIN COUNTY SHERIFF	154.8900	100	46-06-13.9 N	119-07-44.5 W	2	653	655	MO	PW	176.91
WQLG429	ID	SANDPOINT	BONNER	NORTHSIDE FIRE DISTRICT	154.8825	50	48-26-08.0 N	116-29-10.0 W	38	654	692	FB2	PW	193.65

Table 22 – 154.8900 MHz (Existing Licensed MFD RPT 2) – Existing Co-Channel & 7.5 kHz-Spaced Licensed Facilities and Proposed Facilities

The pertinent Co-Channel and 7.5 kHz adjacent channel incumbent stations are shown in the contour map in Figure 8 below. As shown in that map, there is no prohibited overlap between the 37 dBµV/m protected service contours of the incumbent stations and the 19 dBµV/m Co-Channel and 44 dBµV/m 7.5 kHz adjacent channel interference contours produced by the proposed facilities at Moscow Mountain, Theophilus Tower and the KUID-TV site on Paradise Ridge.

The proposed facilities at Moscow Mountain include an increase of the Effective Radiated Power (ERP) from the current value of 7.2 Watts (licensed under KCS544) to 13.1 Watts, which is the height-power limit at the Moscow Mountain site.

As shown in the map in Figure 9 below, there is no overlap between the proposed 19 dBµV/m Co-Channel and 44 dBµV/m 7.5 kHz Adjacent Channel contours from the City of Moscow facilities and the 37 dBµV/m protected service contours of the Co-Channel and 7.5 kHz-spaced adjacent channel stations listed in Table 22 above.

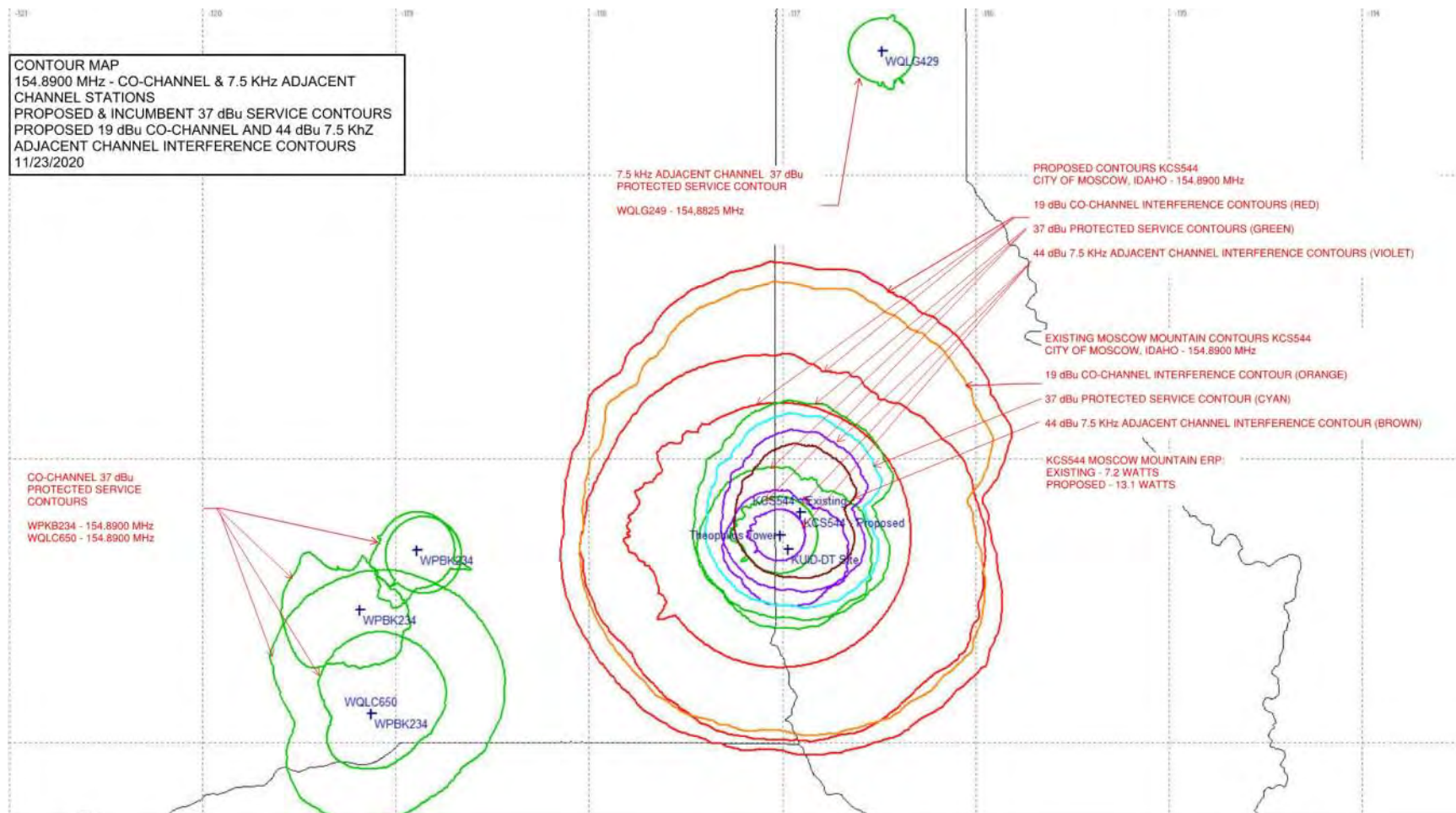


Figure 9 – Co-Channel & 7.5 kHz Adjacent Channel Contour Overlap Map – 154.8900 MHz (37 dB μ V/m Contours = GREEN, 19 dB μ V/m Contours = RED & 44 dB μ V/m Contours = VIOLET)

Existing Public Works Repeater (153.9800 MHz Output/155.775 MHz Input) Licensed at Latah County Courthouse under Callsign KCS544

Based on the information provided by Public Works personnel during the Needs Assessment interview, the existing Public Works stand-alone repeater at the Courthouse site provides adequate outdoor coverage for Public Works operations.

Because Public Works does not require the extensive in-building coverage that both MFD and MPD require, it is not necessary to include the PW repeater channels in the proposed VHF simulcast system. Also, adding the PW channels to the proposed simulcast system would add to the cost of the simulcast system, because these channels would need to be incorporated into the transmitter and receiver combining systems at the simulcast sites, the TX channel would need to be licensed at the simulcast sites, and the simulcast system would require three base station repeaters, versus the two repeaters that would replace the existing Courthouse repeater and provide a backup for that repeater.

The main issue associated with the Public Works VHF repeater is that there is no backup to take the place of the repeater in the event of its failure. This issue can be addressed by installing a backup repeater with a manual cutover capability at the Courthouse site, or by installing a backup stand-alone repeater at a different site, such as the NW Water Tower site used as a voting receiver site in the proposed VHF simulcast system. A repeater installed at the NW Water Tower site could be operated in “hot-standby” mode with a different CTCSS tone than the tone used in the main Courthouse repeater, and the main and backup repeaters could be programmed for different switch positions on the Public Works mobile and portable radios. This would eliminate the need for a manual cutover in the event of the failure of the main repeater.

Coverage maps showing the predicted mobile radio coverage from the NW Water Tower site are included in the VHF coverage maps shown below in this report. As shown in the maps, that site provides good coverage of the entire Public Works service area.

5. PROPOSED CONFIGURATION OF VHF SIMULCAST SYSTEM

The proposed configuration of VHF repeater input and output channels, as well as the proposed use of the existing MFD Repeater #2 input channel as a simplex channel, are shown below.

A. VHF Simulcast System – Configuration of Channels

153.8000 MHz – (Existing MFD Primary Dispatch Repeater Output Channel) – This channel is retained as the repeater output channel for the Moscow Fire Department primary dispatch repeater (MFD RPT1).

Maintain existing “grandfathered” licensed facilities at Moscow Mountain. Modify Existing License KSC544 to add Theophilus Tower and KUID-TV sites and to add this frequency at those sites. Adding these two sites would bring to total number of fixed infrastructure sites to 6, which is the maximum allowed on a single VHF FCC radio license.

156.0975 MHz – (Replacement for existing MFD Primary Dispatch Repeater Input Channel) – This channel replaces 151.1300 MHz as the repeater input channel for the Moscow Fire Department Primary Dispatch Channel (MFD RPT1). The existing channel is seriously degraded by co-channel interference, as described elsewhere in this report.

Modify Existing License KCS544 to add the frequency to Location 5, which defines a 32-kilometer mobile operating radius around Location 1 (1312 White Avenue in Moscow).

154.8900 MHz/159.0000 MHz (Existing MFD RPT2 Moscow Mountain repeater output/input channels) – This channel pair would be added to the proposed VHF 3-site simulcast system.

154.8900 MHz is currently licensed at Moscow Mountain (under callsign KSC544) for an ERP of 7.2 Watts. Modify KSC544 to increase the ERP to 13.1 Watts (the height-power limit for the Moscow Mountain site), add this frequency to the simulcast sites newly added to the license, with an ERP of 100 Watts at the Theophilus Tower site and an ERP of 28.8 Watts at the KUID-TV site.

159.0000 MHz is already licensed (under call sign KSC544) for mobile operation with a 32-kilometer operating radius around Location #1 (1312 White Avenue in Moscow), so no changes to the license are required to continue to operate existing mobile and portable radios on this frequency.

154.4450 MHz/158.9850 MHz – (Existing Moscow Police Department Primary Dispatch Channel) – This channel pair will continue to be used as the MPD primary dispatch channel, with the following changes:

154.4450 MHz is currently licensed under the callsign WQLA210 at three base station sites, with the sites selected manually via CTCSS tones from the mobile radios:

Latah County Courthouse
Water Tower at Jim Lyle Rotary Park
U of I Golf Course

In order to include this frequency as a base station repeater output frequency in the 3-site simulcast system, WQLA210 will need to be modified to add the three proposed simulcast sites. Once that modification is complete and the new simulcast system is operational, the existing base station sites can be removed from the license.

158.9850 MHz – This frequency is currently licensed under the callsign WQLA210 for mobile operating area with a 40-kilometer radius around Location #1 (1215 Nez Perce Drive, which is the Golf Course site), so no changes to the license are required to continue to operate existing mobile and portable radios on this frequency.

151.2575 MHz/159.240 MHz – (New Frequency Pair for Shared TAC Channel #1)

151.2575 MHz – This frequency would be used as the repeater output frequency for a new shared repeated TAC channel (Shared TAC Channel #1), which would operate over the proposed 3-Site Simulcast radio system.

This frequency could be added to the three simulcast radio sites (Moscow Mountain, Theophilus Tower and KUID-TV) on either KSC544 or WQLA210, as part of the addition of those sites to either of those licenses.

159.2400 MHz – This frequency would be used as the repeater input frequency for a new shared repeated TAC channel, which would operate over the proposed 3-Site Simulcast radio system.

Use of this frequency will require the addition of an additional location associated with a mobile operating radius of 24 kilometers around the Moscow Mountain site (as shown in Figure 7 above). This is the maximum service area radius which will prevent contour overlap with 7.5 kHz spaced station WPZC396, Enterprise, Oregon, as shown in Figure 7. This additional location can be added to either KCS544 or WQLA210.

This frequency is limited to a maximum power of 20 Watts, so the mobile radios used in the proposed simulcast system will need to be set to this limit on this particular channel.

154.9575 MHz/155.8875 MHz – (New Frequency Pair for Shared TAC Channel #2)

154.9575 MHz – This frequency would be used as the repeater output frequency for a new shared repeated TAC channel (Shared TAC Channel #2), which would operate over the proposed 3-Site Simulcast radio system.

This frequency could be added to the three simulcast radio sites (Moscow Mountain, Theophilus Tower and KUID-TV) on either KSC544 or WQLA210, as part of the addition of those sites to either of those licenses.

155.8875 MHz – This frequency would be used as the repeater input frequency for a new shared repeated TAC channel, which would operate over the proposed 3-Site Simulcast radio system.

Use of this frequency will require the addition of an additional location associated with a mobile operating radius of 24 kilometers around the Moscow Mountain site (as shown in Figure 7 above). This is the maximum service area radius which will prevent contour overlap with 7.5 kHz spaced station WNZF255, Asotin, Washington, as shown in Figure 7. This additional location can be added to either KCS544 or WQLA210.

153.9800 MHz/155.7750 MHz – (Existing Public Works Stand-Alone Repeater Pair)

As described above the existing public works repeater at the Courthouse will continue to operate with its current licensed facilities, as described above. If a backup repeater is added at the NW Water Tower as described above, that repeater site will require a new license application, since the existing FCC licenses will already have six fixed infrastructure sites per license in order to accommodate the new simulcast system base station sites; this is the maximum number of fixed sites allowed on a single license under the FCC's Rules.

Proposed VHF Simulcast System TX and RX Frequencies, Channel Names and Channel Spacings

The TX and RX channels used in the proposed City of Moscow VHF Simulcast System are summarized in Table 23 below. Table 23 also shows the TX-TX and TX-RX frequency spacings for the proposed City of Moscow VHF Simulcast System channels.

City of Moscow VHF Simulcast TX Channels		TX-TX Frequency Spacing (kHz)				
		153.8000	154.8900	154.4450	151.2575	154.9575
153.8000	MFD Main Dispatch Channel - TX	0.0	-1090.0	-645.0	2542.5	-1157.5
154.8900	MFD TAC Channel #1 - TX	1090.0	0.0	445.0	3632.5	-67.5
154.4450	MPD Main Dispatch Channel - TX	645.0	-445.0	0.0	3187.5	-512.5
151.2575	Shared TAC Channel #1 - TX	-2542.5	-3632.5	-3187.5	0.0	-3700.0
154.9575	Shared TAC Channel #2 - TX	1157.5	67.5	512.5	3700.0	0.0
City of Moscow VHF Simulcast RX Channels		TX-RX Freequency Spacing (kHz)				
		153.8000	154.8900	154.4450	151.2575	154.9575
156.0975	MFD Main Dispatch Channel - RX	2297.5	1207.5	1652.5	4840.0	1140.0
159.0000	MFD TAC Channel #1 - RX	5200.0	4110.0	4555.0	7742.5	4042.5
158.9850	MPD Main Dispatch Channel - RX	5185.0	4095.0	4540.0	7727.5	4027.5
159.2400	Shared TAC Channel #1 - RX	5440.0	4350.0	4795.0	7982.5	4282.5
155.8875	Shared TAC Channel #2 - RX	2087.5	997.5	1442.5	4630.0	930.0

Table 23 – City of Moscow VHF Simulcast System Channel Configuration

B. VHF Transmitter Combiner, Receiver Multicoupler and Antenna Systems

The configuration of the transmitter combiner and receiver multicoupler systems for the three VHF simulcast sites is shown in Appendix 3, which includes a block diagram of the system, system loss calculation spreadsheets and an intermodulation study provided by the combining system manufacturer.

Because of close frequency spacings between some of the TX channels, two transmit (TX) antennas are required at each site, along with a single receive (RX) antenna.

The two transmitting antennas require spacing of 10 vertical feet at the Moscow Mountain and KUID-TV sites and 10 horizontal feet at the Theophilus Tower site.

The required TX-RX antenna spacing at the two sites with lattice towers (Moscow Mountain and KUID-TV) is 20 vertical feet. The required horizontal spacing between

the TX and RX antenna at the Theophilus tower rooftop site is 100 feet, which can be achieved if the antennas are mounted on opposite diagonal corners of the rooftop.

As shown in the intermodulation study in Appendix 3, there are no 3rd-order intermodulation “hits” that would affect any of the receive frequencies used in the system. The only predicted “hit” shown in the report is a 5th order hit which is unlikely to occur at power level high enough when generated by passive mixing in the combining system or in metallic junctions on the tower at one of the sites to degrade the performance of the “victim” receiver on 159.2400 MHz.

The TX and RX antennas shown in the system design are all 6 dBd gain omnidirectional fiberglass colinear dipoles, as shown in Table 24 below.

C. VHF System Console Interface

The console interface for the proposed VHF simulcast system will be provided by two Codan 4-channel analog dispatch gateways (or similar equipment from an alternate manufacturer—the VHF simulcast system configuration shown in this report is based on Codan radio and simulcast control equipment). These gateways will provide 4-wire E&M interface circuits to the Whitcom Dispatch Center over the microwave interconnect system described below.

D. VHF System Simulcast and Receiver Voting Equipment Configuration

The VHF simulcast system shown in this report assumes base station radios provided by Codan. The Codan simulcast system is a distributed system, which has the simulcast delay and receiver voting functions built into each base station and site controller, with each site providing redundant backup functions for the other sites. The radios have an IP interface, and are interconnected via the proposed microwave and fiber interconnect system described below in this report. The IP interconnection can be a “flat” network with all of the radios and controllers on the same subnet, so a higher-level configuration (such as MPLS, which is required for the Motorola 700 MHz system described elsewhere in this report) is not required.

For the VHF system, the connections from the base station radios at each of the simulcast sites to the Whitcom Dispatch Center are assume to be 4-wire E&M connections provided by the Codan console interface equipment.

The Codan proposal is also the basis for the estimated costs for the VHF simulcast radio equipment, simulcast and voting equipment, and console interface equipment for the VHF system shown elsewhere in this report. The reason for using a specific manufacturer’s system and cost proposal as the basis for the VHF system design was to assure that all of the system components required for simulcast operation and the interface to the Whitcom Dispatch Center would be properly accounted for and included in the system design and cost estimate and that a reasonable baseline is established for estimating system costs.

Any RFP or other vehicle used to procure the new VHF system would be written to be vendor-neutral, so that multiple equipment vendors could bid on the proposed system.

E. VHF Backup Power Systems

The proposed VHF system design include 48 VDC rectifier/battery backup systems at each simulcast site designed to provide 12 hours of operation for both the radio system and the microwave interconnect system at the site. The cost of these systems is shown as a separate line item in the system cost estimates shown below in this report.

F. VHF Coverage Prediction Maps

The following sections contain coverage prediction maps for the proposed City of Moscow VHF Simulcast System. The maps in this section include both outbound (talk-out) maps and an inbound (talk-in) maps for mobile radios, head-level portable radios and belt-level portable radios. The simulcast system maps also contain a delay spread map and a simulcast reliability map that provide additional information with respect to simulcast coverage, as described in more detail below.

The predictions in the maps are produced by the Anderson 2D model, which we have used extensively in the Pacific Northwest (including Eastern Washington) and which we have found to produce prediction results that compare well with measurements when combined with high-resolution terrain and LULC (Land Use/Land Cover) data. The digital terrain database used for the prediction maps has a resolution of 10 meters, while the LULC database used for the prediction maps has a resolution of 5 meters. The LULC database has 64 different land use and land cover categories, each one of which is assigned a value representing the signal loss it introduces due to attenuation of the signal as it passes through the “clutter” in the vicinity of the mobile or portable radio receiving or transmitting the desired signal. These attenuation values have been adjusted so that the signal attenuation (loss) values are representative of the clutter losses encountered for VHF signals in the areas in and around Latah County, Idaho (we developed these attenuation values in conjunction with a statewide coverage analysis project for Washington State Patrol, and they produced predictions that corresponded well with signal levels measured in the field in areas where we had both predictions and measured data).

1. VHF Coverage Map Signal Power/Color Key

The map key on the right side of each map describes the type of coverage and the site (or multi-site simulcast system or group of stand-alone sites) depicted in each map. Figure 10 below shows the key to the color code used in all of the maps. The color code key shown below is representative. The actual signal levels corresponding to the colors and coverage reliability ranges will vary among the maps, depending upon whether the map depicts “talk-out” (base to mobile) or “talk-in” (mobile to base)

coverage, and whether the map depicts mobile coverage or portable coverage. The correspondence between grid colors and coverage reliability levels is consistent for all of the maps.

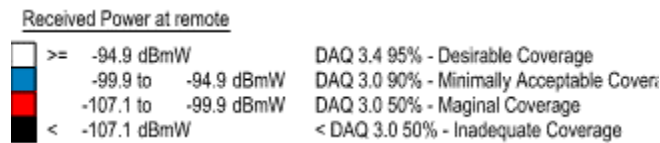


Figure 10 – Representative Coverage Prediction Map Color Key
(12.5 kHz Analog Narrowband Head-Level Portable Talk-Out Parameters Shown)

NO COLOR – 95% Coverage Probability A signal power at least as strong as that shown in the key will have at least a 95% probability of achieving DAQ 3.4 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side – **DESIRABLE COVERAGE**

GREEN – 90% - 95% Coverage Probability A signal power at least as strong as that shown in the key will have at least a 90% probability of achieving DAQ 3.0 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side. - **MINIMALLY ACCEPTABLE COVERAGE**

RED – 50% - 90% Coverage Probability A signal power at least as strong as that shown in the key will have at least a 50% probability of achieving DAQ 3.0 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side. – **MARGINAL COVERAGE**

BLACK - < 50% Coverage Probability A signal power at least as strong as that shown in the key will have less than a 50% probability of achieving DAQ 3.0 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side. – **INADEQUATE COVERAGE**

NOTE: INSTEAD OF SHOWING DESIRABLE COVERAGE AS A COLOR AND AREAS WITHOUT COVERAGE AS NO COLOR OR CLEAR, THE MAPS IN THIS

REPORT SHOW THE “REVERSE” IMAGE, WITH THE BEST COVERAGE SHOWN WITH A TRANSPARENT OVERLAY OVER THE UNDERLYING MAP AND LESS DESIRABLE COVERAGE LEVELS SHOWN WITH COLORED PIXELS. THEREFORE, ANY AREA WHERE THE UNDERLYING MAP IS SHOWN WITHOUT ANY COLORED PIXELS HAS 95% PROBABILITY DAQ 3.4 DESIREABLE COVERAGE.

The coverage maps shown below in this report depict coverage for mobile radios and for a portable radio used at both head level and belt level. The maps show composite coverage from all three simulcast base station repeater sites for outbound signals and from the three simulcast receiver sites plus the two stand-alone voting receiver sites for inbound signals.

Additional maps show predicted in-building coverage for portable radios both at head level and at belt level. The maps showing “Residential” coverage assume 15 dB of additional signal attenuation due to building losses (over and above the losses due to path loss, terrain and land clutter), while the maps showing “Commercial” coverage assume 25 dB of additional signal attenuation due to building losses.

The “Coverage Probability” percentages shown above represent the statistical likelihood that the signal power level corresponding to each percentage will be received at that percentage of the possible locations within a single prediction grid tile, which is a square area 500 feet wide on a side. Because the prediction software predicts the median received signal power at the center of each grid tile, the required received signal power needs to be increased relative to the median (50%) level to account for changes in worst-case “clutter” conditions (trees, houses, larger buildings, etc.) as the radio user moves from location to location within the prediction grid tile area. Even in coverage prediction tiles with predicted signal power levels less than the 50% Coverage Probability level shown above, coverage may still exist, but it will be more spotty within that particular tile area, and will have lower audio quality than DAQ 3.4.

2. VHF Analog Narrowband Coverage Maps

Maps showing VHF analog narrowband (12.5 kHz channel) predicted coverage are shown below in this report.

For the City of Moscow VHF Simulcast System, the maps show composite talk-out and talk-in coverage for all simulcast sites and voting receiver sites, based on the antenna patterns and ERP levels shown below in Table 24. The simulcast delay offset for each of the three simulcast sites is also shown in Table 24.

Antenna Requirements, Antenna Height, ERP and Delay Offset Parameters for City of Moscow VHF Simulcast System								
Repeater Site	TX Antenna	Azimuth (" True)	"Safe Harbor" ERP Limit (Watts)	Simulcast System ERP (Watts)	TX Antenna Elevation (Meters AGL)	TX Antenna Elevation (Meters AMSL)	TX Antenna AHAAT (Meters)	Delay Offset (µSec)
Moscow Mountain	TX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-3 - 150-157 MHz)	N/A	13.1	13.1	20	1297	402	0.0
	TX Antenna #2 - OMNI - 6.0 dBd (Telewave ANT150F6-3 - 150-157 MHz)	N/A	13.1	13.1	17	1294	399	0.0
Theophilus Tower	RX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-4 - 156-164 MHz)	N/A	N/A	N/A	30	1307	N/A	N/A
	TX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-3 - 150-157 MHz) - NOTE 1	N/A	500.0	100.0	46	823	-21	0.0
	TX Antenna #2 - OMNI - 6.0 dBd (Telewave ANT150F6-3 - 150-157 MHz) - NOTE 1	N/A	500.0	100.0	46	823	-21	0.0
	RX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-4 - 156-164 MHz) - NOTE 2	N/A	N/A	N/A	46	833	N/A	N/A
KUID-TV (Paradise Ridge)	TX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-3 - 150-157 MHz)	N/A	28.8	28.8	24	1109	271	7.0
	TX Antenna #2 - OMNI - 6.0 dBd (Telewave ANT150F6-3 - 150-157 MHz)	N/A	28.8	28.8	21	1106	268	7.0
	RX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-4 - 156-164 MHz)	N/A	N/A	N/A	34	1119	N/A	N/A
NW Water Tank - RX Only Site	RX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-4 - 156-164 MHz)	N/A	N/A	N/A	15	817	N/A	N/A
Vista Water Tank RX Only Site	RX Antenna #1 - OMNI - 6.0 dBd (Telewave ANT150F6-4 - 156-164 MHz)	N/A	N/A	N/A	19	838	N/A	N/A
	NOTE 1 - Minimum Horizontal Separation - 10 feet between TX Antenna #1 and TX Antenna #2.							
	NOTE 2 - Minimum Horizontal Separation - 100 feet between TX Antennas #1 & #2 and RX Antenna #1.							

Table 24 – Antenna Requirements, Antenna Heights, ERP and Simulcast Delay Offset Parameters

3. Talk-Out (Outbound) Maps

The talk-out maps show the coverage for base station-to-mobile radio paths for analog narrowband operation, based on a minimum received signal level at a mobile radio of -93.3 dBm and -94.9 dBm at a portable radio for 95% DAQ 3.4 coverage, and -98.3 dBm at a mobile radio and -99.9 dBm at a portable radio for 90% DAQ 3.0 coverage.

The maps in the following sections include composite coverage maps for the proposed VHF simulcast system. Talk-out maps are included for both mobile radio coverage, head-level portable coverage and belt-level portable radio coverage. The maps show predicted coverage for outdoor areas, in-building coverage for residential buildings and in-building coverage for commercial buildings.

4. VHF Talk-In (Inbound) Maps

The talk-in maps show the coverage for mobile to base-station radio paths for analog narrowband operation, based on a minimum received signal level at the base station of -93.3 dBm for 95% DAQ 3.4 coverage, and -98.3 dBm at the base station for 90% DAQ 3.0 coverage.

The maps in the following sections include composite coverage maps for the proposed VHF simulcast system receiver sites, plus two stand-alone voting receiver sites in the City of Moscow (all receiver sites are on the same receiver voting system). Talk-in maps are included for both mobile radio coverage, head-level portable coverage and belt-level portable radio coverage. The

maps show predicted coverage for outdoor areas, in-building coverage for residential buildings and in-building coverage for commercial buildings.

The coverage predictions produced by the EDX Signal Pro™ software treat receiver voting systems by showing coverage at the “best” voted receiver, based on received signal power. This type of prediction is not ideal for modeling receiver voting systems that vote on signal quality, since in those system the “best” signal may not be the signal with the highest received signal power. Therefore, the talk-in predictions are typically “worst-case” with actual receiver voting system producing somewhat better coverage than the coverage shown in the maps in this report.

5. VHF Simulcast Delay Spread Maps

The narrowband analog simulcast delay spread maps contained in the following sections have been generated using the Hess delay spread prediction methodology, which provides more conservative prediction results than other delay spread prediction methodologies implemented in prediction software available (including the EDX software) before this model was incorporated into the EDX prediction software several years ago. The delay spread maps show areas where the worst-case RMS delay spread in the overlap areas among the simulcast sites is within the ranges shown in Figure 11 below and the ratio between the strongest signal and any of the other signals is less than 30 dB and areas A threshold delay spread value of 50 microseconds and a capture ratio of 30 dB are the values we have assumed in the Hess model for narrowband analog simulcast TX systems.



Figure 11 – VHF Simulcast Delay Spread Map Color Key

These maps, the color scheme is similar to the color scheme shown in the coverage prediction maps. In areas shown with NO COLOR, audio quality should be good wherever coverage is sufficient to produce adequate Delivered Audio Quality, as shown in the coverage prediction maps. In areas shown in BLUE, audio quality is likely to be reduced to DAQ 3.0 and distortion of the audio heard on the radio may occur. In grid squares which are shown as RED significant audio distortion may occur, depending upon how much greater than 50 microseconds the delay time actually is at that grid.

6. VHF Simulcast Coverage Reliability Maps

The simulcast reliability maps shown below for the proposed VHF simulcast system combine the effect of simulcast capture ratio, delay spread and predicted received signal strength (“RSSI”) to

provide a prediction of the statistical reliability of DAQ 3.4 (or DAQ 3.0) coverage in a given map grid square (represented by pixels in the map). The calculations on which the map is based are based on the simulcast model developed by Gary Hess at Motorola, and take into account both the destructive effects of simulcast overlap, where the overlap causes interference, and the “constructive” effects of simulcast overlap, where the delay spread is low and the overlap has the effect of improving coverage because signals from more than one site are available. The statistical reliability levels depicted in the maps and the color codes for those levels are shown in Figure 12 below.

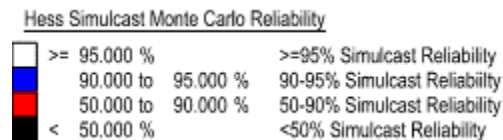


Figure 12 – VHF Simulcast Reliability Map Color Key

In the simulcast reliability maps shown below in this report, the areas where reliability levels below 90% are predicted are primarily areas where there is inadequate coverage due to terrain shadowing or the effects of land use and land cover. In most cases, the lower reliability levels are not caused by simulcast system overlap issues, but are simply related to the absence of sufficient signal strength to provide good coverage.

7. City of Moscow VHF Simulcast System Maps

The City of Moscow VHF Simulcast System maps are shown below in the following section.

Talk-out (Outbound) Maps

Figure 13 shows the predicted mobile radio wide-area talk-out (outbound) coverage for the VHF Simulcast System for both 95% DAQ 3.4 and 90% DAQ 3.0 performance levels.

- In this map the areas with a transparent shading with the underlying map showing through represent coverage equal to or better than 95% DAQ 3.4 (Desirable Coverage).
- Map pixels shown in GREEN represent 90% DAQ 3.0 coverage (Minimally Acceptable Coverage).
- Map pixels shown in RED represent 50% DAQ 3.0 coverage (Marginal Coverage).

- Map pixels shown in BLACK or areas shown without any shading over the underlying map represent areas with less than 50% DAQ 3.0 coverage (Inadequate Coverage).

Figure 14 shows the predicted portable radio wide-area talk-out (outbound) head-level coverage for the VHF Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 15 shows the predicted portable radio wide-area talk-out (outbound) belt-level coverage for the VHF Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 16 shows the predicted portable radio in-building talk-out (outbound) head-level coverage for the VHF Simulcast System for Residential buildings, with the same performance levels as those shown in the mobile radio map.

Figure 17 shows the predicted portable radio in-building talk-out (outbound) head-level coverage for the VHF Simulcast System for Commercial buildings, with the same performance levels as those shown in the mobile radio map.

Talk-In (Inbound) Maps

Figure 18 shows the predicted mobile radio wide-area talk-in (inbound) coverage for the VHF Simulcast System for both 95% DAQ 3.4 and 90% DAQ 3.0 performance levels.

- In this map the areas with a transparent shading with the underlying map showing through represent coverage equal to or better than 95% DAQ 3.4 (Desirable Coverage).
- Map pixels shown in GREEN represent 90% DAQ 3.0 coverage (Minimally Acceptable Coverage).
- Map pixels shown in RED represent 50% DAQ 3.0 coverage (Marginal Coverage).
- Map pixels shown in BLACK or areas shown without any shading over the underlying map represent areas with less than 50% DAQ 3.0 coverage (Inadequate Coverage).

Figure 19 shows the predicted portable radio wide-area talk-in (inbound) head-level coverage for the VHF Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 20 shows the predicted portable radio wide-area talk-in (inbound) belt-level coverage for the VHF Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 21 shows the predicted portable radio in-building talk-in (inbound) head-level coverage for the VHF Simulcast System for Residential buildings, with the same performance levels as those shown in the mobile radio map.

Figure 22 shows the predicted portable radio in-building talk-in (inbound) head-level coverage for the VHF Simulcast System for Commercial buildings, with the same performance levels as those shown in the mobile radio map.

Simulcast Delay Spread and Reliability Maps

Figure 23 is the Delay Spread map for the VHF Simulcast System. CLEAR areas show delay spread values less than 40 μ Sec, BLUE areas show delay spread values between 40 and 50 μ Sec, and RED areas show delay spread values greater than 50 μ Sec, which is the level at which delay spread may begin to produce audible distortion in the audio produced by the radio. (Areas with there is no visible clear or colored shading over the underlying map are those where the received signal level is below the minimum signal power threshold set for the coverage predictions. In these areas, the signal is not usable apart from the issue of simulcast time domain (delay) interference.)

Figure 24 is the Simulcast Reliability map for the VHF Simulcast System. Clear areas in this map show predicted reliability greater than or equal to 95%, while the colored areas show lower levels of reliability as described in the map legend. (Areas with there is no visible clear or colored shading over the underlying map are those where the received signal level is below the minimum signal power threshold set for the coverage predictions. In these areas, the signal is not usable apart from the issue of simulcast time domain (delay) interference.)

VHF TALK-OUT (OUTBOUND) COVERAGE PREDICTION MAPS

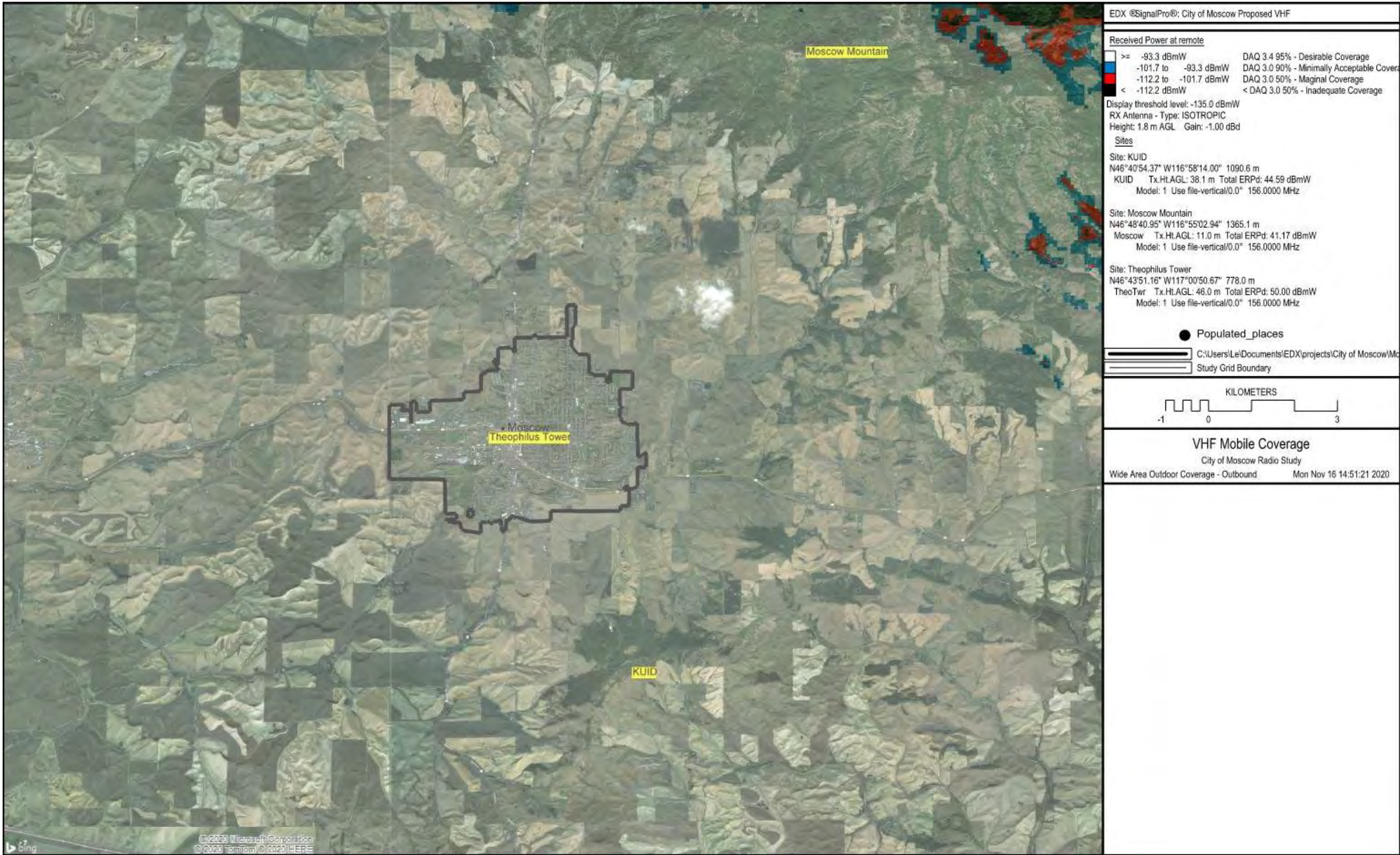


Figure 13 - Proposed VHF Simulcast System - Wide-Area Mobile Radio Talk-out (Outbound) Coverage

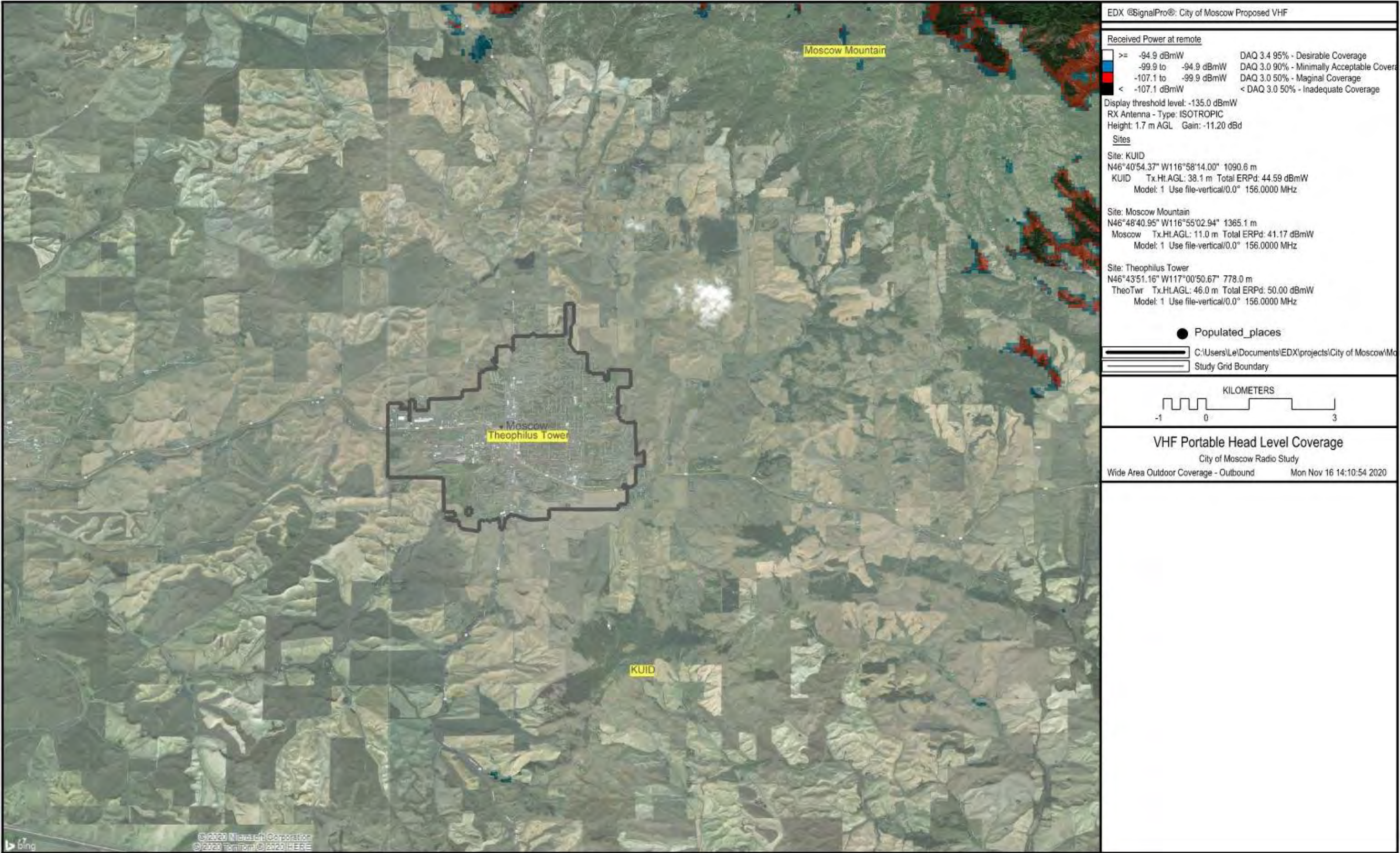


FIGURE 14 - PROPOSED VHF SIMULCAST SYSTEM - WIDE-AREA HEAD-LEVEL PORTABLE RADIO TALK-OUT (OUTBOUND) COVERAGE

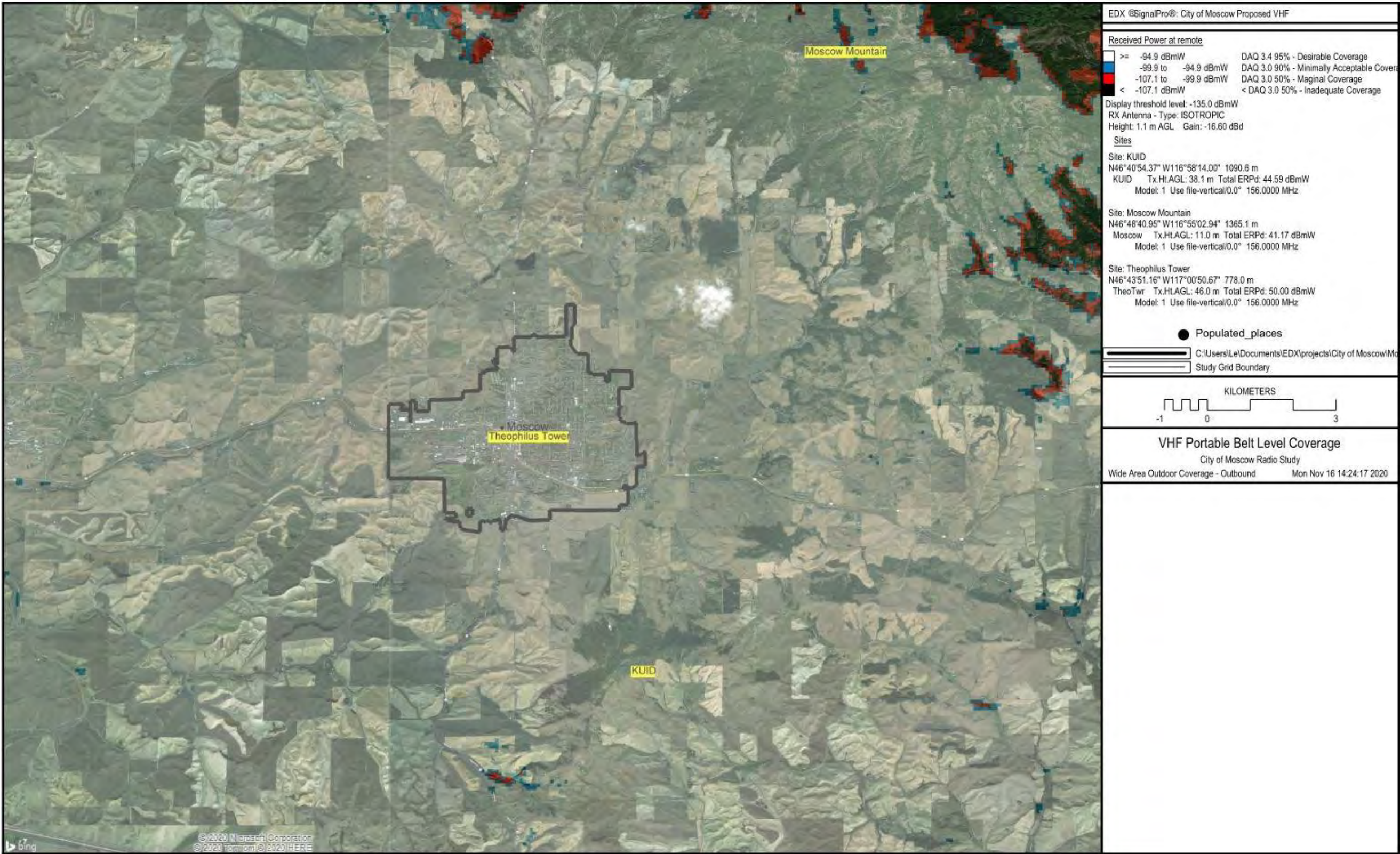


Figure 15 - Proposed VHF Simulcast System - Wide-Area Belt-Level Portable Radio Talk-out (Outbound) Coverage

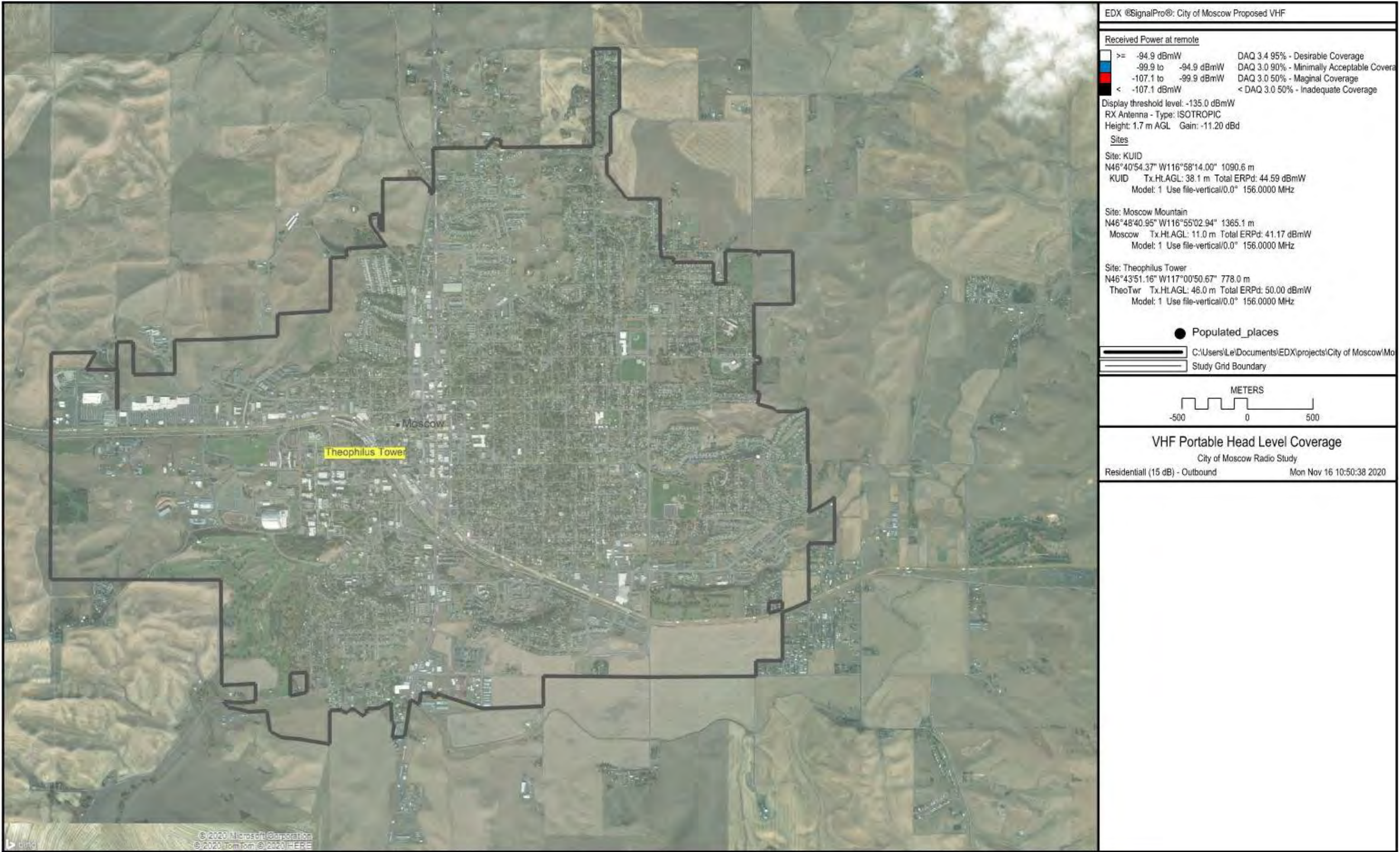


Figure 16 - Proposed VHF Simulcast System – In-Building Head-Level Portable Radio Talk-out (Outbound) Coverage [RESIDENTIAL]



VHF TALK-IN (INBOUND) COVERAGE PREDICTION MAPS

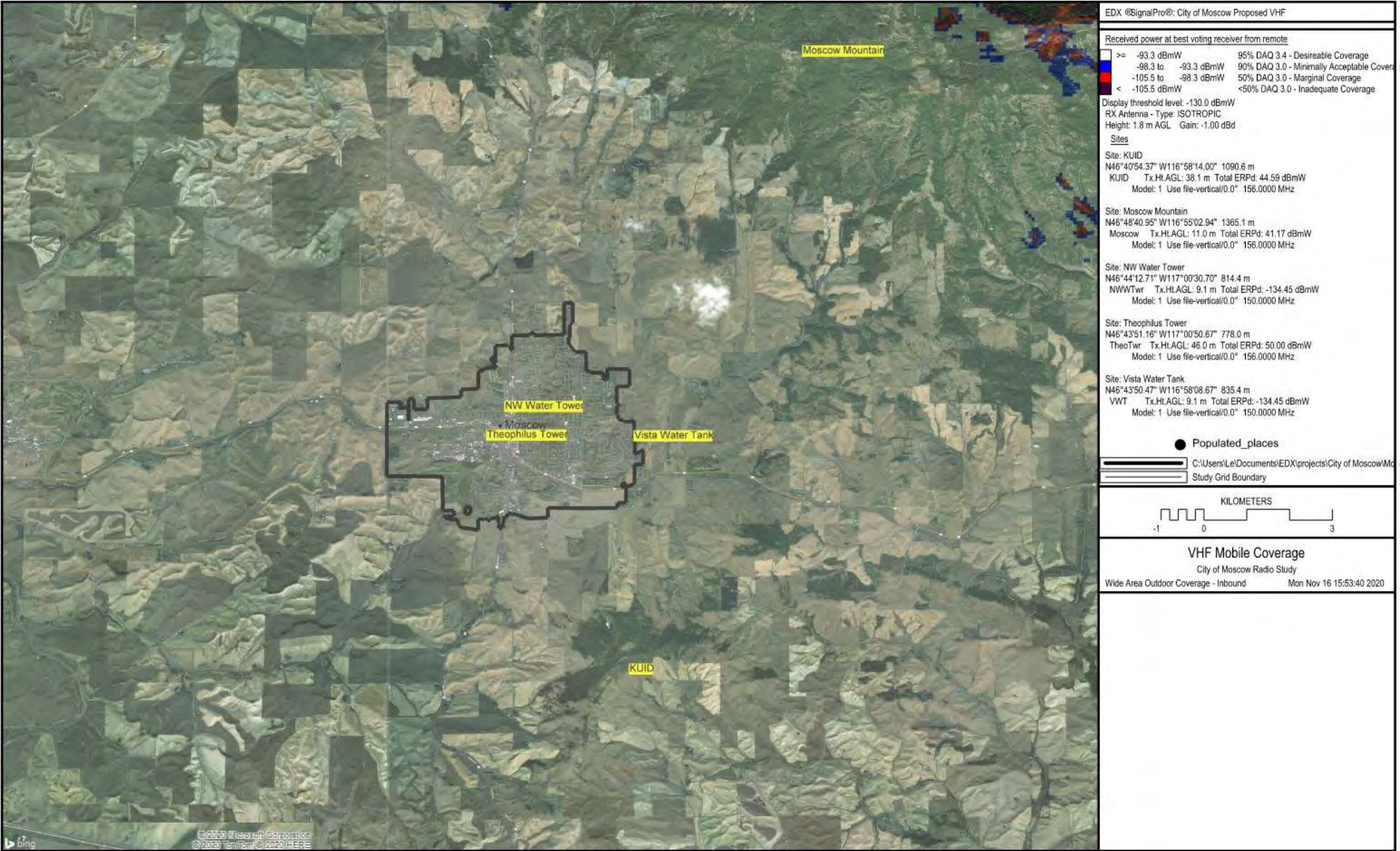


Figure 18 - Proposed VHF Simulcast System - Wide-Area Mobile Radio Talk-In (Inbound) Coverage

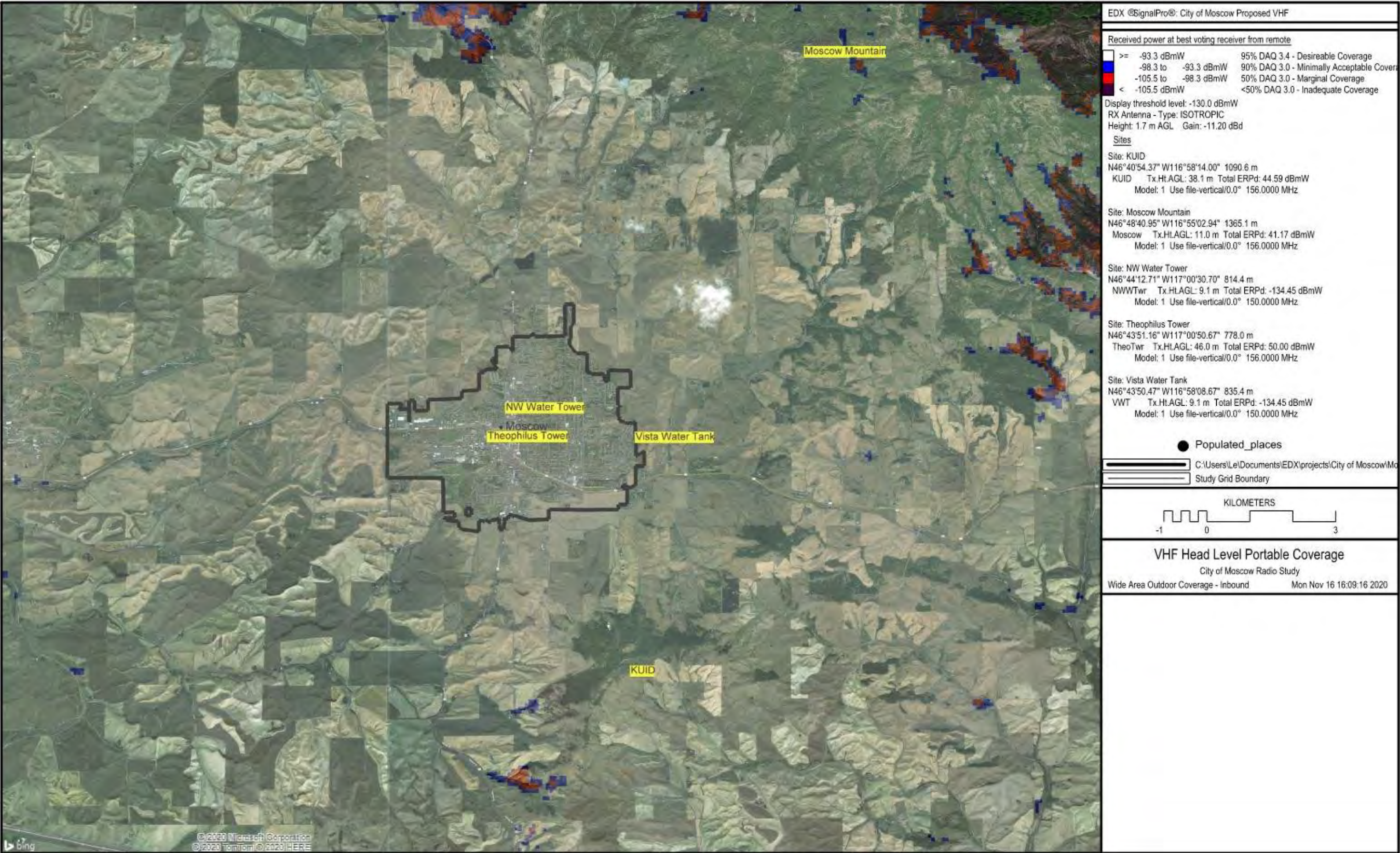


Figure 19 - Proposed VHF Simulcast System - Wide-Area Head-Level Portable Radio Talk-in (Inbound) Coverage

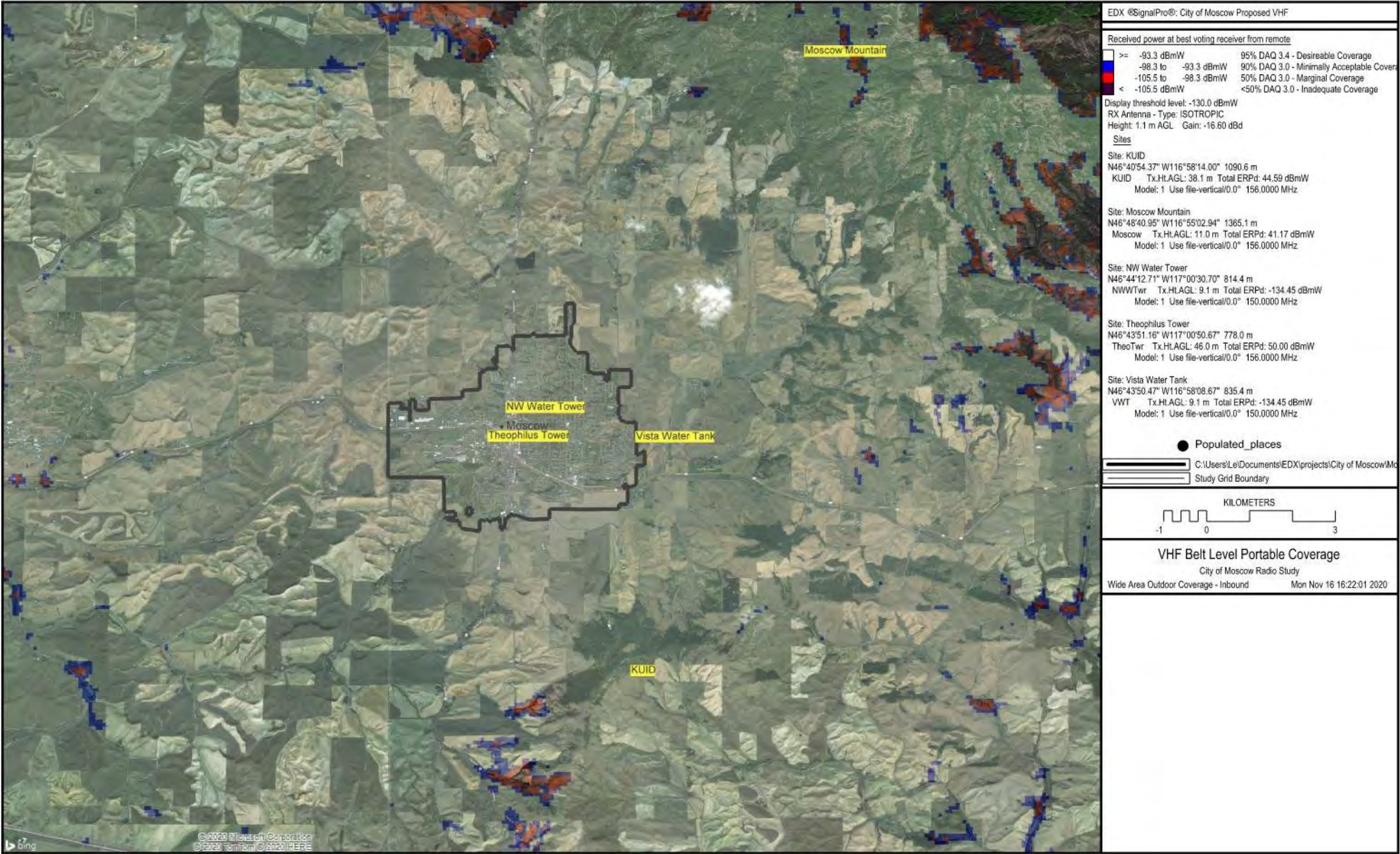


Figure 20 - Proposed VHF Simulcast System - Wide-Area Belt-Level Portable Radio Talk-in (Inbound) Coverage

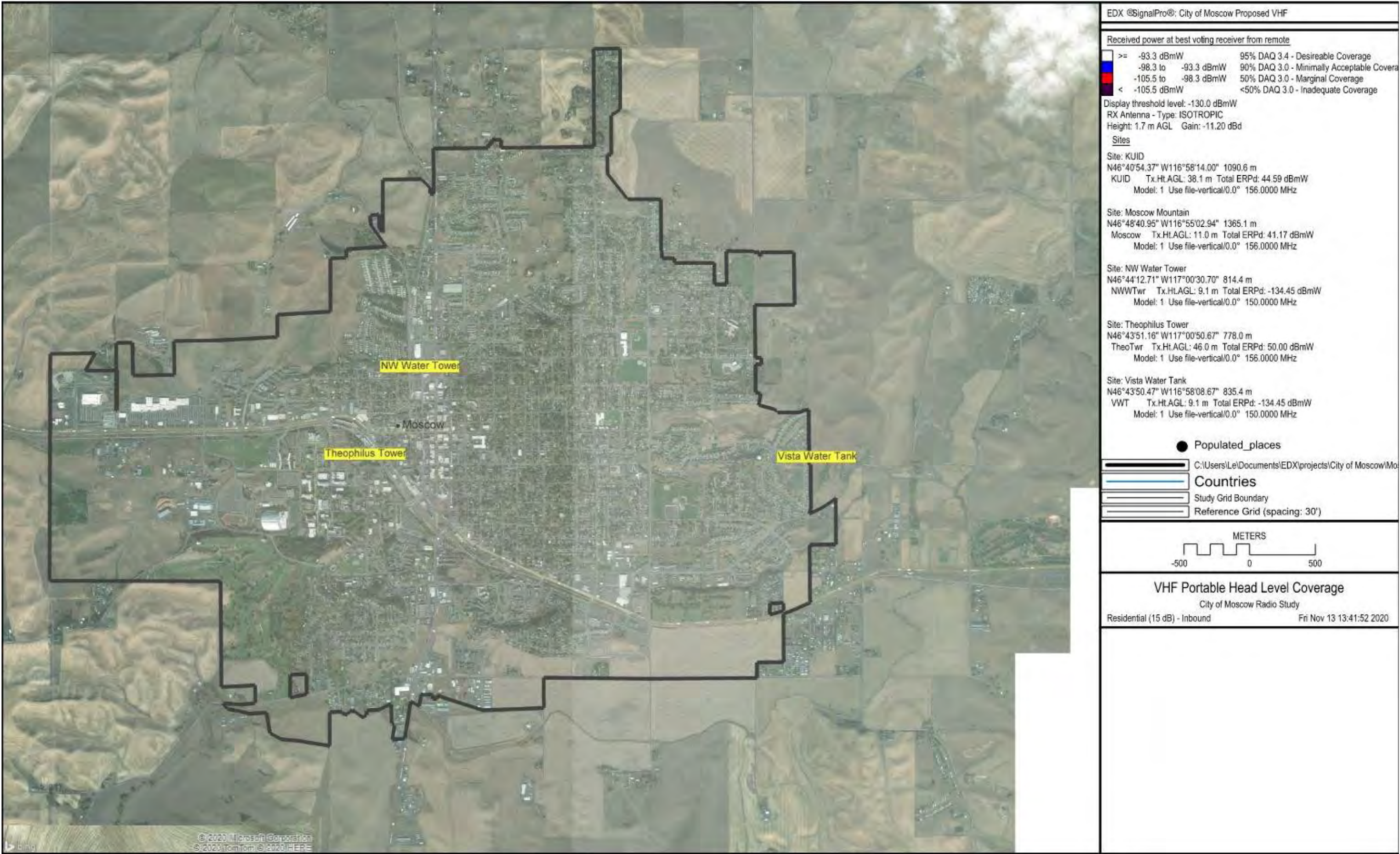


Figure 21 - Proposed VHF Simulcast System – In-Building Head-Level Portable Radio Talk-in (Inbound) Coverage [RESIDENTIAL]

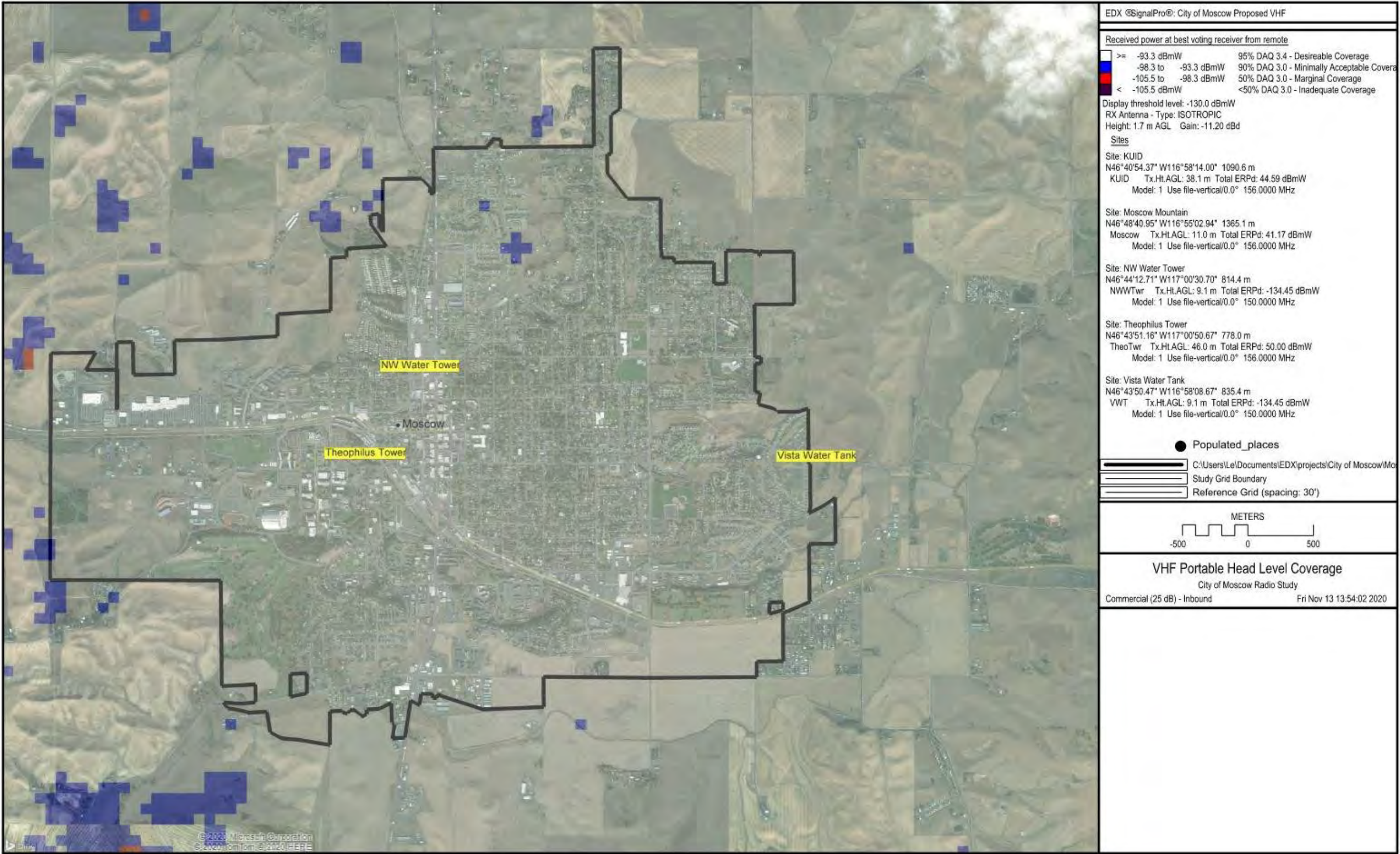


FIGURE 22 - PROPOSED VHF SIMULCAST SYSTEM – IN-BUILDING HEAD-LEVEL PORTABLE RADIO TALK-IN (INBOUND) COVERAGE [COMMERCIAL]

VHF SIMULCAST DELAY SPREAD AND RELIABILITY PREDICTION MAPS

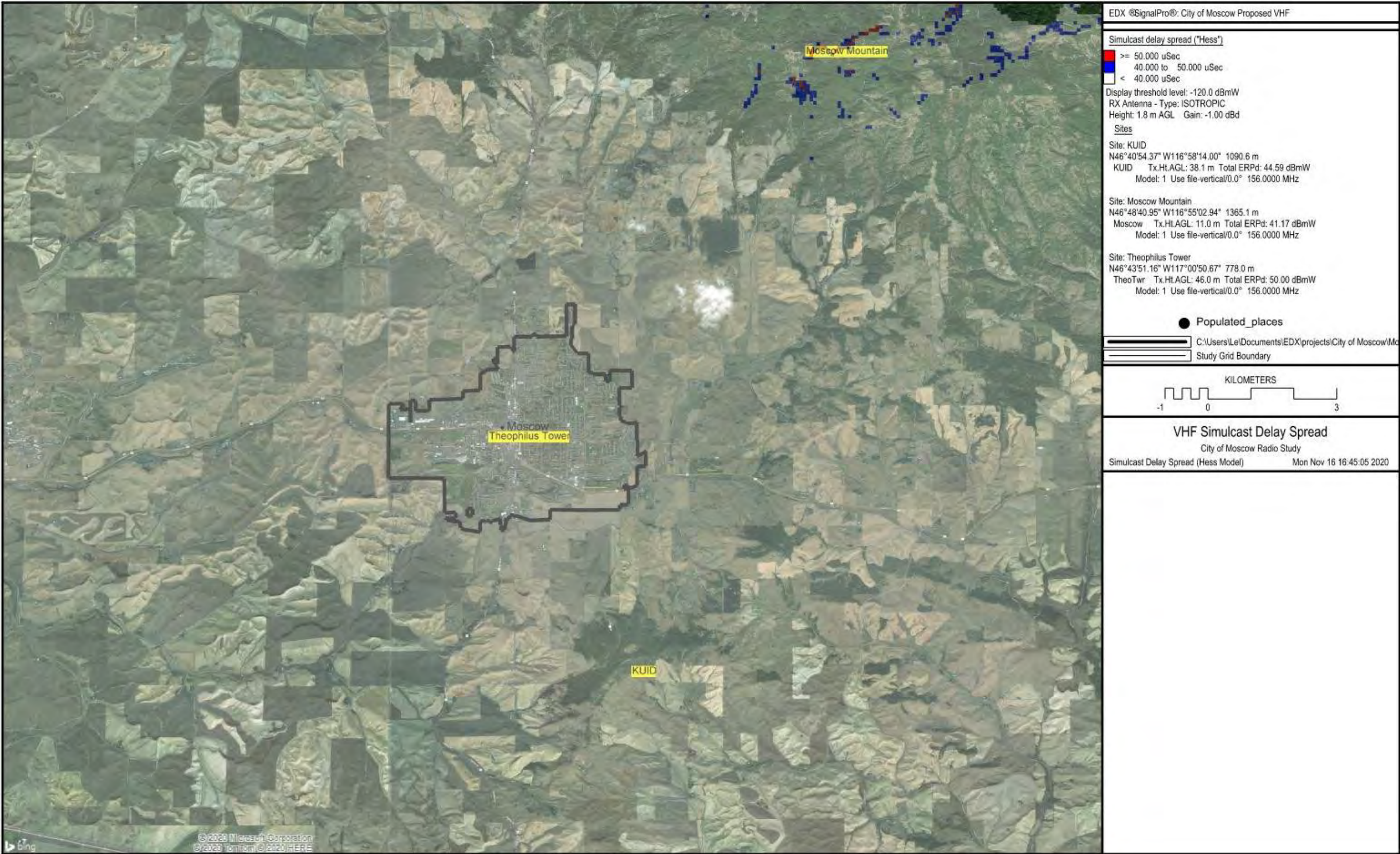


Figure 23 - Proposed VHF Simulcast System – Simulcast Delay Spread Prediction Map

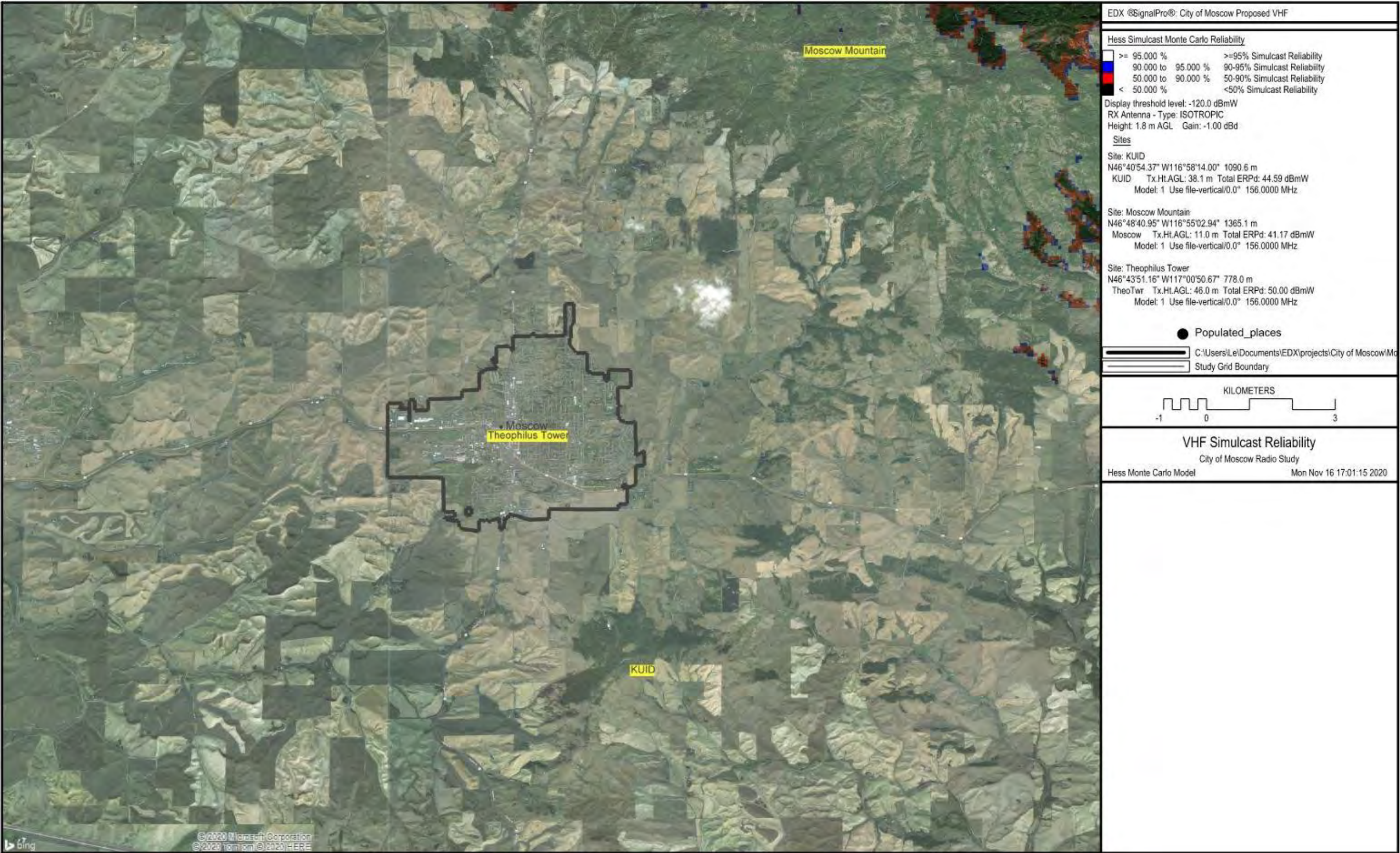


FIGURE 24 - PROPOSED VHF SIMULCAST SYSTEM – SIMULCAST RELIABILITY PREDICTION MAP

6. PROPOSED CONFIGURATION OF 700 MHZ SIMULCAST SYSTEM

Two alternatives for the configuration of a new 700 MHz simulcast trunked radio system for the City of Moscow are described in this report:

- A stand-alone 3-site simulcast P25 Phase 1 five voice channel 700 MHz trunked radio system with its own system core. This version of the new system would not be interconnected to any other systems in the region or state. It would use conventional VHF channels tied to dedicated 700 MHz interoperability talk-groups to provide interoperability with surrounding VHF systems. A dedicated 700 MHz talk group can be used to allow communications with other 700 MHz users, such as state and federal agencies operating on the Idaho 700 MHz Public Safety Radio Network. The mobile and portable radio used by these groups would need to be programmed for access to the City of Moscow system and the interoperability talkgroup(s).

This alternative is significantly more costly in terms of system infrastructure than adding the City of Moscow system to the Idaho 700 MHz Public Safety Radio Network (described in the next paragraph), because it would require a dedicated system core rather than sharing resources on an existing system core. The primary recurring cost for this system alternative would be a 10-year System Upgrade Agreement (SUA) with Motorola to provide for system software, firmware and equipment upgrades.

- A 3-site simulcast P25 Phase 1 five voice channel trunked radio system that would be incorporated into the Idaho 700 MHz Public Safety Radio Network and would use the state system's core. Operating over the state system would provide seamless interoperability with other users on that system, including state and federal agencies. A separate talkgroup patched to a VHF channel would still be required to provide interoperable communications with other agencies operating VHF systems in the Quad Cities region.

Because this system would not require a new system core, its capital cost would be significantly lower than the stand-alone alternative described above. However, there would be ongoing recurring costs under this alternatives, such as the per-radio user fee charged by the Idaho 700 MHz Public Safety Radio Network, and fees related to the interconnection from the City of Moscow system to the Idaho 700 MHz Public Safety Radio Network core in Ada County over the State of Idaho microwave network (described in more detail in the Microwave Interconnect System section below), and the City of Moscow's share of the 10-year System Upgrade Agreement (SUA) between the Idaho 700 MHz Public Safety Radio Network and Motorola to provide for system software, firmware and equipment upgrades.

Implementation of either one of these alternatives would require replacement of all of the existing City of Moscow subscriber units (mobile and portable radios) with new dual-band (700/800 MHz/VHF) trunked radios that would allow operation on both the 700 MHz system and continuing interoperability and operation on the existing VHF systems in the Quad Cities region.

A. Console Interface with Whitcom Dispatch Center

Because the Whitcom Dispatch Center does not use a Motorola Console (Whitcom has an Avtech console system), the proposed 700 MHz system cannot be directly connected to the Whitcom console system. The two alternatives for providing this connection are the Project 25 CSSI (Console Subsystem Interface), which entails additional hardware and software to the new system, or using a control station interface, where the console is connected to dedicated mobile radios at the dispatch center that communicate directly to one of the sites in the system (most likely Moscow Mountain) on talkgroups selected at the console. With the control station interface, the dispatchers lose the ability to override communications from mobile and portable radios in the field to interrupt calls in progress, but that functionality does not exist with the current City of Moscow system, since it also uses a control station interface for dispatching

B. Availability of 700 MHz Channels

There are 15 700 MHz narrowband digital channel pairs allocated to Latah County in the Region 12 700 MHz Regional Plan that do not currently have co-channel or adjacent channel system licensed in the counties adjacent to Latah County in Washington and Idaho. The list of 700 MHz channels allotted to Latah County in the Region 12 700 MHz Plan is shown in Appendix 4 of this report. The six channel pairs required for the proposed 3-site simulcast trunked 700 MHz radio system would be selected from these 15 channel pairs.

The FCC licensing process for these channels would consist of the following steps:

- Prepare an FCC Form 601 and associated engineering exhibits via the CAPRAD system and submit it to the Region 12 700 MHz Regional Planning Committee for approval.
- Once an approval letter is obtained from the Region 12 RPC, submit the application for frequency coordination with an FCC approved frequency coordinator.
- Once the frequencies have gone through the coordination process, the frequency coordinator submits the application to the FCC for processing and approval.

C. 700 MHz System Capacity

The proposed 700 MHz simulcast system, which has 5 trunked voice channels and a control channel, should have more than enough capacity to meet the City of Moscow's

current and future radio traffic requirements. A similar 5 voice channel site in the Idaho 700 MHz Public Safety Radio Network operates with 38 authorized talkgroups on the site and does not experience any call blocking or busy tones with that level of traffic loading.

D. Transmitter Combining, Receiver Multicoupler and Antenna Systems

The transmitter combining and receiver multicoupling systems for both the stand-alone and Idaho multicoupling 700 MHz Public Safety Radio Network options are included in the system equipment that would be installed at the three simulcast repeater sites. The design and configuration of these combining systems is less complex in the 700 MHz band than it is in the VHF band because there is a 30 MHz frequency separation between the TX (outbound) and RX (inbound) sub-bands used in the 700 MHz band. Also, the frequencies used in the system can be selected from the list shown in Appendix 4 to provide optimum spacing between the TX channels to allow a straightforward design and implementation of the transmitter combining systems used at the sites. Also, the 700 MHz antenna system at each site only requires a single TX antenna and a single RX antenna; on the RX side of the system, the coverage predictions shown in the maps shown in the following sections assume that a tower-top antenna amplifier is included at the base station repeater sites.

E. Backup Power Systems

The 700 MHz system design described in this report assumes that the radio and microwave equipment at the remote base station repeater sites, the prime simulcast site and the system core (for the stand-alone alternative) will be provided with battery backup systems with 12 hours of backup capacity.

F. 700 MHz Coverage Prediction Maps

The following sections contain coverage prediction maps for the proposed City of Moscow 700 MHz Simulcast System. The maps in this section include both outbound (talk-out) maps and an inbound (talk-in) maps for mobile radios, head-level portable radios and belt-level portable radios. The simulcast system maps also contain a delay spread map and a simulcast reliability map that provide additional information with respect to simulcast coverage, as described in more detail below.

The predictions in the maps are produced by the Anderson 2D model, which we have used extensively in the Pacific Northwest (including Eastern Washington) and which we have found to produce prediction results that compare well with measurements when combined with high-resolution terrain and LULC (Land Use/Land Cover) data. The digital terrain database used for the prediction maps has a resolution of 10 meters, while the LULC database used for the prediction maps has a resolution of 5 meters. The LULC database has 64 different land use and land cover categories, each one of which is assigned a value representing the signal loss it introduces due to attenuation of the signal as it passes through the “clutter” in the vicinity of the mobile or portable radio

receiving or transmitting the desired signal. These attenuation values have been adjusted so that the signal attenuation (loss) values are representative of the clutter losses encountered for 700 MHz signals in the areas in and around Latah County, Idaho (we developed these attenuation values in conjunction with a statewide coverage analysis project for Washington State Patrol, and they produced predictions that corresponded well with signal levels measured in the field in areas where we had both predictions and measured data).

G. 700 MHz Coverage Map Signal Power/Color Key

The map key on the right side of each map describes the type of coverage and the site (or multi-site simulcast system or group of stand-alone sites) depicted in each map. Figure 25 below shows the key to the color code used in all of the maps. The color code key shown below is representative. The actual signal levels corresponding to the colors and coverage reliability ranges will vary among the maps, depending upon whether the map depicts “talk-out” (base to mobile) or “talk-in” (mobile to base) coverage, and whether the map depicts mobile coverage or portable coverage. The correspondence between grid colors and coverage reliability levels is consistent for all of the maps.

Received Power at remote			
	>=	-100.4 dBmW	DAQ 3.4 95% - Desirable Coverage
		-103.7 to -100.4 dBmW	DAQ 3.0 90% - Minimally Acceptable Cove
		-110.9 to -103.7 dBmW	DAQ 3.0 50% - Maginal Coverage
	<	-110.9 dBmW	< DAQ 3.0 50% - Inadequate Coverage

Figure 25 – Representative Coverage Prediction Map Color Key
(12.5 kHz Analog Narrowband Head-Level Portable Talk-Out Parameters Shown)

NO COLOR – 95% Coverage Probability A signal power at least as strong as that shown in the key will have at least a 95% probability of achieving DAQ 3.4 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side – **DESIRABLE COVERAGE**

GREEN – 90% - 95% Coverage Probability A signal power at least as strong as that shown in the key will have at least a 90% probability of achieving DAQ 3.0 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side. - **MINIMALLY ACCEPTABLE COVERAGE**

RED – 50% - 90% Coverage Probability A signal power at least as strong as that shown in the key will have at least a 50% probability of achieving DAQ 3.0 audio quality within the square prediction grid cell 0.050 miles (264 feet) on a side. – MARGINAL COVERAGE

BLACK - < 50% Coverage Probability A signal power at least as strong as that shown in the key will have less than a 50% probability of achieving DAQ 3.0 audio quality within the square prediction grid cell 0.050)264 feet) miles on a side. – INADEQUATE COVERAGE

NOTE: INSTEAD OF SHOWING DESIREABLE COVERAGE AS A COLOR AND AREAS WITHOUT COVERAGE AS NO COLOR OR CLEAR, THE MAPS IN THIS REPORT SHOW THE “REVERSE” IMAGE, WITH THE BEST COVERAGE SHOWN WITH A TRANSPARENT OVERLAY OVER THE UNDERLYING MAP AND LESS DESIRABLE COVERAGE LEVELS SHOWN WITH COLORED PIXELS. THEREFORE, ANY AREA WHERE THE UNDERLYING MAP IS SHOWN WITHOUT ANY COLORED PIXELS HAS 95% PROBABILITY DAQ 3.4 DESIREABLE COVERAGE.

The coverage maps shown below in this report depict coverage for mobile radios and for a portable radio used at both head level and belt level. The maps show composite coverage from all three simulcast base station repeater sites for outbound signals and from the three simulcast voting receiver sites for inbound signals.

Additional maps show predicted in-building coverage for portable radios both at head level and at belt level. The maps showing “Residential” coverage assume 15 dB of additional signal attenuation due to building losses (over and above the losses due to path loss, terrain and land clutter), while the maps showing “Commercial” coverage assume 25 dB of additional signal attenuation due to building losses.

The “Coverage Probability” percentages shown above represent the statistical likelihood that the signal power level corresponding to each percentage will be received at that percentage of the possible locations within a single prediction grid tile, which is a square area 500 feet wide on a side. Because the prediction software predicts the median received signal power at the center of each grid tile, the required received signal power needs to be increased relative to the median (50%) level to account for changes in worst-case “clutter” conditions (trees, houses, larger buildings, etc.) as the radio user moves from location to location within the prediction grid tile area. Even in coverage prediction tiles with predicted signal power levels less than the 50% Coverage Probability level shown above, coverage may still exist, but it will be more spotty within that particular tile area, and will have lower audio quality than DAQ 3.4.

H. 700 MHZ P25 Phase 1 Coverage Maps

Maps showing 700 MHZ P25 Phase 1 (12.5 kHz channel) predicted coverage are shown below in this report.

For the City of Moscow 700 MHZ Simulcast System, the maps show composite talk-out and talk-in coverage for all simulcast sites, based on the antenna patterns and ERP levels shown below in Table 25. The simulcast delay offset for each of the three simulcast sites is also shown in Table 25.

Antenna Requirements, Antenna Height, ERP and Delay Offset Parameters for City of Moscow 700 MHZ Simulcast System							
Repeater Site	TX Antenna	Simulcast System ERP (Watts)	TX Antenna Elevation (Meters AGL)	TX Antenna Elevation (Meters AMSL)	TX Antenna AHAAT (Meters)	Delay Offset (µSec)	
Moscow Mountain	TX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D03) - 3° Downtilt]	N/A	150.0	20	1297	402	0.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D03) - 3° Downtilt]	N/A	N/A	30	1307	N/A	N/A
Theophilus Tower	TX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D00) - 0° Downtilt]	N/A	100.0	46	823	-21	0.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D00) - 0° Downtilt] - NOTE 1	N/A	N/A	46	833	N/A	N/A
KUID-TV (Paradise Ridge)	TX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D02) - 2° Downtilt]	N/A	50.0	24	1109	271	7.0
	RX Antenna - OMNI - 6.5 dBd [Sinclair SC476HF1LDF (D02) - 2° Downtilt]	N/A	N/A	34	1119	N/A	N/A
	NOTE 1 - Minimum Horizontal Separation - 100 feet between TX Antenna and RX Antenna.						

Table 25 – 700 MHz Antenna Requirements, Antenna Heights, ERP and Simulcast Delay Offset Parameters

I. 700 MHZ Talk-Out (Outbound) Maps

The talk-out maps show the coverage for base station-to-mobile radio paths for P25 Phase 1 operation (with Linear Simulcast Modulation), based on a minimum received signal level at a mobile radio of -101.7 dBm and -100.4 dBm at a portable radio for 95% DAQ 3.4 coverage, and -105.0 dBm at a mobile radio and -103.7 dBm at a portable radio for 90% DAQ 3.0 coverage.

The maps in the following sections include composite coverage maps for the proposed 700 MHZ simulcast system. Talk-out maps are included for both mobile radio coverage, head-level portable coverage and belt-level portable radio coverage. The maps show predicted coverage for outdoor areas, in-building coverage for residential buildings and in-building coverage for commercial buildings.

J. 700 MHZ Talk-In (Inbound) Maps

The talk-in maps show the coverage for mobile to base-station radio paths for P25 Phase 1 operation, based on a minimum received signal level at the base station of -102.9 dBm for 95% DAQ 3.4 coverage, and -106.3 dBm at the base station for 90% DAQ 3.0 coverage.

The maps in the following sections include composite coverage maps for the proposed 700 MHz simulcast system voted receiver sites. Talk-in maps are included for both mobile radio coverage, head-level portable coverage and belt-level portable radio coverage. The maps show predicted coverage for outdoor areas, in-building coverage for residential buildings and in-building coverage for commercial buildings.

The coverage predictions produced by the EDX Signal Pro™ software treat receiver voting systems by showing coverage at the “best” voted receiver, based on received signal power. This type of prediction is not ideal for modeling receiver voting systems that vote on signal quality, since in those system the “best” signal may not be the signal with the highest received signal power. Therefore, the talk-in predictions are typically “worst-case” with actual receiver voting system producing somewhat better coverage than the coverage shown in the maps in this report.

K. 700 MHz Simulcast Delay Spread Maps

The narrowband analog simulcast delay spread maps contained in the following sections have been generated using the Hess delay spread prediction methodology, which provides more conservative prediction results than other delay spread prediction methodologies implemented in prediction software available (including the EDX software) before this model was incorporated into the EDX prediction software several years ago. The delay spread maps show areas where the worst-case RMS delay spread in the overlap areas among the simulcast sites is within the ranges shown in Figure 26 below and the ratio between the strongest signal and any of the other signals is less than 30 dB and areas. A threshold delay spread value of 32 microseconds and a capture ratio of 30 dB are the values we have assumed in the Hess model for a P25 Phase 1 TX system with Linear Simulcast Modulation (LSM).

[This is actually a quite conservative delay spread threshold, since Linear Simulcast Modulation (LSM) has a delay spread threshold comparable to the 50-microsecond threshold assumed for the VHF system described in the previous sections. However, the 32-microsecond threshold is appropriate for P25 Phase 2 operation. Therefore, the maps demonstrate that the proposed 700 MHz simulcast system could operate in either Phase 1 or Phase 2 mode without any serious degradation of audio quality caused by time domain interference (TDI).



Figure 26 – 700 MHz Delay Spread Map Color Key

These maps, the color scheme is similar to the color scheme shown in the coverage prediction maps. In areas shown with NO COLOR, audio quality should be good wherever coverage is sufficient to produce adequate Delivered Audio Quality, as shown in the coverage prediction maps. In areas shown in BLUE, audio quality is likely to be reduced to DAQ 3.0 and distortion of the audio heard on the radio may occur. In grid squares which are shown as RED significant audio distortion may occur, depending upon how much greater than 50 microseconds the delay time actually is at that grid.

L. 700 MHz Simulcast Coverage Reliability Maps

The simulcast reliability maps shown below for the proposed simulcast system combine the effect of simulcast capture ratio, delay spread and predicted received signal strength (“RSSI”) to provide a prediction of the statistical reliability of DAQ 3.4 (or DAQ 3.0) coverage in a given map grid square (represented by pixels in the map). The calculations on which the map is based are based on the simulcast model developed by Gary Hess at Motorola, and take into account both the destructive effects of simulcast overlap, where the overlap causes interference, and the “constructive” effects of simulcast overlap, where the delay spread is low and the overlap has the effect of improving coverage because signals from more than one site are available. The statistical reliability levels depicted in the maps and the color codes for those levels are shown in Figure 12 below.

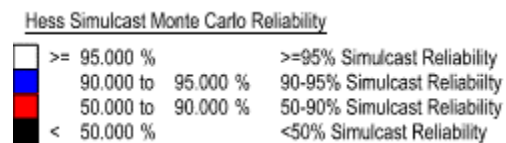


Figure 27 – 700 MHz Simulcast Reliability Map Color Key

In the simulcast reliability maps shown below in this report, the areas where reliability levels below 90% are predicted are primarily areas where there is inadequate coverage due to terrain shadowing or the effects of land use and land cover. In most cases, the lower reliability levels are not caused by simulcast system overlap issues, but are simply related to the absence of sufficient signal strength to provide good coverage.

M. City of Moscow 700 MHz Simulcast System Maps

The City of Moscow Simulcast System maps are shown below in the following section.

700 MHz Talk-out (Outbound) Maps

Figure 28 shows the predicted mobile radio wide-area talk-out (outbound) coverage for the Simulcast System for both 95% DAQ 3.4 and 90% DAQ 3.0 performance levels.

- In this map the areas with a transparent shading with the underlying map showing through represent coverage equal to or better than 95% DAQ 3.4 (Desirable Coverage).
- Map pixels shown in GREEN represent 90% DAQ 3.0 coverage (Minimally Acceptable Coverage).
- Map pixels shown in RED represent 50% DAQ 3.0 coverage (Marginal Coverage).
- Map pixels shown in BLACK or areas shown without any shading over the underlying map represent areas with less than 50% DAQ 3.0 coverage (Inadequate Coverage).

Figure 29 shows the predicted portable radio wide-area talk-out (outbound) head-level coverage for the Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 30 shows the predicted portable radio wide-area talk-out (outbound) belt-level coverage for the Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 31 shows the predicted portable radio in-building talk-out (outbound) head-level coverage for the Simulcast System for Residential buildings, with the same performance levels as those shown in the mobile radio map.

Figure 32 shows the predicted portable radio in-building talk-out (outbound) head-level coverage for the Simulcast System for Commercial buildings, with the same performance levels as those shown in the mobile radio map.

700 MHz Talk-In (Inbound) Maps

Figure 33 shows the predicted mobile radio wide-area talk-in (inbound) coverage for the Simulcast System for both 95% DAQ 3.4 and 90% DAQ 3.0 performance levels.

- In this map the areas with a transparent shading with the underlying map showing through represent coverage equal to or better than 95% DAQ 3.4 (Desirable Coverage).
- Map pixels shown in GREEN represent 90% DAQ 3.0 coverage (Minimally Acceptable Coverage).

- Map pixels shown in RED represent 50% DAQ 3.0 coverage (Marginal Coverage).
- Map pixels shown in BLACK or areas shown without any shading over the underlying map represent areas with less than 50% DAQ 3.0 coverage (Inadequate Coverage).

Figure 34 shows the predicted portable radio wide-area talk-in (inbound) head-level coverage for the Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 35 shows the predicted portable radio wide-area talk-in (inbound) belt-level coverage for the Simulcast System with the same performance levels as those shown in the mobile radio map.

Figure 36 shows the predicted portable radio in-building talk-in (inbound) head-level coverage for the Simulcast System for Residential buildings, with the same performance levels as those shown in the mobile radio map.

Figure 37 shows the predicted portable radio in-building talk-in (inbound) head-level coverage for the Simulcast System for Commercial buildings, with the same performance levels as those shown in the mobile radio map.

700 MHz Simulcast Delay Spread and Reliability Maps

Figure 38 is the Delay Spread map for the Simulcast System. CLEAR areas show delay spread values less than 40 μ Sec, BLUE areas show delay spread values between 40 and 50 μ Sec, and RED areas show delay spread values greater than 50 μ Sec, which is the level at which delay spread may begin to produce audible distortion in the audio produced by the radio. (Areas with there is no visible clear or colored shading over the underlying map are those where the received signal level is below the minimum signal power threshold set for the coverage predictions. In these areas, the signal is not usable apart from the issue of simulcast time domain (delay) interference.)

Figure 39 is the Simulcast Reliability map for the 700 MHz Simulcast System. Clear areas in this map show predicted reliability greater than or equal to 95%, while the colored areas show lower levels of reliability as described in the map legend. (Areas with there is no visible clear or colored shading over the underlying map are those where the received signal level is below the minimum signal power threshold set for the coverage predictions. In these areas, the signal is not usable apart from the issue of simulcast time domain (delay) interference.)

700 MHz TALK-OUT (OUTBOUND) COVERAGE PREDICTION MAPS

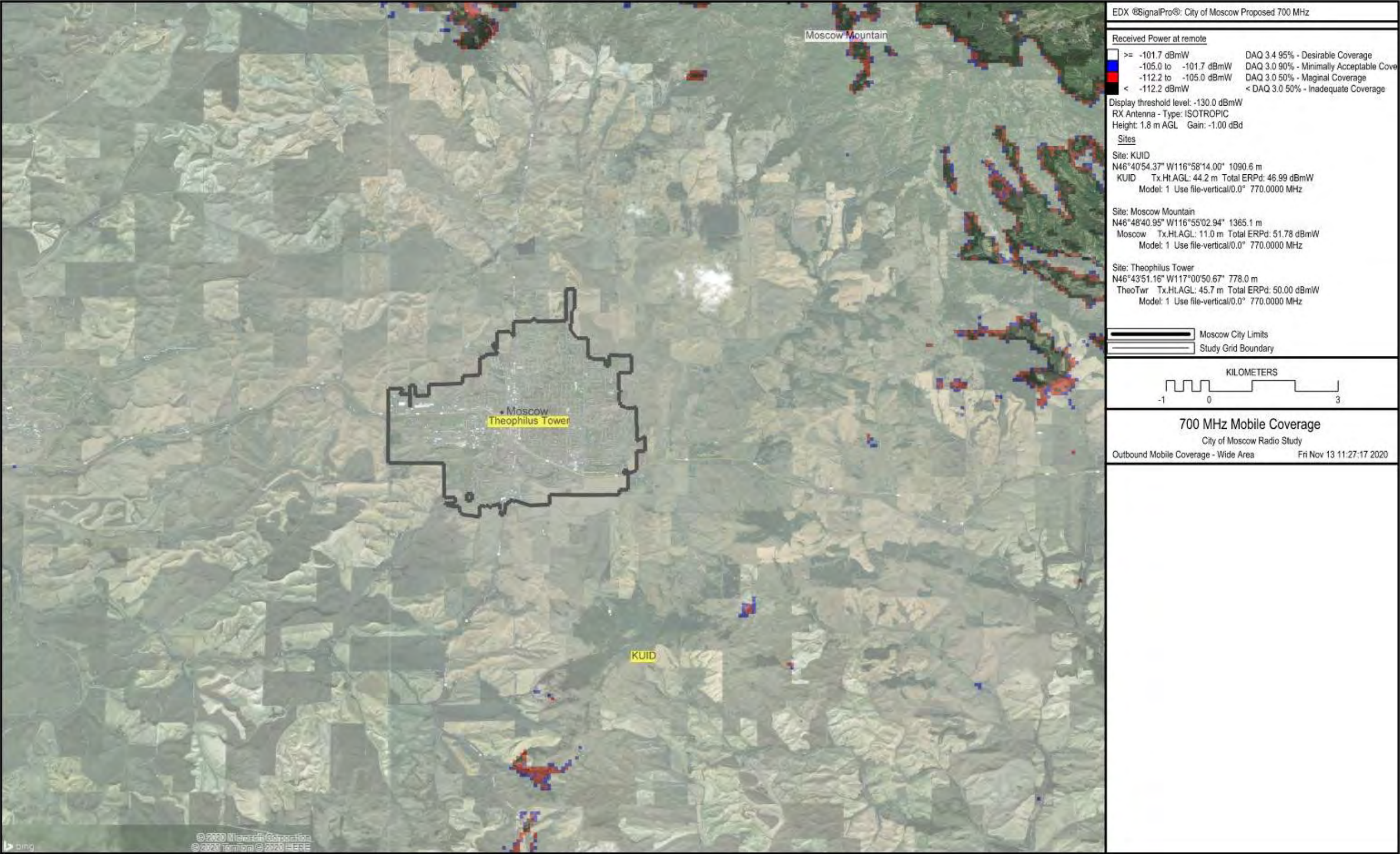


Figure 28 - Proposed 700 MHZ Simulcast System - Wide-Area Mobile Radio Talk-out (Outbound) Coverage

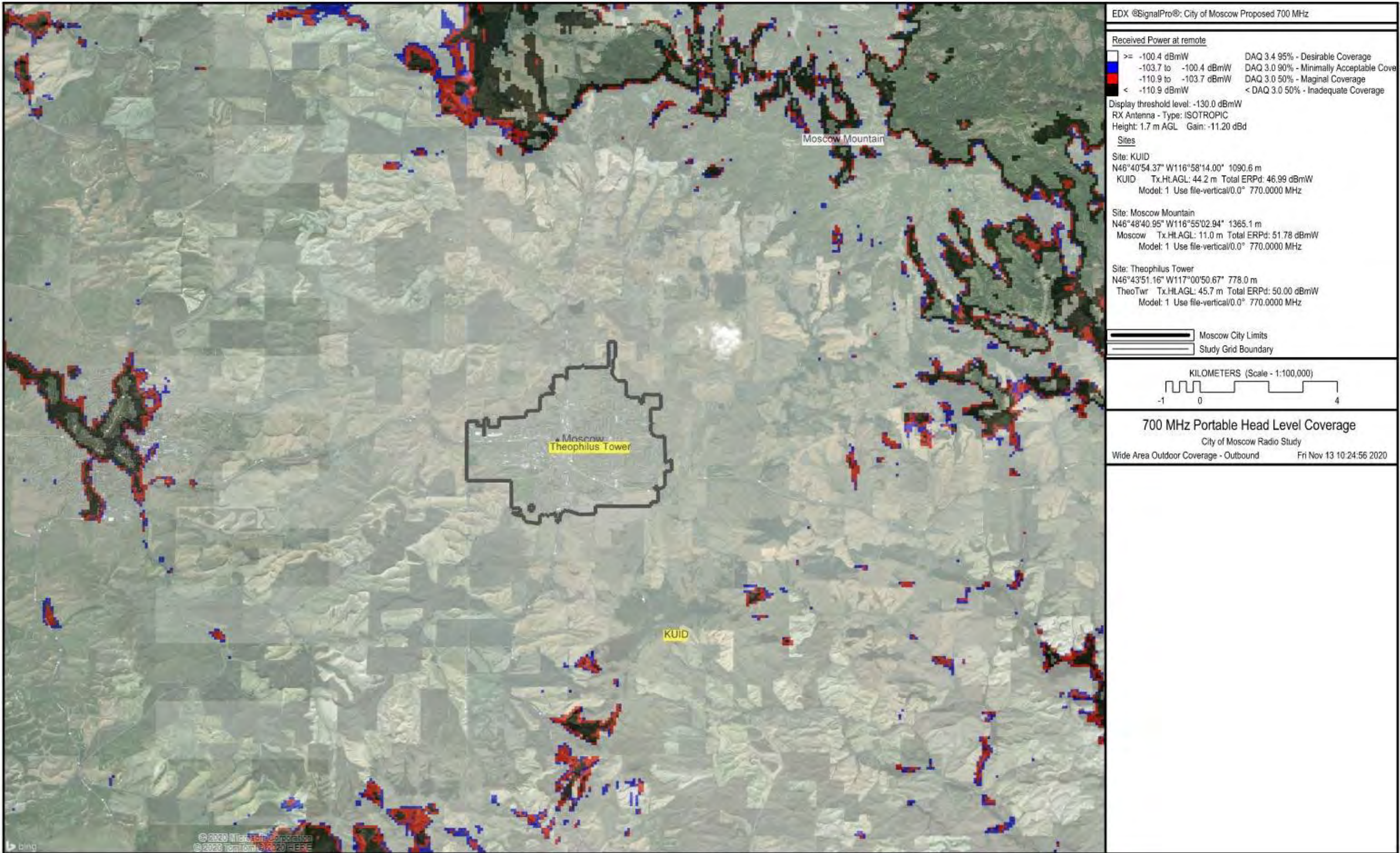


FIGURE 29 - PROPOSED 700 MHZ SIMULCAST SYSTEM - WIDE-AREA HEAD-LEVEL PORTABLE RADIO TALK-OUT (OUTBOUND) COVERAGE

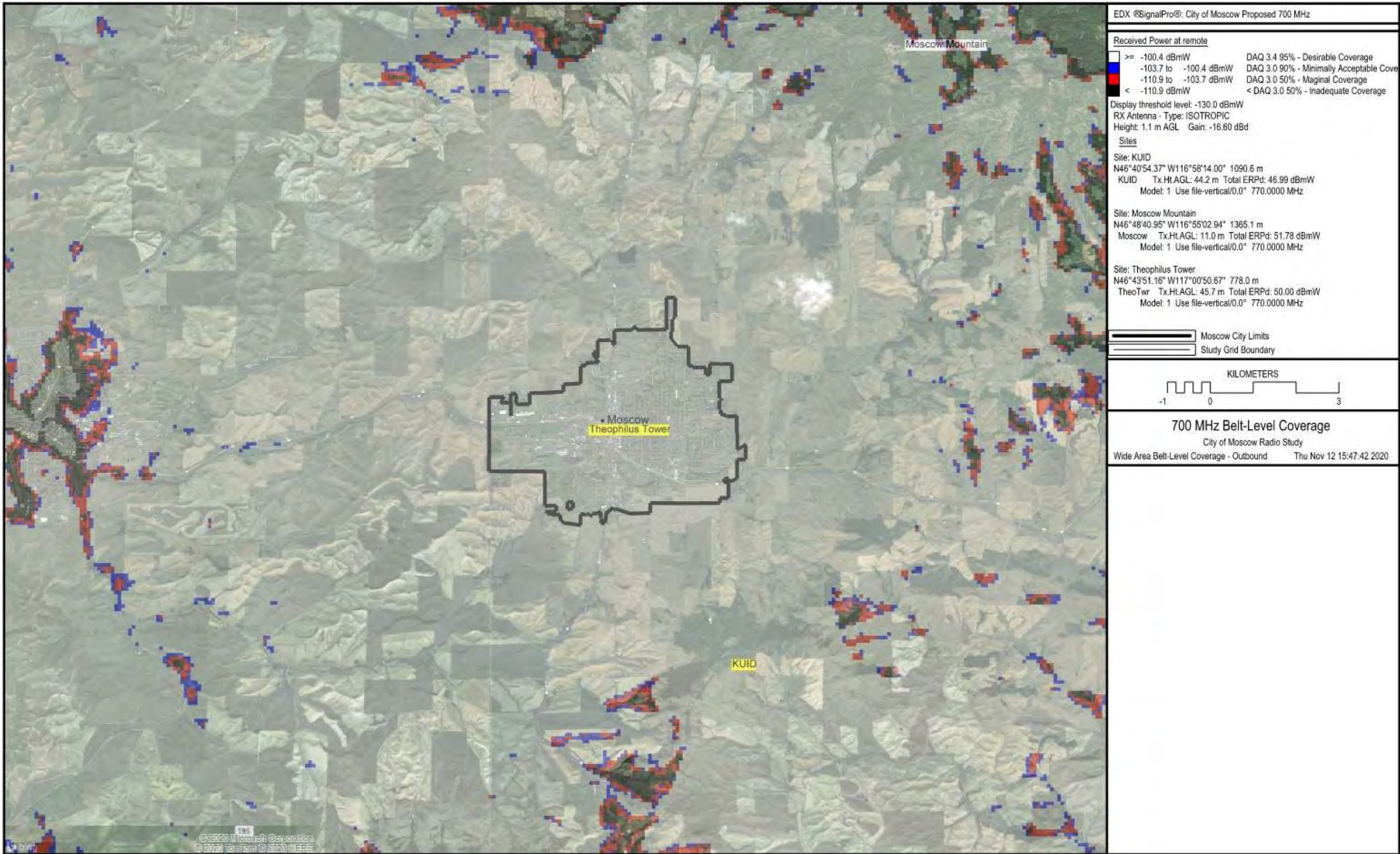


Figure 30 - Proposed 700 MHZ Simulcast System - Wide-Area Belt-Level Portable Radio Talk-out (Outbound) Coverage

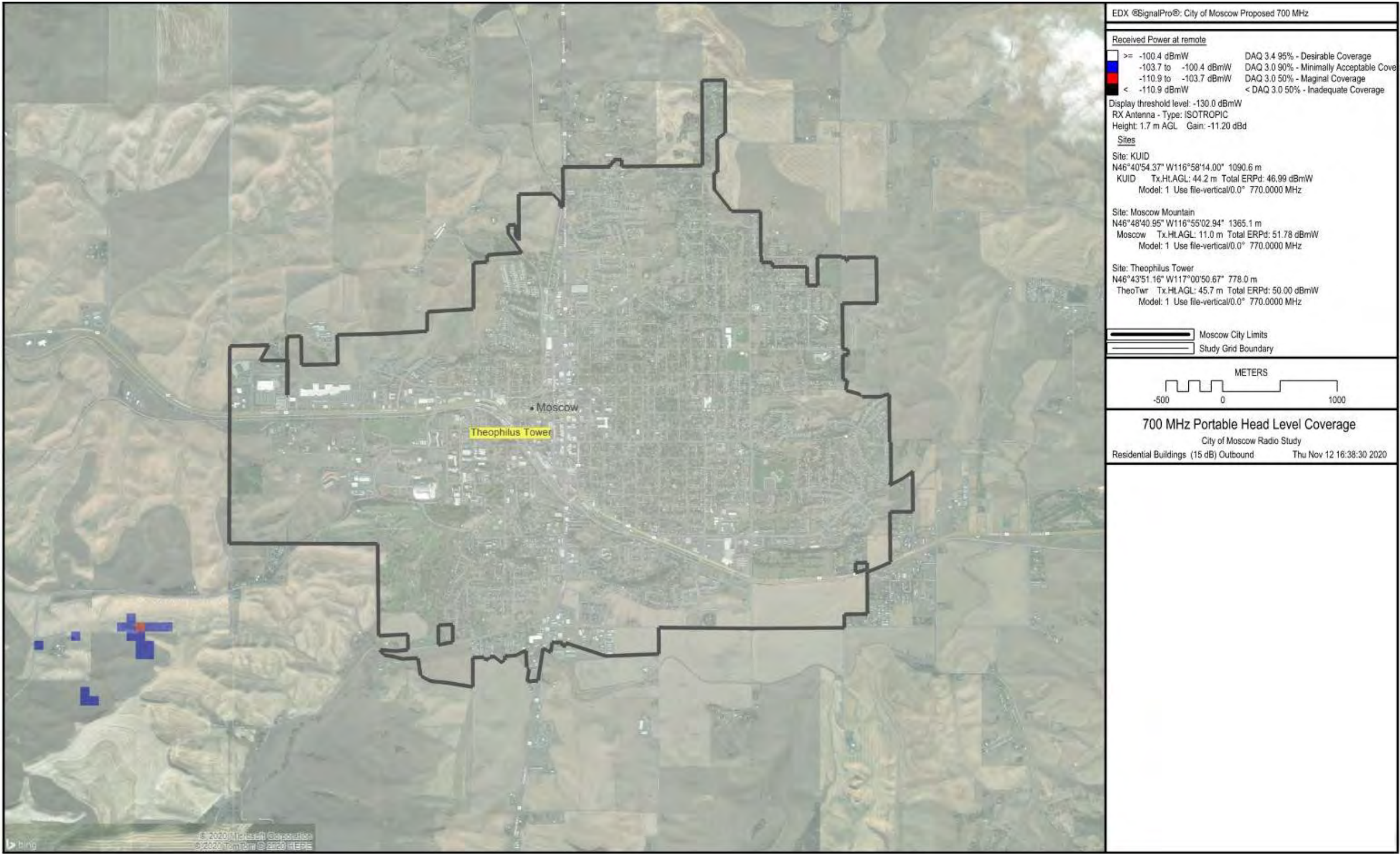


FIGURE 31 - PROPOSED 700 MHZ SIMULCAST SYSTEM – IN-BUILDING HEAD-LEVEL PORTABLE RADIO TALK-OUT (OUTBOUND) COVERAGE [RESIDENTIAL]

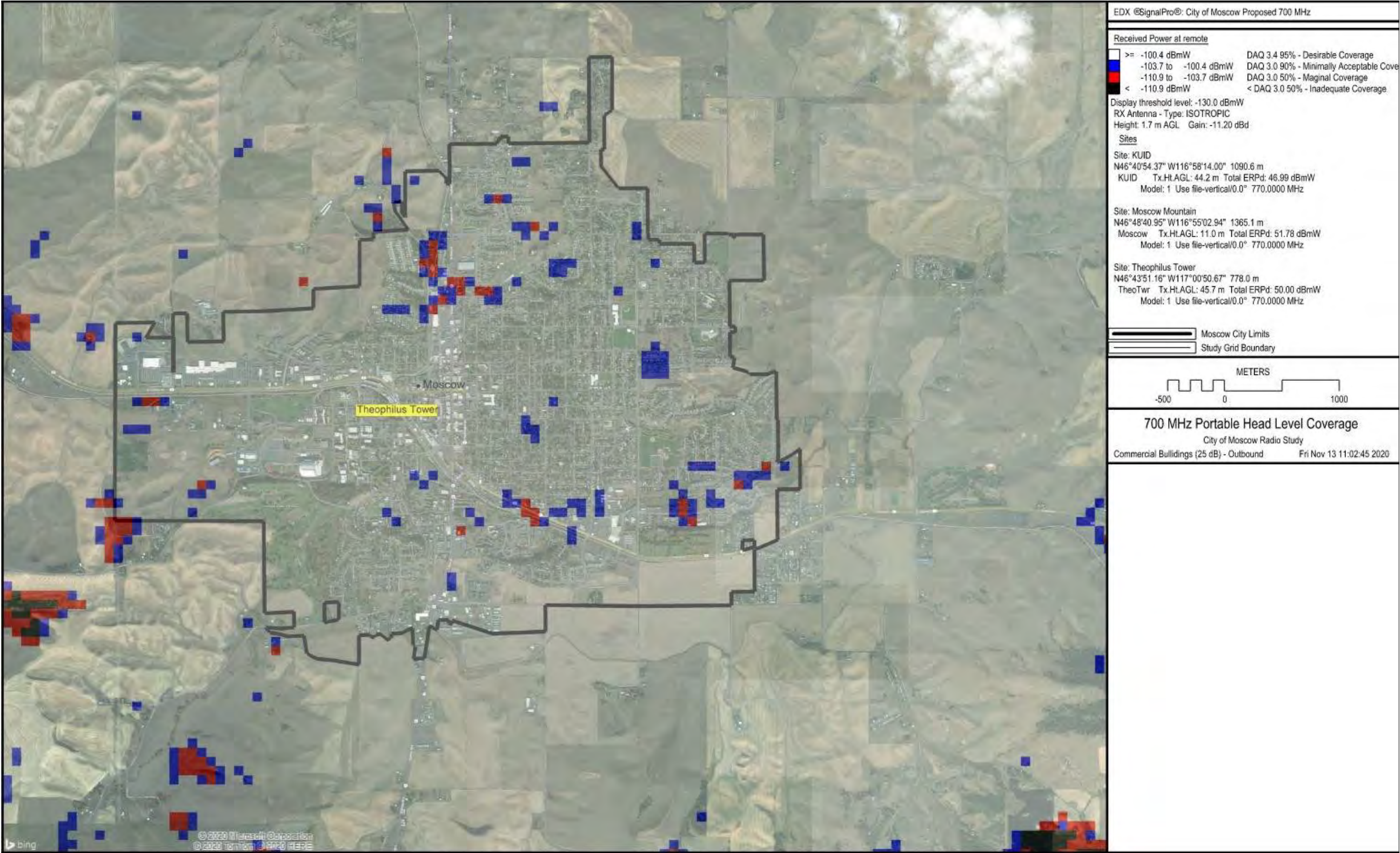


Figure 32 - Proposed 700 MHZ Simulcast System – In-Building Head-Level Portable Radio Talk-out (Outbound) Coverage [COMMERCIAL]

700 MHz TALK-IN (INBOUND) COVERAGE PREDICTION MAPS

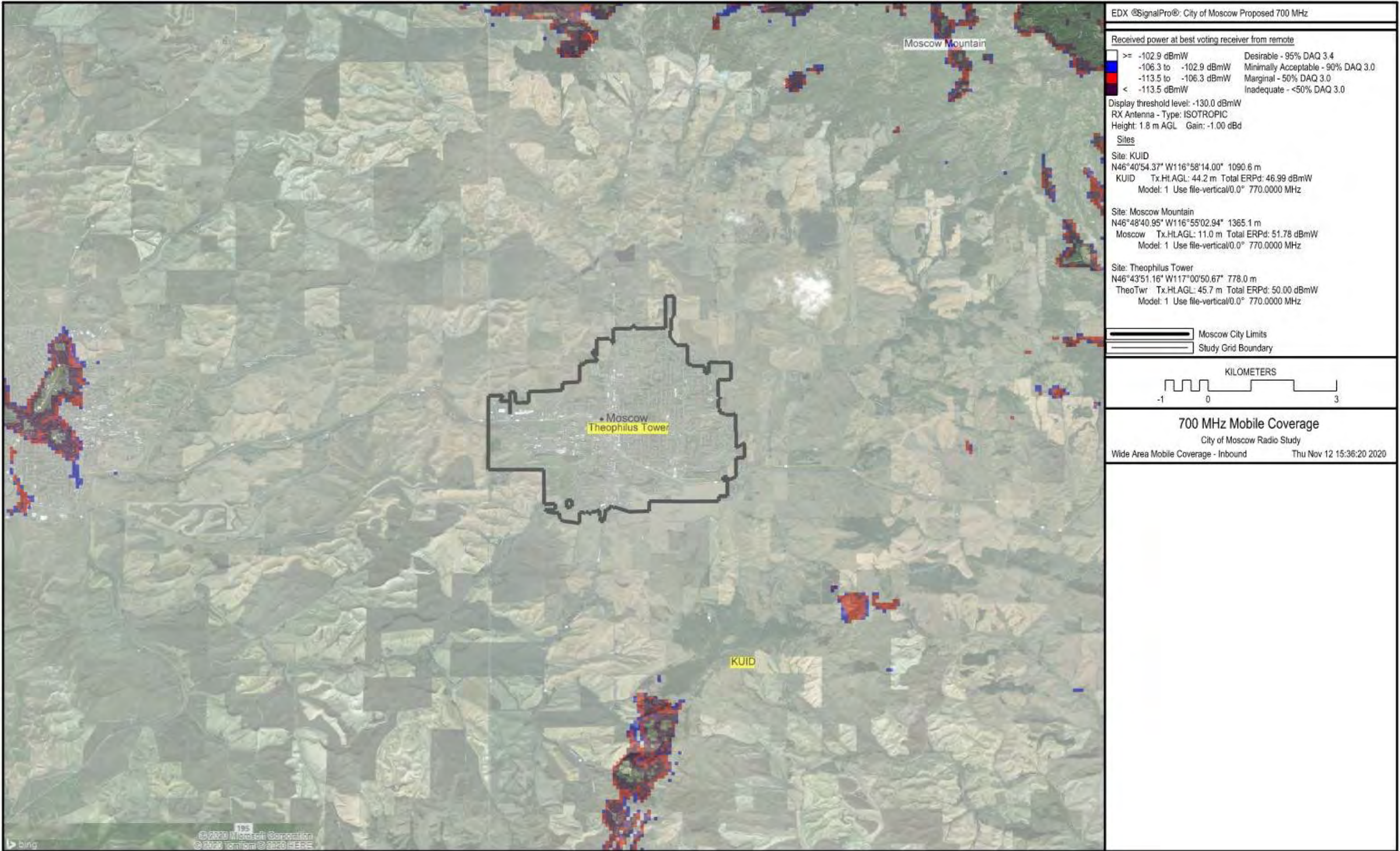


Figure 33 - Proposed 700 MHZ Simulcast System - Wide-Area Mobile Radio Talk-In (Inbound) Coverage

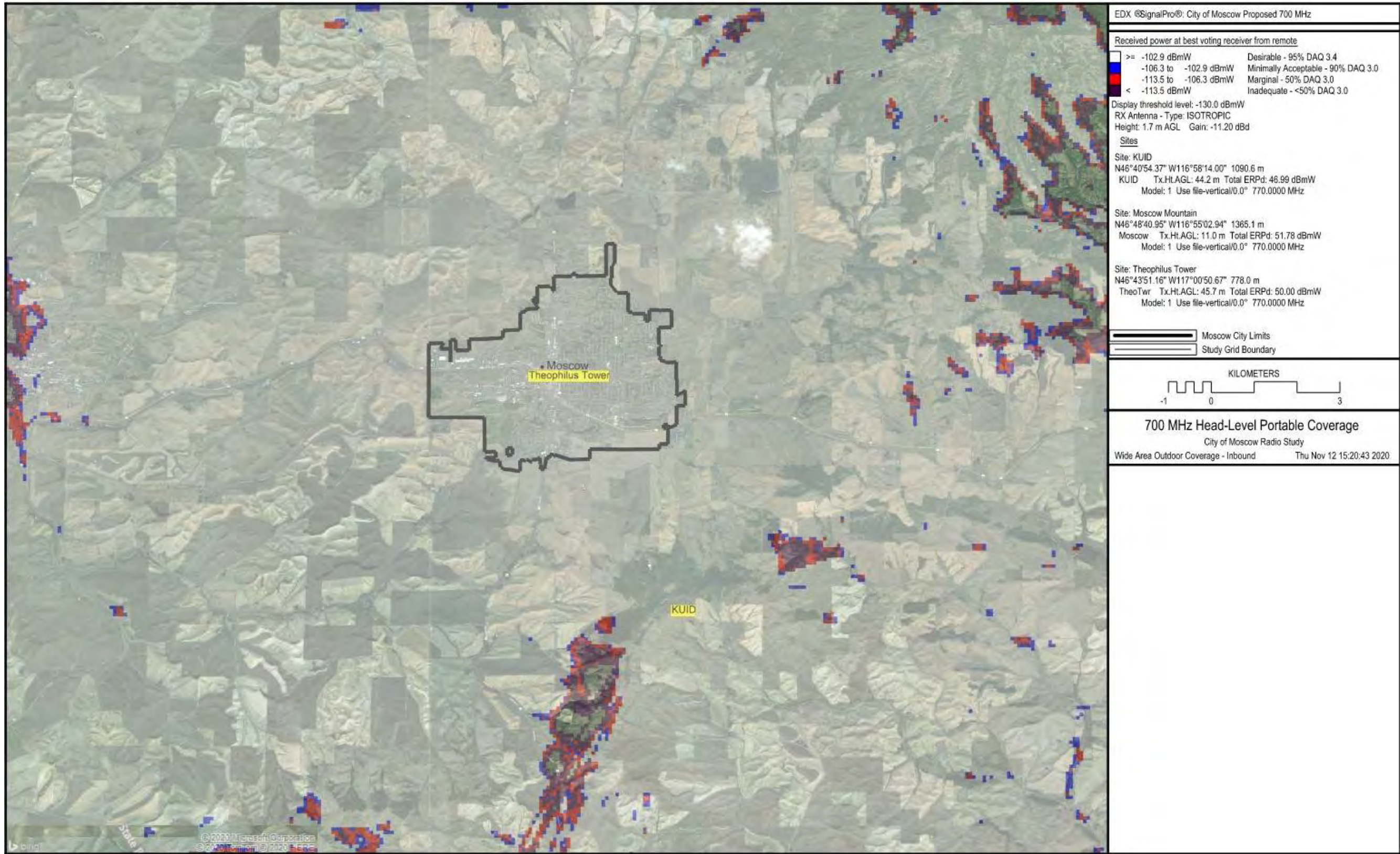


Figure 34 - Proposed 700 MHZ Simulcast System - Wide-Area Head-Level Portable Radio Talk-in (Inbound) Coverage

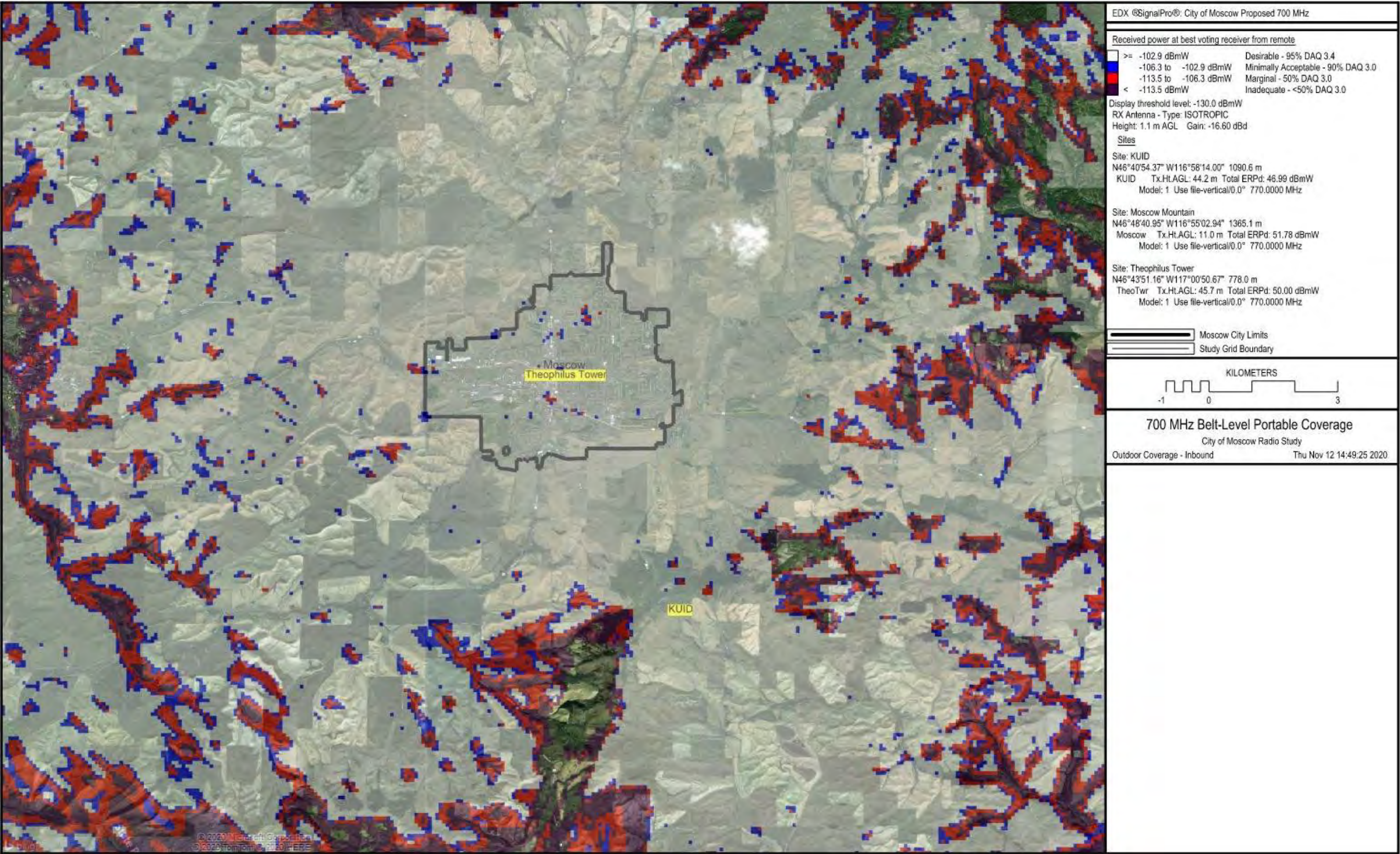


Figure 35 - Proposed 700 MHZ Simulcast System - Wide-Area Belt-Level Portable Radio Talk-in (Inbound) Coverage

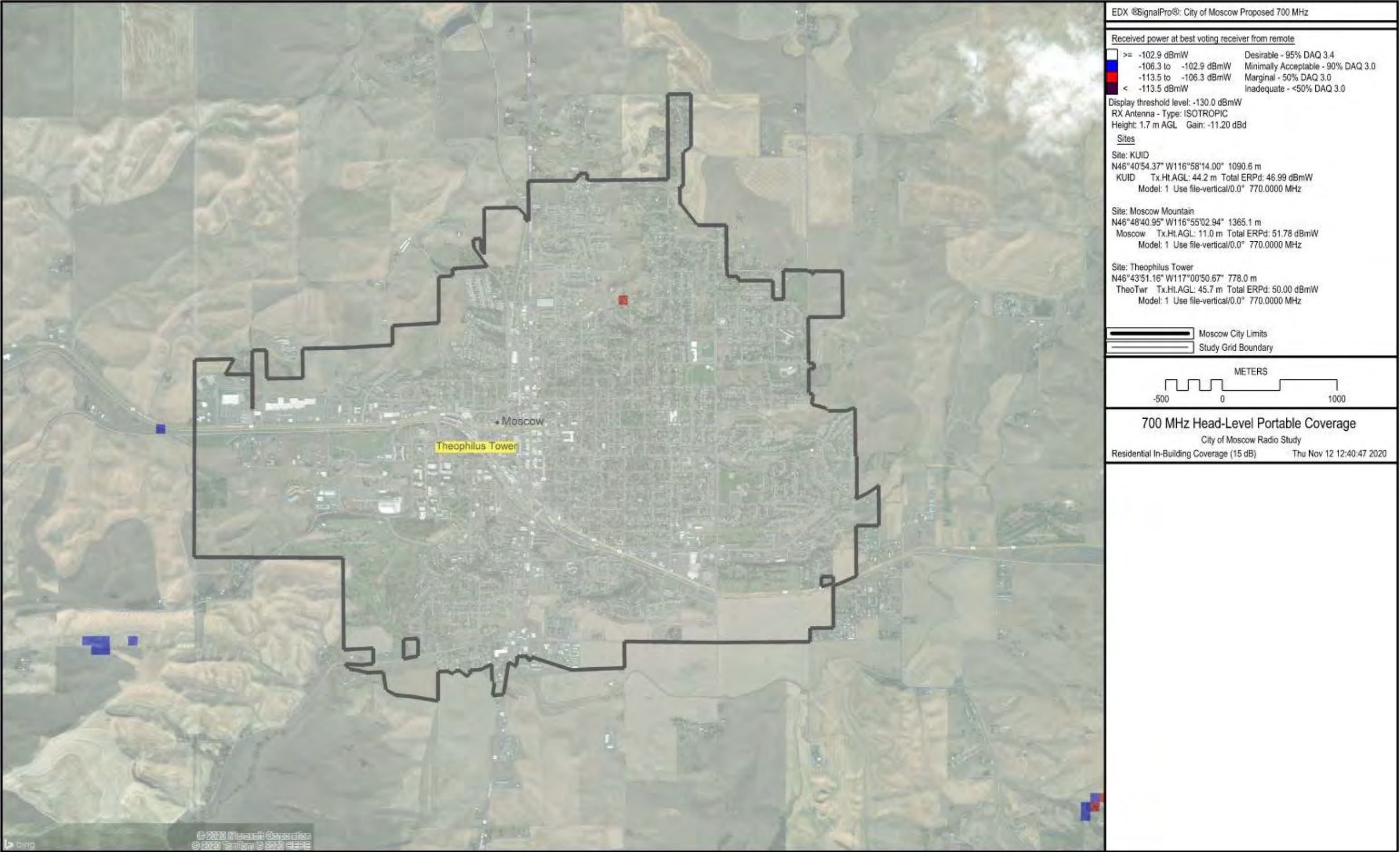


Figure 36 - Proposed 700 MHZ Simulcast System – In-Building Head-Level Portable Radio Talk-in (Inbound) Coverage [RESIDENTIAL]

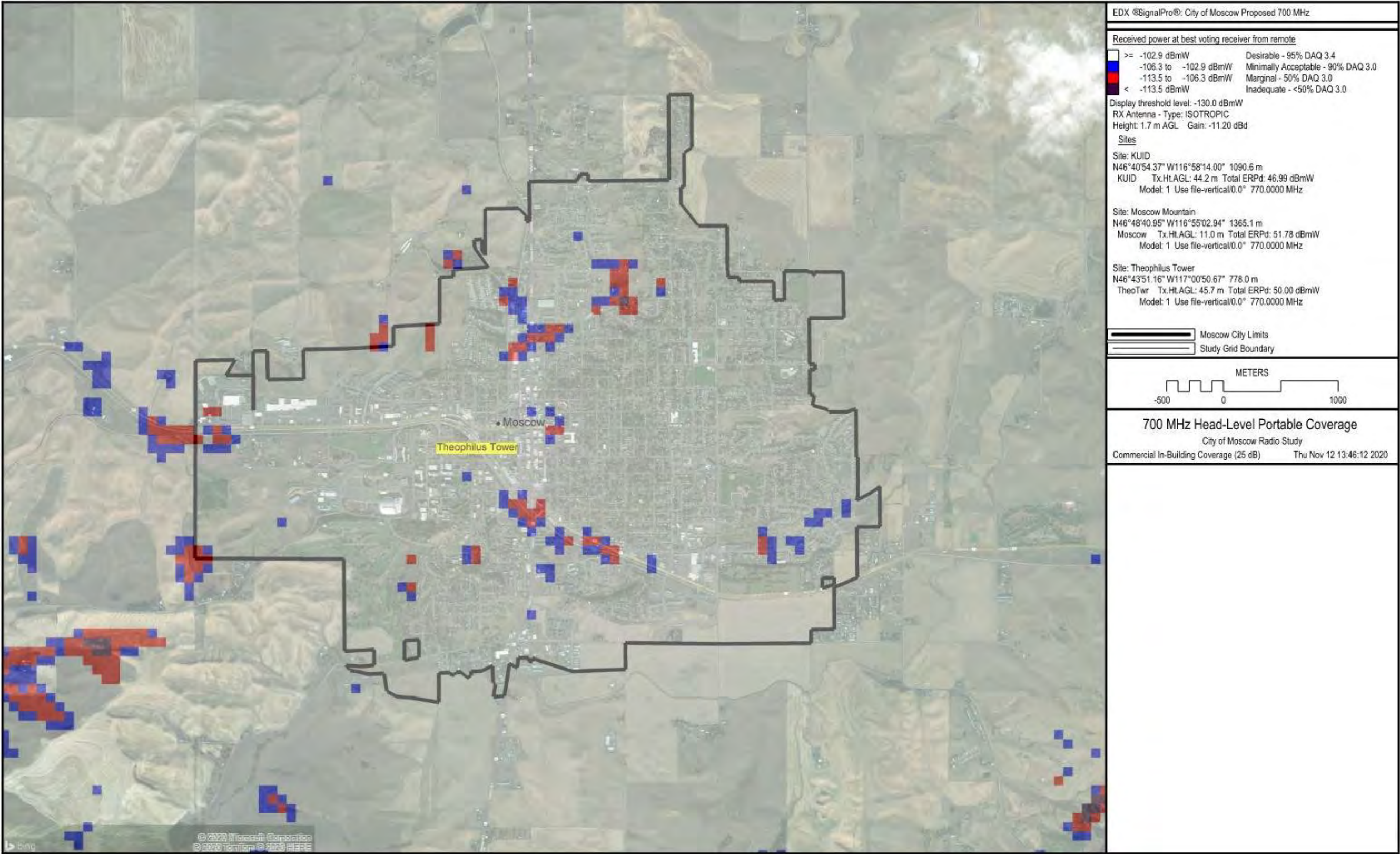


Figure 37 - Proposed 700 MHZ Simulcast System – In-Building Head-Level Portable Radio Talk-in (Inbound) Coverage [COMMERCIAL]

700 MHz SIMULCAST DELAY SPREAD AND RELIABILITY PREDICTION MAPS

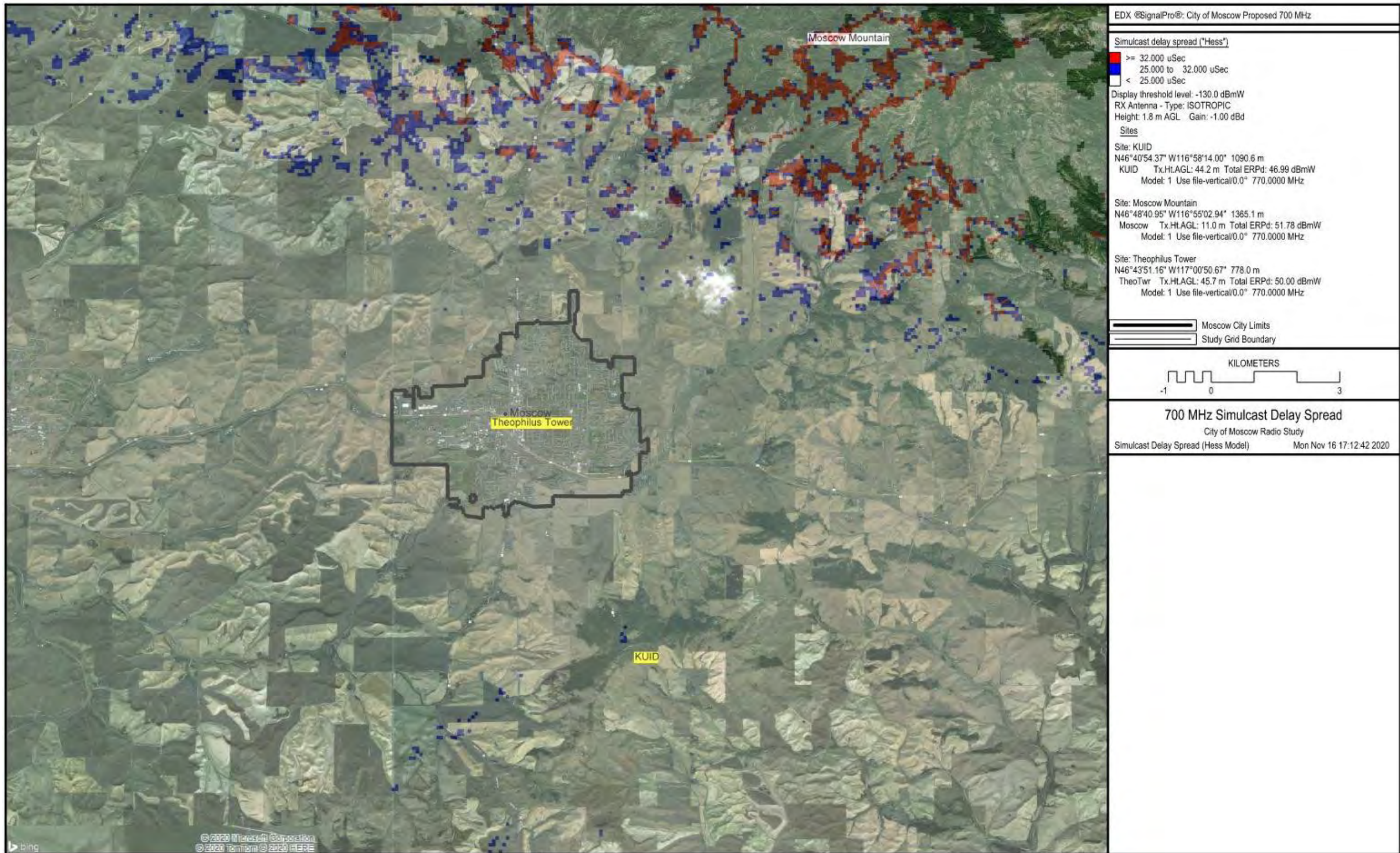


Figure 38 - Proposed 700 MHz Simulcast System – Simulcast Delay Spread Prediction Map

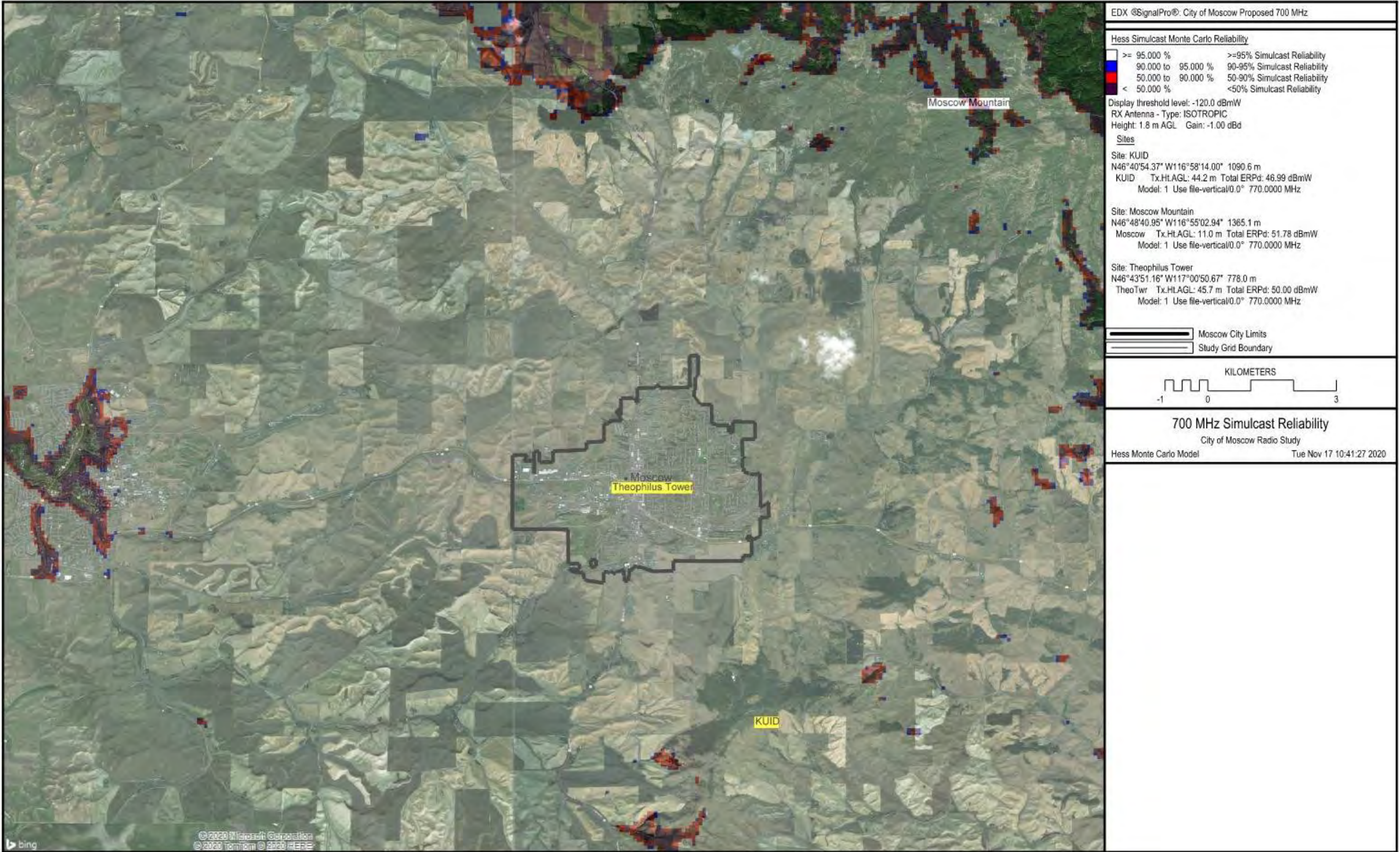


FIGURE 39 - PROPOSED 700 MHZ SIMULCAST SYSTEM – SIMULCAST RELIABILITY PREDICTION MAP

7. MICROWAVE INTERCONNECT SYSTEM

Implementation of the simulcast radio systems (VHF and 700 MHz) described in this report will require an IP-based interconnect system from the simulcast prime site for each of the systems to all of the remote repeater sites in that system.

The connection from the Whitcom dispatch center to the Moscow Mountain will be provided by a new 11 GHz microwave link, as shown in the network maps in Figure 40 and Figure 41 below. This link may not be necessary for the 700 MHz simulcast system if the control station interface is used to connect the system to the Whitcom Dispatch Facility. However, there may be other connections required between the City of Moscow and the Whitcom Dispatch Center in addition to the connections to the 700 MHz radio system, and this link would provide for those connections even if the 700 MHz system links were not required.

All of the interconnecting links shown in the map in Figure 40 and Figure 41 below are assumed to be new microwave links licensed under Part 101 of the FCC's rules operating in the 11 GHz band. Although operation in the licensed microwave bands requires more expensive equipment than the equipment used in the 4.9 and 5.8 GHz unlicensed bands, the licensed links are protected from interference (which the unlicensed links are not) and the licensed equipment is capable of being configured for various forms of redundant backup operation, including monitored hot-standby (MHSB), where two radios are provided for each link and the backup radio takes over automatically in the event of the failure of the main radio. Therefore, our recommendation is to use Part 101 licensed microwave links whenever possible. A more detailed discussion of the reasons for recommending a Part 101 licensed microwave system is contained in Appendix 6.

Path profiles and path performance calculations for all of the microwave links shown in Figure 40 and Figure 41 are included in Appendix 5. All of the path calculations are based on 180 MBPS (ODU600) or 178 MBPS (WTM 4100) microwave radios operating in 30 MHz channels with 4-foot dish antennas on the Whitcom to Moscow Mountain path and 3-foot dish antennas on the other paths.

The two sets of path profiles and calculations shown in Appendix 5 are based on the performance characteristics of Aviat ODU600 split configuration radios (with the RF equipment mounted on the tower and the network interface and power supply equipment mounted inside the equipment shelter) and on the performance characteristics of Aviat WTM 4100 tower-mounted radios (which include all of the interface equipment in the tower-mounted enclosure and which have a single CAT6 ethernet connection with provides both network connectivity and power [via Power Over Ethernet] to the radio). The ODU600 radios are public safety grade Aviat Eclipse microwave radios with redundant multiplexer and network interface modules and a full hot-standby configuration. The WTM 4100 radios are less costly carrier grade radios that are not capable of hot-standby operation; if one of these radios fails, it has to be replaced with a spare, which involves climbing the tower to make the replacement.

The worst-case calculated annual multipath reliability for all of the paths shown Figure 40 and Figure 41 and in Appendix 5 is 99.99942% for the ODU 600 radios and 99.99931% for the WTM 4100 radio, which correspond to an annual outage time of 183 seconds for the ODU600 radios and 217 seconds for the WTM 4100 radios. These reliability and outage numbers are for the Whitcom to Moscow Mountain link, which is the longest path in the network. The predicted reliability in both cases is acceptable for a public safety grade interconnect system. All of the other microwave links shown in Appendix 5 have substantially higher annual reliability numbers than this worst-case link.

The path calculations shown in Appendix 5 are preliminary, and include trees and other obstructions that are based on the 2011 Land Use Land Clutter (“LULC”) data provided by USGS (United States Geological Survey). The obstructions shown in the path profiles may not accurately represent the actual obstructions along each path, and each new path that is not already in use for an existing microwave link would need to be field verified before implementing the microwave interconnect system.

The links for the stand-alone voting receiver sites in the proposed VHF system are also provided via new 23 GHz links from the Theophilus Tower site to the NW Water Tank on the northwest side of the City of Moscow and to the Vista Reservoir on the east side of the City of Moscow, as shown in Figure 40 below.

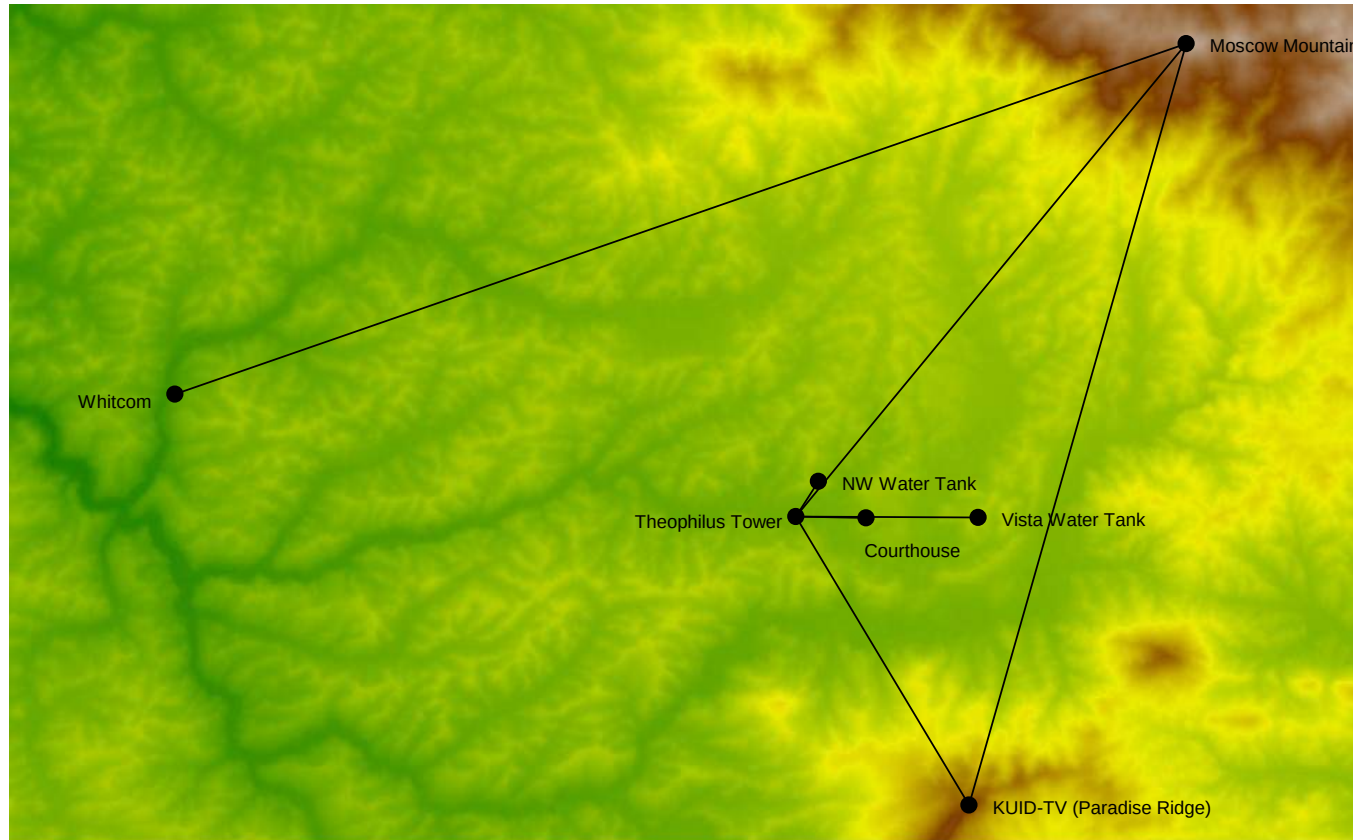


Figure 40 – Proposed Microwave Interconnect Map (VHF Simulcast System)

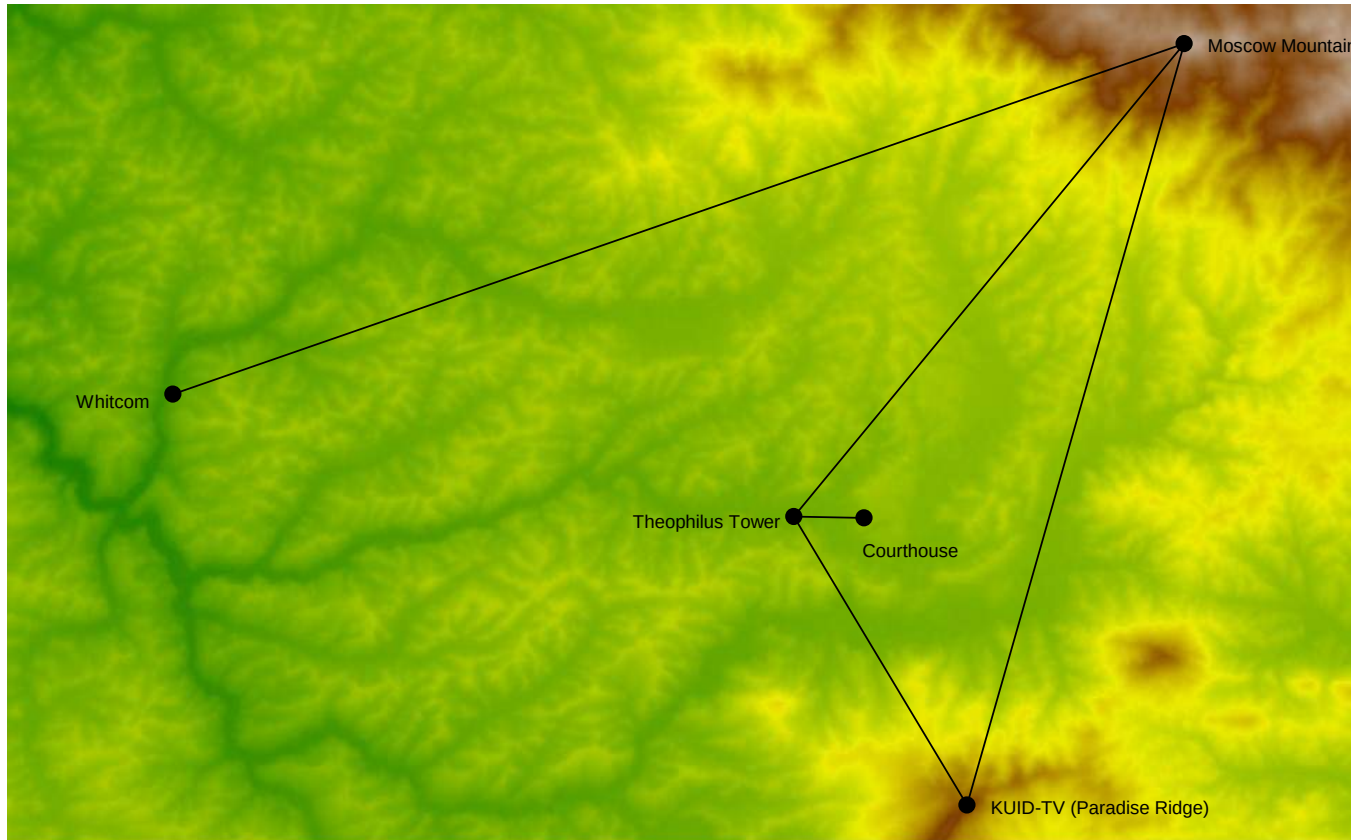


Figure 41 – Proposed Microwave Interconnect Map (700 MHz Simulcast System)

Because the Motorola 700 MHz trunked radio system alternative described above (i.e., joining the Idaho 700 MHz Public Safety Radio Network) requires an MPLS interconnection network among the sites, the microwave radios assumed for the purposes of system performance evaluation and cost analysis for the 700 MHz alternative are Aviat CTR 8540 indoor units paired with the ODU 600 outdoor RF unit. The CTR 8540 is a combination indoor unit and microwave router which is capable of providing MPLS network connections. The path analysis shown in Appendix 5 for the ODU 600 radio is not affected by the use of the IDU/router.

By including the Theophilus Tower to Courthouse link in the microwave interconnect systems for the proposed VHF and 700 MHz systems, it will be possible to interconnect the radio system backbone infrastructure to the City of Moscow Fiber network, which will allow system monitoring and other network connections to the radio system from the locations connected to the fiber system.

A map of the existing City of Moscow fiber interconnect system is shown below in Figure 42.

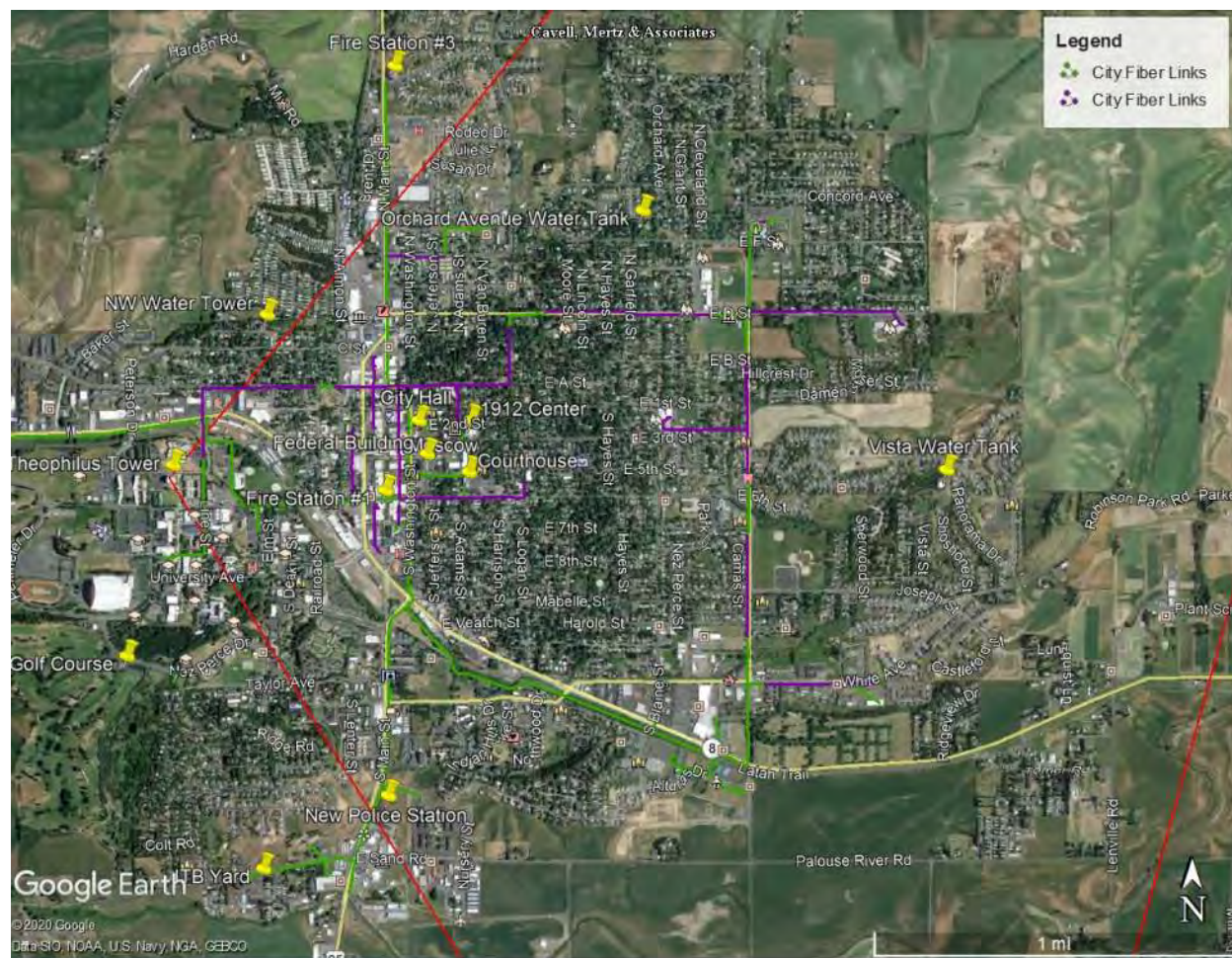


Figure 42 – Existing City of Moscow Fiber Interconnect Network

8. PROPOSED VHF SIMULCAST SYSTEM COST ESTIMATE

The cost estimate for the proposed three-site VHF simulcast system (including the two additional voting receiver sites) and an Aviat ODU600 microwave interconnect system is shown below in Table 26. A second version of the cost estimate, which assumes an Aviat WTM 4100 microwave interconnect system, is shown in Table 27. The cost estimates include all simulcast system equipment, permitting, one-time tower lease setup costs, installation, configuration, optimization and acceptance testing for the VHF simulcast system as well as the proposed 7-hop microwave interconnect system that supports the VHF simulcast system.

The cost estimate tables below include both capital and long-term recurring O&M (operating and maintenance) costs over an assumed system lifetime of 15 years. The tables also include the total lifecycle cost (total cost of ownership) for the VHF system, which is the sum of the capital costs and the recurring costs.

The capital costs include estimated consultant costs for system FCC licensing, production of procurement specifications, procurement support, installation and optimization supervision, and acceptance testing support.

Two different versions of the VHF system cost estimate tables are shown below:

The first set of tables shows the costs assuming an Aviat ODU 600 Microwave Interconnect System with a split indoor/outdoor configuration with the RF unit mounted on the tower and the multiplexing and network interface equipment mounted in an equipment rack indoors.

The second set of tables shows the costs assuming an Aviat WTM 4100 Microwave Interconnect System which has an ‘all outdoor’ configuration, with the RF, multiplexing and network interface equipment housed in a single tower-mounted enclosure.

Although the WTM 4100 microwave system is less costly than the ODU 600 system, it does not have redundant multiplex and network interface equipment, and any failure of either the RF portion of the multiplex/network portion of the radio requires replacement of the entire tower mounted radio.

Spreadsheets showing details of the estimated equipment cost calculations are contained in Appendix 6.

System Alternatives Report – Radio Systems Upgrade Project

City of Moscow, Idaho

January 25, 2021

City of Moscow Radio System Upgrade 1220																			
VHF Simulcast System																			
Capital, O&M and Lifecycle Cost Summary Sheet with ODU600 Microwave System																			
CAPITAL COSTS - VHF Simulcast System																			
VHF Simulcast System Equipment, Permitting, One-Time Tower Lease Setup Costs, Installation, Configuration, Optimization and Acceptance Testing					\$1,596,025														
VHF Simulcast Radio System Equipment, Installation, Configuration and Testing Total					\$1,596,025														
ODU600 Microwave Interconnect System Equipment Installation, Configuration and Optimization					\$278,502														
Equipment, Installation, Optimization & Permitting Total					\$1,874,527														
Total Equipment, Installation, Optimization & Permitting Cost (Rounded to Nearest &10,000)					\$1,870,000														
CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS																			
Consultant Task (H&D)					Cost														
FCC Licensing					\$7,500														
RFP Development					\$20,000														
Procurement Assistance					\$2,500														
Assistance with Site Acquisition & Permitting					\$7,500														
Project Management & Installation Supervision					\$15,000														
Supervision of Acceptance Testing					\$10,000														
Consultant Cost Total					\$62,500														
Total Consultant Support Costs					\$62,500.00														
TOTAL CAPITAL COSTS					\$1,932,500														
TOTAL CAPITAL COSTS ROUNDED TO THE NEXT HIGHEST \$10,000					\$1,940,000														
RECURRING O&M COSTS																			
Present Value (PV) of Recurring Costs (15-Years, 4% cost of money, 3% Inflation)																			
Item or Category			Quantity	Unit	Annual or Monthly Cost	NPV - 15 Years													
Radio System Annual Maintenance			1	LOT	\$54,000	\$797,500													
Site Leases (monthly - 3.5% annual increase)			1	LOT	\$6,000	\$1,071,500													
Total Recurring O&M Costs - 15 Years					\$60,000	\$1,869,000													
NOTE: NPV = Net Present Value; FV = Future Value																			
SYSTEM LIFECYCLE COST OVER 15 YEARS (ALL SUBSYSTEMS)					\$3,801,500														
LIFECYLCE COST CALCULATION ASSUMPTIONS																			
			3.50%	Annual Cost Escalator for Site Leases															
			3.00%	Annual Inflation (Costs Other Than Site Leases)															
			4.00%	Cost of Money															
			-2	Rounding (Nearest \$100)															

TABLE 26 - VHF RADIO SYSTEM COST ESTIMATE WITH ODU600 MICROWAVE RADIO SYSTEM

System Alternatives Report – Radio Systems Upgrade Project

City of Moscow, Idaho

January 25, 2021

City of Moscow Radio System Upgrade 1220															
VHF Simulcast System															
Capital, O&M and Lifecycle Cost Summary Sheet with WTM 4100 Microwave System															
CAPITAL COSTS - VHF Simulcast System															
VHF Simulcast System Equipment, Permitting, One-Time Tower Lease Setup Costs, Installation, Configuration, Optimization and Acceptance Testing	\$1,596,025														
VHF Simulcast Radio System Equipment, Installation, Configuration and Testing Total	\$1,596,025														
WTM 4100 Microwave Interconnect System Equipment Installation, Configuration and Optimization	\$219,372														
Equiment, Installation, Optimization & Permitting Total	\$1,815,397														
Total Equipment, Installation, Optimization & Permitting Cost (Rounded to Nearest &10,000)	\$1,820,000														
CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS															
Consultant Task (H&D)	Cost														
FCC Licensing	\$7,500														
RFP Development	\$20,000														
Procurement Assistance	\$2,500														
Assistance with Site Acquisition & Permitting	\$7,500														
Project Management & Installation Supervision	\$15,000														
Supervision of Acceptance Testing	\$10,000														
Consultant Cost Total	\$62,500														
Total Consultant Support Costs	\$62,500.00														
TOTAL CAPITAL COSTS	\$1,882,500														
TOTAL CAPITAL COSTS ROUNDED TO THE NEXT HIGHEST \$10,000	\$1,890,000														
RECURRING O&M COSTS															
Present Value (PV) of Recurring Costs (15-Years, 4% cost of money, 3% Inflation)															
Item or Category	Quantity	Unit	Annual or Monthly Cost	NPV - 15 Years											
Radio System Annual Maintenance	1	LOT	\$54,000	\$797,500											
Site Leases (monthly - 3.5% annual increase)	1	LOT	\$6,000	\$1,071,500											
Total Recurring O&M Costs - 15 Years			\$60,000	\$1,869,000											
NOTE: NPV = Net Present Value; FV = Future Value															
SYSTEM LIFECYCLE COST OVER 15 YEARS (ALL SUBSYSTEMS)		\$3,751,500	SYSTEM LIFECYCLE COST (Lifecycle Cost = Capital Cost + Recurring O&M Cost)												
LIFECYLCE COST CALCULATION ASSUMPTIONS															
3.50% Annual Cost Escalator for Site Leases															
3.00% Annual Inflation (Costs Other Than Site Leases)															
4.00% Cost of Money															
-2 Rounding (Nearest \$100)															

TABLE 27 - VHF RADIO SYSTEM COST ESTIMATE WITH WTM 4100 MICROWAVE RADIO SYSTEM

9. PROPOSED STAND-ALONE 700 MHZ SIMULCAST SYSTEM COST ESTIMATE

The cost estimate for the proposed three-site 700 MHz stand-alone simulcast system is shown below in Table 28. The cost estimate includes all simulcast system equipment, permitting, one-time tower lease setup costs, installation, configuration, optimization and acceptance testing for the 700 MHz simulcast system as well as the proposed 5-hop microwave/MPLS interconnect system that supports the 700 MHz simulcast system. The cost estimate for the stand-alone version of the 700 MHz system also includes the cost of a Motorola M2 master site (system core).

The cost estimate tables below include both capital and long-term recurring O&M (operations and maintenance) costs over an assumed system lifetime of 15 years. The tables also include the total lifecycle cost (total cost of ownership) for the 700 MHz stand-alone system, which is the sum of the capital costs and the recurring costs.

The capital costs include estimated consultant costs for system FCC licensing, production of procurement specifications, procurement support, installation and optimization supervision, and acceptance testing support. The capital costs also include the costs for a control station interface at the Whitcom Dispatch Center and the addition of two VHF repeaters at the Moscow Mountain site: one to provide interoperability and the other to maintain existing MFD VHF coverage outside of the City of Moscow. These VHF repeaters will be tied into specific talkgroups on the 700 MHz system as described elsewhere in this report.

The O&M Recurring costs include a System Upgrade Agreement (SUA) with Motorola, which covers upgrades of fixed infrastructure system software, firmware and hardware over a 10-year period. The SUA cost includes a 3% annual cost escalator. Although the SUA agreement would typically cover 10 years, the 15-year lifecycle cost calculations assume that the initial SUA cost would increase by 3% per year over the entire 15-year life of the system.

Spreadsheets showing details of the estimated equipment cost calculations are contained in Appendix 6.

System Alternatives Report – Radio Systems Upgrade Project

City of Moscow, Idaho

January 25, 2021

CAPITAL COSTS - 700 MHz Simulcast Trunked System (Alternative 1 - Stand Alone System)																			
3 - 6-Channel (5 Voice Channels + Control Channel) Motorola Astro P25 Phase 1 Siomulcast Repeater Sites @ \$800,000 per site [includes Equipment, Installation, Configuration, Optimization and Acceptance Testing of Radio Equipment, System Monitormg and Alarms, Antenna Systems, and Backup Power Systems]	\$3,000,000																		
Geo Redundant Prime Simulcast Site	\$312,500																		
M2 System Master Site ("System Core")	\$750,000																		
5-Channel Control Station Console Interface System (Whitcom Site)	\$40,000																		
2 VHF Conventional Repeaters (with combining and antenna systems) for interoperability and to maintain existing VHF coverage outside the City of Moscow for MFD)	\$46,000																		
Total Simulcast Equipment, Installation, Optimization and Acceptance Testing	\$4,148,500																		
MPLS Microwave Interconnect System Equipment Installation, Configuration and Optimization	\$207,633																		
Permitting	\$21,000																		
One-Time Tower Site Lease Setup Costs	\$7,500																		
Equipment, Installation, Optimization & Permitting Total	\$4,384,633																		
Total Equipment, Installation, Optimization & Permitting Cost (Rounded to Nearest &10,000)	\$4,380,000																		
CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS																			
Consultant Task (H&D)	Cost																		
FCC Licensing	\$7,500																		
RFP Development	\$20,000																		
Procurement Assistance	\$2,500																		
Assistance with Site Acquisition & Permitting	\$7,500																		
Project Management & Installation Supervision	\$15,000																		
Supervision of Acceptance Testing	\$10,000																		
Consultant Cost Total	\$62,500																		
Total Consultant Support Costs	\$62,500.00																		
TOTAL CAPITAL COSTS	\$4,447,133																		
TOTAL CAPITAL COSTS ROUNDED TO THE NEXT HIGHEST \$10,000	\$4,450,000																		
RECURRING O&M COSTS																			
Present Value (PV) of Recurring Costs (15-Years, 4% cost of money, 3% Inflation)																			
Item or Category	Quantity	Unit	Annual or Monthly Cost	NPV - 15 Years															
Radio System Annual Maintenance	1	LOT	\$70,000	\$1,033,700															
Radio System Manager (Master Site Configuraiton and Management)	1	LOT	\$120,000	\$1,772,100															
Motorola SUA (System Upgrade Agreement - Annual Cost)	1	LOT	\$60,000	\$886,000															
Site Leases (monthly - 3.5% annual increase)	1	LOT	\$6,000	\$1,071,500															
Total Recurring O&M Costs - 15 Years			\$256,000	\$4,763,300															
NOTE: NPV = Net Present Value; FV = Future Value																			
SYSTEM LIFECYCLE COST OVER 15 YEARS (ALL SUBSYSTEMS)	\$9,210,433																		
LIFECYLCCE COST CALCULATION ASSUMPTIONS																			
	3.50%	Annual Cost Escalator for Site Leases																	
	3.00%	Annual Inflation (Costs Other Than Site Leases)																	
	4.00%	Cost of Money																	
	-2	Rounding (Nearest \$100)																	

TABLE 28 – 700 MHz STAND-ALONE RADIO SYSTEM COST ESTIMATE WITH ODU 600/MPLS MICROWAVE RADIO SYSTEM

**10. PROPOSED CITY OF MOSCOW/ IDAHO 700 MHZ PUBLIC SAFETY RADIO
NETWORK 700 MHZ SIMULCAST SYSTEM COST ESTIMATE**

The cost estimate for the proposed three-site 700 MHz simulcast system implemented as part of the Idaho 700 MHz Public Safety Radio Network is shown below in Table 29. The cost estimate includes all simulcast system equipment, permitting, one-time tower lease setup costs, installation, configuration, optimization and acceptance testing for the 700 MHz simulcast system as well as the proposed 5-hop microwave interconnect system that supports the 700 MHz simulcast system. The proposed shared system uses the Idaho 700 MHz Public Safety Radio Network M3 master site (system core) located in Ada County, which results in a lower overall cost for system equipment, but which adds a small recurring cost for the lease of connecting circuits on the State of Idaho microwave network between the City of Moscow system and the M3 master site.

The cost estimate tables below include both capital and long-term recurring O&M (operations and maintenance) costs over an assumed system lifetime of 15 years. The tables also include the total lifecycle cost (total cost of ownership) for the 700 MHz shared system, which is the sum of the capital costs and the recurring costs.

The capital costs include estimated consultant costs for system FCC licensing, production of procurement specifications, procurement support, installation and optimization supervision, and acceptance testing support. The capital costs also include the costs for a control station interface at the Whitcom Dispatch Center and the addition of two VHF repeaters at the Moscow Mountain site: one to provide interoperability and the other to maintain existing MFD VHF coverage outside of the City of Moscow. These VHF repeaters will be tied into specific talkgroups on the 700 MHz system as described elsewhere in this report.

The O&M recurring costs include the Idaho 700 MHz Public Safety Radio Network per radio annual user fee and the annual lease cost for the interconnection between the City of Moscow system and the Idaho 700 MHz Public Safety Radio Network M3 master site (system core) in Ada County. A separate SUA is not shown for this alternative because the increase in the systemwide SUA that results from the addition of the City of Moscow simulcast sites and geo redundant prime site (\$28,704) is distributed across the user fees charged to all users of the system. Since there are more than 15,000 system users on the Idaho 700 MHz Public Safety Radio Network, the increase in the annual per radio user fee that results from the incorporation of the City of Moscow system is quite small. In return for this small increase in the annual user fee, system users other than the City of Moscow will have access to the City of Moscow simulcast sites for their particular talkgroups.

Spreadsheets showing details of the estimated equipment cost calculations are contained in Appendix 6.

System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho

January 25, 2021

CAPITAL COSTS - 700 MHz Simulcast Trunked System (Alternative 2 - Shared System with Idaho 700 MHz Public Safety Network)														
3 - 6-Channel (5 Voice Channels + Control Channel) Motorola Astro P25 Phase 1 Siomulcast Repeater Sites @ \$800,000 per site [includes Equipment, Installation, Configuration, Optimization and Acceptance Testing of Radio Equipment, System Monitorng and Alarms, Antenna Systems, and Backup Power Systems]	\$3,000,000													
Geo Redundant Prime Simulcast Site	\$312,500													
Total Simulcast Equipment, Installation, Optimization and Acceptance Testing	\$3,312,500													
5-Channel Control Station Console Interface System (Whitcom Site)	\$40,000													
2 VHF Conventional Repeaters (with combining and antenna systems) for interoperability and to maintain existing VHF coverage outside the City of Moscow for MFD)	\$46,000													
MPLS Microwave Interconnect System Equipment Installation, Configuration and Optimization	\$207,633													
Permitting	\$21,000													
One-Time Tower Site Lease Setup Costs	\$7,500													
Equiment, Installation, Optimization & Permitting Total	\$3,634,633													
Total Equipment, Installation, Optimization & Permitting Cost (Rounded to Nearest &10,000)	\$3,630,000													
CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS														
Consultant Task (H&D)	Cost													
FCC Licensing	\$7,500													
RFP Development	\$20,000													
Procurement Assistance	\$2,500													
Assistance with Site Acquisition & Permitting	\$7,500													
Project Management & Installation Supervision	\$15,000													
Supervision of Acceptance Testing	\$10,000													
Consultant Cost Total	\$62,500													
Total Consultant Support Costs	\$62,500.00													
TOTAL CAPITAL COSTS	\$3,697,133													
TOTAL CAPITAL COSTS ROUNDED TO THE NEXT HIGHEST \$10,000	\$3,700,000													
RECURRING O&M COSTS														
Present Value (PV) of Recurring Costs (15-Years, 4% cost of money, 3% Inflation)														
Item or Category	Quantity	Unit	Annual or Monthly Cost	NPV - 15 Years										
Radio System Annual Maintenance	1	LOT	\$60,000	\$886,000										
Annual Idaho Public Safety Network Radio Subscriber Fee (Annual)	1	LOT	\$17,446	\$257,600										
Idaho State Microwave System Data Link (Annual) [Link back to System Core in ADA County]	1	LOT	\$4,200	\$62,100										
Site Leases (monthly - 3.5% annual increase)	1	LOT	\$6,000	\$1,071,500										
Total Recurring O&M Costs - 15 Years			\$87,646	\$2,277,200										
NOTE: NPV = Net Present Value; FV = Future Value														
SYSTEM LIFECYCLE COST OVER 15 YEARS (ALL SUBSYSTEMS)	\$5,974,333													
LIFECYLCE COST CALCULATION ASSUMPTIONS														
3.50% Annual Cost Escalator for Site Leases														
3.00% Annual Inflation (Costs Other Than Site Leases)														
4.00% Cost of Money														
-2 Rounding (Nearest \$100)														

TABLE 29 – 700 MHz CITY OF MOSCOW/ IDAHO 700 MHZ PUBLIC SAFETY RADIO NETWORK RADIO SYSTEM COST ESTIMATE WITH ODU 600/MPLS MICROWAVE RADIO SYSTEM

11. VHF SINGLE BAND SUBSCRIBER UNITS (MOBILE AND PORTABLE RADIOS)

For the VHF system alternative, single band VHF mobile and portable radios are suitable for operation on the proposed new simulcast system. Many of the mobile and portable radios now used by the City of Moscow are past their product end-of-life, and are in need of replacement.

In order to be eligible for federal grant funding these mobile and portable radios must be “P25 CAP Compliant” (even if they are to be used in narrowband analog mode, as is the case for the proposed VHF simulcast system) and must be public safety grade radios that meet certain minimum requirements such as channel capacity, mechanical durability, and (for the fire service) intrinsically safe operation. Detailed description of these requirements and the “P25 CAP Compliant” designation are contained in Appendix 7 of this Report.

Appendix 7 also contains detailed recommendations for the proper configuration of mobile and portable radios, and for preventive maintenance for both subscriber units (mobile and portable radios) and base station infrastructure equipment.

Appendix 7 also shows the cost for typically configured VHF single band mobile and portable radios from various manufacturers. All of the radios shown in Appendix 7 are on the “P25 CAP Compliant” list. A list showing all of the base station, mobile and portable equipment currently on this list is included at the end of Appendix 7.

The range of costs for these “P25 CAP Compliant” VHF single band public safety grade radios is shown below in Table 30 [Pricing is based on the NASPO (National Association of State Procurement Officials) nationwide purchasing contract].

Radio Type	Cost Range
Intrinsically Safe Portable Radio	\$1661-\$2813
Non-Intrinsically Safe Portable Radio	\$1132-\$2284
Mobile Radio	\$2156-\$3376

Table 30 – VHF Single Band Mobile and Portable Radio Costs

Table 31 below shows the number of radios now in use on the existing City of Moscow Law Enforcement, Fire/EMS and Public Works radio systems.

dept	mobile	portable
Police	26	60
Fire	22	150
Public works	50	13
total count	98	223

Table 31 – Existing City of Moscow Mobile and Portable Radios

Table 32 below shows the estimated range of replacement costs for the City of Moscow Mobile and Portable Radios, based on the cost ranges shown in Table 30 and the radio quantities shown in Table 31. (Intrinsically Safe portable radios are assumed for all Moscow Fire Department radios.)

Radio Type	Quantity	Low End Cost	High End Cost
Intrinsically Safe Portable Radio	150	\$ 249,150	\$ 422,018
Non-Intrinsically Safe Portable Radio	73	\$ 82,654	\$ 166,761
Mobile Radio	98	\$ 211,375	\$ 330,873
Totals	321	\$ 543,179	\$ 919,651

Table 32 – Replacement Cost Ranges for City of Moscow VHF Single-Band Mobile and Portable Radios

12. 700/800 MHZ/VHF DUAL BAND SUBSCRIBER UNITS (MOBILE AND PORTABLE RADIOS)

Operation on the proposed 700 MHz requires the use of dual-band 700/800 MHz/VHF Dual Band portable and mobile radios in order to maintain interoperability with other agencies in the Quad Cities region that operate in the VHF frequency band and in order to maintain existing Moscow Fire Department coverage in areas outside of the City of Moscow city limits.

Appendix 7 also shows the cost for typically configured dual-band 700/800 MHz/VHF mobile and portable radios from two manufacturers. All of the radios shown in Appendix 7 are on the “P25 CAP Compliant” list.

The range of costs for these “P25 CAP Compliant” dual-band 700/800 MHz/VHF public safety grade radios is shown below in Table 30 [Pricing is based on the NASPO (National Association of State Procurement Officials) nationwide purchasing contract].

Radio Type	Cost Range
Intrinsically Safe Portable Radio	\$4320-\$8500
Non-Intrinsically Safe Portable Radio	\$3840-&7916
Mobile Radio	\$1980-\$7606

Table 33 – Dual-Band 700/800 MHz/VHF Mobile and Portable Radio Costs

Table 31 above shows the number of radios now in use on the existing City of Moscow Law Enforcement, Fire/EMS and Public Works radio systems.

Table 34 below shows the estimated range of replacement costs for the City of Moscow Mobile and Portable Radios, based on the cost ranges shown in Table 32 and the radio quantities shown in Table 31. (Intrinsically Safe portable radios are assumed for all Moscow Fire Department radios.)

Radio Type	Quantity	Low End Cost	High End Cost
Intrinsically Safe Portable Radio	150	\$ 648,000	\$ 1,275,083
Non-Intrinsically Safe Portable Radio	73	\$ 280,320	\$ 577,908
Mobile Radio	98	\$ 194,040	\$ 745,446
Totals	321	\$ 1,122,360	\$ 2,598,437

Table 34 – Replacement Cost Ranges for City of Moscow Dual-Band 700/800 MHz/VHF Mobile and Portable Radios

13. COMPARISON OF ALTERNATIVES

The following sections contain a comparison of the alternatives for the replacement or upgrade of the City of Moscow radio system, with the advantages and disadvantages of each alternative described and evaluated.

A. VHF Conventional Simulcast System

1. ADVANTAGES - VHF SYSTEM

- The primary advantages of the VHF Conventional simulcast system described above are shown below:
- The VHF system is the least costly system alternative of the three alternatives shown in this report.
- The VHF system maintains existing interoperability arrangements with other jurisdictions in the Quad Cities region without requiring upgrading to dual-band mobile and portable radios
- Although the increase in capacity provided by the proposed VHF system is limited to the addition of two shared repeated tactical channels because of the limited availability of additional spectrum in the VHF band, the proposed system does provide some increase in system capacity for both Fire and Law Enforcement users.
- The proposed VHF conventional simulcast system is less complex and requires less ongoing maintenance than the 700 MHz trunked system alternatives.
- Replacement of the existing MPD multi-site system, which requires users to switch between sites in different parts of the City, the VHF simulcast system will simplify operations for users in the field because it will not require any switching.
- The use of voting receivers (including two stand-alone voting receiver sites in addition to the three simulcast sites) will improve talk-in (inbound) coverage, including in-building coverage.
- The microwave interconnect system required for simulcast operation will provide a more reliable and redundant connection back to the Whitcom Dispatch Center than the

existing single leased fiber circuit. The system will also provide redundant connections among the three simulcast repeater sites. The microwave system will also allow monitoring and alarms from the remote simulcast repeater sites.

- The proposed VHF simulcast system with voting receiver sites will provide excellent coverage (including in-building coverage) over the entire City of Moscow and the surrounding area.
- The cost of replacing the existing mobile and portable radios in the City of Moscow radio system (many of which are well beyond the manufacturer's "end-of-life" dates) is less costly for the VHF system alternative than it is for the 700 MHz system alternatives, which require the use of dual-band 700/800 MHz/VHF portable and mobile radios in order to maintain existing interoperability with other agencies in the region.
- The proposed VHF simulcast system could be upgraded to Project 25 Phase 1 conventional operation via a firmware change to the base stations and the mobile and portable radios. The proposed base stations are capable of Linear Simulcast Modulation and the spacing of the sites will allow simulcast operation in this mode without any degradation of audio quality within the system coverage area. This would involve some additional cost for the firmware upgrades. The primary advantage of moving to P25 conventional digital operation would be an improvement in coverage (since the receive signal thresholds for DAQ 3.4 signal quality are significantly lower for P25 Phase 1 operation than they are for narrowband analog operation). However, since the proposed system operating in narrowband analog mode already provides excellent coverage, the additional cost of moving to digital operation is probably not justified, and a move to digital operation would require a complete re-working of the interoperability arrangements with other regional partner agencies, which would add additional expense and complexity to the system.

2. DISADVANTAGES - VHF SYSTEM

- *Ambient Noise and Site Noise*
One of the primary disadvantages of operating in the VHF frequency band is the high level of background noise in the band, both at the receivers operating at base station repeater sites [which are affected by both the "ambient" noise (described below) generated by all kinds of electrical equipment in the area covered by the repeaters, and the noise generated by the operation of other VHF radio facilities at the repeater site itself ("site noise", described in the next paragraph).

Typically, VHF base stations operating at multi-user sites (with multiple facilities operating from the same site) have higher "site noise" levels than base stations operating in higher frequency bands such as the 700 MHz band. Site noise is wideband RF noise that is generated by the operation of multiple transmitters and that is outside of the bandwidth occupied by the normal operation of the transmitter. It has the effect of increasing the received signal level required to achieve a particular level of performance for the receiver (for example, DAQ 3.4 audio quality). Site noise cannot be "filtered out" at the receiver because it is broadband, covers the same frequency used by the base

station receiver. Because receive filter systems are designed to pass the desired receive frequency, they also pass the site noise at the same time.

Site noise levels at multiple user sites everywhere have been increasing over the years, and at some sites the noise levels have become high enough to essentially make a VHF system unusable because the noise reduces the coverage footprint so much. There is industry-wide agreement that site noise in the VHF band will only increase over time, so this noise issue becomes a significant consideration when evaluating the long-term prospects for the operation of a system in the VHF band.

Ambient RF noise in the VHF band can degrade the performance of VHF mobile and portable radios because it raises the noise floor of the radio receiver so that the received signal level required to achieve a particular level of performance (for example, DAQ 3.4) increases dB for dB with the increasing levels of noise. The sources of this ambient noise include all kinds of electronic devices, LED lights, industrial noise, switching power supplies used to power all kinds of equipment and electronics, both in fixed locations and in vehicles. As the use of all of these electronic devices and noise sources becomes more and more widespread, the noise floor in the VHF band will only increase over time, with the ultimate effect of reducing the coverage footprint of existing VHF systems.

Because the proposed City of Moscow has a relatively small primary coverage area, and because it employs multiple “voted” receiver sites, the impact of increasing noise levels in the VHF band will have less of an impact on coverage than it would for a system with wide-area coverage and fewer receiver sites. However, the coverage provided by the VHF system (both outbound and inbound) will be degraded over time by increasing ambient and site noise levels, especially in “fringe” coverage locations and inside buildings.

- *Potential for Interference from Other Systems*

Because the FCC’s Rules define the spectrum used for VHF conventional systems as “shared” spectrum, there is always some potential for interference from other VHF system, especially co-channel systems operating with base stations at high elevation sites (this is the issue that affects the existing MFD repeater input frequency, as described in detail elsewhere in this report). The potential for this type of interference be ameliorated to some extent by careful selection of VHF frequencies to avoid co-channel systems close enough to have to potential to cause interference, but even this kind of careful system design can be offset by the coordination of new system that meet the requirements of frequency coordination agreements, but which can nevertheless cause interference due to their specific configuration of repeater sites or by the operation of fixed base station facilities on channels which are designated in the FCC Rules as “mobile-only” channels (which is an all too common occurrence).

- The proposed VHF conventional simulcast system has limited capacity compared to the 700 MHz trunked radio alternatives. Although the proposed system does provide two additional tactical channels compared to the existing system, a thorough search of the

VHF frequency band did not yield any additional VHF frequencies that could be used for repeated tactical channels, due to the very congested condition of the VHF frequency band, even outside of major population centers. Moscow Fire Department had requested 4 tactical channels and Moscow Police Department had requested 1 tactical channel, if possible, as part of any new VHF radio system, for a total of 5 repeated tactical channels. Unfortunately, there were only enough available VHF frequencies to provide two new repeated tactical channels.

B. 700 MHz Systems (Both Alternatives)

1. ADVANTAGES – 700 MHz SYSTEMS (BOTH ALTERNATIVES)

The following paragraphs describe the advantages common to both 700 MHz system alternatives (stand-alone and shared City of Moscow/State of Idaho system).

- Trunked system operation provides significantly more capacity than VHF conventional operation. The proposed trunked system alternatives with 5 voice channels (the same number of voice channels as the proposed VHF conventional system) will provide more than enough capacity for the current and future needs of all City of Moscow users. This is because trunked systems are significantly more efficient in their use of channels than conventional systems; the channels are “pooled” and used by the system as needed, instead of having each channel assigned to a single group of users. In the trunked system groups of users are assigned to “talkgroups”, which essentially function in a similar fashion to individual channels, and the proposed 700 MHz trunked system is capable of providing for more than 25 talkgroups, provided that the system users observe good “radio discipline” and do not engage in individual “long-winded” calls that occupy extended and uninterrupted periods of time.
- 700 MHz spectrum is managed and assigned by the Region 12 700 MHz Regional Planning Committee so that co-channel and adjacent channel interference between systems is not an issue. The spectrum is assigned for use by agencies on a county-by-county basis, and so is “dedicated” rather than “shared” spectrum.
- Both ambient noise and site noise are much less of a problem in the 700 MHz band than they are in the VHF band. Also, because the 700 MHz band has specific blocks of spectrum assigned for transmit facilities and receive facilities (separated by 30 MHz), there are fewer issues related to site noise and receiver desensitization than in the VHF band, where transmit frequencies are often interleaved closely with receive frequencies.
- For many types of building construction 700 MHz in-building coverage is better than VHF in-building coverage (assuming the same general system configuration). The proposed 700 MHz system does not require additional voting receiver sites to provide comparable levels of in-building coverage compared to the proposed VHF simulcast system.
- A 700 MHz trunked system allows for additional system features (at some additional cost), such as over-the-air programming of radios.
- The proposed microwave radio system that provides the interconnections for the 700 MHz simulcast system requires fewer hops than the system required for the VHF simulcast system (because there are no stand-alone voting receiver sites in the 700

MHz system). However, the 700 MHz system does require an MPLS network to connect the sites together and to connect to the master site (system core), and this offsets some of the cost savings that result from having fewer “hops” in the system. The microwave system will provide improved reliability and redundancy compared to the interconnect systems used in the existing City of Moscow radio system.

2. DISADVANTAGES – 700 MHz SYSTEMS (BOTH ALTERNATIVES)

- The primary disadvantage of both 700 MHz system alternatives relative to the VHF system alternative is increased cost, both for system infrastructure and for subscriber units (mobile and portable radios, which must be dual-band radios in order to maintain existing interoperability functions). Both 700 MHz alternatives are significantly more expensive than the VHF alternative.

C. 700 MHz Systems (Stand-Alone System)

1. ADVANTAGES – 700 MHz STAND-ALONE SYSTEM

- System Control – A stand-alone system would be completely owned and managed by the City of Moscow. However, this is a two-edged sword because that system management would impose the additional recurring cost of an FTE position for a system manager.
- The stand-alone 700 MHz system would not depend upon a communications link back to the master site (system core) in Ada County. The master site could be collocated at one of the simulcast sites in the stand-alone system. However, this disadvantage is somewhat offset by the normal failure modes of the Motorola 700 MHz system. Even with a failure of the link back to the remote master site in the “shared system” alternative, the simulcast system would continue to operate in “site trunking” mode, and would only lose to ability to communicate with other users on the state system (e.g., ISP). City of Moscow users could continue to “talk” on the system in this failure mode.
- The stand-alone alternative does not require the payment of user fees to the Idaho 700 MHz Public Safety Radio Network.

2. DISADVANTAGES – 700 MHz STAND-ALONE SYSTEM

- Cost – Both the capital costs and the recurring O&M costs are significantly higher for the stand-alone system alternative than they are for the “shared system” alternative, primarily of the cost of installing, maintaining and managing the master site (system core). In the “shared system” alternative, the cost of the master site and its maintenance and management are borne by the Idaho 700 MHz Public Safety Radio Network.
- Interoperability - The stand-alone alternative does not provide interoperability between the City of Moscow users and other state and federal agencies operating on the Idaho 700 MHz Public Safety Radio Network.
- The stand-alone alternative requires a separate SUA (System Upgrade Agreement) with Motorola, which adds to the recurring O&M costs for this alternative.

D. 700 MHz System – “Shared System” (with Idaho 700 MHz Public Safety Radio Network)

1. ADVANTAGES – 700 MHz “SHARED SYSTEM” (WITH IDAHO 700 MHZ PUBLIC SAFETY RADIO NETWORK)

- Shared Master Site – Under the “shared system” alternative, the master site would be provided, managed and maintained by the Idaho 700 MHz Public Safety Radio Network. This results in a significant cost savings in both capital costs and recurring costs, compared to the stand-alone system alternative.
- Cost - The “shared system” alternative is significantly less expensive than the stand-alone alternative in terms of both capital costs and recurring O&M costs. Although this alternative does require payment of annual user fees to the Idaho 700 MHz Public Safety Radio Network, those fees cover the cost of the annual SUA with Motorola, including the addition of the City of Moscow facilities to the statewide system SUA.
- Interoperability – The “shared system” alternative provides seamless interoperable communications with other state and federal agencies operating on the Idaho 700 MHz Public Safety Radio Network.

2. DISADVANTAGES – 700 MHz “SHARED SYSTEM” (WITH IDAHO 700 MHZ PUBLIC SAFETY RADIO NETWORK)

- Potential failure modes – As described above, the “shared alternative” requires a communications link (over the State of Idaho Microwave Radio System) from the City of Moscow system to the Idaho 700 MHz Public Safety Radio Network master site (system core) in Ada County. Although this is a potential single point of failure for the system as a whole, the failure mode that would occur if this link went down would still allow City of Moscow users to communicate over the City of Moscow simulcast system, as long as none of the links within that sub-system itself were down.

14. RECOMMENDATIONS

If it is possible to obtain funding for the 700 MHz “shared system” alternative, which uses the master site on the existing Idaho 700 MHz Public Safety Radio Network, then this is the recommended alternative.

This alternative provides long-term protection against degradation of coverage that is likely to result from increasing noise levels in the VHF band, as well as the potential for interference from co-channel stations that may be coordinated and licensed in the future. It also provides the increased radio traffic capacity that comes along with a trunked radio system and it

provides increased interoperability with state and federal agencies compared to the VHF conventional system alternative.

If funding of the “shared system” 700 MHz system alternative does not appear to be financially feasible, then the proposed VHF conventional system alternative should be implemented. Although the proposed VHF system does not provide all of the additional capacity requested by MFD and MPD, it does provide two additional repeated tactical channels that can be used on a “shared” basis and assigned by dispatch as needed. The risk of long-term coverage degradation due to noise and interference in the VHF band and the potential for future co-channel interference is offset somewhat by the system design and by the selection of repeater input frequencies for the proposed system.

Because the implementation of either of the system alternatives described above will take a significant period of time, the replacement of the existing Moscow Fire Department’s repeater input channel with the new channel described above in this report should be performed as a first step (irrespective of the long-term system alternative being implemented) in order to eliminate the existing degradation of MFD’s coverage caused by co-channel interference.

APPENDIX 1

BASIS AND DERIVATION OF RECEIVED SIGNAL POWER AND BER REQUIREMENTS

Once the DAQ objective is defined (e.g., DAQ 3.4 in this case), the received signal strength at the mobile/portable radio (for the outbound path) or at the base station receiver (for the inbound path), the required median signal power required to produce DAQ 3.4 performance from the radio within a given tile on the prediction map can be calculated based on the techniques documented in TSB-88.

The basic components of the calculation of the received signal strength required for a given probability of providing DAQ 3.4 audio quality within a prediction tile and the process followed to arrive at that signal strength value are shown in Appendix 1.

1. $C/(I+N)$ Ratio (Carrier-to-Noise-plus-Interference Ratio) required for system modulation type and required DAQ. This is a number representing a signal power level in dB (decibels) above the noise and interference level in the front end of the receiver. This value is taken from Table A-1 of TSB-88.1-D³.

For a 12.5 kHz (± 2.5 kHz deviation) narrowband analog FM signal the $C/(I+N)$ ratio required for DAQ 3.4 performance is 26.0 dB.

For a P25 Phase 1 digital signal the $C/(I+N)$ ratio required for DAQ 3.4 performance is 17.0 dB.

2. Typically, the noise floor of the receiver (the N in $C/(I+N)$) is not a specification that is available from manufacturers; therefore, it is normally inferred from the Static 12 dB SINAD (Signal-to-Noise and Distortion ratio) sensitivity specification for the radio, based on the $C/(I+N)$ requirement (in dB) shown for that SINAD performance level, which is subtracted from the static sensitivity number (in dBm) to provide the calculated internal noise level of the receiver. This value will vary with the type of modulation used by the radio.
3. The faded $C/(I+N)$ added to the radio's internal noise level creates the received signal power necessary for a 50% probability of achieving the audio performance level defined as Delivered Audio Quality (DAQ).
4. Based on the standard deviation of location variability an additional margin is calculated and added to the required received signal power to provide a 95% probability of achieving a DAQ level of 3.4. The table defining various DAQ levels and associated $C/(I+N)$ requirements is shown below in this Appendix.
5. Predictions of the probability of achieving the specified DAQ performance within a given prediction tile are based on signal power levels received at the

³ TSB-88.1-D, TIA TELECOMMUNICATIONS SYSTEMS BULLETIN; Part 1 – Recommended Methods for Technology Independent Performance Modeling; April 2012; Table A-1 Projected VCPC Parameters for Different DAQs

associated receiver. The calculations take into consideration the power output level of the transmitter and any gain or loss elements in the path between transmitter and receiver.

6. Since performance is determined by the faded $C/(I+N)$ [Where C = Carrier Power Level, I = External Interference and Noise, and N = the internal Noise of the receiver], the external “I” contribution is very important. This includes interference from other sources such as other transmitters on the same or adjacent channels and other external noise sources such as switching power supplies used in all sorts of modern electronic equipment and lighting systems. In the VHF band the number of sources and level of RF noise have increased over time.
7. It is possible to deal with these additional sources of noise and interference either by adding their impact to the calculation of the required signal power level, or by including them in the noise floor assumed for the receiver in the calculations performed by the propagation prediction program.

It is generally simpler to include these noise factors in the propagation predictions and to assume the same required DAQ 3.4 received signal level throughout the system, if possible.

8. The sum of #1 and #2 above (in dBm) is the median signal power required at a receiver within a given prediction tile to produce an audio quality level of DAQ 3.4.
9. As described above, an additional signal margin is required to obtain the desired probability of achieving the required received signal power throughout the area covered by the tile. This initial median signal level calculation assumes that the propagation path characteristics are uniform throughout the tile. In fact, there can often be a significant amount of “location variability” within the area in a prediction tile. This additional margin accounts for that location variability. Its value is dependent upon the desired probability of receiving the required signal power level for DAQ 3.4 performance (95% for the City of Moscow systems) and the standard deviation of the location variability assumed for the tile.

Performance, both predicted and measured, is based on the link budget along with degradation factors such as external noise or interference from co-channel or adjacent channel radio transmissions. Values used are based on TIA TSB-88 recommendations or from field measurements.

Before the link budget can be determined the performance level needs to be defined. TIA TSB-88.1-D provides the information necessary for defining the level of performance.

DAQ

Delivered Audio Quality (DAQ) is defined relative to the static SINAD equivalent intelligibility. The definitions are shown from TSB-88.1-D Table 3.

Table 1 TSB-88 DAQ definitions

DAQ Delivered Audio Quality	Faded Subjective Performance Description	Static SINAD equivalent intelligibility ^{1,2}
1	Unusable, Speech present but unreadable	<8 dB
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion	12 ± 4 dB
3	Speech understandable with slight effort. Occasional repetition necessary due to Noise/Distortion	17 ± 5 dB
3.4	Speech understandable with repetition only rarely needed. Some Noise/Distortion	20 ± 5 dB ³
4	Speech easily understood. Occasional Noise/Distortion	25 ± 5 dB
4.5	Speech easily understood. Infrequent Noise/Distortion	30 ± 5 dB
5	Speech easily understood.	>33 dB

¹ The VCPC is set to the midpoint of the range.

² Measurement of SINAD values is not recommended for analog system performance assessment.

³ The 20 dBS equivalency necessitates a DAQ of approximately 3.4. This value can then be used for linear interpolation of the existing criteria. Non public safety CPC specifications would normally request a DAQ of 3, while Federal Government agencies commonly use a DAQ of 3.4 at the boundary of a protected service area. Note that regulatory limitations could preclude providing a high probability of achieving this level of CPC for portable in-building coverage. In addition, higher infrastructure costs could be needed with potential lessened frequency reuse.

DAQ History

In the early process of developing TSB-88, the general target for users was intended to be DAQ 3.0, 17 dB static SINAD equivalent intelligibility. Input from Federal Agencies created a higher requirement for 20 dB SINAD which was quickly requested by other users and became a default requirement. The value of 3.4 is the result of SINAD being linear in that region so $3/(25-17) = 0.375$, rounded to 0.4 added to DAQ 3.

This was fortuitous, as the digital modulations tend to drop rather rapidly after DAQ 3 resulting in more margins for signal fluctuations when DAQ 3.4 is utilized.

The selection of these benchmark points was confirmed by the TIA membership by using MATLAB to simulate SINAD measurements which are difficult to actually conduct in the field.

Link Budget.

The link budget is based on all the equipment parameters that impact the signal level received at the target radio for down links or the base/voting receiver for uplinks.

Down Link Factors

Transmitter

- Transmitter Power output
- Site filtering losses
- Transmission line losses
- Antenna gain and pattern (manufacturer's specification)

These factors determine the effective radiated power.

Additionally, at the site the antenna height above ground and location on the tower can produce different results which are taken into consideration by the prediction software.

Propagation Loss (calculated by software or derived for knowing the transmitter and receiver values). There are numerous different propagation models. Initially the Anderson 2D model will be used for predictions.

- Terrain variations
- Land Usage Categories and associated loss by category
- Prediction Model

Receiver

- Antenna efficiency in dB and pattern (theoretical or measured)
- Height above ground
- Line and connector losses
- Receiver sensitivity (manufacturer's specification)
 - o Noise figure (derived)
 - o ENBW (TSB-88 recommendations utilized)
 - o Internal Noise Contribution (to be summed with external noise when known)

The noise figure is a very important equipment parameter. It is a constant for a given receiver while the ENBW varies with the associated modulation. Equipment manufacturers specify the radio's reference sensitivity but do not separately change that value based on the modulation other than for analog and for digital. Additionally, the Signal Pro software utilizes the noise figure to derive the receiver's internal noise floor which is the starting point for deriving the overall $C/(I+N)$ for performance. Other noise sources will be added to calculate the $C/(I+N)$.

Motorola only specifies the APX VHF receiver sensitivity as:

	APX7500 Mobile		APX7000 Portable
	Standard	Preamp	
• Analog	0.251 μ V (-119 dBm)	0.158 μ V (-123.0 dBm)	0.216 μ V (-120.3 dBm)
• 1% BER			0.277 μ V (-118.1 dBm)
• 5% BER	0.251 μ V (-119 dBm)	0.158 μ V (-123.0 dBm)	0.188 μ V (-121.5 dBm)

City of Moscow mobiles do not include the preamplifier option. For the VHF band, narrow band FM requires a 7 dB Cs/N with an ENBW of 7.8 kHz which allows calculating a noise figure as follows:

$$NF = -144 - (sens) + 7 + 10 \times \text{Log}(7.8)$$

$$NF = -144 - (-117.5) + 7 + 8.92 = 10.6 \text{ dB}$$

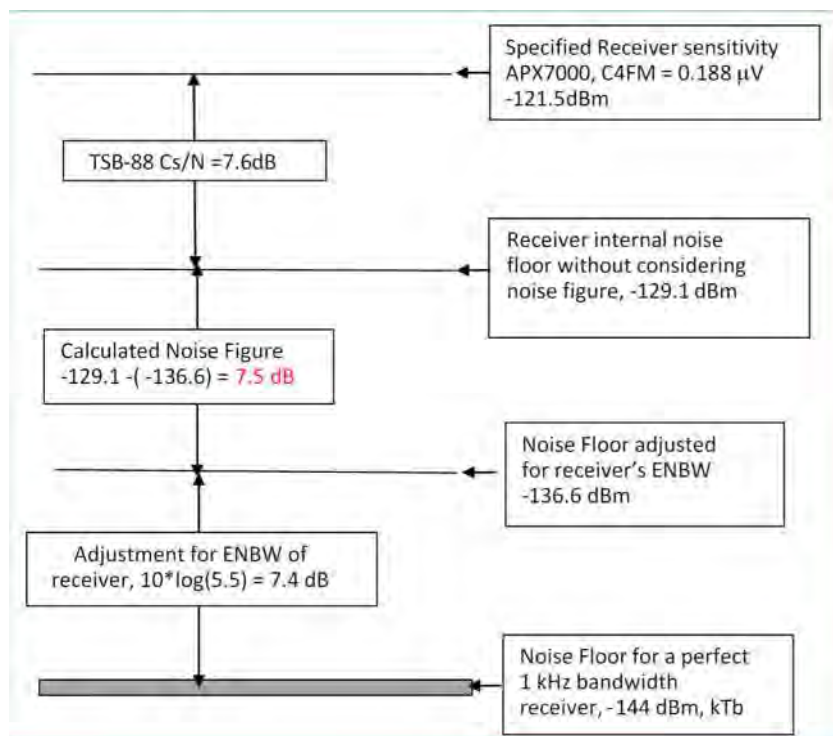


Figure 1 Noise figure derivation

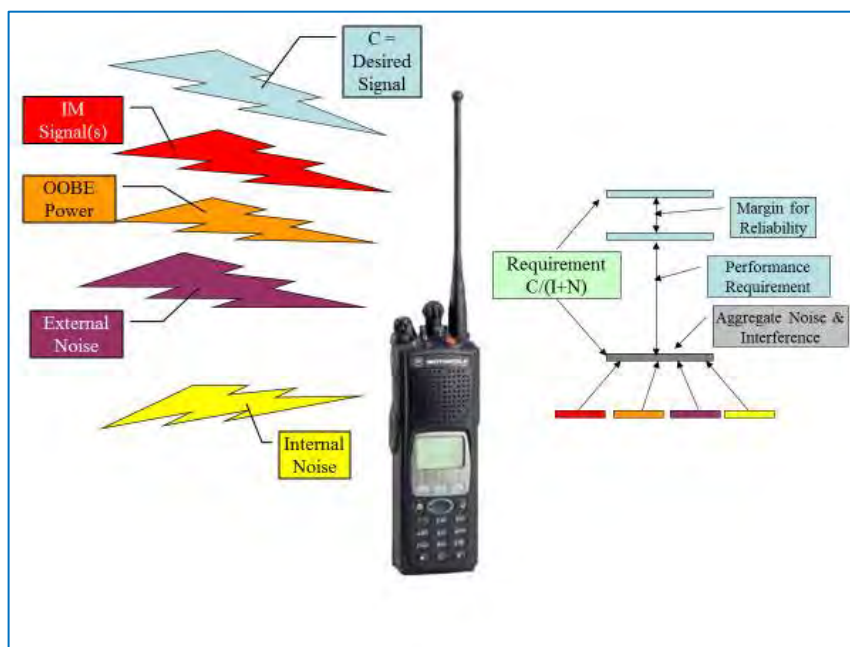


Figure 2 Typical Noise Sources

The 700 MHz APX TDMA receivers are all specified as 0.25 mV (-119.0 dBm) with an ENBW of 6.0 kHz. The mobile Noise Figure is therefore calculated to be $-144 - (-119 - 7.3) + 10 \cdot \log(6) = 9.9$ db.

Uplink noise figures are site specific due to combining equipment losses and configuration of any multicoupler included in the receiving system.

The internal noise is inside the radio, after the antenna. The other external sources and the desired signal power are reduced or increased based on the specific antenna utilized. These all combine to produce the actual $C/(I+N)$ which determines the probability of achieving the desired DAQ as indicated above.

Local noise sources received by the antenna change the $C/(I+N)$, thereby degrading performance

For the initial predictions, prior to obtaining measured values, the effect of external noise is not considered. Once measured values are known then the predictions can be rerun with the appropriate values included.

The Receiver Equivalent Noise Bandwidth (EDNBW) varies with modulation type and determines the Adjacent Channel Rejection. Table 6 of TSB-88.1-D provides the recommended values for simulating the receiver ENBW. The following table is partially extracted from TSB-88.1D.

Table 2 TSB-88 Recommended Receiver IF Values

Modulation Type ¹⁾	ENBW (kHz)	IF Filter Simulation ^{2),3)} See Table 9	Annex A Reference
Analog FM Radios			A.5
Analog FM (12.5 kHz) ± 2.5 kHz	7.8 ⁵⁾	Butterworth 4-3	A.5.1
Analog FM (25 kHz) ± 4 kHz (NPSPAC)	12.6/11.1 ⁴⁾	Butterworth 4-3	A.5.2
Analog FM (25 kHz) ± 5 kHz	16.0/12.6 ⁴⁾	Butterworth 4-3	A.5.3
Digital FDMA Radios			A.6
C4FM (IMBE) (12.5 kHz) (P25 FDMA)	5.5 ⁵⁾	RRC, $\alpha=0.2$	A.6.1
CQPSK LSM (IMBE) (12.5 kHz)	5.5	RRC, $\alpha=0.2$	A.6.2
F4GFSK (AMBE) OPENSKEY® (25kHz)	12.4	Butterworth 4-3	A.7.2
H-DQPSK (P25 TDMA Downlink)	6.0	RRC, $\alpha=0.2$	A.7.3
H-CPM (P25 TDMA Uplink)	6.0	RRC, $\alpha=0.2$	A.7.4

Table A1 from TSB-88.1-D contains the recommended C(I+N) values for all the commonly used modulations.

Table 3 TSB-88 DAQ Performance Values (TSB-88 Table A1)

Modulation Type, (channel spacing)	Static¹⁾. $ref / \frac{C_s}{N}$	DAQ-3.0²⁾. $BER\% / \frac{C_F}{(I+N)}$	DAQ-3.4³⁾. $BER\% / \frac{C_F}{(I+N)}$	DAQ-4.0⁴⁾. $BER\% / \frac{C_f}{(I+N)}$
Analog FM Radios				
Analog FM $\pm$ 2.5kHz (12.5 kHz)	12 dB/7 dB	N/A/23 dB	N/A/26 dB	N/A/33 dB
Analog FM $\pm$ 4kHz (25 kHz) ⁵⁾	12 dB/5 dB	N/A/19 dB	N/A/22 dB	N/A/29 dB
Analog FM $\pm$ 5kHz (25 kHz)	12 dB/4 dB	N/A/17 dB	N/A/20 dB	N/A/27 dB
Digital FDMA Radios				
C4FM (IMBE) (12.5 kHz) ⁶⁾	5%/5.4 dB	2.6%/15.2 dB	2.0%/16.2 dB	1.0%/20.0 dB
C4FM (IMBE) (12.5 kHz) ⁷⁾	5%/7.6 dB	2.6%/16.5 dB	2.0%/17.7 dB	1.0%/21.2 dB
C4FM (VSELP)* (12.5 kHz) ⁷⁾	5%/7.6 dB	1.8%/17.4 dB	1.4%/19.0 dB	0.85%/21.6 dB
CQPSK (IMBE) LSM, 9.6 kb/s (12.5 kHz)	5%/6.5 dB	2.6%/15.7 dB	2.0%/17.0 dB	1.0%/20.5 dB
CQPSK (IMBE) WCQPSK, 9.6 kb/s (12.5 kHz)	5%/6.5 dB	2.6%/15.4 dB	2.0%/16.8 dB	1.0%/20.2 dB
CVSD "XL" CAE (25 kHz)	8.5%/4.0 dB	5.0%/12.0 dB	3.0%/16.5 dB	1.0%/20.5 dB
CVSD "XL" CAE (NPSPAC) ⁸⁾	8.5%/4.0 dB	5.0%/14.0 dB	3.0%/18.5 dB	1.0%/22.5 dB
CVSD "XL" 4 Level (25 kHz)	8.5%/4.0 dB	5.0%/18.0 dB	3.0%/21.5 dB	1.0%/27.0 dB
EDACS® Narrowband Digital	5%/7.3 dB	2.6%/16.7 dB	2.0%/17.7 dB	1.0%/21.2 dB
EDACS® NPSPAC ⁸ Digital	5%/6.3 dB	2.6%/15.7 dB	2.0%/16.7 dB	1.0%/20.2 dB
EDACS® Wideband Digital (25 kHz)	5%/5.3 dB	2.6%/14.7 dB	2.0%/15.7 dB	1.0%/19.2 dB
dPMR 4.8 kb/s (AMBE+2) (6.25 kHz)	5%/7.8 dB	2.6%/16.3 dB	2.0%/17.5 dB	1.0%/20.8 dB
dPMR 4.8 kb/s (AMBE+2) (6.25 kHz)	5%/7.3 dB	2.6%/15.7 dB	2.0%/17.0 dB	1.0%/20.2 dB
dPMR 9.6 kb/s (AMBE+2) (12.5 kHz)	5%/7.0 dB	2.6%/15.5 dB	2.0%/16.7 dB	1.0%/19.9 dB
Tetrapol	5%/4.0 dB	1.8%/14.0 dB	1.4%/15.0 dB	0.85%/19.0 dB
WidePulse C4FM (25 kHz)	5%/9.8 dB	2.6%/17.2 dB	2.0%/18.5 dB	1.0%/21.8 dB
Digital TDMA Radios				
ETSI DMR 2 slot TDMA (AMBE +2) (12.5 kHz)	5%/5.3 dB	2.6%/14.3 dB	2.0%/15.6 dB	1%/19.4 dB
F4GFSK (AMBE) OpenSky®2-slot	5%/11.0 dB	3.5%/17.0 dB	2.5%/19.0 dB	1.3%/22.0 dB
F4GFSK (AMBE) OpenSky®4-slot	5%/11.0 dB	1.3%/22.0 dB	0.9%/24.0 dB	0.5%/27.0 dB
HDQPSK 12 kb/s (AMBE+2)	5%/7.3 dB	3.1%/15.2 dB	2.4%/16.4 dB	1.2%/19.8 dB
HCPM 12 kb/s (AMBE+2)	5%/9.0 dB	3.3%/17.5 dB	2.6%/18.7 dB	1.4%/21.6 dB
Cellular Type Digital Radios (TDMA)⁹⁾				
DIMRS – iDEN® (25 kHz) 6:1	Footnote 9	Footnote 9	Footnote 9	Footnote 9
TETRA (25 kHz) 4:1	Footnote 9	Footnote 9	Footnote 9	Footnote 9

Footnotes for Table A 1

- Radios with gray shading indicate they will no longer be licensable after 1/1 2013 between 150.8 and 512 MHz.
- Static is the reference sensitivity of a wireless detection sub-system (receiver) and is comparable to 12 dB SINAD in an analog system
 - DAQ-2.0 (not shown) is comparable to 12 dB SINAD equivalent intelligibility,
DAQ-3.0 is comparable to 17 dB SINAD equivalent intelligibility
 - DAQ-3.4 is comparable to 20 dB SINAD equivalent intelligibility, used for minimum CPC for some public safety entities.
 - DAQ-4.0 is comparable to 25 dB SINAD equivalent intelligibility
 - This is a NPSPAC configuration, 25 kHz channel bandwidths, but 12.5 kHz channel spacing. 20 dB OCR receivers assumed (25 dB ACPR)
 - A wide IF bandwidth assumed as part of a migration process
 - A narrow IF bandwidth is assumed after migration is completed.
 - Reduced deviation for NPSPAC regulations.
 - Contact manufacturer as sensitivity varies by deployment configuration

Link Margin

The difference in the ERP and the receiver sensitivity at the antenna port for the criterion DAQ determines the margin for performance. At each tile this margin determines the probability of achieving that DAQ by dividing that margin in dB by the location variability standard deviation value (σ). Initially a value of 5.6 dB is used until measured data can reduce or increase this value.

An example of the calculation is:

Transmitter ERP 100 W = 50 dBm

Receiver sensitivity for VHF APX 7500 C4FM mobile

-117.5 dBm spec sensitivity

-7.6 dB to determine noise floor

+17.7 dB for DAQ3.4

-1 dB cable loss

-1 dBd antenna efficiency ($\lambda/4$ antenna, TSB-88)

-105.4 dBm for desired DAQ

Down links budget is +50 dBm - (-105.4 dBm) = 155.4 dB

If the propagation loss to a tile is 145 dB then the DAQ tile margin would be 10.4 dB. Using the generally agreed upon standard location deviation value (σ) of 5.6 dB the statistical factor is $10.4/5.6 = 1.85714$ which for a Gaussian Distribution provides a 96.8% probability. No external noise is included in this example.

Z	Cum Prob
1.85714	96.83544%
Use Goal Seek to determine either	
For Z set Cum Prob to desired as a numeric	
Red is input, Blue is calculated probability	
Single	
	5.60 dB Std Dev
	10.40 dB Margin for 96.835438%

Figure 3 Sample of Margin for Probability

Up Link Factors

The performance in the uplink direction is determined by the same factors but in the opposite direction. Receiver voting enhances the uplink probability, but for the propagation predictions performed for this project only the strongest voting receiver's signal power is utilized (this is due to limitations in the propagation prediction software, which does not allow for the calculation of the probability enhancement provided by the receiver voting system). To highlight the difference between the downlink path and the uplink path a VHF portable radio will be used for this example

Transmitter

- Portable transmitter 6 W (+37.8 dBm)
 - Dual Band antenna on hip (-21.6 dB) (Will be measured as part of antenna testing)
- ERP = 16.2 dBm

Propagation Loss similar to down link unless different antennas and antenna heights used

Receiver

- Antenna Gain and Pattern
- Line loss
- Filter loss
- Multicoupler Gain if used
- Based receiver sensitivity for criterion DAQ

For this example, the base receiver antenna gains and filter losses are assumed to be offset so the resulting sensitivity would be for a -120 dBm receiver:

- -120 dBm Receiver reference sensitivity
- -7.6 dB for internal noise floor
- +17.7 for DAQ 3.4

-109.9 dBm

The Uplink Budget for a VHF portable is $16.2 \text{ dBm} - (-109.9 \text{ dBm}) = 126.1 \text{ dB}$

Note this is considerably less than mobile Down Link Budget of 155.4 dB. For this example, the 145 dB of propagation loss exceeds the link budget. The resultant would be less than 50% probability. Therefore, for this portion of the example a lesser propagation loss of 124 dB is used. The tile margin is therefore only 2.3 dB which when divided by the location standard deviation is 0.41 or a 66% probability of achieving the DAQ at this receive site.

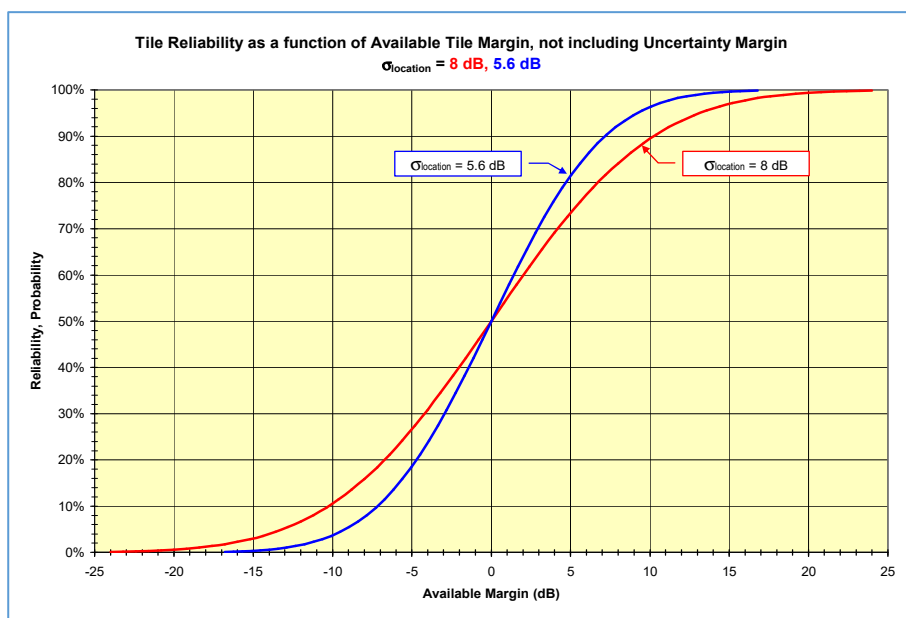


Figure 4 Example of Margin for Probability vs. two Standard Deviation Values

As mentioned, this example doesn't include external noise sources at the receive site. The greater the standard deviation, the less is known about the sources of signal degradation, such as multipath propagation, land use and land cover characteristics (trees and buildings), and interference.

Sources of Signal Degradation

For mobiles and portables in the field, the major source of signal degradation will be local ambient noise and other electronic generated noise.

TSB-88.2 has tables for estimating noise based on LULC values. Unfortunately, there are various LULC data bases so the appropriate values are difficult to utilize. Instead, a simple calculator is proposed as a starting point to estimate external noise based on four environmental categories. This calculator will be updated for City of Moscow's system conditions based on a limited number of measurements made during the outbound and inbound coverage testing performed for Deliverable 3.

- Quiet, little effect on noise floor
- Rural, increased over Quiet
- Residential, further increasing
- Business, highest noise level due to increased number of sources

APPENDIX 2

PATH ANALYSIS AND INTERFERING SIGNAL LEVEL CALCULATIONS FOR CO-CHANNEL INTERFERING SIGNALS ON MFD PRIMARY DISPATCH REPEATER INPUT CHANNEL (151.1300 MHz)

This Appendix contains detailed analyses of the propagation paths between the transmitter sites of the three co-channel stations most likely to cause interference to the MFD main dispatch repeater receiver and the receiver site on Moscow Mountain. The three co-channel stations shown in this analysis are:

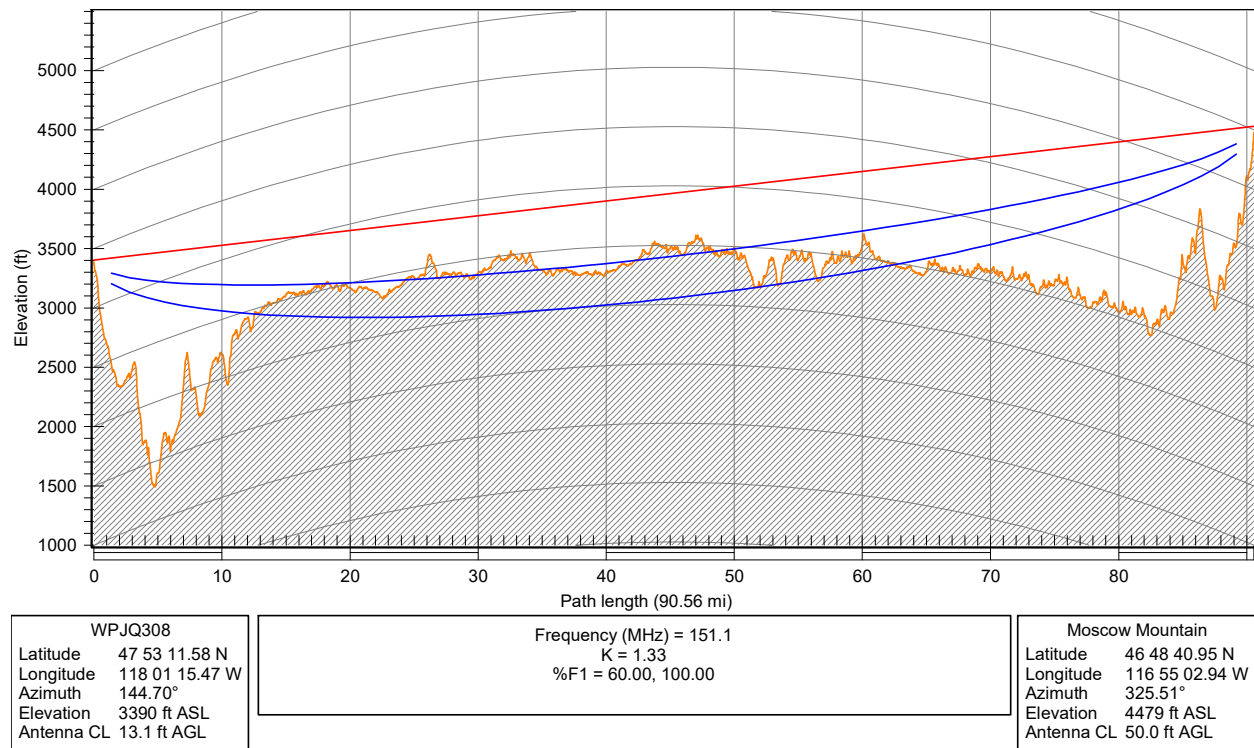
- The FB2 (fixed repeater) operation of WPJQ308 on Wellprint Mountain in Ferry County, Washington.
- The FX1 (fixed control station) operation of WND2708 in Klickitat in Klickitat County, Washington.
- The FB (fixed base station) operation of WPKL682 in East Wenatchee, Douglas County, Washington.

All three of these facilities operate at relatively high elevation sites, but all three of the sites are far enough away from Moscow Mountain that the effect of the curvature of the earth affects the propagation paths from the sites to Moscow Mountain and none of them have line-of-sight paths to the MFD receiver location at the Moscow Mountain site.

However, the diffraction losses caused by terrain and earth curvature are low enough for all three of the paths analyzed below to produce signals at Moscow Mountain strong enough to degrade the performance of the MFD receiver.

WPJQ308, Wellprint Mountain; Ferry County, WA

The path profile between the WPJQ308 site and Moscow Mountain is shown below. The two curved lines shown in the profile represent the 60% and 100% First Fresnel Clearance zones. Any obstructions within these zones will have the effect of reducing the signal from WPJQ308 at the Moscow Mountain receiver site. The curvature of the horizontal grid lines in the path profile represents the effective curvature of the earth at 151.1300 MHz.

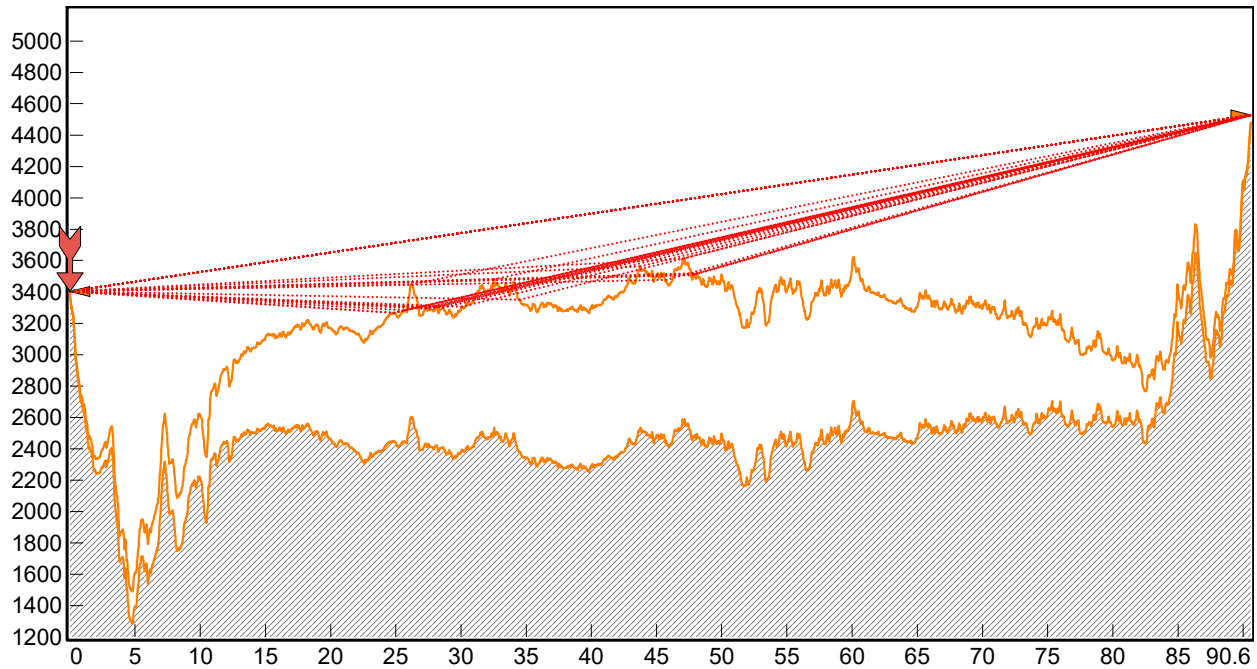


The graph and calculations shown below represent the effect of diffraction of the radio signal from WPJQ308 as it traverses the path toward Moscow Mountain. As shown in the diffraction graph, there are multiple “knife-edge” obstacles along the path that produce signal scattering and reduce the power of the signal at the Moscow Mountain end.

However, the multiple obstructions only reduce the received signal power at Moscow Mountain by about 9 dB, which is not enough to prevent them from causing significant interference to the desired MFD signal at the Moscow Mountain receiver.

Diffraction algorithm	Pathloss
Multiple knife edge method	Deygout
Maximum number of obstacles	2
Obstacle radius method	Major obstacle only
Foreground loss method	Scaled height-gain

	WPJQ308	Moscow Mountain
Elevation (ft)	3389.55	4478.59
Antenna height (ft)	13.10	50.00
Effective antenna height (ft)	1324.02	1455.31
Distance (mi)		90.56
Frequency (MHz)		151.13
Earth radius factor K		1.33
Polarization		Vertical
Tree type		Dry bare trees
Ground type		Average



1 - Near single knife edge

Location (mi)	24.82
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	56.55
V	-0.80
Radius (mi)	4.81
Loss (dB)	0.21

2 - Near single knife edge

Location (mi)	24.90
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	56.37
V	-0.80
Radius (mi)	1.22
Loss (dB)	0.11

3 - Near single knife edge

Location (mi)	25.71
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	55.18
V	-0.78
Radius (mi)	6.56
Loss (dB)	0.33

4 - Near single knife edge

Location (mi)	26.22
Left side (mi)	0.00
Right side (mi)	90.56

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho – APPENDIX 2**

January 25, 2021

Clearance (ft)	0.00
Clearance /F1 (%)	34.86
V	-0.49
Radius (mi)	3.17
Loss (dB)	2.01
5 - Near single knife edge	
Location (mi)	27.31
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	54.69
V	-0.77
Radius (mi)	1.24
Loss (dB)	0.24
6 - Near single knife edge	
Location (mi)	27.49
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	54.54
V	-0.77
Radius (mi)	0.29
Loss (dB)	0.19
7 - Near single knife edge	
Location (mi)	27.60
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	56.02
V	-0.79
Radius (mi)	0.85
Loss (dB)	0.11
8 - Near single knife edge	
Location (mi)	28.08
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	54.95
V	-0.78
Radius (mi)	2.24
Loss (dB)	0.26
9 - Near single knife edge	
Location (mi)	28.62
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	55.99
V	-0.79
Radius (mi)	0.64
Loss (dB)	0.10
10 - Near single knife edge	
Location (mi)	30.06
Left side (mi)	0.00
Right side (mi)	90.56

**System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho – APPENDIX 2**

January 25, 2021

Clearance (ft)	0.00
Clearance /F1 (%)	56.53
V	-0.80
Radius (mi)	0.36
Loss (dB)	0.02
11 - Near single knife edge	
Location (mi)	32.54
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	38.50
V	-0.54
Radius (mi)	73.93
Loss (dB)	1.70
12 - Near single knife edge	
Location (mi)	34.51
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	56.20
V	-0.79
Radius (mi)	0.91
Loss (dB)	0.09
13 - Near single knife edge	
Location (mi)	43.76
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	43.60
V	-0.62
Radius (mi)	46.44
Loss (dB)	1.22
14 - Near single knife edge	
Location (mi)	45.73
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	55.91
V	-0.79
Radius (mi)	0.20
Loss (dB)	0.05
15 - Near single knife edge	
Location (mi)	47.01
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	42.55
V	-0.60
Radius (mi)	11.05
Loss (dB)	1.30
16 - Near single knife edge	
Location (mi)	47.81
Left side (mi)	0.00
Right side (mi)	90.56

Clearance (ft)	0.00
Clearance /F1 (%)	55.61
V	-0.79
Radius (mi)	0.48
Loss (dB)	0.11
17 - Near single knife edge	
Location (mi)	47.95
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	55.07
V	-0.78
Radius (mi)	0.43
Loss (dB)	0.15
18 - Near single knife edge	
Location (mi)	48.10
Left side (mi)	0.00
Right side (mi)	90.56
Clearance (ft)	0.00
Clearance /F1 (%)	54.63
V	-0.77
Radius (mi)	0.30
Loss (dB)	0.17
Diffraction loss	8.39
Tree - building loss (dB)	0.00
Free space loss (dB)	119.33
Atmospheric absorption loss (dB)	0.08
Total loss (dB)	127.79

The table below shows the system assumptions and calculated path characteristics for the 90.6 mile path between WPJQ308 and Moscow Mountain. As shown highlighted in yellow in the table, the predicted receive signal power at the Moscow Mountain receiver is slightly higher than -75 dBm. This is a strong enough signal to cause significant degradation of the performance of the receiver at Moscow Mountain when it is present at the same time as desired signals from MFD mobile and portable radios.

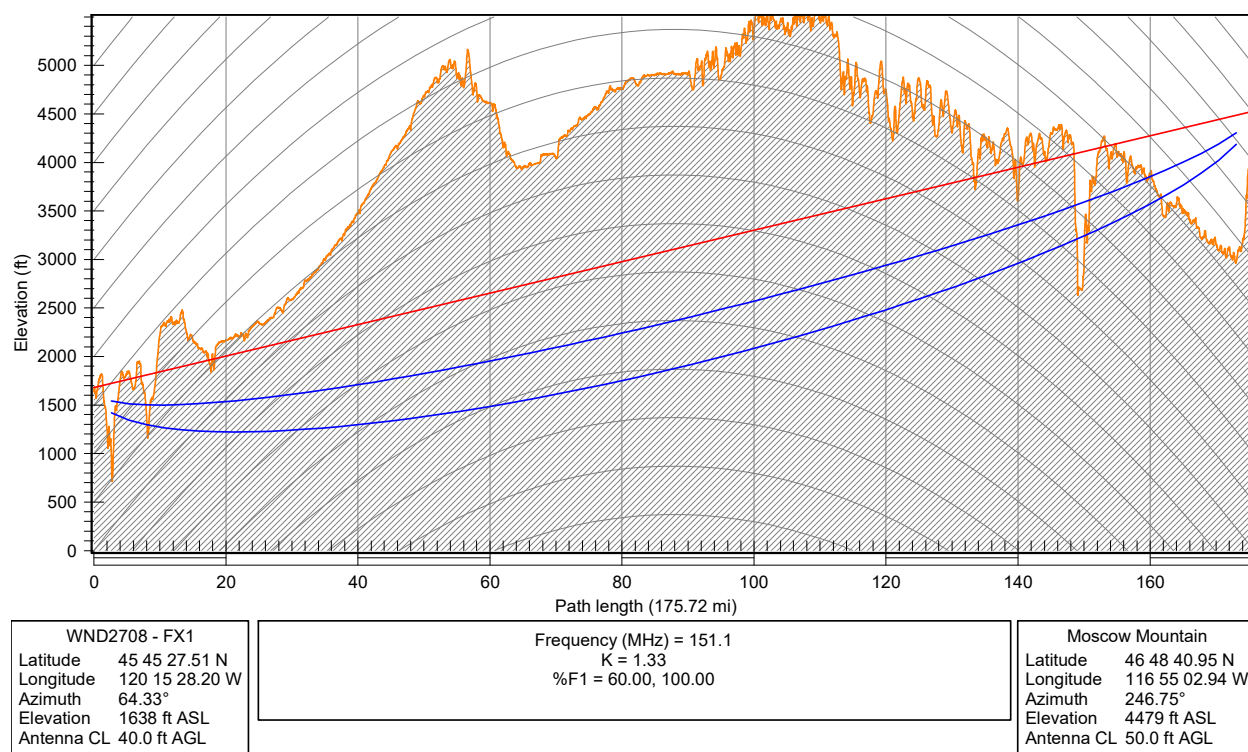
System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho – APPENDIX 2

January 25, 2021

	WPJQ308	Moscow Mountain
Latitude	47 53 11.58 N	46 48 40.95 N
Longitude	118 01 15.47 W	116 55 02.94 W
True azimuth (°)	144.70	325.51
Vertical angle (°)	-0.36	-0.63
Elevation (ft)	3389.55	4478.59
Tower height (ft)		140.00
Tower type	self-supporting	self-supporting
Antenna model	SRL 210 L/2 (TX)	SRL 210 L/2 (RX)
Antenna file name	210c101m	210c101m
Antenna gain (dBd)	2.00	2.00
Antenna height (ft)	13.10	50.00
Orientation loss (dB)	3.77	3.80
Frequency (MHz)	151.13	
Polarization	Vertical	
Path length (mi)	90.57	
Free space loss (dB)	119.33	
Atmospheric absorption loss (dB)	0.08	
Net path loss (dB)		118.68
TX power (dBm)	43.80	
ERP (dBm)	45.80	
ERP (watts)	38.02	
RX threshold level (dBm)		-116.00
RX threshold level (μv)		0.35
Receive signal (dBm)		-74.88
Receive signal (μv)		40.32
Receive field strength (μv/m)	190.46	
Thermal fade margin (dB)		41.12
Annual location availability (%)		100.00000
Annual location unavailability (min)		0.00
Annual multipath availability (%)		99.99227
Annual multipath unavailability (min)		40.61

WND2708, Klickitat, Klickitat County, WA

The path profile between the WND2708 site and Moscow Mountain is shown below. The two curved lines shown in the profile represent the 60% and 100% First Fresnel Clearance zones. Any obstructions within these zones will have the effect of reducing the signal from WND2708 at the Moscow Mountain receiver site. The curvature of the horizontal grid lines in the path profile represents the effective curvature of the earth at 151.1300 MHz. As shown in the profile graph, this path is significantly obstructed by terrain and the effects of earth curvature.



The graph and calculations shown below represent the effect of diffraction of the radio signal from WPKL682 as it traverses the path toward Moscow Mountain. As shown in the diffraction graph, the terrain obstructions and earth curvature effects shown in the profile graph above produce significant signal attenuation and substantially reduce the power of the signal at the Moscow Mountain end.

The total diffraction loss along this path is on the order of 54 dB, which results in a significant reduction in the interfering signal power at Moscow Mountain from this station.

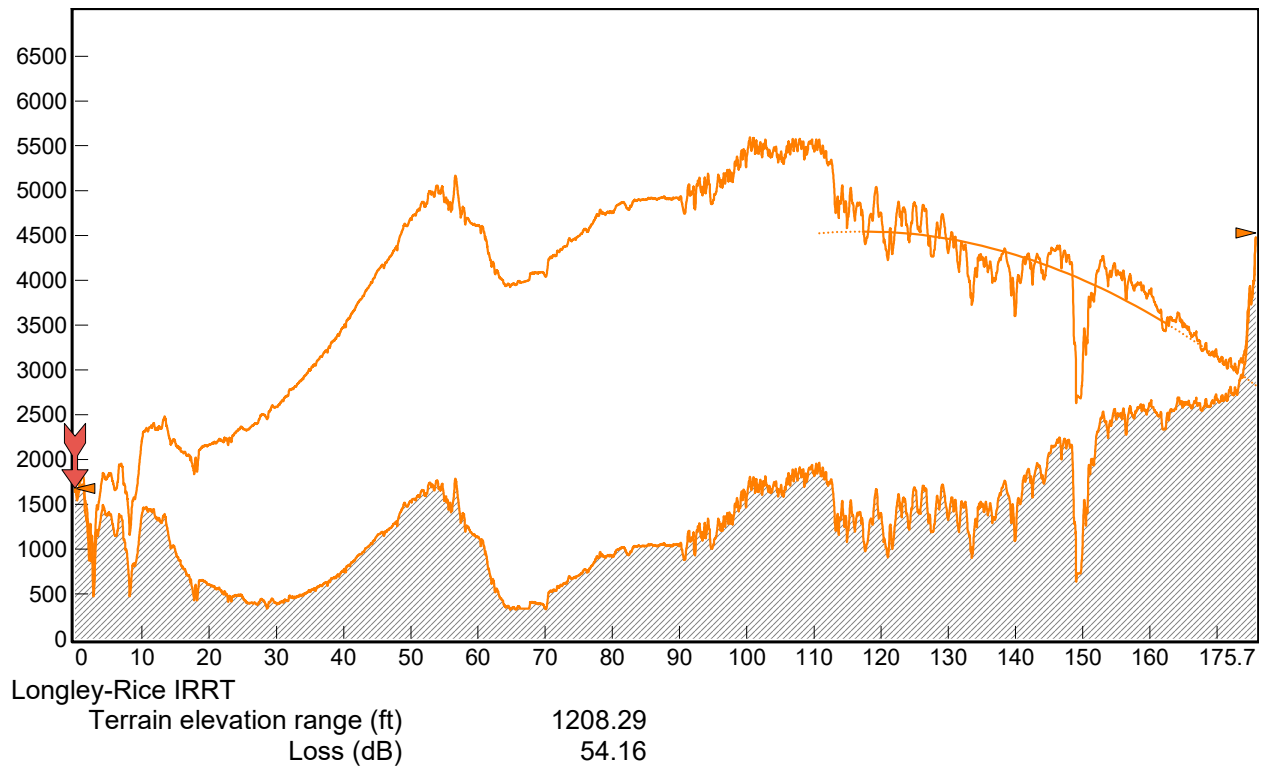
System Alternatives Report – Radio Systems Upgrade Project

City of Moscow, Idaho – APPENDIX 2

January 25, 2021

Diffraction algorithm Pathloss
Multiple knife edge method Deygout
Maximum number of obstacles 2
Obstacle radius method Major obstacle only
Foreground loss method Scaled height-gain

	WND2708 - FX1	Moscow Mountain
Elevation (ft)	1637.91	4478.59
Antenna height (ft)	40.00	50.00
Effective antenna height (ft)	40.00	1702.92
Horizon distance (mi)	0.06	64.93
Horizon elevation (ft)	1681.28	1962.84
Horizon angle (°)	0.57	-0.78
Distance (mi)		175.72
Frequency (MHz)		151.13
Earth radius factor K		1.33
Polarization		Vertical
Tree type		Dry bare trees
Ground type		Average



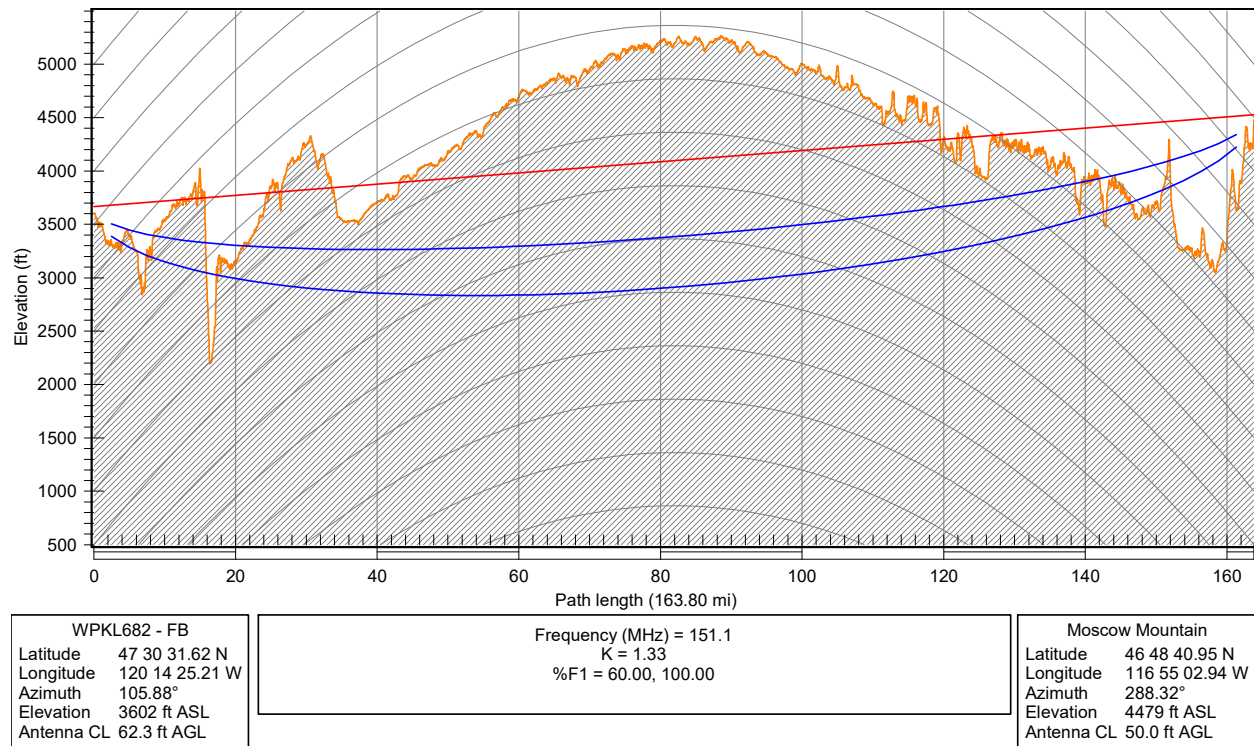
Diffraction loss	54.16
Tree - building loss (dB)	0.00
Troposcatter loss (dB)	57.68
Combined loss (dB)	52.56
Free space loss (dB)	125.08
Atmospheric absorption loss (dB)	0.16
Total loss (dB)	177.80

The table below shows the system assumptions and calculated path characteristics for the 175.7 mile path between WND2708 and Moscow Mountain. A shown highlighted in yellow in the table, the predicted receive signal power at the Moscow Mountain receiver is slightly higher than -120.5 dBm. This is below the minimum signal threshold for the MFD repeater receiver, but it still a high enough signal power level to increase the noise floor at the receiver and to cause at least some degradation of weak or marginal MFD signals at the Moscow Mountain receiver when it is present at the same time as desired signals from MFD mobile and portable radios.

	WND2708 - FX1	Moscow Mountain
Latitude	45 45 27.51 N	46 48 40.95 N
Longitude	120 15 28.20 W	116 55 02.94 W
True azimuth (°)	64.33	246.75
Vertical angle (°)	0.57	-0.78
Elevation (ft)	1637.91	4478.59
Tower height (ft)		140.00
Tower type		self-supporting
Antenna model	SRL 210-C2 L/2 (TX)	SRL 210-C2 L/2 (RX)
Antenna file name	210c201h	210c201h
Antenna gain (dBd)	5.00	5.00
Antenna height (ft)	40.00	50.00
Orientation loss (dB)	1.40	1.40
Frequency (MHz)	151.13	
Polarization	Vertical	
Path length (mi)	175.73	
Free space loss (dB)	125.08	
Atmospheric absorption loss (dB)	0.16	
Diffraction loss	54.16	
Net path loss (dB)		167.90
TX power (dBm)	47.43	
ERP (dBm)	52.43	
ERP (watts)	174.98	
RX threshold level (dBm)		-116.00
RX threshold level (μv)		0.35
Receive signal (dBm)		-120.47
Receive signal (μv)		0.21
Receive field strength (μv/m)	0.54	
Thermal fade margin (dB)		-4.47

WPKL682 - East Wenatchee, Douglas County, Washington.

The path profile between the WPKL682 site and Moscow Mountain is shown below. The two curved lines shown in the profile represent the 60% and 100% First Fresnel Clearance zones. Any obstructions within these zones will have the effect of reducing the signal from WPKL682 at the Moscow Mountain receiver site. The curvature of the horizontal grid lines in the path profile represents the effective curvature of the earth at 151.1300 MHz. As shown in the profile graph, this path is significantly obstructed by terrain and the effects of earth curvature.



The graph and calculations shown below represent the effect of diffraction of the radio signal from WPKL682 as it traverses the path toward Moscow Mountain. As shown in the diffraction graph, the terrain obstructions and earth curvature effects shown in the profile graph above produce significant signal attenuation and substantially reduce the power of the signal at the Moscow Mountain end.

The total diffraction loss along this path is on the order of 37 dB, which results in a significant reduction in the interfering signal power at Moscow Mountain from this station, though not enough reduction to eliminate the potential for interference the desired MFD signals at the MFD receiver at Moscow Mountain.

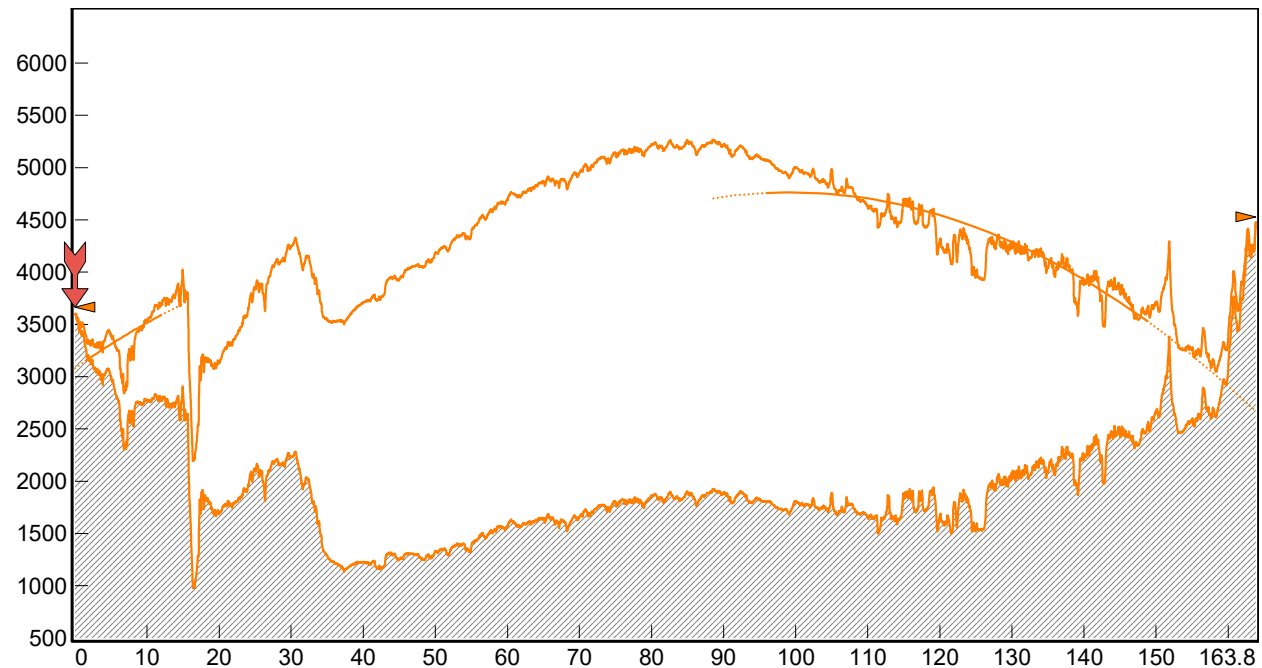
System Alternatives Report – Radio Systems Upgrade Project

City of Moscow, Idaho – APPENDIX 2

January 25, 2021

Diffraction algorithm Pathloss
Multiple knife edge method Deygout
Maximum number of obstacles 2
Obstacle radius method Major obstacle only
Foreground loss method Scaled height-gain

	WPKL682 - FB	Moscow Mountain
Elevation (ft)	3602.46	4478.59
Antenna height (ft)	62.30	50.00
Effective antenna height (ft)	584.82	1857.85
Horizon distance (mi)	14.96	75.24
Horizon elevation (ft)	2907.76	1928.30
Horizon angle (°)	-0.63	-0.78
Distance (mi)		163.80
Frequency (MHz)		151.13
Earth radius factor K		1.33
Polarization		Vertical
Tree type		Dry bare trees
Ground type		Average



Longley-Rice IRRT

Terrain elevation range (ft)	1609.40
Loss (dB)	36.63

Diffraction loss	36.63
Tree - building loss (dB)	0.00
Troposcatter loss (dB)	35.78
Combined loss (dB)	33.17
Free space loss (dB)	124.47
Atmospheric absorption loss (dB)	0.15
Total loss (dB)	157.79

The table below shows the system assumptions and calculated path characteristics for the 163.8. mile path between WPKL682 and Moscow Mountain. A shown highlighted in yellow in the table, the predicted receive signal power at the Moscow Mountain receiver is slightly higher than -110.8 dBm. This a high enough signal power level to cause degradation of weak or marginal MFD signals at the Moscow Mountain receiver when it is present at the same time as desired signals from MFD mobile and portable radios.

System Alternatives Report – Radio Systems Upgrade Project
City of Moscow, Idaho – APPENDIX 2

January 25, 2021

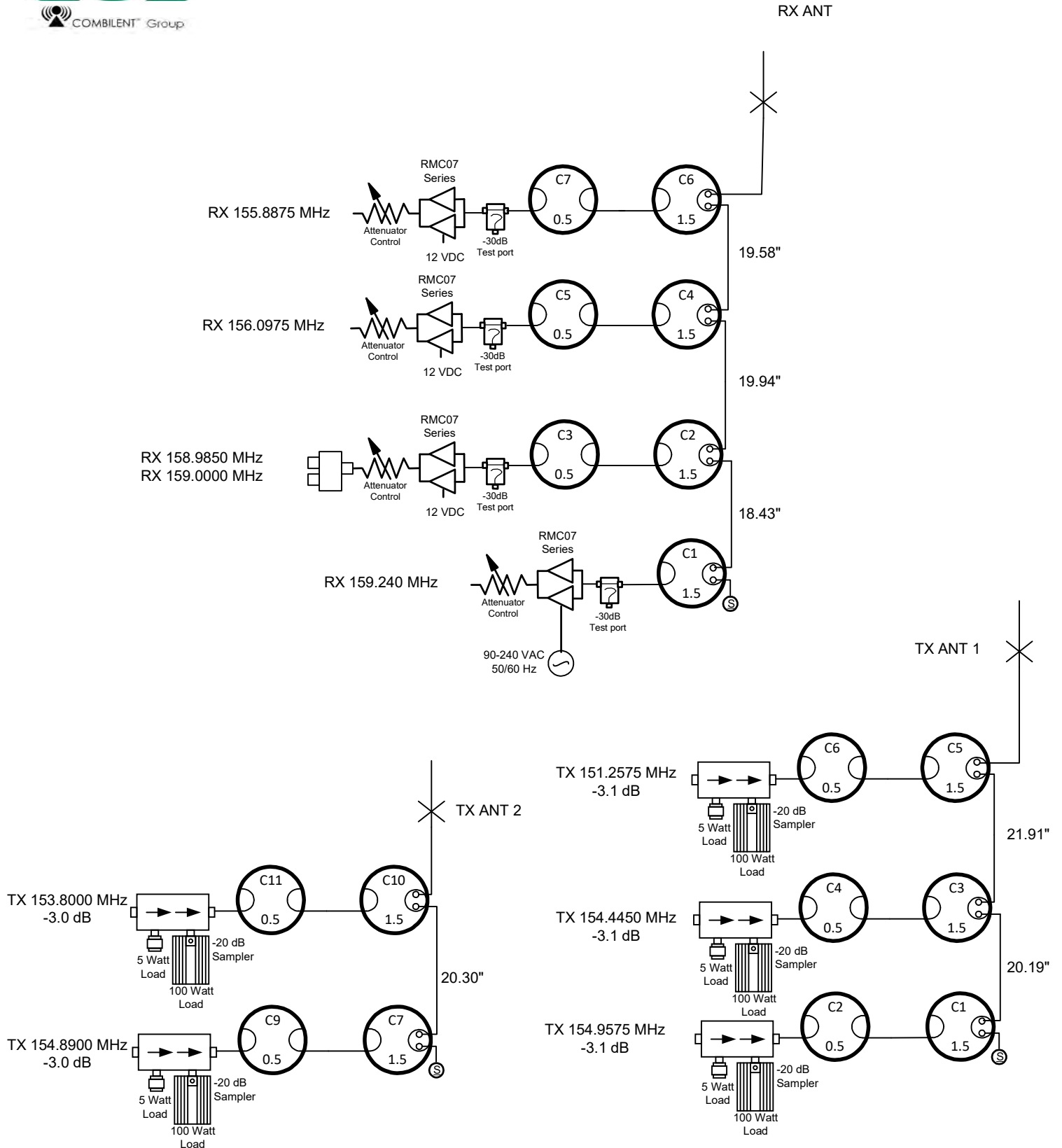
	WPKL682 - FB	Moscow Mountain
Latitude	47 30 31.62 N	46 48 40.95 N
Longitude	120 14 25.21 W	116 55 02.94 W
True azimuth (°)	105.88	288.32
Vertical angle (°)	-0.63	-0.78
Elevation (ft)	3602.46	4478.59
Tower height (ft)		140.00
Tower type		self-supporting
Antenna model	SRL210-C1 L/4 (TX)	SRL210-C1 L/4 (RX)
Antenna file name	210c102l	210c102l
Antenna gain (dBd)	2.50	2.50
Antenna height (ft)	62.30	50.00
Orientation loss (dB)	0.27	0.24
Frequency (MHz)	151.13	
Polarization	Vertical	
Path length (mi)	163.82	
Free space loss (dB)	124.47	
Atmospheric absorption loss (dB)	0.15	
Diffraction loss	36.63	
Net path loss (dB)		152.47
TX power (dBm)	41.65	12 dB SINAD -116.00 0.35
ERP (dBm)	44.15	
ERP (watts)	26.00	
RX threshold criteria		
RX threshold level (dBm)		
RX threshold level (μv)		
Receive signal (dBm)		-110.82
Receive signal (μv)		0.64
Receive field strength (μv/m)	1.91	
Thermal fade margin (dB)		5.18
Annual location availability (%)		90.25543
Annual location unavailability (min)		51217.46
Annual multipath availability (%)		73.85683
Annual multipath unavailability (min)		137408.49

APPENDIX 3 – VHF TRANSMITTER COMBINER AND RECEIVER MULTICOUPLER SYSTEMS



74-37-20259-E CUSTOM VHF TX/RX T-PASS COMBINER CITY OF MOSCOW

25 NOV 20
SG
TK34671





Intermod Study Report

Transmit Frequencies

Name	Freq.	Antenna	Bw	Exclude
	153.80000	TX	12.50	
	154.89000	TX	12.50	
	154.44500	TX	12.50	
	151.25750	TX	12.50	
	154.95750	TX	12.50	

Receive Frequencies

Name	Freq.	Antenna	Bw	Exclude
	156.09750	RX	12.50	
	159.00000	RX	12.50	
	158.98500	RX	12.50	
	159.24000	RX	12.50	
	155.88750	RX	12.50	

System Wide Intermod Results Including External TX & External RX

Q*F (0) - No hits for this equation set

F1+F2+F3 (0) - No hits for this equation set

F1+F2-F3 (0) - No hits for this equation set

Q1*F1+Q2*F2 (0) - No hits for this equation set

Q1*F1-Q2*F2 (1)

Q1	F1	Q2	F2	IM	RX	RX-IM	Window
5	154.89000	-4	153.80000	159.25000	159.24000	0.01000	0.01250



TXRX Systems Inc.
8625 Industrial Parkway
Angola, NY 14006-9692 USA

Phone: **716-549-4700**
Fax: **716-549-4772**
www.txrx.com

Quotation

By signing, you are accepting all terms and conditions stipulated in this quotation.		QUOTATION NO. 00148411	DATE QUOTED 12/02/20	
		VALID UNTIL 03/02/21	RFQ NO.	
SIGNATURE _____ DATE _____		QUOTED BY Scott Galligan sgalligan@txrx.com		ORDSRC 01
		SHIPPED VIA Ground		INCOTERMS 2010 FOB Origin
		PAYMENT TERMS Credit Card		P/C PPA TAX CODE WA

QUOTED TO	01*16534 HATFIELD & DAWSON ATTN: TOM ECKELS 9500 GREENWOOD AVE SEATTLE , WA 98103 USA	SHIP TO	01*16534 HATFIELD & DAWSON ATTN: TOM ECKELS 9500 GREENWOOD AVE SEATTLE , WA 98103 USA
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LINE	TOTAL QTY	ITEM NUMBER DESCRIPTION	QTY	LIST PRICE	NET PRICE	EXT PRICE
001	3	74-37-20259-E MULTCPLR TXRX 144-174MHz RACK MT Config Rev: 119112.0 APPROXIMATE LEAD TIME 4-6 WEEKS SHIPPING NOT INCLUDED IN QUOTE	3	29550.00	20685.00	62055.00
* TXRX Systems, Inc. Terms and Conditions are located at http://txrx.com/services/customer-service/terms-and-conditions-of-sale						

Ackn Contact: TOM ECKELS 206-783-9151

SUBTOTAL 62055.00

TAX 6267.56

TOTAL USD U.S.A. DOLLARS	68322.56
-------------------------------------	-----------------

CONFIDENTIAL QUOTE: This quotation contains product and/or price information that is considered confidential to the named recipient, TXRX Systems Inc. THIS QUOTE IS NON-TRANSFERABLE TO ANY OTHER PARTY.

Custom/Special Products carry our standard warranty, but are non-returnable and non-cancellable. If you have any questions concerning this quote, please contact the sales person indicated above.

165 of 358

APPENDIX 4 – REGION 12 700 MHz CHANNEL LIST FOR LATAH COUNTY

City of Moscow Radio Systems Upgrade Project

Appendix 4

REGION 12 700 MHz CHANNEL LIST FOR LATAH COUNTY

Region 12 - Idaho - Latah County

Population: 37,244 representing 2.376% of Region

Show by: 6.25KHz 12.5KHz 25.0KHz

Geocoordinates : 47-07-31N 117-00-01W [Edit](#)

Class	Bandwidth	Channel	Base Frequency	Mobile Frequency	Notation	Call Sign
General Use	Voice 12.5KHz	17-18	769.10625	799.10625	Adjacent - Ruby Mtn / Spokane RHQ, WA	
General Use	Voice 12.5KHz	47-48	769.29375	799.29375		
General Use	Voice 12.5KHz	91-92	769.56875	799.56875		
General Use	Voice 12.5KHz	137-138	769.85625	799.85625		
General Use	Voice 12.5KHz	249-250	770.55625	800.55625		
General Use	Voice 12.5KHz	285-286	770.78125	800.78125	Adjacent - Puffer Butte, WA	
General Use	Voice 12.5KHz	333-334	771.08125	801.08125	Co Channel - Mt Spokane, WA / Adjacent - Freeburn, WA	
General Use	Voice 12.5KHz	365-366	771.28125	801.28125		
General Use	Voice 12.5KHz	393-394	771.45625	801.45625		
General Use	Voice 12.5KHz	423-424	771.64375	801.64375	Co Channel - Mt Spokane, WA	
General Use	Voice 12.5KHz	463-464	771.89375	801.89375		
General Use	Voice 12.5KHz	487-488	772.04375	802.04375		
General Use	Voice 12.5KHz	515-516	772.21875	802.21875	Adjacent - Mica Pk, WA	
General Use	Voice 12.5KHz	549-550	772.43125	802.43125	Co Channel - Mt Spokane, WA	
General Use	Voice 12.5KHz	575-576	772.59375	802.59375	Adjacent - Magnison Butte, WA	
General Use	Voice 12.5KHz	601-602	772.75625	802.75625		
General Use	Voice 12.5KHz	625-626	772.90625	802.90625		
General Use	Voice 12.5KHz	663-664	773.14375	803.14375		
General Use	Voice 12.5KHz	703-704	773.39375	803.39375	Co Channel - Colville Mtn, WA	
General Use	Voice 12.5KHz	745-746	773.65625	803.65625	Adjacent - Flagstaff Mtn, WA	
General Use	Voice 12.5KHz	785-786	773.90625	803.90625		
General Use	Voice 12.5KHz	837-838	774.23125	804.23125		
General Use	Voice 12.5KHz	863-864	774.39375	804.39375	Adjacent - Ridpath / Ruby Mtn, WA	
General Use	Voice 12.5KHz	911-912	774.69375	804.69375		
General Use	Voice 12.5KHz	941-942	774.88125	804.88125		
State License	Voice 25KHz	229-232	770.4375	800.4375		
State License	Voice 25KHz	649-652	773.0625	803.0625		
State License	Voice 25KHz	729-732	773.5625	803.5625	Moscow Mtn (ISP) - WPTZ800	
State License	Voice 25KHz	809-812	774.0625	804.0625		
State License	Voice 25KHz	889-892	774.5625	804.5625		

APPENDIX 5 – MICROWAVE SYSTEM PATH PROFILES AND RELIABILITY CALCULATIONS

Preliminary Path Calculations

Customer: Hatfield &
Dawson/City of Moscow, ID

Project: Five links of
Eclipse/ODU600v2 11 & 23
GHz

MSO: NA201106-57616

Release 2.0
12/11/2020

Issue Releases

Issue Number	Issue Release Date	Changes	Prepared by:
1.0	11/10/2020	Initial Release	M. Martinez
2.0	12/11/2020	Added links from Theophilus Tower to NW Water Tank & Vista Water Tank	M. Martinez



Table of Contents

System Map 2

Link Summary..... 3

Path Profiles & Calculations 4

 1- Whitcom-Moscow Mountain Link 4

 2- KUID-TV (Paradise Ridge)-Moscow Mountain Link 7

 3- Theophilus Tower-KUID-TV (Paradise Ridge) Link 10

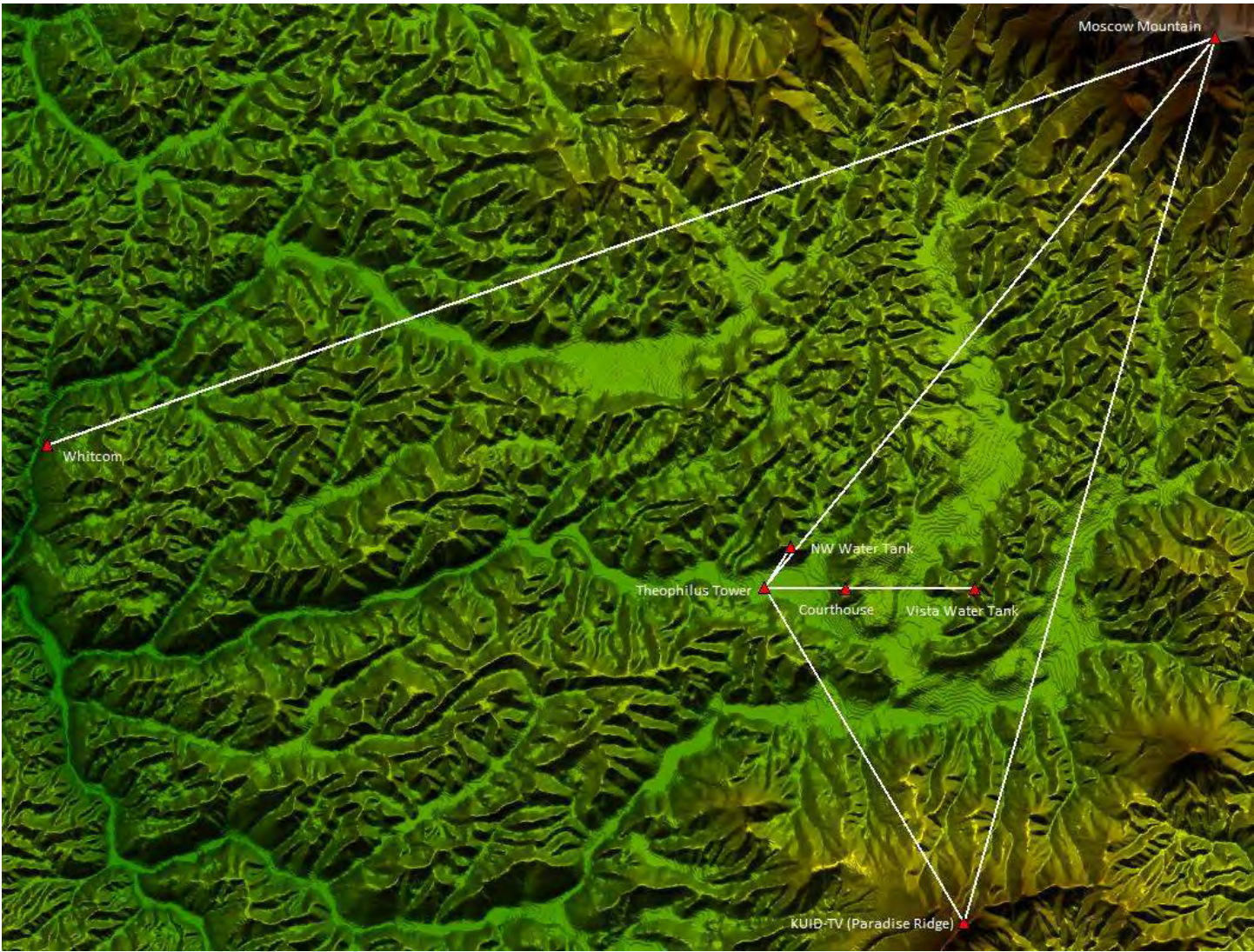
 4- Theophilus Tower-Courthouse Link..... 13

 5- Theophilus Tower-Moscow Mountain Link 16

 6- Vista Water Tank-Theophilus Tower Link..... 19

 7- Theophilus Tower-NW Water Tank link 22

System Map



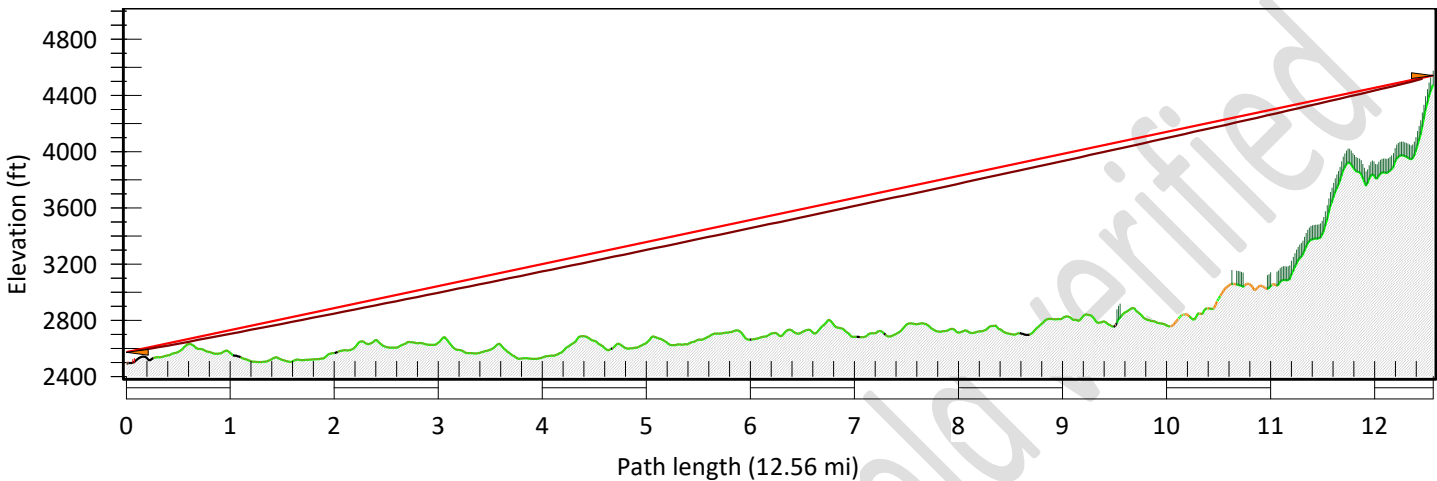
Link Summary

Link	Site names	Main Antenna Model	Main Antenna Height (ft)	Radio Model	Configuration	Modulation - Throughput (Mbps)	Path length (mi)	Fade margin (dB)	Annual Two Way Availability (%)
1	Whitcom	SB 4 - W100E	85	ODU600v2/11 GHz/30	1+1	256QAM - 180 Mbps	12.57	28.11	99.99942
	Moscow Mountain	SB 4 - W100E	65	MHz/High Power/ACM					
2	KUID-TV (Paradise Ridge)	SC 3 - W100B	85	ODU600v2/11 GHz/30	1+0	256QAM - 180 Mbps	9.32	30.27	99.99984
	Moscow Mountain	SC 3 - W100B	80	MHz/High Power/ACM					
3	Theophilus Tower	SC 3 - W100B	140	ODU600v2/11 GHz/30	1+0	256QAM - 180 Mbps	3.96	34.84	99.99999
	KUID-TV (Paradise Ridge)	SC 3 - W100B	75	MHz/Std. Power/ACM					
4	Theophilus Tower	SC 2 - 220C	140	ODU600v2/23 GHz/30	1+1	256QAM - 180 Mbps	0.82	35.22	99.99999
	Courthouse	SC 2 - 220C	50	MHz/Std. Power/ACM					
5	Theophilus Tower	SC 3 - W100B	140	ODU600v2/11 GHz/30	1+0	256QAM - 180 Mbps	7.22	32.55	99.99995
	Moscow Mountain	SC 3 - W100B	70	MHz/High Power/ACM					
6	Vista Water Tank	SC 2 - 220C	50	ODU600v2/23 GHz/30	1+1	256QAM - 180 Mbps	2.14	29.51	99.99989
	Theophilus Tower	SC 2 - 220C	140	MHz/High Power/ACM					
7	Theophilus Tower	SC 1 - 220A	140	ODU600v2/23 GHz/30	1+1	256QAM - 180 Mbps	0.49	29.59	99.99990
	NW Water Tank	SC 1 - 220A	50	MHz/Std. Power/ACM					



Path Profiles & Calculations

1- Whitcom-Moscow Mountain Link



Whitcom	
Latitude	46 45 05.96 N
Longitude	117 10 03.00 W
Azimuth	70.74°
Elevation	2486 ft ASL
Antenna CL	85.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

Moscow Mountain	
Latitude	46 48 40.95 N
Longitude	116 55 02.94 W
Azimuth	250.92°
Elevation	4474 ft ASL
Antenna CL	65.0 ft AGL

	Whitcom	Moscow Mountain
Latitude	46 45 05.96 N	46 48 40.95 N
Longitude	117 10 03.00 W	116 55 02.94 W
True azimuth (°)	70.74	250.92
Vertical angle (°)	1.63	-1.77
Elevation (ft)	2486.44	4474.44
Tower height (ft)	100.00	140.00
Tower type	self supporting	self supporting
Antenna model	SB 4 - W100E (TR)	SB 4 - W100E (TR)
Antenna gain (dBi)	40.10	40.10
Antenna height (ft)	85.00	65.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	1.60	1.60
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	12.57	
Free space loss (dB)	139.57	
Atmospheric absorption loss (dB)	0.32	
Net path loss (dB)	66.89	66.89
Configuration	1+1	1+1
Radio model	E6v2hp11_30M ACM_R70	E6v2hp11_30M ACM_R70
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	140.00	
C factor	0.13	
Average annual temperature (°F)	45.99	
Fade occurrence factor (Po)	7.288E-003	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

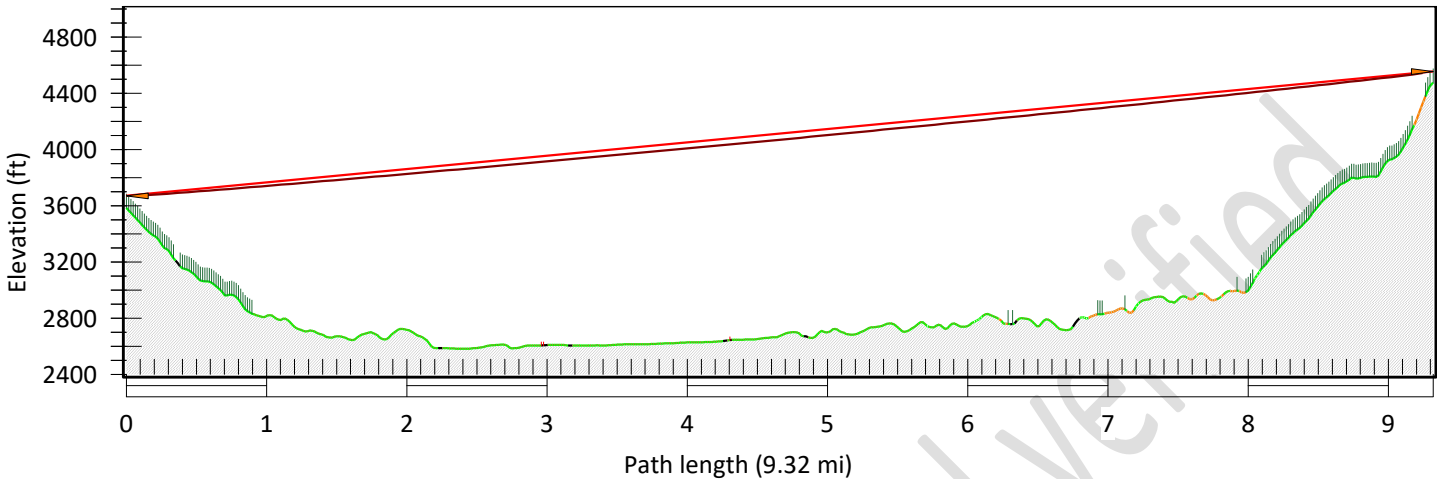
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	29.50	29.50	-65.50	-65.50	66.00	66.00	-37.39	-37.39	28.11	28.11	28.11	28.11
128QAM 155 Mbps	29.50	29.50	-69.00	-69.00	66.00	66.00	-37.39	-37.39	31.61	31.61	31.61	31.61
64QAM 132 Mbps	29.50	29.50	-71.50	-71.50	66.00	66.00	-37.39	-37.39	34.11	34.11	34.11	34.11
32QAM 109 Mbps	29.50	29.50	-74.00	-74.00	66.00	66.00	-37.39	-37.39	36.61	36.61	36.61	36.61
16QAM 90 Mbps	29.50	29.50	-77.00	-77.00	66.00	66.00	-37.39	-37.39	39.61	39.61	39.61	39.61
QPSK 39 Mbps	29.50	29.50	-90.00	-90.00	66.00	66.00	-37.39	-37.39	52.61	52.61	52.61	52.61

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9989	99.9989	99.9997	99.9997	99.9999	99.9999	99.9994	99.9994
128QAM 155 Mbps	99.9995	99.9995	99.9999	99.9999	99.9999	99.9999	99.9997	0.0003
64QAM 132 Mbps	99.9997	99.9997	99.9999	99.9999	99.9999	99.9999	99.9998	0.0001
32QAM 109 Mbps	99.9998	99.9998	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



2- KUID-TV (Paradise Ridge)-Moscow Mountain Link



KUID-TV (Paradise Ridge)	
Latitude	46 40 54.00 N
Longitude	116 58 17.00 W
Azimuth	15.92°
Elevation	3583 ft ASL
Antenna CL	85.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

Moscow Mountain	
Latitude	46 48 40.95 N
Longitude	116 55 02.94 W
Azimuth	195.96°
Elevation	4474 ft ASL
Antenna CL	80.0 ft AGL

	KUID-TV (Paradise Ridge)	Moscow Mountain
Latitude	46 40 54.00 N	46 48 40.95 N
Longitude	116 58 17.00 W	116 55 02.94 W
True azimuth (°)	15.92	195.96
Vertical angle (°)	0.98	-1.08
Elevation (ft)	3583.48	4474.44
Tower height (ft)	330.00	140.00
Tower type	self supporting	self supporting
Antenna model	SC 3 - W100B (TR)	SC 3 - W100B (TR)
Antenna gain (dBi)	38.60	38.60
Antenna height (ft)	85.00	80.00
Miscellaneous loss (dB)	2.00	2.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	9.32	
Free space loss (dB)	136.97	
Atmospheric absorption loss (dB)	0.24	
Net path loss (dB)	64.73	64.73
Configuration	1+0	1+0
Radio model	E6v2hp11_30M ACM_R70	E6v2hp11_30M ACM_R70
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	140.00	
C factor	0.13	
Average annual temperature (°F)	45.80	
Fade occurrence factor (Po)	2.973E-003	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

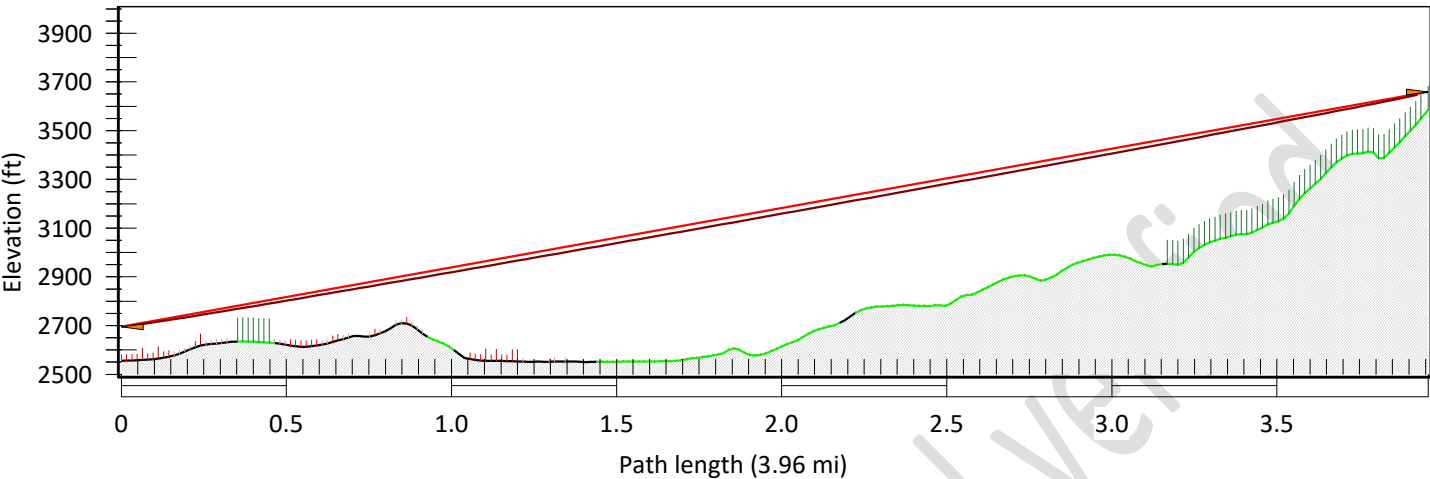
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	29.50	29.50	-65.50	-65.50	66.10	66.10	-35.23	-35.23	30.27	30.27	30.27	30.27
128QAM 155 Mbps	29.50	29.50	-69.00	-69.00	66.10	66.10	-35.23	-35.23	33.77	33.77	33.77	33.77
64QAM 132 Mbps	29.50	29.50	-71.50	-71.50	66.10	66.10	-35.23	-35.23	36.27	36.27	36.27	36.27
32QAM 109 Mbps	29.50	29.50	-74.00	-74.00	66.10	66.10	-35.23	-35.23	38.77	38.77	38.77	38.77
16QAM 90 Mbps	29.50	29.50	-77.00	-77.00	66.10	66.10	-35.23	-35.23	41.77	41.77	41.77	41.77
QPSK 39 Mbps	29.50	29.50	-90.00	-90.00	66.10	66.10	-35.23	-35.23	54.77	54.77	54.77	54.77

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9997	99.9997	99.9999	99.9999	99.9999	99.9999	99.9998	99.9998
128QAM 155 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001
64QAM 132 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 109 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



3- Theophilus Tower-KUID-TV (Paradise Ridge) Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	149.15°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

KUID-TV (Paradise Ridge)	
Latitude	46 40 54.00 N
Longitude	116 58 17.00 W
Azimuth	329.18°
Elevation	3583 ft ASL
Antenna CL	75.0 ft AGL

	Theophilus Tower	KUID-TV (Paradise Ridge)
Latitude	46 43 51.10 N	46 40 54.00 N
Longitude	117 00 50.70 W	116 58 17.00 W
True azimuth (°)	149.15	329.18
Vertical angle (°)	2.62	-2.66
Elevation (ft)	2554.94	3583.48
Tower height (ft)	130.00	330.00
Tower type	roof mount	self supporting
Antenna model	SC 3 - W100B (TR)	SC 3 - W100B (TR)
Antenna gain (dBi)	38.60	38.60
Antenna height (ft)	140.00	75.00
Miscellaneous loss (dB)	2.00	2.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	3.96	
Free space loss (dB)	129.54	
Atmospheric absorption loss (dB)	0.10	
Net path loss (dB)	57.16	57.16
Configuration	1+0	1+0
Radio model	E6v2sp11_30M ACM_R70	E6v2sp11_30M ACM_R70
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	133.65	
C factor	0.14	
Average annual temperature (°F)	46.25	
Fade occurrence factor (Po)	2.426E-004	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

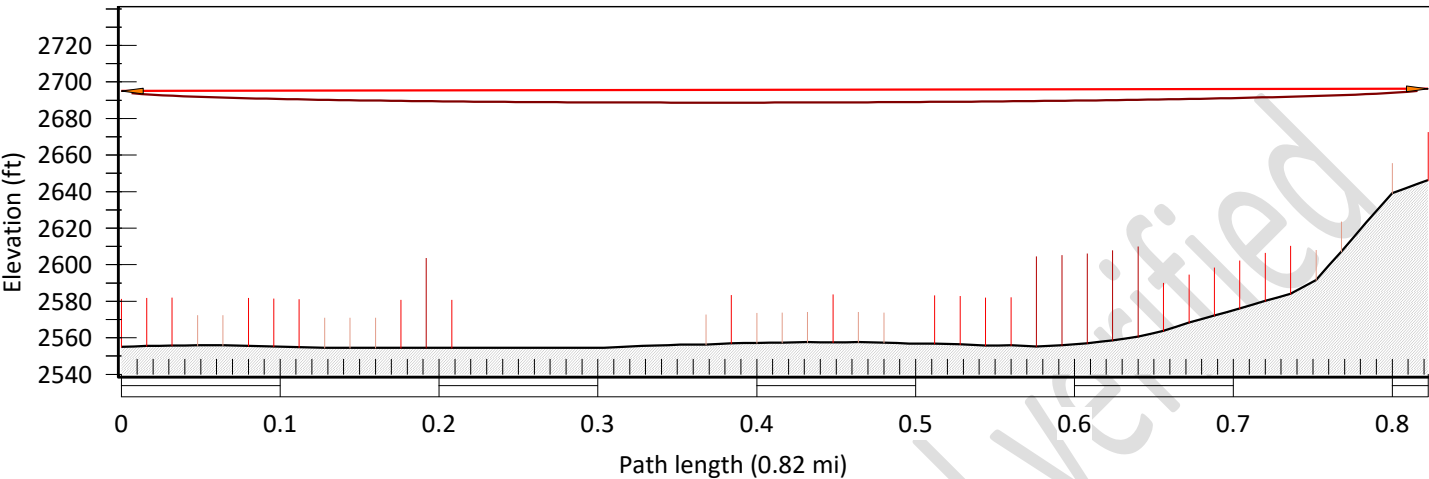
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	26.50	26.50	-65.50	-65.50	63.10	63.10	-30.66	-30.66	34.84	34.84	34.84	34.84
128QAM 155 Mbps	26.50	26.50	-69.00	-69.00	63.10	63.10	-30.66	-30.66	38.34	38.34	38.34	38.34
64QAM 132 Mbps	26.50	26.50	-71.50	-71.50	63.10	63.10	-30.66	-30.66	40.84	40.84	40.84	40.84
32QAM 109 Mbps	26.50	26.50	-74.00	-74.00	63.10	63.10	-30.66	-30.66	43.34	43.34	43.34	43.34
16QAM 90 Mbps	26.50	26.50	-77.00	-77.00	63.10	63.10	-30.66	-30.66	46.34	46.34	46.34	46.34
QPSK 39 Mbps	26.50	26.50	-90.00	-90.00	63.10	63.10	-30.66	-30.66	59.34	59.34	59.34	59.34

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 155 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 132 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 109 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



4- Theophilus Tower-Courthouse Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	91.16°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 22700.0
Main 1 K = 1.330 %F1 = 100.00

Courthouse	
Latitude	46 43 50.23 N
Longitude	116 59 48.37 W
Azimuth	271.17°
Elevation	2646 ft ASL
Antenna CL	50.0 ft AGL

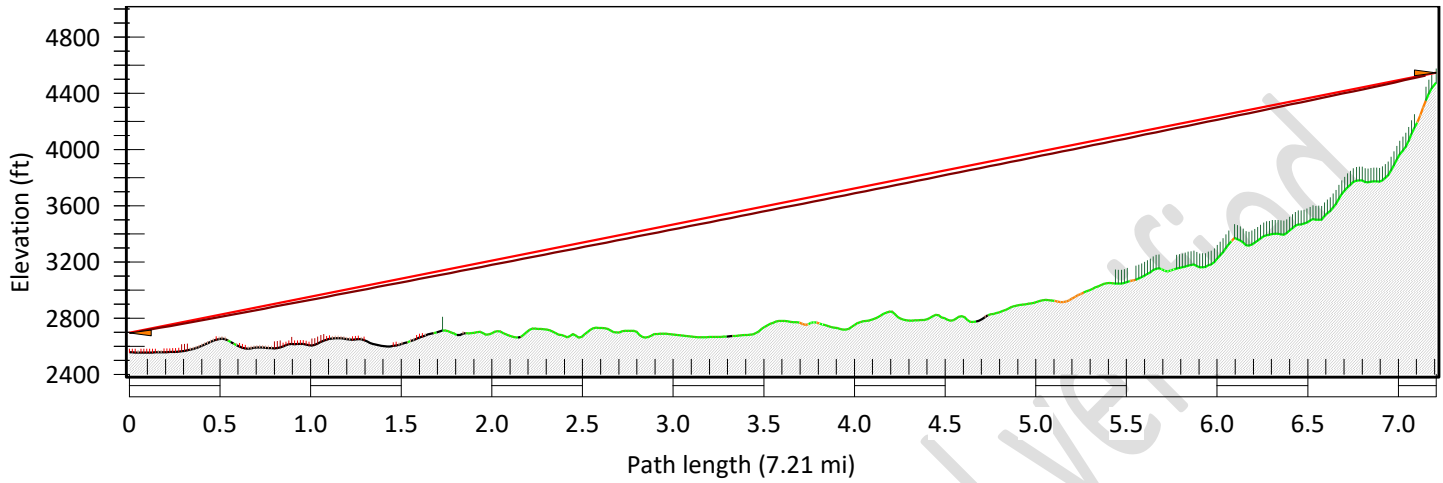
	Theophilus Tower	Courthouse
Latitude	46 43 51.10 N	46 43 50.23 N
Longitude	117 00 50.70 W	116 59 48.37 W
True azimuth (°)	91.16	271.17
Vertical angle (°)	0.01	-0.02
Elevation (ft)	2554.94	2646.17
Tower height (ft)	130.00	40.00
Tower type	roof mount	roof mount
Antenna model	SC 2 - 220C (TR)	SC 2 - 220C (TR)
Antenna gain (dBi)	41.10	41.10
Antenna height (ft)	140.00	50.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	1.60	1.60
Frequency (MHz)	22700.00	
Polarization	Vertical	
Path length (mi)	0.82	
Free space loss (dB)	122.02	
Atmospheric absorption loss (dB)	0.26	
Net path loss (dB)	47.28	47.28
Configuration	1+1	1+1
Radio model	E6v2sp23_30M ACM_R70	E6v2sp23_30M ACM_R70
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	20.00	
C factor	1.65	
Average annual temperature (°F)	46.17	
Fade occurrence factor (Po)	5.198E-005	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	17.50	17.50	-65.00	-65.00	55.00	55.00	-29.78	-29.78	35.22	35.22	35.22	35.22
128QAM 155 Mbps	18.50	18.50	-68.50	-68.50	56.00	56.00	-28.78	-28.78	39.72	39.72	39.72	39.72
64QAM 132 Mbps	18.50	18.50	-71.00	-71.00	56.00	56.00	-28.78	-28.78	42.22	42.22	42.22	42.22
32QAM 109 Mbps	18.50	18.50	-73.50	-73.50	56.00	56.00	-28.78	-28.78	44.72	44.72	44.72	44.72
16QAM 90 Mbps	19.50	19.50	-76.50	-76.50	57.00	57.00	-27.78	-27.78	48.72	48.72	48.72	48.72
QPSK 39 Mbps	20.50	20.50	-89.50	-89.50	58.00	58.00	-26.78	-26.78	62.72	62.72	62.72	62.72

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 155 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 132 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 109 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

5- Theophilus Tower-Moscow Mountain Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	39.47°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

Moscow Mountain	
Latitude	46 48 40.95 N
Longitude	116 55 02.94 W
Azimuth	219.54°
Elevation	4474 ft ASL
Antenna CL	70.0 ft AGL

	Theophilus Tower	Moscow Mountain
Latitude	46 43 51.10 N	46 48 40.95 N
Longitude	117 00 50.70 W	116 55 02.94 W
True azimuth (°)	39.47	219.54
Vertical angle (°)	2.74	-2.82
Elevation (ft)	2554.94	4474.44
Tower height (ft)	130.00	140.00
Tower type	roof mount	self supporting
Antenna model	SC 3 - W100B (TR)	SC 3 - W100B (TR)
Antenna gain (dBi)	38.60	38.60
Antenna height (ft)	140.00	70.00
Miscellaneous loss (dB)	2.00	2.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	7.22	
Free space loss (dB)	134.75	
Atmospheric absorption loss (dB)	0.18	
Net path loss (dB)	62.45	62.45
Configuration	1+0	1+0
Radio model	E6v2hp11_30M ACM_R70	E6v2hp11_30M ACM_R70
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	140.00	
C factor	0.13	
Average annual temperature (°F)	45.79	
Fade occurrence factor (Po)	1.380E-003	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

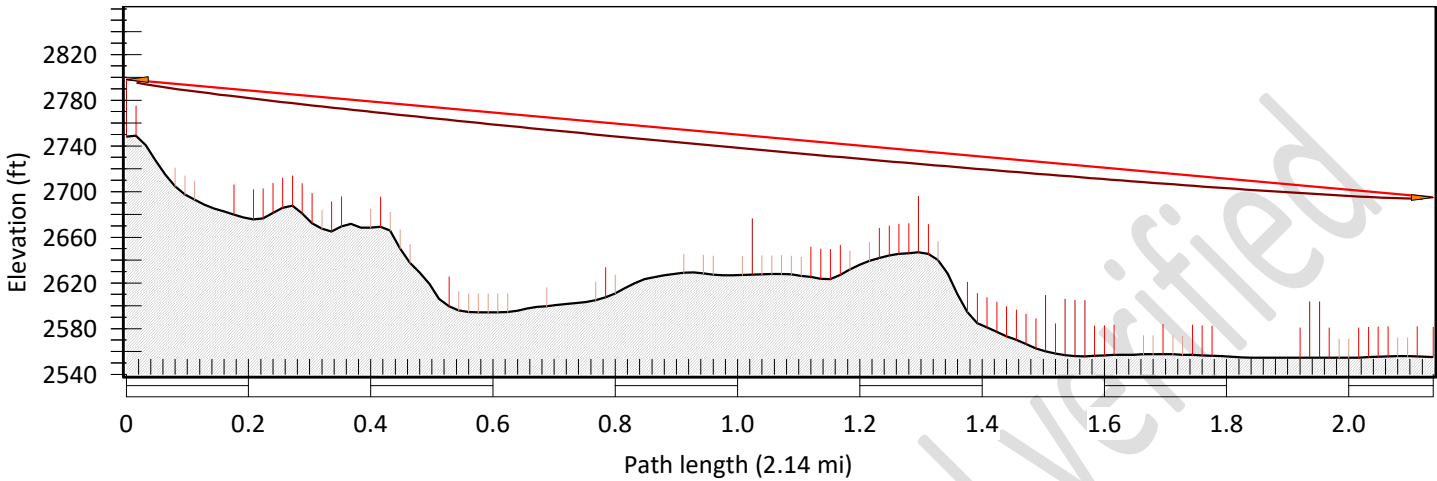
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	29.50	29.50	-65.50	-65.50	66.10	66.10	-32.95	-32.95	32.55	32.55	32.55	32.55
128QAM 155 Mbps	29.50	29.50	-69.00	-69.00	66.10	66.10	-32.95	-32.95	36.05	36.05	36.05	36.05
64QAM 132 Mbps	29.50	29.50	-71.50	-71.50	66.10	66.10	-32.95	-32.95	38.55	38.55	38.55	38.55
32QAM 109 Mbps	29.50	29.50	-74.00	-74.00	66.10	66.10	-32.95	-32.95	41.05	41.05	41.05	41.05
16QAM 90 Mbps	29.50	29.50	-77.00	-77.00	66.10	66.10	-32.95	-32.95	44.05	44.05	44.05	44.05
QPSK 39 Mbps	29.50	29.50	-90.00	-90.00	66.10	66.10	-32.95	-32.95	57.05	57.05	57.05	57.05

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 155 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 132 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 109 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



6- Vista Water Tank-Theophilus Tower Link



Vista Water Tank	
Latitude	46 43 50.47 N
Longitude	116 58 08.67 W
Azimuth	270.34°
Elevation	2748 ft ASL
Antenna CL	50.0 ft AGL

Frequency (MHz) = 22700.0
Main 1 K = 1.330 %F1 = 100.00

Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	90.31°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

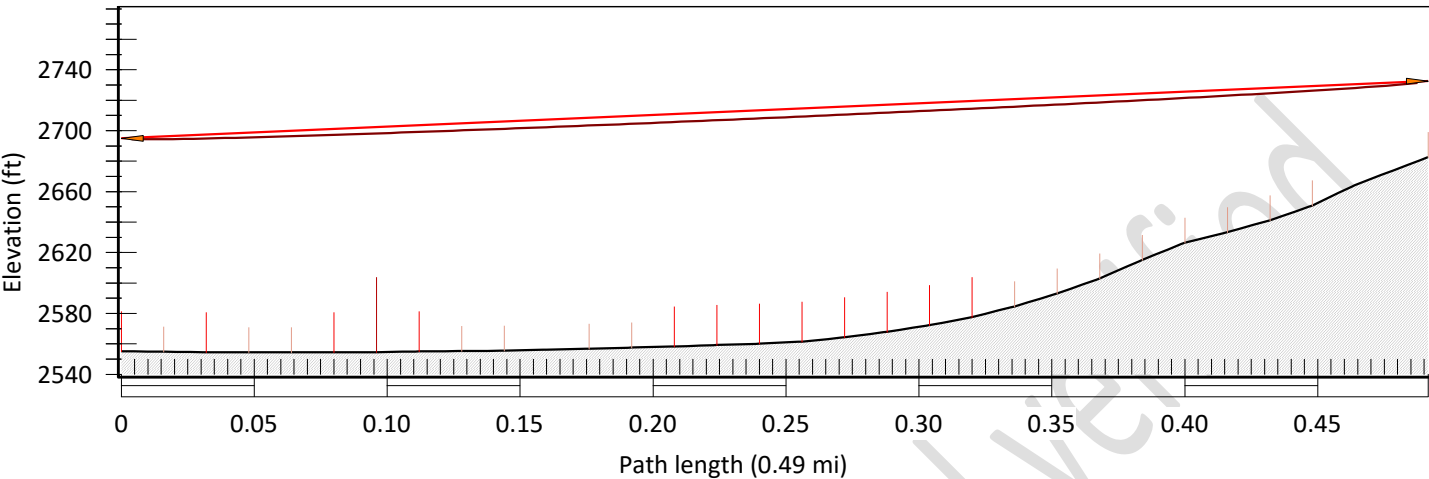
	Vista Water Tank	Theophilus Tower
Latitude	46 43 50.47 N	46 43 51.10 N
Longitude	116 58 08.67 W	117 00 50.70 W
True azimuth (°)	270.34	90.31
Vertical angle (°)	-0.53	0.51
Elevation (ft)	2747.96	2554.94
Tower height (ft)		130.00
Tower type		roof mount
Antenna model	SC 2 - 220C (TR)	SC 2 - 220C (TR)
Antenna gain (dBi)	41.10	41.10
Antenna height (ft)	50.00	140.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	1.60	1.60
Frequency (MHz)	22700.00	
Polarization	Vertical	
Path length (mi)	2.14	
Free space loss (dB)	130.32	
Atmospheric absorption loss (dB)	0.67	
Net path loss (dB)	55.99	55.99
Configuration	1+1	1+1
Radio model	E6v2hp23_30M ACM_R70	E6v2hp23_30M ACM_R70
Emission designator	30MOD7W	30MOD7W
Climatic factor	0.50	
Terrain roughness (ft)	23.94	
C factor	1.30	
Average annual temperature (°F)	46.12	
Fade occurrence factor (Po)	7.224E-004	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	20.50	20.50	-65.00	-65.00	58.00	58.00	-35.49	-35.49	29.51	29.51	29.51	29.51
128QAM 155 Mbps	21.50	21.50	-68.50	-68.50	59.00	59.00	-34.49	-34.49	34.01	34.01	34.01	34.01
64QAM 132 Mbps	21.50	21.50	-71.00	-71.00	59.00	59.00	-34.49	-34.49	36.51	36.51	36.51	36.51
32QAM 109 Mbps	21.50	21.50	-73.50	-73.50	59.00	59.00	-34.49	-34.49	39.01	39.01	39.01	39.01
16QAM 90 Mbps	22.50	22.50	-76.50	-76.50	60.00	60.00	-33.49	-33.49	43.01	43.01	43.01	43.01
QPSK 39 Mbps	23.50	23.50	-89.50	-89.50	61.00	61.00	-32.49	-32.49	57.01	57.01	57.01	57.01

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 155 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001
64QAM 132 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 109 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

7- Theophilus Tower-NW Water Tank link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	32.47°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 22700.0
Main 1 K = 1.330 %F1 = 100.00

NW Water Tank	
Latitude	46 44 12.71 N
Longitude	117 00 30.70 W
Azimuth	212.47°
Elevation	2682 ft ASL
Antenna CL	50.0 ft AGL

	Theophilus Tower	NW Water Tank
Latitude	46 43 51.10 N	46 44 12.71 N
Longitude	117 00 50.70 W	117 00 30.70 W
True azimuth (°)	32.47	212.47
Vertical angle (°)	0.83	-0.83
Elevation (ft)	2554.94	2682.47
Tower height (ft)	130.00	
Tower type	roof mount	
Antenna model	SC 1 - 220A (TR)	SC 1 - 220A (TR)
Antenna gain (dBi)	36.00	36.00
Antenna height (ft)	140.00	50.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	1.60	1.60
Frequency (MHz)	22700.00	
Polarization	Vertical	
Path length (mi)	0.49	
Free space loss (dB)	117.55	
Atmospheric absorption loss (dB)	0.15	
Net path loss (dB)	52.91	52.91
Configuration	1+1	1+1
Radio model	E6v2sp23_30M ACM_R70	E6v2sp23_30M ACM_R70
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	20.00	
C factor	1.65	
Average annual temperature (°F)	46.17	
Fade occurrence factor (Po)	1.109E-005	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 180 Mbps	17.50	17.50	-65.00	-65.00	49.90	49.90	-35.41	-35.41	29.59	29.59	29.59	29.59
128QAM 155 Mbps	18.50	18.50	-68.50	-68.50	50.90	50.90	-34.41	-34.41	34.09	34.09	34.09	34.09
64QAM 132 Mbps	18.50	18.50	-71.00	-71.00	50.90	50.90	-34.41	-34.41	36.59	36.59	36.59	36.59
32QAM 109 Mbps	18.50	18.50	-73.50	-73.50	50.90	50.90	-34.41	-34.41	39.09	39.09	39.09	39.09
16QAM 90 Mbps	19.50	19.50	-76.50	-76.50	51.90	51.90	-33.41	-33.41	43.09	43.09	43.09	43.09
QPSK 39 Mbps	20.50	20.50	-89.50	-89.50	52.90	52.90	-32.41	-32.41	57.09	57.09	57.09	57.09

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 180 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 155 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 132 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 109 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 39 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

Preliminary Path Calculations

Customer: Hatfield &
Dawson/City of Moscow, ID

Project: Five links of WTM
4100 11 & 23 GHz

MSO: NA201106-57616

Release 1.0
12/11/2020

Issue Releases

Issue Number	Issue Release Date	Changes	Prepared by:
1.0	11/10/2020	Initial Release	M. Martinez
2.0	12/11/2020	Added links from Theophilus Tower to NW Water Tank & Vista Water Tank	M. Martinez



Table of Contents

System Map 2

Link Summary..... 3

Path Profiles & Calculations 4

 1- Whitcom-Moscow Mountain Link 4

 2- KUID-TV (Paradise Ridge)-Moscow Mountain Link 7

 3- Theophilus Tower-KUID-TV (Paradise Ridge) Link 10

 4- Theophilus Tower-Courthouse Link..... 13

 5- Theophilus Tower-Moscow Mountain Link 16

 6- Vista Water Tank-Theophilus Tower Link 19

 7- Theophilus Tower-NW Water Tank Link..... 22

System Map

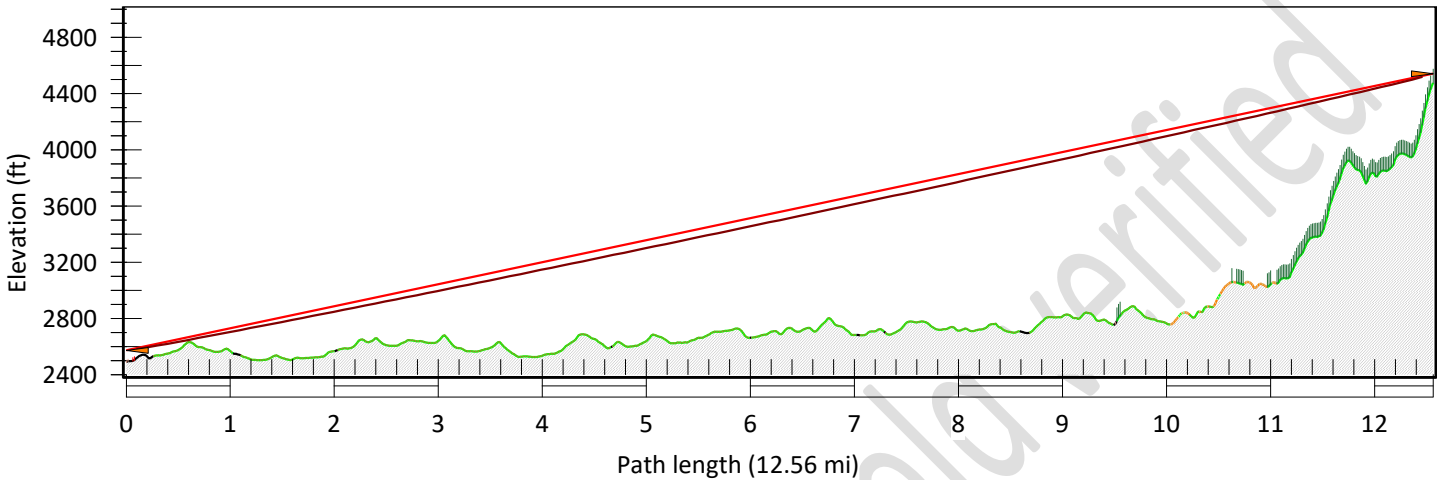


Link Summary

Link	Site names	Main Antenna Model	Main Antenna Height (ft)	Radio Model	Configuration	Modulation - Throughput (Mbps)	Path length (mi)	Fade margin (dB)	Annual Two Way Availability (%)
1	Whitcom	SB 4 - W100E	85	WTM 4100/11 MHz/30 MHz/ACM	2+0	256QAM - 178 Mbps	12.57	27.31	99.99931
	Moscow Mountain	SB 4 - W100E	65						
2	KUID-TV (Paradise Ridge)	SC 3 - W100B	85	WTM 4100/11 MHz/30 MHz/ACM	1+0	256QAM - 178 Mbps	9.32	32.27	99.99989
	Moscow Mountain	SC 3 - W100B	80						
3	Theophilus Tower	SC 3 - W100B	140	WTM 4100/11 MHz/30 MHz/ACM	1+0	256QAM - 178 Mbps	3.96	39.84	99.99999
	KUID-TV (Paradise Ridge)	SC 3 - W100B	75						
4	Theophilus Tower	SC 2 - 220C	140	WTM 4100/23 MHz/30 MHz/ACM	2+0	256QAM - 178 Mbps	0.82	37.42	99.99999
	Courthouse	SC 2 - 220C	50						
5	Theophilus Tower	SC 3 - W100B	140	WTM 4100/11 MHz/30 MHz/ACM	1+0	256QAM - 178 Mbps	7.22	34.55	99.99996
	Moscow Mountain	SC 3 - W100B	70						
6	Vista Water Tank	SC 2 - 220C	50	WTM 4100/23 MHz/30 MHz/ACM	2+0	256QAM - 178 Mbps	2.14	28.71	99.99987
	Theophilus Tower	SC 2 - 220C	140						
7	Theophilus Tower	SC 1 - 220A	140	WTM 4100/23 MHz/30 MHz/ACM	2+0	256QAM - 178 Mbps	0.49	31.79	99.99999
	NW Water Tank	SC 1 - 220A	50						

Path Profiles & Calculations

1- Whitcom-Moscow Mountain Link



Whitcom	
Latitude	46 45 05.96 N
Longitude	117 10 03.00 W
Azimuth	70.74°
Elevation	2486 ft ASL
Antenna CL	85.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

Moscow Mountain	
Latitude	46 48 40.95 N
Longitude	116 55 02.94 W
Azimuth	250.92°
Elevation	4474 ft ASL
Antenna CL	65.0 ft AGL

	Whitcom	Moscow Mountain
Latitude	46 45 05.96 N	46 48 40.95 N
Longitude	117 10 03.00 W	116 55 02.94 W
True azimuth (°)	70.74	250.92
Vertical angle (°)	1.63	-1.77
Elevation (ft)	2486.44	4474.44
Tower height (ft)	100.00	140.00
Tower type	self supporting	self supporting
Antenna model	SB 4 - W100E (TR)	SB 4 - W100E (TR)
Antenna gain (dBi)	40.10	40.10
Antenna height (ft)	85.00	65.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	3.00	3.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	12.57	
Free space loss (dB)	139.57	
Atmospheric absorption loss (dB)	0.32	
Net path loss (dB)	69.69	69.69
Configuration	2+0	2+0
Radio model	WT41_11_30M_ACM	WT41_11_30M_ACM
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	140.00	
C factor	0.13	
Average annual temperature (°F)	45.99	
Fade occurrence factor (Po)	7.288E-003	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

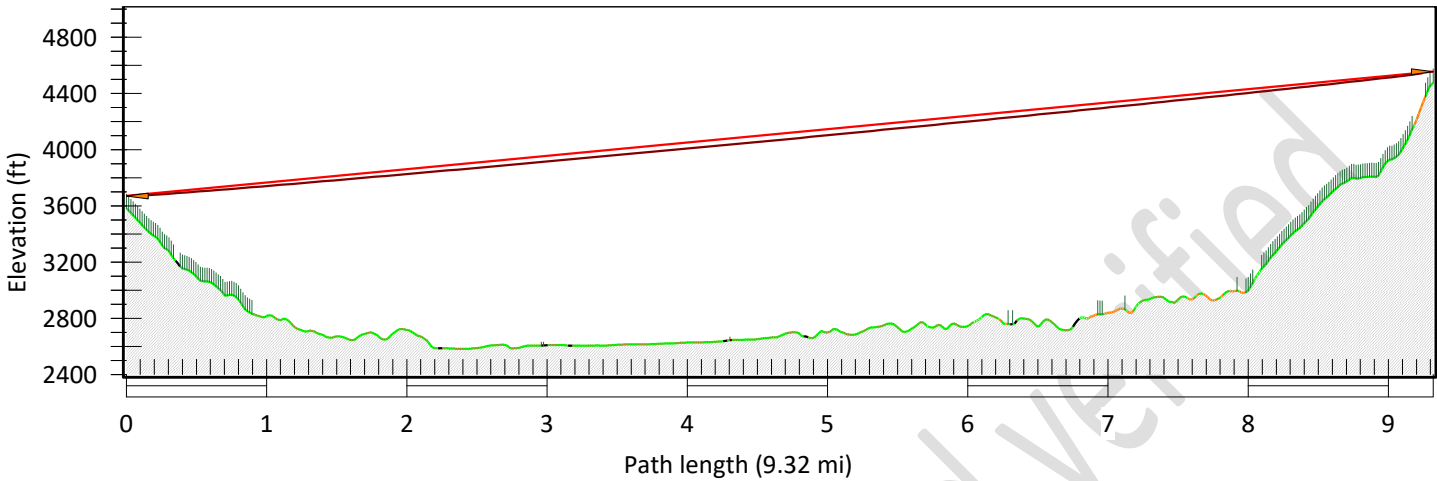
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	29.50	29.50	-67.50	-67.50	64.60	64.60	-40.19	-40.19	27.31	27.31	27.31	27.31
128QAM 154 Mbps	29.50	29.50	-71.00	-71.00	64.60	64.60	-40.19	-40.19	30.81	30.81	30.81	30.81
64QAM 135 Mbps	29.50	29.50	-73.00	-73.00	64.60	64.60	-40.19	-40.19	32.81	32.81	32.81	32.81
32QAM 101 Mbps	29.50	29.50	-76.50	-76.50	64.60	64.60	-40.19	-40.19	36.31	36.31	36.31	36.31
16QAM 90 Mbps	29.50	29.50	-79.00	-79.00	64.60	64.60	-40.19	-40.19	38.81	38.81	38.81	38.81
QPSK 38 Mbps	29.50	29.50	-91.00	-91.00	64.60	64.60	-40.19	-40.19	50.81	50.81	50.81	50.81

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9986	99.9986	99.9997	99.9997	99.9999	99.9999	99.9993	99.9993
128QAM 154 Mbps	99.9994	99.9994	99.9999	99.9999	99.9999	99.9999	99.9997	0.0004
64QAM 135 Mbps	99.9996	99.9996	99.9999	99.9999	99.9999	99.9999	99.9998	0.0001
32QAM 101 Mbps	99.9998	99.9998	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



2- KUID-TV (Paradise Ridge)-Moscow Mountain Link



KUID-TV (Paradise Ridge)	
Latitude	46 40 54.00 N
Longitude	116 58 17.00 W
Azimuth	15.92°
Elevation	3583 ft ASL
Antenna CL	85.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

Moscow Mountain	
Latitude	46 48 40.95 N
Longitude	116 55 02.94 W
Azimuth	195.96°
Elevation	4474 ft ASL
Antenna CL	80.0 ft AGL

	KUID-TV (Paradise Ridge)	Moscow Mountain
Latitude	46 40 54.00 N	46 48 40.95 N
Longitude	116 58 17.00 W	116 55 02.94 W
True azimuth (°)	15.92	195.96
Vertical angle (°)	0.98	-1.08
Elevation (ft)	3583.48	4474.44
Tower height (ft)	330.00	140.00
Tower type	self supporting	self supporting
Antenna model	SC 3 - W100B (TR)	SC 3 - W100B (TR)
Antenna gain (dBi)	38.60	38.60
Antenna height (ft)	85.00	80.00
Miscellaneous loss (dB)	2.00	2.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	9.32	
Free space loss (dB)	136.97	
Atmospheric absorption loss (dB)	0.24	
Net path loss (dB)	64.73	64.73
Configuration	1+0	1+0
Radio model	WT41_11_30M_ACM	WT41_11_30M_ACM
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	140.00	
C factor	0.13	
Average annual temperature (°F)	45.80	
Fade occurrence factor (Po)	2.973E-003	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

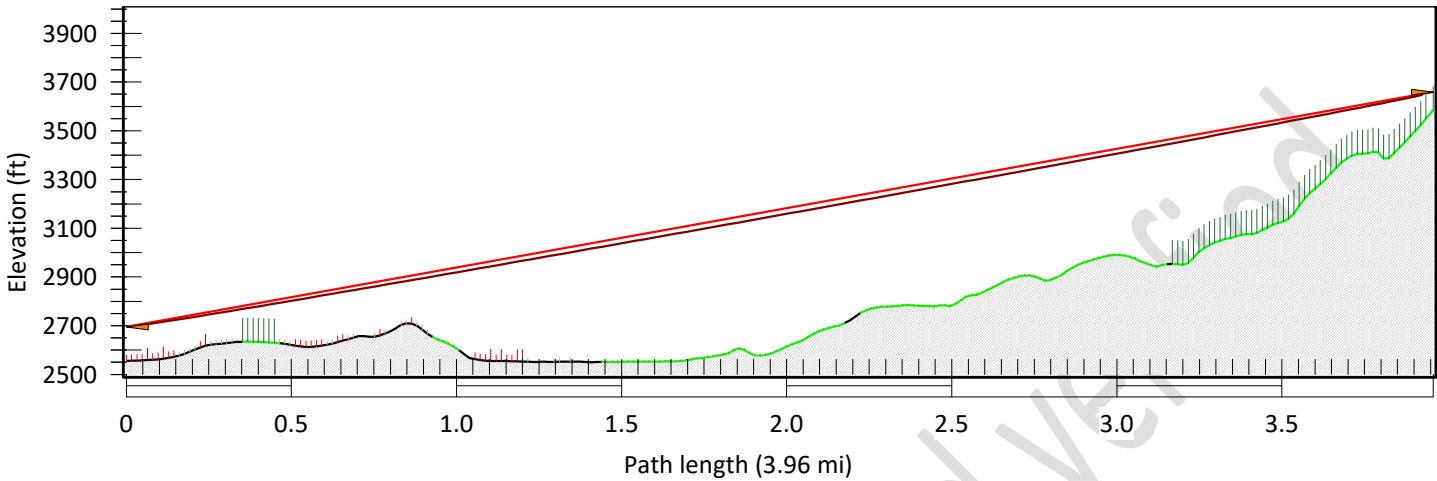
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	29.50	29.50	-67.50	-67.50	66.10	66.10	-35.23	-35.23	32.27	32.27	32.27	32.27
128QAM 154 Mbps	29.50	29.50	-71.00	-71.00	66.10	66.10	-35.23	-35.23	35.77	35.77	35.77	35.77
64QAM 135 Mbps	29.50	29.50	-73.00	-73.00	66.10	66.10	-35.23	-35.23	37.77	37.77	37.77	37.77
32QAM 101 Mbps	29.50	29.50	-76.50	-76.50	66.10	66.10	-35.23	-35.23	41.27	41.27	41.27	41.27
16QAM 90 Mbps	29.50	29.50	-79.00	-79.00	66.10	66.10	-35.23	-35.23	43.77	43.77	43.77	43.77
QPSK 38 Mbps	29.50	29.50	-91.00	-91.00	66.10	66.10	-35.23	-35.23	55.77	55.77	55.77	55.77

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9998	99.9998	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 154 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001
64QAM 135 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 101 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



3- Theophilus Tower-KUID-TV (Paradise Ridge) Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	149.15°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

KUID-TV (Paradise Ridge)	
Latitude	46 40 54.00 N
Longitude	116 58 17.00 W
Azimuth	329.18°
Elevation	3583 ft ASL
Antenna CL	75.0 ft AGL

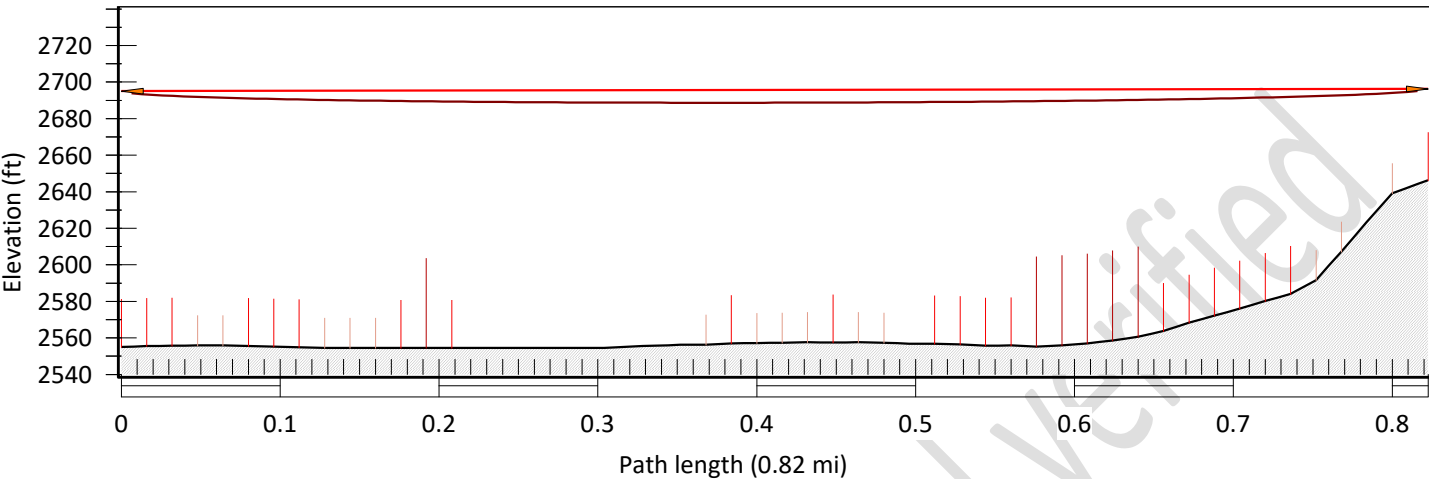
	Theophilus Tower	KUID-TV (Paradise Ridge)
Latitude	46 43 51.10 N	46 40 54.00 N
Longitude	117 00 50.70 W	116 58 17.00 W
True azimuth (°)	149.15	329.18
Vertical angle (°)	2.62	-2.66
Elevation (ft)	2554.94	3583.48
Tower height (ft)	130.00	330.00
Tower type	roof mount	self supporting
Antenna model	SC 3 - W100B (TR)	SC 3 - W100B (TR)
Antenna gain (dBi)	38.60	38.60
Antenna height (ft)	140.00	75.00
Miscellaneous loss (dB)	2.00	2.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	3.96	
Free space loss (dB)	129.54	
Atmospheric absorption loss (dB)	0.10	
Net path loss (dB)	57.16	57.16
Configuration	1+0	1+0
Radio model	WT41_11_30M_ACM	WT41_11_30M_ACM
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	133.65	
C factor	0.14	
Average annual temperature (°F)	46.25	
Fade occurrence factor (Po)	2.426E-004	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	29.50	29.50	-67.50	-67.50	66.10	66.10	-27.66	-27.66	39.84	39.84	39.84	39.84
128QAM 154 Mbps	29.50	29.50	-71.00	-71.00	66.10	66.10	-27.66	-27.66	43.34	43.34	43.34	43.34
64QAM 135 Mbps	29.50	29.50	-73.00	-73.00	66.10	66.10	-27.66	-27.66	45.34	45.34	45.34	45.34
32QAM 101 Mbps	29.50	29.50	-76.50	-76.50	66.10	66.10	-27.66	-27.66	48.84	48.84	48.84	48.84
16QAM 90 Mbps	29.50	29.50	-79.00	-79.00	66.10	66.10	-27.66	-27.66	51.34	51.34	51.34	51.34
QPSK 38 Mbps	29.50	29.50	-91.00	-91.00	66.10	66.10	-27.66	-27.66	63.34	63.34	63.34	63.34

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 154 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 135 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 101 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

4- Theophilus Tower-Courthouse Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	91.16°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 22700.0
Main 1 K = 1.330 %F1 = 100.00

Courthouse	
Latitude	46 43 50.23 N
Longitude	116 59 48.37 W
Azimuth	271.17°
Elevation	2646 ft ASL
Antenna CL	50.0 ft AGL

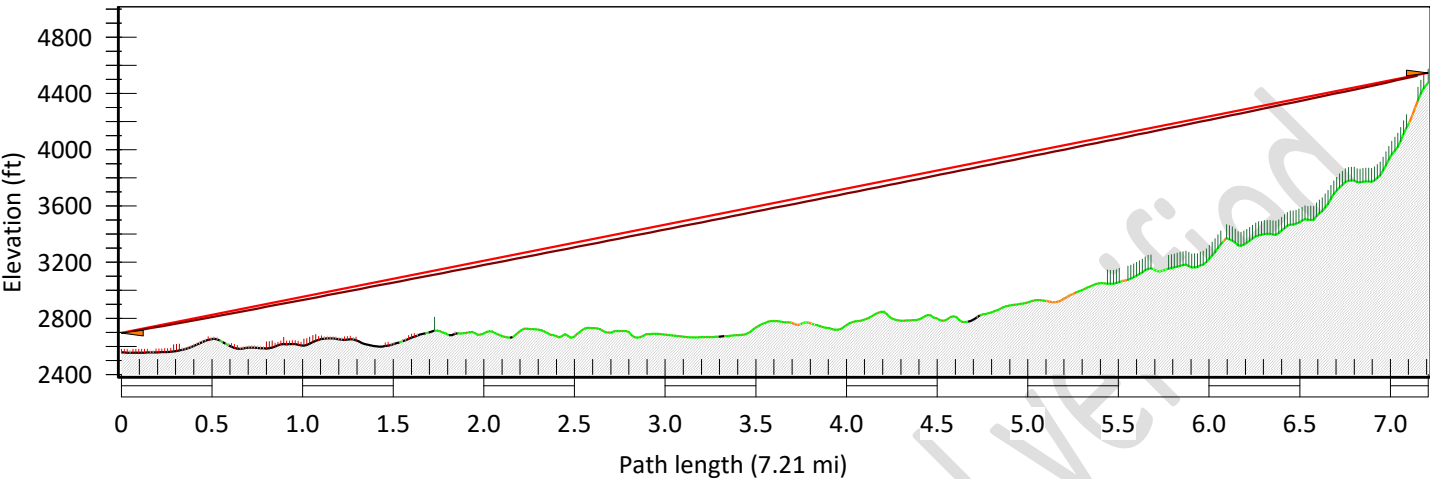
	Theophilus Tower	Courthouse
Latitude	46 43 51.10 N	46 43 50.23 N
Longitude	117 00 50.70 W	116 59 48.37 W
True azimuth (°)	91.16	271.17
Vertical angle (°)	0.01	-0.02
Elevation (ft)	2554.94	2646.17
Tower height (ft)	130.00	40.00
Tower type	roof mount	roof mount
Antenna model	SC 2 - 220C (TR)	SC 2 - 220C (TR)
Antenna gain (dBi)	41.10	41.10
Antenna height (ft)	140.00	50.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	3.00	3.00
Frequency (MHz)	22700.00	
Polarization	Vertical	
Path length (mi)	0.82	
Free space loss (dB)	122.02	
Atmospheric absorption loss (dB)	0.26	
Net path loss (dB)	50.08	50.08
Configuration	2+0	2+0
Radio model	WT41_23_30M_ACM	WT41_23_30M_ACM
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	20.00	
C factor	1.65	
Average annual temperature (°F)	46.17	
Fade occurrence factor (Po)	5.198E-005	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	20.50	20.50	-67.00	-67.00	56.60	56.60	-29.58	-29.58	37.42	37.42	37.42	37.42
128QAM 154 Mbps	21.00	21.00	-70.50	-70.50	57.10	57.10	-29.08	-29.08	41.42	41.42	41.42	41.42
64QAM 135 Mbps	21.50	21.50	-72.50	-72.50	57.60	57.60	-28.58	-28.58	43.92	43.92	43.92	43.92
32QAM 101 Mbps	21.50	21.50	-76.00	-76.00	57.60	57.60	-28.58	-28.58	47.42	47.42	47.42	47.42
16QAM 90 Mbps	21.50	21.50	-78.50	-78.50	57.60	57.60	-28.58	-28.58	49.92	49.92	49.92	49.92
QPSK 38 Mbps	23.50	23.50	-90.50	-90.50	59.60	59.60	-26.58	-26.58	63.92	63.92	63.92	63.92

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 154 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 135 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 101 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

5- Theophilus Tower-Moscow Mountain Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	39.47°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 11200.0
Main 1 K = 1.330 %F1 = 100.00

Moscow Mountain	
Latitude	46 48 40.95 N
Longitude	116 55 02.94 W
Azimuth	219.54°
Elevation	4474 ft ASL
Antenna CL	70.0 ft AGL

	Theophilus Tower	Moscow Mountain
Latitude	46 43 51.10 N	46 48 40.95 N
Longitude	117 00 50.70 W	116 55 02.94 W
True azimuth (°)	39.47	219.54
Vertical angle (°)	2.74	-2.82
Elevation (ft)	2554.94	4474.44
Tower height (ft)	130.00	140.00
Tower type	roof mount	self supporting
Antenna model	SC 3 - W100B (TR)	SC 3 - W100B (TR)
Antenna gain (dBi)	38.60	38.60
Antenna height (ft)	140.00	70.00
Miscellaneous loss (dB)	2.00	2.00
Frequency (MHz)	11200.00	
Polarization	Vertical	
Path length (mi)	7.22	
Free space loss (dB)	134.75	
Atmospheric absorption loss (dB)	0.18	
Net path loss (dB)	62.45	62.45
Configuration	1+0	1+0
Radio model	WT41_11_30M_ACM	WT41_11_30M_ACM
Emission designator	30M0D7W	30M0D7W
Climatic factor	0.50	
Terrain roughness (ft)	140.00	
C factor	0.13	
Average annual temperature (°F)	45.79	
Fade occurrence factor (Po)	1.380E-003	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

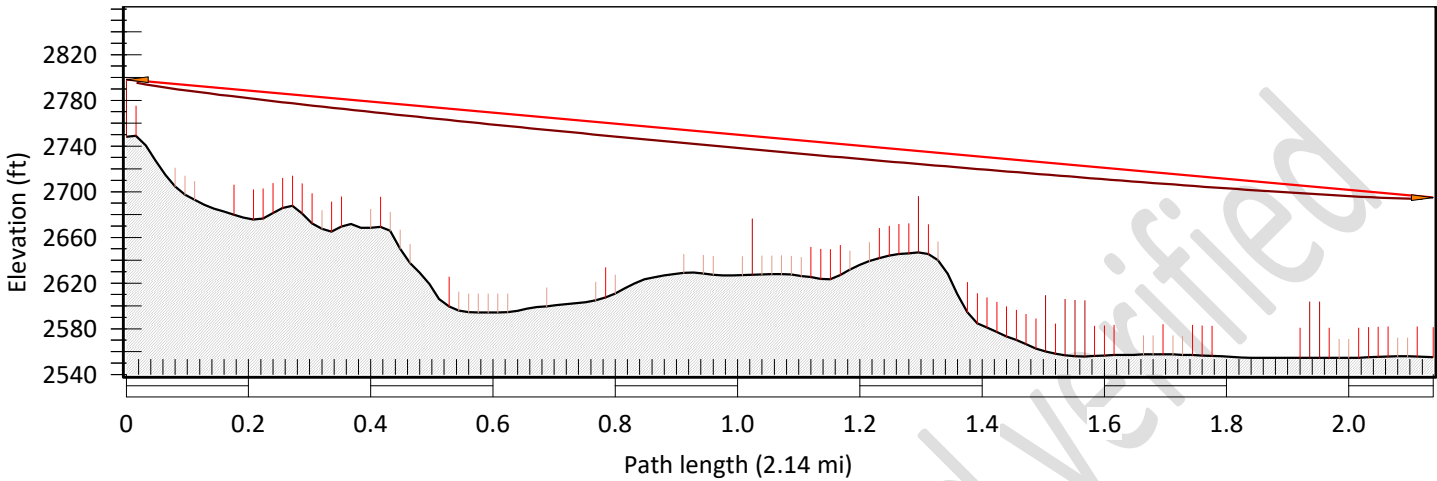
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	29.50	29.50	-67.50	-67.50	66.10	66.10	-32.95	-32.95	34.55	34.55	34.55	34.55
128QAM 154 Mbps	29.50	29.50	-71.00	-71.00	66.10	66.10	-32.95	-32.95	38.05	38.05	38.05	38.05
64QAM 135 Mbps	29.50	29.50	-73.00	-73.00	66.10	66.10	-32.95	-32.95	40.05	40.05	40.05	40.05
32QAM 101 Mbps	29.50	29.50	-76.50	-76.50	66.10	66.10	-32.95	-32.95	43.55	43.55	43.55	43.55
16QAM 90 Mbps	29.50	29.50	-79.00	-79.00	66.10	66.10	-32.95	-32.95	46.05	46.05	46.05	46.05
QPSK 38 Mbps	29.50	29.50	-91.00	-91.00	66.10	66.10	-32.95	-32.95	58.05	58.05	58.05	58.05

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 154 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 135 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 101 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane



6- Vista Water Tank-Theophilus Tower Link



Vista Water Tank	
Latitude	46 43 50.47 N
Longitude	116 58 08.67 W
Azimuth	270.34°
Elevation	2748 ft ASL
Antenna CL	50.0 ft AGL

Frequency (MHz) = 22700.0
Main 1 K = 1.330 %F1 = 100.00

Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	90.31°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

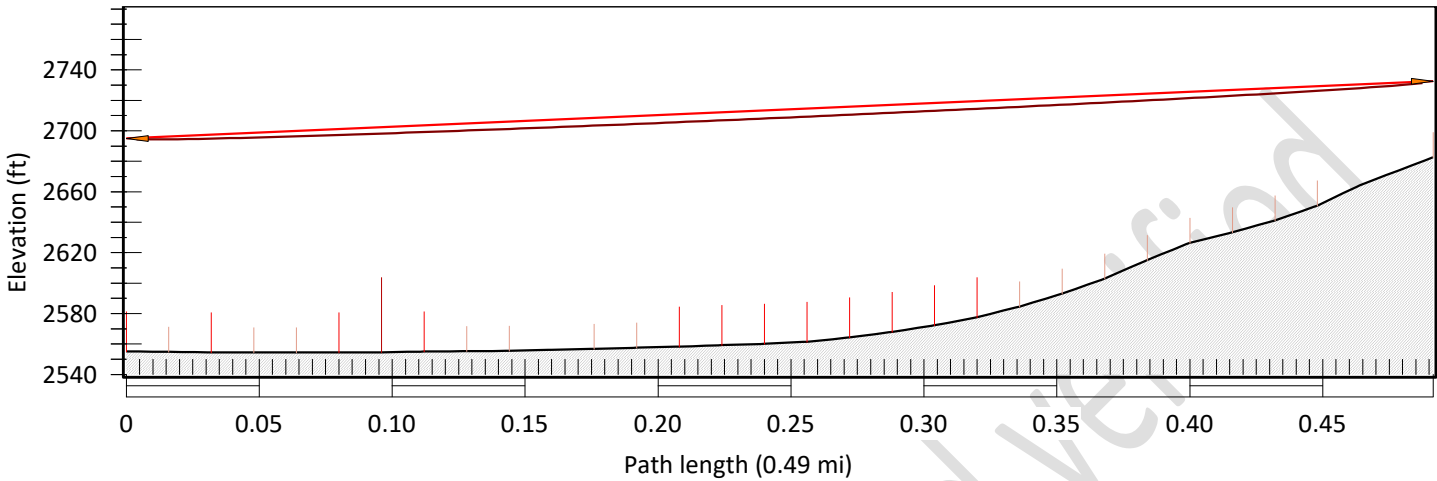
	Vista Water Tank	Theophilus Tower
Latitude	46 43 50.47 N	46 43 51.10 N
Longitude	116 58 08.67 W	117 00 50.70 W
True azimuth (°)	270.34	90.31
Vertical angle (°)	-0.53	0.51
Elevation (ft)	2747.96	2554.94
Tower height (ft)		130.00
Tower type		roof mount
Antenna model	SC 2 - 220C (TR)	SC 2 - 220C (TR)
Antenna gain (dBi)	41.10	41.10
Antenna height (ft)	50.00	140.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	3.00	3.00
Frequency (MHz)	22700.00	
Polarization	Vertical	
Path length (mi)	2.14	
Free space loss (dB)	130.32	
Atmospheric absorption loss (dB)	0.67	
Net path loss (dB)	58.79	58.79
Configuration	2+0	2+0
Radio model	WT41_23_30M_ACM	WT41_23_30M_ACM
Emission designator	30MOD7W	30MOD7W
Climatic factor	0.50	
Terrain roughness (ft)	23.94	
C factor	1.30	
Average annual temperature (°F)	46.12	
Fade occurrence factor (Po)	7.224E-004	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	20.50	20.50	-67.00	-67.00	56.60	56.60	-38.29	-38.29	28.71	28.71	28.71	28.71
128QAM 154 Mbps	21.00	21.00	-70.50	-70.50	57.10	57.10	-37.79	-37.79	32.71	32.71	32.71	32.71
64QAM 135 Mbps	21.50	21.50	-72.50	-72.50	57.60	57.60	-37.29	-37.29	35.21	35.21	35.21	35.21
32QAM 101 Mbps	21.50	21.50	-76.00	-76.00	57.60	57.60	-37.29	-37.29	38.71	38.71	38.71	38.71
16QAM 90 Mbps	21.50	21.50	-78.50	-78.50	57.60	57.60	-37.29	-37.29	41.21	41.21	41.21	41.21
QPSK 38 Mbps	23.50	23.50	-90.50	-90.50	59.60	59.60	-35.29	-35.29	55.21	55.21	55.21	55.21

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 154 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0001
64QAM 135 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 101 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

7- Theophilus Tower-NW Water Tank Link



Theophilus Tower	
Latitude	46 43 51.10 N
Longitude	117 00 50.70 W
Azimuth	32.47°
Elevation	2555 ft ASL
Antenna CL	140.0 ft AGL

Frequency (MHz) = 22700.0
Main 1 K = 1.330 %F1 = 100.00

NW Water Tank	
Latitude	46 44 12.71 N
Longitude	117 00 30.70 W
Azimuth	212.47°
Elevation	2682 ft ASL
Antenna CL	50.0 ft AGL

	Theophilus Tower	NW Water Tank
Latitude	46 43 51.10 N	46 44 12.71 N
Longitude	117 00 50.70 W	117 00 30.70 W
True azimuth (°)	32.47	212.47
Vertical angle (°)	0.83	-0.83
Elevation (ft)	2554.94	2682.47
Tower height (ft)	130.00	
Tower type	roof mount	
Antenna model	SC 1 - 220A (TR)	SC 1 - 220A (TR)
Antenna gain (dBi)	36.00	36.00
Antenna height (ft)	140.00	50.00
Miscellaneous loss (dB)	2.00	2.00
Circulator branching loss (dB)	3.00	3.00
Frequency (MHz)	22700.00	
Polarization	Vertical	
Path length (mi)	0.49	
Free space loss (dB)	117.55	
Atmospheric absorption loss (dB)	0.15	
Net path loss (dB)	55.71	55.71
Configuration	2+0	2+0
Radio model	WT41_23_30M_ACM	WT41_23_30M_ACM
Emission designator	30MOD7W	30MOD7W
Climatic factor	0.50	
Terrain roughness (ft)	20.00	
C factor	1.65	
Average annual temperature (°F)	46.17	
Fade occurrence factor (Po)	1.109E-005	
Polarization	Vertical	
Rain region	Lewiston, Idaho	

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
256QAM 178 Mbps	20.50	20.50	-67.00	-67.00	51.50	51.50	-35.21	-35.21	31.79	31.79	31.79	31.79
128QAM 154 Mbps	21.00	21.00	-70.50	-70.50	52.00	52.00	-34.71	-34.71	35.79	35.79	35.79	35.79
64QAM 135 Mbps	21.50	21.50	-72.50	-72.50	52.50	52.50	-34.21	-34.21	38.29	38.29	38.29	38.29
32QAM 101 Mbps	21.50	21.50	-76.00	-76.00	52.50	52.50	-34.21	-34.21	41.79	41.79	41.79	41.79
16QAM 90 Mbps	21.50	21.50	-78.50	-78.50	52.50	52.50	-34.21	-34.21	44.29	44.29	44.29	44.29
QPSK 38 Mbps	23.50	23.50	-90.50	-90.50	54.50	54.50	-32.21	-32.21	58.29	58.29	58.29	58.29

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
256QAM 178 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999
128QAM 154 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
64QAM 135 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
32QAM 101 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
16QAM 90 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000
QPSK 38 Mbps	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	99.9999	0.0000

Multipath fading method - Vigants - Barnett
 Rain fading method - Crane

APPENDIX 6 – COST ESTIMATES FOR PROPOSED VHF AND 700 MHz SYSTEM ALTERNATIVES

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Equipment and Cost Summary Sheet (Summary)

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and ODU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$635.00	each			Valmont List Price
8	11	6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$353.00	each	\$ 3,883.00		Valmont List Price
9	11	126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$65.49	each	\$ 720.39		Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
Entry Port, Waveguide Hangers and Associated Hardware NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST ESTIMATE									
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$17.00	each			Aviat NASPO pricing
Interconnecting Cable, Connectors, and Associated Hardware -Stand-Alone Fixed Control Stations NO FIXED CONTROL STATIONS USED IN SYSTEM									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNFS38-030P1	\$154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49	5	Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$5,286.00	each	\$ 26,430.00		LaMarche Quotation (08/01/19)
50	16	3000 Watt 48 VDC Rectifer Module	LaMarche	DCR-50	\$760.00	each	\$ 12,160.00		LaMarche Quotation (08/01/19)
51	3	48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$14,381.00	each	\$ 43,143.00		C&D Technologies Budgetary Cost
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$2,256.67	each			TESSCO List Price
53	2	48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$2,500.00	Lot	\$ 5,000.00		techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit Included)	Alpha	CE-3X2-T + CE-3G	\$12,275.10	each			Alpha Quotation

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Equipment and Cost Summary Sheet (Summary)

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$4,351.00	each			Unipower Telecom Quotation
Shelters, Towers, Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$129,000.00	each			Estimate
61									
62	2	6' X 6' X 104" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$41,000.00	each	\$82,000.00		American Products Quotation
63	2	Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$26,000.00	LOT	\$52,000.00		Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF Antennas									
65	6	VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$1,843.74	each	\$11,062.44		Telewave NASPO Price
66	5	VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$1,826.34	each	\$9,131.70		Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
Transmitter Combiners & Receiver Multicouplers									
79	3	VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259 E	\$22,774.19	each	\$68,322.56		TX-RX Quotation (NASPO Pricing)
80	2	8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$2,695.00	each	\$5,390.00		Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87	1270	LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$3.65	foot	\$4,635.50		TESSCO List Price
88	11	N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$52.50	each	\$577.50		TESSCO List Price
89	11	Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$42.61	each	\$468.71		TESSCO List Price
90	44	Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$25.70	each	\$1,130.80		TESSCO List Price
91	11	Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$23.33	each	\$256.63		TESSCO List Price
92	22	Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$20.89	each	\$459.58		TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$19.94	each			TESSCO List Price
95	22	Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$19.94	each	\$438.68		TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$75.01	each			TESSCO List Price
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$19.71	each			RFS List Price
102	11	4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$112.77	each	\$1,240.47		TESSCO List Price
103	2	4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$43.76	each	\$87.52		TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1-1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$102.37	each			TESSCO List Price
109	2	4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$20.40	each	\$40.80		TESSCO List Price

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Cobminer & Antenna System Equipment Cost Subtotal									\$103,242.89
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111	10	VHF (136-174 MHz) NBFM Voting Reciever with - 48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$13,440.14	each	\$ 134,401.40		CODAN Quotation - NASPO Pricing
112	15	VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$40,320.42	each	\$ 604,806.30		CODAN Quotation - NASPO Pricing
113	1	System Spares	CODAN	RADIO SYSTEM SPARES	\$186,286.00	LUMP SUM	\$ 186,286.00		CODAN Quotation - NASPO Pricing
114	1	Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$73,152.00	LUMP SUM	\$ 73,152.00		CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPING.	N/A	N/A	Included in costs shown above	each	N/A		CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$998,645.70
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT			SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION REPEATER COSTS ABOVE						
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-iC Option	\$5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135									
Total Equipment Cost (All Sites)							\$	1,327,225	
Sum of Site Totals (Cross Check)							\$	-	
Total Rounded to next highest \$10,000							\$	1,330,000	

LMR Radio Equipment Installation	\$	18,000	NOTE 1
LMR Radio System Optimization	\$	8,000	
LMR Antenna System, Lightning Protection and DC Backup Power Installation	\$	36,000	
Equipment, Installation & Optimization Subtotal	\$	62,000	
Tower Structural Studies	\$	7,000	
Permitting	\$	21,000	
One-Time Tower Site Lease Setup Costs	\$	2,000	
Installation, Optimization & Permitting Total	\$	92,000	
Rounded	\$	92,000	

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
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SYSTEM SUPPORT & SOFT COSTS					
1		Mobilization	1.5%	Based on Radio Equipment Cost Only	\$16,000
2		Field Testing	3.0%	Included in LMR Radio System Optimization	
3		Shipping	2%	Based on Radio Equipment Cost - Excluding Base Station Radios and Voting Receivers	\$11,800
4		Documentation	1.5%	New Radio Installs Only	\$16,000
5		Training			
6		Idaho State Sales Tax (Latah County Rate)	6.00%	Latah County Rate	\$79,600
7		Radio System Contractor Project Management	5.0%		\$53,400
System Support & Soft Costs Total					\$176,800

NOTE 1 -

INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS

Consultant Task (H&D)	Cost
FCC Licensing	\$7,500
RFP Development	\$20,000
Procurement Assistance & Vendor Selection	\$2,500
Assistance with Site Acquisition & Permitting	\$7,500
Project Management & Installation Supervision	\$15,000
Supervision of Acceptance Testing	\$10,000
Consultant Cost Total	\$62,500

Total Estimate \$ 1,658,524.98

Total Rounded to next highest \$10,000 \$ 1,660,000.00

Total Estimate (Not Including Consulting Engineering Costs) \$ 1,596,024.98

Total Rounded to next highest \$10,000 \$ 1,600,000.00

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each			Valmont List Price
8	3	6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each	\$1,059.00		Valmont List Price
9	3	126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each	\$196.47		Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST						
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Interconnecting Cable, Connectors, and Associated Hardware -Stand-Alone Fixed Control Stations									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNF38-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49	1	Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each	\$5,286.00		LaMarche Quotation (08/01/19)
50	4	3000 Watt 48 VDC Rectifer Module	LaMarche	DCR-50	\$ 760.00	each	\$3,040.00		LaMarche Quotation (08/01/19)

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
51	1	48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$ 14,381.00	each	\$14,381.00		C&D Technologies Budgetary Cost
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price
53		48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot			techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61									
62		6' X 6' X 104" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each			American Products Quotation
63		Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT			Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65	2	VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each	\$3,687.48		Telewave NASPO Price
66	1	VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each	\$1,826.34		Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
		Transmitter Combiners & Receiver Multicouplers							
79	1	VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each	\$22,774.19		TX-RX Quotation (NASPO Pricing)
80		8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each			Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87	320	LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot	\$1,168.00		TESSCO List Price
88	3	N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each	\$157.50		TESSCO List Price
89	3	Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each	\$127.83		TESSCO List Price
90	11	Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each	\$282.70		TESSCO List Price
91	3	Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each	\$69.99		TESSCO List Price
92	6	Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each	\$125.34		TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95	6	Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each	\$119.64		TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price
102	3	4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each	\$338.31		TESSCO List Price
103		4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each			TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1 1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109	1	4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each	\$20.40		TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$30,697.72
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111		VHF (136-174 MHz) NBFM Voting Reciever with -48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each			CODAN Quotation - NASPO Pricing
112	5	VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each	\$201,602.10		CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$201,602.10
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT			SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION REPEATER COSTS ABOVE						
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-iC Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135									
Total Equipment Cost - Moscow Mountain Site							\$256,262		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT,
TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING
PROTECTION, AND DC POWER SYSTEMS.

LMR Radio Equipment Installation		\$4,000.00
LMR Radio System Optimization		\$2,000.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation		\$8,000.00
	Equipment, Installation & Optimization Subtotal	\$14,000.00
Tower Structural Study		\$3,500.00
Permitting		\$7,000.00
Installation, Optimization & Permitting Total		\$24,500.00

NOTE 1

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Theophilus Tower Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each			Valmont List Price
8	3	6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each	\$1,059.00		Valmont List Price
9	3	126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each	\$196.47		Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST									
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2 2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Interconnecting Cable, Connectors, and Associated Hardware -Stand-Alone Fixed Control Stations									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNFS38-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49	1	Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each	\$5,286.00		LaMarche Quotation (08/01/19)
50	4	3000 Watt 48 VDC Rectifier Module	LaMarche	DCR-50	\$ 760.00	each	\$3,040.00		LaMarche Quotation (08/01/19)
51	1	48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$ 14,381.00	each	\$14,381.00		C&D Technologies Budgetary Cost
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Theophilus Tower Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
53		48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot			techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit Included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61									
62		6' X 6' X 104"" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each			American Products Quotation
63		Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT			Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65	2	VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each	\$3,687.48		Telewave NASPO Price
66	1	VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each	\$1,826.34		Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
		Transmitter Combiners & Receiver Multicouplers							
79	1	VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each	\$22,774.19		TX-RX Quotation (NASPO Pricing)
80		8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each			Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87	330	LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot	\$1,204.50		TESSCO List Price
88	3	N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each	\$157.50		TESSCO List Price
89	3	Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each	\$127.83		TESSCO List Price
90	11	Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each	\$282.70		TESSCO List Price
91	3	Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each	\$69.99		TESSCO List Price
92	6	Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each	\$125.34		TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95	6	Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each	\$119.64		TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price
102	3	4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each	\$338.31		TESSCO List Price
103		4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each			TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Theophilus Tower Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1-1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109		4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each			TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$30,713.82
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111		VHF (136-174 MHz) NBFM Voting Reciever with -48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each			CODAN Quotation - NASPO Pricing
112	5	VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each	\$201,602.10		CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$201,602.10
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT			SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION						
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-iC Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135						each			
Total Equipment Cost - Theophilus Tower Site							\$256,278		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

LMR Radio Equipment Installation		\$4,000.00
LMR Radio System Optimization		\$2,000.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation		\$8,000.00
Equipment, Installation & Optimization Subtotal		\$14,000.00
Tower Structural Study		
Permitting		\$7,000.00
Installation, Optimization & Permitting Total		\$21,000.00

NOTE 1

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each			Valmont List Price
8	3	6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each	\$1,059.00		Valmont List Price
9	3	126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each	\$196.47		Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST									
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8") (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
NO FIXED CONTROL STATIONS USED IN SYSTEM									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNFS38-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49	1	Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each	\$5,286.00		LaMarche Quotation (08/01/19)
50	4	3000 Watt 48 VDC Rectifier Module	LaMarche	DCR-50	\$ 760.00	each	\$3,040.00		LaMarche Quotation (08/01/19)
51	1	48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$ 14,381.00	each	\$14,381.00		C&D Technologies Budgetary Cost

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
KUID-TV Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price
53		48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot			techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit Included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61		6' X 6' X 104" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each			American Products Quotation
62		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
63		Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT			Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			#REF!
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65	2	VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each	\$3,687.48		Telewave NASPO Price
66	1	VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each	\$1,826.34		Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
		Transmitter Combiners & Receiver Multicouplers							
79	1	VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each	\$22,774.19		TX-RX Quotation (NASPO Pricing)
80		8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each			Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87	420	LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot	\$1,533.00		TESSCO List Price
88	3	N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each	\$157.50		TESSCO List Price
89	3	Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each	\$127.83		TESSCO List Price
90	14	Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each	\$359.80		TESSCO List Price
91	3	Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each	\$69.99		TESSCO List Price
92	6	Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each	\$125.34		TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95	6	Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each	\$119.64		TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
KUID-TV Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
102	3	4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each	\$338.31		TESSCO List Price
103		4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each			TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1-1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109	1	4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each	\$20.40		TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$31,139.82
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111		VHF (136-174 MHz) NBFM Voting Reciever with -48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each			CODAN Quotation - NASPO Pricing
112	5	VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each	\$201,602.10		CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$201,602.10
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT									
SIMULCAST, GPS AND RECEIVER VOTING EQUIUMENT INCLUDED IN BASE STATION									
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-iC Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Total Equipment Cost - KUID-TV Site							\$256,704		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT,
TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING
PROTECTION, AND DC POWER SYSTEMS.

LMR Radio Equipment Installation		\$4,000.00
LMR Radio System Optimization		\$2,000.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation		\$8,000.00
	Equipment, Installation & Optimization Subtotal	\$14,000.00
Tower Structural Study		\$3,500.00
Permitting		\$7,000.00
Installation, Optimization & Permitting Total		\$24,500.00

NOTE 1

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
NW Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each			Valmont List Price
8	1	6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each	\$353.00		Valmont List Price
9	1	126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each	\$65.49		Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST									
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8") (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
NO FIXED CONTROL STATIONS USED IN SYSTEM									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNFS38-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49	1	Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each	\$5,286.00		LaMarche Quotation (08/01/19)
50	2	3000 Watt 48 VDC Rectifier Module	LaMarche	DCR-50	\$ 760.00	each	\$1,520.00		LaMarche Quotation (08/01/19)
51		48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 124 Amps)	C&D Technologies	AT-27P	\$ 18,960.00	each			C&D Technologies Budgetary Cost

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
NW Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price
53	1	48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot	\$2,500.00		techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit Included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61									
62	1	6' X 6' X 104"" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each	\$41,000.00		American Products Quotation
63	1	Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT	\$26,000.00		Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65		VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each			Telewave NASPO Price
66	1	VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each	\$1,826.34		Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
		Transmitter Combiners & Receiver Multicouplers							
79		VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each			TX-RX Quotation (NASPO Pricing)
80	1	8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each	\$2,695.00		Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87	100	LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot	\$365.00		TESSCO List Price
88	1	N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each	\$52.50		TESSCO List Price
89	1	Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each	\$42.61		TESSCO List Price
90	4	Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each	\$102.80		TESSCO List Price
91	1	Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each	\$23.33		TESSCO List Price
92	2	Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each	\$41.78		TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95	2	Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each	\$39.88		TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
NW Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
102	1	4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each	\$112.77		TESSCO List Price
103	1	4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each	\$43.76		TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1-1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109		4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each			TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$5,345.77
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111	5	VHF (136-174 MHz) NBFM Voting Reciever with -48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each	\$67,200.70		CODAN Quotation - NASPO Pricing
112		VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each			CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$67,200.70
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT									
SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION									
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-iC Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135									

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
NW Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Total Equipment Cost - NW Water Tank Site					\$149,270.96		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT,
TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING
PROTECTION, AND DC POWER SYSTEMS.

LMR Radio Equipment Installation		\$3,000.00
LMR Radio System Optimization		\$1,000.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation		\$6,000.00
	Equipment, Installation & Optimization Subtotal	\$10,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$10,000.00

NOTE 1

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each			Valmont List Price
8	1	6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each	\$353.00		Valmont List Price
9	1	126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each	\$65.49		Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
Entry Port, Waveguide Hangers and Associated Hardware									
BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST									
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Interconnecting Cable, Connectors, and Associated Hardware -Stand-Alone Fixed Control Stations									
NO FIXED CONTROL STATIONS USED IN SYSTEM									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNFS38-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49	1	Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each	\$5,286.00		LaMarche Quotation (08/01/19)
50	2	3000 Watt 48 VDC Rectifer Module	LaMarche	DCR-50	\$ 760.00	each	\$1,520.00		LaMarche Quotation (08/01/19)
51		48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$ 14,381.00	each			C&D Technologies Budgetary Cost
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Vista Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
53	1	48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot	\$2,500.00		techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit Included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61									
62	1	6' X 6' X 104''' Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each	\$41,000.00		American Products Quotation
63	1	Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT	\$26,000.00		Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65		VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each			Telewave NASPO Price
66	1	VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each	\$1,826.34		Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
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76									
77									
78									
		Transmitter Combiners & Receiver Multicouplers							
79		VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each			TX-RX Quotation (NASPO Pricing)
80	1	8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each	\$2,695.00		Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87	100	LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot	\$365.00		TESSCO List Price
88	1	N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each	\$52.50		TESSCO List Price
89	1	Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each	\$42.61		TESSCO List Price
90	4	Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each	\$102.80		TESSCO List Price
91	1	Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each	\$23.33		TESSCO List Price
92	2	Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each	\$41.78		TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95	2	Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each	\$39.88		TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price
102	1	4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each	\$112.77		TESSCO List Price
103	1	4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each	\$43.76		TESSCO List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Vista Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1-1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109		4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each			TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$5,345.77
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111	5	VHF (136-174 MHz) NBFM Voting Reciever with - 48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each	\$67,200.70		CODAN Quotation - NASPO Pricing
112		VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each			CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$67,200.70
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT			SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION						
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-iC Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135									
Total Equipment Cost - Vista Water Tank Site							\$149,271		

NOTE 1 -

LMR Radio Equipment Installation	\$3,000.00
LMR Radio System Optimization	\$1,000.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation	\$6,000.00

NOTE 1

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Vista Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.				Equipment, Installation & Optimization Subtotal			\$10,000.00		
				Tower Structural Study			N/A		
				Permitting			N/A		
				Installation, Optimization & Permitting Total			\$10,000.00		

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each			Valmont List Price
8		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
9		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST ESTIMATE									
Entry Port, Waveguide Hangers and Associated Hardware									
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightnring Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Interconnecting Cable, Connectors, and Associated Hardware for Stand-Alone Fixed Control Stations			NO FIXED CONTROL STATIONS USED IN SYSTEM						
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNF538-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49		Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each			LaMarche Quotation (08/01/19)
50		3000 Watt 48 VDC Rectifer Module	LaMarche	DCR-50	\$ 760.00	each			LaMarche Quotation (08/01/19)

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Whitcom Dispatch Center

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
51		48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$ 14,381.00	each			C&D Technologies Budgetary Cost
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price
53		48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot			techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61									
62		6' X 6' X 104" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each			American Products Quotation
63		Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT			Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65		VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each			Telewave NASPO Price
66		VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each			Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
Transmitter Combiners & Receiver Multicouplers									
79		VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each			TX-RX Quotation (NASPO Pricing)
80		8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each			Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87		LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot			TESSCO List Price
88		N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each			TESSCO List Price
89		Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each			TESSCO List Price
90		Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each			TESSCO List Price
91		Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each			TESSCO List Price
92		Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each			TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95		Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Whitcom Dispatch Center

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price
102		4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each			TESSCO List Price
103		4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each			TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1 1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109		4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each			TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$0.00
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111		VHF (136-174 MHz) NBFM Voting Reciever with -48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each			CODAN Quotation - NASPO Pricing
112		VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each			CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$0.00
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT			SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION						
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-1C Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Whitcom Dispatch Center

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
134						each			
135									
		Total Equipment Cost - Whitcom Site					\$0		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT,
TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING
PROTECTION, AND DC POWER SYSTEMS.

LMR Radio Equipment Installation		\$0.00
LMR Radio System Optimization		\$0.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation		N/A
	Equipment, Installation & Optimization Subtotal	\$0.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$0.00

NOTE 1

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Network, Alarm & Monitoring Equipment									
1		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
2		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
3		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
4		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
5		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
6						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
7		Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microfect	UAS60	\$ 635.00	each			Valmont List Price
8		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microfect	PSA6	\$ 353.00	each			Valmont List Price
9		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microfect	P2126	\$ 65.49	each			Valmont List Price
10		Antenna Site Strut (with Mounting Hardware)	Valmont Microfect	B1061	\$ 231.00	each			Valmont List Price
11		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
12		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microfect	SP250-6	\$ 50.00	each			Valmont List Price
13									
14									
15									
16									
17									
Below are included in overall microwave system cost shown in separate microwave radio cost									
Entry Port, Waveguide Hangers and Associated Hardware			BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST SHOWN IN SEPARATE MICROWAVE RADIO COST						
18		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
19		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
20		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
21		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
22		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
23		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
24		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
25		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
26		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
27		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
28		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
29		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
30		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
31		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
32		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
33		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
34		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Interconnecting Cable, Connectors, and Associated Hardware -Stand-Alone Fixed Control Stations									
35		LCF12-50J 1/2" Foam Dielectric Cable	RFS	LCF12-50	\$ 1.13	feet			Tessco List Price
36		Type N Male Connectors for LCF12-50 Cable	RFS	NM-LCF14-070	\$ 14.46	each			Tessco List Price
37		Type N Female Connectors for LCF12-50 Cable	RFS	NF-LCF14-070	\$ 14.46	each			Tessco List Price
38		Non-Insulated Cable Hangers for LCF12-50 Cable	Wireless Solutions	WS-CLH12	\$ 11.95	lof ot 10			Tessco 427088 List Price
39		Angle Adapter Member Kit for Cable Hangers	RFS	ANGLE-CLP1	\$ 79.30	lot of 10			RFS List Price
40		Grounding Kit - 24" (610 mm) lead with factory-attached two-hole lug;; with standard weatherproofing	RFS	GKCLIP24-12 (Tessco 411076)	\$ 9.52	each			Tessco List Proce
41		3-foot 3/8" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	RFS	NMNFS38-030P1	\$ 154.80	each			Tessco List Price
42		Cold Shrink Weatherproofing Kit for LCF12-50 Cable to 3/8" Superflexible jumper - Type N Connectors	RFS	921226-002 (Tessco 458582)	\$ 15.89	each			Tessco List Price
43		Cold Shrink Weatherproofing Kit for 1/2" Foam Cable to Antenna Type N Interface	3M	CXS-2	\$ 55.35	each			Tessco 422636 List Price
44									
45									
46									
47									
48									
DC Power and Interconnection Equipment									
49		Integrated 48 VDC Power Supply/Charger System with Distribution Bus - LaMarche DCPS-200 Rectifier Shelf with 16 breakers, 4 rectifier positions, controller, LVD contactor, I/O User Interface Board, and singlet SNMP Ethernet Module. (Cost includes \$1125.88 Tarriff Surcharge)	LaMarche	DCPS-200	\$ 5,286.00	each			LaMarche Quotation (08/01/19)
50		3000 Watt 48 VDC Rectifier Module	LaMarche	DCR-50	\$ 760.00	each			LaMarche Quotation (08/01/19)
51		48 VDC Battery String (VRLA Batteries, 12-hour constant current rating: 86 Amps) [VRLA Batteries	C&D Technologies	AT-19P	\$ 14,381.00	each			C&D Technologies Budgetary Cost

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Latah County Courthouse Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
52		Newmar 13.6 VDC 40 Amp Power Integrated Power Supply System	Newmar	IPS-12-40	\$ 2,256.67	each			TESSCO List Price
53		48 VDC Battery String (190 Amp Hours - 8.25 Amps @ 24 Hour Discharge Rate)	Northstar	4 X NSB-190FT-RED	\$ 2,500.00	Lot			techbatterysolutions.com list price for Single NSB-190FT-RED (Cabling Added)
54		5 KW Propane Generator with Propane Tank Storage and Level Guages (Pre-Cast Concrete Pad and Connecting Conduit Included)	Alpha	CE-3X2-T + CE-3G	\$ 12,275.10	each			Alpha Quotation
55		Installation of 5 kW Propane Generator	Alpha	Generator Shipping & Installation	\$ 5,000.00	LOT			Estimate
56		Solar Power System - 7 kWhr CORE System with 13.6 VDC output port, AC Charger, and Solar Panel Array (plus 1-year warranty extension)	Gridless Power	Gridless CORE 7k	\$ 23,700.00	each			Gridless Power List Price Quotation
57		Installation of Solar Power System	Gridless Power	Shipping & Installation	\$ 4,250.00	LOT			Estimate
58		48 VDC Fuse Panel	Trimm	7071211001	\$ 225.68	each			Trimm List Price Quotation
59		1.5 KVA 48 VDC to 120 VAC Inverter	Unipower Telecom	SLI15 (1 RU)	\$ 4,351.00	each			Unipower Telecom Quotation
Equipment Racks and Cabinets									
60		New 100' Self-Supporting Tower with Foundation and Installation (Includes Permitting) [See Site Improvement Costs Worksheet]	N/A	N/A	\$ 129,000.00	each			Estimate
61									
62		6' X 6' X 104"" Pre-Fabricated Shelter with HVAC, Load Center, External Generator Plug-in, Cable Tray and Interior Ground System (Including WA Labor & Industries Approval) [See Site Improvement Costs Worksheet]	American Products	AMCS-7277104-STD	\$ 41,000.00	each			American Products Quotation
63		Permitting, Shipping and Installation for 6' X 6' Equipment Shelter [See Site Improvement Costs Worksheet]	American Products	Permitting, Shipping & Installation	\$ 26,000.00	LOT			Estimate
64		Cooper B-Line 45 RU Seismic-Rated Equipment Racks - Normal Depth - 19" Width	Eaton (Cooper) B-Line	SB85223084YZ	\$ 998.90	each			Vendor Price Quotation
VHF & UHF RADIO SYSTEM EQUIPMENT									
VHF/UHF MHz Antennas									
65		VHF Collinear omni antenna, 6 dBd gain, 150-157 MHz [VHF TX ANTENNA]	Telewave	ANT150F6-3	\$ 1,843.74	each			Telewave NASPO Price
66		VHF Collinear omni antenna, 6 dBd gain, 156-164 MHz [VHF RX ANTENNA]	Telewave	ANT150F6-4	\$ 1,826.34	each			Tessco List Price
67		Broadband VHF log periodic VPOL antenna - 147–174 MHz; 7.0 dBd Gain	Kathrein-Scala	CL7-150/URM	\$ 805.00	each			Kathrein-Scala List Price
68		Dual VHF Yagi antenna array; VPOL 147–174 MHz; Antennas oriented at 95° True & 275° True 5.0 dBd gain	Kathrein-Scala	2-YA7-155	\$ 2,647.00	each			Kathrein-Scala List Price
69		VHF Yagi antenna; VPOL 147–174 MHz; 6.85 dBd gain	Kathrein-Scala	YA7-155	\$ 900.00	each			Kathrein-Scala List Price
70		UHF Parabolic Reflector Antenna; 450-470 MHz; 15 dBd Gain; Horizontal Beamwidth: 18°; Vertical Beamwidth 32°	Sinclair	SV360-SF2SNM	\$ 1,780.00	each			Sinclair List Price
71									
72									
73									
74									
75									
76									
77									
78									
Transmitter Combiners & Receiver Multicouplers									
79		VHF Transmitter Combiner/Receiver Multicoupler System for Proposed VHF Simulcast System	TX-RX	74-37-20259_E	\$ 22,774.19	each			TX-RX Quotation (NASPO Pricing)
80		8-Channel Receiver Multicoupler; 138-225 MHz with 4 MHz Bandpass Preselector (155.5000-159.5000 MHz)	EMR	24108-1/P5	\$ 2,695.00	each			Talley List Price
81		100-1000 Multiband Short-Haul Control Station Combiner - 8 Channels; 32.5 dB Insertion Loss; 30 dB Minimum Isolation; 1.25:1 Maximum VSWR	TX-RX	43-05-01A	\$ 2,493.00	each			Tessco List Price
82						each			
83						each			
84						each			
85						each			
86									
Transmission Line and Related Equipment									
87		LCF78-50 7/8" Foam Dielectric Cable	RFS	LCF78-50JAA7	\$ 3.65	foot			TESSCO List Price
88		N Male Connector for LCF78-50 7/8" Coaxial Cable, OMNI FIT, O-ring sealing	RFS	NM-LCF78-D01K	\$ 52.50	each			TESSCO List Price
89		Coaxial Cable Connector for LCF78-50 7/8" Foam Dielectric, N Female, OMNI FIT, O-ring sealing	RFS	NF-LCF78D01K	\$ 42.61	each			TESSCO List Price
90		Cable hanger, non-insulated, bolt-on, stainless steel for 7/8" coaxial cable (kit of 10)	COMMSCOPE	42396A-5	\$ 25.70	each			TESSCO List Price
91		Hoisting Grip for 7/8" Coaxial Cable, Lace-Up	RFS	HOIST1-78L	\$ 23.33	each			TESSCO List Price
92		Grounding Kit - with factory-attached two-hole lug;; with standard weatherproofing - for 7/8" Foam Dielectric Cable	SABRE SITE SOLUTIONS	C20100568	\$ 20.89	each			TESSCO List Price
93		3-foot 1/2" Superflexible Foam Dielectric Jumper with Molded Type N Male Connectors	COMMSCOPE	L4A-NMNM-3-P	\$ 81.17	each			TESSCO List Price
94		Universal Weatherproofing Kit for LCF12-50 Cable to 1/2" Superflexible jumper - Type N Connectors	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
95		Universal Weatherproofing Kit for 7/8" Foam Cable to Superflexible jumper, Superflexible jumper to 7-16 DIN Antenna Connector, or Antenna/Entry Port Type N Interface	COMMSCOPE	221213	\$ 19.94	each			TESSCO List Price
96		RFS 1-1/4" Foam Dielectric Cable	RFS	UCF114-50JA	\$ 7.69	foot			TESSCO List Price
97		Coaxial Cable Connector for UCF114-50JA 1-1/4" Foam Dielectric, Radiating, N Male, RAPID FIT, O-ring sealing	RFS	15586055	\$ 132.75	each			TESSCO List Price
98		Coaxial Cable Connector for UCF114-50JA-50A 1-1/4" Foam Dielectric, Radiating, N Female, RAPID FIT, O-ring sealing	RFS	NF-LCF114-D01	\$ 132.75	each			TESSCO List Price
99		Cable hanger, non-insulated, bolt-on, stainless steel for 1 1/4" coaxial cable (kit of 10)	RFS	RSB-114	\$ 12.37	each			TESSCO List Price
100		Angle Adapter Member Kit for Cable Hangers (Kit of 10)	RFS	ANGLE-CLPI	\$ 75.01	each			TESSCO List Price
101		Universal Grounding Kit - 5' lead with factory-attached two-hole lug;; with standard weatherproofing fpr 1-1/4" Foam Dielectric Cable	COMMSCOPE	252172	\$ 19.71	each			RFS List Price

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Latah County Courthouse Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
102		4-foot 1/2" Superflexible Foam Dielectric Jumper with Type N Male Connector and 7-16 DIN Male Connector	Commscope	L4A-NMDM-4-P-SGW	\$ 112.77	each			TESSCO List Price
103		4" Entry Port Boot for 1-1/4" coaxial cable	RFS	BOOT4-114-1	\$ 43.76	each			TESSCO List Price
104		Hoisting Grip for 1 1/4" Coaxial Cable, Lace-Up	COMMSCOPE	L6SGRIP	\$ 31.80	each			RFS List Price
105		Polyphaser 125-1000 MHz 375 Watt Bulkhead Mount Surge Arrestor with Type N Female Connectors (DC-Block)	Polyphaser	IS-B50LN-C2	\$ 77.43	each			TESSCO List Price
106		Polyphaser Bulkhead Mount 400-1200 MHz Surge Arrestor with Type N Female Connectors (15 VDC DC-Pass for sites with Tower Top Preamplifiers)	Polyphaser	CGXZ+15NFNF-A	\$ 117.82	each			SOLID SIGNAL Online Price
107		7-16 DIN Female Connector for LCF78-50 7/8" Foam Coaxial Cable	RFS	716F-LCF78-D01K	\$ 33.72	each			TESSCO List Price
108		7-16 DIN Female Connector for LCFS114-50JA 1-1/4" Foam Coaxial Cable	RFS	716F-LCF114-D01K	\$ 102.37	each			TESSCO List Price
109		4" Entry Port Boot for 7/8" coaxial cable	Sabre Site Solutions	C20100033	\$ 20.40	each			TESSCO List Price
Cobminer & Antenna System Equipment Cost Subtotal									\$0.00
BASE STATION/REPEATER EQUIPMENT									
110		UHF (450-470 MHz) NBFM Drop-Link Half-Duplex Base Station with 13.6 VDC Power Supply; 600 Ohm Audio Interface, 4-Wire E&M Control; 30 Watts TPO	CODAN	MT-4E SERIES		each			CODAN Quotation - NASPO Pricing
111		VHF (136-174 MHz) NBFM Voting Reciever with -48 VDC Power Supply; Ethernet Interface, GPS, Simulcast, Alarm & Monitoring System, Receiver Voting Systems and Console Gateway Included (Voting Receivers assumed to be 25% of total system cost.)	CODAN	CASCADE SERIES	\$ 13,440.14	each			CODAN Quotation - NASPO Pricing
112		VHF (136-174 MHz) NBFM Base Station Repeater with -48 VDC Power Supply; Ethernet Interface, Alarm & Monitoring System, GPS, Simulcast and Receiver Voting Systems, and Console Gateway Included. (Base Station Repeaters assumed to be 75% of total system cost.)	CODAN	CASCADE SERIES	\$ 40,320.42	each			CODAN Quotation - NASPO Pricing
113		System Spares	CODAN	RADIO SYSTEM SPARES	\$ 186,286.00	LUMP SUM			CODAN Quotation - NASPO Pricing
114		Implementation Services - Program Management, System Design, Staging, Acceptance testing, Site Surveys	CODAN	SERVICES	\$ 73,152.00	LUMP SUM			CODAN Quotation - NASPO Pricing
115		NOTE: BASE STATION & SIMULCAST SYSTEM COSTS SHOWN IN THIS SECTION INCLUDE ALL COSTS FOR ALARM AND MONITORING SYSTEM, SIMULCAST TIMING SYSTEMS, SITE CONTROLLERS AND MASTER CONTROLLER/SERVER, RACK MOUNTED DC POWER EQUIPMENT REQUIRED FOR 48 VDC OPERATION, EQUIPMENT RACKING AND TESTING AT THE FACTORY, FACTORY SUPERVISION AND SUPPORT DURING INTSTALLATION AND COMMISSIONING, AND SHIPPPING.	N/A	N/A	Included in costs shown above	each			CODAN Quotation - NASPO Pricing
116						each			
117						each			
118									
119									
120									
121									
Base Station/Repeater Equipment Subtotal									\$0.00
SIMULCAST, MUX, RX VOTING & RELATED EQUIPMENT			SIMULCAST, GPS AND RECEIVER VOTING EQUIPMENT INCLUDED IN BASE STATION						
GPS Master Oscillator and Audio/PTT Distribution									
122		Spectracom SecureSync GPS MasterOscillator 1200-413 GPS/OCXO 48/24VDC power input, and an Ethernet port with 1) 10MHz output and 1) 1PPS output + Spectracom Model 1204-1C Option Card with 3) 10MHz Outputs	Orolia-Spectracom	SecureSync 1200-413 + 1204-1C Option	\$ 5,055.00	each			Simulcast Solutions Quotation
123		Spectracom CTCSS Filter Assembly; 12 VDC Power Input	Orolia-Spectracom	1118-2	\$ 700.00	each			Simulcast Solutions Quotation
124		Selector/Distribution Amplifier; Ethernet Port; Power Inputs = 48/24 VDC & 115 VAC; 8) 10 MHz Outputs from 2) 10 MHz Inputs; 8) 1PPS outputs from 1) 1PPS Input. P240R-0032-002F DC Power Connector; MP06R-0004-0001 DC Power Connector Housing;	Orolia-Spectracom	SAS-17E	\$ 3,355.00	each			Simulcast Solutions Quotation
125		Spectracom Model 8230 GPS Antenna	Orolia-Spectracom	8230	\$ 255.00	each			Simulcast Solutions Quotation
126		Spectracom Model 8226 GPS Antenna Line Surge Suppressor	Orolia-Spectracom	8226	\$ 265.00	each			Simulcast Solutions Quotation
127		Audio/PTT Distribution Amplifier - Power Input 48 VDC	TBD	TBD	TBD	each			Simulcast Solutions Quotation
128		GPS Master Oscillator and Audio/PTT Distribution Spares	Orolia-Spectracom	1 each SecureSync; 1- each Audio DA; 1 each 8230	TBD	LOT			Simulcast Solutions Quotation
Receiver Voting Equipment									
129		Standard Voter Chassis; Rack Mount, AC/+12VDC Powered. Includes Card Cage, PSM-1A Power Supply Module, CIM-2A Console Interface Module, and CPM-3 Control Processor Module.	Raytheon	SNV-12 - 5951-800000	\$ 5,683.00	each			Simulcast Solutions Quotation
130		Site Voter Module - Up to 12 per chassis	Raytheon	SNV-12 - 5951-800000	\$ 989.00	each			Simulcast Solutions Quotation
Fiber Interconnect and Ethernet Network Equipment									
131		Latah County Courthouse - City of Moscow Fiber Network Interconnect	TBD	TBD	\$ 2,800.00	lot			Estimate
132		10/100/1000 Ethernet to Fiber Media Converter with SC Duplex Connector	SerialComm	ETH-FIBER-SM-2	\$ 130.00	each			Online Price from SerialComm.com
133		30 meter (98') Multimode Fiber Jumper with SC duplex connectors	FS.com	OM3-SC-SCDX-FS	\$ 12.75	each			Online Price from FS.com
IP Based Console Interface Equipment									
134						each			
135									

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed VHF Simulcast System
Latah County Courthouse Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Total Equipment Cost - Latah County Courthouse Site						\$0	

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT,
TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING
PROTECTION, AND DC POWER SYSTEMS.

LMR Radio Equipment Installation		\$0.00
LMR Radio System Optimization		\$0.00
LMR Antenna System, Lightning Protection and DC Backup Power Installation		N/A
	Equipment, Installation & Optimization Subtotal	\$0.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$0.00

NOTE 1

Site Lease Costs		
Site	Estimated Lease Cost (Monthly)	
Moscow Mountain	\$	2,000.00
Theophilus Tower	\$	2,000.00
KUID-TV	\$	2,000.00
Total Monthly Lease Costs	\$	6,000.00

One-Time Site Lease Setup Costs		
Site	Estimated Lease Setup Cost (One-Time)	
Moscow Mountain	N/A	
Theophilus Tower	\$	1,000.00
KUID-TV	\$	1,000.00
Total One-Time Setup Costs	\$	2,000.00

Rounding **City of Moscow Radio System Upgrade 1220**
-3 **Site Infrastructure Improvement Costs**
Tower and Equipment Shelter Costs

SELF-SUPPORTING TOWER

Item #	Description	Quantity	Unit Cost	Units	Installation	Extended Cost
1	100' Triangular Self-Supporting Tower	1	\$40,000	Each	\$30,000.00	\$70,000.00
2	Tower Foundation (Installation Costs Included)	1	\$40,000	Each	INCLUDED	\$40,000.00
3	Shipping to Latah County	1	\$2,000	Each	N/A	\$2,000.00
4	Land Use & Permitting Costs	1	\$16,700	1 LOT	N/A	\$16,700.00
5	Tower Subtotal					\$128,700.00
Rounded						\$129,000.00

Assumes "typical" soil conditions

EQUIPMENT SHELTER

Item #	Description		Unit Cost	Units	Installation	Extended Cost
1	6' x 6' PREFAB SHELTER (With AC 200 Amp Power Distribution, R65 Grounding, Redundant HVAC System, AC Surge Arrestor, XFER Switch, GEN Inlet, GEN Disconnect, Cable Ladder, Entry Port, Telco Board, ID PE Stamped Drawings)	1	\$37,000	Each	\$ 4,000	\$41,000
2	Shipping to Latah County	1	\$8,000	Each	N/A	\$8,000
3	Building Concrete Slab Design and Installation	1	\$2,800	Each	INCLUDED	\$2,800
4	Crane Offload (1 Offload Assumed)	1	\$7,000	Each	N/A	\$7,000
5	Land Use & Permitting Costs	1	\$8,200	1 LOT	N/A	\$8,200
6	Equipment Shelter Subtotal					\$67,000

Land Use and Permitting Cost Summary

The following processes will need to be undertaken for each site (estimated costs for each process are included with the process descriptions):

Lease [New Towers and New Equipment Shelters]

This will require some coordination with Lewis County and the permitting specialist on the consultant team, as it will be a required part of the paperwork for the land use application portion of the process.

\$1,200

FCC Tower Construction Notification System (TCNS) [New Towers Only]

This system is part of the FCC’s process to comply with the National Historical Preservation Act (NHP). This system is used to notify tribes of tower construction and provides them an opportunity to comment on the proposed tower facility.

\$800

National Historic Preservation Act, Section 106 [New Towers Only}

This is the process that is required to be followed as part of the tower construction process. This is normally referred to as a “Section 106.” The process requires coordination and review by the State of Washington’s Office of Historic Preservation (SHPO).

\$5,200

National Environmental Policy Act (NEPA) [New Towers Only]

A tower specific NEPA checklist needs to be completed for the proposed tower site.

\$2,500

Local Permitting Process [New Towers and Equipment Shelters]

In the case of Latah County and in the case of each municipality included within the County, an application for land use approval is necessary. This process is likely to require a Conditional Use Permit (“CUP”), which requires the submittal various documents outlining the type of tower proposed and describes the necessary site improvements, and may require a hearing. This process also includes filing an application for a building permit and other construction permits to construct the tower.

\$7,000

Caveats:

- Assumes no cultural survey becomes required during the TCNS process.
- Does not include travel to Lewis County required for hearings or charges for hearing attendance.
- Assumes others will take the required compass photos at the proposed site (8 photos minimum - directions: N, NE, E, SE, S, SW, W, NW) for Section 106 documentation.
- Assumes that there will be no costs to obtain required SHPO information for Section 106 (on historic properties, artifacts, and historic structures – typical historical preservation information likely available through Washington’s SHPO’s data base).
- Assumes no legal expenses regarding the development of the lease.
- Assumes no costs to obtain habitat information for the NEPA checklist review

Building Permit [Existing Towers and Equipment Shelters]

A Building Permit is Required in Latah County to install new antennas on existing towers or antenna support structures or to install new equipment in an existing shelter.

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed Microwave Interconnect System (ODU600)
Equipment and Cost Summary Sheet (Summary)

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$178,797.00	Lump Sum	\$178,797.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$137,467.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
Microwave Link Antennas									
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$159.00	each			Aviat NASPO pricing
31		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$159.00				Aviat NASPO pricing
32		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL	\$79.00	each			Aviat NASPO pricing
33									
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and ODU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	13	Universal Adjustable Slope Standoff Pipe Mount - 4- 1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$635.00	each	\$8,255.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$50.00	each			Valmont List Price
46									
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Entry Port, Waveguide Hangers and Associated Hardware									
			NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$215.00	foot			Aviat NASPO pricing

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed Microwave Interconnect System (ODU600)
Equipment and Cost Summary Sheet (Summary)

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$17.00	each			Aviat NASPO pricing
							Total Equipment Cost (All Sites)	\$	187,052
							Sum of Site Totals (Cross Check)	\$	187,052
							Total Rounded to next highest \$10,000	\$	190,000

MW Radio Equipment Installation	\$	39,000	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization	\$	13,000	
MW Antenna System and Lightning Protection Installation			INCLUDED IN VHF RADIO COST ESTIMATE
Equipment, Installation & Optimization Subtotal	\$	52,000	
Tower Structural Studies			INCLUDED IN VHF RADIO COST ESTIMATE
Permitting			
One-Time Tower Site Lease Setup Costs	\$	-	
Installation, Optimization & Permitting Total	\$	52,000	
Rounded	\$	52,000	

SYSTEM SUPPORT & SOFT COSTS				
1		Mobilization	1.5%	Based on Radio Equipment Cost Only \$2,400
2		Field Testing	3.0%	Included in LMR Radio System Optimization
3		Shipping	2.0%	Included In Radio Equipment Costs
4		Documentation	1.5%	New Radio Installs Only \$2,400
5		Training		
6		Idaho State Sales Tax	6.0%	Latah County Rate \$11,200
7		MW System Installation Contractor Project Management	5.0%	\$8,100
System Support & Soft Costs Total				\$24,100

NOTE 1 -

INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS		
Consultant Task (H&D)	Cost	
FCC Licensing		Provided by MW Equipment Vendor (OPTIONAL)
RFP Development		Included in VHF Radio System Cost Estimate
Procurement Assistance & Vendor Selection		Included in VHF Radio System Cost Estimate
Assistance with Site Acquisition & Permitting		Included in VHF Radio System Cost Estimate
MW System Project Management & Installation Supervision	\$9,600	
MW System Supervision of Acceptance Testing	\$5,750	
Consultant Cost Total	\$15,350	

Total Estimate \$ 278,502.00

Total Rounded to next highest \$10,000 \$ 280,000.00

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed Microwave Interconnect System (ODU600)
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 28,800.00	Lump Sum	\$28,800.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 21,404.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
		Microwave Link Antennas							
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	2	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$1,270.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed Microwave Interconnect System (ODU600)
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Moscow Mountain Site							\$30,070		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$6,000.00
MW Radio System Optimization		\$2,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$8,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$8,000.00

INCLUDED IN MW RADIO EQUIPMENT
INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 52,340.00	Lump Sum	\$52,340.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8									
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 39,966.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	5	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microfect	UAS60	\$ 635.00	each	\$3,175.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microfect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microfect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microfect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microfect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8") (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Theophilus TowerSite							\$55,515		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$15,000.00
MW Radio System Optimization		\$5,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$20,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$20,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 16,978.00	Lump Sum	\$16,978.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 10,870.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12VSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	2	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$1,270.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
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48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - KUID-TV Site							\$18,248		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$6,000.00
MW Radio System Optimization		\$2,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$8,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$8,000.00

INCLUDED IN MW RADIO EQUIPMENT
INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 12,946.00	Lump Sum	\$12,946.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,592.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
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19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - NW Water Tank Site							\$13,581.00		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$4,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$4,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE
INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 14,788.00	Lump Sum	\$14,788.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,633.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
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24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
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49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Vista Water Tank Site							\$15,423		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization		\$1,000.00	
MW Antenna System and Lightning Protection Installation		\$0.00	INCLUDED IN VHF RADIO COST ESTIMATE
	Equipment, Installation & Optimization Subtotal	\$4,000.00	
Tower Structural Study		N/A	INCLUDED IN VHF RADIO COST ESTIMATE
Permitting		N/A	
Installation, Optimization & Permitting Total		\$4,000.00	

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed Microwave Interconnect System (ODU600)
Whitcom Dispatch Center

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 14,837.00	Lump Sum	\$14,837.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 10,534.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
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27						each			
		Microwave Link Antennas	NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12VSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflex	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflex	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflex	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflex	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflex	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Whitcom Site							\$15,472		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$4,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$4,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE
INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 13,226.00	Lump Sum	\$13,226.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,871.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
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14						each			
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26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$803.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$1,046.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$159.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL	\$79.00				Aviat NASPO pricing
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12VSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflex	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflex	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflex	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflex	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflex	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Latah County Courthouse Site							\$13,861		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$4,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$4,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$178,797.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$137,467.00	Lump Sum	\$137,467.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
Microwave Link Antennas									
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$159.00	each			Aviat NASPO pricing
31		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$159.00				Aviat NASPO pricing
32		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL	\$79.00	each			Aviat NASPO pricing
33									
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and ODU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	13	Universal Adjustable Slope Standoff Pipe Mount - 4- 1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$635.00	each	\$8,255.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$50.00	each			Valmont List Price
46									
47									
48									
49									
50									
Entry Port, Waveguide Hangers and Associated Hardware									
			NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$215.00	foot			Aviat NASPO pricing

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
Equipment and Cost Summary Sheet (Summary)

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$17.00	each			Aviat NASPO pricing
							Total Equipment Cost (All Sites)	\$	145,722
							Sum of Site Totals (Cross Check)	\$	145,722
							Total Rounded to next highest \$10,000	\$	150,000

MW Radio Equipment Installation	\$	27,000	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization	\$	13,000	
MW Antenna System and Lightning Protection Installation			INCLUDED IN VHF RADIO COST ESTIMATE
Equipment, Installation & Optimization Subtotal	\$	40,000	
Tower Structural Studies			INCLUDED IN VHF RADIO COST ESTIMATE
Permitting			
One-Time Tower Site Lease Setup Costs	\$	-	
Installation, Optimization & Permitting Total	\$	40,000	
Rounded	\$	40,000	

SYSTEM SUPPORT & SOFT COSTS				
1		Mobilization	1.5%	Based on Radio Equipment Cost Only \$1,800
2		Field Testing	3.0%	Included in LMR Radio System Optimization
3		Shipping	2.0%	Included In Radio Equipment Costs
4		Documentation	1.5%	New Radio Installs Only \$1,800
5		Training		
6		Idaho State Sales Tax	6.0%	Latah County Rate \$8,700
7		MW System Installation Contractor Project Management	5.0%	\$6,000
System Support & Soft Costs Total				\$18,300

NOTE 1 -

INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS		
Consultant Task (H&D)	Cost	
FCC Licensing		Provided by MW Equipment Vendor (OPTIONAL)
RFP Development		Included in VHF Radio System Cost Estimate
Procurement Assistance & Vendor Selection		Included in VHF Radio System Cost Estimate
Assistance with Site Acquisition & Permitting		Included in VHF Radio System Cost Estimate
MW System Project Management & Installation Supervision	\$9,600	
MW System Supervision of Acceptance Testing	\$5,750	
Consultant Cost Total	\$15,350	

Total Estimate \$ 219,372.00

Total Rounded to next highest \$10,000 \$ 220,000.00

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 28,800.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 21,404.00	Lump Sum	\$21,404.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
		Microwave Link Antennas							
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	2	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$1,270.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Moscow Mountain Site							\$22,674		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$4,000.00
MW Radio System Optimization		\$2,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$6,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$6,000.00

INCLUDED IN MW RADIO EQUIPMENT
INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 52,340.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8									
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 39,966.00	Lump Sum	\$39,966.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
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24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	5	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microfect	UAS60	\$ 635.00	each	\$3,175.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microfect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microfect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microfect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microfect	SP250-6	\$ 50.00	each			Valmont List Price
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47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8") (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Theophilus TowerSite							\$43,141		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$10,000.00
MW Radio System Optimization		\$5,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$15,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$15,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 16,978.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 10,870.00	Lump Sum	\$10,870.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
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26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12VSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	2	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$1,270.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - KUID-TV Site							\$12,140		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$4,000.00
MW Radio System Optimization		\$2,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$6,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$6,000.00

INCLUDED IN MW RADIO EQUIPMENT
INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
NW Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 12,946.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,592.00	Lump Sum	\$9,592.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
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27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
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City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
NW Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - NW Water Tank Site							\$10,227.00		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$2,000.00	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization		\$1,000.00	
MW Antenna System and Lightning Protection Installation		\$0.00	INCLUDED IN VHF RADIO COST ESTIMATE
	Equipment, Installation & Optimization Subtotal	\$3,000.00	
Tower Structural Study		N/A	INCLUDED IN VHF RADIO COST ESTIMATE
Permitting		N/A	
Installation, Optimization & Permitting Total		\$3,000.00	

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 14,788.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,633.00	Lump Sum	\$9,633.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
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27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
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City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
Vista Water Tank Voting Receiver Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Vista Water Tank Site							\$10,268		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$2,000.00	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization		\$1,000.00	
MW Antenna System and Lightning Protection Installation		\$0.00	INCLUDED IN VHF RADIO COST ESTIMATE
	Equipment, Installation & Optimization Subtotal	\$3,000.00	
Tower Structural Study		N/A	INCLUDED IN VHF RADIO COST ESTIMATE
Permitting		N/A	
Installation, Optimization & Permitting Total		\$3,000.00	

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 14,837.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 10,534.00	Lump Sum	\$10,534.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
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27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
		Microwave Link Antennas							
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Whitcom Site							\$11,169		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$2,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$3,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$3,000.00

INCLUDED IN MW RADIO EQUIPMENT
INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed WTM 4100 Microwave Interconnect System
Latah County Courthouse Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6		ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 13,226.00	Lump Sum			Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10	1	WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,871.00	Lump Sum	\$9,871.00		Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
		Microwave Link Antennas	NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$803.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$1,046.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$159.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL	\$79.00				Aviat NASPO pricing
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
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50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Latah County Courthouse Site							\$10,506		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$4,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$4,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$124,898.00	Lump Sum	\$124,898.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$118,242.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
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24						each			
25						each			
26						each			
27						each			
Microwave Link Antennas			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$159.00	each			Aviat NASPO pricing
31		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$159.00				Aviat NASPO pricing
32		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL	\$79.00	each			Aviat NASPO pricing
33									
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5; Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and ODU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	11	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$635.00	each	\$6,985.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$50.00	each			Valmont List Price
46									
47									
48									
49									
50									
Entry Port, Waveguide Hangers and Associated Hardware			NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8") (VAPC-01-0001)	Aviat	2940-04-00-01	\$10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$17.00	each			Aviat NASPO pricing
Total Equipment Cost (All Sites)							\$	131,883	
Sum of Site Totals (Cross Check)							\$	131,883	
Total Rounded to next highest \$10,000							\$	140,000	

MW Radio Equipment Installation	\$	33,000	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization	\$	11,000	
MW Antenna System and Lightning Protection Installation			INCLUDED IN VHF RADIO COST ESTIMATE
Equipment, Installation & Optimization Subtotal	\$	44,000	
Tower Structural Studies			INCLUDED IN VHF RADIO COST ESTIMATE
Permitting			
One-Time Tower Site Lease Setup Costs	\$	-	
Installation, Optimization & Permitting Total	\$	44,000	
Rounded	\$	44,000	

SYSTEM SUPPORT & SOFT COSTS					
1		Mobilization	1.5%	Based on Radio Equipment Cost Only	\$1,600
2		Field Testing	3.0%	Included in LMR Radio System Optimization	
3		Shipping	2.0%	Included In Radio Equipment Costs	
4		Documentation	1.5%	New Radio Installs Only	\$1,600
5		Training			
6		Idaho State Sales Tax	6.0%	Latah County Rate	\$7,900
7		MW System Installation Contractor Project Management	5.0%		\$5,300
System Support & Soft Costs Total					\$16,400

NOTE 1 -

INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

CONSULTING ENGINEERING AND CONSULTANT SUPPORT COSTS	
Consultant Task (H&D)	Cost
FCC Licensing	
RFP Development	
Procurement Assistance & Vendor Selection	
Assistance with Site Acquisition & Permitting	
MW System Project Management & Installation Supervision	\$9,600
MW System Supervision of Acceptance Testing	\$5,750
Consultant Cost Total	\$15,350

Provided by MW Equipment Vendor (OPTIONAL)
Included in VHF Radio System Cost Estimate
Included in VHF Radio System Cost Estimate
Included in VHF Radio System Cost Estimate

Total Estimate \$ 207,633.00
Total Rounded to next highest \$10,000 \$ 210,000.00

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed ODU 600 Microwave Interconnect System with CTR8540 MPLS Router
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 29,399.00	Lump Sum	\$29,399.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 21,404.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
21						each			
22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
		Microwave Link Antennas	NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	2	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$1,270.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price</

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed ODU 600 Microwave Interconnect System with CTR8540 MPLS Router
Moscow Mountain Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Moscow Mountain Site							\$30,669		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$6,000.00
MW Radio System Optimization		\$2,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$8,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$8,000.00

INCLUDED IN MW RADIO EQUIPMENT
INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 27,806.00	Lump Sum	\$27,806.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8									
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 39,966.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
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22						each			
23						each			
24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	5	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microfect	UAS60	\$ 635.00	each	\$3,175.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microfect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microfect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microfect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microfect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
48									
49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8") (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Theophilus TowerSite							\$30,981		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$15,000.00
MW Radio System Optimization		\$5,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$20,000.00
Tower Structural Study		\$0.00
Permitting		\$0.00
Installation, Optimization & Permitting Total		\$20,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE

INCLUDED IN VHF RADIO COST ESTIMATE

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 16,507.00	Lump Sum	\$16,507.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 10,870.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
14						each			
15						each			
16						each			
17						each			
18						each			
19						each			
20						each			
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24						each			
25						each			
26						each			
27						each			
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL					
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12VSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	2	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$1,270.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
47									
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49									
50									

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - KUID-TV Site							\$17,777		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$6,000.00	INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS
MW Radio System Optimization		\$2,000.00	
MW Antenna System and Lightning Protection Installation		\$0.00	
	Equipment, Installation & Optimization Subtotal	\$8,000.00	INCLUDED IN VHF RADIO COST ESTIMATE
Tower Structural Study		\$0.00	
Permitting		\$0.00	
Installation, Optimization & Permitting Total		\$8,000.00	

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed ODU 600 Microwave Interconnect System with CTR8540 MPLS Router
Whitcom Dispatch Center

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source	
Microwave Radios And Associated Equipment										
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation	
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation	
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price	
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price	
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price	
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 16,541.00	Lump Sum	\$16,541.00		Aviat NASPO pricing	
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing	
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing	
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing	
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 10,534.00	Lump Sum			Aviat NASPO pricing	
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing	
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing	
13						each				
14						each				
15						each				
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27						each				
			NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
		Microwave Link Antennas								
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$ 792.00	each			Aviat NASPO pricing	
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$ 1,031.00	each			Aviat NASPO pricing	
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$ 159.00	each			Aviat NASPO pricing	
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$ 79.00	each			Aviat NASPO pricing	
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL						
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE								
Network, Alarm & Monitoring Equipment										
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com	
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price	
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)	
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)	
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)	
39						each				
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]										
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price	
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price	
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price	
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price	
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price	
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price	
46										
47										
48										
49										
50										

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Whitcom Site							\$17,176		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
	Equipment, Installation & Optimization Subtotal	\$4,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$4,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE
INCLUDED IN VHF RADIO COST ESTIMATE

City of Moscow Radio System Upgrade 1220
Site Equipment List with Estimated Costs - Proposed ODU 600 Microwave Interconnect System with CTR8540 MPLS Router
Latah County Courthouse Site

Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
Microwave Radios And Associated Equipment									
1		Puregas P208W Dehydrator - 48 VDC	Puregas	P208W	\$ 4,300.00	each			Online Price Quotation
2		Dehydrator 20-70 VDC; 0.1-7.5 PSI, programmable; IP interface	ATI	ADH Netcom DC	\$ 4,525.00	each			Online Price Quotation
3		High Pressure Gas Distribution Manifold, 0-15 psi, 2 port; Includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing.	RFS	GDM-2	\$ 294.03	each			Tessco List Price
4		High Pressure Gas Distribution Manifold, 0-15 psi, 8 port; includes 1/8" FPT input, manifold block & release valve. 0-15 PSIG gauge,15' 3/8" tubing per outlet.	RFS	GDM-8	\$ 399.44	each			Tessco List Price
5		Talley wallmount kit - 18.5" Wide By 19.25", MT050/MT/XT300 Wall Shelf	Talley	AE01D-D1658-100	\$ 162.00	each			Talley List Price
6	1	ODU 600 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (RF link test services; configuration engineering/documentation/drafting; network/system engineering; program management.	Aviat	ODU 600 SYSTEM	\$ 15,398.00	Lump Sum	\$15,398.00		Aviat NASPO pricing
7		Eclipse: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-ECLIPSE-VILT-B	\$ 13,000.00	each			Aviat NASPO pricing
8		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
9		84" four-post rack, 19 in. mounting, aluminum finish.	Chatsworth			each			Aviat NASPO pricing
10		WTM 4100 Microwave Radio (7 paths), including split (indoor/outdoor) system radio equipment, spares, coaxial cables and accessories, antennas, spares and services (WTM preload license service; configuration engineering/documentation/drafting; network/system engineering; program management;	Aviat	WTM4100 SYSTEM	\$ 9,871.00	Lump Sum			Aviat NASPO pricing
11		WTM 4000: Installation, Operation, and Maintenance – Virtual Instructor led Training – 10 Students Max (OPTIONAL)	Aviat	TRN-WTM4K-VILT-B	\$ 9,250.00	each			Aviat NASPO pricing
12		FCC Frequency Coordination and Licensing (OPTIONAL)	Aviat	SVCS-PN-EN-XE-LA	\$ 13,727.00	each			Aviat NASPO pricing
13						each			
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27						each			
		Microwave Link Antennas	NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
28		Antenna, 10/11 GHz, 0.9m (3ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SC3-W100BGT1R)	Radio Frequency Systems	RFS-SC3-W100XGT1R	\$803.00	each			Aviat NASPO pricing
29		Antenna, 10/11 GHz, 1.2m (4ft), Compact Line, UHP (GT1- Rectangular Interface), Direct Mount, Parabolic (Std: White), 10.000-11.700 GHz, Radome (Std: White), Single Pol., Class III/FCC101A, Single Piece Reflector (SB4-W100EGT1R)	Radio Frequency Systems	RFS-SB4-W100XGT1R	\$1,046.00	each			Aviat NASPO pricing
30		Side Strut for 3ft Antenna (SMA-SK-3)	Radio Frequency Systems	RFS-SMA-SK-3	\$159.00	each			Aviat NASPO pricing
32		Side Strut for 4ft Antenna (SMA-SK-4)	Radio Frequency Systems	RFS-SMA-SK-4	\$159.00	each			Aviat NASPO pricing
		Side Strut Connecting Kit for 3-4ft Antennas (SMA-SKO-UNIVERSAL)	Radio Frequency Systems	RFS-SMASKOUNIVERSL	\$79.00				Aviat NASPO pricing
		NOTE: ANTENNA COSTS INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE							
Network, Alarm & Monitoring Equipment									
34		Industrial 8-Port 10/100 Fast Ethernet Switch; 48 VDC Input Power; Mounting Bracket	Stride	SE2-SW8U-T	\$ 150.00	each			Online Price from AutomationDirect.com
35		Ethernet Wireline Extender with Power Supply	Westerno	DDW142	\$ 1,500.00	each			Industrial Networking Solutions List Price
36		NetGuardian 832G5, Dual -48V & NIC, Tmp/Batt, 12vSP, RoHS, RTC - Alarm Collector System with DPS Temperature Sensor Node	DPS Telecom	D-PK-NETG5-12222.00001 + D-PK-DSNSR-12001.00101	\$ 4,551.00	each			DPS Telecom Quotation (12/6/2019)
37		Hinged WW back plane for NetGuardian 864 G5, white,19inch	DPS Telecom	D-PK-NGPAN-12021.00001	\$ 359.00	each			DPS Telecom Quotation (12/6/2019)
38		TMON 64 Alarm Management System with SNMP Trap Processor Software Module	DPS Telecom	D-PK-SLMX2-12100.00002 + D-SK-490-10A-00	\$ 28,108.00	each			DPS Telecom Quotation (12/6/2019)
39						each			
Antenna and RFU Mounting Hardware [TOWER MOUNTING HARDWARE SHOWN IN THIS SPREADSHEET IS FOR COST ESTIMATE PURPOSES ONLY. FIELD VERIFICATION OF ACTUAL TOWER LEG DIMENSIONS IS REQUIRED BEFORE ORDERING ANTENNA MOUNTING HARDWARE!]									
40	1	Universal Adjustable Slope Standoff Pipe Mount - 4-1/2" x 60" (For Microwave Dish Antennas)	Valmont Microflect	UAS60	\$ 635.00	each	\$635.00		Valmont List Price
41		6-foot Universal Antenna Standoff - Omni and Panel Antenna Mounting)	Valmont Microflect	PSA6	\$ 353.00	each			Valmont List Price
42		126" X 2-3/8" Diameter Antenna Mounting Pipe for 6-foot Universal Standoff	Valmont Microflect	P2126	\$ 65.49	each			Valmont List Price
43		Antenna Site Strut (with Mounting Hardware)	Valmont Microflect	B1061	\$ 231.00	each			Valmont List Price
44		Outboard Side Strut for 8', 10' and 12' microwave Dishes	Commscope	520570-2	\$ 430.00	each			Talley List Price
45		Two Cantilever Wall Mounts w/U-Bolts	Valmont Microflect	SP250-6	\$ 50.00	each			Valmont List Price
46									
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Equipment Item Number	Quantity	Description	Manufacturer	Part Number	Unit Cost	Units	Extended Cost		Cost Estimate Source
		Entry Port, Waveguide Hangers and Associated Hardware	NOTE: CABLES AND HARDWARE SHOWN BELOW ARE INCLUDED IN OVERALL MICROWAVE SYSTEM COST ABOVE						
51		WTM 4000 PoE Cable, CAT 6, 22AWG, 75m, Pre-terminated with RJ-45, Gland Pre-fitted (C45593-A567-A100)	Aviat	037-579724-075	\$ 114.00	each			Aviat NASPO pricing
52		Outdoor GbE, PoE++ Data Line Surge Protector (ALPU-F140)	Aviat	074-310011-001	\$ 145.00	each			Aviat NASPO pricing
53		Connector, Shielded, RJ-45	Aviat	039-020096-721	\$ 1.00	each			Aviat NASPO pricing
54		PoE Injector, 112W, 40 to 72VDC, power cord not included	Aviat	045-310107-001	\$ 215.00	foot			Aviat NASPO pricing
55		PoE Injector, 112 W 100 to 240 VAC, power cord not included	Aviat	045-310105-001	\$ 195.00	each			Aviat NASPO pricing
56		Power Cord, IEC 60320-C13 to North America plug, 2-2.5 m (6.5-8') (VAPC-01-0001)	Aviat	2940-04-00-01	\$ 10.00	each			Aviat NASPO pricing
57		Mini Click-on Hangers for 6-8 MM Cable (68MCLICK), kit of 10	Aviat	AND-68MCLICK	\$ 26.00	each			Aviat NASPO pricing
58		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 43.00	each			Aviat NASPO pricing
59		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 29.00	each			Aviat NASPO pricing
60		Cable, ODU, 9913, with Conn/Ground Kit, 75 m, CNT400 CCAL type (STXC400-GKWT-75)	Aviat	037-579311-075	\$ 199.00	each			Aviat NASPO pricing
61		Hoisting Grip for 3/8" CNT-400 Coaxial Cable (C2SGRIP)	Aviat	AND-C2SGRIP	\$ 13.00	each			Aviat NASPO pricing
62		Miniature Click-On Hanger for 9-12 mm diameter cable (BHD-38), kit of 10	Aviat	179-530160-007	\$ 12.00	each			Aviat NASPO pricing
63		Angle Adapter, SS, for mini Click-On Hangers (294572), kit of 10	Aviat	179-530160-005	\$ 38.00	each			Aviat NASPO pricing
64		Hardware Kit, Single Stack, SS, for mini Click-on Hangers (252027-10KT-P), kit of 10	Aviat	AND-252027-10KT-P	\$ 26.00	each			Aviat NASPO pricing
65		Lightning Arrestor Kit, Universal, 50 hm, type N, Female to Female (108-1118B-B-KIT)	Aviat	179-530062-001	\$ 38.00	each			Aviat NASPO pricing
66		Type N Male Crimp Connector (172102H243)	Aviat	840-600202-001	\$ 8.00	each			Aviat NASPO pricing
67		Rubber Boot Assembly Kit, 4", with 4 3/8" holes insert (BALR44)	Aviat	179-530160-004	\$ 17.00	each			Aviat NASPO pricing
Total Equipment Cost - Latah County Courthouse Site							\$16,033		

NOTE 1 -
INCLUDES TRANSMITTER/RECEIVER COMBINING EQUIPMENT, TRANSMISSION LINE AND ANTENNA SYSTEMS, LIGHTNING PROTECTION, AND DC POWER SYSTEMS.

MW Radio Equipment Installation		\$3,000.00
MW Radio System Optimization		\$1,000.00
MW Antenna System and Lightning Protection Installation		\$0.00
Equipment, Installation & Optimization Subtotal		\$4,000.00
Tower Structural Study		N/A
Permitting		N/A
Installation, Optimization & Permitting Total		\$4,000.00

INCLUDED IN MW RADIO EQUIPMENT INSTALLATION COSTS

INCLUDED IN VHF RADIO COST ESTIMATE
INCLUDED IN VHF RADIO COST ESTIMATE

APPENDIX 7 - SUBSCRIBER EQUIPMENT & SYSTEM MAINTENANCE REQUIREMENTS AND P25 COMPLIANCE ANALYSIS & COSTS

1 Introduction

This Appendix contains recommendations with respect to the minimum standard subscriber unit equipment first responders in the City of Moscow should be using to maximize use of the radio system Infrastructure for the next ten (10) years and to provide reliable day-to-day communications over the radio system infrastructure. It also contains recommendations for the proper configuration and maintenance of system infrastructure and subscriber radio equipment.

2 Minimum Requirements for Subscriber Equipment

Modern public safety grade portable radios provide long-term reliable operation (when properly maintained as described elsewhere in this report), comply with standards that define both ruggedness and resistance to intrusion by dirt, dust and water, and provide features that enable efficient operation on a multi-site simulcast VHF conventional radio system such as the system described in the main body of this Systems Alternatives Report.

In addition to these general requirements, the Fire service has additional requirements for radios used for fireground operations that allow the radios to function well in wet and potentially hazardous locations typically encountered as part of firefighting. These radios should be fully immersible and rated as “intrinsically safe” to allow their use in circumstances where flammable and/or explosive gases may be encountered.

Portable and mobile radios used on the proposed new system must be capable of being programmed with multiple “zones” or groups of channels to allow for a smooth migration from the existing system to the new system, to allow for different programming templates for different user groups on the new system and to allow for the inclusion of channels from other agencies for interoperability. Public safety grade radios typically come with a minimum of 512 channels and 128 zones, though the actual channel and zone capacity varies from manufacturer to manufacturer. All of the portable radios listed in the table attached to this Appendix are equipped with a suitable channel and zone capacity.

For long-term reliability and “survivability” portable radios should be public safety grade, and should meet the following MIL-STD-810C/D/E/F requirements:

- Low Pressure 500.5/ I, II
- High Temperature 501.5/ I, II
- Low Temperature 502.5/ I, II
- Temp. Shock 503.5/ I
- Solar Radiation 505.5/ I
- Rain 506.5/ I, III
- Humidity 507.5/ II
- Salt Fog 509.5
- Dust 510.5/ I
- Vibration 514.6/ I
- Immersion 512.5/I
- Shock 516.6/I, IV

Portables should also be able to survive a 1-meter drop to a concrete surface (per TIA-603-C). Portable radios should also comply with International Protection Standards IP54 (minimum) for dust and water intrusion and IP66 (minimum; IP67 preferred) for immersion.

The source of funding for user agency subscriber radios also has an impact on both subscriber and base station radio requirements. In general, federal grants that fund the purchase of radio subscriber units or base station equipment require the equipment to be “P25 compliant”, which limits the range of appropriate subscriber radios to those that can meet these requirements.

All of the portable and mobile radios listed in the table attached to this Appendix have been certified as “P25 CAP Compliant”. An analysis of these requirements is shown below in the next section of this report

A particular advantage of using “P25 CAP Compliant” mobile and portable radios (described below in this report) is the enhancement of interoperability with agencies and radio systems in neighboring jurisdictions and/or in more distant mutual aid operations such as wildland fires. A VHF radio which is “P25 Compliant” can be easily programmed to operate on a VHF P25 system in another jurisdiction even as the City of Moscow public safety radio system continues to operate in narrowband analog mode.

The portable and mobile radios listed in the table titled “P25 CAP Compliant Equipment” (attached to this Appendix) are all public safety grade radios, so they all comply with the standards and requirements listed above. Therefore, any of these radios will provide long-term reliable operation on the City of Moscow system infrastructure, provided that they are properly maintained.

3 Proper Configuration and use of Portable and Mobile Radios

All land mobile radio systems are made up of two major “sub-systems”: the fixed system infrastructure (base station sites and voting receiver sites) and the mobile subscriber units (mobile and portable radios). In order for the entire system to function properly, both “sub-systems” need to be properly configured, maintained and optimized. It is not uncommon to attribute coverage and performance issues to the system infrastructure in cases where the actual cause of the inadequate performance of the overall system is related to inadequate performance of the mobile and portable radios, either because they have not been properly configured or because they have not been properly maintained.

Portable radios should have a minimum transmitter output power of 5 Watts (36.99 dBm), which is the standard output power listed for nearly all of the radios shown in the pricing spreadsheets below. The one exception is ICOM F9011 portable radio series, which has a maximum output power of 6 Watts. The difference between 5 Watts and 6 Watts is only 0.79 dB, so there is essentially no difference in terms of inbound coverage between a 5-Watt radio and 6-Watt radio as long as both radios are properly maintained and have batteries in good condition. Therefore, “upgrading” from a 5-Watt radio to a 6-Watt radio is not a “solution” for dealing with talk-in coverage issues.

The use of proper portable and mobile radio antennas is critically important, especially in the VHF band, where antennas are significantly less efficient and introduce higher system losses than antennas operating in higher frequency bands such as the 700/800 MHz band.

Portable radios must be equipped with the standard VHF helical antennas provided by the manufacturer in order to provide the coverage depicted in the coverage maps shown in the Alternatives Report. “Stubby” VHF antennas are significantly less efficient than the helical antennas, and their use will result in degraded portable radio coverage which will not be related to the radio system infrastructure, but will be the result of the use of an inappropriate antenna on the portable radio.

Likewise, the use of UHF antennas to shorten the length of the antenna will result in severely degraded inbound and outbound coverage from the portable radio on which they are used. These antennas are severely mis-matched as VHF frequencies since they are “tuned” for operation in the UHF band, which results in most of the power coming out of the portable radio being reflected back to the radio rather than being radiated outward as an inbound signal; the efficiency with which the “outbound” signal from the base station site is also reduced by the mis-match, which results in a lower received signal power than the signal power that would be received with a properly tuned VHF antenna.

A portable radio antenna should not be used as a “handle” to extract the radio from its case or otherwise pick up the radio. This damages the antenna, which degrades the performance of the

radio, both for inbound (talk-in) and outbound (talk-out) signals.

The coverage maps shown in the System Alternatives Report show both head level and belt level portable radio coverage. Use of the radio at belt level with a shoulder mic adds additional body losses that result in reduced coverage. In general, but especially in areas where coverage is spotty or marginal (such as inside commercial buildings), portable radios should be used at head level, especially for inbound calls.

In order to provide the coverage depicted in the coverage maps shown in the Alternatives Report, fire and law enforcement mobile radios should have a minimum rated power output of 100 Watts (with the possible exception of mobile radios in some administrative vehicles, which can be 50-Watt radios if the vehicles will be used primarily in the urbanized area of the City of Moscow and not on forested back roads). Mobile radio antennas should be 3 dBd gain 5/8-wave whip antennas. The use of “shark fin” antennas and low profile “hockey puck” antenna should be avoided unless absolutely necessary for “stealth” purposes; when they are used, users need to be aware that their coverage will be degraded relative to vehicles with standard whip antennas. These antennas are much less efficient and tend to have higher VSWR specifications than a 5/8-wave whip antenna, which means that more of the outgoing signal from the radio is reflected back to the radio and that both inbound and outbound coverage are degraded relative to the whip antenna.

4 Maintenance of Fixed Infrastructure Equipment

It is critical for the proper operation of the new system to establish a regular annual Preventive Maintenance (PM) procedure for remote site equipment, microwave radio equipment, and other equipment that is part of the radio system infrastructure.

Shown below is a typical test sheet for annual PM tests at a remote radio site. One test that is not shown on the sheet, but that should be included at least once a year is a measurement of the site noise at each site because an increasing noise floor at a given site can indicate other problems with either City of Moscow or equipment owned by others at the site that may need to be addressed.

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance

City of Moscow Radio System Upgrade

January 25, 2021

SITE:	SITE NAME	
DATE:	DATE	
TESTER:	NAME	
Channel Name	CHANNEL NAME	
TRANSMITTER TESTS		
Transmit Frequency	158.850000	MHz
Transmit Frequency Error	-1.900000	Hz
Tx CTCSS Tone	94.800000	Hz
TX Power		
Power Level at Duplexer antenna port	45.00	Watts
Power Level at Transmitter RF Port (Forward)	75.00	Watts
Power Level at Transmitter RF Port (reverse)	4.80	Watts
Power Level Forward at Metering Screen	68.00	Watts
Power Level reverse at Metering Screen	6.00	Watts
TX CTCSS Deviation	274.00	Hz
Repeat Composite Deviation	1.79	KHz
DUPLEXER AND ANTENNA TESTS		
Duplexer Insertion Loss at TX Frequency (TX Side)	1.40	dB
Duplexer Isolation at RX Frequency (TX Side)	75.00	dB
Duplexer Insertion Loss at TX Frequency (RX Side)	1.39	dB
Duplexer Isolation at RX Frequency (TX Side)	75.66	dB
Antenna Return Loss at TX Frequency	10.88	dB
Antenna Return Loss at RX Frequency	17.54	dB
VSWR at TX Frequency	1.82:1	
VSWR at RX Frequency	1.5:1	
RECEIVER TESTS		
Receive Frequency	156.060000	MHz
Receive Tone	91.5	Hz
Receive Tone Test deviation	300	Hz
Test Tone Input Deviation	1.5	KHz
RX Sensitivity at RX port		dBm

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For simulcast systems, the delay settings for each subsystem should be checked annually, just to make sure that they have not been inadvertently changed during some other maintenance process.

Microwave radio links should be tested annually for BER (Bit Error Rate), typically measured over a 24-hour period, and jitter and wander (especially on links used for P25 sub-systems). In addition, received power level, output power and frequency should be checked to make sure that they are within proper tolerances. As in the case of the measurements at sites, logging this information annually provides a way of identifying both equipment degradation and degradation caused by obstructions along the path for each link.

Fiber links should also be tested annually for BER, jitter and wander.

For DC power systems, the annual tests should include voltage measurements (-48 VDC systems should be -54 VDC), measurements across each -13.6 VDC string for 12 VDC systems.

5 Maintenance of Portable and Mobile Radios

As described above, any land mobile radio system consists of both fixed system infrastructure and mobile and portable radios that communicate with that fixed infrastructure. Regular maintenance of both mobile and portable radios (e.g. an annual PM [Preventive Maintenance]) and proper maintenance of batteries for portable radios is critical for the proper operation of a radio system.

Because each agency in City of Moscow is responsible for its own mobile and portable radios, the maintenance of these radios is performed by a wide range of service providers, or by in-house personnel who may not have the appropriate tools maintain the radios. This means that there is no consistent radio maintenance procedure being followed for all of the radios operating on the City of Moscow radio systems. Typically, a lack of regular radio maintenance relates to limited available budgets, and radio maintenance being given a lower priority than other critical needs.

However, proper adjustment and maintenance of mobile equipment can make a tremendous difference in the operation of any radio system, and in some cases inadequate coverage that is ascribed to the system infrastructure is actually the result of inadequate maintenance and repair of subscriber radios.

Annual PM (Preventive Maintenance) should be performed on all mobile and portable radios and should include return loss testing of both mobile and portable radio antennas and replacement of any antennas that show low return loss (high VSWR) values, alignment of mobile and portable radios following manufacturer's recommendations for each radio, and checking battery terminals and other DC power connections for mobile

radios to assure that the terminals are clean and the radio is receiving adequate voltage and current. Batteries should also be tested, and any batteries that show degraded capacity should be replaced.

As an example, we completed a project a few years ago where the mobile and portable radios were simply reprogrammed for narrowband operation by resetting the bandwidth in the radios without making any other adjustments to “tweak” the radio for proper operation in narrowband mode. When these radios were properly adjusted, the users experienced a significant improvement in coverage in the areas where they had previously complained about poor coverage, especially for portable radios. While the radios were being serviced, it was also discovered that many of the portable radios had batteries with less than 20% capacity and that many of the radios had damaged antennas, which also had a serious impact on coverage from those radios.

Based on the information we received in conjunction with the Needs Analysis Report, the mobiles and portables in City of Moscow have all been properly programmed for narrowband operation; however regular maintenance and battery capacity still remain issues that can and do affect radio system coverage for portable radios.

The issues with respect to maintenance of mobile and portable radios described above are just as critical for the new system configurations described in this Systems Alternatives Report as they are for the existing radio systems in City of Moscow.

6 “P25 Capable” and “P25 Compliant” Equipment

Many federal grants include requirements that the equipment purchased with the grant money be at least capable of operation in P25 Phase 1 conventional mode, even if the equipment is not initially set up for P25 operation. These two terms tend to cause confusion for local government agencies seeking grant funding, in part because they are often not very well-defined in the grant requirements and instructions.

The distinction between “P25 Capable” and “P25 Compliant” has to do with the equipment certification process that is part of the P25 suite of standards. “P25 Capable” is a term typically used by manufacturers to assert that their equipment is capable of operating on a P25 system. “P25 Compliant” is a term more often used in grant descriptions to describe equipment that has been tested and certified to be compatible with P25 systems.

There is a voluntary program called “P25 CAP” that provides standardized equipment testing designed to assure that a given manufacturer’s equipment is compatible with radio systems using the P25 standards. Base station and subscriber equipment that has passed the tests in the P15 CAP program is said to be “P25 CAP Compliant” (which is actually what “P25 Compliant” is meant to mean). The following statement from the Department of Homeland Directorate of Science and Technology clarifies this distinction:

Users may assume P25 capable and P25 Compliant mean the same thing. Unfortunately, they would be wrong. Only communications equipment documentation that is submitted to the Department of Homeland Security (DHS) Science and Technology Directorate (S&T) showing the vendor equipment has been tested at a DHS

S&T recognized laboratory in accordance with DHS S&T documented test procedures, satisfying the testing requirements and approved by DHS S&T, is considered “P25 CAP Compliant.”¹

The Department of Homeland Security provides a list of P25 CAP Compliant equipment that is eligible for purchase using federal grant funds, as described below:

Once the equipment passes, a Summary Test Report (STR) and a Suppliers’ Declaration of Compliance (SDOC) document is submitted to DHS S&T for approval and posting to its website. DHS S&T reviews the documentation and, once approved, makes them available on its website along with a full list of P25 CAP Approved (i.e., Grant-Eligible) Equipment. It is this list, and only this list, which is referenced by several federal grant programs, like those through the Federal Emergency Management Agency, as allowable equipment for purchase using federal grant funds.²

The current version of this list is shown in Appendix 1. It contains both base station equipment and mobile and portable radio subscriber equipment that has met the requirements of the P25 CAP program. Any equipment on this list is officially P25 CAP Compliant in is therefore eligible for purchase using grant funding.

One consequence of the P25 CAP program is that essentially all public safety grade mobile and portable radio equipment available from the major manufacturers is P25 CAP Compliant, so the radios are P25 radios with analog functionality included. The major manufacturers no longer offer public safety grade narrowband analog portable and mobile radios that are not P25 compliant.

6.1 Base Station Equipment

Base station equipment currently provided by all of the major equipment vendors is capable of being configured for narrowband conventional mode initially and “upgraded” to Project 25 Phase 1 mode via a firmware upgrade without any physical modification of the equipment. P25 Phase 1 operation is based on Frequency Division Multiple Access, in which a single RF frequency is used for each voice path on the system. Not all base station equipment is capable of being directly upgraded to P25 Phase 2 operation (which uses Time Division Multiple Access, in which a single RF frequency provides two voice paths) without physical changes to the equipment because Phase 2 operation requires linear amplifiers in the base stations, which are not a standard feature of base stations used for analog of Phase 1 operation. Phase 2 operation is generally not a requirement for grant funding (at least not at this time).

Some vendors charge a firmware upgrade fee to enable P25 conventional operation (for example) in a base station this is configured for analog operation, while other vendors include P25 Conventional operation (and sometimes even P25 trunked operation) as a standard feature in their base station radios.

The base station equipment listed in Appendix 1 is fully P25 CAP Compliant, but may be initially configured only for narrowband analog operation.

¹ “P25 CAP Compliance: What Should It Mean to You?; DHS Science and Technology Directorate (2018); Page 1.

² Ibid.; Page 2.

6.2 Portable and Mobile Radio Equipment

All of the mobile and portable radio models listed in Appendix 1 have been certified to be fully P25 CAP Compliant. All of the manufacturers and models listed in Appendix provide both narrowband analog operation and the P25 Phase 1 Common Air Interface (CAI) in their standard firmware. Some manufacturers require a firmware upgrade for P25 Conventional operation, while others provide this mode as a standard feature. All of the manufacturers (except EF Johnson) require a firmware upgrade to provide P25 trunked operation for operation on P25 trunked radio systems. All of the equipment is capable of “mixed mode” operation, where some channels are analog and others are P25 conventional (this is useful in circumstances where agencies in adjacent jurisdictions operate P25 VHF systems).

The following sections of this report contain pricing for portable and mobile radios from each of the major manufacturers listed in Appendix 1. The pricing is based on single band VHF mobile and portable radios, with identical features and accessories assumed for each radio (as much as possible) to allow for an “apples-to-apples” comparison. In cases where the manufacturer provided a priced option for “intrinsically safe” portable radios, pricing is included for “intrinsically safe” fire radios for use in hazardous environments. Mobile radios are assumed to be remotely mounted with a control head in the passenger compartment of the vehicle.

6.3 Portable and Mobile Radio Costs

The equipment costs shown in this section are based on typical mobile and portable radio configurations for public safety grade radios listed in Appendix 1 – List of Grant-Eligible P25 Cap Compliant Public Safety Land Mobile Radio Equipment. The assumed radio components, firmware options, and extended (3-year) warranty for each radio are consistent (as much as possible) across all of the portable radios and all of the mobile radios shown below.

The costs show for each radio were obtained from each manufacturer’s current published NASPO ValuePoint price list, which is based in turn on each manufacturer’s current contract with the NASPO ValuePoint organization, plus any contract addenda added by individual states, such as the State of Washington.

The NASPO ValuePoint Cooperative Purchasing Organization is described below:

The NASPO ValuePoint Cooperative Purchasing Organization is a nonprofit, wholly owned subsidiary of NASPO. NASPO ValuePoint is a unified, nationally focused cooperative alliance aggregating the demand of all 50 states, the District of Columbia and the organized US territories, their political subdivisions and other eligible entities, spurring best, innovation and competition in the marketplace..... Since 1993 NASPO ValuePoint has been the cooperative purchasing arm of NASPO (the National Association of State Procurement Officials) encouraging, fostering and guiding the nation's most significant public contract cooperative.³

As shown in the costs sheets the cost range for the portable and mobile radios available on the NASPO contract is shown in the table below:

Radio Type	Cost Range
Intrinsically Safe Portable Radio	\$1661-\$2813
Non-Intrinsically Safe Portable Radio	\$1132-\$2284
Mobile Radio	\$2156-\$3376

6.3.1 Harris Portable and Mobile Radios

NASPO Pricing for Harris portable and mobile radios is shown in the spreadsheets below. The XG-75 portable radio is assumed for the Intrinsically Safe fire radio because it is the radio that has the “intrinsically safe” option. For Fire and Law Enforcement mobiles, 100 Watts transmitter output power is assumed. For administrative vehicles, a lower power 50-Watt mobile is assumed.

³ From “NASPO ValuePoint Cooperative Purchasing Organization Announces the Release of New Website”; <https://www.naspo.org/News/ArtMID/6856/ArticleID/1692>

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

Harris XG-75 Portable Radio - FIRE (P25 Conventional) - Rated for Hazardous Locationsd (Intrinsically Safe)	
Equipment Item	Unit Cost (NASPO Contract)
PORTABLE,XG-75,136-174MHZ,SCAN,BLK-GRY	\$ 1,457.80
Feature,MDC-1200	\$ 14.43
SPKR MIC,PREMIUM,FIRE,NC,XG75P	\$ 466.20
ANTENNA, 136-151 MHZ, HELICAL, FM	\$ 18.50
CASE,LEATHER,PREMIUM,XG75/25,BELT LOOP	\$ 96.20
BATTERY,LI-ION,2400 MAH	\$ 59.20
Option,Immersible Radio Operation	\$ 177.60
WARRANTY, EXTENDED 3 YR, PORTABLE	\$ 160.00
Total Cost (NASPO PRICING)	\$ 2,449.93
Harris XG-25P Portable Radio (P25 Conventional) - FIRE & LAW - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
Portable,XG-25P,136-174MHz,Scan	\$ 814.00
Feature,MDC-1200	\$ 14.43
SPEAKER MIC,RUGGED,COILED,FM	\$ 192.40
ANTENNA, 136-151 MHZ, HELICAL, FM	\$ 18.50
CASE,LEATHER,PREMIUM,XG75/25,BELT LOOP	\$ 96.20
BATTERY,LI-ION,2400 MAH	\$ 59.20
WARRANTY, EXTENDED 3 YR, PORTABLE	\$ 160.00
Total Cost (NASPO PRICING)	\$ 1,354.73
Harris XG-75 Mobile Radio (P25 Conventional) - FIRE, LAW Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
MOBILE,XG-75M/M7300,136-174MHZ,110W	\$ 1,924.00
Feature,MDC-1200	\$ 14.43
Speaker,100W,TS100	\$ 196.10
MICROPHONE,STD,STRAIGHT CONNECTOR	\$ 59.20
Antenna,Base,Standard Roof Mount	\$ 26.90
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
Control Unit,CH721,Scan,Remote Mount	\$ 532.80
WARRANTY, EXTENDED 3 YR, MOBILE	\$ 180.00
Total Cost (NASPO PRICING)	\$ 2,992.43
Harris XG-75 Mobile Radio (P25 Conventional) - Administrative Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
Mobile,XG-25M,136-174 MHz,50W	\$ 1,554.00
Feature,MDC-1200	\$ 14.43
SPEAKER, MOBILE, 4 OHM	\$ 19.98
Microphone,Standard,XG-25M	\$ 19.98
Antenna,Base,Standard Roof Mount	\$ 26.90
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
Control Unit,CH721,Scan,Remote Mount	\$ 532.80
WARRANTY, EXTENDED 3 YR, MOBILE	\$ 180.00
Total Cost (NASPO PRICING)	\$ 2,407.09

6.3.2 ICOM Portable and Mobile Radios

NASPO Pricing for ICOM portable and mobile radios is shown in the spreadsheets below. An intrinsically safe option did not appear to be listed for ICOM portable radios, though it may well be an option. For that reason, the portable radio pricing below shows only non-intrinsically safe portables. The mobile radio listed has a transmitter output power of 110 Watts (the “base station” configuration was the only listing for this power level; we assumed that the cost is the same for a remote-mount vehicle configuration).

ICOM 9011T Portable Radio (P25 Conventional) - FIRE (Non-Intrinsically Safe) & LAW - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
136-174 MHz P25 Conventional portable, 6W, 512 CH, display, simple keypad	\$ 960.08
Feature,MDC-1200	Included (analog mode only)
14-pin loud waterproof speaker mic (no accessory jack)	\$ 74.05
136-174MHz short helical broadband antenna for F9011	\$ 67.75
Leather carrying case with a swivel clip for the F9011T/9021T radios with a full keypad cutout	\$ 31.38
Li-ion 7.4V 2300mAh (typical capacity), 2250mAh (minimum value)	\$ 38.30
3 year extended warranty (for specified LM Radios Only)	\$ 183.75
Total Cost (NASPO PRICING)	\$ 1,355.31
ICOM 9511T Mobile Radio (P25 Conventional) - FIRE, LAW Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
136-174MHz 110W P25 Conventional basestation configuration with full keypad.	\$ 1,214.21
Feature,MDC-1200	Included
20W large external speaker	\$ 69.03
Self grounding microphone for mobile radios	\$ 42.04
Antenna,Base,Standard Roof Mount (NMO) (Estimated Price; not on NASPO Price List)	\$ 20.00
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
RMK-4 01 Dual head and separation kit for F9511HT. Requires external speaker and cable.	\$ 539.65
8m/26.2ft separation cable for remote mounting kits	\$ 47.69
WARRANTY, EXTENDED 3 YR, MOBILE	\$ 180.00
Total Cost (NASPO PRICING)	\$ 2,171.62

6.3.3 Kenwood Portable and Mobile Radios

NASPO Pricing for Kenwood portable and mobile radios is shown in the spreadsheets below. The pricing includes both an intrinsically safe portable radio and a non-intrinsically safe portable radio. The mobile radio listed has a transmitter output power of 110 Watts.

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance

City of Moscow Radio System Upgrade

January 25, 2021

Kenwood TK-5210 VHF Portable Radio (P25 Conventional) - FIRE (Intrinsically Safe)	
Equipment Item	Unit Cost (NASPO Contract)
TK-5210-ISGK2 136-174MHz 5W, 1024 CH, Standard Model (Factory Mutual Approved)	\$ 1,598.00
Feature,MDC-1200	Included (analog mode only)
KRA-26M VHF helical antenna 146-162 MHz	\$ 14.00
KMC-41M MIL-SPEC, IP54/55 Noise-canceling Speaker Mic [Intrinsically Safe Approved Accessory]	\$ 96.50
KLH-133K Heavy duty leather carrying case for TK-5*10 Basic Models	\$ 44.25
KNB-33L 2000 mAh, Li-ion battery - requires KSC-32/326K charger [Immersion Option compatible]	\$ 105.00
3-Year Warranty	Included
Total Cost (NASPO PRICING)	\$ 1,857.75
Kenwood NX-5200 VHF Portable Radio (P25 Conventional) - FIRE (Non-Intrinsically Safe) & LAW - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
NX-5200K2 VHF (136-174MHz), 5.0 Watts NXDN Conventional / TYPE-C Trunking	\$ 825.00
Feature,MDC-1200	Included (analog mode only)
KMC-42WDM MIL-SPEC, IP67 (Immersion) Noise-canceling Speaker Mic	\$ 114.00
KRA-26M VHF helical antenna 146-162 MHz	\$ 14.00
KLH-200K3 Heavy duty leather carrying case for NX-5000-series (for both K2 & K3 models)	\$ 44.25
KNB-L2M Li-ion 2600mAh (Standard)	\$ 135.00
3-Year Warranty	Included
Total Cost (NASPO PRICING)	\$ 1,132.25
Kenwood TK-5710 VHF Mobile Radio (P25 Conventional) - FIRE, LAW Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
TK-5710HBGK 136-174MHz 50-110W 100 Zones/1024 Channels (R.F. DECK ONLY)	\$ 2,211.00
Feature,MDC-1200	Included
KES-5 External Speaker (40W max input)	\$ 61.25
KMC-27 MIL-SPEC noise-canceling mobile hand microphone	\$ 104.00
Antenna,Base,Standard Roof Mount (NMO) (Estimated Price; not on NASPO Price List)	\$ 20.00
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
10BHS KCH-14M, KRK-5, KCT-22M2, KCT-23M4, KMB-9, KMC-27 - Single Head Remote Mount	\$ 921.00
17 ft separation cable for remote mounting kits	Included in remote Kit above
WARRANTY, EXTENDED 3 YR, MOBILE	Included
Total Cost (NASPO PRICING)	\$ 3,376.25

6.3.4 Tait Mobile Radios

NASPO Pricing for Tait mobile radios is shown in the spreadsheets below. There are no current production model portable radios from Tait on the NASPO contract (the TP9100 series has been discontinued and the TP9400 series is not shown in the contract pricing. The mobile radio listed has a transmitter output power of 50 Watts, which is the highest output power listed in the Tait price sheets.

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance

City of Moscow Radio System Upgrade

January 25, 2021

Tait TM-9455 VHF Mobile Radio (Analog Conventional with P25 CAI in Firmware) - FIRE, LAW Vehicles (NOTE: Maximum Transmitter Output Power is 50 Watts)	
Equipment Item	Unit Cost (NASPO Contract)
Mobile 136-174M BNC Standard Microphone U-Cradle	\$ 2,707.00
Feature,MDC-1200	Included
TM External Speaker 10W for 30-50W Radio	\$ 73.00
Standard mobile hand microphone	Included
Antenna,Base,Standard Roof Mount (NMO) (Estimated Price; not on NASPO Price List)	\$ 20.00
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
TM93/94 Remote Head Upgrade Kit 18m (60ft)	\$ 436.00
17 ft separation cable for remote mounting kits	Included in remote Kit above
3-Year Warranty (Warranty terms not specified on Tait website)	Not Specified
Total Cost (NASPO PRICING)	\$ 3,295.00

6.3.5 Motorola Portable and Mobile Radios

NASPO Pricing for Motorola portable and mobile radios is shown in the spreadsheets below. Motorola's NASPO Price Sheet shows the APX4000 as its offering for a single-band VHF portable radio. The price sheet also shows the APX900 (which is available for the VHF band according to its spec sheet) only as an 800/900 MHz radio. The pricing shown below is for the APX4000 portable radio. The APX4500 mobile radio is rated for a maximum power output of 50 Watts, according to the datasheet for the radio. An intrinsically safe option is not shown in the price list for the Motorola portable radios.

Motorola APX4000 VHF Portable Radio (Analog Conventional - P25 Common Air Interface Standard in Firmware) - FIRE (Non-Intrinsically Safe) & LAW - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
APX 4000 VHF MHZ MODEL 2 PORTABLE	\$ 1,432.99
Feature,MDC-1200	Included (analog mode only)
IMPRES RSM DSPLY W JACK, W CHNL (Remote Speaker Mic)	\$ 331.42
ALT: VHF STUBBY ANTENNA (147-160MHZ) (PMAD4094A)	\$ 5.67
APX2000/4000 TWO-KNOB,SWIVEL,LEATHER CARRY CASE	\$ 48.18
ALT: IMPRESS LI-ION 3000MAH	\$ 53.55
ADD: 5 YEAR SERVICE FROM THE START LITE (Standard Warranty is 1 Year)	\$ 162.00
Total Cost (NASPO PRICING)	\$ 2,033.81
Motorola APX-4500 VHF Mobile Radio (P25 Conventional) - FIRE, LAW Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
APX4500 VHF (Available in UHF & 700 / 800)	\$ 1,141.72
Feature,MDC-1200	Included
HSN4032B Non-Water Resistant Speaker, 13 Watt Rated Audiod (On-Line Price; not in NASPO Pricing)	\$ 61.64
ADD: PALM MICROPHONE	\$ 52.56
Antenna,Base,Standard Roof Mount (NMO) (Estimated Price; not on NASPO Price List)	\$ 20.00
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
ADD: APX O2 CONTROL HEAD (Grey)	\$ 359.16
ADD: REMOTE MOUNT MID POWER	\$ 216.81
ADD: 5 YEAR SERVICE FROM THE START LITE (Standard Warranty is 1 Year)	\$ 246.00
Total Cost (NASPO PRICING)	\$ 2,156.89

6.3.6 EF Johnson Mobile and Portable Radios

NASPO Pricing for EF Johnson mobile radios is shown in the spreadsheets below. Cost sheets are included for both intrinsically safe and non-intrinsically safe portable radios. The transmitter output power for the EJ Johnson mobile radio is 50 Watts. EF Johnson included P25 conventional mode and P25 trunked mode as standard features in its portable and mobile radios.

EF Johnson VP5000 Portable Radio - FIRE (Analog Conventional - P25 Conventional and P25 Trunking Included as Standard in Radio Firmware) - Rated for Hazardous Locations (Intrinsically Safe)	
Equipment Item	Unit Cost (NASPO Contract)
VP5230BKF2 - VHF, 136-174 MHz, Model 2 (standard keypad)	\$ 1,244.00
Feature,MDC-1200	\$ 40.00
KMC-42WDM - MIL-SPEC, IP67 (Immersion) Noise-canceling Speaker Mic	\$ 91.20
KRA-26M - VHF helical antenna 146-162 MHz	\$ 11.20
Heavy duty leather carrying case (for both K2 & K3 models)	\$ 35.40
Intrinsically Safe (CSA) - <i>KNB-LS5 battery required</i>	\$ 79.20
KNB-LS5 - Li-ion Battery Intrinsically Safe	\$ 160.00
Option,Immersible Radio Operation	IP67 Included
WARRANTY, EXTENDED 3 YR, PORTABLE	Included
Total Cost (NASPO PRICING)	\$ 1,661.00
EF Johnson VP5000 Portable Radio (Analog Conventional - P25 Conventional and P25 Trunking Included as Standard in Radio Firmware) - FIRE & LAW - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
VP5230BKF3 - VHF, 136-174 MHz, Model 3 (full keypad)	\$ 1,244.00
Feature,MDC-1200	\$ 40.00
KMC-42WDM - MIL-SPEC, IP67 (Immersion) Noise-canceling Speaker Mic	\$ 91.20
KRA-26M - VHF helical antenna 146-162 MHz	\$ 11.20
Heavy duty leather carrying case (for both K2 & K3 models)	\$ 35.40
KNB-L2M - BATTERY,LI-ION,2600 MAH	\$ 108.00
WARRANTY, EXTENDED 3 YR, PORTABLE	Included
Total Cost (NASPO PRICING)	\$ 1,529.80
EF Johnson VM6000 Mobile Radio (Analog Conventional - P25 Common Air Interface Included as Standard in Radio Firmware)P25 Conventional - Upgradable to P25 Conventional) - FIRE, LAW Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
VM 6000 136-174 MHZ	\$ 1,720.00
Feature,MDC-1200	\$ 40.00
Low Profile Ext. Speaker	\$ 60.00
VCH Standard Mobile Mic	\$ 112.00
Antenna,Base,Standard Roof Mount (NMO) (Estimated Price; not on NASPO Price List)	\$ 20.00
5/8λ 3 dBd Gain Antenna (Amazon Price - Not on NASPO List)	\$ 59.00
Viking Control Head (VCH)	
The pricing is valid only when purchased with the radio. If purchased separately, List price is \$1,695	\$ 720.00
17 Ft remote cable	\$ 128.00
WARRANTY, EXTENDED 3 YR, MOBILE	Included
Total Cost (NASPO PRICING)	\$ 2,859.00

6.3.7 BK Technologies (Bendix King) Portable and Mobile Radios

NASPO Pricing for BK Technologies portable and mobile radios is shown in the spreadsheets below. Both intrinsically safe and non-intrinsically safe portable radios are shown in the price lists below. The mobile radio listed has a transmitter output power of 110 Watts (with an option output power upgrade; the price for a 50-Watt mobile will be \$227.50 lower than the price shown below.

Bendix Kink KNG Series - Portable Radio - FIRE (Analog Conventional - P25 Conventional and P25 Trunking Included as Standard in Radio Firmware) - Rated for Hazardous Locations (Intrinsically Safe)	
Equipment Item	Unit Cost (NASPO Contract)
KNG-P150 - 136-174 MHz, 5000 channels, 6 Watt, P25 Digital/Analog Portable	\$ 1,763.45
Feature,MDC-1200	Included (analog mode only)
Microphone, Speaker , Fire Mic, KNG-P	\$ 516.75
Antenna, VHF, 136-174MHz, SMA, KNG-P150	\$ 19.50
Leather Case "Cordovan Color"	\$ 48.75
Factory Install Intrinsically Safe, KNG-Pxxx only	\$ 113.75
Battery Pack, Li-ion, 3450 mAh, 10.8 V Intrinsically Safe (Used with KAA0422 Case)	\$ 172.25
Option,Immersible Radio Operation	IP67 Included
WARRANTY, EXTENDED 3 YR, PORTABLE	\$ 179.00
Total Cost (NASPO PRICING)	\$ 2,813.45
Benidix King KNG 150 Portable Radio (Analog Conventional - P25 Conventional Included as Standard in Radio Firmware) - FIRE & LAW - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
KNG-P150 - 136-174 MHz, 5000 channels, 6 Watt, P25 Digital/Analog Portable	\$ 1,763.45
Feature,MDC-1200	Included (analog mode only)
Speaker Microphone Cancelling 3.5mm KNG P Series	\$ 146.25
Antenna, VHF, 136-174MHz, SMA, KNG-P150	\$ 19.50
Case, Leather, Large, Belt-loop, Open Key, Blk	\$ 29.95
Li-Ion-Ion Battery 3450 mAH	\$ 146.25
WARRANTY, EXTENDED 3 YR, PORTABLE	\$ 179.00
Total Cost (NASPO PRICING)	\$ 2,284.40
Bendix King KNG Series Moble Radio (Analog Conventional - P25 Conventional Included as Standard in Radio Firmware) - FIRE, LAW Vehicles	
Equipment Item	Unit Cost (NASPO Contract)
KNG-M150R 136-174 MHz, Digital/Analog, P25, 5000 channels, 50 Watts Remote Mount	\$ 1,820.00
KAA0154 High Power, 110W KNG-M150	\$ 227.50
Feature,MDC-1200	Included (analog mode only)
KAA0261 External Speaker 20W, 4 Ohm, W/ Mounting Bracket (Replacement or Spare)	\$ 32.50
KAA0276S Standard Handheld Microphone KNG-M with Straight connector	\$ 172.90
Antenna,Base,Standard Roof Mount (NMO) (Estimated Price; not from NASPO Price List)	\$ 20.00
5/8λ 3 dBd Gain Antenna (Amazon Price - Not from NASPO List)	\$ 59.00
KAA0639 Kit Install KAA0670 HCH Trunk Mount "Remote Interface Box"	\$ 87.75
KAA0636 Cable Assy Remote Mount 17' KNG-MxxxR	\$ 117.65
WARRANTY, EXTENDED 3 YR, MOBILE	\$ 179.00
Total Cost (NASPO PRICING)	\$ 2,716.30

6.3.8 Motorola Dual-Band Portable and Mobile Radios

NASPO Pricing for Motorola dual band 700/800 MHz/VHF portable and mobile radios is shown in the spreadsheets below. Motorola's NASPO Price Sheet shows the APX8000 radio series as its offering for a dual-band 700/800 MHz/VHF portable and mobile radios. The pricing shown below is based on APX8000 series radios.

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance

City of Moscow Radio System Upgrade

January 25, 2021

NOTE: Motorola's NASPO Price Sheet shows the APX8000 as its offering for a dual-band 700/800 MHz/VHF portable radio. The NASPO pricing sheet also shows the APX7000 dual band radio, but it is marked as discontinued. The pricing shown below is for the APX8000 portable radio and the APX8500 mobile radio.

Motorola APX8000 VHF Portable Radio (P25 Phase 1 Trunking) - FIRE (Non-Intrinsically Safe), LAW Enforcement & Public Works - General Field Use &

Equipment Item	Part Number	Unit Cost (NASPO Contract)
APX 8000 ALL BAND PORTABLE MODEL 2.5	H91TGD9PW6 N	\$4,367.59
ADD: ASTRO DIGITAL CAI OPERATION	Q806	\$375.95
BATT IMPRES 2 LIION R IP68 3400T	PMNN4504	\$140.89
CHARGER, SINGLE-UNIT, IMPRES 2, 3A, 115VAC, US/NA	NNTN8860A	\$120.45
ADD: 5 YEAR SERVICE FROM THE START LITE	Q887	\$206.00
Analog Operation	Q241	\$0.00
ADD: ENABLE DUAL BAND OPERATION	QA00579	\$730.00
ADD: SMARTZONE OPERATION	H38	\$1,095.00
ADD: P25 9600 BAUD TRUNKING	Q361	\$219.00
ADD: P25 LINK LAYER AUTHENTICATION	QA01767	\$73.00
Multicast Voting Scan	Q387	\$146.00
NYLON CASE 3 FIX BL 2100MAH	PMLN5328C	\$35.77
IMPRES RSM DSPLY W JACK, W CHNL	HMN4104B	\$331.42
PC programing software and cables	PMKN4013C	\$75.48
Total Cost (NASPO PRICING)		\$ 7,916.55

Motorola APX8000 VHF Portable Radio (P25 Phase 1 Trunking) - FIRE (Intrinsically Safe)

Equipment Item	Part Number	Unit Cost (NASPO Contract)
APX 8000 ALL BAND PORTABLE MODEL 2.5	H91TGD9PW6 N	\$4,367.59
ENH: APX8000XE RUGGED RADIO	QA02006AC	\$584.00
ADD: ASTRO DIGITAL CAI OPERATION	Q806	\$375.95
BATT IMPRES 2 LIION R IP68 3400T	PMNN4504	\$140.89
CHARGER, SINGLE-UNIT, IMPRES 2, 3A, 115VAC, US/NA	NNTN8860A	\$120.45
ADD: 5 YEAR SERVICE FROM THE START LITE	Q887	\$206.00
Analog Operation	Q241	\$0.00
ADD: ENABLE DUAL BAND OPERATION	QA00579	\$730.00
ADD: SMARTZONE OPERATION	H38	\$1,095.00
ADD: P25 9600 BAUD TRUNKING	Q361	\$219.00
ADD: P25 LINK LAYER AUTHENTICATION	QA01767	\$73.00
Multicast Voting Scan	Q387	\$146.00
NYLON CASE 3 FIX BL 2100MAH	PMLN5328C	\$35.77
IMPRES RSM DSPLY W JACK, W CHNL	HMN4104B	\$331.42
PC programing software and cables	PMKN4013C	\$75.48
Total Cost (NASPO PRICING)		\$ 8,500.55

Motorola APX-8500 700/Hoo MHz/VHF Mobile Radio (P25 Phase 1 Trunking) - FIRE, LAW & PUBLIC WORKS VEHICLES

Equipment Item	Unit Cost (NASPO Contract)
APX8500 ALL BAND HP MOBILE	\$4,102.60
ADD: ASTRO DIGITAL CAI OPERATION	\$375.95
ADD: REMOTE MOUNT MID POWER	\$216.81
ADD: SPKR 15W WATER RESISTANT	\$43.80
ADD: ALL BAND MOBILE ANTENNA (7/8/V/U)	\$69.35
ADD: PALM MICROPHONE	\$52.56
ADD: APX O2 CONTROL HEAD (Grey)	\$359.16
ADD: APX O7 CONTROL HEAD.	\$461.36
ADD: 5 YEAR SERVICE FROM THE START LITE	\$319.00
ENH: SMARTZONE OPERATION APX	\$1,095.00
ADD: P25 TRUNKING SOFTWARE	\$219.00
ENH: OVER THE AIR PROVISIONING	\$73.00
APX MOBILE RADIO AUTHENTICATION	\$73.00
ADD: MULITCAST VOTING SCAN	\$146.00
Total Cost (NASPO PRICING)	\$7,606.59

6.3.9 EF Johnson Dual-Band Mobile and Portable Radios

NASPO Pricing for EF Johnson dual-band 700/800 MHz/VHF portable and mobile radios is shown in the spreadsheets below. Cost sheets are included for both intrinsically safe and non-intrinsically safe portable radios. The transmitter output power for the EJ Johnson mobile radio is 35 Watts, which is adequate for both 700 MHz and VHF operation in the proposed City of Moscow systems.

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance

City of Moscow Radio System Upgrade

January 25, 2021

EF Johnson VP900 Dual-Band Portable Radio - FIRE (Analog Conventional, P25 Conventional and P25 Phase 1 Trunking) - Rated for Hazardous Locations (Intrinsically Safe)	
Equipment Item	Unit Cost (NASPO Contract)
700/800 MHz, 762-806 MHz + VHF 2.5W and VHF and 806-870 MHz, 3W, Model 3 (full keypad; Hazardous Location - FM)	\$ 2,540.00
Antenna	Contract
Multiband 700/800 + VHF Standard	\$ -
Battery	Contract
Viking Li-ion Battery	\$ -
Housing	Contract
Black Housing	\$ -
Protocol	Contract
Analog FM (included in base radio)	\$ -
Digital/Project 25 CAI AMBE+2 with Free Single-Key DES-OFB (includes protocol option 1)	\$ 160.00
System Option	Contract
Conventional System	\$ 280.00
<i>The following selections require Protocol Option 2 (Digital/Project 25 CAI AMBE+2):</i>	
Project 25 Conventional System	\$ 280.00
Project 25 Phase 1 Trunking Only (includes system option 4)	\$ 380.00
Channels/Talkgroups	
2048 Channels/Talkgroups (standard)	\$ -
Encryption (requires Protocol Option 2 - Digital/Project 25 CAI AMBE+2)	
Single-Key DES-OFB (included with Protocol Option 2)	\$ -
ARC4 (ADP compatible)	\$ -
Programming & Data	
MDC1200/GE-Star Signaling	\$ 40.00
FIRESafe™ First Responder	\$ 200.00
FIRESafe™ First Command (includes FIRESafe™ First Responder)	\$ 280.00
<i>The following selections require Protocol Option 2 (Digital/Project 25 CAI AMBE+2):</i>	
P25 Paging Encode	\$ 80.00
<i>The following selections require a System Option 5-8 (options with Phase 1 or Phase 2):</i>	
Project 25 Authentication	\$ 80.00
Total Cost (NASPO PRICING)	\$ 4,320.00

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance

City of Moscow Radio System Upgrade

January 25, 2021

EF Johnson VP900 Portable Radio (Analog Conventional - P25 Conventional and P25 Phase 1 Trunking) - FIRE, LAW ENFORCEMENT & PUBLIC WORKS - General Field Use & Administrative Personnel	
Equipment Item	Unit Cost (NASPO Contract)
700/800 MHz, 762-806 MHz + VHF 2.5W and VHF and 806-870 MHz, 3W, Model 3 (full keypad)	\$ 2,380.00
Antenna	Contract
Multiband 700/800 + VHF Standard	\$ -
Battery	Contract
Viking Li-ion Battery	\$ -
Housing	Contract
Black Housing	\$ -
Protocol	Contract
Analog FM (included in base radio)	\$ -
Digital/Project 25 CAI AMBE+2 with Free Single-Key DES-OFB (includes protocol option 1)	\$ 160.00
System Option	Contract
Conventional System	\$ 280.00
<i>The following selections require Protocol Option 2 (Digital/Project 25 CAI AMBE+2):</i>	
Project 25 Conventional System	\$ 280.00
Project 25 Phase 1 Trunking Only (includes system option 4)	\$ 380.00
Optional Features	Contract
Channels/Talkgroups	
2048 Channels/Talkgroups (standard)	\$ -
Encryption (requires Protocol Option 2 - Digital/Project 25 CAI AMBE+2)	
Single-Key DES-OFB (included with Protocol Option 2)	\$ -
ARC4 (ADP compatible)	\$ -
Programming & Data	
MDC1200/GE-Star Signaling	\$ 40.00
<i>The following selections require Protocol Option 2 (Digital/Project 25 CAI AMBE+2):</i>	
P25 Paging Encode	\$ 80.00
OTAP (Over-the-Air Programming)	\$ 160.00
<i>The following selections require a System Option 5-8 (options with Phase 1 or Phase 2):</i>	
Project 25 Authentication	\$ 80.00
Total Cost (NASPO PRICING)	\$ 3,840.00

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

EF Johnson Dual-Band VM900 Mobile Radio (Analog Conventional & P25 Trunking) - FIRE, LAW ENFORCEMENT & PUBLIC WORKS VEHICLES	
Equipment Item	Unit Cost (NASPO Contract)
Radio - Base Model	Contract
700/800 MHz, 762-870 MHz + VHF, 30/35W Dash Mount or Remote Mount	\$ 2,140.00
Control Head Type	Contract
Dash Mount Options	
Standard LCD Control Head	\$ -
Dash-Mount Control Head (includes standard palm mic)	\$ 64.00
Dash-Mount Control Head with no mic	\$ -
Remote Mount Options	
Standard LCD Control Head	\$ -
Remote Control Head (includes standard palm mic)	\$ 440.00
Remote Control Head with no mic	\$ 376.00
Dual Control Head (includes two remote control heads attached to the remote mount radio, two microphones, and two mounting brackets)	\$ 960.00
Dual Control Head with no mics	\$ 832.00
Accessory Cable	Contract
Cable, Serial, USB, Standard Interface R597-5357-70201 (included with dash mount)	\$ -
Cable, Single remote, Serial, USB, Standard Interface R597-5357-70701 (included with remote mount)	\$ -
Cable, Dual Remote, Serial, USB, Standard R597-5357-74201 (included with remote dual mount)	\$ -
Protocol	Contract
Analog FM	\$ -
Digital/Project 25 CAI AMBE+2 with Free Single-Key DES-OFB (includes protocol option 1)	\$ 280.00
System Option	Contract
Conventional System	\$ 440.00
Project 25 Conventional System	\$ 440.00
Project 25 Phase 1 Trunking Only (includes system option 4)	\$ 620.00
Optional Features	Contract
Channels/Talkgroups	
1024 Channels/Talkgroups (standard)	\$ -
Encryption (requires Protocol Option 2 - Digital/Project 25 CAI AMBE+2)	
Single-Key DES-OFB (included with Protocol Option 2)	\$ -
ARC4 (ADP compatible)	\$ -
Programming & Data	
MDC1200/GE-Star Signaling	\$ 40.00
<i>The following selection requires Protocol Option 2 (Digital/Project 25 CAI AMBE+2):</i>	
P25 Paging Encode	\$ 80.00
<i>The following selections require a System Option 5-8 (options with Phase 1 or Phase 2):</i>	
Project 25 Authentication	\$ 80.00
Project 25 Data Trunking (includes Project 25 Data Conventional)	\$ 160.00
Total Cost (NASPO PRICING)	\$ 1,980.00
Dual Control Head Option for Fire Apparatus	
Dual Control Head (includes two remote control heads attached to the remote mount radio, two microphones, two mounting brackets, and two external speakers)	\$ 2,192.00

NOTE: THE NASPO CONTRACT PRICING ALSO INCLUDES DUAL-BAND RADIOS PROVIDED BY HARRIS. HOWEVER, THE FORMAT OF THE PRICE SHEETS IS DIFFICULT TO WORK WITH AND THE HARRIS PRICING FALLS IN BETWEEN THE MOTOROLA AND E.F. JOHNSON PRICING SHOWN ABOVE. THEREFORE THE HARRIS PRICING IS NOT INCLUDED IN THIS APPENDIX.

LIST OF GRANT-ELIGIBLE P25 CAP COMPLIANT PUBLIC SAFETY LAND MOBILE RADIO EQUIPMENT

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

<u>Supplier</u>	<u>Equipment Name:</u> 	<u>Equipment Type:</u>
Airbus	Airbus TB5500i	Project 25 Phase 1 Trunked Base Station/Repeater
Airbus	Airbus VESTA	Project 25 Phase 1/2 Trunked Base Station/Repeater
BK Technologies	BK Technologies BKR 5000-V Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-KNG2-P150 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-KNG2-P400 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-KNG2-P500 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-KNG2-P800 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-M150 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-M400 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-M500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
BK Technologies	BK Technologies KNG-M800 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Codan Radio Communications	Codan Radio Communications MT-4E Base Repeater	Project 25 Phase 1 Conventional Base Station/Repeater
EF Johnson Technologies	EF Johnson 4500 700/800 Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
EF Johnson Technologies	EF Johnson 4500 UHF Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
EF Johnson Technologies	EF Johnson 4500 VHF Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
EF Johnson Technologies	EF Johnson VM5000 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VM600 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VM6000 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VM7000 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VM900 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VP5000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

<u>Supplier</u>	<u>Equipment Name:</u> 	<u>Equipment Type:</u>
EF Johnson Technologies	EF Johnson VP600 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VP6000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
EF Johnson Technologies	EF Johnson VP900 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
GME	GME CM60-U25B Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
GME	GME CM60-UL25B Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
GME	GME CM60-V25B Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM F9011T/S/B Portable Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM F9021T/S/B (450 – 520) Portable Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM F9511HT Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM F9511T/S Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM F9521T/S (406-470) Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM F9521T/S (450-512) Mobile Subscriber	Project 25 Phase 1 Trunked Subscriber Unit
ICOM	ICOM IC-F7010 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
ICOM	ICOM IC-F7020 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
ICOM	ICOM IC-F7040 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
ICOM	ICOM IC-F7510 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
ICOM	ICOM IC-F7520 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
ICOM	ICOM IC-F7540 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD NX-5200 VHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD NX-5300 UHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD NX-5400 700/800 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD NX-5700 VHF Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD NX-5800 UHF Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD NX-5900 700/800 MHz Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5210 Portable Radio, VHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5220 Portable Subscriber Unit, VHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5310 Portable Radio, UHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5320 UHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

JVCKENWOOD	JVCKENWOOD TK-5410 Portable Radio, 700 / 800 MHz	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5710 Mobile Radio, VHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5720 Mobile Subscriber Unit, VHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5810 Mobile Radio, UHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5820 Mobile Subscriber Unit, UHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5910 Mobile Radio, 700/800 MHz	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris MASTR V 800/700/UHF/VHF Base Station	Project 25 Phase 1/2 Trunked Base Station/Repeater
L3Harris	L3Harris XG-100M Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-15P 700-800 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-15P UHF-H Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-15P VHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-25M 700/800 MHz Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-25M UHF-L Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-25M VHF Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-25P 700/800 MHz Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-25P UHF-L Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-25P VHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M M7300 700/800 MHz Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M/M7300 UHF-H Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M/M7300 UHF-L Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M/M7300 VHF 110W Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M/M7300 VHF 50W Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75P UHF-L 100mW Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75P UHF-L Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75P VHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75PE 700/800MHz Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5710 Mobile Radio, VHF	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	JVCKENWOOD TK-5720 Mobile Subscriber Unit,	Project 25 Phase 1/2 Trunked Subscriber

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

	<u>VHF</u>	Unit
JVCKENWOOD	<u>JVCKENWOOD TK-5810 Mobile Radio, UHF</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	<u>JVCKENWOOD TK-5820 Mobile Subscriber Unit, UHF</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
JVCKENWOOD	<u>JVCKENWOOD TK-5910 Mobile Radio, 700/800 MHz</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris MASTR V 800/700/UHF/VHF Base Station</u>	Project 25 Phase 1/2 Trunked Base Station/Repeater
L3Harris	<u>L3Harris XG-100M Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-15P 700-800 Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-15P UHF-H Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-15P VHF Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-25M 700/800 MHz Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-25M UHF-L Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-25M VHF Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-25P 700/800 MHz Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-25P UHF-L Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-25P VHF Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-75M M7300 700/800 MHz Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	<u>L3Harris XG-75M/M7300 UHF-H Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

L3Harris	L3Harris XG-75M/M7300 UHF-L Mobile Subscriber	Unit Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M/M7300 VHF 110W Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75M/M7300 VHF 50W Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75P UHF-L 100mW Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75P UHF-L Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75P VHF Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75PE 700/800MHz Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XG-75PE UHF-H Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-150P Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-185M Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-185P Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-185Pi Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-200M Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-200P Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
L3Harris	L3Harris XL-200Pi Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Leonardo Security and Information	Leonardo ECOS-D RBS4000H	Project 25 Phase 1 Conventional Base

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 20201

Systems		Station/Repeater
Motorola Solutions	Motorola APX 1000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 1000i Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 1500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 2000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 2500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 3000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 4000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 4500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 5000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 5500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 6000, APX 6000XE, APX 6000Li Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 6500, APX 6500Li Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 7000, APX 7000XE Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 7500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 8000 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX 8500 Mobile Subscriber	Project 25 Phase 1/2 Trunked Subscriber

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

Motorola Solutions	Motorola APX 900 Portable Subscriber	Unit Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola APX NEXT Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola ASTRO 25 System	Project 25 Phase 1/2 Trunked Base Station/Repeater
Motorola Solutions	Motorola ATS 2500p Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola SRX 2200 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
Motorola Solutions	Motorola VX-P949 Portable Subscriber	Project 25 Phase 1/2 Trunked Subscriber Unit
PowerTrunk	PowerTrunk HTT-500-2	Project 25 Phase 1 Conventional Subscriber Unit
PowerTrunk	PowerTrunk MDT-500-2	Project 25 Phase 1 Conventional Subscriber Unit
Radio Activity	Radio Activity KA 160 Base Station Repeater	Project 25 Phase 1 Conventional Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCB1A Base Station Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCB1B Base Station Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCH1A Base Station Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCH1B Base Station Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCH2A Base Station Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCH2B Base Station Repeater	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	Tait Communications TB9400-TBCH3A Base Station	Project 25 Phase 1/2 Trunked Base

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

	<u>Repeater</u>	Station/Repeater
Tait Communications	<u>Tait Communications TB9400-TBCH3B Base Station Repeater</u>	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	<u>Tait Communications TB9400-TBCHHA Base Station Repeater</u>	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	<u>Tait Communications TB9400-TBCHHB Base Station Repeater</u>	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	<u>Tait Communications TB9400-TBCK4A Base Station Repeater</u>	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	<u>Tait Communications TB9400-TBCK4B Base Station Repeater</u>	Project 25 Phase 1/2 Trunked Base Station/Repeater
Tait Communications	<u>Tait Communications TM9400-TMBB1A Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TM9400-TMBB1B Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TM9400-TMBH5A Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TM9400-TMBH5B Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TM9400-TMBH7A Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TM9400-TMBH7B Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TM9400-TMBK5B Mobile Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDB1B Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDB1C Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDH7B Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDH7C Portable</u>	Project 25 Phase 1/2 Trunked Subscriber

APPENDIX 7 – System Maintenance, Subscriber Equipment Requirements & Costs, and P25 Compliance
City of Moscow Radio System Upgrade

January 25, 2021

	<u>Subscriber</u>	Unit
Tait Communications	<u>Tait Communications TP9400-TPDHBB Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDHKC Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDK5B Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9400-TPDK5C Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9600-TPGB1A Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9600-TPGH7A Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9600-TPGHKA Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Tait Communications	<u>Tait Communications TP9600-TPGK5A Portable Subscriber</u>	Project 25 Phase 1/2 Trunked Subscriber Unit
Unication	<u>Unication G4 Pager Portable Subscriber</u>	Project 25 Phase 1 Trunked Subscriber Unit
Unication	<u>Unication G5 Pager Portable Subscriber</u>	Project 25 Phase 1 Trunked Subscriber Unit
Unication	<u>Unication U3 Portable Subscriber</u>	Project 25 Phase 1 Trunked Subscriber Unit

APPENDIX 8 - Licensed and Quasi-Licensed Microwave Radio Systems

1. *Unlicensed Links (900 MHz, 2.4 GHz, 5.8 GHz)*

The problems with operating in any unlicensed band are that there is no protection from interference and it is often difficult or impossible to determine the source of interference when it does occur. Also, as more and more users install unlicensed equipment in a given area, the noise floor in the band rises, which has the potential to make a link which is initially reliable become less reliable or even unusable. Historically, both the 900 MHz unlicensed band and the 2.4 GHz unlicensed band have exhibited precisely these characteristics. The 5.8 GHz ISM band and especially the 5.3 U-NII band have not been as heavily used in the past as these lower frequency bands, but the more and more widespread adoption and use of 5 GHz wireless routers and other unlicensed devices operating in the 5 GHz wireless bands have the potential to produce the same interference and noise floor issues seen in the lower frequency bands.

We have seen cases where 5.8 GHz point-to-point link equipment caused interference to other 5.8 GHz point-to-point link equipment at the same site (in some cases, even multiple sets of equipment from the same manufacturer exhibited mutual interference problems). Since the first agency to install this equipment has no control over others who come later and install additional links in this band, this kind of interference is always a potential problem, especially at large multiple-user communications sites. In many cases, individual users have no awareness of the other systems operating in the same band at a given site, and only discover other users when interference occurs.

Because the 2.4 GHz band is used for a wide variety of unlicensed applications, including microwave ovens, cordless phones, and home and commercial WI-FI networks, it is usually not the best choice for an unlicensed link. As described above, the 5.8 GHz and 5.3 GHz bands are less congested than the 2.4 GHz band, at least at present. However, the potential for interference either now or in the future, and the eventual prospect of band congestion affecting link reliability causes us to recommend avoidance of these bands for public safety “mission critical” operations.

2. *Quasi-Licensed Links (4.9 GHz)*

The FCC has allocated spectrum for use specifically by “*Entities providing public safety services as defined under section 90.523*” [the eligibility section of the of FCC’s Rules covering the 700 MHz public safety band] in the 4940-4990 MHz (4.940-4.990 GHz) band, with rules governing the use of that spectrum contained in 47 CFR Part 90, Subpart Y of the FCC’s Rules. The entities described as eligible in §90.523 include essentially any state or local government entity or agency. The band is configured with eighteen 1 MHz channels, which may be aggregated to make up channel bandwidths of 5, 10 15, or 20 MHz. A license in this band gives the agency holding the license the authority to operate on any channel in the band and to use those channels anywhere within the geographic boundaries of its jurisdiction. Stations are required to be individually licensed if:

1. International agreements require coordination of the station
2. The station would operate in an area that would affect one of the “radio quiet zones” defined in the FCC’s Rules
3. The station’s antenna support structure requires FAA notification and FCC ASR Registration

Fixed point-to-point links in the 4.9 GHz band must be individually licensed (separately from the agency’s overall 4.9 GHz general license), and are allowed to operate on a secondary, non-interference basis with respect to base, mobile, and temporary fixed locations. This means that they must accept interference from and may not cause interference to these other systems.

Temporary fixed locations are allowed to operate without licensing for up to 1 year.

Even though it is a band in which a nominal license is required, the 4.9 GHz band shares some of the characteristics of the unlicensed bands described above because agencies are free to deploy systems wherever and whenever they choose, and there is no requirement for coordination or notification so that other users of the band know when and where these systems will operate.

Because the use of the band is limited to government agencies, the total universe of potential users, and therefore potential sources of interference, is more limited than it is in the unlicensed bands. The FCC’s assumption seems to be that government agencies will “play nice in the sandbox” and cooperate to solve mutual interference problems if they arise. However, this may not necessarily be the case, and without some kind of list which indicates, at a minimum, which agencies are operating this band, it may be difficult to track down interference problems in this band (just as it is in the unlicensed bands), should they occur. That said, the potential users of such systems in Eastern Washington and North Central Idaho are limited to the local City and County government agencies that now operate radio systems in the area, with the possible addition of State of Washington and State of Idaho entities. Coordination among these entities is not required by the FCC’s rules, and there is no central “clearing house” set up to maintain records of existing and proposed new systems. (Although the Region 43 700 MHz Regional Planning Committee attempted once upon a time to set up a database to keep track of new 4.9 GHz systems, contribution of system data to the database was strictly voluntary, and many agencies [especially in the more rural parts of the State] were not aware its existence.)

3. Secondary Operation

It needs to be emphasized that point-to-point links in the 4.9 GHz band operate on a secondary basis to broadband systems designed to provide wide-area coverage and to provide point-to-point links to support broadband systems. This can be an issue if one or more agencies decide to implement some kind of mobile wireless system in the 4.9 GHz band in or near the urbanized areas of Whitman, Latah or Nez Perce Counties. In that

case there could well be a conflict between point-to-point links to any sites in the City of Moscow system.

The other potential problem with 4.9 GHz systems has to do with illegal use of these systems by private individuals and entities. The equipment used in this band can be purchased by anyone, and there have been reports of individuals and private companies setting up systems in this band without being properly licensed. Since the licensing process (especially for wide-area systems) does not require any location specific data, and since it is quite difficult to track down the existence of systems in this band, interference from “illicit” systems is an ever-present possibility for 4.9 GHz systems.

The equipment available for use in this band is not capable of being configured for hot-standby operation, where a backup unit can take over if the main unit fails, so the equipment reliability of a system made up of these radios units will be lower than the reliability of a system configured with dual hot-standby radios, and the failure of a single radio will interrupt service to all sites served by that radio. This is a trade off made for the lower cost of a system configured with these radios, compared with radios that can be configured for hot-standby operation.

For the reasons described above, we recommend using 4.9 GHz quasi-licensed links only under limited circumstances where there is little likelihood of future interference and system degradation over time. For mission critical applications, such as providing high-reliability interconnect systems for public safety radio systems, we recommend using microwave systems licensed under Part 101 of the Commission’s rules, which have specific coordination procedures and detailed technical standards to limit interference between stations operating in the bands (6, 11, 18, 23, etc. GHz) covered by those rules.

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COMPARATIVE COVERAGE MAPS THEOPHILUS TOWER SITE AND WELL 10 SITE

PREPARED FOR:



Hatfield & Dawson Consulting Engineers
November 23, 2021

1. TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	2
2. INTRODUCTION	2
3. THEOPHILUS TOWER AND WELL 10 STAND-ALONE COVERAGE MAPS	3
A. Talk-out Coverage Maps	3
B. Talk-in Coverage Maps	6
4. COVERAGE MAPS WITH THEOPHILUS TOWER OR WELL 10 SITE AS PART OF 3-SITE SIMULCAST SYSTEM	9
A. Talk-out Coverage Maps	9
B. Talk-in Coverage Maps	13
5. RECOMMENDATIONS.....	17

1. EXECUTIVE SUMMARY

This report contains comparative coverage maps showing the difference in belt-level in-building portable radio coverage between the Theophilus Tower site proposed in the System Alternatives Report and a site at the Well 10 site on the west side of the City of Moscow, which is owned by the City of Moscow. Use of the Well 10 site in lieu of the Theophilus Tower site would avoid the need for a site lease with the University of Idaho, but it would also require the erection of a new tower at the Well 10 site.

The maps contained in this report show a comparison of belt level commercial and residential in-building portable radio coverage between Theophilus Tower and Well 10 as stand-alone sites. Additional maps show the same coverage comparison between these two sites with each site incorporated into a 3-site simulcast/voting receiver system, as proposed in the System Alternatives Report.

Based on the coverage predictions shown in this report, we recommend incorporating the Well 10 base station site into the 3-site simulcast system, in lieu of the Theophilus Tower previously assumed in the System Alternatives Report. On the receive side of the system, the Oak Avenue Water Tower, Vista Water Tank, New PD, and Northwest Water Tank voting receiver sites need to be incorporated into the system in order to provide adequate belt-level talk-in coverage from inside commercial buildings throughout the City of Moscow.

2. INTRODUCTION

This report contains comparative coverage maps showing the difference in belt-level in-building portable radio coverage between the Theophilus Tower site proposed in the System Alternatives Report and a site at the Well 10 site on the west side of the City of Moscow, which is owned by the City of Moscow. Use of the Well 10 site in lieu of the Theophilus Tower site would avoid the need for a site lease with the University of Idaho, but it would also require the erection of a new tower at the Well 10 site.

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Based on the coverage predictions shown in this report, we recommend incorporating the Well 10 base station site into the 3-site simulcast system, in lieu of the Theophilus Tower previously assumed in the System Alternatives Report. On the receive side of the system, the Oak Avenue Water Tower, Vista Water Tank, New PD, and Northwest Water Tank voting receiver sites need to be incorporated into the system in order to provide adequate belt-level talk-in coverage from inside commercial buildings throughout the City of Moscow.

3. THEOPHILUS TOWER AND WELL 10 STAND-ALONE COVERAGE MAPS

The maps shown below in Figure 1 and Figure 2 below show talk-out and talk-in coverage maps for belt-level coverage inside commercial buildings from the Theophilus Tower and Well 10 sites as stand-alone sites.

A. TALK-OUT COVERAGE MAPS

The maps shown below in Figure 1 and Figure 2 below show talk-out coverage maps for belt-level coverage inside commercial buildings from the Theophilus Tower and Well 10 sites as stand-alone sites.

As shown in the maps, the areas of the City of Moscow with marginal or inadequate in-building coverage from the Theophilus Tower site are primarily in the eastern half of the city, and in areas of the southern and northern portions of the city. Because the Well 10 site is located further west than the Theophilus Tower site, the areas with marginal or inadequate in-building coverage from this site are larger than those associated with the Theophilus Tower site, though they also fall within the northern, eastern and southern areas of the city. The Well 10 site provides more extensive coverage along the West Pullman Road/Highway 8 west of the city limits than the Theophilus Tower site.

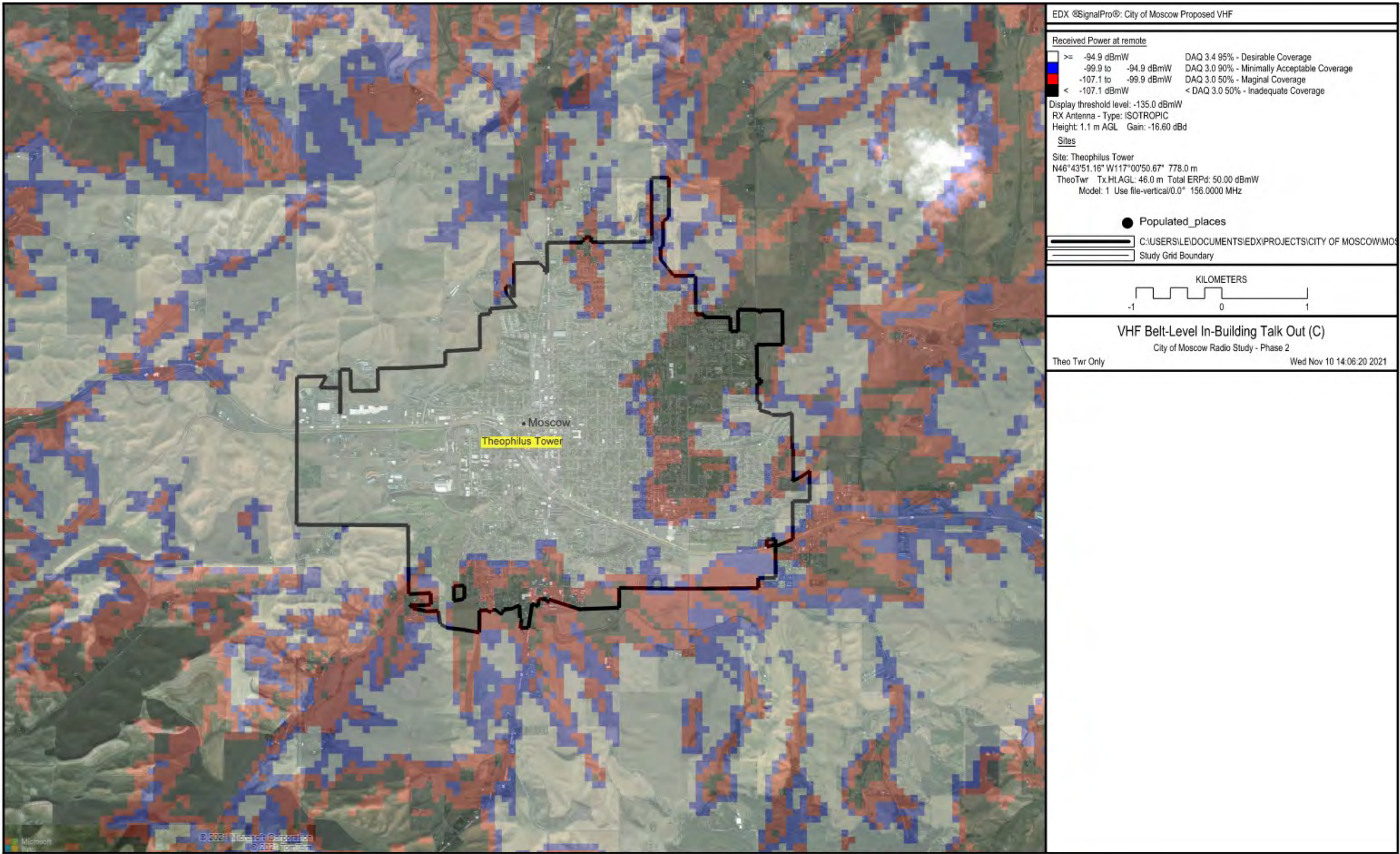


Figure 1 – Belt-Level Portable Talk-Out Radio Coverage in Commercial Buildings – Theophilus Tower Site Only

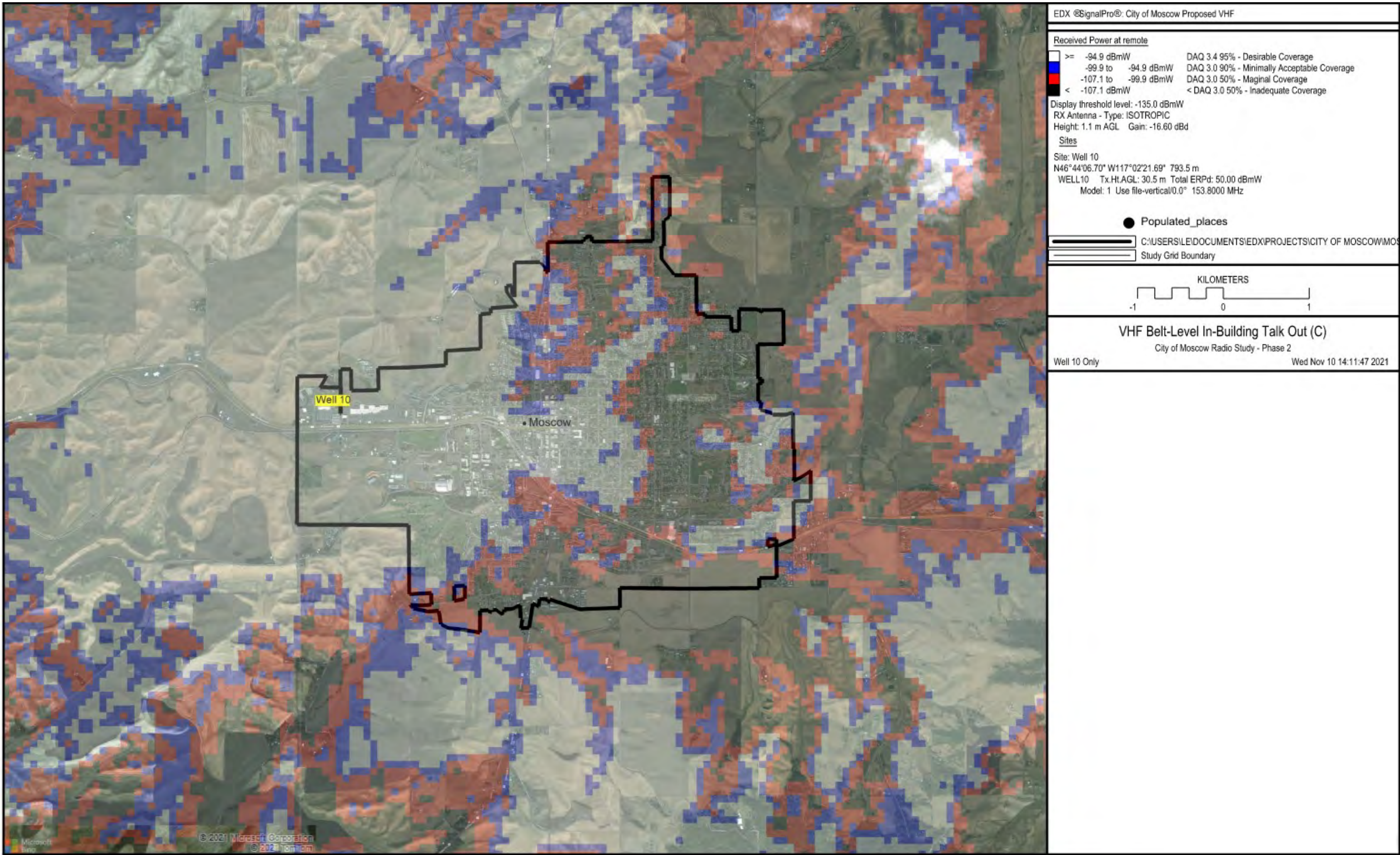


Figure 2 – Belt-Level Portable Radio Talk-Out Coverage in Commercial Buildings – Well 10 Site Only

B. TALK-IN COVERAGE MAPS

The maps shown below in Figure 3 and Figure 4 below show talk-in coverage maps for belt-level coverage inside commercial buildings from the Theophilus Tower and Well 10 sites as stand-alone sites.

As shown in the maps, talk-in belt level portable coverage in commercial buildings from the Theophilus Tower site only is marginal or inadequate in the northern, eastern and southern portions of the city, with the areas of marginal or inadequate coverage somewhat larger than the areas shown in the talk-out map in Figure 1 above.

Talk-in belt-level coverage from the Well 10 site only is marginal or inadequate in most of the eastern half of the city, including both the northern and southern areas of the city. The areas of marginal or inadequate coverage are more extensive than the areas shown in the talk-out map in Figure 2 above. Talk-in coverage west of the City of Moscow along West Pullman Road/Highway 8 is better from the Well 10 site than it is from the Theophilus Tower site.

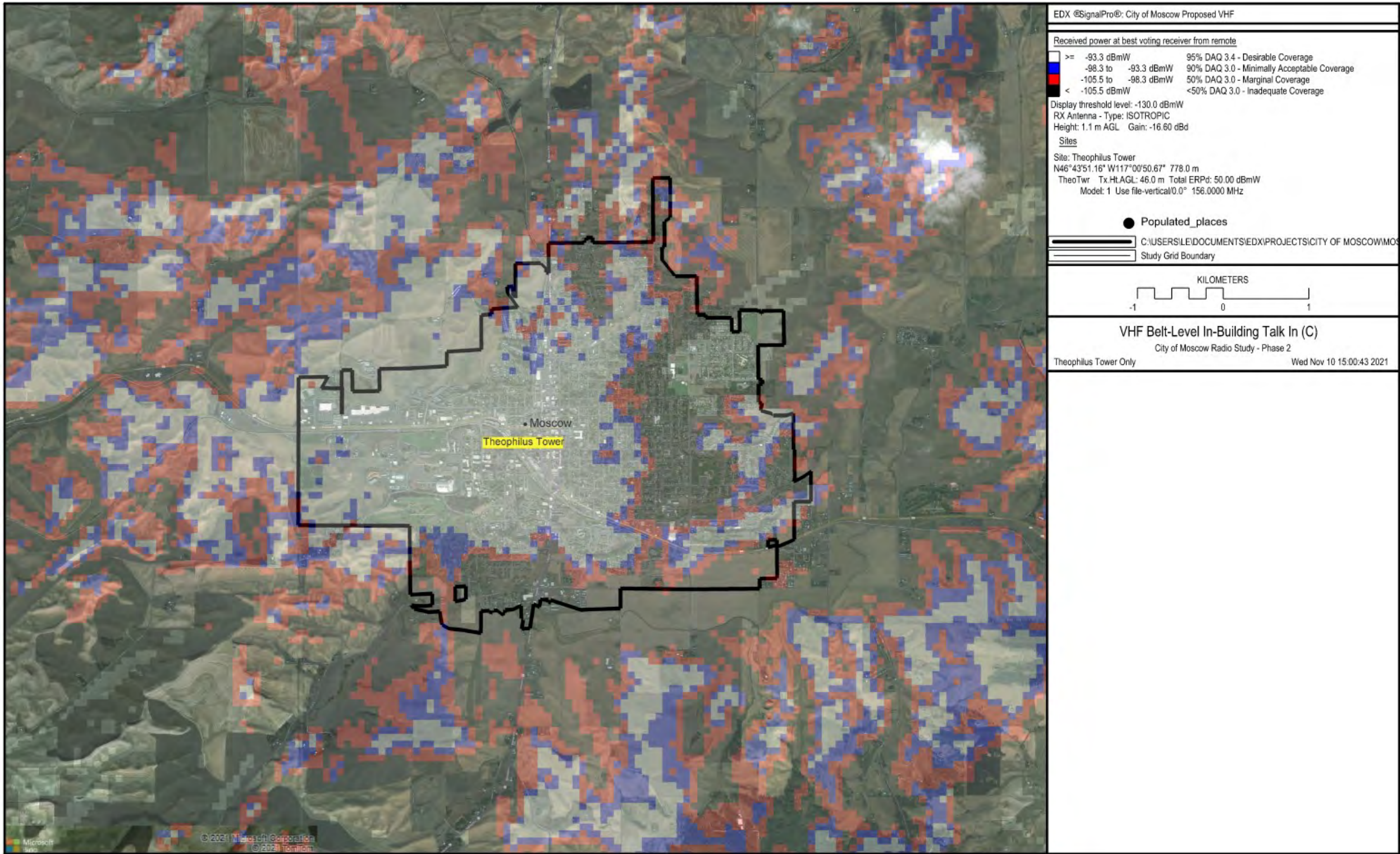


Figure 3 – Belt-Level Portable Talk-In Radio Coverage in Commercial Buildings – Theophilus Tower Site Only

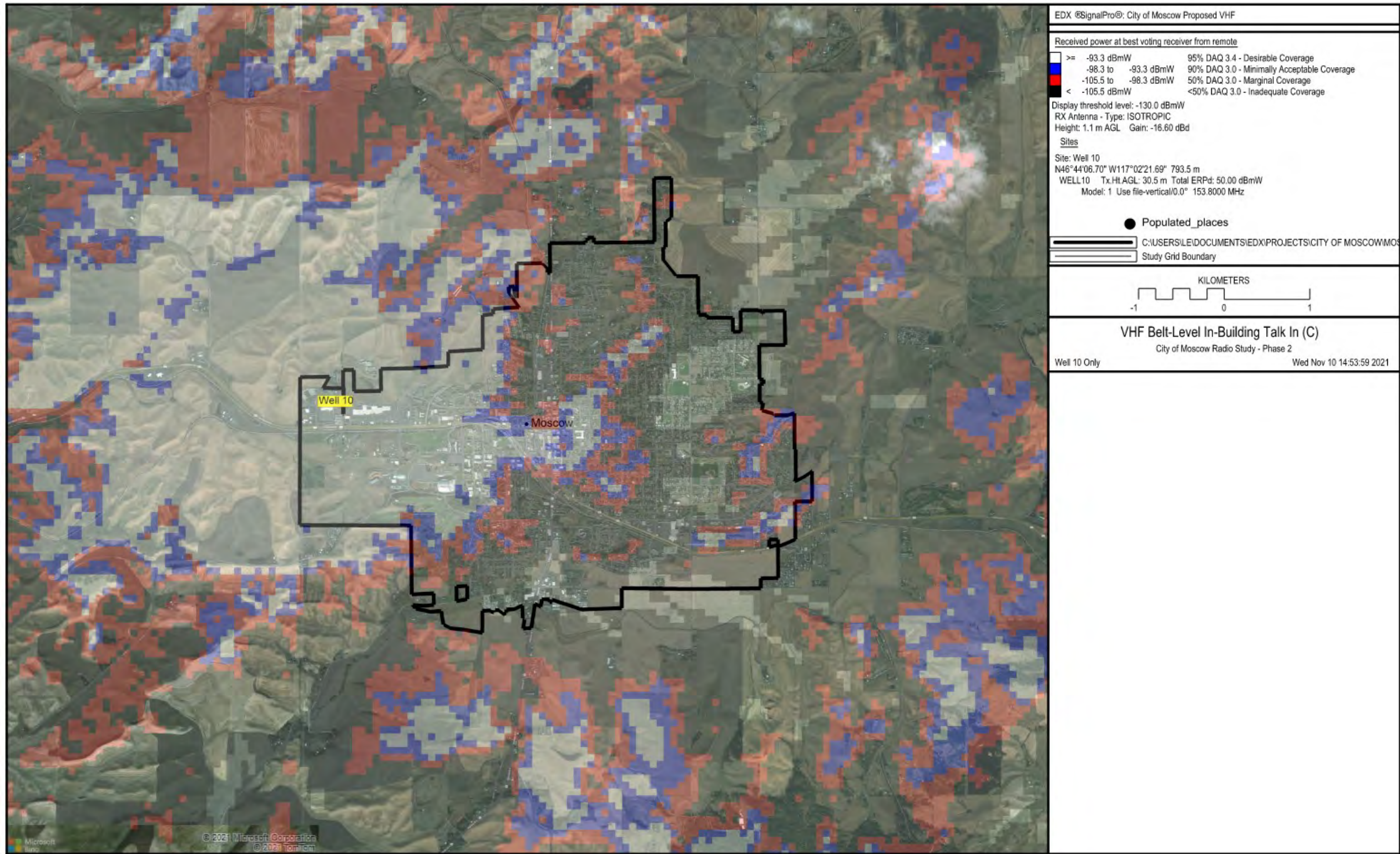


Figure 4 – Belt-Level Portable Talk-In Radio Coverage in Commercial Buildings – Well 10 Site Only

4. COVERAGE MAPS WITH THEOPHILUS TOWER OR WELL 10 SITE AS PART OF 3-SITE SIMULCAST SYSTEM

A. TALK-OUT COVERAGE MAPS

The maps shown below in Figure 5 and Figure 6 below show talk-out coverage maps for belt-level coverage inside commercial buildings from the Theophilus Tower and Well 10 sites incorporated into the 3-site simulcast system proposed in the System Alternatives Report. Figure 7 below shown talk-out head-level coverage inside commercial buildings from the Well 10 site as part of the proposed 3-site simulcast system.

As shown in Figure 5, the three-site simulcast system with the Theophilus Tower provides good belt-level coverage inside commercial buildings throughout the city, with the vast majority of the area of the city having “desirable” coverage, and a few small areas having “minimally acceptable” coverage.

Figure 6 shows belt-level coverage inside commercial buildings with the three-site simulcast system with the Well 10 site as the “in town” base station repeater site. As shown in Figure 6, this system configuration results in a few more areas with “minimally acceptable” coverage, and a few areas in the north central portion of the city with “marginal” belt-level coverage in commercial buildings. However, the areas with marginal coverage appear to have residential rather than commercial buildings, so belt-level in building coverage in these areas is actually likely to be adequate.

Figure 7 shows head-level coverage inside commercial buildings with the three-site simulcast system with the Well 10 site as the “in town” base station repeater site. As shown in Figure 7, head-level coverage inside commercial buildings is good throughout the city with the exception of one small area in the north central portion of the city, which is located in a residential area—so in-building coverage in this small area should not be an issue.

From the standpoint of talk-out in-building coverage in commercial buildings the significant advantage of using the City-owned Well 10 site (from the standpoint of long-term site lease costs) should outweigh the small difference in coverage compared to the Theophilus Tower site.

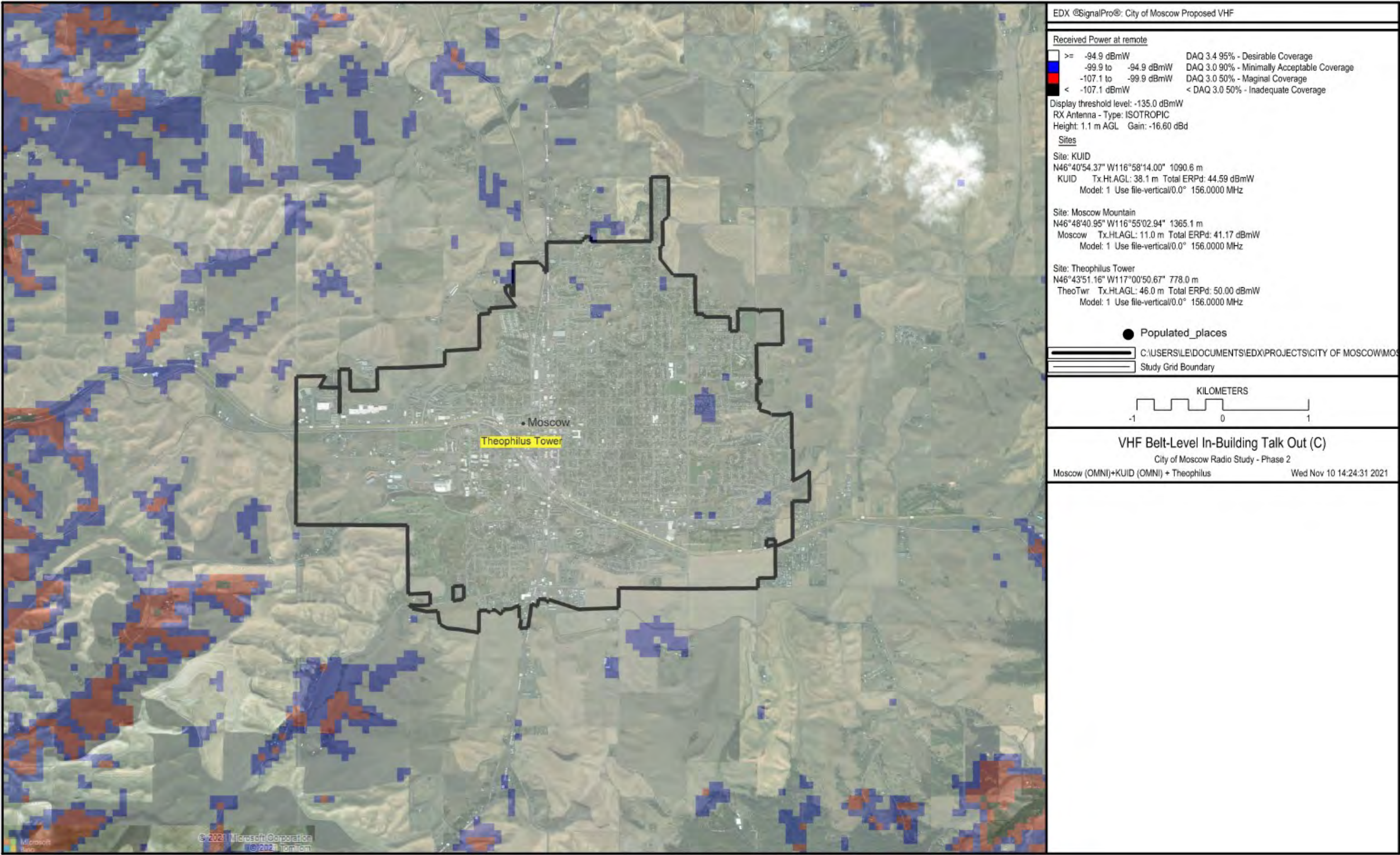


Figure 5 – Talk-Out Portable Belt-Level Coverage in Commercial Buildings – Moscow Mountain + Theophilus Tower + KUID-TV Sites

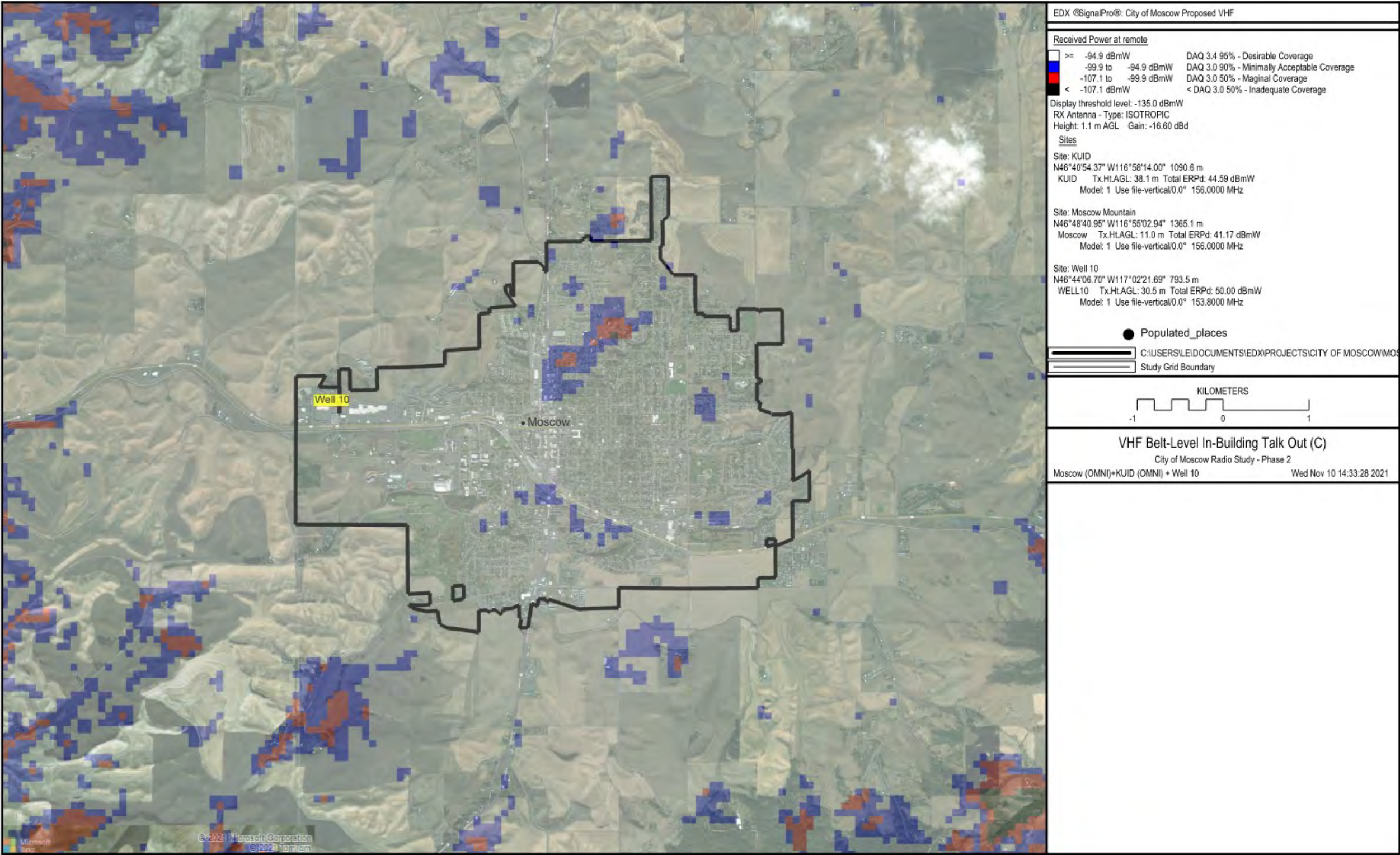


Figure 6 – Talk-Out Portable Belt-Level Coverage in Commercial Buildings – Moscow Mountain + Well 10 + KUID-TV Sites

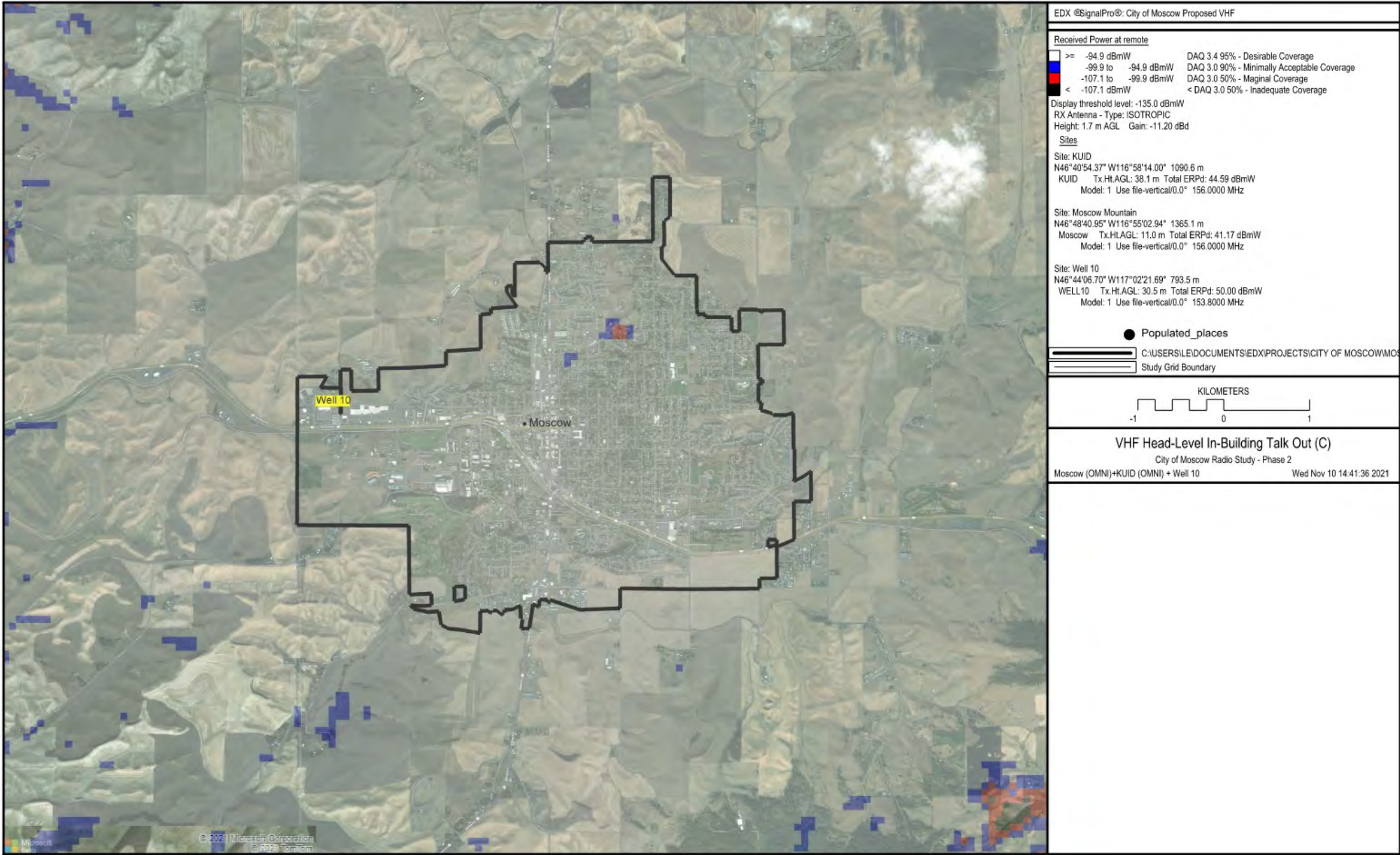


Figure 7 – Talk-Out Portable Head-Level Coverage in Commercial Buildings – Moscow Mountain + Well 10 + KUID-TV Sites

B. TALK-IN COVERAGE MAPS

The maps shown below in Figure 8 and Figure 9 below show talk-in coverage maps for belt-level coverage inside commercial buildings from the Theophilus Tower and Well 10 sites incorporated into the 3-site simulcast system proposed in the System Alternatives Report. These maps include the Oak Avenue Water Tower and the Vista Water Tank voting receiver sites as well as the voting receiver sites at the three simulcast base station sites. Figure 10 below shows talk-in belt-level coverage inside commercial buildings with the Well 10 site as part of the proposed 3-site simulcast system and with the Northwest Water Tower voting receiver site added to the stand-alone voting receiver sites.

As shown in Figure 8 below, the three-site simulcast system with the Moscow Mountain, Theophilus Tower and KUID-TV base station repeater sites combined with the Oak Avenue Water Tower, New PD and Vista Water Tank voting receiver sites provides good belt-level talk-in coverage from inside commercial building throughout the City of Moscow.

Figure 9 depicts the coverage impact of substituting the Well 10 site for the Theophilus Tower site in the three-site simulcast system, with the configuration of the voting receiver sites unchanged. As shown in Figure 9 below, this site configuration results in some areas of marginal belt-level portable talk-in coverage from inside commercial buildings in the south-central portion of downtown Moscow.

As shown in Figure 10 below, the addition of a voting receiver site at the Northwest Water Tower fills in the area with inadequate coverage, and the resulting overall talk-in belt-level portable coverage from inside commercial buildings is good throughout the City of Moscow, and is nearly identical to the coverage provided by the simulcast system with the Theophilus Tower site. The only significant difference is one very small area in the southwest portion of the city which has predicted “minimally-acceptable” coverage with the Theophilus Tower site and “marginal” coverage with the Well 10 site. This small area appears to fall within the Arboretum and Botanical Garden, so commercial in-building coverage at this location will not be an issue.

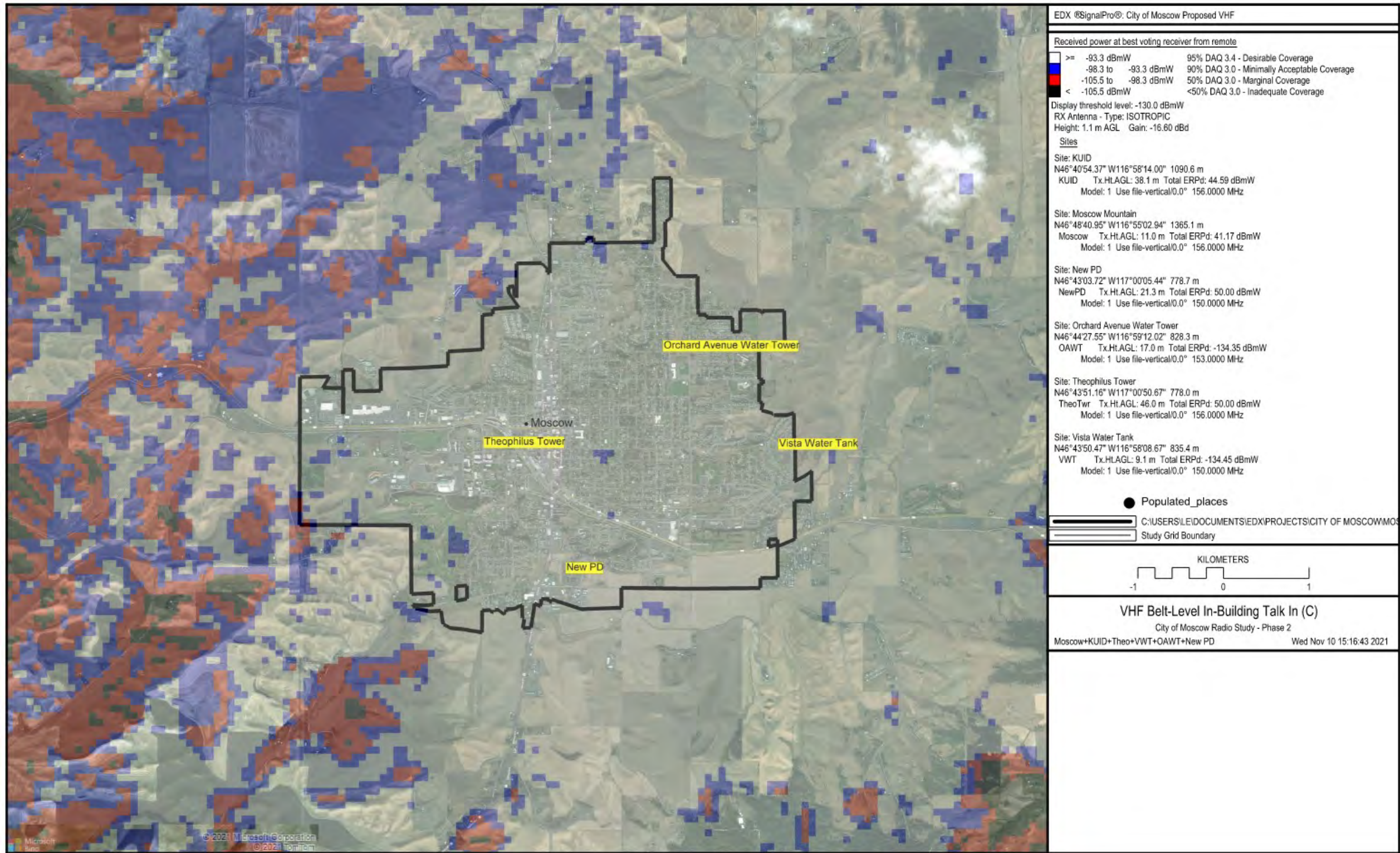


Figure 8 – Talk-in Belt Level Portable Coverage in Commercial Buildings – Moscow Mountain + Theophilus Tower + KUID-TV Base Station Repeater Sites + OAWT, New PD & VWT Voting Receivers

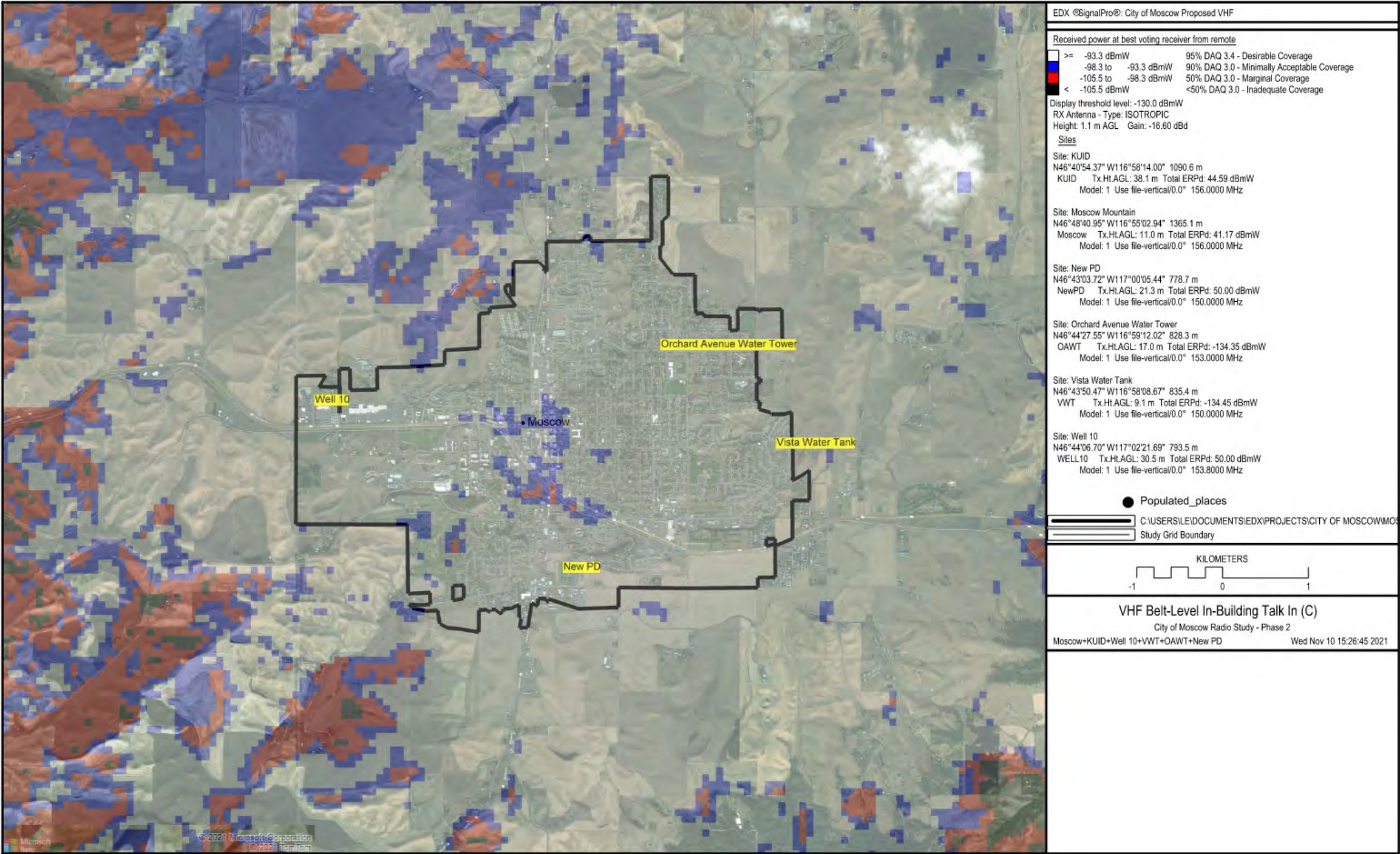


Figure 9 – Talk-in Belt Level Portable Coverage in Commercial Buildings – Moscow Mountain + Well 10 + KUID-TV Base Station Repeater Sites + OAWT, New PD & VWT Voting Receivers

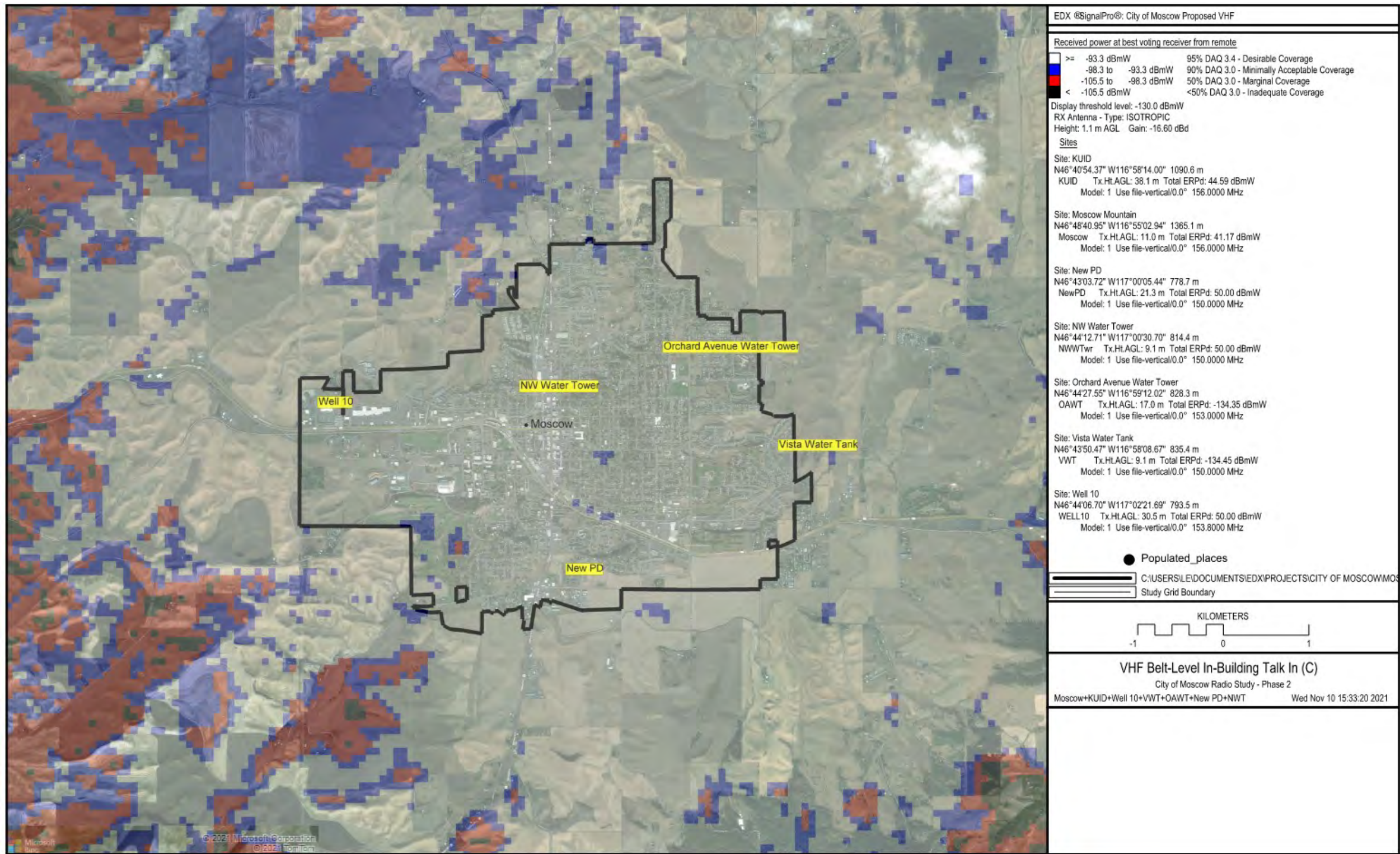


Figure 10 – Talk-in Belt Level Portable Coverage in Commercial Buildings – Moscow Mountain + Theophilus Tower + KUID-TV Base Station Repeater Sites + OAT, VWT & NWT Voting Receivers

5. RECOMMENDATIONS

Based on the coverage predictions shown in this report, we recommend incorporating the Well 10 base station site into the 3-site simulcast system, in lieu of the Theophilus Tower previously assumed in the System Alternatives Report. On the receive side of the system, the Oak Avenue Water Tower, Vista Water Tank, New PD, and Northwest Water Tank voting receiver sites need to be incorporated into the system in order to provide adequate belt-level talk-in coverage from inside commercial buildings throughout the City of Moscow.

For the purposes of the coverage predictions shown in this report, a new 120-foot self-supporting tower has been assumed at the Well 10 site, and the antenna system for the voting receiver site at the New PD site has been assumed to be mounted on the building rooftop.

The Well 10 site appears to have City of Moscow fiber interconnect available, so the fiber can be used to connect the site to the City fiber interconnect system. The tower at the Well 10 site would also be used to support microwave antennas to provide the interconnections to the Moscow Mountain, KUID-TV, Northwest Water Tower, Vista Water Tank, and Oak Avenue Water Tank sites, which are not connected to the City fiber system.

END OF REPORT

Attachment C
Scope of Work
City of Moscow VHF Emergency Radio
System Implementation

Task 1 - Licensing of proposed VHF TX and RX frequencies

This task shall include the completion of FCC Form 601 and contour overlap exhibits to modify existing City of Moscow FCC licenses to include all of TX and RX channels shown in Table 23 of the Final System Alternatives Report at the three proposed simulcast base station sites, including submission of the applications to a Public Safety Frequency Coordinator, and responding to questions and any requests for additional technical analysis from the Frequency Coordinator. Once coordination is complete, the Coordinator submits the application to the FCC, which typically takes from 60-90 days to grant the application.

Task 1b - Microwave Radio System Coordination and Licensing

Licensing of the microwave radio paths shown in the Final System Alternatives Report is assumed to be provided by the vendor that provides the microwave radio equipment, and will be included as a requirement in the microwave system specifications described below. Microwave license applications are also filed through a coordinator, and there is a 30-day PCN (Prior Coordination Notice) process that must be completed before the actual license application is submitted to the FCC. Once the licenses are granted, the facilities covered by the licenses must be put in service within 18 months

Task 2 – Preparation of Specification Documents for new VHF Simulcast System and Microwave Interconnect System

CONSULTANT shall provide detailed technical specifications and RFP documents (drawings, coordination of overall Section 1 terms and conditions specifications, etc.) for the recommended system upgrade shown in the System Alternatives Report, as modified to include the Well 10 repeater site in lieu of the Theophilus Tower repeater site, and the implementation of four voting receiver sites as shown in the Well 10 coverage map report. Technical specifications will include requirements for system testing and acceptance. CONSULTANT will also produce updated cost estimates for the proposed system upgrades including the changes in the proposed system configuration and the addition of a new tower at the Well 10 site. CONSULTANT will work with CITY to identify requirements for both technical specifications and overall Section 1 specifications (terms and conditions, etc.). Specifications will be provided in CSI format, unless otherwise called for. As part of the development of specifications, CONSULTANT will provide technical information required to complete site lease arrangements for the repeater sites that require site leases (KUIID & Moscow Mt.). CONSULTANT will provide draft versions of the specifications and cost estimates for review by CITY, followed by a final version that incorporates changes and comments provided in response to the draft documents.

Task 3 – Assistance with Preparation of Procurement Documents

CONSULTANT will work with CITY to incorporate the technical specification documents into the procurement document format used by CITY to assure that the bid specification documents include all technical and other non-technical requirements.

Task 4 – Assistance with Bid Evaluation and Vendor Selections

CONSULTANT will work with CITY to assist in bid proposal evaluation for the VHF and microwave systems and to select the final vendor(s) for the system implementation.

Task 5 - Supervision of System Implementation and Final Acceptance Testing

CONSULTANT will provide supervision of system installation and system acceptance testing based on documentation provided by the installation contractor(s) and two site inspection trips, one near the end of the installation process, and one after the punch list items identified during the second visit have been completed. Installation work performed prior to the pre-final inspection will be monitored via photos provided by the Contractor(s) and/or CITY. CONSULTANT will review submittals and other documentation provided by the installation contractor and respond to questions and RFIs related to system implementation and testing requirements. CONSULTANT will provide an initial on-site evaluation of site and coverage testing methods proposed by the installation and testing contractor(s), and will review the results of these tests to assure that they comply with the requirements stated in the specifications. CONSULTANT will provide pre-final inspection of the sites at which installation is being performed and a final inspection of the sites – to include a punch list of required corrective actions; A final site inspection will be performed once the punch-list items are completed and system acceptance testing is also complete, with a recommendation with respect to system acceptance by CITY.

Attachment D
Compensation for Services

Task	Task Compensation
Task 1 - Licensing of proposed VHF TX and RX frequencies and Task 1b - Microwave Radio System Coordination and Licensing	\$10,950.00 for Task 1, Task 1b to be performed by equipment provider
Task 2 – Preparation of Specification Documents for new VHF Simulcast System and Microwave Interconnect System	\$14,400.00
Task 3 – Assistance with Preparation of Procurement Documents	\$2,000.00
Task 4 – Assistance with Bid Evaluation and Vendor Selections	\$3,000.00
Task 5 - Supervision of System Implementation and Final Acceptance Testing	\$17,650.00
Total Not to Exceed Cost	\$48,000

Exhibit E
Project Schedule

Task	Anticipated Completion Date
Task 1 - Licensing of proposed VHF TX and RX frequencies and Task 1b - Microwave Radio System Coordination and Licensing	July 2022
Task 2 – Preparation of Specification Documents for new VHF Simulcast System and Microwave Interconnect System	August 2022
Task 3 – Assistance with Preparation of Procurement Documents	October 2022
Task 4 – Assistance with Bid Evaluation and Vendor Selections	November 2022
Radio System Construction	Spring/Summer 2023
Task 5 - Supervision of System Implementation and Final Acceptance Testing	October 2023
Project Completion	November 2023

CITY COUNCIL STAFF REPORT

DATE: Monday, February 7, 2022



AGENDA ITEM TITLE

Economic Development Administration Sixth Street Bridge Disaster Recovery Grant Agreement - Bill Belknap

RESPONSIBLE STAFF

Bill Belknap, Deputy City Supervisor - Community Planning and Design

REVIEWED BY

City Attorney and Grants Manager

ADDITIONAL PRESENTER(S)

OTHER RESOURCES

DESCRIPTION

After the Sixth Street Bridge was damaged by flooding events in 2019, the City applied for a disaster recovery grant administered by the Economic Development Administration (EDA) to assist with funding the construction of a new Sixth Street bridge over Paradise Creek near Mountain View Road. On January 12, 2022, EDA announced the grant award in the amount of \$955,000 for the project. The new 24-foot, single-span bridge will replace the existing culvert system and will include sidewalks, bike lanes, and be elevated to reduce future flooding in the area. This EDA grant, to be matched with \$515,000 from the City and project construction is anticipated to begin this summer and be completed by the end of 2022. Due to the time sensitive nature of the acceptance of the grant award, the City Supervisor signed the grant acceptance document and the matter is now before the Council to ratify the acceptance of the grant award by resolution.

STAFF RECOMMENDATION

Ratify acceptance of the grant award in the amount of \$955,000 and approve the associated Council Resolution.

PROPOSED ACTIONS

PROPOSED ACTIONS: Ratify acceptance of the grant award in the amount of \$955,000 and approve the associated Council Resolution; or take other action as deemed appropriate.

FISCAL IMPACT

PERSONNEL IMPACT

ATTACHMENTS

1. Resolution 2022 - Acceptance of EDA Grant_final
2. EDA Agreement

RESOLUTION 2022 -

A RESOLUTION OF THE CITY OF MOSCOW, A MUNICIPAL CORPORATION OF THE STATE OF IDAHO, ACCEPTING THE DEPARTMENT OF COMMERCE'S ECONOMIC DEVELOPMENT ADMINISTRATION (EDA) AWARD OF NINE HUNDRED FIFTY-FIVE THOUSAND DOLLARS (\$955,000) FOR THE 6TH STREET BRIDGE REPLACEMENT PROJECT; PROVIDING THAT THIS RESOLUTION BE IN EFFECT UPON ITS PASSAGE AND APPROVAL ACCORDING TO LAW.

WHEREAS, the U.S. Department of Commerce, Economic Development Administration's (EDA) mission is to lead the Federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy by making strategic investments in the nation's most economically distressed communities that encourage private sector collaboration and creation of higher-skill, higher wage jobs; and

WHEREAS, EDA's investments are results driven, embracing the principles of technological innovation, entrepreneurship and regional development; and

WHEREAS, the City of Moscow applied for a disaster recovery grant from the EDA to assist with the replacement of the 6th Street Bridge over Paradise Creek near Mountain View Road which was damaged during both the 2017 and 2019 flooding events; and

WHEREAS, the City received notice on January 13, 2022, that the U.S. Department of Commerce's EDA approved the City of Moscow's application for Financial Assistance for a \$955,000 EDA investment for the 6th Street Bridge Replacement project; and

WHEREAS, the new 24-foot, single-span bridge will replace the existing culvert system that was damaged by flooding in 2019, and will include sidewalks, bike lanes, and be elevated to lessen future flooding in the area; and

WHEREAS, this EDA grant will be matched with \$515,000 from the City of Moscow; and

WHEREAS, this Council believes it to be in the best interests of the City of Moscow to preauthorize the acceptance of the U.S. Department of Commerce's EDA award for the 6th Street Bridge Replacement project;

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Council of the City of Moscow, Idaho as follows:

SECTION 1: All matters stated above are found to be true and correct and are incorporated herein by reference as if copied in their entirety and shall be adopted with the following sections of this Resolution.

SECTION 2: That the Mayor and Finance Director be and are hereby preauthorized and directed to accept the Department of Commerce's EDA Award (Federal Award ID Number 07-79-07731;

URI: 116259) in the amount of Nine Hundred Fifty-Five Thousand Dollars (\$955,000) for the 6th Street bridge replacement project (Attachment “A”).

SECTION 3: That the Mayor, Finance Director, and City Staff are each hereby preauthorized and directed to take such further action as may be appropriate in order to effect the purpose of this Resolution and comply with the Award provisions as detailed in Attachment “B”.

SECTION 4: That the U.S. Department of Commerce, Financial Assistance Award Form CD-450, Attachment B, signed by City Supervisor on January 18, 2022, is hereby ratified.

SECTION 5: SEVERABILITY. Provisions of this Resolution shall be deemed severable and the invalidity of any provision of this Resolution shall not affect the validity of the remaining provisions.

SECTION 6: EFFECTIVE DATE. This Resolution shall be effective upon its passage and approval.

PASSED on Motion by the Following Vote:

	Aye	Nay	Abstain	Absent
Hailey Lewis	_____	_____	_____	_____
Gina Taruscio	_____	_____	_____	_____
Sandra Kelly	_____	_____	_____	_____
Maureen Laflin	_____	_____	_____	_____
Anne Zabala	_____	_____	_____	_____
Julia Parker	_____	_____	_____	_____

ADOPTED by the City Council of the City of Moscow, Idaho and **APPROVED** by the Mayor of the City of Moscow, this ____ day of _____, 2022.

Art Bettge, Mayor

CERTIFICATION and ATTESTATION. I hereby certify that the above is a true copy of a Resolution passed at a regular meeting of the City Council, City of Moscow, held on _____, 2022 and attest to the Mayor’s signature.

Laurie M. Hopkins, City Clerk



U.S. DEPARTMENT OF COMMERCE
Economic Development Administration
Jackson Federal Building, Room 1890
915 Second Avenue
Seattle, Washington 98174
206-220-7660

January 13, 2022

In reply refer to: 6th Street Bridge
Investment No.: 07-79-07731

Alisa J. Anderson
Grants Manager/ADA Coordinator
City of Moscow
206 East Third Street
P. O. Box 9203
Moscow, ID 83843-1703

Dear Ms. Anderson:

I am pleased to inform you that the Department of Commerce's Economic Development Administration (EDA) has approved your application for a \$955,000 EDA investment for the 6th Street Bridge Replacement project.

Enclosed is a digitally signed copy of the Financial Assistance Award on Form CD-450. Your agreement to the terms and conditions of the award should be indicated by the signature of your principal official on the signed copy of the Form CD-450 by one of the following methods:

1. Using a certified signature through Adobe or some other software.
2. Printing the document, signing in ink, and returning a scanned copy by e-mail.

The fully executed Form CD-450 should be returned via email to sperson@eda.gov and dlarkins@eda.gov. If not signed and returned within 30 days of receipt, EDA may declare the Award null and void. Please retain a copy for your records.

Please do not make any commitments in reliance on this award until you have carefully reviewed and accepted the terms and conditions. Any commitments entered into prior to obtaining the approval of EDA in accordance with its regulations and requirements will be at your own risk.

EDA's mission is to lead the Federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy. EDA implements this mission by making strategic investments in the nation's most economically distressed communities that encourage private sector collaboration and creation of higher-skill, higher wage jobs. EDA investments are results driven, embracing the principles of technological innovation, entrepreneurship and regional development.

I share your expectations regarding the impact of this investment and look forward to working with you to meet the economic development needs of your community.

Sincerely,

Sheba Person-Whitley
Regional Director

Enclosures

Copy: Maiea Sellers, Area Director
Daniel Larkins, Economic Development Specialist
Shalini Bansal, Supervisory Program Manager

FORM CD-450 (REV. 10/18)		U.S. DEPARTMENT OF COMMERCE		☒ GRANT ☐ COOPERATIVE AGREEMENT	
FINANCIAL ASSISTANCE AWARD				FEDERAL AWARD ID NUMBER	
				07-79-07731; URI: 116259	
RECIPIENT NAME				PERIOD OF PERFORMANCE	
City of Moscow				18 months from the date of award	
STREET ADDRESS				FEDERAL SHARE OF COST	
206 East Third Street PO Box 9203				\$ 955,000	
CITY, STATE, ZIP CODE				RECIPIENT SHARE OF COST	
Moscow, ID 83348-1703				\$ 515,000	
AUTHORITY				TOTAL ESTIMATED COST	
42 U.S.C. 3149 Section 209 of the Public Works and Economic Development Act of 1965 (Public Law 89-136) as amended by the Economic Development Administration Reauthorization Act of 2004 (Public Law 108-373)				\$ 1,470,000	
CFDA NO. AND NAME					
11.307/Economic Adjustment Assistance 2019 EDA Disaster Supplemental					
PROJECT TITLE					
6th Street Bridge Replacement					
This Award Document (Form CD-450) signed by the Grants Officer constitutes an obligation of Federal funding. By signing this Form CD-450, the Recipient agrees to comply with the Award provisions checked below and attached. Upon acceptance by the Recipient, the Form CD-450 must be signed by an authorized representative of the Recipient and returned to the Grants Officer. If not signed and returned without modification by the Recipient within 30 days of receipt, the Grants Officer may unilaterally withdraw this Award offer and de-obligate the funds. ☒ DEPARTMENT OF COMMERCE FINANCIAL ASSISTANCE STANDARD TERMS AND CONDITIONS ☐ R & D AWARD ☐ FEDERAL-WIDE RESEARCH TERMS AND CONDITIONS, AS ADOPTED BY THE DEPT. OF COMMERCE ☒ SPECIFIC AWARD CONDITIONS ☐ LINE ITEM BUDGET ☒ 2 CFR PART 200, UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS, AS ADOPTED PURSUANT TO 2 CFR § 1327.101 ☐ 48 CFR PART 31, CONTRACT COST PRINCIPLES AND PROCEDURES ☐ MULTI-YEAR AWARD. PLEASE SEE THE MULTI-YEAR SPECIFIC AWARD CONDITION. ☒ OTHER(S): 13 C.F.R. Chapter III, Economic Development Administration, Department of Commerce U.S. Department of Commerce, Economic Development Administration, Standard Terms and Conditions for Construction Projects (March 22, 2021)					
SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER				DATE	
Sheba Person-Whitley Digitally signed by Sheba Person-Whitley Date: 2022.01.18 14:13:26 -08'00'				01/18/22	
PRINTED NAME, PRINTED TITLE, AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL				DATE	
Bill Belknap, City Supervisor Bill Belknap Digitally signed by Bill Belknap DN: cn=Bill Belknap, o=City of Moscow, ou=City of Moscow, email=Bill.Belknap@cityofmoscow.idaho.gov, c=US Date: 2022.01.18 15:48:37 -08'00'				01/18/22	

|SPECIFIC AWARD CONDITIONS
U.S. DEPARTMENT OF COMMERCE
Economic Development Administration (EDA)

CONSTRUCTION PROJECTS: Public Works and Economic Adjustment Assistance Programs
under Sections 201 and 209 of the Public Works and Economic Development Act, as amended,
42 U.S.C. §§ 3141 and 3149

Public Works and Economic Adjustment Assistance Programs

Project Title: 6 th Street Bridge Replacement	
Recipient Name: City of Moscow	Project Number: 07-79-07731

1. **AUTHORIZED SCOPE OF WORK:** This EDA Award supports the work described in the approved final scope of work, which is incorporated by reference into this Award, as the *Authorized Scope of Work*. All work on this project must be consistent with the *Authorized Scope of Work*, unless the Grants Officer has authorized a modification of the scope of work in writing through an amendment memorialized by a fully executed *Amendment to Financial Assistance Award* (Form CD-451).

The *Authorized Scope of Work* for this project includes:

The project involves the replacement of a bridge on a public street (6th Street) in Moscow, ID. The new bridge will consist of precast concrete arch segments complete with traffic lanes, bike lanes, and sidewalk. Additional work involves relocation of City utilities to coordinate with the new bridge.

2. The Recipient Contact's name, title, address, and telephone number are:

Bill Belknap City Supervisor Phone: 208-883-7011 Email: bbelknap@ci.moscow.id.us	City of Moscow East Third Street, P. O. Box 9203 Moscow, ID 83348-1703
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3. The Grants Officer is authorized to award, amend, suspend, and terminate financial assistance awards. The Grants Officer is:

Sheba Person-Whitley, Regional Director Seattle Regional Office Phone: (206) 220 -7665 Email: sperson@eda.gov Fax: (206) 220- 7657	Economic Development Administration Seattle Regional Office 915 Second Avenue, Room 1890 Seattle, <u>Washington</u> 98174-1012
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4. The Federal Program Officer (Area Director) oversees the programmatic aspects of this Award. The Federal Program Officer is:

Kerstin Millius, Area Director Seattle Regional Office Phone: (206) 220-7700 Email: kmillius@eda.gov Fax: (206) 220- 7657	Economic Development Administration Seattle Regional Office 915 Second Avenue, Room 1890 Seattle, Washington 98174-1012
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5. The EDA Project Officer is responsible for day-to-day administration and liaison with the Recipient and receives all reports and payment requests. The Project Officer is:

Richard Moore Phone: (206) 507-4839 FAX: (206) 220-7657 Email: Rmoore4@eda.gov	Economic Development Administration Seattle Regional Office 915 Second Avenue, Room 1890 Seattle, Washington 98174-1012
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6. **CONTACT CHANGES:** Changes to the contact information above may be made in writing by the EDA Project Officer without an amendment on Form CD-451.

7. **ADDITIONAL INCLUDED DOCUMENTS:** In addition to the regulations, documents, or authorities incorporated by reference on the *Financial Assistance Award* (Form CD-450), the following additional documents are hereby incorporated by reference into this Award:

- The Recipient's application, including any attachments, project descriptions, schedules, and subsequently submitted supplemental documentation.

Should there be a discrepancy among these documents, the Special Award Conditions (this document), including any attachments, shall control.

8. **PROJECT DEVELOPMENT TIME SCHEDULE:** The Recipient agrees to the following Project Development Time Schedule:

Return of Executed Financial Assistance Award30 calendar days after receipt of
Form CD-450/CD-451
Start of Construction 12 Months from the Date of Award
Construction Completed 30 Months from the Date of Award
Authorized Award End Date 60 Months from the Date of Award
Submission of Final Financial Report (Form SF-425) ...No later than 120 calendar days from
the Award End Date

Project Closeout – All project closeout documents, including final financial reports (Form SF 425 or any successor form) and any required program reports, shall be submitted to EDA not more than 120 calendar days after the date the Recipient accepts the completed project from the contractor(s).

The Recipient shall diligently pursue the development of the project so as to ensure completion within this time schedule and shall promptly notify EDA in writing of any event that could substantially delay meeting any of the prescribed time limits for the project as set forth above. The Recipient further acknowledges that failure to meet the development time schedule may result in EDA taking action to terminate the Award in accordance with the regulations set forth at 2 CFR §§ 200.339–200.343, as applicable.

9. PROJECT REPORTING AND FINANCIAL DISBURSEMENTS INSTRUCTIONS:

A. AWARD DISBURSEMENTS: Reimbursement basis only. EDA will make disbursements under this Award on a reimbursement basis only, based on actual costs incurred, after all preconditions set forth in these Special Award Conditions have been met.

The “*Outlay Report and Request for Reimbursement*” (Form SF-271 or any successor form) is used to request a disbursement, which shall be approved in writing by the Project Officer.

Please note that prior to the initial disbursement, the Recipient must complete the attached Form SF-3881 (or any successor form) “*ACH Vendor/Miscellaneous Payment Enrollment Form*” and submit it to NOAA’s Accounting Office by FAX at (301) 528-3675. (*FAX is required to secure confidentiality of sensitive information.*) The form must be completed by the respective parties (EDA, Recipient Bank, and Recipient) at the start of each new award.

B. REPORTS:

- a. *Project Progress Reports*: The Recipient shall submit project progress reports to the Project Officer on a quarterly basis for the periods ending **December 31, March 31, June 30, and September 30**, or any portion thereof, until the final disbursement is made by EDA. Reports should be submitted using the approved EDA template, which will be provided by the Project Officer and discussed during the project kick-off meeting. Reports are due no later than 1 month following the end of the quarterly period.
- b. *Financial Reports*: The Recipient shall submit a “*Federal Financial Report*” (Form SF-425 or any successor form) on a semi-annual basis for the periods ending **March 31 and September 30**, or any portion thereof, for the entire period of performance. Form SF-425 and instructions for completing this form are available at:
<https://www.grants.gov/web/grants/forms/post-award-reporting-forms.html>.

Reports are due no later than 1 month following the end of the semi-annual period.

A final Form SF-425 must be submitted no more than 120 calendar days after the expiration date of the Award (*i.e.*, the Award End Date specified on the Form CD-450 or a subsequently executed Form CD-451). Final Financial Reports should follow the guidance

outlined in the instructions for submitting mid-term financial reports, but should ensure that all fields accurately reflect the total outlays for the entire period of performance and that all matching funds and program income (if applicable) are fully reported. Determination of the final grant rate and final balances owed to the government will be determined based on the information on the final Form SF-425, so it is imperative that it be submitted in a timely and accurate manner.

- 10. ALLOWABLE COSTS AND AUTHORIZED BUDGET:** Total allowable costs will be determined after the final financial documents are submitted in accordance with the applicable authorities specified on the *Financial Assistance Award* (Form CD-450), including the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 CFR part 200 (Uniform Guidance).

Except as otherwise expressly provided for within these Special Award Conditions, the Federal share of the allowable costs shall be based on the Investment Rate for the Award, as established on the Form CD-450 or any subsequent amendment (Form CD-451). In the event of an underrun in total allowable costs for this project, the Federal share of allowable costs shall be determined by the Investment Rate. The Federal share of total allowable costs shall not exceed the dollar amount specified on the original Award or any subsequent amendments.

Line Item Budget:

- A. Under the terms of the Award, the total approved authorized budget is:

Federal Share (EDA Amount)	\$955,000
Non-Federal Matching Share	\$515,000
Total Project Cost	\$1,470,000

B. Under the terms of this Award, the total approved line item budget is:

COST CLASSIFICATION	Proposed	Approved
Administrative and legal expenses	\$90,000	\$90,000
Land, structures, rights-of-way, etc.		
Relocation expenses and payments		
Architectural and engineering fees		
Other architectural and engineering fees		
Project inspection fees	\$140,000	\$140,000
Site work		
Demolition and removal		
Construction	\$1,125,000	\$1,125,000
Equipment		
Contingencies	\$115,000	\$115,000
Total Project Cost	\$1,470,000	\$1,470,000

11. MATCHING SHARE: The Recipient agrees to provide the Recipient's non-Federal Matching Share contribution for eligible project expenses in proportion to the Federal share requested for such project expenses (see 13 CFR § 300.3). By accepting the Award, the Recipient also certifies that the Matching Share of the project costs is committed to the project, is not encumbered in any way that would prevent its use for the project, and will be available as needed for the project.

12. REFUND CHECKS, INTEREST, OR UNUSED FUNDS: Treasury has given EDA two options for having payments deposited to EDA's account:

- A. The first is the pay.gov website. This option allows the payee to pay EDA through the internet. The payee will have the option to make a one-time payment or to set up an account to make regular payments.
- B. The second is paper check conversion. All checks must include on their face the name of the DOC agency funding the Award, the award number, and a description of no more than two words identifying the reason for the check. A copy of the check should be provided to the EDA Project Officer. This option allows the payee to send a check to NOAA's Accounting Office, which processes EDA's accounting functions, at the following address:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Finance Office, AOD, EDA Grants
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The accounting staff will scan the checks in to an encrypted file and transfer the file to the Federal Reserve Bank, where the funds will be deposited in EDA's account. While this process will not be an issue with most payees, there are occasionally issues for entities remitting funds to EDA via check. If you are remitting funds to EDA via check, please make note of the following:

- If a check is sent to EDA, it will be converted into an electronic funds transfer by copying the check and using the account information to electronically debit your account for the amount of the check. The debit from your account will usually occur within 24 hours and will appear on your regular account statement.
- EDA will not return your original check; the original will be destroyed and a copy will be maintained in our office. If the Electronic Funds Transfer (EFT) cannot be processed for technical reasons, the copy will be processed in place of the original check. If the EFT cannot be completed because of insufficient funds, EDA will charge you a one-time fee of \$25.00, which will be collected by EFT.

13. CONSTRUCTION COMPLETION: In keeping with prudent grants management policy, EDA construction projects must be completed within five years of the date the Form CD-450 is signed by the Recipient accepting the Award. If construction is not completed by that date and the Grants Officer determines, after consultation with the Recipient, that construction to completion cannot reasonably be expected to be completed promptly and expeditiously, the grant may be terminated. Extensions beyond the five-year period of performance are exceedingly rare and can only be authorized by the Assistant Secretary. Nothing in this paragraph is intended to alter the Project Development Time Schedule set out above.

14. USEFUL LIFE: The useful life of this project is hereby determined to be 20 years from Start of Award, or trigger used to determine, when the useful life timeframe begins to run.

15. GOALS FOR WOMEN AND MINORITIES IN CONSTRUCTION: Department of Labor regulations set forth at 41 CFR part 60-4 establish goals and timetables for the participation of minorities and women in the construction industry. Those regulations apply to all federally assisted construction contracts in excess of \$10,000. The Recipient shall comply with those regulations and shall obtain compliance with 41 CFR part 60-4 from contractors and subcontractors employed on the project by including such notices, clauses, and provisions in the Solicitations for Offers or Bids as required by 41 CFR part 60-4. The goal for the participation of women in each trade area shall be as follows: from April 1, 1981 until further notice: 6.9 percent.

All changes to this goal, as published in the Federal Register in accordance with the Office of Federal Contract Compliance Programs regulations at 41 CFR § 60-4.6, or any successor regulations, shall hereafter be incorporated by reference into these Special Award Conditions.

Goals for minority participation shall be as prescribed by Appendix B-80 of the *Federal Register* notice published October 3, 1980 at 45 FR 65984-65991, or any subsequently published amendments. The Recipient shall include the "*Standard Federal Equal Employment Opportunity*

Construction Contract Specifications” (or cause them to be included, if appropriate) in all Federally-assisted contracts and subcontracts. The goals and timetables for minority and female participation may not be less than those published pursuant to 41 CFR § 60-4.6.

16. **PROCUREMENT:** The Recipient agrees that all procurement transactions shall be in accordance with the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 CFR §§ 200.317–200.327 and the EDA regulations contained in 13 CFR Chapter III, especially 13 CFR part 305 and 13 CFR § 302.17 (“Conflicts of Interest”).
17. **EVIDENCE OF GOOD TITLE:** Before the initial disbursement of funds by EDA, the Recipient shall provide an opinion of counsel, satisfactory to EDA, that the Recipient has acquired good and marketable title to land, free of all encumbrances, to all real property necessary for completion of the project, as well as any necessary rights-of-way, easements, State or local government permits, or long-term lease interests necessary for the completion of the project, in accordance with 13 CFR part 314.
18. **NONRELOCATION:** By accepting this Award of financial assistance, the Recipient attests that the EDA-funded project will not be used to induce the relocation or the movement of existing jobs from one Region to another Region by a primary beneficiary of the Award (see 13 CFR § 300.3). In the event that EDA determines that its assistance was used for such purposes, EDA reserves the right to pursue all rights and remedies, including suspension of disbursements, termination of the Award for convenience or cause, and disallowance of any costs attributable, directly or indirectly, to the relocation.

For purposes of ensuring that EDA assistance will not be used for relocation purposes, each applicant must inform EDA of all employers that constitute primary beneficiaries of the project. EDA considers an employer to be a “primary beneficiary” if the applicant estimates that such employer will create or save 100 or more permanent jobs as a result of the investment assistance and specifically names the employer in its application to EDA. In smaller communities, EDA may consider a primary beneficiary to be an employer of 50 or more permanent jobs so identified.

19. **PERFORMANCE MEASURES:** The Recipient agrees to report on program performance measures and program outcomes in such a form and at such intervals as may be prescribed by EDA in compliance with the Government Performance and Results Act (GPRA) of 1993, and the Government Performance and Results Modernization Act of 2010.

At this time, all Awards for construction assistance require Recipients to report actual job creation/retention and private investment leverage at three (3), six (6), and nine (9) years after an EDA investment. The Recipient must retain sufficient documentation so that they can submit these required reports. Failure to submit these reports may adversely impact the ability of the Recipient to secure future funding from EDA.

Performance measures and reporting requirements that apply to program activities funded by this investment will be provided in a separate GPRA information collection document. EDA staff will contact the Recipient in writing within a reasonable period prior to the time of submission of the reports with information on how this data should be submitted. The Recipient must ensure

adequate and sufficient records are kept to support the methodology for computing initial job creation/retention and private investment estimates and all subsequent actual performance data, and must make this information available at EDA's request, including in the event of an audit or performance site visit.

20. REAL PROPERTY REPORTING: Consistent with 2 CFR § 200.330 ("Reporting on real property"), the Recipient must submit reports (using Form SF-429 "Real Property Status Report" or any successor form). The initial SF-429 form must be returned to the EDA Project Officer no later than December 31 of the year of the initial disbursement of Federal funds. Because EDA's interest in this real property extends at least 15 years, successive reports will be required by December 31 every **two** years thereafter during the established useful life of the property, rather than on an annual basis. At its sole discretion, EDA reserves the right to require more or less frequent real property reporting for the duration of the useful life of real property in which it retains an interest under this project.

21. WASTE, FRAUD AND ABUSE: Consistent with 2 CFR part 200, Recipient personnel responsible for managing the Recipient's finances and overseeing any contractors, sub-contractors or Subrecipients, will complete the training PowerPoint entitled "Compliance with EDA Disaster Assistance Program Requirements" and return the signed Certificate of Training Completion (page 38 of the training) to EDA along with the signed Form CD-450 within 30 days of receipt.

Further, Recipient will monitor Award activities for common fraud schemes, such as:

- false claims for materials and labor,
- bribes related to the acquisition of materials and labor,
- product substitution,
- mismarking or mislabeling on products and materials, and
- time and materials overcharging.

Should Recipient detect any suspicious activity, Recipient will contact EDA staff listed above and the Office of Inspector General, as indicated at <https://www.oig.doc.gov/Pages/Contact-Us.aspx>, as soon as possible.

22. PRE-AWARD COSTS NOT AUTHORIZED: Pre-award Costs incurred prior to the Grants Officer's signature on this Award are not authorized and may not be charged to this Award.

- 23. FREEDOM OF INFORMATION ACT (FOIA):** EDA is responsible for meeting its Freedom of Information Act (FOIA) (5 U.S.C. § 552) responsibilities for its records. DOC regulations at 15 CFR part 4 set forth the requirements and procedures that EDA must follow in order to make the requested material, information, and records publicly available. Unless prohibited by law and to the extent required under the FOIA, contents of applications and other information submitted by applicants and recipients may be released in response to a FOIA request. The Recipient should be aware that EDA may make certain application information publicly available. Accordingly, the Recipient should notify EDA if it believes any Application information to be confidential.
- 24. SCOPE OF WORK/NON-DUPLICATION OF PAST AND CURRENT FEDERALLY FUNDED ACTIVITIES:** The Scope of Work shall not duplicate activities funded under any other federal programs, including but not limited to any current EDA Award. Recipient shall not use federal or matching share funds for this Award for the completion of any activity required under any other federally funded project and shall not claim the costs of any activity funded under any other federally funded project as part of this EDA Award.
- 25. STAFFING CHANGES:** In the event of a change in the key professional staff positions related to project management, the Recipient shall provide the name of the individual selected to fill the position to the Project Officer and a copy of his or her resume within 30 business days of the selection.
- 26. ARCHEOLOGICAL AND HISTORICAL RESOURCES:** If during construction of the project, historical and archeological resources, including burial grounds and artifacts are discovered, the Recipient shall immediately stop construction in the area, contact the Idaho State Historic Preservation Officer (SHPO), the Nez Perce Tribe, other interested Tribes, and EDA, and follow the SHPO or ~~THPO~~ instructions for the preservation of resources.
- 27. POTENTIAL U.S. ARMY CORPS OF ENGINEERS (USACE) PERMITTING:** Prior to solicitation of bids, the Recipient shall provide either:
- A. Evidence satisfactory to the EDA that the Recipient has received the proper permit from USACE. Recipient shall follow all requirements contained within the permit; or
 - B. Evidence satisfactory to the EDA from USACE that no permit is required, this may include having to obtain and provide a jurisdictional determination from USACE.
- 28. FLOODPLAINS:** Prior to solicitation of bids, the Recipient shall provide evidence satisfactory to the EDA that the Recipient has received a "No-Rise" Certification from the City of Moscow Floodplain Zoning Administrator.
- 29. HAZARDOUS OR TOXIC SUBSTANCES:** If visual or olfactory evidence of potential soil contamination from current or historical practices is encountered during construction, work will stop immediately upon discovery and the appropriate Ecology regional office will be notified.
- 30. PROJECT INSPECTION AGREEMENT:** Prior to the initial disbursement of funds by EDA, the Recipient must submit to EDA for approval, a Project Inspection Agreement that meets the requirements in the EDA's "Summary of EDA Construction Standards," as well as the

competitive procurement standards of 2 CFR part 200 and EDA Regulations in 13 CFR Chapter III. The fee for basic Project Inspection Services will be a lump sum or an agreed maximum, and no part of the fees for other services will be based on a cost-plus-percentage-of-cost or a cost using a multiplier.



U.S. DEPARTMENT OF COMMERCE
Economic Development Administration
Jackson Federal Building, Room 1890
915 Second Avenue
Seattle, Washington 98174
206-220-7660

January 13, 2022

In reply refer to: 6th Street Bridge
Investment No.: 07-79-07731

Alisa J. Anderson
Grants Manager/ADA Coordinator
City of Moscow
206 East Third Street
P. O. Box 9203
Moscow, ID 83843-1703

Dear Ms. Anderson:

I am pleased to inform you that the Department of Commerce's Economic Development Administration (EDA) has approved your application for a \$955,000 EDA investment for the 6th Street Bridge Replacement project.

Enclosed is a digitally signed copy of the Financial Assistance Award on Form CD-450. Your agreement to the terms and conditions of the award should be indicated by the signature of your principal official on the signed copy of the Form CD-450 by one of the following methods:

1. Using a certified signature through Adobe or some other software.
2. Printing the document, signing in ink, and returning a scanned copy by e-mail.

The fully executed Form CD-450 should be returned via email to sperson@eda.gov and dlarkins@eda.gov. If not signed and returned within 30 days of receipt, EDA may declare the Award null and void. Please retain a copy for your records.

Please do not make any commitments in reliance on this award until you have carefully reviewed and accepted the terms and conditions. Any commitments entered into prior to obtaining the approval of EDA in accordance with its regulations and requirements will be at your own risk.

EDA's mission is to lead the Federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy. EDA implements this mission by making strategic investments in the nation's most economically distressed communities that encourage private sector collaboration and creation of higher-skill, higher wage jobs. EDA investments are results driven, embracing the principles of technological innovation, entrepreneurship and regional development.

I share your expectations regarding the impact of this investment and look forward to working with you to meet the economic development needs of your community.

Sincerely,

Sheba Person-Whitley
Regional Director

Enclosures

Copy: Maiea Sellers, Area Director
Daniel Larkins, Economic Development Specialist
Shalini Bansal, Supervisory Program Manager

FORM CD-450 (REV. 10/18)		U.S. DEPARTMENT OF COMMERCE		GRANT COOPERATIVE AGREEMENT	
FINANCIAL ASSISTANCE AWARD				FEDERAL AWARD ID NUMBER	
RECIPIENT NAME				PERIOD OF PERFORMANCE	
STREET ADDRESS				FEDERAL SHARE OF COST \$	
CITY, STATE, ZIP CODE				RECIPIENT SHARE OF COST \$	
AUTHORITY				TOTAL ESTIMATED COST \$	
CFDA NO. AND NAME					
PROJECT TITLE					
This Award Document (Form CD-450) signed by the Grants Officer constitutes an obligation of Federal funding. By signing this Form CD-450, the Recipient agrees to comply with the Award provisions checked below and attached. Upon acceptance by the Recipient, the Form CD-450 must be signed by an authorized representative of the Recipient and returned to the Grants Officer. If not signed and returned without modification by the Recipient within 30 days of receipt, the Grants Officer may unilaterally withdraw this Award offer and de-obligate the funds. DEPARTMENT OF COMMERCE FINANCIAL ASSISTANCE STANDARD TERMS AND CONDITIONS R & D AWARD FEDERAL-WIDE RESEARCH TERMS AND CONDITIONS, AS ADOPTED BY THE DEPT. OF COMMERCE SPECIFIC AWARD CONDITIONS LINE ITEM BUDGET 2 CFR PART 200, UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS, AS ADOPTED PURSUANT TO 2 CFR § 1327.101 48 CFR PART 31, CONTRACT COST PRINCIPLES AND PROCEDURES MULTI-YEAR AWARD. PLEASE SEE THE MULTI-YEAR SPECIFIC AWARD CONDITION. OTHER(S): _____ _____ _____ _____ _____ _____ _____					
SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER				DATE	
PRINTED NAME, PRINTED TITLE, AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL				DATE	

SPECIFIC AWARD CONDITIONS
U.S. DEPARTMENT OF COMMERCE
Economic Development Administration (EDA)

CONSTRUCTION PROJECTS: Public Works and Economic Adjustment Assistance Programs
under Sections 201 and 209 of the Public Works and Economic Development Act, as amended,
42 U.S.C. §§ 3141 and 3149

Public Works and Economic Adjustment Assistance Programs

Project Title: 6th Street Bridge Replacement	
Recipient Name: City of Moscow	Project Number: 07-79-07731

1. **AUTHORIZED SCOPE OF WORK:** This EDA Award supports the work described in the approved final scope of work, which is incorporated by reference into this Award, as the *Authorized Scope of Work*. All work on this project must be consistent with the *Authorized Scope of Work*, unless the Grants Officer has authorized a modification of the scope of work in writing through an amendment memorialized by a fully executed *Amendment to Financial Assistance Award* (Form CD-451).

The *Authorized Scope of Work* for this project includes:

The project involves the replacement of a bridge on a public street (6th Street) in Moscow, ID. The new bridge will consist of precast concrete arch segments complete with traffic lanes, bike lanes, and sidewalk. Additional work involves relocation of City utilities to coordinate with the new bridge.

2. The Recipient Contact's name, title, address, and telephone number are:

Bill Belknap City Supervisor Phone: 208-883-7011 Email: bbelknap@ci.moscow.id.us	City of Moscow East Third Street, P. O. Box 9203 Moscow, ID 83348-1703
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3. The Grants Officer is authorized to award, amend, suspend, and terminate financial assistance awards. The Grants Officer is:

Sheba Person-Whitley, Regional Director Seattle Regional Office Phone: (206) 220 -7665 Email: sperson@eda.gov Fax: (206) 220- 7657	Economic Development Administration Seattle Regional Office 915 Second Avenue, Room 1890 Seattle, Washington 98174-1012
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4. The Federal Program Officer (Area Director) oversees the programmatic aspects of this Award. The Federal Program Officer is:

Kerstin Millius, Area Director Seattle Regional Office Phone: (206) 220-7700 Email: kmillius@eda.gov Fax: (206) 220- 7657	Economic Development Administration Seattle Regional Office 915 Second Avenue, Room 1890 Seattle, Washington 98174-1012
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5. The EDA Project Officer is responsible for day-to-day administration and liaison with the Recipient and receives all reports and payment requests. The Project Officer is:

Richard Moore Phone: (206) 507-4839 FAX: (206) 220-7657 Email: Rmoore4@eda.gov	Economic Development Administration Seattle Regional Office 915 Second Avenue, Room 1890 Seattle, Washington 98174-1012
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6. **CONTACT CHANGES:** Changes to the contact information above may be made in writing by the EDA Project Officer without an amendment on Form CD-451.

7. **ADDITIONAL INCLUDED DOCUMENTS:** In addition to the regulations, documents, or authorities incorporated by reference on the *Financial Assistance Award* (Form CD-450), the following additional documents are hereby incorporated by reference into this Award:

- The Recipient's application, including any attachments, project descriptions, schedules, and subsequently submitted supplemental documentation.

Should there be a discrepancy among these documents, the Special Award Conditions (this document), including any attachments, shall control.

8. **PROJECT DEVELOPMENT TIME SCHEDULE:** The Recipient agrees to the following Project Development Time Schedule:

Return of Executed Financial Assistance Award30 calendar days after receipt of
Form CD-450/CD-451
Start of Construction 12 Months from the Date of Award
Construction Completed 30 Months from the Date of Award
Authorized Award End Date 60 Months from the Date of Award
Submission of Final Financial Report (Form SF-425) ...No later than 120 calendar days from
the Award End Date

Project Closeout – All project closeout documents, including final financial reports (Form SF 425 or any successor form) and any required program reports, shall be submitted to EDA not more than 120 calendar days after the date the Recipient accepts the completed project from the contractor(s).

The Recipient shall diligently pursue the development of the project so as to ensure completion within this time schedule and shall promptly notify EDA in writing of any event that could substantially delay meeting any of the prescribed time limits for the project as set forth above. The Recipient further acknowledges that failure to meet the development time schedule may result in EDA taking action to terminate the Award in accordance with the regulations set forth at 2 CFR §§ 200.339–200.343, as applicable.

9. PROJECT REPORTING AND FINANCIAL DISBURSEMENTS INSTRUCTIONS:

A. AWARD DISBURSEMENTS: Reimbursement basis only. EDA will make disbursements under this Award on a reimbursement basis only, based on actual costs incurred, after all preconditions set forth in these Special Award Conditions have been met.

The “*Outlay Report and Request for Reimbursement*” (Form SF-271 or any successor form) is used to request a disbursement, which shall be approved in writing by the Project Officer.

Please note that prior to the initial disbursement, the Recipient must complete the attached Form SF-3881 (or any successor form) “*ACH Vendor/Miscellaneous Payment Enrollment Form*” and submit it to NOAA’s Accounting Office by FAX at (301) 528-3675. (*FAX is required to secure confidentiality of sensitive information.*) The form must be completed by the respective parties (EDA, Recipient Bank, and Recipient) at the start of each new award.

B. REPORTS:

- a. *Project Progress Reports*: The Recipient shall submit project progress reports to the Project Officer on a quarterly basis for the periods ending **December 31, March 31, June 30, and September 30**, or any portion thereof, until the final disbursement is made by EDA. Reports should be submitted using the approved EDA template, which will be provided by the Project Officer and discussed during the project kick-off meeting. Reports are due no later than 1 month following the end of the quarterly period.
- b. *Financial Reports*: The Recipient shall submit a “*Federal Financial Report*” (Form SF-425 or any successor form) on a semi-annual basis for the periods ending **March 31** and **September 30**, or any portion thereof, for the entire period of performance. Form SF-425 and instructions for completing this form are available at:
<https://www.grants.gov/web/grants/forms/post-award-reporting-forms.html>.

Reports are due no later than 1 month following the end of the semi-annual period.

A final Form SF-425 must be submitted no more than 120 calendar days after the expiration date of the Award (*i.e.*, the Award End Date specified on the Form CD-450 or a subsequently executed Form CD-451). Final Financial Reports should follow the guidance

outlined in the instructions for submitting mid-term financial reports, but should ensure that all fields accurately reflect the total outlays for the entire period of performance and that all matching funds and program income (if applicable) are fully reported. Determination of the final grant rate and final balances owed to the government will be determined based on the information on the final Form SF-425, so it is imperative that it be submitted in a timely and accurate manner.

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Except as otherwise expressly provided for within these Special Award Conditions, the Federal share of the allowable costs shall be based on the Investment Rate for the Award, as established on the Form CD-450 or any subsequent amendment (Form CD-451). In the event of an underrun in total allowable costs for this project, the Federal share of allowable costs shall be determined by the Investment Rate. The Federal share of total allowable costs shall not exceed the dollar amount specified on the original Award or any subsequent amendments.

Line Item Budget:

A. Under the terms of the Award, the total approved authorized budget is:

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Non-Federal Matching Share	\$515,000
Total Project Cost	\$1,470,000

B. Under the terms of this Award, the total approved line item budget is:

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Equipment		
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National Oceanic and Atmospheric Administration
Finance Office, AOD, EDA Grants
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- EDA will not return your original check; the original will be destroyed and a copy will be maintained in our office. If the Electronic Funds Transfer (EFT) cannot be processed for technical reasons, the copy will be processed in place of the original check. If the EFT cannot be completed because of insufficient funds, EDA will charge you a one-time fee of \$25.00, which will be collected by EFT.

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All changes to this goal, as published in the Federal Register in accordance with the Office of Federal Contract Compliance Programs regulations at 41 CFR § 60-4.6, or any successor regulations, shall hereafter be incorporated by reference into these Special Award Conditions.

Goals for minority participation shall be as prescribed by Appendix B-80 of the *Federal Register* notice published October 3, 1980 at 45 FR 65984-65991, or any subsequently published amendments. The Recipient shall include the "*Standard Federal Equal Employment Opportunity*

Construction Contract Specifications” (or cause them to be included, if appropriate) in all Federally-assisted contracts and subcontracts. The goals and timetables for minority and female participation may not be less than those published pursuant to 41 CFR § 60-4.6.

- 16. PROCUREMENT:** The Recipient agrees that all procurement transactions shall be in accordance with the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 CFR §§ 200.317–200.327 and the EDA regulations contained in 13 CFR Chapter III, especially 13 CFR part 305 and 13 CFR § 302.17 (“Conflicts of Interest”).
- 17. EVIDENCE OF GOOD TITLE:** Before the initial disbursement of funds by EDA, the Recipient shall provide an opinion of counsel, satisfactory to EDA, that the Recipient has acquired good and marketable title to land, free of all encumbrances, to all real property necessary for completion of the project, as well as any necessary rights-of-way, easements, State or local government permits, or long-term lease interests necessary for the completion of the project, in accordance with 13 CFR part 314.
- 18. NONRELOCATION:** By accepting this Award of financial assistance, the Recipient attests that the EDA-funded project will not be used to induce the relocation or the movement of existing jobs from one Region to another Region by a primary beneficiary of the Award (see 13 CFR § 300.3). In the event that EDA determines that its assistance was used for such purposes, EDA reserves the right to pursue all rights and remedies, including suspension of disbursements, termination of the Award for convenience or cause, and disallowance of any costs attributable, directly or indirectly, to the relocation.

For purposes of ensuring that EDA assistance will not be used for relocation purposes, each applicant must inform EDA of all employers that constitute primary beneficiaries of the project. EDA considers an employer to be a “primary beneficiary” if the applicant estimates that such employer will create or save 100 or more permanent jobs as a result of the investment assistance and specifically names the employer in its application to EDA. In smaller communities, EDA may consider a primary beneficiary to be an employer of 50 or more permanent jobs so identified.

- 19. PERFORMANCE MEASURES:** The Recipient agrees to report on program performance measures and program outcomes in such a form and at such intervals as may be prescribed by EDA in compliance with the Government Performance and Results Act (GPRA) of 1993, and the Government Performance and Results Modernization Act of 2010.

At this time, all Awards for construction assistance require Recipients to report actual job creation/retention and private investment leverage at three (3), six (6), and nine (9) years after an EDA investment. The Recipient must retain sufficient documentation so that they can submit these required reports. Failure to submit these reports may adversely impact the ability of the Recipient to secure future funding from EDA.

Performance measures and reporting requirements that apply to program activities funded by this investment will be provided in a separate GPRA information collection document. EDA staff will contact the Recipient in writing within a reasonable period prior to the time of submission of the reports with information on how this data should be submitted. The Recipient must ensure

adequate and sufficient records are kept to support the methodology for computing initial job creation/retention and private investment estimates and all subsequent actual performance data, and must make this information available at EDA's request, including in the event of an audit or performance site visit.

20. REAL PROPERTY REPORTING: Consistent with 2 CFR § 200.330 ("Reporting on real property"), the Recipient must submit reports (using Form SF-429 "Real Property Status Report" or any successor form). The initial SF-429 form must be returned to the EDA Project Officer no later than December 31 of the year of the initial disbursement of Federal funds. Because EDA's interest in this real property extends at least 15 years, successive reports will be required by December 31 every **two** years thereafter during the established useful life of the property, rather than on an annual basis. At its sole discretion, EDA reserves the right to require more or less frequent real property reporting for the duration of the useful life of real property in which it retains an interest under this project.

21. WASTE, FRAUD AND ABUSE: Consistent with 2 CFR part 200, Recipient personnel responsible for managing the Recipient's finances and overseeing any contractors, sub-contractors or Subrecipients, will complete the training PowerPoint entitled "Compliance with EDA Disaster Assistance Program Requirements" and return the signed Certificate of Training Completion (page 38 of the training) to EDA along with the signed Form CD-450 within 30 days of receipt.

Further, Recipient will monitor Award activities for common fraud schemes, such as:

- false claims for materials and labor,
- bribes related to the acquisition of materials and labor,
- product substitution,
- mismarking or mislabeling on products and materials, and
- time and materials overcharging.

Should Recipient detect any suspicious activity, Recipient will contact EDA staff listed above and the Office of Inspector General, as indicated at <https://www.oig.doc.gov/Pages/Contact-Us.aspx>, as soon as possible.

22. PRE-AWARD COSTS NOT AUTHORIZED: Pre-award Costs incurred prior to the Grants Officer's signature on this Award are not authorized and may not be charged to this Award.

- 23. FREEDOM OF INFORMATION ACT (FOIA):** EDA is responsible for meeting its Freedom of Information Act (FOIA) (5 U.S.C. § 552) responsibilities for its records. DOC regulations at 15 CFR part 4 set forth the requirements and procedures that EDA must follow in order to make the requested material, information, and records publicly available. Unless prohibited by law and to the extent required under the FOIA, contents of applications and other information submitted by applicants and recipients may be released in response to a FOIA request. The Recipient should be aware that EDA may make certain application information publicly available. Accordingly, the Recipient should notify EDA if it believes any Application information to be confidential.
- 24. SCOPE OF WORK/NON-DUPLICATION OF PAST AND CURRENT FEDERALLY FUNDED ACTIVITIES:** The Scope of Work shall not duplicate activities funded under any other federal programs, including but not limited to any current EDA Award. Recipient shall not use federal or matching share funds for this Award for the completion of any activity required under any other federally funded project and shall not claim the costs of any activity funded under any other federally funded project as part of this EDA Award.
- 25. STAFFING CHANGES:** In the event of a change in the key professional staff positions related to project management, the Recipient shall provide the name of the individual selected to fill the position to the Project Officer and a copy of his or her resume within 30 business days of the selection.
- 26. ARCHEOLOGICAL AND HISTORICAL RESOURCES:** If during construction of the project, historical and archeological resources, including burial grounds and artifacts are discovered, the Recipient shall immediately stop construction in the area, contact the Idaho State Historic Preservation Officer (SHPO), the Nez Perce Tribe, other interested Tribes, and EDA, and follow the SHPO or THPO instructions for the preservation of resources.
- 27. POTENTIAL U.S. ARMY CORPS OF ENGINEERS (USACE) PERMITTING:** Prior to solicitation of bids, the Recipient shall provide either:
- A. Evidence satisfactory to the EDA that the Recipient has received the proper permit from USACE. Recipient shall follow all requirements contained within the permit; or
 - B. Evidence satisfactory to the EDA from USACE that no permit is required, this may include having to obtain and provide a jurisdictional determination from USACE.
- 28. FLOODPLAINS:** Prior to solicitation of bids, the Recipient shall provide evidence satisfactory to the EDA that the Recipient has received a “No-Rise” Certification from the City of Moscow Floodplain Zoning Administrator.
- 29. HAZARDOUS OR TOXIC SUBSTANCES:** If visual or olfactory evidence of potential soil contamination from current or historical practices is encountered during construction, work will stop immediately upon discovery and the appropriate Ecology regional office will be notified.
- 30. PROJECT INSPECTION AGREEMENT:** Prior to the initial disbursement of funds by EDA, the Recipient must submit to EDA for approval, a Project Inspection Agreement that meets the requirements in the EDA’s “Summary of EDA Construction Standards,” as well as the

competitive procurement standards of 2 CFR part 200 and EDA Regulations in 13 CFR Chapter III. The fee for basic Project Inspection Services will be a lump sum or an agreed maximum, and no part of the fees for other services will be based on a cost-plus-percentage-of-cost or a cost using a multiplier.

**U.S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION
STANDARD TERMS AND CONDITIONS FOR CONSTRUCTION PROJECTS**

Title II of the Public Works and Economic Development Act of 1965

Public Works and Economic Development Facilities
and
Economic Adjustment Assistance Construction Components



March 22, 2021

Table of Contents

PART I: GENERAL PROVISIONS	4
A. Construction Award Purpose	4
B. Authorities.....	4
1. In General.....	4
2. PWEDA	4
3. EDA Regulations	4
4. Conflicts Among Authorities.....	4
C. Updates to Authorities.....	4
1. Updates to Regulations and Requirements	4
2. Applicability to the Award.....	5
D. Variances	5
E. Recipient as Trustee.....	5
F. Additional Funding.....	5
G. Definitions	5
H. Reaffirmation of Application and Award Acceptance.....	5
PART II: SPECIAL REQUIREMENTS FOR EDA CONSTRUCTION PROJECTS	7
A. Financial Requirements	7
1. Financial Reports	7
2. Disbursements.....	7
3. Federal and Non-Federal Cost Sharing.....	8
4. Budget Revisions and Transfer of Funds.....	8
5. Indirect Costs and Facilities and Administrative Costs	9
6. Incurring Costs Prior to Award.....	10
7. Program Income.....	10
B. Programmatic Requirements	10
1. Project Progress and Performance Reporting	10
2. Time Extensions.....	11
3. Interim Reporting of Significant Project Developments.....	12
4. Programmatic Changes	12
5. Government Performance and Results Act.....	12
6. Beneficiary Compliance.....	13
7. Hold Harmless	13
8. Prohibition on Use of Third Parties to Secure Award.....	13
9. Payment of Attorneys' or Consultants' Fees	13
10. Recipient's Duty to Refrain from Employing Certain Government Employees.....	13
11. Commencement of Construction	14
12. Project Sign and Use of EDA Logo	14
13. Efficient Administration of Project.....	15
14. Conflicts-of-Interest Rules.....	15

15.	Records-Keeping Requirements	16
16.	Termination Actions	17
17.	Project Closeout Procedures	18
18.	Freedom of Information Act	20
C.	Additional Requirements Related to Construction Projects	20
1.	The Davis-Bacon Act, as amended (40 U.S.C. §§ 3141–3144, 3146, 3147; 42 U.S.C. § 3212)	20
2.	The Contract Work Hours and Safety Standards Act, as amended (40 U.S.C. §§ 3701-3708)	20
3.	The National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and the Advisory Council on Historic Preservation Guidelines (36 CFR part 800)	20
4.	Preservation of Historical and Archeological Data (54 U.S.C. § 312502)	20
5.	The Architectural Barriers Act of 1968, as amended (42 U.S.C. § 4151 et seq.)	21
6.	The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. § 4601 et seq.)	21
7.	The Energy Conservation and Production Act (42 U.S.C. § 6834 et seq.)	21
8.	Executive Order 13717, “Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction”	21
9.	Compliance with Local Construction Requirements	21
D.	Non-Discrimination Requirements	21
E.	Audits	21
1.	General	21
2.	Requirement to Submit a Copy of the Audit to EDA	22
F.	Tribal Employment Rights Ordinances	22
G.	EDA Contracting Provisions for Construction Projects	22
H.	Property	22
1.	Standards	22
2.	Title	23
3.	EDA’s Interest in Award Property	23
4.	Insurance and Bonding	25
5.	Leasing Restrictions	25
6.	Eminent Domain	26
7.	Disposal of Real Property	26
8.	Reporting on Property	26
I.	Environmental Requirements	27
1.	General	27
2.	Compliance with Other Applicable Environmental Requirements	27
J.	American-Made Equipment and Products	28
	PART III: DEPARTMENT OF COMMERCE STANDARD TERMS AND CONDITIONS	29

PART I: GENERAL PROVISIONS

A. Construction Award Purpose

This financial assistance award (the Award), executed by the Economic Development Administration (EDA) and the recipient (Recipient or non-Federal entity), is awarded for the purpose of carrying out the design, engineering, or construction of certain physical infrastructure as specifically set forth in the Award's scope of work.

B. Authorities

1. In General

Recipient must administer this Award in conformance with the terms of the Award, including any properly executed amendment thereto, the EDA-approved budget and scope of work, these EDA Standard Terms and Conditions for Construction Projects (EDA Construction STCs) and the Department of Commerce (DOC) Financial Assistance Standard Terms and Conditions (DOC Standard Terms and Conditions), as well as any specific award conditions; relevant policies issued by EDA; applicable Federal statutes, regulations, and Executive Orders; and the provisions of the Office of Management and Budget (OMB) *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* codified at 2 CFR part 200 (OMB Uniform Guidance).

2. PWEDA

The Public Works and Economic Development program is authorized under section 201 and the Economic Adjustment Assistance program is authorized under section 209 of PWEDA (42 U.S.C. §§ 3141 and 3149, respectively).

3. EDA Regulations

The regulations implementing PWEDA are contained in chapter III of title 13 of the Code of Federal Regulations (CFR), and apply in full to this Award. The regulations specific to EDA construction projects can be found at 13 CFR parts 305 and 314, and subpart A to part 307.

4. Conflicts Among Authorities

Any inconsistency or conflict among the authorities governing the Recipient's administration of this Award will be resolved in the following order of precedence: Federal laws and regulations (including the OMB Uniform Guidance), applicable notices published in the *Federal Register*, Executive Orders, OMB circulars, these EDA Construction STCs, specific award conditions, and any written policy guidance issued by EDA. However, a specific award condition may amend or take precedence over a provision of these EDA Construction STCs on a case-by-case basis, when warranted by the specific circumstances of the Award. In the event of a conflict between Parts I or II of these EDA Construction STCs and Part III, which incorporates the DOC Standard Terms and Conditions, Parts I and II will control.

C. Updates to Authorities

1. Updates to Regulations and Requirements

The DOC, EDA, or OMB may issue changes from time to time to the regulations and other policies and requirements that apply to this Award. Such changes may upon occasion increase

administrative or programmatic flexibility in administering this Award in a manner that is mutually beneficial to EDA and the Recipient. In addition, if required by law, these changes may impose new requirements. The implementation of any such regulatory, administrative, or programmatic change in administering this Award requires EDA's prior written approval.

2. Applicability to the Award

These EDA Construction STCs apply to the Award as of the Federal award date, as defined at 2 CFR § 200.1, or, if attached to the Award by amendment, as of the effective date of such amendment.

D. Variances

EDA's policy is to administer all awards uniformly; however, there may be special circumstances that warrant a variance. To accommodate these circumstances and to encourage innovative and creative ways to address economic development problems, EDA will consider requests for variances to the procedures set out in these EDA Construction STCs if they do not conflict with applicable Federal statutory and regulatory requirements, are consistent with the goals of EDA's programs, and make sound economic and financial sense. Any approved variance will be implemented through a specific award condition incorporated under the Award.

E. Recipient as Trustee

The Recipient holds grant funds and any property acquired or improved with EDA assistance in trust for the public purposes of an Award. The Recipient's obligation to the Federal Government continues for the estimated useful life of the Project, as determined by EDA, during which EDA retains an undivided equitable reversionary interest (the Federal Interest) in property acquired or improved, in whole or in part, with EDA investment assistance. *See* 13 CFR § 314.2 ("Federal Interest").

If EDA determines that the Recipient fails or has failed to meet this obligation, EDA may exercise any rights or remedies with respect to its Federal Interest in the Project. However, EDA's forbearance in exercising any right or remedy in connection with the Federal Interest does not constitute a waiver thereof.

F. Additional Funding

EDA has no obligation to provide any additional funding in connection with the Award. Any change to the Award to increase funding or to extend the period of performance is at the discretion of EDA, subject to the availability of funds, via an amendment executed by the Grants Officer.

G. Definitions

Capitalized terms and acronyms used but not otherwise defined in these EDA Construction STCs have the meaning ascribed to them at 13 CFR §§ 300.3, 302.20, 307.8, and 314.1, and subpart A to 2 CFR part 200.

H. Reaffirmation of Application and Award Acceptance

By accepting this Award, the Recipient's authorized representative hereby reaffirms and states that:

1. All data in the Application were true and correct when the Application was submitted and remain

- true and correct as of the date of this Award;
2. The Application was, as of the date of submission and the date of this Award, duly authorized as required by local law by the governing body of the Recipient; and
 3. The Recipient has read, understood, and will comply with all terms of this Award, including the assurances and certifications submitted as part of the Application (including assurances submitted through the System for Award Management (SAM.gov)).

Acceptance of the Award is established by any action on the part of the Recipient indicating an intent to accept the Award, including by signing the Financial Assistance Award (Form CD-450) (either via a “wet” signature or electronically) or by requesting any disbursement of Award funds. “Application” means all forms, documentation, and any information submitted to EDA as part and in furtherance of a request for an Award and includes submissions made in response to any request by EDA after submission of the initial Application.

PART II:
SPECIAL REQUIREMENTS FOR EDA CONSTRUCTION PROJECTS

A. Financial Requirements

1. Financial Reports

- a. During the period of performance, the Recipient must submit financial reports as follows, unless otherwise specified in a specific award condition.
 - i. *Reports on Award reimbursements.* In accordance with 2 CFR § 200.328 (“Financial reporting”), the Recipient must submit a “Federal Financial Report” (Form SF-425 or any successor form) on a semi-annual basis for the periods ending March 31 and September 30, or any portion thereof, unless otherwise specified in a specific award condition. Reports are due no later than 30 calendar days following the end of each reporting period, and instructions for completing and submitting Form SF-425 will be discussed during the Project kick-off meeting. Recipients may contact their EDA Project Officer with questions on how to complete or submit the report, if necessary, but they must submit reports on time and are encouraged to pose such questions sufficiently before the deadline to allow for complete, accurate, and timely submission of required reports.
 - ii. *Reports on Award advances.* While EDA generally does not advance funds, when the agency does so, the Recipient must submit Form SF-425 within 15 business days following the end of each quarter for an award where the Federal share of costs is under \$1 million. In accordance with 2 CFR § 200.328, because of increased risk and the need to ensure the appropriate use of Federal funds, where EDA advances funds under an award where the Federal share of costs is \$1 million or more the Recipient must submit Form SF-425 within 15 business days following the end of each month, or as otherwise specified in a specific award condition.
- b. The Recipient must submit a final Form SF-425 no later than 120 calendar days after the end date of the period of performance. *See also* Part II, section B.16.c “Final reporting deadline” of these EDA Construction STCs.
- c. Noncompliance with the financial reporting requirements may result in appropriate enforcement action under this Award, including but not limited to suspension of Award payments, disallowance of costs or termination of an award. A Recipient’s non-compliance with financial reporting requirements will also be taken into account in EDA’s consideration of any future applications for EDA financial assistance (*see* 2 CFR § 200.206(b)(2)(iii) and section A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions) of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs).
- d. Financial reports should be submitted to the Project Officer in electronic format, unless otherwise specified in the specific award conditions.

2. Disbursements

- a. *Method of payment.* The Grants Officer determines the appropriate method of payment.

Unless otherwise specified in a specific award condition, the method of payment under this Award will be reimbursement. Payments will be made through electronic funds transfers directly to the Recipient's bank account and in accordance with the requirements of the Debt Collection Improvement Act of 1996 (31 U.S.C. § 3720B *et seq.*). The Award number must be included on all payment-related correspondence, information, and forms.

- b. *Disbursement requests.* The Recipient must use Form SF-271, "Outlay Report and Request for Reimbursement for Construction Programs," to request reimbursement under the Award. Substantiating invoices and/or vouchers also must be provided. Each request for the disbursement of funds must be made to the Project Officer. Form SF-271 can be downloaded from the Grants.gov post-award reporting forms website at <https://www.grants.gov/web/grants/forms/post-award-reporting-forms.html>.
 - i. *Initial disbursement request.* For the initial disbursement only, the Recipient must complete and submit Form SF-3881, "ACH Vendor/Miscellaneous Payment Enrollment Form," along with Form SF-271, to the Project Officer.
 - ii. *Interim disbursement requests.* All requests for interim disbursement must be submitted using Form SF-271 and include substantiating invoices and/or vouchers.
 - iii. *Final disbursement request.* See Part II, section B.16 "Project Closeout Procedures" of these EDA Construction STCs.

3. Federal and Non-Federal Cost Sharing

- a. For purposes of this Award, the Federal share is the amount of EDA funds invested under the Award, while the non-Federal share, or "Matching Share," means non-EDA funds and any in-kind contributions that are approved by EDA and provided by the Recipient or by third parties as a condition of the Award.
- b. By accepting the Award, the Recipient certifies that the Matching Share of Project costs is committed to the Project, available as needed, and not conditioned or encumbered in any way that precludes its use consistent with the requirements of the Award. See 13 CFR § 301.5 ("Matching share requirements").
- c. In the case of an overrun at the construction bid opening, the Recipient may augment the Matching Share by an amount sufficient to cover the excess cost. The Recipient must furnish a letter to EDA identifying the source of the additional funds and confirming that all Matching Share meets the requirements of 13 CFR § 301.5. See 13 CFR § 305.10 ("Bid underrun and overrun").

4. Budget Revisions and Transfer of Funds

- a. *Approved budget plan; notification of deviations.* The EDA-approved budget set forth in the specific award conditions or otherwise incorporated under the Award is the budget plan for the Project. The Recipient must notify EDA of deviations from the budget in accordance with 2 CFR § 200.308 ("Revision of budget and program plans"). If prior written approval is not required under 2 CFR § 200.308, the Recipient may request the Grants Officer's review of

and guidance on proposed revisions to the budget.

- b. *Requesting budget revisions.* Requests for budget revisions to the EDA-approved budget must be submitted through the Project Officer to the Grants Officer, who will make the final determination on such requests and notify the Recipient in writing.
- c. *Budget revisions that require an amendment.* In accordance with 2 CFR § 200.308(f) and (h), an amendment executed by the Grants Officer are required for budget revisions when:
 - i. The revision results from changes in the scope or the objective of the Project;
 - ii. The need arises for additional EDA funds to complete the Project;
 - iii. The Federal share exceeds the simplified acquisition threshold (currently set at \$250,000) and the cumulative amount of transfers among direct cost categories exceeds or is expected to exceed 10 percent of the total budget as last approved by EDA; and
 - iv. A revision is desired that involves specific costs for which prior written approval requirements may be imposed consistent with applicable cost principles listed in subpart E of 2 CFR part 200 (“Cost Principles”).
- d. *Prior approval for transfers between construction and non-construction items.* When an Award supports both construction and non-construction work, the Recipient must obtain prior written approval from the Grants Officer before making any fund or budget transfer from non-construction to construction or vice versa. *See* 2 CFR § 200.308(h)(5).
- e. *Project underrun amounts.* Underrun amounts will be transferred to the contingencies line item. Contingency funds are to be used to address situations resulting from unknown conditions and changes required for the fulfillment of authorized activities under this Award. EDA may approve the use of underrun funds to increase the Federal share of the Project or further improve the Project, as long as EDA determines that the use is consistent with the original purpose of the Award. *See* 13 CFR § 308.1 (“Use of funds in projects constructed under projected cost”).
- f. *Additional EDA funding in case of Project overrun amounts.* In accepting this Award, the Recipient agrees to fund any overrun amounts from non-Federal sources, or if the Recipient is unable or unwilling to do so, to request termination of the Award. Additional EDA assistance for the Project is at the discretion of EDA and may not be approved.

5. Indirect Costs and Facilities and Administrative Costs

- a. Indirect costs, or facilities and administrative (F&A) costs for educational institutions, are generally not applicable under this Award. *See* the definition of “indirect (facilities and administrative) (F&A)) costs” at 2 CFR § 200.1.
- b. When indirect costs are applicable, they will not be allowable charges against the Award unless approved under the Award and specifically included as a line item in the Award’s approved budget. *See* section B.06 of the DOC Standard Terms and Conditions (“Indirect or Facilities and Administrative Costs”), which are incorporated into these EDA Construction STCs in Part III.

6. **Incurring Costs Prior to Award**

Project activities, including the procurement of good and services, which may include construction activities, carried out prior to EDA's approval of this Award are done at the sole risk of the Recipient and at the risk of not being reimbursed by EDA. Such activity may result in the rejection of the Application, the disallowance of costs, or other adverse consequences as a result of noncompliance with EDA or Federal requirements, including but not limited to procurement requirements, civil rights requirements, Federal labor standards, or environmental and historic preservation requirements. The Grants Officer must authorize pre-award costs and activities in writing, and such costs must also be allowable under relevant Federal cost principles and the specific Award terms and be included in the EDA-approved budget. Pre-award costs not included in the authorized budget are not allowable and will not be reimbursed. *See* 13 CFR § 302.8 ("Pre-approval Investment Assistance costs").

7. **Program Income**

For Projects that generate revenue (*e.g.*, rent for buildings or real property constructed or improved with EDA funds, rent or fees charged for use of equipment purchased with EDA funds, fees charged by the Recipient or a third party in connection with Project operations, etc.), the Recipient agrees, for the estimated useful life of the EDA-assisted facility or equipment, to use income generated from the facility or equipment, in the following order of priority unless modified by a specific award condition:

- a. Administration, operation, maintenance, and repair of Project facilities in a manner consistent with good property management practice and in accordance with established building codes. This includes, where applicable, repayment of indebtedness resulting from any EDA-approved encumbrance (*e.g.*, approved mortgage) on the EDA-assisted facility. In the case of equipment, administration, operation, maintenance, and repair of the equipment, or the facility in which the equipment is located as required to maintain and operate the equipment, for the equipment's estimated useful life.
- b. Economic development activities that are authorized for support by EDA, provided such activities meet the economic development purposes of PWEDA and are located within the designated Project region.
- c. Any program income in excess of paragraphs a. and b. of this section that is generated during the period of performance must be deducted from total allowable Project costs in accordance with 2 CFR § 200.307(e)(1). *See also* 2 CFR § 200.307 ("Program income").

8. **Information on Recipient integrity.** The Recipient agrees to provide EDA with information and documentation necessary for EDA to conduct due diligence to ensure the financial integrity and responsibility of the Recipient and key individuals associated with the Recipient in the management or administration of this Award.

B. **Programmatic Requirements**

1. **Project Progress and Performance Reporting**

- a. Project progress reports must be submitted in accordance with the procedures set out in 2 CFR § 200.329 ("Monitoring and reporting program performance"), as applicable, and as

indicated below. Failure to submit required reports in a complete, accurate, and timely manner may result in the withholding of payments under this Award; deferral of processing of new awards, amendments, or supplemental funding; or other appropriate enforcement action. See 13 CFR § 302.18 (“Post-approval requirements”) and section A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions) of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs.

- b. Unless otherwise specified in a specific award condition, the Project progress report must contain the following information for each Project program, function, or activity:
 - i. A comparison of planned and actual accomplishments according to the timetable or list of Project objectives in this Award;
 - ii. An explanation of any delays or failures to meet the Project timetable or Project goals; and
 - iii. Any other pertinent information including, when appropriate, analysis and explanation of cost overruns or high unit costs.

Project progress reports must be submitted for each calendar quarter to the Project Officer. Each Project progress report must be submitted in accordance with the deadlines outlined in the specific award conditions, or, when not otherwise specified, Project progress reports will be due on a quarterly basis not later than January 31, April 30, July 31, and October 31 for the immediately previous quarter. The final Project progress report must be submitted to EDA no later than 120 calendar days after the end date of the period of performance. See Part II, section B.16.c “Project Closeout Procedures” of these EDA Construction STCs for more information on Project Closeout.

- c. The Recipient must submit quarterly Project progress reports to the EDA Project Officer electronically unless otherwise specified in the specific award conditions.

2. Time Extensions

- a. Unless otherwise authorized by a specific award condition, any extension of the period of performance can only be authorized by the Grants Officer in writing.
- b. The Recipient is responsible for implementing the Project in accordance with the development time schedule contained in this Award. As soon as the Recipient becomes aware that it may not be possible to meet the development time schedule, the Recipient must notify the Grants Officer. The Recipient’s notice to EDA must contain the following:
 - i. An explanation of the Recipient’s inability to complete work by the specified date (*e.g.*, a lengthy period of unusual weather delayed the contractor’s ability to excavate the site, major re-engineering required in order to obtain State or Federal approvals, unplanned environmental mitigation required);
 - ii. A statement describing any other contemplated changes to the Project;
 - iii. Documentation that demonstrates there is still a bona fide need for the Project; and
 - iv. A statement that no further delay is anticipated and that the Project can be completed within the revised time schedule.

EDA reserves the right to withhold disbursements while the Recipient is not in compliance with the time schedule and to suspend or terminate this Award if the Recipient fails to proceed with reasonable diligence to accomplish the Project as intended.

3. Interim Reporting of Significant Project Developments

The Recipient must promptly report any event that may have a significant impact upon the Project, including delays or adverse conditions that may materially affect the ability of the Recipient to attain Project objectives within established time periods or meet the development time schedule without waiting for the next quarterly progress report. The Recipient should report such events to the Project Officer in the most time-expedient way possible and then, if the initial report was not in writing, report the event to the Project Officer in writing. Such a report must include a statement of the event or issue, a statement of the course of action taken or contemplated to resolve the matter, and any Federal assistance needed to resolve the situation. If budget changes are required, the Recipient must submit a written budget revision request. See 2 CFR § 200.329(e) (“Monitoring and reporting program performance”) and Part II, section A.4. “Budget Revisions and Transfers of Funds” of these EDA Construction STCs.

4. Programmatic Changes

- a. In accordance with 2 CFR § 200.308 (“Revision of budget and program plans”), the Recipient must submit a written request for any proposed programmatic changes, including all changes to the scope of the Award, to the Project Officer. See Part II, section A.4 “Budget Revisions and Transfers of Funds” of these EDA Construction STCs for budget revisions that may require the prior written approval of EDA. In these cases, the Project Officer will forward the request to the Grants Officer, who makes the final decision on approving the request. In addition, the Recipient must request prior written approvals for certain items of cost in accordance with 2 CFR § 200.407 (“Prior written approval (prior approval)”).
- b. Any changes made to the Project without EDA’s approval are made at the Recipient’s own risk, and may result in disallowance of costs, suspension, termination, or other EDA action with respect to the Award. See 13 CFR § 302.7(b) (“Amendments and changes”).
- c. *Contract Change Orders.* After construction contracts for the Project have been executed, it may become necessary to alter them through a formal contract change order that must be issued by the Recipient and accepted by the contractor. All contract change orders must be reviewed by EDA, even if EDA is not participating in the cost of the change order or the contract price is to be reduced. Work on the Project may continue pending EDA review and approval of the change order, but all such work will be at the Recipient’s risk as to whether the cost of the work is eligible for EDA reimbursement. See 13 CFR § 305.13 (“Contract change orders”).

5. Government Performance and Results Act

In addition to quarterly Project progress reports, EDA may require the Recipient to report on Project performance beyond the end date of the period of performance for Government Performance and Results Act (GPRA) or other purposes. In no case will the Recipient be required to submit any GPRA report more than ten years after the date of Award closeout. Data used by the Recipient in preparing reports must be accurate and, whenever possible, from independent sources. See 13 CFR § 302.16 (“Accountability”).

6. Beneficiary Compliance

In the event a beneficiary of the Project fails to comply in any manner with certifications, assurances, or agreements that such beneficiary has entered into in accordance with EDA's requirements, the Recipient will reimburse EDA the Award amount or an amount to be determined by the EDA pursuant to 13 CFR §§ 314.4 ("Unauthorized use of property") and 314.5 ("Federal share"). When EDA determines that the failure of a beneficiary to comply with EDA requirements affects a portion of the property benefited by the Award, the Recipient will reimburse EDA proportionately.

7. Hold Harmless

To the maximum extent permitted by law, the Recipient agrees to indemnify and hold the United States harmless from and against all liabilities that the United States may incur due to the actions or omissions of the Recipient, including to the extent that such liabilities are incurred because of toxic or hazardous contamination or groundwater, surface water, soil, or other conditions caused by actions of the Recipient or any of its predecessors (other than the United States or its agents) on the property. *See* 13 CFR § 302.19 ("Indemnification").

8. Prohibition on Use of Third Parties to Secure Award

Unless otherwise specified in the application materials supporting this Award, the Recipient warrants that no person or selling agency has been employed or retained to solicit or secure this Award upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees, or bona fide established commercial or selling agencies maintained by the Recipient for the purpose of securing business. For breach or violation of this warranty, EDA has the right to terminate this Award for material noncompliance, or at its discretion, to deduct from the Award amount, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

9. Payment of Attorneys' or Consultants' Fees

No Award funds may be used, directly or indirectly, to reimburse attorneys' or consultants' fees incurred in connection with obtaining an award under PWEDA, such as, for example, preparing an application for EDA assistance. However, ordinary and reasonable attorneys' and consultants' fees incurred for meeting Award requirements (*e.g.*, conducting a title search or preparing plans and specifications) may be eligible Project costs and may be paid out of Award funds, provided such costs are otherwise eligible. *See* 13 CFR § 302.10 ("Attorneys' and consultants' fees, employment of expeditors, and post-employment restriction").

10. Recipient's Duty to Refrain from Employing Certain Government Employees

- a. Pursuant to section 606(2) of PWEDA (42 U.S.C. § 3216), for the two-year period beginning on the date EDA executes this Award, any Recipient that is a nonprofit organization, District Organization, or for-profit entity agrees that it will not employ, offer any office or employment to, or retain for professional services any person who:
 - i. On the date EDA executes this Award or within the one-year period ending on that date, served as an officer, attorney, agent, or employee of the Department, and
 - ii. Occupied a position or engaged in activities that the Assistant Secretary determines

involved discretion with respect to the funding of an Award.

- b. In addition to the types of Recipients noted in paragraph a. above, EDA may require another Eligible Applicant to execute an agreement to abide by the above-described post-employment restriction on a case-by-case basis—for example, when an institution of higher education implements activities under or related to the Award through a separate nonprofit organization or association.
- c. The two-year period and associated restrictions referenced above also will apply beginning on the date that EDA executes any cost amendment to this Award that provides additional funds to the Recipient.

See also 13 CFR § 302.10 (“Attorneys’ and consultants’ fees, employment of expeditors, and post-employment restriction”).

11. Commencement of Construction

- a. *Delayed construction starts.* If significant construction (as determined by EDA) is not commenced within two years of the Award date or by the date estimated for start of construction in this Award (or the expiration of any extension granted in writing by EDA), whichever is later, this Award will be automatically suspended by a written notification issued by the Grants Officer and may be terminated if EDA determines, after consultation with the Recipient, that construction to completion cannot reasonably be expected to proceed promptly and expeditiously.
- b. *Early construction starts.* The Recipient must make a written request to EDA for early construction start permission (that is, after the date of Award, but before EDA gives formal approval for construction to commence). Costs incurred under a contract are only allowable after EDA determines that the award of the contract is in compliance with all terms and conditions of the Award. If construction commences prior to EDA’s determination, the Recipient proceeds at its own risk until EDA’s review and concurrence. *See* 13 CFR § 305.11 (“Contract awards; early construction start”).

12. Project Sign and Use of EDA Logo

- a. *Project sign.* The Recipient is responsible for constructing, erecting, and maintaining in good condition throughout the construction period a sign (or signs) in a conspicuous place at the Project site indicating that the Federal Government is participating in the Project. EDA will provide specifications for the sign and may require more than one sign if site conditions so warrant. If the EDA-recommended sign specifications conflict with State or local law, the Recipient may modify such recommended specifications so as to comply with State or local law. *See* 13 CFR § 305.12 (“Project sign”).
- b. *Use of EDA logo.* With EDA’s prior written permission, the Recipient may use the EDA logo to publicize the Award as well as to amplify the impact of the Award. In such cases, the EDA logo may be displayed on Award-related materials that discuss or advertise the purpose or use of the Project (e.g. websites, social media, fliers, pamphlets, brochures). To seek permission to use the EDA logo, the Recipient must contact the EDA Project Officer and provide a written description of how the Recipient proposes to use the EDA logo. In general,

the EDA logo may be used either alone or next to Recipient's logo. The EDA logo may not be used to endorse a third party as interpreted at EDA's sole discretion. The Recipient must not use the EDA logo in a negative or defamatory manner, and the Recipient must not use the U.S. Department of Commerce (DOC) logo. EDA may rescind such permission at any time.

13. Efficient Administration of Project

The Recipient agrees to properly and efficiently administer, operate, and maintain the Project for its estimated useful life, as required by section 504 of PWEDA (42 U.S.C. § 3194). If EDA determines at any time during the estimated useful life of the facility that the Project is not being properly and efficiently administered, operated, and maintained, EDA may terminate this Award (if it is still active) and/or may take appropriate enforcement action to protect the Federal Interest in the Project, including requiring the Recipient to repay the Federal Share. *See* 13 CFR §§ 302.12 ("Project administration, operation and maintenance"), 302.18 ("Post-approval requirements"), and 314.2 ("Federal Interest") through 314.5 ("Federal Share").

14. Conflicts-of-Interest Rules

- a. An "Interested Party" is defined in 13 CFR § 300.3 ("Definitions") as "any officer, employee, or member of the board of directors or other governing board of the Recipient, including any other parties that advise, approve, recommend, or otherwise participate in the business decisions of the Recipient, such as agents, advisors, consultants, attorneys, accountants, or shareholders." An Interested Party includes the Interested Party's Immediate Family and other persons directly connected to the Interested Party by law or through a business organization. "Immediate Family" is defined in 13 CFR § 300.3 as "a person's spouse (or domestic partner or significant other), parents, grandparents, siblings, children and grandchildren, but does not include distant relatives, such as cousins, unless the distant relative lives in the same household as the person."
- b. The Recipient must disclose in writing any potential conflicts of interest to EDA or the pass-through entity as soon as practicable after the identification of such potential conflict. In addition, the Recipient must maintain written standards of conduct to establish safeguards to prohibit an Interested Party from using its position for a purpose that constitutes or presents the appearance of personal or organizational conflicts-of-interest or of personal gain in the administration of an award. *See* 13 CFR § 302.17(a) and (b) ("Conflicts of interest"), 2 CFR § 200.112 ("Conflict of interest"), as applicable, and assurances submitted as part of the Application, including assurances submitted through SAM.gov or via Form SF-424D ("Assurances – Construction Projects").
- c. An Interested Party must not receive any direct or indirect financial or personal benefit in connection with this Award or its use for payment or reimbursement of costs by or to the Recipient. A conflict of interest generally exists when an Interested Party participates in a matter that has a direct and predictable effect on the Interested Party's personal or financial interests. A conflict also may exist where there is an appearance that an Interested Party's objectivity in performing his or her responsibilities under the Project is impaired. For example, an appearance of impairment of objectivity may result from an organizational conflict where, because of other activities or relationships with other persons or entities, an Interested Party is unable to render impartial assistance, services or advice to the Recipient, a participant in the Project or to the Federal government. Additionally, a conflict of interest

may result from non-financial gain to an Interested Party, such as benefit to reputation or prestige in a professional field. *See* 13 CFR § 302.17(a) and (b).

- d. Section F.01.c of the DOC Standard Terms and Conditions, which are incorporated as Part III of these EDA Construction STCs, specifies procurement-related conflicts of interest requirements. *See also* 2 CFR §§ 200.317-200.327 (“Procurement Standards”).

15. Records-Keeping Requirements

- a. *Records.* The Recipient must maintain records that document compliance with the terms and conditions of this Award. At a minimum, the Recipient’s records must fully disclose:
 - i. The amount and disposition of all EDA funding under the Award;
 - ii. All Project expenditures and procurement actions;
 - iii. The total cost of the Project that the Award funds;
 - iv. Copies of all reports and disbursement requests submitted to EDA;
 - v. The benefits/impacts of the Project, as reported through GPRA and other reports to EDA;
 - vi. The amount and nature of the portion of Project costs provided by non-EDA sources;
 - vii. Contractor compliance with applicable Federal requirements; and
 - viii. Such other records as EDA requires the Recipient to maintain, including such records as will facilitate an effective audit.
- b. *Records retention.* In general, and in accordance with 2 CFR § 200.334 (“Retention requirements for records”), all records pertinent to this Award must be retained for a period of three years from the date of submission of the final Project expenditure report (the final Form SF-271 for disbursement). The only exceptions are the following:
 - i. If any litigation, claim, or audit is started before the expiration of the three-year period, the records must be retained until all litigation, claims, or audit findings involving the records have been resolved and final actions taken.
 - ii. When the Recipient is notified in writing by EDA, its cognizant agency for either audit or indirect costs, its oversight agency for audit, or the relevant pass-through entity to extend the retention period, it must retain the records as directed.
 - iii. Records for real property and equipment acquired with Federal funds must be retained for three years after final disposition of the relevant real property or equipment.
 - iv. When records are transferred to or maintained by EDA or pass-through entity, the three-year retention requirement is not applicable to the Recipient.
 - v. *Records for program income transactions after the period of performance.* In some cases, Recipients must report program income after the period of performance. Where there is such a requirement, the retention period for the records pertaining to the earning of the program income starts from the end of the Recipient’s fiscal year in which the program income is earned. *See also* Part II, section A.7 “Program Income” of these EDA Construction STCs.

- vi. *Indirect cost rate proposals and cost allocation plans.* This paragraph applies to the following types of documents and their supporting records: indirect cost rate computations or proposals, cost allocation plans, and any similar accounting computations of the rate at which a particular group of costs is chargeable (such as computer usage chargeback rates or composite fringe benefit rates).
 - (1) *If submitted for negotiation.* If the proposal, plan, or other computation is required to be submitted to the Federal Government (or to the pass-through entity) to form the basis for negotiation of the rate, then the three-year retention period for its supporting records starts from the date of such submission.
 - (2) *If not submitted for negotiation.* If the proposal, plan, or other computation is not required to be submitted to the Federal Government (or to the pass-through entity) for negotiation purposes, then the three-year retention period for the proposal, plan, or computation and its supporting records starts from the end of the fiscal year (or other accounting period) covered by the proposal, plan, or other computation.
- c. **Monitoring and reporting obligations.** The Recipient is responsible for monitoring any subrecipients and contractors to ensure their compliance with the records retention requirements. The Recipient must immediately notify the Project Officer if records are lost. See 2 CFR §§ 200.331 – 200.333 (“Subrecipient Monitoring and Management”).

16. Termination Actions

- a. In accordance with 2 CFR § 200.340 (“Termination”), this Award may be terminated in whole or in part as follows:
 - i. *Termination by EDA for the Recipient’s failure to comply with the terms and conditions of the Award.* EDA may terminate this Award, in whole or in part, if the Recipient fails to comply with the Terms and Conditions of the Award, including but not limited to:
 - (1) Any representation made by the Recipient to the Federal awarding agency in connection with the Application for Federal assistance is incorrect or incomplete in any material respect;
 - (2) The Project has changed substantially, without EDA prior approval, so as to affect significantly the accomplishment of the Project as intended (including an unauthorized use of property as provided in 13 CFR § 314.4 (“Unauthorized use of property”));
 - (3) The Recipient has violated commitments it made in its Application and supporting documents or has violated any of the Terms and Conditions of the Award;
 - (4) The conflicts-of-interest rules at 13 CFR § 302.17 (“Conflicts of interest”) are violated; or
 - (5) The Recipient fails to report immediately to EDA any change of authorized representative acting in lieu of or on behalf of the Recipient.

See also section A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions) of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs.

- ii. *Termination by EDA when the Award no longer effectuates program goals or agency priorities.* To the greatest extent authorized by law, EDA may terminate this Award if it no longer effectuates program goals or agency priorities.
 - iii. *Termination by the Recipient.* The Recipient may terminate this Award in whole or in part upon by sending the EDA Grants Officer written notification setting forth the reasons for such termination, the effective date, and, in the case of partial termination, the portion to be terminated. However, if EDA determines in the case of partial termination that the reduced or modified portion of the EDA Award will not accomplish the purposes for which the EDA Award was made, EDA may terminate the Award in its entirety.
 - iv. *Termination pursuant to Award termination provisions.* EDA or the pass-through entity may terminate this Award pursuant to termination provisions included in the Award. Any Award-specific termination provision will be included as a specific award condition.
 - v. *Termination upon mutual agreement.* EDA and the Recipient may mutually agree to terminate this Award in whole or in part. In such cases, EDA and the Recipient must agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated.
- b. If the Award is wholly or partially terminated, the Recipient remains responsible for compliance with the requirements in 2 CFR §§ 200.344 (“Closeout”) and 200.345 (“Post-closeout adjustments and continuing responsibilities”).

17. Project Closeout Procedures

- a. *Project Closeout.* As defined at 2 CFR § 200.1, Project Closeout means the process by which EDA determines that all applicable administrative actions and all required work of the Award have been completed and takes actions as described at 2 CFR § 200.344 (“Closeout”). In the context of an EDA construction award, Project Closeout generally begins with the Recipient’s acceptance of the Project from the contractor(s).
- b. *Final disbursement.* When Project construction and final inspection have been completed, or substantially completed as determined by EDA, and the Recipient has accepted the Project from the contractor(s), the Recipient can begin the Closeout process by submitting the following documentation to EDA:
 - i. A request for final disbursement on an executed Form SF-271;
 - ii. A written certification that all costs charged against this Award (Federal and non-Federal shares) are for eligible activities and represent allowable costs, for which there is documentation in the Recipient’s records;
 - iii. An executed certificate of final acceptance signed by the Recipient and the Recipient’s architect/engineer;
 - iv. The Recipient’s certification that its current audit (in accordance with subpart F of 2 CFR part 200), if applicable, has been submitted to the Federal Audit Clearinghouse;

- v. The Recipient's certification that its currently valid single or program-specific audit in accordance with subpart F of 2 CFR part 200 ("Audit Requirements"), if applicable, does not contain any material findings (if the Recipient's currently valid audit does contain material findings, the Recipient must submit the applicable audit preferably via e-mail to the Project Officer, who will review with the Grants Officer); and
- vi. Other documentation as may be required by EDA.

EDA will advise the Recipient of costs determined to be allowable and unallowable. If a balance of this Award is due to the Recipient, the balance will be paid by EDA. If the Recipient has received an amount in excess of the amount due the Recipient, the Recipient must refund the excess to EDA. The Recipient must contact the Project Officer for refund instructions.

As noted above, if the Recipient's most recent audit completed pursuant to subpart F of 2 CFR part 200 contains material findings, the Recipient must submit the audit, preferably via e-mail, to the Project Officer, who will review with the Grants Officer before final disbursement. If e-mail is unavailable, the Recipient may submit a hardcopy version of the audit to the Project Officer.

- c. *Final reporting deadline.* The Recipient must submit, no later than 120 calendar days after the end date of the period of performance, all financial, performance, and other reports as required by the Terms and Conditions of this Award. The Grants Officer may extend the 120 calendar day submission period upon a written request from the Recipient.
- d. *Deadline to liquidate obligations.* Unless EDA authorizes an extension, the Recipient must liquidate all financial obligations incurred under this Award no later than 120 calendar days after the end date of the period of performance.
- e. *Post-Closeout requirements.* As noted above in section B.12 "Efficient Administration of Project" of these EDA Construction STCs, after construction is completed and the Project is closed out financially, the Recipient has an ongoing responsibility to properly administer, operate, and maintain the Project for its estimated useful life (as determined by EDA) in accordance with Award purposes. See 13 CFR § 302.12 ("Project administration, operation and maintenance"). The Recipient must comply with all Award requirements and maintain records to document such compliance, which must be made available for inspection by EDA or other Government officials as required.

In addition, in accordance with 2 CFR § 200.345 "Post-closeout adjustments and continuing responsibilities," the Closeout of this Award does not affect any of the following:

- i. The right of EDA to disallow costs and recover funds on the basis of a later audit or other Project review;
- ii. The Recipient's obligation to return any funds due as a result of later corrections or other transactions;
- iii. Audit requirements per subpart F of 2 CFR part 200; and
- iv. Requirements for property management and disposition, records retention, and

performance measurement reports. See subpart D of 2 CFR part 200 (“Post Federal Award Requirements”), as applicable.

- f. *GPRA reporting.* As required under GPRA and in accordance with a schedule that will be provided by EDA, the Recipient must submit additional Performance Measurement Reports, generally three, six, and nine years after the date of the Award to accurately and completely report the impacts of the Project, especially in terms of job creation and private investment leveraging.

18. Freedom of Information Act

EDA is responsible for meeting its Freedom of Information Act (“FOIA”) (5 U.S.C. § 552) responsibilities for its records. DOC regulations at 15 CFR part 4 set forth the requirements and procedures that EDA must follow in order to make the requested material, information, and records publicly available. Unless prohibited by law and to the extent required under the FOIA, contents of Applications and other information submitted by applicants and Recipients may be released in response to a FOIA request. The Recipient should be aware that EDA may make certain Application and other submitted information publicly available. Accordingly, as set forth in 15 CFR § 4.9 (“Confidential commercial information”), the Recipient should identify in its Application any “business information” it believes to be protected from disclosure pursuant to 5 U.S.C. § 552(b)(4).

C. Additional Requirements Related to Construction Projects

The Recipient and any subrecipients, must, in addition to other statutory and regulatory requirements detailed in these EDA Construction STCs and the assurances made to EDA in connection with the Award, comply and require each of its contractors and subcontractors employed in the completion of the Project to comply with all applicable Federal, State, territorial, and local laws, and in particular, the following Federal laws (and the regulations issued thereunder), executive orders, OMB circulars, OMB Uniform Guidance, and local law requirements.

1. **The Davis-Bacon Act, as amended (40 U.S.C. §§ 3141–3144, 3146, 3147; 42 U.S.C. § 3212)**, which requires minimum wages for mechanics and laborers employed on Federal Government public works projects to be based on the wages that the Secretary of Labor determines to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the civil subdivision of the State in which the Project is to be performed, or in the District of Columbia if the Project is to be performed there.
2. **The Contract Work Hours and Safety Standards Act, as amended (40 U.S.C. §§ 3701-3708)**, which provides work hour standards for every laborer and mechanic employed by any contractor or subcontractor in the performance of a Federal public works project.
3. **The National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 *et seq.*), and the Advisory Council on Historic Preservation Guidelines (36 CFR part 800)**, which require stewardship of historic properties in projects involving Federal funds.
4. **Preservation of Historical and Archeological Data (54 U.S.C. § 312502)**, which requires appropriate surveys and preservation efforts if a Federally licensed project may cause

irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data.

5. **The Architectural Barriers Act of 1968, as amended (42 U.S.C. § 4151 *et seq.*)**, and the regulations issued thereunder, which prescribe standards for the design and construction of any building or facility intended to be accessible to the public or that may house handicapped employees.
6. **The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. § 4601 *et seq.*)**, and implementing regulations issued at 49 CFR part 24 (“Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs”), which establish uniform policies for the fair and equitable treatment of persons, businesses, or farm operations affected by the acquisition, rehabilitation, or demolition of real property acquired for a project financed wholly or in part with Federal financial assistance.
7. **The Energy Conservation and Production Act (42 U.S.C. § 6834 *et seq.*)**, which establishes energy efficiency performance standards for the construction of new residential and commercial structures undertaken with Federal financial assistance.
8. **Executive Order 13717, “Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction”**, which requires that new buildings constructed with Federal assistance comply with the earthquake-resistant design provisions of the 2015 editions of the International Building Code (IBC) or the International Residential Code (IRC), nationally recognized building codes promulgated by the International Code Council (ICC), or equivalent codes, consistent with the provisions of and to the extent required by 40 U.S.C. § 3312.
9. **Compliance with Local Construction Requirements.** The Recipient will comply with current local building codes, standards, and other requirements applicable to the Project.

D. Non-Discrimination Requirements

No person in the United States shall, on the ground of race, color, national origin, handicap, age, religion, or sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance. In addition to the non-discrimination requirements set forth in section G.02 “Non-Discrimination Requirements” of the DOC Standard Terms and Conditions, which are incorporated in Part III of these Construction STCs, the Recipient agrees to comply with Pub. L. No. 92-65, 42 U.S.C. § 3123, which proscribes discrimination on the basis of sex in assistance provided under PWEDA.

E. Audits

1. General

- a. Recipients must comply with the audit requirements set out as subpart F to 2 CFR part 200 (“Audit Requirements”). Generally, if the Recipient expends \$750,000 or more in Federal awards during the Recipient’s fiscal year, the Recipient must have a single or program-specific audit conducted for that fiscal year. The cost of preparing the audit may be

included in the Project budget.

- b. For program specific audits, EDA's Public Works and Economic Adjustment Assistance programs generally have specific audit guidelines that will be incorporated into the Award and may be found in the annual Compliance Supplement, which is Appendix XI to 2 CFR part 200 and available on OMB's website. When DOC does not have a program-specific audit guide available for the program, the auditor will follow the requirements for a program-specific audit as described in 2 CFR § 200.507 ("Program-specific audits").

2. Requirement to Submit a Copy of the Audit to EDA

If the Recipient's current audit required under subpart F of 2 CFR part 200 ("Audit Requirements") contains material findings, the Recipient must submit a copy of the audit to the Project Officer, who will review it with the Grants Officer. *See also* Part II, section B.16 "Project Closeout Procedures" of these EDA Construction STCs.

See section D "Audits" of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs, for additional information related to audit requirements.

F. Tribal Employment Rights Ordinances

As set out in 31 U.S.C. § 1352, special provisions are applicable to Indian Tribes, Tribal organizations, and other Indian organizations eligible to receive Federal contracts, grants, loans, or cooperative agreements. In accordance with DOC policy, EDA recognizes Tribal Employment Rights Ordinances ("TEROs"), which may provide for preferences in contracting and employment, in connection with its financial assistance awards. Federal awards granted to American Indian and Alaska Native Tribal governments generally may provide for preference to qualified Indians in all aspects of employment, contracting, and other business activities, as well as the payment of a TERO fee. The payment of the TERO fee, which supports the Tribal employment rights office to administer the preferences, should generally be allowable as an expense that is "necessary and reasonable for the performance of the Federal award," as provided under 2 CFR § 200.403 ("Factors affecting allowability of costs").

G. EDA Contracting Provisions for Construction Projects

The Recipient must use the "*EDA Contracting Provisions for Construction Projects*" as guidance in developing all construction contracts. The "*EDA Contracting Provisions for Construction Projects*" lists applicable EDA and other Federal requirements for construction contracts.

H. Property

1. Standards

With respect to any property acquired or improved in whole or in part with Award funds, the Recipient must comply with the Property Standards set forth at 2 CFR §§ 200.310 ("Insurance coverage") through 200.316 ("Property trust relationship"), and EDA's regulations at 13 CFR part 314. Property acquired or improved in whole or in part by the Recipient under this Award may consist of real property; personal property, including equipment and supplies; and intangible property, such as money, notes, contractual rights, and security interests. Any property reports required under 2 CFR §§ 200.310 through 200.316, such as periodic inventories and requests for disposition instructions, must be submitted to the Grants Officer through the Project Officer on

Form SF-428 and/or SF-429, as applicable. *See also* section A.01.d “Real Property, Tangible Property and Intangible Property Reports and Requests for Dispositions” of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs.

2. Title

- a. Title to equipment, supplies, and intangible property acquired in whole or in part under this Award generally vests upon acquisition in the Recipient. The use, management and disposition of equipment, supplies, and intangible property acquired in whole or in part under this Award must be in accordance with 2 CFR §§ 200.313 (“Equipment”), 200.314 (“Supplies”), and 200.315 (“Intangible property”), as applicable, and EDA regulations at 13 CFR part 314. *See also* section C.03 “Intellectual Property Rights” of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs.
- b. Title to real property acquired in whole or in part under this Award generally vests upon acquisition in the Recipient, subject to the condition that the Recipient uses the real property for the authorized purpose of the Project. *See* 2 CFR § 200.311 (“Real property”) and EDA regulations at 13 CFR part 314.

3. EDA’s Interest in Award Property

- a. *General - evidence of title.* As stated in Part I, section E, of these EDA Construction STCs “Recipient as Trustee”, real property, equipment, and intangible property acquired or improved under this Award must be held in trust by the Recipient as trustee for the public purposes of an Award. This trust relationship exists throughout the duration of the property’s estimated useful life, as determined by EDA, during which time EDA retains an undivided, equitable reversionary interest in the property (“Federal Interest”). *See* 13 CFR § 314.2.

Before advertising for construction bids or at such other time as EDA requires, the Recipient must furnish evidence, satisfactory in form and substance to EDA, that title to real property required for the Project (other than property of the United States and as provided in 13 CFR § 314.7(c) (“Title”)) is vested in the Recipient and that such easements, rights-of-way, State or local government occupancy or use permits, long-term leases, or other property interests or access rights required for the Project have been or will be obtained by the Recipient within an acceptable time, as determined by EDA. All liens, mortgages, other encumbrances, reservations, reversionary interests, or other restrictions on title or the Recipient’s interest in the property must be disclosed to EDA. *See* 13 CFR § 314.7 (“Title”). With limited exceptions set forth at 13 CFR §§ 314.6(a) and (b) (“Encumbrances”) or as otherwise authorized by EDA, Recipient-owned property acquired or improved in whole or in part with Award funds must not be used to secure a mortgage or deed of trust or in any way otherwise encumbered. *See* 13 CFR § 314.6.

- b. *Recording EDA’s Interest in Real Property.*
 - i. For all Projects involving the acquisition, construction, or improvement of a building, infrastructure, or other real property, as determined by EDA, the Recipient must execute and furnish to EDA, prior to initial Award disbursement or at such other time as EDA requires, a lien, covenant, or other statement, satisfactory to EDA in form and substance, of EDA’s interest in the property acquired or improved in whole or in part with the funds made available under this Award. EDA may permit such statement to be recorded after

initial Award disbursement in the event that grant funds are being used to acquire such property or for authorized costs, such as design and engineering services. The statement must specify the estimated useful life of the Project and must include the disposition, encumbrance, and the Federal Share compensation requirements, as well as any other requirements specified by EDA in its reasonable discretion. *See* 13 CFR §§ 314.1 (“Definitions”) and 314.8(a) (“Recorded statement for real property”). *See also* 2 CFR § 200.316 (“Property trust relationship”).

- ii. This lien, covenant, or other statement of the Federal interest must be perfected and placed of record in the real property records of the jurisdiction in which the property is located, all in accordance with applicable law. EDA may require an opinion of counsel for the Recipient to substantiate that the document was validly executed and properly recorded. *See* 13 CFR § 314.8(b).
- iii. Facilities in which the EDA assistance is only a small part of a larger project, as determined by EDA, may be exempted from the requirements listed in paragraphs H.3.b.i and ii above. *See* 13 CFR § 314.8(c).
- iv. In extraordinary circumstances and at EDA’s discretion, EDA may choose to accept another instrument to protect EDA’s interest in the Project property, such as an escrow agreement or letter of credit, provided that EDA determines such instrument is adequate and a recorded statement in accord with section H.3.b.i above is not reasonably available. The terms and provisions of the relevant instrument must be satisfactory to EDA. The costs and fees for escrow services or letters of credit must be paid by the Recipient. *See* 13 CFR § 314.8(d).
- c. *Recording EDA’s Interest in Personal Property.* For all Projects involving the acquisition or improvement of significant items of equipment or other tangible personal property, including but not limited to watercraft, motor vehicles, machinery, equipment, removable fixtures, or structural components of buildings, the Recipient must execute a security interest, covenant, or other statement of EDA’s reversionary interest in the personal property acceptable in form and substance to EDA, which statement must be perfected and placed of record in accordance with applicable law (usually accomplished by filing a Uniform Commercial Code Financing Statement (Form UCC-1), as provided by State law), with continuances re-filed as appropriate. EDA may require an opinion of counsel for the Recipient to substantiate that the Form UCC-1 or other filing was validly executed and properly recorded. *See* 13 CFR § 314.9 (“Recorded statement for Project personal property”).
- d. *EDA’s Interest and the estimated useful life.* The Recipient acknowledges that EDA retains an undivided equitable reversionary interest in property acquired or improved in whole or in part with grant funds made available through this Award throughout the estimated useful life (as determined by EDA) of the Project, except in applicable instances set forth at 13 CFR § 314.7(c) (“Title”). *See* 13 CFR § 314.2(a) (“Federal interest”).
- e. *Unauthorized Use of Award Property.* The Recipient agrees that if any interest in property acquired or improved in whole or in part with Award funds is disposed of, encumbered, or alienated in any manner, or no longer used for the authorized purposes of the Award during the Project’s estimated useful life without EDA’s written approval, EDA will be entitled to recover the Federal Share, as defined at 13 CFR § 314.5 (“Federal share”). Examples of

alienation of Award property include sale or other conveyance of the Recipient's interest, leasing or mortgaging the property, or granting an option for any of the foregoing.

If, during the Project's estimated useful life, the property is no longer needed for the purposes of the Award, as determined by EDA, EDA may permit its use for other acceptable purposes consistent with those authorized by PWEDA and 13 CFR Chapter III. *See* 13 CFR § 314.3(b) ("Authorized use of property") or may direct the Recipient to sell the property and remit the Federal Share of the sales proceeds to EDA. *See* 2 C.F.R. §§ 200.311, 200.313.

- f. *Calculating the Federal Share.* For purposes of any lien or security interest, the amount of the Federal Share is the portion of the current fair market value of any property (after deducting any actual and reasonable selling and repair expenses incurred to put the property into marketable condition) attributable to EDA's participation in the Project. *See* 13 CFR § 314.5 ("Federal share").

4. Insurance and Bonding

- a. *Insurance.* The Recipient must, at a minimum, provide the equivalent insurance coverage for real property and equipment acquired or improved with Federal funds as provided for property owned by the Recipient. Federally owned property need not be otherwise insured unless required by the Terms and Conditions of the Award. *See* 2 CFR § 200.310 ("Insurance coverage").
- b. *Bonding.* If the Award exceeds the simplified acquisition threshold as defined at 2 CFR § 200.1, EDA may accept the Recipient's or subrecipient's bonding policy and requirements if EDA or the pass-through entity determines that the Federal Interest is adequately protected. If not, the following minimum requirements will apply:
 - i. A bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" must consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of the bid, execute such contractual documents as may be required within the time specified.
 - ii. A performance bond on the part of the contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.
 - iii. A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to ensure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract. *See* 2 CFR § 200.326 ("Bonding requirements").

5. Leasing Restrictions.

Leasing or renting of facilities or property is prohibited unless specifically authorized by EDA. The Recipient agrees that any leasing or renting of any facilities or property involved in this Project will be subject to the following:

- a. That said lease arrangement is consistent with the authorized general and special purpose of

the Award;

- b. That said lease arrangement is for adequate consideration;
- c. That said lease arrangement is consistent with applicable EDA requirements concerning but not limited to nondiscrimination and environmental compliance; and
- d. That all revenue derived from said leasing arrangement shall be subject to Part II, section A.7 “Program Income” of these EDA Construction STCs.

6. Eminent Domain

The Recipient will use funds solely for the authorized purpose of the Project. Pursuant to Executive Order 13406, “Protecting the Property Rights of the American People,” the Recipient agrees:

- a. Not to exercise any power of eminent domain available to the Recipient (including the commencement of eminent domain proceedings) for use in connection with the Project for the purpose of advancing the economic interests of private parties; and
- b. Not to accept title to land, easements, or other interests in land acquired by the exercise of any power of eminent domain for use in connection with the Project for such purposes. The Recipient agrees that any use of the power of eminent domain to acquire land, easements, or interests in land, whether by the Recipient or any other entity that has the power of eminent domain, in connection with the Project without the prior written consent of EDA is an unauthorized use of the Project. If the Recipient puts the Project to an unauthorized use, the Recipient must compensate EDA for the Federal Share in accordance with 13 CFR §§ 314.4 (“Unauthorized use of property”) and 314.5 (“Federal share”), as the same may be amended from time to time.

7. Disposal of Real Property

- a. During the estimated useful life of the Project, if EDA and the Recipient determine that property acquired or improved in whole or in part with Award funds is no longer needed for the original purposes of this Award, EDA may, in its discretion, approve use of the property in other Federal grant programs or in programs that have purposes consistent with those authorized by PWEDA and 13 CFR chapter III. *See* 13 CFR § 314.3(b) (“Authorized use of property”).
- b. When property is not authorized for other uses as provided in section H.7.a above, EDA will provide disposition instructions to the Recipient, which may include directing the Recipient to sell the property and remit the Federal Share of the sales proceeds to EDA.

8. Reporting on Property.

- a. *Real Property status reports and requests for disposition.* In accordance with 2 CFR § 200.330 “Reporting on real property”, the Recipient must submit reports using Form SF-429 (Real Property Status Report), including appropriate attachments, at least annually on the status of real property in which EDA retains an interest, which generally includes real property acquired or improved under the award, unless such interest extends 15 years or longer. If EDA’s interest is for a period of 15 years or longer, unless otherwise specified in a specific award condition, the Recipient must submit an annual report for the

first three years of the award and thereafter submit a real property status report every five years. If the Recipient wishes to dispose of real property acquired or improved under an EDA award, the Recipient must request disposition instructions, including the submission of Form SF-429, with appropriate attachments, from the Grants Officer in accordance with 2 CFR 200.311(c).

- b. *Tangible Personal Property status reports and requests for dispositions.* The Recipient must submit periodic reports as specified in the terms of the Award using Form SF-428 (Tangible Personal Property Report), including appropriate attachments thereto, concerning tangible personal property that is Federally owned or tangible personal property in which EDA retains an interest. In addition, if the Recipient wishes to dispose of tangible personal property acquired or improved under an EDA award, the Recipient must request disposition instructions, including the submission of Form SF-428, with appropriate attachments, from the Grants Officer in accordance with 2 CFR 200.313(e).

See also section A.01.d of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs.

I. Environmental Requirements

1. **General.** In addition to the environmental statutes, executive orders, and requirements set forth in section G.04 of the DOC Standard Terms and Conditions “Environmental Requirements,” which are incorporated in Part III of these EDA Construction STCs, the Recipient must comply with the following:
 - a. **Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. §§ 4371-4375).** Federally supported public works facilities and activities that affect the environment must be implemented in compliance with policies established under existing law.
 - b. **The Lead-Based Paint Poisoning Prevention Act (42 U.S.C. § 4821 *et seq.*).** Use of lead-based paint in residential structures improved with Federal assistance is prohibited.
 - c. **The Farmland Protection Policy Act (7 U.S.C. §§ 4201–4209).** Projects are subject to review under this Act if they may irreversibly directly or indirectly convert farmland, including forest land, pastureland, cropland, or other land, to nonagricultural use.
 - d. **The Noise Control Act of 1972 (42 U.S.C. § 4901 *et seq.*).** Federally supported facilities and activities must comply with Federal, State, interstate, and local requirements respecting control and abatement of environmental noise to the same extent that any person is subject to such requirements.
 - e. **The Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 *et seq.*).** This Act provides a process for returning certain Native American cultural items to lineal descendants, culturally affiliated Indian tribes, and Native Hawaiian organizations.
2. **Compliance with Other Applicable Environmental Requirements**

The Recipient agrees to promptly notify the Grants Officer in writing of any environmental requirement or restriction, regulatory or otherwise, with which it must comply. Before Project Closeout and final disbursement of Award funds, the Recipient further agrees to provide evidence

satisfactory to the Grants Officer that any required environmental remediation has been completed: (1) in compliance with all applicable Federal, State and local regulations; and (2) in accordance with any legally enforceable restrictions related to environmental restriction on the property such as environmental easements, deed restrictions, no further action determinations, or voluntary cleanup certifications. Compliance with said laws or restrictions must be included in any contract documents for Project construction. The Recipient must certify compliance before final disbursement of grant funds.

J. American-Made Equipment and Products

Recipients are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this Award.

See also section G.05.a (Buy-American Preferences) of the DOC Standard Terms and Conditions, which are incorporated in Part III of these EDA Construction STCs.

**PART III:
DEPARTMENT OF COMMERCE
STANDARD TERMS & CONDITIONS**

The DOC Standard Terms and Conditions dated November 12, 2020 are incorporated herein by reference herein as Part III of these EDA Construction STCs.

In the event of a conflict between Parts I or II of these EDA Construction STCs and Part III, which incorporates the DOC Standard Terms and Conditions, Parts I and II will control.

DEPARTMENT OF COMMERCE
FINANCIAL ASSISTANCE
STANDARD TERMS AND CONDITIONS



12 November 2020

DEPARTMENT OF COMMERCE
FINANCIAL ASSISTANCE STANDARD TERMS AND CONDITIONS

Table of Contents

PREFACE	5
A. PROGRAMMATIC REQUIREMENTS	6
.01 Reporting Requirements	6
.02 Revisions of Program Plans	8
.03 Other Federal Awards with Similar Programmatic Activities	9
.04 Prohibition against Assignment by a Non-Federal Entity	9
.05 Disclaimer Provisions	9
.06 Unsatisfactory Performance or Non-Compliance with Award Provisions	9
B. FINANCIAL REQUIREMENTS.....	10
.01 Financial Management.....	10
.02 Award Payments	10
.03 Federal and Non-Federal Sharing	12
.04 Budget Changes and Transfer of Funds among Categories.....	12
.05 Program Income	13
.06 Indirect or Facilities and Administrative Costs	13
.07 Incurring Costs or Obligating Federal Funds Before and After the Period of Performance	15
.08 Tax Refunds	16
.09 Internal Controls	16
C. PROPERTY STANDARDS.....	16
.01 Standards.....	16
.02 Real and Personal Property	16
.03 Intellectual Property Rights	17
D. AUDITS	19
.01 Organization-Wide, Program-Specific, and Project Audits.....	19
.02 Audit Resolution Process	20
E. DEBTS	21
.01 Payment of Debts Owed to the Federal Government	21
.02 Late Payment Charges	21
.03 Barring Delinquent Federal Debtors from Obtaining Federal Loans or Loan Insurance Guarantees.....	22

.04	Effect of Judgment Lien on Eligibility for Federal Grants, Loans, or Programs.....	22
F.	CONFLICT OF INTEREST, CODE OF CONDUCT AND OTHER REQUIREMENTS PERTAINING TO DOC FINANCIAL ASSISTANCE AWARDS, INCLUDING SUBAWARD AND PROCUREMENT ACTIONS	22
.01	Conflict of Interest and Code of Conduct.....	22
.02	Nonprocurement Debarment and Suspension.....	23
.03	Requirements for Subawards	23
.04	Requirements for Procurements.....	23
.05	Whistleblower Protections	24
.06	Small Businesses, Minority Business Enterprises and Women’s Business Enterprises	24
G.	NATIONAL POLICY REQUIREMENTS	25
.01	United States Laws and Regulations.....	25
.02	Non-Discrimination Requirements	25
a.	Statutory Provisions	25
b.	Other Provisions.....	26
c.	Title VII Exemption for Religious Organizations	27
.03	LOBBYING RESTRICTIONS.....	27
a.	Statutory Provisions	27
b.	Disclosure of Lobbying Activities	27
.04	Environmental Requirements.....	27
a.	The National Environmental Policy Act (42 U.S.C. §§ 4321 <i>et seq.</i>)	28
b.	The National Historic Preservation Act (16 U.S.C. §§ 470 <i>et seq.</i>)	28
c.	Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands)	29
d.	Clean Air Act (42 U.S.C. §§ 7401 <i>et seq.</i>), Federal Water Pollution Control Act (33 U.S.C. §§ 1251 <i>et seq.</i>) (Clean Water Act), and Executive Order 11738 (“Providing for administration of the Clean Air Act and the Federal Water Pollution Control Act with respect to Federal contracts, grants or loans”)	29
e.	The Flood Disaster Protection Act (42 U.S.C. §§ 4002 <i>et seq.</i>)	29
f.	The Endangered Species Act (16 U.S.C. §§ 1531 <i>et seq.</i>).....	29
g.	The Coastal Zone Management Act (16 U.S.C. §§ 1451 <i>et seq.</i>).....	29
h.	The Coastal Barriers Resources Act (16 U.S.C. §§ 3501 <i>et seq.</i>).....	30
i.	The Wild and Scenic Rivers Act (16 U.S.C. §§ 1271 <i>et seq.</i>)	30
j.	The Safe Drinking Water Act of 1974, as amended, (42 U.S.C. §§ 300f <i>et seq.</i>)	30
k.	The Resource Conservation and Recovery Act (42 U.S.C. §§ 6901 <i>et seq.</i>).....	30

l.	The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund) (42 U.S.C. §§ 9601 <i>et seq.</i>) and the Community Environmental Response Facilitation Act (42 U.S.C. § 9601 note <i>et seq.</i>)	30
m.	Executive Order 12898 (“Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations”)	30
n.	The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 <i>et seq.</i>)	30
o.	Clean Water Act (CWA) Section 404 (33 U.S.C. § 1344)	31
p.	Rivers and Harbors Act (33 U.S.C. § 407)	31
q.	The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. § 668 <i>et seq.</i>), and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001)	31
r.	Executive Order 13112 (Invasive Species, February 3, 1999)	31
s.	Fish and Wildlife Coordination Act (16 U.S.C. § 661 <i>et seq.</i>)	31
.05	OTHER NATIONAL POLICY REQUIREMENTS	32
a.	Buy-American Preferences	32
b.	Criminal and Prohibited Activities	32
c.	Drug-Free Workplace	33
d.	Foreign Travel	33
e.	Increasing Seat Belt Use in the United States	34
f.	Federal Employee Expenses and Subawards or Contracts Issued to Federal Employees or Agencies	34
g.	Minority Serving Institutions Initiative	34
h.	Research Misconduct	35
i.	Research Involving Human Subjects	35
j.	Care and Use of Live Vertebrate Animals	36
k.	Management and Access to Data and Publications	37
l.	Homeland Security Presidential Directive	38
m.	Compliance with Department of Commerce Bureau of Industry and Security Export Administration Regulations	38
n.	The Trafficking Victims Protection Act of 2000 (22 U.S.C. § 7104(g)), as amended, and the implementing regulations at 2 C.F.R. Part 175	40
o.	The Federal Funding Accountability and Transparency Act (FFATA) (31 U.S.C. § 6101 note)	42
p.	Recipient Integrity and Performance Matters (Appendix XII to 2 C.F.R. Part 200)	47
q.	Never Contract with the Enemy (2 C.F.R. Part 183; 2 C.F.R. § 200.215)	49

r.	Prohibition on certain telecommunications and video surveillance services or equipment (Public Law 115-232, section 889; 2 C.F.R. § 200.216)	50
s.	Federal Financial Assistance Planning During a Funding Hiatus or Government Shutdown	51

PREFACE

This document sets out the standard terms and conditions (ST&Cs) applicable to this U.S. Department of Commerce (DOC or Commerce) financial assistance award (hereinafter referred to as the DOC ST&Cs or Standard Terms). A non-Federal entity¹ receiving a DOC financial assistance award must, in addition to the assurances made as part of the application, comply and require each of its subrecipients, contractors, and subcontractors employed in the completion of the project to comply with all applicable statutes, regulations, executive orders (E.O.s), Office of Management and Budget (OMB) circulars, provisions of the OMB Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (codified at 2 C.F.R. Part 200) (OMB Uniform Guidance), provisions of these Standard Terms, and any other terms and conditions incorporated into this DOC financial assistance award. In addition, unless otherwise provided by the terms and conditions of this DOC financial assistance award, Subparts A through E of 2 C.F.R. Part 200 and the Standard Terms are applicable to for-profit entities, foreign public entities and to foreign organizations that carry out a DOC financial assistance award.²

This award is subject to the laws and regulations of the United States. Any inconsistency or conflict in terms and conditions specified in the award will be resolved according to the following order of precedence: federal laws and regulations, applicable notices published in the *Federal Register*, E.O.s, OMB circulars, DOC ST&Cs, agency standard award conditions (if any), and specific award conditions. A specific award condition may amend or take precedence over a Standard Term on a case-by-case basis, when indicated by the specific award condition.

Some of the Standard Terms herein contain, by reference or substance, a summary of the pertinent statutes, regulations published in the *Federal Register* or Code of Federal Regulations (C.F.R.), E.O.s, OMB circulars, or the certifications and assurances provided by applicants through Standard Forms (*e.g.*, SF-424s) or through DOC forms (*e.g.* Form CD-511). To the extent that it is a summary, such Standard Term provision is not in derogation of, or an amendment to, any such statute, regulation, E.O., OMB circular, certification, or assurance.

¹ Note that the OMB Uniform Guidance uses the term “non-Federal entity” to generally refer to an entity that carries out a Federal award as a recipient or subrecipient. Because some of the provisions of these DOC ST&Cs apply to recipients rather than subrecipients, or vice versa, for clarity, these DOC ST&Cs use the terms “non-Federal entity,” “recipient,” and “subrecipient” consistent with their meanings in the OMB Uniform Guidance. In addition, the OMB Uniform Guidance uses the term “pass-through entity” to refer to a non-Federal entity that makes a subaward. As defined at 2 C.F.R. § 200.1:

“Non-Federal entity” is “a state, local government, Indian tribe, institution of higher education (IHE), or nonprofit organization that carries out a Federal award as a recipient or subrecipient.”

“Recipient” is “an entity, usually but not limited to non-Federal entities, that receives a Federal award directly from a Federal awarding agency. The term recipient does not include subrecipients or individuals that are beneficiaries of the award.”

“Subrecipient” is “an entity, usually but not limited to non-Federal entities, that receives a subaward from a pass-through entity to carry out part of a Federal award; but does not include an individual that is a beneficiary of such award. A subrecipient may also be a recipient of other Federal awards directly from a Federal awarding agency.”

“Pass-through entity” is “a non-Federal entity that provides a subaward to a subrecipient to carry out part of a Federal program.”

² See 2 C.F.R. § 200.1 for the definitions of “foreign public entity” and “foreign organization.”

DOC commenced implementation of the Research Terms and Conditions (RT&Cs) for Federal awards effective October 1, 2017; the RT&Cs address and implement the Uniform Guidance issued by OMB. For awards designated on the Form CD-450 (Financial Assistance Award) as Research, both the DOC ST&Cs and the RT&Cs as implemented by DOC apply to the award. The RT&Cs as well as the DOC implementation statement, agency specific requirements, prior approval matrix, subaward requirements, and national policy requirements are posted on the National Science Foundation's website – <https://www.nsf.gov/awards/managing/rtc.jsp>. The DOC ST&Cs and the RT&Cs are generally intended to harmonize with each other; however, where the DOC ST&Cs and the RT&Cs differ in a Research award, the RT&Cs prevail, unless otherwise indicated in a specific award condition.

A. PROGRAMMATIC REQUIREMENTS

.01 Reporting Requirements

a. Recipients must submit all reports as required by DOC, electronically or, if unable to submit electronically, in hard copy, as outlined below and as may be supplemented by the terms and conditions of a specific DOC award.

b. Performance (Technical) Reports. Recipients must submit performance (technical) reports to the Program Officer. Performance (technical) reports should be submitted in the same frequency as the Form SF-425 (Federal Financial Report), unless otherwise directed by the Grants Officer.

1. Performance (technical) reports must contain the information prescribed in 2 C.F.R. § 200.329 (Monitoring and reporting program performance), unless otherwise specified in the award conditions.

2. As appropriate and in accordance with the format provided by the Program Officer (or other OMB-approved information collections, including the Research Program Performance Report [RPPR] as adopted by DOC for use in research awards), recipients are required to relate financial data to the performance accomplishments of this Federal award. When applicable, recipients must also provide cost information to demonstrate cost effective practices (e.g., through unit cost data). The recipient's performance will be measured in a way that will help DOC to improve program outcomes, share lessons learned, and spread the adoption of best or promising practices. As described in 2 C.F.R. § 200.211 (Information contained in a Federal award), DOC will identify the timing and scope of expected performance by the recipient as related to the outcomes intended to be achieved by the Federal program.

3. Recipients (or pass-through entities as applicable) must submit a final performance report within 120 calendar days after the expiration of the period of performance. The subrecipient is required to submit its final performance report to the pass-through entity within 90 calendar days unless an extension has been granted.

c. Financial Reports. In accordance with 2 C.F.R. § 200.328 (Financial reporting), the recipient must submit a Form SF-425 (Federal Financial Report) or any successor form on a semi-annual basis for the periods ending March 31 and September 30, or any portion thereof, unless otherwise specified in a specific award condition. Reports must be submitted to DOC as directed by the Grants Officer, in accordance with the award conditions and are due no later than 30 calendar days following the end of each reporting period. Recipients (or pass-through entities as applicable) must submit a final Form SF-425 within 120 calendar days after the expiration of the period of performance. The subrecipient is required to submit its financial report to the pass-through entity within 90 calendar days unless an extension has been granted. A recipient may submit a final financial report in lieu of an interim financial report due at the end of the period of performance (*e.g.*, in lieu of submitting a financial report for the last semi-annual or other reporting under an award, a recipient may submit a final (cumulative) financial report covering the entire award period).

d. Real Property, Tangible Personal Property and Intangible Property Reports and Requests for Dispositions. Unless otherwise required by the terms and conditions of a DOC financial assistance award, where real property, tangible personal property or intangible property is acquired or improved (in the case of real property or tangible personal property), or produced or acquired (in the case of intangible property), pursuant to a DOC award, non-Federal entities are required to submit the following real property, tangible personal property and intangible property reports (as appropriate):

1. Real Property Status Reports and Requests for Dispositions: Non-Federal entities must submit reports using Form SF-429 (Real Property Status Report) or any successor form, including appropriate attachments thereto, at least annually disclosing the status of real property that is Federally-owned property or real property in which the Federal Government retains a Federal Interest, unless the Federal Interest in the real property extends 15 years or longer. In cases where the Federal Interest attached is for a period of 15 years or more, the DOC or pass-through entity, at its option, may require the non-Federal entity to report at various multi-year frequencies (*e.g.*, every two years or every three years, not to exceed a five-year reporting period; or, the DOC or pass-through entity may require annual reporting for the first three years of a Federal award and thereafter require reporting every five years). In addition, DOC or a pass-through entity may require a non-Federal entity to submit Form SF-429, with appropriate attachments, relating to a non-Federal entity's request to acquire, improve or contribute real property under a DOC financial assistance award. Non-Federal entities wishing to dispose of real property acquired or improved, in whole or in part, pursuant to a DOC award must request disposition instructions, including the submission of Form SF-429, with appropriate attachments, from the Grants Officer in accordance with the requirements set forth in 2 C.F.R. § 200.311(c). *See also* the real property standards set forth in Section C. of these Standard Terms (Property Standards).
2. Tangible Personal Property Status Reports and Requests for Dispositions: DOC or a pass-through entity may also require a non-Federal entity to submit periodic reports using Form SF-428 (Tangible Personal Property Report) or any successor form, including appropriate attachments thereto, concerning tangible personal property that is Federally-owned or tangible personal property in which the Federal Government retains an interest. In

addition, DOC or a pass-through entity may require a non-Federal entity to submit Form SF-428 in connection with a non-Federal entity's request to dispose of tangible personal property acquired under a DOC financial assistance award. Non-Federal entities wishing to dispose of tangible personal property acquired or improved, in whole or in part, pursuant to a DOC award must request disposition instructions, including the submission of Form SF-428, with appropriate attachments, from the Grants Officer in accordance with the requirements set forth in 2 C.F.R. § 200.313(e). *See also* the tangible property standards set forth in Section C. of these Standard Terms (Property Standards).

3. Intangible Property Status Reports and Requests for Dispositions: The specific requirements governing the development, reporting, and disposition of rights to intangible property, including inventions and patents resulting from DOC awards, are set forth in 37 C.F.R. Part 401, which is hereby incorporated by reference into this award. Non-Federal entities are required to submit their disclosures, elections, and requests for waiver from any requirement for substantial U.S. manufacture, electronically using the Interagency Edison extramural invention reporting system (iEdison) at www.iedison.gov. Non-Federal entities may obtain a waiver of this electronic submission requirement by providing to the Grants Officer compelling reasons for allowing the submission of paper reports. When no longer needed for the originally authorized purpose, disposition of the intangible property must occur in accordance with the provisions in 2 C.F.R. § 200.313(e). *See also* the intangible property standards set forth in Section C. of these Standard Terms (Property Standards).

e. Subawards and Executive Compensation Reports. For reporting requirements on subawards and Executive Compensation, see paragraph G.05.o of these Standard Terms (The Federal Funding Accountability and Transparency Act (FFATA) (31 U.S.C. § 6101 note)).

f. Recipient Integrity and Performance Matters. For reporting requirements pertaining to integrity and performance matters, see paragraph G.05.p of these Standard Terms (Recipient Integrity and Performance Matters (Appendix XII to 2 C.F.R. Part 200)).

g. Research Performance Progress Reports. All research awards shall submit the Research Performance Progress Report (RPPR) in accordance with instructions set forth in the following link: [RPPR Instructions](#).

.02 Revisions of Program Plans

In accordance with 2 C.F.R. § 200.308 (Revision of budget and program plans) and 2 C.F.R. § 200.407 (Prior written approval (prior approval)), the recipient must obtain prior written approval from the DOC Grants Officer for certain proposed programmatic change requests, unless otherwise provided by the terms and conditions of a DOC award. Requests for prior approval for changes to program plans must be submitted to the Federal Program Officer (or electronically for awards administered through Grants Online). Requests requiring prior DOC approval are not effective unless and until approved in writing by the DOC Grants Officer.

.03 Other Federal Awards with Similar Programmatic Activities

The recipient must immediately provide written notification to the DOC Program Officer and the DOC Grants Officer if, subsequent to receipt of the DOC award, other financial assistance is received to support or fund any portion of the scope of work incorporated into the DOC award. DOC will not pay for costs that are funded by other sources.

.04 Prohibition against Assignment by a Non-Federal Entity

A non-Federal entity must not transfer, pledge, mortgage, assign, encumber or hypothecate a DOC financial assistance award or subaward, or any rights to, interests therein or claims arising thereunder, to any party or parties, including but not limited to banks, trust companies, other financing or financial institutions, or any other public or private organizations or individuals without the express prior written approval of the DOC Grants Officer or the pass-through entity (which, in turn, may need to obtain prior approval from the DOC Grants Officer).

.05 Disclaimer Provisions

a. The United States expressly disclaims all responsibility or liability to the non-Federal entity or third persons (including but not limited to contractors) for the actions of the non-Federal entity or third persons resulting in death, bodily injury, property damages, or any other losses resulting in any way from the performance of this award or any subaward, contract, or subcontract under this award.

b. The acceptance of this award or any subaward by the non-Federal entity does not in any way constitute an agency relationship between the United States and the non-Federal entity or the non-Federal entity's contractors or subcontractors.

.06 Unsatisfactory Performance or Non-Compliance with Award Provisions

a. Failure to perform the work in accordance with the terms of the award and maintain satisfactory performance as determined by DOC may result in the imposition of additional award conditions pursuant to 2 C.F.R. § 200.208 (Specific conditions) or other appropriate enforcement action as specified in 2 C.F.R. § 200.339 (Remedies for noncompliance).

b. Failure to comply with the provisions of an award will be considered grounds for appropriate enforcement action pursuant to 2 C.F.R. § 200.339 (Remedies for noncompliance), including but not limited to: the imposition of additional award conditions in accordance with 2 C.F.R. § 200.208 (Specific conditions); temporarily withholding award payments pending the correction of the deficiency; changing the payment method to reimbursement only; the disallowance of award costs and the establishment of an accounts receivable; wholly or partially suspending or terminating an award; initiating suspension or debarment proceedings in accordance with 2 C.F.R. Parts 180 and 1326; and such other remedies as may be legally available.

c. 2 C.F.R. §§ 200.340 (Termination) through 200.343 (Effects of suspension and termination) apply to an award that is terminated prior to the end of the period of performance

due to the non-federal entity's material failure to comply with the award terms and conditions. In addition, the failure to comply with the provisions of a DOC award may adversely impact the availability of funding under other active DOC or Federal awards and may also have a negative impact on a non-Federal entity's eligibility for future DOC or Federal awards.

B. FINANCIAL REQUIREMENTS

.01 Financial Management

a. In accordance with 2 C.F.R. § 200.302(a) (Financial Management), each State must expend and account for the Federal award in accordance with State laws and procedures for expending and accounting for the State's own funds. In addition, the State's and any other non-Federal entity's financial management systems, including records documenting compliance with Federal statutes, regulations, and the terms and conditions of the Federal award, must be sufficient to permit the preparation of reports required by general and program-specific terms and conditions; and the tracing of funds to a level of expenditures adequate to establish that such funds have been used in accordance with Federal statutes, regulations, and the terms and conditions applicable to the Federal award. *See also* 2 C.F.R. § 200.450 (Lobbying) for additional management requirements to verify that Federal funds are not used for unallowable lobbying costs.

b. The financial management system of each non-Federal entity must provide all information required by 2 C.F.R. § 200.302(b). *See also* 2 C.F.R. §§ 200.334 (Retention requirements for records); 200.335 (Requests for transfer of records); 200.336 (Methods for collection, transmission and storage of information); 200.337 (Access to records); and 200.338 (Restrictions on public access to records).

.02 Award Payments

a. Consistent with 2 C.F.R. § 200.305(a) (Federal payment), for States, payments are governed by Treasury-State Cash Management Improvement Act (CMIA) agreements and default procedures codified at 31 C.F.R. Part 205 (Rules and Procedures for Efficient Federal-State Funds Transfers) and Treasury Financial Manual Volume I, 4A-2000 (Overall Disbursing Rules for All Federal Agencies).

b. Consistent with 2 C.F.R. § 200.305(b), for non-Federal entities other than States, payment methods must minimize the amount of time elapsing between the transfer of funds from the U.S. Treasury or the pass-through entity and the disbursement by the non-Federal entity.

1. The Grants Officer determines the appropriate method of payment and, unless otherwise stated in a specific award condition, the advance method of payment must be authorized. Advances must be limited to the minimum amounts needed and be timed to be in accordance with the actual, immediate cash requirements of the non-Federal entity in carrying out the purpose of the approved program or project. Unless otherwise provided by the terms and conditions of a DOC award, non-Federal entities must time advance payment requests so that Federal funds are on hand for a maximum of 30 calendar days before being disbursed by the

non-Federal entity for allowable award costs.

2. If a non-Federal entity demonstrates an unwillingness or inability to establish procedures that will minimize the time elapsing between the transfer of funds and disbursement by the non-Federal entity or if a non-Federal entity otherwise fails to continue to qualify for the advance method of payment, the Grants Officer or the pass-through entity may change the method of payment to reimbursement only.

c. Unless otherwise provided for in the award terms, payments from DOC to recipients under this award will be made using the Department of Treasury's Automated Standard Application for Payment (ASAP) system. Under the ASAP system, payments are made through preauthorized electronic funds transfers directly to the recipient's bank account, in accordance with the requirements of the Debt Collection Improvement Act of 1996. To receive payments under ASAP, recipients are required to enroll with the Department of Treasury, Financial Management Service, Regional Financial Centers, which allows them to use the on-line and Voice Response System (VRS) method of withdrawing funds from their ASAP established accounts. The following information will be required to make withdrawals under ASAP:

1. ASAP account number – the Federal award identification number found on the cover sheet of the award;
2. Agency Location Code (ALC); and
3. Region Code.

d. Recipients enrolled in the ASAP system do not need to submit a Form SF-270 (Request for Advance or Reimbursement) for payments relating to their award. Awards paid under the ASAP system will contain a specific award condition, clause, or provision describing enrollment requirements and any controls or withdrawal limits set in the ASAP system.

e. When the Form SF-270 or successor form is used to request payment, the recipient must submit the request no more than monthly, and advances must be approved for periods to cover only expenses reasonably anticipated over the next 30 calendar days. Prior to receiving payments via the Form SF-270, the recipient must complete and submit to the Grants Officer the Form SF-3881 (ACH Vendor Miscellaneous Payment Enrollment Form) or successor form along with the initial Form SF-270. Form SF-3881 enrollment must be completed before the first award payment can be made via a Form SF-270 request.

f. The Federal award identification number must be included on all payment-related correspondence, information, and forms.

g. Non-Federal entities receiving advance award payments must adhere to the depository requirements set forth in 2 C.F.R. §§ 200.305(b)(7) through (b)(11). Interest amounts up to \$500 per non-Federal entity's fiscal year may be retained by the non-Federal entity for administrative expenses.

.03 Federal and Non-Federal Sharing

a. Awards that include Federal and non-Federal sharing incorporate a budget consisting of shared allowable costs. If actual allowable costs are less than the total approved budget, the Federal and non-Federal cost shares must be calculated by applying the approved Federal and non-Federal cost share ratios to actual allowable costs. If actual allowable costs exceed the total approved budget, the Federal share must not exceed the total Federal dollar amount authorized by the award.

b. The non-Federal share, whether in cash or third-party in-kind contributions, is to be paid out at the same general rate as the Federal share. Exceptions to this requirement may be granted by the Grants Officer based on sufficient documentation demonstrating previously determined plans for, or later commitment of, cash or third-party in-kind contributions. In any case, the recipient must meet its cost share commitment as set forth in the terms and conditions of the award; failure to do so may result in the assignment of specific award conditions or other further action as specified in Standard Term A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions). The non-Federal entity must create and maintain sufficient records justifying all non-Federal sharing requirements to facilitate questions and audits; see Section D of these Standard Terms (Audits), for audit requirements. See 2 C.F.R. § 200.306 for additional requirements regarding cost sharing.

.04 Budget Changes and Transfer of Funds among Categories

a. Recipients are required to report deviations from the approved award budget and request prior written approval from DOC in accordance with 2 C.F.R. § 200.308 (Revision of budget and program plans) and 2 C.F.R. § 200.407 (Prior written approval (prior approval)). Requests for such budget changes must be submitted to the Grants Officer (or electronically for awards serviced through Grants Online) who will notify the recipient of the final determination in writing. Requests requiring prior DOC approval do not become effective unless and until approved in writing by the DOC Grants Officer.

b. In accordance with 2 C.F.R. § 200.308(f), transfers of funds by the recipient among direct cost categories are permitted for awards in which the Federal share of the project is equal to or less than the simplified acquisition threshold. For awards in which the Federal share of the project exceeds the simplified acquisition threshold, transfers of funds among direct cost categories must be approved in writing by the Grants Officer when the cumulative amount of such direct costs transfers exceeds 10 percent of the total budget as last approved by the Grants Officer. The 10 percent threshold applies to the total Federal and non-Federal funds authorized by the Grants Officer at the time of the transfer request. This is the accumulated amount of Federal funding obligated to date by the Grants Officer along with any non-Federal share. The same requirements apply to the cumulative amount of transfer of funds among programs, functions, and activities. This transfer authority does not authorize the recipient to create new budget categories within an approved budget without Grants Officer approval. Any transfer that causes any Federal appropriation, or part thereof, to be used for an unauthorized purpose is not and will not be permitted. In addition, this provision does not prohibit the recipient from requesting Grants Officer approval for revisions to the budget. See 2 C.F.R. § 200.308 (Revision

of budget and program plans) (as applicable) for specific requirements concerning budget revisions and transfer of funds between budget categories.

.05 Program Income

Unless otherwise indicated in the award terms, program income may be used for any required cost sharing or added to the project budget, consistent with 2 C.F.R. § 200.307 (Program income).

.06 Indirect or Facilities and Administrative Costs

a. Indirect costs (or facilities and administration costs (F&A)) for major institutions of higher education and major nonprofit organizations can generally be defined as costs incurred for a common or joint purpose benefitting more than one cost objective, and not readily assignable to the cost objectives specifically benefited, without effort disproportionate to the results achieved. Indirect costs will not be allowable charges against an award unless permitted under the award and specifically included as a line item in the award's approved budget.

b. Unrecovered indirect costs, including unrecovered indirect costs on cost sharing or matching, may be included as part of cost sharing or matching as allowed under 2 C.F.R. § 200.306(c) (Cost sharing or matching) or the terms and conditions of a DOC award.

c. Cognizant Agency for Indirect (F&A) Costs. OMB established the cognizant agency concept, under which a single agency represents all others in dealing with non-Federal entities in common areas. The cognizant agency for indirect costs reviews and approves non-Federal entities' indirect cost rates. In accordance with Appendices III – VII to 2 C.F.R. Part 200 the cognizant agency for indirect costs reviews and approves non-Federal entities' indirect cost rates. With respect to for-profit organizations, the term cognizant Federal agency generally is defined as the agency that provides the largest dollar amount of negotiated contracts, including options. See 48 C.F.R. § 42.003. If the only Federal funds received by a commercial organization are DOC award funds, then DOC becomes the cognizant Federal agency for indirect cost negotiations.

1. General Review Procedures Where DOC is the Cognizant Agency.

i. Within 90 calendar days of the award start date, the recipient must submit to the Grants Officer any documentation (indirect cost proposal, cost allocation plan, etc.) necessary to allow DOC to perform the indirect cost rate proposal review. Below are two sources available for guidance on how to put an indirect cost plan together:

- (A) Department of Labor: <https://www.dol.gov/oasam/boc/dcd/np-comm-guide.htm>
or
- (B) Department of the Interior: <https://www.doi.gov/ibc/services/finance/indirect-Cost-Services/>.

ii. The recipient may use the rate proposed in the indirect cost plan as a provisional rate until the DOC provides a response to the submitted plan.

- iii. The recipient is required to annually submit indirect cost proposals no later than six months after the recipient's fiscal year end, except as otherwise provided by 2 C.F.R. § 200.414(g).
2. When DOC is not the oversight or cognizant Federal agency, the recipient must provide the Grants Officer with a copy of a negotiated rate agreement or a copy of the transmittal letter submitted to the cognizant or oversight Federal agency requesting a negotiated rate agreement within 30 calendar days of receipt of a negotiated rate agreement or submission of a negotiated rate proposal.
3. If the recipient is proposing indirect costs as part of a project budget, but is not required to have a negotiated rate agreement pursuant to 2 C.F.R. Part 200, Appendix VII, Paragraph D.1.b (*i.e.*, a governmental department or agency that receives \$35 million or less in direct Federal funding), the recipient may be required to provide the Grants Officer with a copy of its Certificate of Indirect Costs as referenced in 2 C.F.R. Part 200, Appendix VII, Paragraph D.3. or such other documentation, acceptable in form and substance to the Grants Officer, sufficient to confirm that proposed indirect costs are calculated and supported by documentation in accordance with 2 C.F.R. Part 200, Appendix VII. In cases where the DOC is the recipient's cognizant Federal agency, the DOC reserves the right, pursuant to 2 C.F.R. Part 200, Appendix VII, Paragraph D.1.b, to require the recipient to submit its indirect cost rate proposal for review by DOC.
- d. If the recipient fails to submit required documentation to DOC within 90 calendar days of the award start date, the Grants Officer may amend the award to preclude the recovery of any indirect costs under the award. If the DOC, oversight, or cognizant Federal agency determines there is a finding of good and sufficient cause to excuse the recipient's delay in submitting the documentation, an extension of the 90-day due date may be approved by the Grants Officer.
- e. The maximum dollar amount of allocable indirect costs for which DOC will reimburse the recipient is the lesser of:
 1. The line item amount for the Federal share of indirect costs contained in the approved award budget, including all budget revisions approved in writing by the Grants Officer; or
 2. The Federal share of the total indirect costs allocable to the award based on the indirect cost rate approved by the cognizant agency for indirect costs and applicable to the period in which the cost was incurred, in accordance with 2 C.F.R. 200 Appendix III, C.7, provided that the rate is approved on or before the award end date.
- f. In accordance with 2 CFR § 200.414(c)(3), DOC set forth policies, procedures, and general decision-making criteria for deviations from negotiated indirect cost rates. These policies and procedures are applicable to all Federal financial assistance programs awarded and administered by DOC bureaus as Federal awarding agencies and may be found at http://www.osec.doc.gov/oam/grants_management/policy/documents/FAM%202015-02.pdf.

g. In accordance with 2 CFR § 200.414(g), any non-Federal entity that has a negotiated indirect cost rate may apply to the entity's cognizant agency for indirect costs for a one-time extension of a currently negotiated indirect cost rate for a period of up to four years, reducing the frequency of rate calculations and negotiations between an institution and its cognizant agency.

h. In accordance with 2 CFR § 200.414(f), any non-Federal entity that does not have a current negotiated (including provisional) rate, except for those non-Federal entities described in paragraph D.1.b of Appendix VII to 2 CFR Part 200, may elect to charge a de minimis rate of 10 percent of modified total direct costs. No documentation is required to justify the 10 percent de minimis indirect cost rate.

.07 Incurring Costs or Obligating Federal Funds Before and After the Period of Performance

a. In accordance with 2 C.F.R. § 200.309 (Modifications to Period of Performance) and the terms and conditions of a DOC award, a non-Federal entity may charge to the Federal award only allowable costs incurred during the period of performance, which is established in the award document. As defined at 2 C.F.R. § 200.1, the "period of performance" means the total estimated time interval between the start of an initial Federal award and the planned end date, which may include one or more funded portions, or budget periods. Identification of the Period of Performance in the Federal award per § 200.211(b)(5) does not commit the awarding agency to fund the award beyond the currently approved budget period." The period of performance may sometimes be referred to as the project period or award period. This Standard Term is subject to exceptions for allowable costs pertaining to: (i) pre-award costs (*see* 2 C.F.R. § 200.458); (ii) publication and printing costs (*see* 2 C.F.R. § 200.461); and administrative costs incurred relating to the close-out of an award (*see* 2 C.F.R. § 200.344).

b. Reasonable, necessary, allowable and allocable administrative award closeout costs are authorized for a period of up to 120 calendar days following the end of the period of performance. For this purpose, award closeout costs are those strictly associated with close-out activities and are typically limited to the preparation of final progress, financial, and required project audit reports, unless otherwise approved in writing by the Grants Officer. A non-Federal entity may request an extension of the 120-day closeout period, as provided in 2 C.F.R. § 200.344 (Closeout).

c. Unless authorized by a specific award condition, any extension of the period of performance may only be authorized by the Grants Officer in writing. This is not a delegable authority. Verbal or written assurances of funding from anyone other than the Grants Officer does not constitute authority to obligate funds for programmatic activities beyond the end of the period of performance.

d. The DOC has no obligation to provide any additional prospective funding. Any amendment of the award to increase funding and to extend the period of performance is at the sole discretion of DOC.

.08 Tax Refunds

The non-Federal entity shall contact the Grants Officer immediately upon receipt of the refund of any taxes, including but not limited to Federal Insurance Contributions Act (FICA) taxes, Federal Unemployment Tax Act (FUTA) taxes, or Value Added Taxes (VAT) that were allowed as charges to a DOC award, regardless of whether such refunds are received by the non-Federal entity during or after the period of performance. The Grants Officer will provide written disposition instructions to the non-Federal entity, which may include the refunded taxes being credited to the award as either a cost reduction or a cash refund, or may allow the non-Federal entity to use such refunds for approved activities and costs under a DOC award. See 2 C.F.R. § 200.470 (Taxes (including Value Added Tax)).

.09 Internal Controls

Each recipient must comply with standards for internal controls described at 2 C.F.R. § 200.303 (Internal controls). The “Standards for Internal Control in the Federal Government” issued by the Comptroller General of the United States referenced in § 200.303 are available online at <http://www.gao.gov/assets/80/76455.pdf> and the “Internal Control Integrated Framework” issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) is available online at [Internal Control Guidance](#).

C. PROPERTY STANDARDS

.01 Standards

Each non-Federal entity must comply with the Property Standards set forth in 2 C.F.R. §§ 200.310 (Insurance coverage) through 200.316 (Property trust relationship).

.02 Real and Personal Property

a. In accordance with 2 C.F.R. § 200.316 (Property trust relationship), real property, equipment, and other personal property acquired or improved with a Federal award must be held in trust by the non-Federal entity as trustee for the beneficiaries of the project or program under which the property was acquired or improved. This trust relationship exists throughout the duration of the property’s estimated useful life, as determined by the Grants Officer in consultation with the Program Office, during which time the Federal Government retains an undivided, equitable reversionary interest in the property (Federal Interest). During the duration of the Federal Interest, the non-Federal entity must comply with all use and disposition requirements and restrictions as set forth in 2 C.F.R. §§ 200.310 (Insurance coverage) through 200.316 (Property trust relationship), as applicable, and in the terms and conditions of the Federal award.

b. The Grants Officer may require a non-Federal entity to execute and to record (as applicable) a statement of interest, financing statement (form UCC-1), lien, mortgage or other public notice of record to indicate that real or personal property acquired or improved in whole or in part with Federal funds is subject to the Federal Interest, and that certain use and disposition

requirements apply to the property. The statement of interest, financing statement (Form UCC 1), lien, mortgage or other public notice must be acceptable in form and substance to the DOC and must be placed on record in accordance with applicable State and local law, with continuances re-filed as appropriate. In such cases, the Grants Officer may further require the non-Federal entity to provide the DOC with a written statement from a licensed attorney in the jurisdiction where the property is located, certifying that the Federal Interest has been protected, as required under the award and in accordance with applicable State and local law. The attorney's statement, along with a copy of the instrument reflecting the recordation of the Federal Interest, must be returned to the Grants Officer. Without releasing or excusing the non-Federal entity from these obligations, the non-Federal entity, by execution of the financial assistance award or by expending Federal financial assistance funds (in the case of a subrecipient), authorizes the Grants Officer and/or program office to file such notices and continuations as it determines to be necessary or convenient to disclose and protect the Federal Interest in the property. The Grants Officer may elect not to release any or a portion of the Federal award funds until the non-Federal entity has complied with this provision and any other applicable award terms or conditions, unless other arrangements satisfactory to the Grants Officer are made.

.03 Intellectual Property Rights

a. General. The rights to any work or other intangible property produced or acquired under a Federal award are determined by 2 C.F.R. § 200.315 (Intangible property). The non-Federal entity owns any work produced or purchased under a Federal award subject to the DOC's royalty-free, nonexclusive, and irrevocable right to obtain, reproduce, publish, or otherwise use the work or authorize others to receive, reproduce, publish, or otherwise use the work for Government purposes.

b. Inventions. Unless otherwise provided by law, the rights to any invention made by a non-Federal entity under a DOC financial assistance award are determined by the Bayh-Dole Act, Pub. L. No. 96-517, as amended, and as codified in 35 U.S.C. § 200 *et seq.*, and modified by E.O. 12591 (52 FR 13414), as amended by E.O. 12618 (52 FR 48661). 35 U.S.C. § 201(h) defines "small business firm" as "a small business concern as defined at section 2 of Public Law 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration." Section 1(b)(4) of E.O. 12591 extended the Bayh-Dole Act to non-Federal entities "regardless of size" to the extent permitted by law. The specific requirements governing the development, reporting, and disposition of rights to inventions and patents resulting from Federal awards are described in more detail in 37 C.F.R. Part 401, which implements 35 U.S.C. 202 through 204 and includes standard patent rights clauses in 37 C.F.R. § 401.14, which is hereby incorporated by reference into this award.

The Bayh-Dole regulations set forth in 37 C.F.R. parts 401 and 404 were amended by 83 FR 15954, with an effective date of May 14, 2018 (Amended Bayh-Dole Regulations). The Amended Bayh-Dole Regulations apply to all new financial assistance awards issued on or after May 14, 2018. The Amended Bayh-Dole Regulations do not apply to financial assistance awards issued prior to May 14, 2018, including amendments made to such awards, unless an award amendment includes a specific condition incorporating the Amended Bayh-Dole Regulations into the terms and conditions of the subject award.

1. Ownership. A non-Federal entity may have rights to inventions in accordance with 37 C.F.R. Part 401. These requirements are technical in nature and non-Federal entities are encouraged to consult with their Intellectual Property counsel to ensure the proper interpretation of and adherence to the ownership rules. Unresolved questions pertaining to a non-Federal entities' ownership rights may further be addressed to the Grants Officer.

2. Responsibilities - iEdison. The non-Federal entity must comply with all the requirements of the standard patent rights clause and 37 C.F.R. Part 401, including the standard patent rights clause in 37 C.F.R. § 401.14. Non-Federal entities are required to submit their disclosures, elections, and requests for waiver from any requirement for substantial U.S. manufacture, electronically using the Interagency Edison extramural invention reporting system (iEdison) at www.iedison.gov. Non-Federal entities may obtain a waiver of this electronic submission requirement by providing the Grants Officer with compelling reasons for allowing the submission of paper reports.

c. Patent Notification Procedures. Pursuant to E.O. 12889 (58 FR 69681), the DOC is required to notify the owner of any valid patent covering technology whenever the DOC or a non-Federal entity, without making a patent search, knows (or has demonstrable reasonable grounds to know) that technology covered by a valid United States patent has been or will be used without a license from the owner. To ensure proper notification, if the non-Federal entity uses or has used patented technology under this award without a license or permission from the owner, the non-Federal entity must notify the Grants Officer.

This notice does not constitute authorization or consent by the Government to any copyright or patent infringement occurring under the award.

d. A non-Federal entity may copyright any work produced under a Federal award, subject to the DOC's royalty-free, nonexclusive, and irrevocable right to obtain, reproduce, publish, or otherwise use the work, or authorize others to do so for Government purposes. Works jointly authored by DOC and non-Federal entity employees may be copyrighted, but only the part of such works authored by the non-Federal entity is protectable in the United States because, under 17 U.S.C. § 105, copyright protection is not available within the United States for any work of the United States Government. On occasion and as permitted under 17 U.S.C. § 105, DOC may require the non-Federal entity to transfer to DOC a copyright in a particular work for Government purposes or when DOC is undertaking primary dissemination of the work.

e. Freedom of Information Act (FOIA). In response to a FOIA request for research data relating to published research findings (as defined by 2 C.F.R. § 200.315(e)(2)) produced under a Federal award that were used by the Federal government in developing an agency action that has the force and effect of law, the DOC will request, and the non-Federal entity must provide, within a reasonable time, the research data so that they can be made available to the public through the procedures established under the FOIA.

D. AUDITS

Under the Inspector General Act of 1978, as amended, 5 U.S.C. App. 3, §§ 1 *et seq.*, an audit of the award may be conducted at any time. The Inspector General of the DOC, or any of his or her duly authorized representatives, must have the right to access any pertinent books, documents, papers, and records of the non-Federal entity, whether written, printed, recorded, produced, or reproduced by any electronic, mechanical, magnetic, or other process or medium, to make audits, inspections, excerpts, transcripts, or other examinations as authorized by law. This right also includes timely and reasonable access to the non-Federal entity's personnel for interview and discussion related to such documents. See 2 C.F.R. § 200.337 (Access to records). When the DOC Office of Inspector General (OIG) requires a program audit on a DOC award, the OIG will usually make the arrangements to audit the award, whether the audit is performed by OIG personnel, an independent accountant under contract with DOC, or any other Federal, State, or local audit entity.

.01 Organization-Wide, Program-Specific, and Project Audits

a. A recipient must, within 90 days of the end of its fiscal year, notify the Grants Officer of the amount of Federal awards, including all DOC and non-DOC awards, that the recipient expended during its fiscal year.

b. Recipients that are subject to the provisions of Subpart F of 2 C.F.R. Part 200 and that expend \$750,000 or more in a year in Federal awards during their fiscal year must have an audit conducted for that year in accordance with the requirements contained in Subpart F of 2 C.F.R. Part 200. Within the earlier of 30 calendar days after receipt of the auditor's report(s), or nine months after the end of the audit period, unless a different period is specified in a program-specific audit guide, a copy of the audit must be submitted electronically to the Federal Audit Clearinghouse (FAC) through the FAC's Internet Data Entry System (IDES) (<https://harvester.census.gov/facides/>). In accordance with 2 C.F.R. § 200.425 (Audit services), the recipient may include a line item in the budget for the allowable costs associated with the audit, which is subject to the approval of the Grants Officer.

c. Unless otherwise specified in the terms and conditions of the award, entities that are not subject to Subpart F of 2 C.F.R. Part 200 (e.g., for-profit entities, foreign public entities and foreign organizations) and that expend \$750,000 or more in DOC funds during their fiscal year (including both as a recipient and a subrecipient) must submit to the Grants Officer either: (i) a financial related audit of each DOC award or subaward in accordance with Generally Accepted Government Auditing Standards (GAGAS); or (ii) a project specific audit for each award or subaward in accordance with the requirements contained in 2 C.F.R. § 200.507. Within the earlier of 30 calendar days after receipt of the auditor's report(s), or nine months after the end of the audit period, unless a different period is specified in a program-specific audit guide, a copy of the audit must be submitted to the Grants Officer. In accordance with 2 C.F.R. § 200.425, the recipient may include a line item in the budget for the allowable costs associated with the audit, which is subject to the approval of the Grants Officer. Entities that are not subject to Subpart F of 2 C.F.R. Part 200 and that expend less than \$750,000 in DOC funds in a given fiscal year are

not required to submit an audit(s) for that year, but must make their award-related records available to DOC or other designated officials for review and audit.

d. Recipients are responsible for compliance with the above audit requirements and for informing the Grants Officer of the status of their audit, including when the relevant audit has been completed and submitted in accordance with the requirements of this section. Failure to provide audit reports within the timeframes specified above may result in appropriate enforcement action, up to and including termination of the award, and may jeopardize eligibility for receiving future DOC awards.

e. In accordance with 2 C.F.R. § 200.332(d)(3), pass-through entities are responsible for issuing a management decision for applicable audit findings pertaining only to the Federal award provided by the pass-through entity to a subrecipient.

.02 Audit Resolution Process

a. An audit of the award may result in the disallowance of costs incurred by the recipient and the establishment of a debt (account receivable) due to DOC. For this reason, the recipient should take seriously its responsibility to respond to all audit findings and recommendations with adequate explanations and supporting evidence whenever audit results are disputed.

b. A recipient whose award is audited has the following opportunities to dispute the proposed disallowance of costs and the establishment of a debt:

1. The recipient has 30 calendar days from the date of the transmittal of the draft audit report to submit written comments and documentary evidence.
2. The recipient has 30 calendar days from the date of the transmittal of the final audit report to submit written comments and documentary evidence.
3. The DOC will review the documentary evidence submitted by the recipient and will notify the recipient of the results in an *Audit Resolution Determination Letter*. The recipient has 30 calendar days from the date of receipt of the *Audit Resolution Determination Letter* to submit a written appeal, unless this deadline is extended in writing by the DOC. The appeal is the last opportunity for the recipient to submit written comments and documentary evidence to the DOC to dispute the validity of the audit resolution determination.
4. An appeal of the Audit Resolution Determination does not prevent the establishment of the audit-related debt nor does it prevent the accrual of applicable interest, penalties and administrative fees on the debt in accordance with 15 C.F.R. Part 19. If the Audit Resolution Determination is overruled or modified on appeal, appropriate corrective action will be taken retroactively.
5. The DOC will review the recipient's appeal and notify the recipient of the results in an *Appeal Determination Letter*. After the opportunity to appeal has expired or after the appeal determination has been rendered, DOC will not accept any further documentary evidence from the recipient. No other administrative appeals are available in DOC.

E. DEBTS

.01 Payment of Debts Owed to the Federal Government

a. The non-Federal entity must promptly pay any debts determined to be owed to the Federal Government. Any funds paid to a non-Federal entity in excess of the amount to which the non-Federal entity is finally determined to be entitled under the terms of the Federal award constitute a debt to the Federal government. In accordance with 2 C.F.R. § 200.346 (Collection of amounts due), if not paid within 90 calendar days after demand, DOC may reduce a debt owed to the Federal Government by:

1. Making an administrative offset against other requests for reimbursement;
2. Withholding advance payments otherwise due to the non-Federal entity; or
3. Taking any other action permitted by Federal statute.

The foregoing does not waive any claim on a debt that DOC may have against another entity, and all rights and remedies to pursue other parties are preserved.

b. DOC debt collection procedures are set out in 15 C.F.R. Part 19. In accordance with 2 C.F.R. § 200.346 (Collection of amounts due) and 31 U.S.C. § 3717, failure to pay a debt owed to the Federal Government must result in the assessment of interest, penalties and administrative costs in accordance with the provisions of 31 U.S.C. § 3717 and 31 C.F.R. § 901.9. Commerce entities will transfer any Commerce debt that is delinquent for more than 120 calendar days to the U.S. Department of the Treasury's Financial Management Service for debt collection services, a process known as cross-servicing, pursuant to 31 U.S.C. § 3711(g), 31 C.F.R. § 285.12, and 15 C.F.R. § 19.9. DOC may also take further action as specified in DOC ST&C A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions). Funds for payment of a debt must not come from other Federally-sponsored programs, and the DOC may conduct on-site visits, audits, and other reviews to verify that other Federal funds have not been used to pay a debt.

.02 Late Payment Charges

a. Interest will be assessed on the delinquent debt in accordance with section 11 of the Debt Collection Act of 1982, as amended (31 U.S.C. § 3717(a)). The minimum annual interest rate to be assessed is the U.S. Department of the Treasury's Current Value of Funds Rate (CVFR). The CVFR is available online at https://www.fiscal.treasury.gov/fsreports/rpt/cvfr/cvfr_home.htm and also published by the Department of the Treasury in the *Federal Register* (<http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR>) and in the *Treasury Financial Manual Bulletin*. The assessed rate must remain fixed for the duration of the indebtedness.

b. Penalties will accrue at a rate of not more than six percent per year or such other higher rate as authorized by law.

c. Administrative charges, i.e., the costs of processing and handling a delinquent debt, will be determined by the Commerce entity collecting the debt, as directed by the Office of the Chief Financial Officer and Assistant Secretary for Administration.

.03 Barring Delinquent Federal Debtors from Obtaining Federal Loans or Loan Insurance Guarantees

Pursuant to 31 U.S.C. § 3720B and 31 C.F.R. § 901.6, unless waived by DOC, the DOC is not permitted to extend financial assistance in the form of a loan, loan guarantee, or loan insurance to any person delinquent on a nontax debt owed to a Federal agency. This prohibition does not apply to disaster loans.

.04 Effect of Judgment Lien on Eligibility for Federal Grants, Loans, or Programs

Pursuant to 28 U.S.C. § 3201(e), unless waived by the DOC, a debtor who has a judgment lien against the debtor's property for a debt to the United States is not eligible to receive any grant or loan that is made, insured, guaranteed, or financed directly or indirectly by the United States or to receive funds directly from the Federal Government in any program, except funds to which the debtor is entitled as beneficiary, until the judgment is paid in full or otherwise satisfied.

F. CONFLICT OF INTEREST, CODE OF CONDUCT AND OTHER REQUIREMENTS PERTAINING TO DOC FINANCIAL ASSISTANCE AWARDS, INCLUDING SUBAWARD AND PROCUREMENT ACTIONS

.01 Conflict of Interest and Code of Conduct

a. DOC Conflict of Interest Policy. In accordance with 2 C.F.R. § 200.112 (Conflict of interest), the non-Federal entity must disclose in writing any potential conflict of interest to the DOC or pass-through entity. In addition, a non-Federal entity will establish and maintain written standards of conduct that include safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain in the administration of an award. It is the DOC's policy to maintain the highest standards of conduct and to prevent real or apparent conflicts of interest in connection with DOC financial assistance awards.

b. A conflict of interest generally exists when an interested party participates in a matter that has a direct and predictable effect on the interested party's personal or financial interests. A financial interest may include employment, stock ownership, a creditor or debtor relationship, or prospective employment with the organization selected or to be selected for a subaward. A conflict also may exist where there is an appearance that an interested party's objectivity in performing his or her responsibilities under the project is impaired. For example, an appearance of impairment of objectivity may result from an organizational conflict where, because of other activities or relationships with other persons or entities, an interested party is unable to render

impartial assistance, services or advice to the recipient, a participant in the project or to the Federal Government. Additionally, a conflict of interest may result from non-financial gain to an interested party, such as benefit to reputation or prestige in a professional field. For purposes of the DOC Conflict of Interest Policy, an interested party includes, but is not necessarily limited to, any officer, employee or member of the board of directors or other governing board of a non-Federal entity, including any other parties that advise, approve, recommend, or otherwise participate in the business decisions of the recipient, such as agents, advisors, consultants, attorneys, accountants or shareholders. This also includes immediate family and other persons directly connected to the interested party by law or through a business arrangement.

c. Procurement-related conflict of interest. In accordance with 2 C.F.R. § 200.318 (General procurement standards), non-Federal entities must maintain written standards of conduct covering conflicts of interest and governing the performance of their employees engaged in the selection, award and administration of contracts. See paragraph F.04 of these Standard Terms (Requirements for Procurements).

.02 Nonprocurement Debarment and Suspension

Non-Federal entities must comply with the provisions of 2 C.F.R. Part 1326 (Nonprocurement Debarment and Suspension), which generally prohibit entities that have been debarred, suspended, or voluntarily excluded from participating in Federal nonprocurement transactions either through primary or lower tier covered transactions, and which set forth the responsibilities of recipients of Federal financial assistance regarding transactions with other persons, including subrecipients and contractors.

.03 Requirements for Subawards

a. The recipient or pass-through entity must require all subrecipients, including lower tier subrecipients, to comply with the terms and conditions of a DOC financial assistance award, including applicable provisions of the OMB Uniform Guidance (2 C.F.R. Part 200), and all associated Terms and Conditions set forth herein. See 2 C.F.R. § 200.101(b)(2) (Applicability to different types of Federal awards), which describes the applicability of 2 C.F.R. Part 200 to various types of Federal awards and §§ 200.331-333 (Subrecipient monitoring and management).

b. The recipient or pass through entity may have more restrictive policies for the RTC **waived** prior approvals (no-cost extensions, re-budgeting, etc.) for their subaward recipients. Such restrictive policies must be addressed in their subaward agreements and in accordance with §200.331.

.04 Requirements for Procurements

a. States. Pursuant to 2 C.F.R. § 200.317 (Procurements by states), when procuring property and services under this Federal award, a State must follow the same policies and procedures it uses for procurements from its non-Federal funds. The State must comply with 2 C.F.R. §§ 200.321 (Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms), 200.322 (Domestic preferences for procurements), and

200.323 (Procurement of recovered materials), and ensure that every purchase order or other contract includes any clauses required by 2 C.F.R. § 200.327 (Contract provisions).

b. Other Non-Federal Entities. All other non-Federal entities, including subrecipients of a State, must follow the procurement standards in 2 C.F.R. §§ 200.318 (General procurement standards) through 200.327 (Contract provisions) which include the requirement that non-Federal entities maintain written standards of conduct covering conflicts of interest and governing the performance of their employees engaged in the selection, award, and administration of contracts. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a Federal award if he or she has a real or apparent conflict of interest.

.05 Whistleblower Protections

This award is subject to the whistleblower protections afforded by 41 U.S.C. § 4712 (Enhancement of contractor protection from reprisal for disclosure of certain information), which generally provide that an employee or contractor (including subcontractors and personal services contractors) of a non-Federal entity may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing to a person or body information that the employee reasonably believes is evidence of gross mismanagement of a Federal award, subaward, or a contract under a Federal award or subaward, a gross waste of Federal funds, an abuse of authority relating to a Federal award or subaward or contract under a Federal award or subaward, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal award, subaward, or contract under a Federal award or subaward. These persons or bodies include:

- a. A Member of Congress or a representative of a committee of Congress.
- b. An Inspector General.
- c. The Government Accountability Office.
- d. A Federal employee responsible for contract or grant oversight or management at the relevant agency.
- e. An authorized official of the Department of Justice or other law enforcement agency.
- f. A court or grand jury.
- g. A management official or other employee of the contractor, subcontractor, or grantee who has the responsibility to investigate, discover, or address misconduct.

Non-Federal entities and contractors under Federal awards and subawards must inform their employees in writing of the rights and remedies provided under 41 U.S.C. § 4712, in the predominant native language of the workforce.

.06 Small Businesses, Minority Business Enterprises and Women's Business Enterprises

In accordance with 2 C.F.R. § 200.321 (Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms), the recipient must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. DOC encourages non-Federal entities to use small

businesses, minority business enterprises and women's business enterprises in contracts under financial assistance awards. The Minority Business Development Agency within the DOC will assist non-Federal entities in matching qualified minority business enterprises with contract opportunities. For further information visit MBDA's website at <http://www.mbda.gov>. If you do not have access to the Internet, you may contact MBDA via telephone or mail:

U.S. Department of Commerce
Minority Business Development Agency
Herbert C. Hoover Building
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230
(202) 482-0101

G. NATIONAL POLICY REQUIREMENTS

.01 United States Laws and Regulations

This award is subject to the laws and regulations of the United States. The recipient must comply with all applicable requirements of all other Federal laws, executive orders, regulations and policies governing this program.

.02 Non-Discrimination Requirements

No person in the United States may, on the ground of race, color, national origin, handicap, age, religion, or sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under, any program or activity receiving Federal financial assistance. The recipient agrees to comply with the non-discrimination requirements below:

a. Statutory Provisions

1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d *et seq.*) and DOC implementing regulations published at 15 C.F.R. Part 8 prohibiting discrimination on the grounds of race, color, or national origin under programs or activities receiving Federal financial assistance;
2. Title IX of the Education Amendments of 1972 (20 U.S.C. §§ 1681 *et seq.*) prohibiting discrimination on the basis of sex under Federally assisted education programs or activities;
3. The Americans with Disabilities Act of 1990 (42 U.S.C. §§ 12101 *et seq.*) prohibiting discrimination on the basis of disability under programs, activities, and services provided or made available by State and local governments or instrumentalities or agencies thereto, as well as public or private entities that provide public transportation;
4. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), and DOC implementing regulations published at 15 C.F.R. Part 8b prohibiting discrimination on the

basis of handicap under any program or activity receiving or benefiting from Federal assistance.

For purposes of complying with the accessibility standards set forth in 15 C.F.R. § 8b.18(c), non-federal entities must adhere to the regulations, published by the U.S. Department of Justice, implementing Title II of the Americans with Disabilities Act (ADA) (28 C.F.R. part 35; 75 FR 56164, as amended by 76 FR 13285) and Title III of the ADA (28 C.F.R. part 36; 75 FR 56164, as amended by 76 FR 13286). The revised regulations adopted new enforceable accessibility standards called the “2010 ADA Standards for Accessible Design” (2010 Standards), which replace and supersede the former Uniform Federal Accessibility Standards for new construction and alteration projects;

5. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 *et seq.*), and DOC implementing regulations published at 15 C.F.R. Part 20 prohibiting discrimination on the basis of age in programs or activities receiving Federal financial assistance; and
6. Any other applicable non-discrimination law(s).

b. Other Provisions

1. Parts II and III of E.O. 11246 (Equal Employment Opportunity, 30 FR 12319),³ which requires Federally assisted construction contracts to include the nondiscrimination provisions of §§ 202 and 203 of E.O. 11246 and Department of Labor regulations implementing E.O. 11246 (41 C.F.R. § 60-1.4(b)).
2. E.O. 13166 (65 FR 50121, Improving Access to Services for Persons with Limited English Proficiency), requiring Federal agencies to examine the services provided, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so LEP persons can have meaningful access to them. The DOC issued policy guidance on March 24, 2003 (68 FR 14180) to articulate the Title VI prohibition against national origin discrimination affecting LEP persons and to help ensure that non-Federal entities provide meaningful access to their LEP applicants and beneficiaries.
3. In accordance with E.O. 13798 and Office of Management and Budget, M-20-09 – Guidance Regarding Federal Grants, states or other public grantees may not condition sub-awards of Federal grant money in a manner that would disadvantage grant applicants based on their religious character.

³ As amended by E.O. 11375(32 FR 14303), E.O. 11478 (34 FR 12985), E.O. 12086 (43 FR 46501), E.O. 12107 (44 FR 1055), E.O. 13279 (F67 FR 77141), E.O. 13665 (79 FR 20749), and E.O. 13672 (79 FR 42971).

c. Title VII Exemption for Religious Organizations

Generally, Title VII of the Civil Rights Act of 1964, 42 U.S.C. §§ 2000e *et seq.*, provides that it is an unlawful employment practice for an employer to discharge any individual or otherwise to discriminate against an individual with respect to compensation, terms, conditions, or privileges of employment because of such individual's race, color, religion, sex, or national origin. However, Title VII, 42 U.S.C. § 2000e-1(a), expressly exempts from the prohibition against discrimination based on religion, "a religious corporation, association, educational institution, or society with respect to the employment of individuals of a particular religion to perform work connected with the carrying on by such corporation, association, educational institution, or society of its activities."

.03 LOBBYING RESTRICTIONS

a. Statutory Provisions

Non-Federal entities must comply with 2 C.F.R. § 200.450 (Lobbying), which incorporates the provisions of 31 U.S.C. § 1352; and OMB guidance and notices on lobbying restrictions. In addition, non-Federal entities must comply with the DOC regulations published at 15 C.F.R. Part 28, which implement the New Restrictions on Lobbying. These provisions prohibit the use of Federal funds for lobbying the executive or legislative branches of the Federal Government in connection with the award and require the disclosure of the use of non-Federal funds for lobbying. Lobbying includes attempting to improperly influence, meaning any influence that induces or tends to induce a Federal employee or officer to give consideration or to act regarding a Federal award or regulatory matter on any basis other than the merits of the matter, either directly or indirectly. Costs incurred to improperly influence are unallowable. See 2 C.F.R. § 200.450(b) and (c).

b. Disclosure of Lobbying Activities

Any recipient that receives more than \$100,000 in Federal funding and conducts lobbying with non-federal funds relating to a covered Federal action must submit a completed Form SF-LLL (Disclosure of Lobbying Activities). The Form SF-LLL must be submitted within 30 calendar days following the end of the calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed. The recipient must submit any required SF-LLL forms, including those received from subrecipients, contractors, and subcontractors, to the Grants Officer.

.04 Environmental Requirements

Environmental impacts must be considered by Federal decision makers in their decisions whether or not to approve: (1) a proposal for Federal assistance; (2) the proposal with mitigation; or (3) a different proposal having less adverse environmental impacts. Federal environmental laws require that the funding agency initiate an early planning process that considers potential impacts that projects funded with Federal assistance may have on the environment. Each non-Federal entity must comply with all environmental standards, to include those prescribed under

the following statutes and E.O.s and must identify to the awarding agency any impact the award may have on the environment. In some cases, award funds can be withheld by the Grants Officer under a specific award condition requiring the non-Federal entity to submit additional environmental compliance information sufficient to enable the DOC to make an assessment on any impacts that a project may have on the environment.

a. The National Environmental Policy Act (42 U.S.C. §§ 4321 *et seq.*)

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) implementing regulations (40 C.F.R. Parts 1500 through 1508) require that an environmental analysis be completed for all major Federal actions to determine whether they have significant impacts on the environment. NEPA applies to the actions of Federal agencies and may include a Federal agency's decision to fund non-Federal projects under grants and cooperative agreements when the award activities remain subject to Federal authority and control. Non-Federal entities are required to identify to the awarding agency any direct, indirect or cumulative impact an award will have on the quality of the human environment and assist the agency in complying with NEPA. Non-Federal entities may also be requested to assist DOC in drafting an environmental assessment or environmental impact statement if DOC determines such documentation is required, but DOC remains responsible for the sufficiency and approval of the final documentation. Until the appropriate NEPA documentation is complete and in the event that any additional information is required during the period of performance to assess project environmental impacts, funds can be withheld by the Grants Officer under a specific award condition requiring the non-Federal entity to submit the appropriate environmental information and NEPA documentation sufficient to enable DOC to make an assessment on any impacts that a project may have on the environment.

b. The National Historic Preservation Act (16 U.S.C. §§ 470 *et seq.*)

Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. § 470f) and the Advisory Council on Historic Preservation (ACHP) implementing regulations (36 C.F.R. Part 800) require that Federal agencies take into account the effects of their undertakings on historic properties and, when appropriate, provide the ACHP with a reasonable opportunity to comment. Historic properties include but are not necessarily limited to districts, buildings, structures, sites and objects. In this connection, archeological resources and sites that may be of traditional religious and cultural importance to Federally-recognized Indian Tribes, Alaskan Native Villages and Native Hawaiian Organizations may be considered historic properties. Non-Federal entities are required to identify to the awarding agency any effects the award may have on properties included on or eligible for inclusion on the National Register of Historic Places. Non-Federal entities may also be requested to assist DOC in consulting with State or Tribal Historic Preservation Officers, ACHPs or other applicable interested parties necessary to identify, assess, and resolve adverse effects to historic properties. Until such time as the appropriate NHPA consultations and documentation are complete and in the event that any additional information is required during the period of performance in order to assess project impacts on historic properties, funds can be withheld by the Grants Officer under a specific award condition requiring the non-Federal entity to

submit any information sufficient to enable DOC to make the requisite assessment under the NHPA.

Additionally, non-Federal entities are required to assist the DOC in assuring compliance with the Archeological and Historic Preservation Act of 1974 (54 U.S.C. § 312502 *et seq.*, formerly 16 U.S.C. § 469a-1 *et seq.*); Executive Order 11593 (Protection and Enhancement of the Cultural Environment, May 13, 1971); Executive Order 13006 (Locating Federal Facilities on Historic Properties in Our Nation's Central Cities, May 21, 1996); and Executive Order 13007 (Indian Sacred Sites, May 24, 1996).

c. Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands)

Non-Federal entities must identify proposed actions in Federally defined floodplains and wetlands to enable DOC to decide whether there is an alternative to minimize any potential harm.

d. Clean Air Act (42 U.S.C. §§ 7401 *et seq.*), Federal Water Pollution Control Act (33 U.S.C. §§ 1251 *et seq.*) (Clean Water Act), and Executive Order 11738 ("Providing for administration of the Clean Air Act and the Federal Water Pollution Control Act with respect to Federal contracts, grants or loans")

Non-Federal entities must comply with the provisions of the Clean Air Act (42 U.S.C. §§ 7401 *et seq.*), Clean Water Act (33 U.S.C. §§ 1251 *et seq.*), and E.O. 11738 (38 FR 25161), and must not use a facility on the Excluded Parties List (EPL) (located on the System for Award Management (SAM) website, SAM.gov) in performing any award that is nonexempt under 2 C.F.R. § 1532, and must notify the Program Officer in writing if it intends to use a facility that is on the EPL or knows that the facility has been recommended to be placed on the EPL.

e. The Flood Disaster Protection Act (42 U.S.C. §§ 4002 *et seq.*)

Flood insurance, when available, is required for Federally assisted construction or acquisition in flood-prone areas. Per 2 C.F.R. § 200.447(a), the cost of required flood insurance is an allowable expense, if it is reflected in the approved project budget.

f. The Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*)

Non-Federal entities must identify any impact or activities that may involve a threatened or endangered species. Federal agencies have the responsibility to ensure that no adverse effects to a protected species or habitat occur from actions under Federal assistance awards and conduct the reviews required under the Endangered Species Act, as applicable.

g. The Coastal Zone Management Act (16 U.S.C. §§ 1451 *et seq.*)

Funded projects must be consistent with a coastal State's approved management program for the coastal zone.

h. The Coastal Barriers Resources Act (16 U.S.C. §§ 3501 *et seq.*)

Only in certain circumstances can Federal funding be provided for actions within a Coastal Barrier System.

i. The Wild and Scenic Rivers Act (16 U.S.C. §§ 1271 *et seq.*)

This Act applies to awards that may affect existing or proposed components of the National Wild and Scenic Rivers system.

j. The Safe Drinking Water Act of 1974, as amended, (42 U.S.C. §§ 300f *et seq.*)

This Act precludes Federal assistance for any project that the EPA determines may contaminate a sole source aquifer which threatens public health.

k. The Resource Conservation and Recovery Act (42 U.S.C. §§ 6901 *et seq.*)

This Act regulates the generation, transportation, treatment, and disposal of hazardous wastes, and provides that non-Federal entities give preference in their procurement programs to the purchase of recycled products pursuant to EPA guidelines.

l. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund) (42 U.S.C. §§ 9601 *et seq.*) and the Community Environmental Response Facilitation Act (42 U.S.C. § 9601 note *et seq.*)

These requirements address responsibilities related to hazardous substance releases, threatened releases and environmental cleanup. There are also reporting and community involvement requirements designed to ensure disclosure of the release or disposal of regulated substances and cleanup of hazards to state and local emergency responders.

m. Executive Order 12898 (“Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations”)

Federal agencies are required to identify and address the disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on low income and minority populations.

n. The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 *et seq.*)

Non-Federal entities must identify to DOC any effects the award may have on essential fish habitat (EFH). Federal agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with the National Marine Fisheries Service (NMFS) regarding the potential effects of their actions and respond in writing to NMFS recommendations. These recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH. In addition, NMFS is required to comment on any state agency activities that would impact EFH. Provided the specifications outlined in the regulations are met, EFH consultations will be incorporated into interagency

procedures previously established under NEPA, the ESA, Clean Water Act, Fish and Wildlife Coordination Act, or other applicable statutes.

o. Clean Water Act (CWA) Section 404 (33 U.S.C. § 1344)

CWA Section 404 regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as levees and some coastal restoration activities), and infrastructure development (such as highways and airports). CWA Section 404 requires a permit from the U.S. Army Corps of Engineers before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g., certain farming and forestry activities).

p. Rivers and Harbors Act (33 U.S.C. § 407)

A permit may be required from the U.S. Army Corps of Engineers if the proposed activity involves any work in, over or under navigable waters of the United States. Recipients must identify any work (including structures) that will occur in, over or under navigable waters of the United States and obtain the appropriate permit, if applicable.

q. The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. § 668 *et seq.*), and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001)

Many prohibitions and limitations apply to projects that adversely impact migratory birds and bald and golden eagles. Executive Order 13186 directs Federal agencies to enter a Memorandum of Understanding with the U.S. Fish and Wildlife Service to promote conservation of migratory bird populations when a Federal action will have a measurable negative impact on migratory birds.

r. Executive Order 13112 (Invasive Species, February 3, 1999)

Federal agencies must identify actions that may affect the status of invasive species and use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them. In addition, an agency may not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere.

s. Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*)

During the planning of water resource development projects, agencies are required to give fish and wildlife resources equal consideration with other values. Additionally, the U.S.

Fish and Wildlife Service and fish and wildlife agencies of states must be consulted whenever waters of any stream or other body of water are “proposed or authorized, permitted or licensed to be impounded, diverted... or otherwise controlled or modified” by any agency under a Federal permit or license.

.05 OTHER NATIONAL POLICY REQUIREMENTS

a. Buy-American Preferences

Strengthening Buy-American Preferences for Infrastructure Projects. Recipients of covered programs (as defined in Executive Order 13858, 31 January 2019, and 2 C.F.R. §200.322 (Domestic preferences for procurements)) are hereby notified that they are encouraged to use, to the greatest extent practicable, iron and aluminum as well as steel, cement, and other manufactured products produced in the United States in every contract, subcontract, purchase order, or subaward that is chargeable under this Award.

b. Criminal and Prohibited Activities

1. The Program Fraud Civil Remedies Act (31 U.S.C. § 3801 *et seq.*), provides for the imposition of civil penalties against persons who make false, fictitious, or fraudulent claims to the Federal Government for money (including money representing grants, loans, or other benefits).
2. The False Claims Amendments Act of 1986 and the False Statements Accountability Act of 1996 (18 U.S.C. §§ 287 and 1001, respectively), provide that whoever makes or presents any false, fictitious, or fraudulent statement, representation, or claim against the United States must be subject to imprisonment of not more than five years and must be subject to a fine in the amount provided by 18 U.S.C. § 287.
3. The Civil False Claims Act (31 U.S.C. §§ 3729 - 3733), provides that suits can be brought by the government, or a person on behalf of the government, for false claims made under Federal assistance programs.
4. The Copeland Anti-Kickback Act (18 U.S.C. § 874), prohibits a person or organization engaged in a Federally supported project from enticing an employee working on the project from giving up a part of his compensation under an employment contract. The Copeland Anti-Kickback Act also applies to contractors and subcontractors pursuant to 40 U.S.C. § 3145.
5. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601 *et seq.*) and implementing regulations issued at 15 C.F.R. Part 11, which provides for fair and equitable treatment of displaced persons or persons whose property is acquired as a result of Federal or Federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

6. The Hatch Act (5 U.S.C. §§ 1501-1508 and 7321-7326), which limits the political activities of employees or officers of state or local governments whose principal employment activities are funded in whole or in part with Federal funds.

7. To ensure compliance with Federal law pertaining to financial assistance awards, an authorized representative of a non-Federal entity may be required to periodically provide certain certifications to the DOC regarding Federal felony and Federal criminal tax convictions, unpaid federal tax assessments, delinquent Federal tax returns and such other certifications that may be required by Federal law.

c. Drug-Free Workplace

The non-Federal entity must comply with the provisions of the Drug-Free Workplace Act of 1988 (41 U.S.C. § 8102) and DOC implementing regulations published at 2 C.F.R. Part 1329 (Requirements for Drug-Free Workplace (Financial Assistance)), which require that the non-Federal entity take certain actions to provide a drug-free workplace.

d. Foreign Travel

1. Each non-Federal entity must comply with the provisions of the Fly America Act (49 U.S.C. § 40118). The implementing regulations of the Fly America Act are found at 41 C.F.R. §§ 301-10.131 through 301-10.143.

2. The Fly America Act requires that Federal travelers and others performing U.S. Government-financed air travel must use U.S. flag air carriers, to the extent that service by such carriers is available. Foreign air carriers may be used only in specific instances, such as when a U.S. flag air carrier is unavailable or use of U.S. flag air carrier service will not accomplish the agency's mission.

3. One exception to the requirement to fly U.S. flag carriers is transportation provided under a bilateral or multilateral air transport agreement, to which the United States Government and the government of a foreign country are parties, and which the Department of Transportation has determined meets the requirements of the Fly America Act pursuant to 49 U.S.C. § 40118(b). The United States Government has entered into bilateral/multilateral "Open Skies Agreements" (U.S. Government Procured Transportation) that allow federal funded transportation services for travel and cargo movements to use foreign air carriers under certain circumstances. There are multiple "Open Skies Agreements" currently in effect. For more information about the current bilateral and multilateral agreements, visit the GSA [website](#). Information on the Open Skies agreements (U.S. Government Procured Transportation) and other specific country agreements may be accessed via the Department of State's [website](#).

4. If a foreign air carrier is anticipated to be used for any portion of travel under a DOC financial assistance award, the non-Federal entity must receive prior approval from the Grants Officer. When requesting such approval, the non-Federal entity must provide a justification in accordance with guidance provided by 41 C.F.R. § 301-10.142, which requires the non-Federal entity to provide the Grants Officer with the following: name; dates

of travel; origin and destination of travel; detailed itinerary of travel; name of the air carrier and flight number for each leg of the trip; and a statement explaining why the non-Federal entity meets one of the exceptions to the regulations. If the use of a foreign air carrier is pursuant to a bilateral agreement, the non-Federal entity must provide the Grants Officer with a copy of the agreement or a citation to the official agreement available on the GSA website. The Grants Officer must make the final determination and notify the non-Federal entity in writing (which may be done through the recipient in the case of subrecipient travel). Failure to adhere to the provisions of the Fly America Act will result in the non-Federal entity not being reimbursed for any transportation costs for which any non-Federal entity improperly used a foreign air carrier.

Note: When using code-sharing flights (two or more airlines having flight numbers assigned to the same flight) involving U.S. flag carriers and non-U.S. flag carriers, the airline symbol and flight number of the U.S. flag carrier must be used on the ticket to qualify as a U.S. flag carrier (e.g. "*Delta Airlines Flight XXXX, operated by KLM*"). Conversely, if the ticket shows "[*Foreign Air Carrier*] XXX, operated by Delta," that travel is using a foreign air carrier and is subject to the Fly America Act and must receive prior approval from the Grants Officer as outlined in paragraph G.05.d.4.

e. Increasing Seat Belt Use in the United States

Pursuant to E.O. 13043 (62 FR 19217), non-Federal entities should encourage employees and contractors to enforce on-the-job seat belt policies and programs when operating company-owned, rented, or personally owned vehicles.

f. Federal Employee Expenses and Subawards or Contracts Issued to Federal Employees or Agencies

1. Use of award funds (Federal or non-Federal) or the non-Federal entity's provision of in-kind goods or services for the purposes of transportation, travel, or any other expenses for any Federal employee may raise appropriation augmentation issues. In addition, DOC policy may prohibit the acceptance of gifts, including travel payments for federal employees, from non-Federal entities regardless of the source. Therefore, before award funds may be used by Federal employees, non-Federal entities must submit requests for approval of such action to the Federal Program Officer who must review and make a recommendation to the Grants Officer. The Grants Officer will notify the non-Federal entity in writing (generally through the recipient) of the final determination.
2. A non-Federal entity or its contractor may not issue a subaward, contract or subcontract of any part of a DOC award to any agency or employee of DOC or to other Federal employee, department, agency, or instrumentality, without the advance prior written approval of the DOC Grants Officer.

g. Minority Serving Institutions Initiative

Pursuant to E.O.s 13555 (White House Initiative on Educational Excellence for Hispanics) (75 FR 65417), 13592 (Improving American Indian and Alaska Native

Educational Opportunities and Strengthening Tribal Colleges and Universities) (76 FR 76603), and 13779 (White House Initiative to Promote Excellence and Innovation at Historically Black Colleges and Universities) (82 FR 12499), DOC is strongly committed to broadening the participation of minority serving institutions (MSIs) in its financial assistance programs. DOC's goals include achieving full participation of MSIs to advance the development of human potential, strengthen the Nation's capacity to provide high-quality education, and increase opportunities for MSIs to participate in and benefit from Federal financial assistance programs. DOC encourages all applicants and non-Federal entities to include meaningful participation of MSIs. Institutions eligible to be considered MSIs are listed on the Department of Education website.

h. Research Misconduct

The DOC adopts, and applies to financial assistance awards for research, the Federal Policy on Research Misconduct (Federal Policy) issued by the Executive Office of the President's Office of Science and Technology Policy on December 6, 2000 (65 FR 76260). As provided for in the Federal Policy, research misconduct refers to the fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. Research misconduct does not include honest errors or differences of opinion. Non-Federal entities that conduct extramural research funded by DOC must foster an atmosphere conducive to the responsible conduct of sponsored research by safeguarding against and resolving allegations of research misconduct. Non-Federal entities also have the primary responsibility to prevent, detect, and investigate allegations of research misconduct and, for this purpose, may rely on their internal policies and procedures, as appropriate, to do so. Non-Federal entities must notify the Grants Officer of any allegation that meets the definition of research misconduct and detail the entity's inquiry to determine whether there is sufficient evidence to proceed with an investigation, as well as the results of any investigation. The DOC may take appropriate administrative or enforcement action at any time under the award, up to and including award termination and possible suspension or debarment, and referral to the Commerce OIG, the U.S. Department of Justice, or other appropriate investigative body.

i. Research Involving Human Subjects

1. All proposed research involving human subjects must be conducted in accordance with 15 C.F.R. Part 27 (Protection of Human Subjects). No research involving human subjects is permitted under this award unless expressly authorized by specific award condition, or otherwise in writing by the Grants Officer.
2. Federal policy defines a human subject as a living individual about whom an investigator (whether professional or student) conducting research (1) Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or (2) Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens. Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

3. DOC regulations at 15 C.F.R. Part 27 require that non-Federal entities maintain appropriate policies and procedures for the protection of human subjects. In the event it becomes evident that human subjects may be involved in this project, the non-Federal entity (generally through the recipient) must submit appropriate documentation to the Federal Program Officer for approval by the appropriate DOC officials. As applicable, this documentation must include:

- i. Documentation establishing approval of an activity in the project by an Institutional Review Board (IRB) under a Federal wide Assurance issued by Department of Health and Human Services or other Federal agency guidelines (*see also* 15 C.F.R. § 27.103);
- ii. Documentation to support an exemption for an activity in the project under 15 C.F.R. § 27.104(d);
- iii. Documentation of IRB approval of any modification to a prior approved protocol or to an informed consent form;
- iv. Documentation of an IRB approval of continuing review approved prior to the expiration date of the previous IRB determination; and
- v. Documentation of any reportable events, such as serious adverse events, unanticipated problems resulting in risk to subjects or others, and instances of noncompliance.

4. No work involving human subjects may be undertaken, conducted, or costs incurred and/or charged for human subjects research, until the appropriate documentation is approved in writing by the Grants Officer. In accordance with 15 C.F.R. § 27.118, if research involving human subjects is proposed after an award is made, the non-Federal entity must contact the Federal Program Officer and provide required documentation. Notwithstanding this prohibition, work may be initiated or costs incurred and/or charged to the project for protocol or instrument development related to human subjects research.

j. Care and Use of Live Vertebrate Animals

Non-Federal entities must comply with the Laboratory Animal Welfare Act of 1966, as amended, (Pub. L. No. 89-544, 7 U.S.C. §§ 2131 *et seq.*) (animal acquisition, transport, care, handling, and use in projects), and implementing regulations (9 C.F.R. Parts 1, 2, and 3); the Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*); Marine Mammal Protection Act (16 U.S.C. §§ 1361 *et seq.*) (taking possession, transport, purchase, sale, export or import of wildlife and plants); the Nonindigenous Aquatic Nuisance Prevention and Control Act (16 U.S.C. §§ 4701 *et seq.*) (ensure preventive measures are taken or that probable harm of using species is minimal if there is an escape or release); and all other applicable statutes pertaining to the care, handling, and treatment of warm-blooded animals held for research, teaching, or other activities supported by Federal financial assistance. No research involving vertebrate animals is permitted under any DOC financial assistance award unless authorized by the Grants Officer.

k. Management and Access to Data and Publications

1. In General. The recipient acknowledges and understands that information and data contained in applications for financial assistance, as well as information and data contained in financial, performance and other reports submitted by recipients, may be used by the DOC in conducting reviews and evaluations of its financial assistance programs. For this purpose, recipient information and data may be accessed, reviewed and evaluated by DOC employees, other Federal employees, Federal agents and contractors, and/or by non-Federal personnel, all of who enter into appropriate or are otherwise subject to confidentiality and nondisclosure agreements covering the use of such information. Recipients are expected to support program reviews and evaluations by submitting required financial and performance information and data in an accurate and timely manner, and by cooperating with DOC and external program evaluators. In accordance with 2 C.F.R. § 200.303(e), recipients are reminded that they must take reasonable measures to safeguard protected personally identifiable information and other confidential or sensitive personal or business information created or obtained relating to a DOC financial assistance award.
2. Scientific Data. Non-Federal entities must comply with the data management and access to data requirements established by the DOC funding agency as set forth in the applicable Notice of Funding Opportunity and/or in Specific Award Conditions.
3. Publications, Videos, and Acknowledgment of Sponsorship.
 - i. Publication of results or findings in appropriate professional journals and production of video or other media is encouraged as an important method of recording, reporting and otherwise disseminating information and expanding public access to federally-funded projects (*e.g.*, scientific research). Non-Federal entities must comply with the data management and access to data requirements established by the DOC funding agency as set forth in the applicable Notice of Funding Opportunity and/or in Specific Award Conditions.
 - ii. Non-Federal entities may be required to submit a copy of any publication materials, including but not limited to print, recorded, or Internet materials, to the funding agency.
 - iii. When releasing information related to a funded project, non-Federal entities must include a statement that the project or effort undertaken was or is sponsored by DOC and must also include the applicable financial assistance award number.
 - iv. Non-Federal entities are responsible for assuring that every publication of material based on, developed under, or otherwise produced pursuant to a DOC financial assistance award contains the following disclaimer or other disclaimer approved by the Grants Officer:

This [report/video/etc.] was prepared by [recipient name] using Federal funds under award [number] from [name of operating unit], U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do

not necessarily reflect the views of the [name of operating unit] or the U.S. Department of Commerce.

I. Homeland Security Presidential Directive

If the performance of this DOC financial assistance award requires non-Federal entity personnel to have routine access to Federally-controlled facilities and/or Federally-controlled information systems (for purpose of this term “routine access” is defined as more than 180 calendar days), such personnel must undergo the personal identity verification credential process. In the case of foreign nationals, the DOC will conduct a check with U.S. Citizenship and Immigration Services’ (USCIS) Verification Division, a component of the Department of Homeland Security (DHS), to ensure the individual is in a lawful immigration status and that he or she is eligible for employment within the United States. Any items or services delivered under a financial assistance award must comply with DOC personal identity verification procedures that implement Homeland Security Presidential Directive 12 (Policy for a Common Identification Standard for Federal Employees and Contractors), Federal Information Processing Standard (FIPS) PUB 201, and OMB Memorandum M-05-24. The recipient must ensure that its subrecipients and contractors (at all tiers) performing work under this award comply with the requirements contained in this term. The Grants Officer may delay final payment under an award if the subrecipient or contractor fails to comply with the requirements listed in the term below. The recipient must insert the following term in all subawards and contracts when the subaward recipient or contractor is required to have routine physical access to a Federally-controlled facility or routine access to a Federally-controlled information system:

The subrecipient or contractor must comply with DOC personal identity verification procedures identified in the subaward or contract that implement Homeland Security Presidential Directive 12 (HSPD-12), Office of Management and Budget (OMB) Guidance M-05-24, as amended, and Federal Information Processing Standards Publication (FIPS PUB) Number 201, as amended, for all employees under this subaward or contract who require routine physical access to a Federally-controlled facility or routine access to a Federally-controlled information system.

The subrecipient or contractor must account for all forms of Government-provided identification issued to the subrecipient or contractor employees in connection with performance under this subaward or contract. The subrecipient or contractor must return such identification to the issuing agency at the earliest of any of the following, unless otherwise determined by DOC: (1) When no longer needed for subaward or contract performance; (2) Upon completion of the subrecipient or contractor employee’s employment; (3) Upon subaward or contract completion or termination.

m. Compliance with Department of Commerce Bureau of Industry and Security Export Administration Regulations

1. This clause applies to the extent that this financial assistance award encompasses activities that involve export-controlled items.

2. In performing this financial assistance award, a non-Federal entity may participate in activities involving items subject to export control (export-controlled items) under the Export Administration Regulations (EAR). The non-Federal entity is responsible for compliance with all applicable laws and regulations regarding export-controlled items, including the EAR's deemed exports and re-exports provisions. The non-Federal entity must establish and maintain effective export compliance procedures at DOC and non-DOC facilities, including facilities located abroad, throughout performance of the financial assistance award. At a minimum, these export compliance procedures must include adequate restrictions on export-controlled items, to guard against any unauthorized exports, including in the form of releases or transfers to foreign nationals. Such releases or transfers may occur through visual inspection, including technology transmitted electronically, and oral or written communications.

3. Definitions

- i. Export-controlled items. Items (commodities, software, or technology), that are subject to the EAR (15 C.F.R. §§ 730-774), implemented by the DOC's Bureau of Industry and Security. These are generally known as "dual-use" items, items with a military and commercial application. The export (shipment, transmission, or release/transfer) of export-controlled items may require a license from DOC.
 - ii. Deemed Export/Re-export. The EAR defines a deemed export as a release or transfer of export-controlled items (specifically, technology or source code) to a foreign person (foreign national) in the U.S. Such release is "deemed" to be an export to the foreign person's most recent country of citizenship or permanent residency (*see* 15 C.F.R. § 734.13(a)(2) & (b)). A release may take the form of visual inspection or oral or written exchange of information. *See* 15 C.F.R. § 734.15(a). If such a release or transfer is made abroad to a foreign person of a country other than the country where the release occurs, it is considered a deemed re-export to the foreign person's most recent country of citizenship or permanent residency. *See* 15 C.F.R. § 734.14(a)(2). Licenses from DOC may be required for deemed exports or re-exports. An act causing the release of export-controlled items to a foreign person (e.g., providing or using an access key or code) may require authorization from DOC to the same extent that an export or re-export of such items to the foreign person would. *See* 15 C.F.R. § 734.15(b).
4. The non-Federal entity must secure all export-controlled items that it possesses or that comes into its possession in performance of this financial assistance award, to ensure that the export of such items, including in the form of release or transfer to foreign persons, is prevented, or licensed, as required by applicable Federal laws, E.O.s, and/or regulations, including the EAR.
5. As applicable, non-Federal entity personnel and associates at DOC sites will be informed of any procedures to identify and protect export-controlled items from unauthorized export.

6. To the extent the non-Federal entity wishes to release or transfer export-controlled items to foreign persons, the non-Federal entity will be responsible for obtaining any necessary licenses, including licenses required under the EAR for deemed exports or deemed re-exports. Failure to obtain any export licenses required under the EAR may subject the non-Federal entity to administrative or criminal enforcement. See 15 C.F.R. part 764.
7. Nothing in the terms of this financial assistance award is intended to change, supersede, or waive the requirements of applicable Federal laws, E.O.s or regulations.
8. Compliance with this term will not satisfy any legal obligations the non-Federal entity may have regarding items that may be subject to export controls administered by other agencies such as the Department of State, which has jurisdiction over exports and re-exports of defense articles and services subject to the International Traffic in Arms Regulations (ITAR) (22 C.F.R. §§ 120-130), including the release of defense articles to foreign persons in the United States and abroad.
9. The non-Federal entity must include the provisions contained in this term in all lower tier transactions (subawards, contracts, and subcontracts) under this financial assistance award that may involve research or other activities that implicate export-controlled items.

n. The Trafficking Victims Protection Act of 2000 (22 U.S.C. § 7104(g)), as amended, and the implementing regulations at 2 C.F.R. Part 175

The Trafficking Victims Protection Act of 2000 authorizes termination of financial assistance provided to a private entity, without penalty to the Federal Government, if any non-Federal entity engages in certain activities related to trafficking in persons. The DOC hereby incorporates the following award term required by 2 C.F.R. § 175.15(b):

Trafficking in persons.

a. Provisions applicable to a recipient that is a private entity.

1. *You as the recipient, your employees, subrecipients under this award, and subrecipients' employees may not—*
 - i. *Engage in severe forms of trafficking in persons during the period of time that the award is in effect;*
 - ii. *Procure a commercial sex act during the period of time that the award is in effect; or*
 - iii. *Use forced labor in the performance of the award or subawards under the award.*

2. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a subrecipient that is a private entity —

i. Is determined to have violated a prohibition in paragraph a.1 of this award term; or

ii. Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either— (A) Associated with performance under this award; or (B) Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 C.F.R. Part 180 (OMB Guidelines to Agencies on Governmentwide Debarment and Suspension – Nonprocurement), as implemented by DOC at 2 C.F.R. Part 1326 (Nonprocurement Debarment and Suspension).

b. Provision applicable to a recipient other than a private entity. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a subrecipient that is a private entity—

1. Is determined to have violated an applicable prohibition in paragraph a.1 of this award term; or

2. Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph a.1 of this award term through conduct that is either—

i. Associated with performance under this award; or

ii. Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 C.F.R. Part 180 (OMB Guidelines to Agencies on Governmentwide Debarment and Suspension – Nonprocurement), as implemented by DOC at 2 C.F.R. Part 1326, (Nonprocurement Debarment and Suspension).

c. Provisions applicable to any recipient.

1. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.

2. Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:

i. Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)), and

ii. Is in addition to all other remedies for noncompliance that are available to us under this award.

3. You must include the requirements of paragraph a.1 of this award term in any subaward you make to a private entity.

d. Definitions. For purposes of this award term:

1. “Employee” means either:

i. An individual employed by you or a subrecipient who is engaged in the performance of the project or program under this award; or

ii. Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

2. “Forced labor” means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

3. “Private entity”:

i. Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 C.F.R. § 175.25;

ii. Includes: (A) A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 C.F.R. § 175.25(b); and (B) A for-profit organization.

4. “Severe forms of trafficking in persons,” “commercial sex act,” and “coercion” have the meanings given at section 103 of the TVPA, as amended (22 U.S.C. § 7102).

o. The Federal Funding Accountability and Transparency Act (FFATA) (31 U.S.C. § 6101 note)

1. **Reporting Subawards and Executive Compensation.** Under FFATA, recipients of financial assistance awards of \$30,000 or more are required to report periodically on executive compensation and subawards, as described in the following term from 2 C.F.R. Part 170, Appendix A, which is incorporated into this award:

Reporting Subawards and Executive Compensation

a. Reporting of first-tier subawards.

1. *Applicability.* Unless you are exempt as provided in paragraph d. of this award term, you must report each action that equals or exceeds \$30,000 in Federal funds for a subaward

to a non-Federal entity or Federal agency (see definitions in paragraph e. of this award term).

2. Where and when to report.

- i. You must report each obligating action described in paragraph a.1. of this award term to <http://www.fsrs.gov>.
- ii. For subaward information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)

3. What to report. You must report the information about each obligating action that the submission instructions posted at <http://www.fsrs.gov> specify.

b. Reporting Total Compensation of Recipient Executives for non-Federal entities.

1. Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if—

- i. the total Federal funding authorized to date under this Federal award equals or exceeds \$30,000 as defined in 2 C.F.R § 170.320;

- ii. in the preceding fiscal year, you received—

- (A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 C.F.R. § 170.320 (and subawards), and

- (B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 C.F.R. § 170.320 (and subawards); and,

- iii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. § 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)

2. Where and when to report. You must report executive total compensation described in paragraph b.1. of this award term:

- i. As part of your registration profile found at the System for Award Management (SAM) website located at <https://www.sam.gov>.

- ii. By the end of the month following the month in which this award is made, and annually thereafter.

c. Reporting of Total Compensation of Subrecipient Executives.

1. *Applicability and what to report.* Unless you are exempt as provided in paragraph d. of this award term, for each first-tier non-Federal entity subrecipient under this award, you shall report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if—

- i. in the subrecipient's preceding fiscal year, the subrecipient received—

- (A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 C.F.R. § 170.320 (and subawards) and,

- (B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and

- ii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>).

See also 2 C.F.R. § 200.300(b).

2. *Where and when to report.* You must report subrecipient executive total compensation described in paragraph c.1. of this award term:

- i. To the recipient.

- ii. By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (i.e., between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. Exemptions. If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report: i. Subawards, and ii. The total compensation of the five most highly compensated executives of any subrecipient.

e. **Definitions.** For purposes of this award term:

1. *Federal Agency means a Federal agency as defined at 5 U.S.C. 551(1) and further clarified by 5 U.S.C. 552(f).*
2. *Non-Federal entity means all of the following, as defined in 2 C.F.R. Part 25:*
 - i. *A Governmental organization, which is a State, local government, or Indian tribe;*
 - ii. *A foreign public entity;*
 - iii. *A domestic or foreign nonprofit organization; and,*
 - iv. *A domestic or foreign for-profit organization.*
3. *Executive means officers, managing partners, or any other employees in management positions.*
4. *Subaward:*
 - i. *This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.*
 - ii. *The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see 2 C.F.R § 200.331).*
 - iii. *A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.*
5. *Subrecipient means a non-Federal entity or Federal agency that:*
 - i. *Receives a subaward from you (the recipient) under this award; and*
 - ii. *Is accountable to you for the use of the Federal funds provided by the subaward.*
6. *Total compensation means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and includes the following (for more information see 17 C.F.R. § 229.402(c)(2)):*
 - i. *Salary and bonus.*
 - ii. *Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.*

- iii. *Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.*
- iv. *Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.*
- v. *Above-market earnings on deferred compensation which is not tax-qualified.*
- vi. *Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.*

2. **System for Award Management (SAM) and Universal Identifier Requirements** -- as described in 2 C.F.R. Part 25, Appendix A, which is incorporated into this award:

System for Award Management (SAM) and Universal Identifier Requirements

a. ***Requirement for System for Award Management.*** Unless you are exempted from this requirement under 2 C.F.R. § 25.110, you as the recipient must maintain current information in the SAM. This includes information on your immediate and highest level owner and subsidiaries, as well as on all of your predecessors that have been awarded a Federal contract or Federal financial assistance within the last three years, if applicable, until you submit the final financial report required under this Federal award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently if required by changes in your information or another Federal award term.

b. ***Requirement for Unique Entity Identifier.*** If you are authorized to make subawards under this Federal award, you:

- 1. *Must notify potential subrecipients that no entity (see definition in paragraph c of this award term) may receive a subaward from you until the entity has provided its Unique Entity Identifier to you.*
- 2. *May not make a subaward to an entity unless the entity has provided its Unique Entity Identifier to you. Subrecipients are not required to obtain an active SAM registration, but must obtain a Unique Entity Identifier.*

c. ***Definitions for purposes of this term:***

- 1. *SAM means the Federal repository into which a recipient must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the SAM Internet site (currently at <https://www.SAM.gov>).*

2. *Unique Entity Identifier means the identifier assigned by SAM to uniquely identify business entities.*
3. *Entity includes non-Federal entities as defined at 2 C.F.R. § 200.1 and also includes all of the following, for purposes of this part:*
 - i. *A foreign organization;*
 - ii. *A foreign public entity;*
 - iii. *A domestic for-profit organization; and*
 - iv. *A Federal agency.*
4. *Subaward has the meaning given in 2 C.F.R § 200.1.*
5. *Subrecipient has the meaning given in 2 C.F.R § 200.1.*

See also 2 C.F.R. § 200.300(b).

p. Recipient Integrity and Performance Matters (Appendix XII to 2 C.F.R. Part 200)

Reporting of Matters Related to Recipient Integrity and Performance

1. **General Reporting Requirement.** If the total value of your currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds \$10,000,000 for any period of time during the period of performance of this Federal award, then you as the recipient during that period of time must maintain the currency of information reported to the System for Award Management (SAM) that is made available in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System (FAPIIS)) about civil, criminal, or administrative proceedings described in paragraph 2 of this award term and condition. This is a statutory requirement under section 872 of Public Law 110-417, as amended (41 U.S.C. 2313). As required by section 3010 of Public Law 111-212, all information posted in the designated integrity and performance system on or after April 15, 2011, except past performance reviews required for Federal procurement contracts, will be publicly available.
2. **Proceedings About Which You Must Report.** Submit the information required about each proceeding that:
 - i. Is relating to the award or performance of a grant, cooperative agreement, or procurement contract from the Federal Government;
 - ii. Reached its final disposition during the most recent five-year period; and

iii. Is one of the following:

- (A) A criminal proceeding that resulted in a conviction, as defined in paragraph 5 of this award term and condition;
- (B) A civil proceeding that resulted in a finding of fault and liability and payment of a monetary fine, penalty, reimbursement, restitution, or damages of \$5,000 or more;
- (C) An administrative proceeding, as defined in paragraph 5 of this award term and condition, that resulted in a finding of fault and liability and your payment of either a monetary fine or penalty of \$5,000 or more or reimbursement, restitution, or damages in excess of \$100,000; or
- (D) Any other criminal, civil, or administrative proceeding if:
 - I. It could have led to an outcome described in paragraph 2.c.(1), (2), or (3) of this award term and condition;
 - II. It had a different disposition arrived at by consent or compromise with an acknowledgment of fault on your part; and
 - III. The requirement in this award term and condition to disclose information about the proceeding does not conflict with applicable laws and regulations.

3. Reporting Procedures. Enter in the SAM Entity Management area the information that SAM requires about each proceeding described in paragraph 2 of this award term and condition. You do not need to submit the information a second time under assistance awards that you received if you already provided the information through SAM because you were required to do so under Federal procurement contracts that you were awarded.

4. Reporting Frequency. During any period when you are subject to the requirement in paragraph 1 of this award term and condition, you must report proceedings information through SAM for the most recent five-year period, either to report new information about any proceeding(s) that you have not reported previously or affirm that there is no new information to report. Recipients that have Federal contract, grant, and cooperative agreement awards with a cumulative total value greater than \$10,000,000 must disclose semiannually any information about the criminal, civil, and administrative proceedings.

5. Definitions. For purposes of this award term and condition:

- i. Administrative proceeding means a non-judicial process that is adjudicatory in nature to make a determination of fault or liability (e.g., Securities and Exchange Commission Administrative proceedings, Civilian Board of Contract Appeals proceedings, and Armed Services Board of Contract Appeals proceedings). This includes proceedings at the Federal and State level but only in connection with performance of a Federal contract or grant. It does not include audits, site visits, corrective plans, or inspection of deliverables.

ii. Conviction, for purposes of this award term and condition, means a judgment or conviction of a criminal offense by any court of competent jurisdiction, whether entered upon a verdict or a plea, and includes a conviction entered upon a plea of nolo contendere.

iii. Total value of currently active grants, cooperative agreements, and procurement contracts includes:

(A) Only the Federal share of the funding under any Federal award with a recipient cost share or match; and

(B) The value of all expected funding increments under a Federal award and options, even if not yet exercised.

q. Never Contract with the Enemy (2 C.F.R Part 183; 2 C.F.R. § 200.215)

Under 2 C.F.R. § 200.215 (Never contract with the enemy) Federal awarding agencies and recipients are subject to the regulations implementing Never Contract with the Enemy in 2 C.F.R. Part 183. These regulations affect covered contracts, grants and cooperative agreements that are expected to exceed \$50,000 within the period of performance, are performed outside the United States and its territories, and are in support of a contingency operation in which members of the Armed Forces are actively engaged in hostilities.

1. **Applicability.** This term applies only to recipients of covered grants or cooperative agreements, as defined in 2 C.F.R. § 183.35 Definitions.

2. **Requirements.** As applicable, recipients must fulfill the requirements as described in the following terms from 2 C.F.R. Part 183, Appendix A, which is incorporated into this award:

a. Term 1. Prohibition on Providing Funds to the Enemy.

1. *The recipient must—*

- i. *Exercise due diligence to ensure that none of the funds, including supplies and services, received under this grant or cooperative agreement are provided directly or indirectly (including through subawards or contracts) to a person or entity who is actively opposing the United States or coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities, which must be completed through 2 CFR Part 180.300 prior to issuing a subaward or contract and;*
- ii. *Terminate or void in whole or in part any subaward or contract with a person or entity listed in SAM as a prohibited or restricted source pursuant to subtitle E of Title VIII of the NDAA for FY 2015, unless the Federal awarding agency provides written approval to continue the subaward or contract.*

2. *The recipient may include the substance of this clause, including this paragraph (1), in subawards under this grant or cooperative agreement that have an estimated value over \$50,000 and will be performed outside the United States, including its outlying areas.*

3. *The Federal awarding agency has the authority to terminate or void this grant or cooperative agreement, in whole or in part, if the Federal awarding agency becomes aware that the recipient failed to exercise due diligence as required by paragraph (1) of this clause or if the Federal awarding agency becomes aware that any funds received under this grant or cooperative agreement have been provided directly or indirectly to a person or entity who is actively opposing coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities*

b. Term 2. Additional Access to Recipient Records.

1. *In addition to any other existing examination-of-records authority, the Federal Government is authorized to examine any records of the recipient and its subawards or contracts to the extent necessary to ensure that funds, including supplies and services, available under this grant or cooperative agreement are not provided, directly or indirectly, to a person or entity that is actively opposing United States or coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities, except for awards awarded by the Department of Defense on or before Dec 19, 2017 that will be performed in the United States Central Command (USCENTCOM) theater of operations*

2. *The substance of this clause, including this paragraph (2), is required to be included in subawards or contracts under this grant or cooperative agreement that have an estimated value over \$50,000 and will be performed outside the United States, including its outlying areas.*

r. Prohibition on certain telecommunications and video surveillance services or equipment (Public Law 115-232, section 889; 2 C.F.R. § 200.216)

(a) Recipients and subrecipients are prohibited from obligating or expending loan or grant funds to:

- (1) Procure or obtain,
- (2) Extend or renew a contract to procure or obtain, or
- (3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

- (i). For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- (ii). Telecommunications or video surveillance services provided by such entities or using such equipment.
- (iii). Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

(b) In implementing the prohibition under Public Law 115-232, section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.

(c) See Public Law 115-232, section 889 for additional information.

(d) See also §200.471.

s. Federal Financial Assistance Planning During a Funding Hiatus or Government Shutdown

This term sets forth initial guidance that will be implemented for Federal assistance awards in the event of a lapse in appropriations, or a government shutdown. The Grants Officer may issue further guidance prior to an anticipated shutdown.

1. Unless there is an actual rescission of funds for specific grant or cooperative agreement obligations, non-Federal entities under Federal financial assistance awards for which funds have been obligated generally will be able to continue to perform and incur allowable expenses under the award during a funding hiatus. Non-Federal entities are advised that ongoing activities by Federal employees involved in grant or cooperative agreement administration (including payment processing) or similar operational and administrative work cannot continue when there is a funding lapse. Therefore, there may be delays, including payment processing delays, in the event of a shutdown.

2. All award actions will be delayed during a government shutdown; if it appears that a non-Federal entity's performance under a grant or cooperative agreement will require agency involvement, direction, or clearance during the period of a possible government shutdown, the Program Officer or Grants Officer, as appropriate, may attempt to provide such involvement, direction, or clearance prior to the shutdown or advise non-Federal entities that such involvement, direction, or clearance will not be forthcoming during the shutdown. Accordingly, non-Federal entities whose ability to withdraw funds is subject to prior agency approval, which in general are non-Federal entities that have been designated high risk, non-Federal entities under construction awards, or are otherwise limited to reimbursements or subject to agency review, will be able to draw funds down from the relevant Automatic Standard Application for Payment (ASAP) account only if agency approval is given and coded into ASAP prior to any government shutdown or closure. This limitation may not be lifted during a government shutdown. Non-Federal entities should plan to work with the Grants Officer to request prior approvals in advance of a shutdown wherever possible. Non-Federal entities whose authority to draw down award funds is restricted may decide to suspend work until the government reopens.
3. The ASAP system should remain operational during a government shutdown. Non-Federal entities that do not require any Grants Officer or agency approval to draw down advance funds from their ASAP accounts should be able to do so during a shutdown. The 30-day limitation on the drawdown of advance funds will still apply notwithstanding a government shutdown (see section B.02.b.1 of these terms).

**ACH VENDOR/MISCELLANEOUS PAYMENT
ENROLLMENT FORM**

OMB No. 1510-0056

This form is used for Automated Clearing House (ACH) payments with an addendum record that contains payment-related information processed through the Vendor Express Program. Recipients of these payments should bring this information to the attention of their financial institution when presenting this form for completion. See reverse for additional instructions.

PRIVACY ACT STATEMENT

The following information is provided to comply with the Privacy Act of 1974 (P.L. 93-579). All information collected on this form is required under the provisions of 31 U.S.C. 3322 and 31 CFR 210. This information will be used by the Treasury Department to transmit payment data, by electronic means to vendor's financial institution. Failure to provide the requested information may delay or prevent the receipt of payments through the Automated Clearing House Payment System.

AGENCY INFORMATION

FEDERAL PROGRAM AGENCY

AGENCY IDENTIFIER:

AGENCY LOCATION CODE (ALC):

ACH FORMAT:

☐ CCD +

☐ CTX

ADDRESS:

CONTACT PERSON NAME:

TELEPHONE NUMBER:

()

ADDITIONAL INFORMATION:

PAYEE/COMPANY INFORMATION

NAME

SSN NO. OR TAXPAYER ID NO.

ADDRESS

CONTACT PERSON NAME:

TELEPHONE NUMBER:

()

FINANCIAL INSTITUTION INFORMATION

NAME:

ADDRESS:

ACH COORDINATOR NAME:

TELEPHONE NUMBER:

()

NINE-DIGIT ROUTING TRANSIT NUMBER:

— — — — —

DEPOSITOR ACCOUNT TITLE:

DEPOSITOR ACCOUNT NUMBER:

LOCKBOX NUMBER:

TYPE OF ACCOUNT:

☐ CHECKING

☐ SAVINGS

☐ LOCKBOX

SIGNATURE AND TITLE OF AUTHORIZED OFFICIAL:
(Could be the same as ACH Coordinator)

TELEPHONE NUMBER:

()

Instructions for Completing SF 3881 Form

Make three copies of form after completing. Copy 1 is the Agency Copy; copy 2 is the Payee/Company Copy; and copy 3 is the Financial Institution Copy.

1. Agency Information Section - Federal agency prints or types the name and address of the Federal program agency originating the vendor/miscellaneous payment, agency identifier, agency location code, contact person name and telephone number of the agency. Also, the appropriate box for ACH format is checked.
2. Payee/Company Information Section - Payee prints or types the name of the payee/company and address that will receive ACH vendor/miscellaneous payments, social security or taxpayer ID number, and contact person name and telephone number of the payee/company. Payee also verifies depositor account number, account title, and type of account entered by your financial institution in the Financial Institution Information Section.
3. Financial Institution Information Section - Financial institution prints or types the name and address of the payee/company's financial institution who will receive the ACH payment, ACH coordinator name and telephone number, nine-digit routing transit number, depositor (payee/company) account title and account number. Also, the box for type of account is checked, and the signature, title, and telephone number of the appropriate financial institution official are included.

Burden Estimate Statement

The estimated average burden associated with this collection of information is 15 minutes per respondent or recordkeeper, depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be directed to the Financial Management Service, Facilities Management Division, Property and Supply Branch, Room B-101, 3700 East West Highway, Hyattsville, MD 20782 and the Office of Management and Budget, Paperwork Reduction Project (1510-0056), Washington, DC 20503.

DEPARTMENT OF COMMERCE
FINANCIAL ASSISTANCE
STANDARD TERMS AND CONDITIONS



12 November 2020

DEPARTMENT OF COMMERCE
FINANCIAL ASSISTANCE STANDARD TERMS AND CONDITIONS

Table of Contents

PREFACE	5
A. PROGRAMMATIC REQUIREMENTS	6
.01 Reporting Requirements	6
.02 Revisions of Program Plans	8
.03 Other Federal Awards with Similar Programmatic Activities	9
.04 Prohibition against Assignment by a Non-Federal Entity	9
.05 Disclaimer Provisions	9
.06 Unsatisfactory Performance or Non-Compliance with Award Provisions	9
B. FINANCIAL REQUIREMENTS.....	10
.01 Financial Management.....	10
.02 Award Payments	10
.03 Federal and Non-Federal Sharing	12
.04 Budget Changes and Transfer of Funds among Categories.....	12
.05 Program Income	13
.06 Indirect or Facilities and Administrative Costs	13
.07 Incurring Costs or Obligating Federal Funds Before and After the Period of Performance	15
.08 Tax Refunds	16
.09 Internal Controls	16
C. PROPERTY STANDARDS.....	16
.01 Standards.....	16
.02 Real and Personal Property	16
.03 Intellectual Property Rights	17
D. AUDITS	19
.01 Organization-Wide, Program-Specific, and Project Audits.....	19
.02 Audit Resolution Process	20
E. DEBTS	21
.01 Payment of Debts Owed to the Federal Government	21
.02 Late Payment Charges	21
.03 Barring Delinquent Federal Debtors from Obtaining Federal Loans or Loan Insurance Guarantees.....	22

.04	Effect of Judgment Lien on Eligibility for Federal Grants, Loans, or Programs.....	22
F.	CONFLICT OF INTEREST, CODE OF CONDUCT AND OTHER REQUIREMENTS PERTAINING TO DOC FINANCIAL ASSISTANCE AWARDS, INCLUDING SUBAWARD AND PROCUREMENT ACTIONS	22
.01	Conflict of Interest and Code of Conduct.....	22
.02	Nonprocurement Debarment and Suspension.....	23
.03	Requirements for Subawards	23
.04	Requirements for Procurements.....	23
.05	Whistleblower Protections	24
.06	Small Businesses, Minority Business Enterprises and Women’s Business Enterprises	24
G.	NATIONAL POLICY REQUIREMENTS	25
.01	United States Laws and Regulations.....	25
.02	Non-Discrimination Requirements	25
a.	Statutory Provisions	25
b.	Other Provisions.....	26
c.	Title VII Exemption for Religious Organizations	27
.03	LOBBYING RESTRICTIONS.....	27
a.	Statutory Provisions	27
b.	Disclosure of Lobbying Activities	27
.04	Environmental Requirements.....	27
a.	The National Environmental Policy Act (42 U.S.C. §§ 4321 <i>et seq.</i>)	28
b.	The National Historic Preservation Act (16 U.S.C. §§ 470 <i>et seq.</i>)	28
c.	Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands)	29
d.	Clean Air Act (42 U.S.C. §§ 7401 <i>et seq.</i>), Federal Water Pollution Control Act (33 U.S.C. §§ 1251 <i>et seq.</i>) (Clean Water Act), and Executive Order 11738 (“Providing for administration of the Clean Air Act and the Federal Water Pollution Control Act with respect to Federal contracts, grants or loans”)	29
e.	The Flood Disaster Protection Act (42 U.S.C. §§ 4002 <i>et seq.</i>)	29
f.	The Endangered Species Act (16 U.S.C. §§ 1531 <i>et seq.</i>).....	29
g.	The Coastal Zone Management Act (16 U.S.C. §§ 1451 <i>et seq.</i>).....	29
h.	The Coastal Barriers Resources Act (16 U.S.C. §§ 3501 <i>et seq.</i>).....	30
i.	The Wild and Scenic Rivers Act (16 U.S.C. §§ 1271 <i>et seq.</i>).....	30
j.	The Safe Drinking Water Act of 1974, as amended, (42 U.S.C. §§ 300f <i>et seq.</i>)	30
k.	The Resource Conservation and Recovery Act (42 U.S.C. §§ 6901 <i>et seq.</i>).....	30

l.	The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund) (42 U.S.C. §§ 9601 <i>et seq.</i>) and the Community Environmental Response Facilitation Act (42 U.S.C. § 9601 note <i>et seq.</i>)	30
m.	Executive Order 12898 (“Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations”)	30
n.	The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 <i>et seq.</i>)	30
o.	Clean Water Act (CWA) Section 404 (33 U.S.C. § 1344)	31
p.	Rivers and Harbors Act (33 U.S.C. § 407)	31
q.	The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. § 668 <i>et seq.</i>), and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001)	31
r.	Executive Order 13112 (Invasive Species, February 3, 1999)	31
s.	Fish and Wildlife Coordination Act (16 U.S.C. § 661 <i>et seq.</i>)	31
.05	OTHER NATIONAL POLICY REQUIREMENTS	32
a.	Buy-American Preferences	32
b.	Criminal and Prohibited Activities	32
c.	Drug-Free Workplace	33
d.	Foreign Travel	33
e.	Increasing Seat Belt Use in the United States	34
f.	Federal Employee Expenses and Subawards or Contracts Issued to Federal Employees or Agencies	34
g.	Minority Serving Institutions Initiative	34
h.	Research Misconduct	35
i.	Research Involving Human Subjects	35
j.	Care and Use of Live Vertebrate Animals	36
k.	Management and Access to Data and Publications	37
l.	Homeland Security Presidential Directive	38
m.	Compliance with Department of Commerce Bureau of Industry and Security Export Administration Regulations	38
n.	The Trafficking Victims Protection Act of 2000 (22 U.S.C. § 7104(g)), as amended, and the implementing regulations at 2 C.F.R. Part 175	40
o.	The Federal Funding Accountability and Transparency Act (FFATA) (31 U.S.C. § 6101 note)	42
p.	Recipient Integrity and Performance Matters (Appendix XII to 2 C.F.R. Part 200)	47
q.	Never Contract with the Enemy (2 C.F.R. Part 183; 2 C.F.R. § 200.215)	49

r. Prohibition on certain telecommunications and video surveillance services or equipment (Public Law 115-232, section 889; 2 C.F.R. § 200.216)	50
s. Federal Financial Assistance Planning During a Funding Hiatus or Government Shutdown	51

PREFACE

This document sets out the standard terms and conditions (ST&Cs) applicable to this U.S. Department of Commerce (DOC or Commerce) financial assistance award (hereinafter referred to as the DOC ST&Cs or Standard Terms). A non-Federal entity¹ receiving a DOC financial assistance award must, in addition to the assurances made as part of the application, comply and require each of its subrecipients, contractors, and subcontractors employed in the completion of the project to comply with all applicable statutes, regulations, executive orders (E.O.s), Office of Management and Budget (OMB) circulars, provisions of the OMB Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (codified at 2 C.F.R. Part 200) (OMB Uniform Guidance), provisions of these Standard Terms, and any other terms and conditions incorporated into this DOC financial assistance award. In addition, unless otherwise provided by the terms and conditions of this DOC financial assistance award, Subparts A through E of 2 C.F.R. Part 200 and the Standard Terms are applicable to for-profit entities, foreign public entities and to foreign organizations that carry out a DOC financial assistance award.²

This award is subject to the laws and regulations of the United States. Any inconsistency or conflict in terms and conditions specified in the award will be resolved according to the following order of precedence: federal laws and regulations, applicable notices published in the *Federal Register*, E.O.s, OMB circulars, DOC ST&Cs, agency standard award conditions (if any), and specific award conditions. A specific award condition may amend or take precedence over a Standard Term on a case-by-case basis, when indicated by the specific award condition.

Some of the Standard Terms herein contain, by reference or substance, a summary of the pertinent statutes, regulations published in the *Federal Register* or Code of Federal Regulations (C.F.R.), E.O.s, OMB circulars, or the certifications and assurances provided by applicants through Standard Forms (*e.g.*, SF-424s) or through DOC forms (*e.g.* Form CD-511). To the extent that it is a summary, such Standard Term provision is not in derogation of, or an amendment to, any such statute, regulation, E.O., OMB circular, certification, or assurance.

¹ Note that the OMB Uniform Guidance uses the term “non-Federal entity” to generally refer to an entity that carries out a Federal award as a recipient or subrecipient. Because some of the provisions of these DOC ST&Cs apply to recipients rather than subrecipients, or vice versa, for clarity, these DOC ST&Cs use the terms “non-Federal entity,” “recipient,” and “subrecipient” consistent with their meanings in the OMB Uniform Guidance. In addition, the OMB Uniform Guidance uses the term “pass-through entity” to refer to a non-Federal entity that makes a subaward. As defined at 2 C.F.R. § 200.1:

“Non-Federal entity” is “a state, local government, Indian tribe, institution of higher education (IHE), or nonprofit organization that carries out a Federal award as a recipient or subrecipient.”

“Recipient” is “an entity, usually but not limited to non-Federal entities, that receives a Federal award directly from a Federal awarding agency. The term recipient does not include subrecipients or individuals that are beneficiaries of the award.”

“Subrecipient” is “an entity, usually but not limited to non-Federal entities, that receives a subaward from a pass-through entity to carry out part of a Federal award; but does not include an individual that is a beneficiary of such award. A subrecipient may also be a recipient of other Federal awards directly from a Federal awarding agency.”

“Pass-through entity” is “a non-Federal entity that provides a subaward to a subrecipient to carry out part of a Federal program.”

² See 2 C.F.R. § 200.1 for the definitions of “foreign public entity” and “foreign organization.”

DOC commenced implementation of the Research Terms and Conditions (RT&Cs) for Federal awards effective October 1, 2017; the RT&Cs address and implement the Uniform Guidance issued by OMB. For awards designated on the Form CD-450 (Financial Assistance Award) as Research, both the DOC ST&Cs and the RT&Cs as implemented by DOC apply to the award. The RT&Cs as well as the DOC implementation statement, agency specific requirements, prior approval matrix, subaward requirements, and national policy requirements are posted on the National Science Foundation's website – <https://www.nsf.gov/awards/managing/rtc.jsp>. The DOC ST&Cs and the RT&Cs are generally intended to harmonize with each other; however, where the DOC ST&Cs and the RT&Cs differ in a Research award, the RT&Cs prevail, unless otherwise indicated in a specific award condition.

A. PROGRAMMATIC REQUIREMENTS

.01 Reporting Requirements

a. Recipients must submit all reports as required by DOC, electronically or, if unable to submit electronically, in hard copy, as outlined below and as may be supplemented by the terms and conditions of a specific DOC award.

b. Performance (Technical) Reports. Recipients must submit performance (technical) reports to the Program Officer. Performance (technical) reports should be submitted in the same frequency as the Form SF-425 (Federal Financial Report), unless otherwise directed by the Grants Officer.

1. Performance (technical) reports must contain the information prescribed in 2 C.F.R. § 200.329 (Monitoring and reporting program performance), unless otherwise specified in the award conditions.

2. As appropriate and in accordance with the format provided by the Program Officer (or other OMB-approved information collections, including the Research Program Performance Report [RPPR] as adopted by DOC for use in research awards), recipients are required to relate financial data to the performance accomplishments of this Federal award. When applicable, recipients must also provide cost information to demonstrate cost effective practices (e.g., through unit cost data). The recipient's performance will be measured in a way that will help DOC to improve program outcomes, share lessons learned, and spread the adoption of best or promising practices. As described in 2 C.F.R. § 200.211 (Information contained in a Federal award), DOC will identify the timing and scope of expected performance by the recipient as related to the outcomes intended to be achieved by the Federal program.

3. Recipients (or pass-through entities as applicable) must submit a final performance report within 120 calendar days after the expiration of the period of performance. The subrecipient is required to submit its final performance report to the pass-through entity within 90 calendar days unless an extension has been granted.

c. Financial Reports. In accordance with 2 C.F.R. § 200.328 (Financial reporting), the recipient must submit a Form SF-425 (Federal Financial Report) or any successor form on a semi-annual basis for the periods ending March 31 and September 30, or any portion thereof, unless otherwise specified in a specific award condition. Reports must be submitted to DOC as directed by the Grants Officer, in accordance with the award conditions and are due no later than 30 calendar days following the end of each reporting period. Recipients (or pass-through entities as applicable) must submit a final Form SF-425 within 120 calendar days after the expiration of the period of performance. The subrecipient is required to submit its financial report to the pass-through entity within 90 calendar days unless an extension has been granted. A recipient may submit a final financial report in lieu of an interim financial report due at the end of the period of performance (*e.g.*, in lieu of submitting a financial report for the last semi-annual or other reporting under an award, a recipient may submit a final (cumulative) financial report covering the entire award period).

d. Real Property, Tangible Personal Property and Intangible Property Reports and Requests for Dispositions. Unless otherwise required by the terms and conditions of a DOC financial assistance award, where real property, tangible personal property or intangible property is acquired or improved (in the case of real property or tangible personal property), or produced or acquired (in the case of intangible property), pursuant to a DOC award, non-Federal entities are required to submit the following real property, tangible personal property and intangible property reports (as appropriate):

1. Real Property Status Reports and Requests for Dispositions: Non-Federal entities must submit reports using Form SF-429 (Real Property Status Report) or any successor form, including appropriate attachments thereto, at least annually disclosing the status of real property that is Federally-owned property or real property in which the Federal Government retains a Federal Interest, unless the Federal Interest in the real property extends 15 years or longer. In cases where the Federal Interest attached is for a period of 15 years or more, the DOC or pass-through entity, at its option, may require the non-Federal entity to report at various multi-year frequencies (*e.g.*, every two years or every three years, not to exceed a five-year reporting period; or, the DOC or pass-through entity may require annual reporting for the first three years of a Federal award and thereafter require reporting every five years). In addition, DOC or a pass-through entity may require a non-Federal entity to submit Form SF-429, with appropriate attachments, relating to a non-Federal entity's request to acquire, improve or contribute real property under a DOC financial assistance award. Non-Federal entities wishing to dispose of real property acquired or improved, in whole or in part, pursuant to a DOC award must request disposition instructions, including the submission of Form SF-429, with appropriate attachments, from the Grants Officer in accordance with the requirements set forth in 2 C.F.R. § 200.311(c). *See also* the real property standards set forth in Section C. of these Standard Terms (Property Standards).
2. Tangible Personal Property Status Reports and Requests for Dispositions: DOC or a pass-through entity may also require a non-Federal entity to submit periodic reports using Form SF-428 (Tangible Personal Property Report) or any successor form, including appropriate attachments thereto, concerning tangible personal property that is Federally-owned or tangible personal property in which the Federal Government retains an interest. In

addition, DOC or a pass-through entity may require a non-Federal entity to submit Form SF-428 in connection with a non-Federal entity's request to dispose of tangible personal property acquired under a DOC financial assistance award. Non-Federal entities wishing to dispose of tangible personal property acquired or improved, in whole or in part, pursuant to a DOC award must request disposition instructions, including the submission of Form SF-428, with appropriate attachments, from the Grants Officer in accordance with the requirements set forth in 2 C.F.R. § 200.313(e). *See also* the tangible property standards set forth in Section C. of these Standard Terms (Property Standards).

3. Intangible Property Status Reports and Requests for Dispositions: The specific requirements governing the development, reporting, and disposition of rights to intangible property, including inventions and patents resulting from DOC awards, are set forth in 37 C.F.R. Part 401, which is hereby incorporated by reference into this award. Non-Federal entities are required to submit their disclosures, elections, and requests for waiver from any requirement for substantial U.S. manufacture, electronically using the Interagency Edison extramural invention reporting system (iEdison) at www.iedison.gov. Non-Federal entities may obtain a waiver of this electronic submission requirement by providing to the Grants Officer compelling reasons for allowing the submission of paper reports. When no longer needed for the originally authorized purpose, disposition of the intangible property must occur in accordance with the provisions in 2 C.F.R. § 200.313(e). *See also* the intangible property standards set forth in Section C. of these Standard Terms (Property Standards).

e. Subawards and Executive Compensation Reports. For reporting requirements on subawards and Executive Compensation, see paragraph G.05.o of these Standard Terms (The Federal Funding Accountability and Transparency Act (FFATA) (31 U.S.C. § 6101 note)).

f. Recipient Integrity and Performance Matters. For reporting requirements pertaining to integrity and performance matters, see paragraph G.05.p of these Standard Terms (Recipient Integrity and Performance Matters (Appendix XII to 2 C.F.R. Part 200)).

g. Research Performance Progress Reports. All research awards shall submit the Research Performance Progress Report (RPPR) in accordance with instructions set forth in the following link: [RPPR Instructions](#).

.02 Revisions of Program Plans

In accordance with 2 C.F.R. § 200.308 (Revision of budget and program plans) and 2 C.F.R. § 200.407 (Prior written approval (prior approval)), the recipient must obtain prior written approval from the DOC Grants Officer for certain proposed programmatic change requests, unless otherwise provided by the terms and conditions of a DOC award. Requests for prior approval for changes to program plans must be submitted to the Federal Program Officer (or electronically for awards administered through Grants Online). Requests requiring prior DOC approval are not effective unless and until approved in writing by the DOC Grants Officer.

.03 Other Federal Awards with Similar Programmatic Activities

The recipient must immediately provide written notification to the DOC Program Officer and the DOC Grants Officer if, subsequent to receipt of the DOC award, other financial assistance is received to support or fund any portion of the scope of work incorporated into the DOC award. DOC will not pay for costs that are funded by other sources.

.04 Prohibition against Assignment by a Non-Federal Entity

A non-Federal entity must not transfer, pledge, mortgage, assign, encumber or hypothecate a DOC financial assistance award or subaward, or any rights to, interests therein or claims arising thereunder, to any party or parties, including but not limited to banks, trust companies, other financing or financial institutions, or any other public or private organizations or individuals without the express prior written approval of the DOC Grants Officer or the pass-through entity (which, in turn, may need to obtain prior approval from the DOC Grants Officer).

.05 Disclaimer Provisions

a. The United States expressly disclaims all responsibility or liability to the non-Federal entity or third persons (including but not limited to contractors) for the actions of the non-Federal entity or third persons resulting in death, bodily injury, property damages, or any other losses resulting in any way from the performance of this award or any subaward, contract, or subcontract under this award.

b. The acceptance of this award or any subaward by the non-Federal entity does not in any way constitute an agency relationship between the United States and the non-Federal entity or the non-Federal entity's contractors or subcontractors.

.06 Unsatisfactory Performance or Non-Compliance with Award Provisions

a. Failure to perform the work in accordance with the terms of the award and maintain satisfactory performance as determined by DOC may result in the imposition of additional award conditions pursuant to 2 C.F.R. § 200.208 (Specific conditions) or other appropriate enforcement action as specified in 2 C.F.R. § 200.339 (Remedies for noncompliance).

b. Failure to comply with the provisions of an award will be considered grounds for appropriate enforcement action pursuant to 2 C.F.R. § 200.339 (Remedies for noncompliance), including but not limited to: the imposition of additional award conditions in accordance with 2 C.F.R. § 200.208 (Specific conditions); temporarily withholding award payments pending the correction of the deficiency; changing the payment method to reimbursement only; the disallowance of award costs and the establishment of an accounts receivable; wholly or partially suspending or terminating an award; initiating suspension or debarment proceedings in accordance with 2 C.F.R. Parts 180 and 1326; and such other remedies as may be legally available.

c. 2 C.F.R. §§ 200.340 (Termination) through 200.343 (Effects of suspension and termination) apply to an award that is terminated prior to the end of the period of performance

due to the non-federal entity's material failure to comply with the award terms and conditions. In addition, the failure to comply with the provisions of a DOC award may adversely impact the availability of funding under other active DOC or Federal awards and may also have a negative impact on a non-Federal entity's eligibility for future DOC or Federal awards.

B. FINANCIAL REQUIREMENTS

.01 Financial Management

a. In accordance with 2 C.F.R. § 200.302(a) (Financial Management), each State must expend and account for the Federal award in accordance with State laws and procedures for expending and accounting for the State's own funds. In addition, the State's and any other non-Federal entity's financial management systems, including records documenting compliance with Federal statutes, regulations, and the terms and conditions of the Federal award, must be sufficient to permit the preparation of reports required by general and program-specific terms and conditions; and the tracing of funds to a level of expenditures adequate to establish that such funds have been used in accordance with Federal statutes, regulations, and the terms and conditions applicable to the Federal award. *See also* 2 C.F.R. § 200.450 (Lobbying) for additional management requirements to verify that Federal funds are not used for unallowable lobbying costs.

b. The financial management system of each non-Federal entity must provide all information required by 2 C.F.R. § 200.302(b). *See also* 2 C.F.R. §§ 200.334 (Retention requirements for records); 200.335 (Requests for transfer of records); 200.336 (Methods for collection, transmission and storage of information); 200.337 (Access to records); and 200.338 (Restrictions on public access to records).

.02 Award Payments

a. Consistent with 2 C.F.R. § 200.305(a) (Federal payment), for States, payments are governed by Treasury-State Cash Management Improvement Act (CMIA) agreements and default procedures codified at 31 C.F.R. Part 205 (Rules and Procedures for Efficient Federal-State Funds Transfers) and Treasury Financial Manual Volume I, 4A-2000 (Overall Disbursing Rules for All Federal Agencies).

b. Consistent with 2 C.F.R. § 200.305(b), for non-Federal entities other than States, payment methods must minimize the amount of time elapsing between the transfer of funds from the U.S. Treasury or the pass-through entity and the disbursement by the non-Federal entity.

1. The Grants Officer determines the appropriate method of payment and, unless otherwise stated in a specific award condition, the advance method of payment must be authorized. Advances must be limited to the minimum amounts needed and be timed to be in accordance with the actual, immediate cash requirements of the non-Federal entity in carrying out the purpose of the approved program or project. Unless otherwise provided by the terms and conditions of a DOC award, non-Federal entities must time advance payment requests so that Federal funds are on hand for a maximum of 30 calendar days before being disbursed by the

non-Federal entity for allowable award costs.

2. If a non-Federal entity demonstrates an unwillingness or inability to establish procedures that will minimize the time elapsing between the transfer of funds and disbursement by the non-Federal entity or if a non-Federal entity otherwise fails to continue to qualify for the advance method of payment, the Grants Officer or the pass-through entity may change the method of payment to reimbursement only.

c. Unless otherwise provided for in the award terms, payments from DOC to recipients under this award will be made using the Department of Treasury's Automated Standard Application for Payment (ASAP) system. Under the ASAP system, payments are made through preauthorized electronic funds transfers directly to the recipient's bank account, in accordance with the requirements of the Debt Collection Improvement Act of 1996. To receive payments under ASAP, recipients are required to enroll with the Department of Treasury, Financial Management Service, Regional Financial Centers, which allows them to use the on-line and Voice Response System (VRS) method of withdrawing funds from their ASAP established accounts. The following information will be required to make withdrawals under ASAP:

1. ASAP account number – the Federal award identification number found on the cover sheet of the award;
2. Agency Location Code (ALC); and
3. Region Code.

d. Recipients enrolled in the ASAP system do not need to submit a Form SF-270 (Request for Advance or Reimbursement) for payments relating to their award. Awards paid under the ASAP system will contain a specific award condition, clause, or provision describing enrollment requirements and any controls or withdrawal limits set in the ASAP system.

e. When the Form SF-270 or successor form is used to request payment, the recipient must submit the request no more than monthly, and advances must be approved for periods to cover only expenses reasonably anticipated over the next 30 calendar days. Prior to receiving payments via the Form SF-270, the recipient must complete and submit to the Grants Officer the Form SF-3881 (ACH Vendor Miscellaneous Payment Enrollment Form) or successor form along with the initial Form SF-270. Form SF-3881 enrollment must be completed before the first award payment can be made via a Form SF-270 request.

f. The Federal award identification number must be included on all payment-related correspondence, information, and forms.

g. Non-Federal entities receiving advance award payments must adhere to the depository requirements set forth in 2 C.F.R. §§ 200.305(b)(7) through (b)(11). Interest amounts up to \$500 per non-Federal entity's fiscal year may be retained by the non-Federal entity for administrative expenses.

.03 Federal and Non-Federal Sharing

a. Awards that include Federal and non-Federal sharing incorporate a budget consisting of shared allowable costs. If actual allowable costs are less than the total approved budget, the Federal and non-Federal cost shares must be calculated by applying the approved Federal and non-Federal cost share ratios to actual allowable costs. If actual allowable costs exceed the total approved budget, the Federal share must not exceed the total Federal dollar amount authorized by the award.

b. The non-Federal share, whether in cash or third-party in-kind contributions, is to be paid out at the same general rate as the Federal share. Exceptions to this requirement may be granted by the Grants Officer based on sufficient documentation demonstrating previously determined plans for, or later commitment of, cash or third-party in-kind contributions. In any case, the recipient must meet its cost share commitment as set forth in the terms and conditions of the award; failure to do so may result in the assignment of specific award conditions or other further action as specified in Standard Term A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions). The non-Federal entity must create and maintain sufficient records justifying all non-Federal sharing requirements to facilitate questions and audits; see Section D of these Standard Terms (Audits), for audit requirements. See 2 C.F.R. § 200.306 for additional requirements regarding cost sharing.

.04 Budget Changes and Transfer of Funds among Categories

a. Recipients are required to report deviations from the approved award budget and request prior written approval from DOC in accordance with 2 C.F.R. § 200.308 (Revision of budget and program plans) and 2 C.F.R. § 200.407 (Prior written approval (prior approval)). Requests for such budget changes must be submitted to the Grants Officer (or electronically for awards serviced through Grants Online) who will notify the recipient of the final determination in writing. Requests requiring prior DOC approval do not become effective unless and until approved in writing by the DOC Grants Officer.

b. In accordance with 2 C.F.R. § 200.308(f), transfers of funds by the recipient among direct cost categories are permitted for awards in which the Federal share of the project is equal to or less than the simplified acquisition threshold. For awards in which the Federal share of the project exceeds the simplified acquisition threshold, transfers of funds among direct cost categories must be approved in writing by the Grants Officer when the cumulative amount of such direct costs transfers exceeds 10 percent of the total budget as last approved by the Grants Officer. The 10 percent threshold applies to the total Federal and non-Federal funds authorized by the Grants Officer at the time of the transfer request. This is the accumulated amount of Federal funding obligated to date by the Grants Officer along with any non-Federal share. The same requirements apply to the cumulative amount of transfer of funds among programs, functions, and activities. This transfer authority does not authorize the recipient to create new budget categories within an approved budget without Grants Officer approval. Any transfer that causes any Federal appropriation, or part thereof, to be used for an unauthorized purpose is not and will not be permitted. In addition, this provision does not prohibit the recipient from requesting Grants Officer approval for revisions to the budget. See 2 C.F.R. § 200.308 (Revision

of budget and program plans) (as applicable) for specific requirements concerning budget revisions and transfer of funds between budget categories.

.05 Program Income

Unless otherwise indicated in the award terms, program income may be used for any required cost sharing or added to the project budget, consistent with 2 C.F.R. § 200.307 (Program income).

.06 Indirect or Facilities and Administrative Costs

a. Indirect costs (or facilities and administration costs (F&A)) for major institutions of higher education and major nonprofit organizations can generally be defined as costs incurred for a common or joint purpose benefitting more than one cost objective, and not readily assignable to the cost objectives specifically benefited, without effort disproportionate to the results achieved. Indirect costs will not be allowable charges against an award unless permitted under the award and specifically included as a line item in the award's approved budget.

b. Unrecovered indirect costs, including unrecovered indirect costs on cost sharing or matching, may be included as part of cost sharing or matching as allowed under 2 C.F.R. § 200.306(c) (Cost sharing or matching) or the terms and conditions of a DOC award.

c. Cognizant Agency for Indirect (F&A) Costs. OMB established the cognizant agency concept, under which a single agency represents all others in dealing with non-Federal entities in common areas. The cognizant agency for indirect costs reviews and approves non-Federal entities' indirect cost rates. In accordance with Appendices III – VII to 2 C.F.R. Part 200 the cognizant agency for indirect costs reviews and approves non-Federal entities' indirect cost rates. With respect to for-profit organizations, the term cognizant Federal agency generally is defined as the agency that provides the largest dollar amount of negotiated contracts, including options. See 48 C.F.R. § 42.003. If the only Federal funds received by a commercial organization are DOC award funds, then DOC becomes the cognizant Federal agency for indirect cost negotiations.

1. General Review Procedures Where DOC is the Cognizant Agency.

i. Within 90 calendar days of the award start date, the recipient must submit to the Grants Officer any documentation (indirect cost proposal, cost allocation plan, etc.) necessary to allow DOC to perform the indirect cost rate proposal review. Below are two sources available for guidance on how to put an indirect cost plan together:

- (A) Department of Labor: <https://www.dol.gov/oasam/boc/dcd/np-comm-guide.htm>
or
- (B) Department of the Interior: <https://www.doi.gov/ibc/services/finance/indirect-Cost-Services/>.

ii. The recipient may use the rate proposed in the indirect cost plan as a provisional rate until the DOC provides a response to the submitted plan.

- iii. The recipient is required to annually submit indirect cost proposals no later than six months after the recipient's fiscal year end, except as otherwise provided by 2 C.F.R. § 200.414(g).
2. When DOC is not the oversight or cognizant Federal agency, the recipient must provide the Grants Officer with a copy of a negotiated rate agreement or a copy of the transmittal letter submitted to the cognizant or oversight Federal agency requesting a negotiated rate agreement within 30 calendar days of receipt of a negotiated rate agreement or submission of a negotiated rate proposal.
3. If the recipient is proposing indirect costs as part of a project budget, but is not required to have a negotiated rate agreement pursuant to 2 C.F.R. Part 200, Appendix VII, Paragraph D.1.b (*i.e.*, a governmental department or agency that receives \$35 million or less in direct Federal funding), the recipient may be required to provide the Grants Officer with a copy of its Certificate of Indirect Costs as referenced in 2 C.F.R. Part 200, Appendix VII, Paragraph D.3. or such other documentation, acceptable in form and substance to the Grants Officer, sufficient to confirm that proposed indirect costs are calculated and supported by documentation in accordance with 2 C.F.R. Part 200, Appendix VII. In cases where the DOC is the recipient's cognizant Federal agency, the DOC reserves the right, pursuant to 2 C.F.R. Part 200, Appendix VII, Paragraph D.1.b, to require the recipient to submit its indirect cost rate proposal for review by DOC.
- d. If the recipient fails to submit required documentation to DOC within 90 calendar days of the award start date, the Grants Officer may amend the award to preclude the recovery of any indirect costs under the award. If the DOC, oversight, or cognizant Federal agency determines there is a finding of good and sufficient cause to excuse the recipient's delay in submitting the documentation, an extension of the 90-day due date may be approved by the Grants Officer.
- e. The maximum dollar amount of allocable indirect costs for which DOC will reimburse the recipient is the lesser of:
 1. The line item amount for the Federal share of indirect costs contained in the approved award budget, including all budget revisions approved in writing by the Grants Officer; or
 2. The Federal share of the total indirect costs allocable to the award based on the indirect cost rate approved by the cognizant agency for indirect costs and applicable to the period in which the cost was incurred, in accordance with 2 C.F.R. 200 Appendix III, C.7, provided that the rate is approved on or before the award end date.
- f. In accordance with 2 CFR § 200.414(c)(3), DOC set forth policies, procedures, and general decision-making criteria for deviations from negotiated indirect cost rates. These policies and procedures are applicable to all Federal financial assistance programs awarded and administered by DOC bureaus as Federal awarding agencies and may be found at http://www.osec.doc.gov/oam/grants_management/policy/documents/FAM%202015-02.pdf.

g. In accordance with 2 CFR § 200.414(g), any non-Federal entity that has a negotiated indirect cost rate may apply to the entity's cognizant agency for indirect costs for a one-time extension of a currently negotiated indirect cost rate for a period of up to four years, reducing the frequency of rate calculations and negotiations between an institution and its cognizant agency.

h. In accordance with 2 CFR § 200.414(f), any non-Federal entity that does not have a current negotiated (including provisional) rate, except for those non-Federal entities described in paragraph D.1.b of Appendix VII to 2 CFR Part 200, may elect to charge a de minimis rate of 10 percent of modified total direct costs. No documentation is required to justify the 10 percent de minimis indirect cost rate.

.07 Incurring Costs or Obligating Federal Funds Before and After the Period of Performance

a. In accordance with 2 C.F.R. § 200.309 (Modifications to Period of Performance) and the terms and conditions of a DOC award, a non-Federal entity may charge to the Federal award only allowable costs incurred during the period of performance, which is established in the award document. As defined at 2 C.F.R. § 200.1, the "period of performance" means the total estimated time interval between the start of an initial Federal award and the planned end date, which may include one or more funded portions, or budget periods. Identification of the Period of Performance in the Federal award per § 200.211(b)(5) does not commit the awarding agency to fund the award beyond the currently approved budget period." The period of performance may sometimes be referred to as the project period or award period. This Standard Term is subject to exceptions for allowable costs pertaining to: (i) pre-award costs (*see* 2 C.F.R. § 200.458); (ii) publication and printing costs (*see* 2 C.F.R. § 200.461); and administrative costs incurred relating to the close-out of an award (*see* 2 C.F.R. § 200.344).

b. Reasonable, necessary, allowable and allocable administrative award closeout costs are authorized for a period of up to 120 calendar days following the end of the period of performance. For this purpose, award closeout costs are those strictly associated with close-out activities and are typically limited to the preparation of final progress, financial, and required project audit reports, unless otherwise approved in writing by the Grants Officer. A non-Federal entity may request an extension of the 120-day closeout period, as provided in 2 C.F.R. § 200.344 (Closeout).

c. Unless authorized by a specific award condition, any extension of the period of performance may only be authorized by the Grants Officer in writing. This is not a delegable authority. Verbal or written assurances of funding from anyone other than the Grants Officer does not constitute authority to obligate funds for programmatic activities beyond the end of the period of performance.

d. The DOC has no obligation to provide any additional prospective funding. Any amendment of the award to increase funding and to extend the period of performance is at the sole discretion of DOC.

.08 Tax Refunds

The non-Federal entity shall contact the Grants Officer immediately upon receipt of the refund of any taxes, including but not limited to Federal Insurance Contributions Act (FICA) taxes, Federal Unemployment Tax Act (FUTA) taxes, or Value Added Taxes (VAT) that were allowed as charges to a DOC award, regardless of whether such refunds are received by the non-Federal entity during or after the period of performance. The Grants Officer will provide written disposition instructions to the non-Federal entity, which may include the refunded taxes being credited to the award as either a cost reduction or a cash refund, or may allow the non-Federal entity to use such refunds for approved activities and costs under a DOC award. See 2 C.F.R. § 200.470 (Taxes (including Value Added Tax)).

.09 Internal Controls

Each recipient must comply with standards for internal controls described at 2 C.F.R. § 200.303 (Internal controls). The “Standards for Internal Control in the Federal Government” issued by the Comptroller General of the United States referenced in § 200.303 are available online at <http://www.gao.gov/assets/80/76455.pdf> and the “Internal Control Integrated Framework” issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) is available online at [Internal Control Guidance](#).

C. PROPERTY STANDARDS

.01 Standards

Each non-Federal entity must comply with the Property Standards set forth in 2 C.F.R. §§ 200.310 (Insurance coverage) through 200.316 (Property trust relationship).

.02 Real and Personal Property

a. In accordance with 2 C.F.R. § 200.316 (Property trust relationship), real property, equipment, and other personal property acquired or improved with a Federal award must be held in trust by the non-Federal entity as trustee for the beneficiaries of the project or program under which the property was acquired or improved. This trust relationship exists throughout the duration of the property’s estimated useful life, as determined by the Grants Officer in consultation with the Program Office, during which time the Federal Government retains an undivided, equitable reversionary interest in the property (Federal Interest). During the duration of the Federal Interest, the non-Federal entity must comply with all use and disposition requirements and restrictions as set forth in 2 C.F.R. §§ 200.310 (Insurance coverage) through 200.316 (Property trust relationship), as applicable, and in the terms and conditions of the Federal award.

b. The Grants Officer may require a non-Federal entity to execute and to record (as applicable) a statement of interest, financing statement (form UCC-1), lien, mortgage or other public notice of record to indicate that real or personal property acquired or improved in whole or in part with Federal funds is subject to the Federal Interest, and that certain use and disposition

requirements apply to the property. The statement of interest, financing statement (Form UCC 1), lien, mortgage or other public notice must be acceptable in form and substance to the DOC and must be placed on record in accordance with applicable State and local law, with continuances re-filed as appropriate. In such cases, the Grants Officer may further require the non-Federal entity to provide the DOC with a written statement from a licensed attorney in the jurisdiction where the property is located, certifying that the Federal Interest has been protected, as required under the award and in accordance with applicable State and local law. The attorney's statement, along with a copy of the instrument reflecting the recordation of the Federal Interest, must be returned to the Grants Officer. Without releasing or excusing the non-Federal entity from these obligations, the non-Federal entity, by execution of the financial assistance award or by expending Federal financial assistance funds (in the case of a subrecipient), authorizes the Grants Officer and/or program office to file such notices and continuations as it determines to be necessary or convenient to disclose and protect the Federal Interest in the property. The Grants Officer may elect not to release any or a portion of the Federal award funds until the non-Federal entity has complied with this provision and any other applicable award terms or conditions, unless other arrangements satisfactory to the Grants Officer are made.

.03 Intellectual Property Rights

a. General. The rights to any work or other intangible property produced or acquired under a Federal award are determined by 2 C.F.R. § 200.315 (Intangible property). The non-Federal entity owns any work produced or purchased under a Federal award subject to the DOC's royalty-free, nonexclusive, and irrevocable right to obtain, reproduce, publish, or otherwise use the work or authorize others to receive, reproduce, publish, or otherwise use the work for Government purposes.

b. Inventions. Unless otherwise provided by law, the rights to any invention made by a non-Federal entity under a DOC financial assistance award are determined by the Bayh-Dole Act, Pub. L. No. 96-517, as amended, and as codified in 35 U.S.C. § 200 *et seq.*, and modified by E.O. 12591 (52 FR 13414), as amended by E.O. 12618 (52 FR 48661). 35 U.S.C. § 201(h) defines "small business firm" as "a small business concern as defined at section 2 of Public Law 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration." Section 1(b)(4) of E.O. 12591 extended the Bayh-Dole Act to non-Federal entities "regardless of size" to the extent permitted by law. The specific requirements governing the development, reporting, and disposition of rights to inventions and patents resulting from Federal awards are described in more detail in 37 C.F.R. Part 401, which implements 35 U.S.C. 202 through 204 and includes standard patent rights clauses in 37 C.F.R. § 401.14, which is hereby incorporated by reference into this award.

The Bayh-Dole regulations set forth in 37 C.F.R. parts 401 and 404 were amended by 83 FR 15954, with an effective date of May 14, 2018 (Amended Bayh-Dole Regulations). The Amended Bayh-Dole Regulations apply to all new financial assistance awards issued on or after May 14, 2018. The Amended Bayh-Dole Regulations do not apply to financial assistance awards issued prior to May 14, 2018, including amendments made to such awards, unless an award amendment includes a specific condition incorporating the Amended Bayh-Dole Regulations into the terms and conditions of the subject award.

1. Ownership. A non-Federal entity may have rights to inventions in accordance with 37 C.F.R. Part 401. These requirements are technical in nature and non-Federal entities are encouraged to consult with their Intellectual Property counsel to ensure the proper interpretation of and adherence to the ownership rules. Unresolved questions pertaining to a non-Federal entities' ownership rights may further be addressed to the Grants Officer.

2. Responsibilities - iEdison. The non-Federal entity must comply with all the requirements of the standard patent rights clause and 37 C.F.R. Part 401, including the standard patent rights clause in 37 C.F.R. § 401.14. Non-Federal entities are required to submit their disclosures, elections, and requests for waiver from any requirement for substantial U.S. manufacture, electronically using the Interagency Edison extramural invention reporting system (iEdison) at www.iedison.gov. Non-Federal entities may obtain a waiver of this electronic submission requirement by providing the Grants Officer with compelling reasons for allowing the submission of paper reports.

c. Patent Notification Procedures. Pursuant to E.O. 12889 (58 FR 69681), the DOC is required to notify the owner of any valid patent covering technology whenever the DOC or a non-Federal entity, without making a patent search, knows (or has demonstrable reasonable grounds to know) that technology covered by a valid United States patent has been or will be used without a license from the owner. To ensure proper notification, if the non-Federal entity uses or has used patented technology under this award without a license or permission from the owner, the non-Federal entity must notify the Grants Officer.

This notice does not constitute authorization or consent by the Government to any copyright or patent infringement occurring under the award.

d. A non-Federal entity may copyright any work produced under a Federal award, subject to the DOC's royalty-free, nonexclusive, and irrevocable right to obtain, reproduce, publish, or otherwise use the work, or authorize others to do so for Government purposes. Works jointly authored by DOC and non-Federal entity employees may be copyrighted, but only the part of such works authored by the non-Federal entity is protectable in the United States because, under 17 U.S.C. § 105, copyright protection is not available within the United States for any work of the United States Government. On occasion and as permitted under 17 U.S.C. § 105, DOC may require the non-Federal entity to transfer to DOC a copyright in a particular work for Government purposes or when DOC is undertaking primary dissemination of the work.

e. Freedom of Information Act (FOIA). In response to a FOIA request for research data relating to published research findings (as defined by 2 C.F.R. § 200.315(e)(2)) produced under a Federal award that were used by the Federal government in developing an agency action that has the force and effect of law, the DOC will request, and the non-Federal entity must provide, within a reasonable time, the research data so that they can be made available to the public through the procedures established under the FOIA.

D. AUDITS

Under the Inspector General Act of 1978, as amended, 5 U.S.C. App. 3, §§ 1 *et seq.*, an audit of the award may be conducted at any time. The Inspector General of the DOC, or any of his or her duly authorized representatives, must have the right to access any pertinent books, documents, papers, and records of the non-Federal entity, whether written, printed, recorded, produced, or reproduced by any electronic, mechanical, magnetic, or other process or medium, to make audits, inspections, excerpts, transcripts, or other examinations as authorized by law. This right also includes timely and reasonable access to the non-Federal entity's personnel for interview and discussion related to such documents. See 2 C.F.R. § 200.337 (Access to records). When the DOC Office of Inspector General (OIG) requires a program audit on a DOC award, the OIG will usually make the arrangements to audit the award, whether the audit is performed by OIG personnel, an independent accountant under contract with DOC, or any other Federal, State, or local audit entity.

.01 Organization-Wide, Program-Specific, and Project Audits

a. A recipient must, within 90 days of the end of its fiscal year, notify the Grants Officer of the amount of Federal awards, including all DOC and non-DOC awards, that the recipient expended during its fiscal year.

b. Recipients that are subject to the provisions of Subpart F of 2 C.F.R. Part 200 and that expend \$750,000 or more in a year in Federal awards during their fiscal year must have an audit conducted for that year in accordance with the requirements contained in Subpart F of 2 C.F.R. Part 200. Within the earlier of 30 calendar days after receipt of the auditor's report(s), or nine months after the end of the audit period, unless a different period is specified in a program-specific audit guide, a copy of the audit must be submitted electronically to the Federal Audit Clearinghouse (FAC) through the FAC's Internet Data Entry System (IDES) (<https://harvester.census.gov/facides/>). In accordance with 2 C.F.R. § 200.425 (Audit services), the recipient may include a line item in the budget for the allowable costs associated with the audit, which is subject to the approval of the Grants Officer.

c. Unless otherwise specified in the terms and conditions of the award, entities that are not subject to Subpart F of 2 C.F.R. Part 200 (e.g., for-profit entities, foreign public entities and foreign organizations) and that expend \$750,000 or more in DOC funds during their fiscal year (including both as a recipient and a subrecipient) must submit to the Grants Officer either: (i) a financial related audit of each DOC award or subaward in accordance with Generally Accepted Government Auditing Standards (GAGAS); or (ii) a project specific audit for each award or subaward in accordance with the requirements contained in 2 C.F.R. § 200.507. Within the earlier of 30 calendar days after receipt of the auditor's report(s), or nine months after the end of the audit period, unless a different period is specified in a program-specific audit guide, a copy of the audit must be submitted to the Grants Officer. In accordance with 2 C.F.R. § 200.425, the recipient may include a line item in the budget for the allowable costs associated with the audit, which is subject to the approval of the Grants Officer. Entities that are not subject to Subpart F of 2 C.F.R. Part 200 and that expend less than \$750,000 in DOC funds in a given fiscal year are

not required to submit an audit(s) for that year, but must make their award-related records available to DOC or other designated officials for review and audit.

d. Recipients are responsible for compliance with the above audit requirements and for informing the Grants Officer of the status of their audit, including when the relevant audit has been completed and submitted in accordance with the requirements of this section. Failure to provide audit reports within the timeframes specified above may result in appropriate enforcement action, up to and including termination of the award, and may jeopardize eligibility for receiving future DOC awards.

e. In accordance with 2 C.F.R. § 200.332(d)(3), pass-through entities are responsible for issuing a management decision for applicable audit findings pertaining only to the Federal award provided by the pass-through entity to a subrecipient.

.02 Audit Resolution Process

a. An audit of the award may result in the disallowance of costs incurred by the recipient and the establishment of a debt (account receivable) due to DOC. For this reason, the recipient should take seriously its responsibility to respond to all audit findings and recommendations with adequate explanations and supporting evidence whenever audit results are disputed.

b. A recipient whose award is audited has the following opportunities to dispute the proposed disallowance of costs and the establishment of a debt:

1. The recipient has 30 calendar days from the date of the transmittal of the draft audit report to submit written comments and documentary evidence.
2. The recipient has 30 calendar days from the date of the transmittal of the final audit report to submit written comments and documentary evidence.
3. The DOC will review the documentary evidence submitted by the recipient and will notify the recipient of the results in an *Audit Resolution Determination Letter*. The recipient has 30 calendar days from the date of receipt of the *Audit Resolution Determination Letter* to submit a written appeal, unless this deadline is extended in writing by the DOC. The appeal is the last opportunity for the recipient to submit written comments and documentary evidence to the DOC to dispute the validity of the audit resolution determination.
4. An appeal of the Audit Resolution Determination does not prevent the establishment of the audit-related debt nor does it prevent the accrual of applicable interest, penalties and administrative fees on the debt in accordance with 15 C.F.R. Part 19. If the Audit Resolution Determination is overruled or modified on appeal, appropriate corrective action will be taken retroactively.
5. The DOC will review the recipient's appeal and notify the recipient of the results in an *Appeal Determination Letter*. After the opportunity to appeal has expired or after the appeal determination has been rendered, DOC will not accept any further documentary evidence from the recipient. No other administrative appeals are available in DOC.

E. DEBTS

.01 Payment of Debts Owed to the Federal Government

a. The non-Federal entity must promptly pay any debts determined to be owed to the Federal Government. Any funds paid to a non-Federal entity in excess of the amount to which the non-Federal entity is finally determined to be entitled under the terms of the Federal award constitute a debt to the Federal government. In accordance with 2 C.F.R. § 200.346 (Collection of amounts due), if not paid within 90 calendar days after demand, DOC may reduce a debt owed to the Federal Government by:

1. Making an administrative offset against other requests for reimbursement;
2. Withholding advance payments otherwise due to the non-Federal entity; or
3. Taking any other action permitted by Federal statute.

The foregoing does not waive any claim on a debt that DOC may have against another entity, and all rights and remedies to pursue other parties are preserved.

b. DOC debt collection procedures are set out in 15 C.F.R. Part 19. In accordance with 2 C.F.R. § 200.346 (Collection of amounts due) and 31 U.S.C. § 3717, failure to pay a debt owed to the Federal Government must result in the assessment of interest, penalties and administrative costs in accordance with the provisions of 31 U.S.C. § 3717 and 31 C.F.R. § 901.9. Commerce entities will transfer any Commerce debt that is delinquent for more than 120 calendar days to the U.S. Department of the Treasury's Financial Management Service for debt collection services, a process known as cross-servicing, pursuant to 31 U.S.C. § 3711(g), 31 C.F.R. § 285.12, and 15 C.F.R. § 19.9. DOC may also take further action as specified in DOC ST&C A.06 (Unsatisfactory Performance or Non-Compliance with Award Provisions). Funds for payment of a debt must not come from other Federally-sponsored programs, and the DOC may conduct on-site visits, audits, and other reviews to verify that other Federal funds have not been used to pay a debt.

.02 Late Payment Charges

a. Interest will be assessed on the delinquent debt in accordance with section 11 of the Debt Collection Act of 1982, as amended (31 U.S.C. § 3717(a)). The minimum annual interest rate to be assessed is the U.S. Department of the Treasury's Current Value of Funds Rate (CVFR). The CVFR is available online at https://www.fiscal.treasury.gov/fsreports/rpt/cvfr/cvfr_home.htm and also published by the Department of the Treasury in the *Federal Register* (<http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR>) and in the *Treasury Financial Manual Bulletin*. The assessed rate must remain fixed for the duration of the indebtedness.

b. Penalties will accrue at a rate of not more than six percent per year or such other higher rate as authorized by law.

c. Administrative charges, i.e., the costs of processing and handling a delinquent debt, will be determined by the Commerce entity collecting the debt, as directed by the Office of the Chief Financial Officer and Assistant Secretary for Administration.

.03 Barring Delinquent Federal Debtors from Obtaining Federal Loans or Loan Insurance Guarantees

Pursuant to 31 U.S.C. § 3720B and 31 C.F.R. § 901.6, unless waived by DOC, the DOC is not permitted to extend financial assistance in the form of a loan, loan guarantee, or loan insurance to any person delinquent on a nontax debt owed to a Federal agency. This prohibition does not apply to disaster loans.

.04 Effect of Judgment Lien on Eligibility for Federal Grants, Loans, or Programs

Pursuant to 28 U.S.C. § 3201(e), unless waived by the DOC, a debtor who has a judgment lien against the debtor's property for a debt to the United States is not eligible to receive any grant or loan that is made, insured, guaranteed, or financed directly or indirectly by the United States or to receive funds directly from the Federal Government in any program, except funds to which the debtor is entitled as beneficiary, until the judgment is paid in full or otherwise satisfied.

F. CONFLICT OF INTEREST, CODE OF CONDUCT AND OTHER REQUIREMENTS PERTAINING TO DOC FINANCIAL ASSISTANCE AWARDS, INCLUDING SUBAWARD AND PROCUREMENT ACTIONS

.01 Conflict of Interest and Code of Conduct

a. DOC Conflict of Interest Policy. In accordance with 2 C.F.R. § 200.112 (Conflict of interest), the non-Federal entity must disclose in writing any potential conflict of interest to the DOC or pass-through entity. In addition, a non-Federal entity will establish and maintain written standards of conduct that include safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain in the administration of an award. It is the DOC's policy to maintain the highest standards of conduct and to prevent real or apparent conflicts of interest in connection with DOC financial assistance awards.

b. A conflict of interest generally exists when an interested party participates in a matter that has a direct and predictable effect on the interested party's personal or financial interests. A financial interest may include employment, stock ownership, a creditor or debtor relationship, or prospective employment with the organization selected or to be selected for a subaward. A conflict also may exist where there is an appearance that an interested party's objectivity in performing his or her responsibilities under the project is impaired. For example, an appearance of impairment of objectivity may result from an organizational conflict where, because of other activities or relationships with other persons or entities, an interested party is unable to render

impartial assistance, services or advice to the recipient, a participant in the project or to the Federal Government. Additionally, a conflict of interest may result from non-financial gain to an interested party, such as benefit to reputation or prestige in a professional field. For purposes of the DOC Conflict of Interest Policy, an interested party includes, but is not necessarily limited to, any officer, employee or member of the board of directors or other governing board of a non-Federal entity, including any other parties that advise, approve, recommend, or otherwise participate in the business decisions of the recipient, such as agents, advisors, consultants, attorneys, accountants or shareholders. This also includes immediate family and other persons directly connected to the interested party by law or through a business arrangement.

c. Procurement-related conflict of interest. In accordance with 2 C.F.R. § 200.318 (General procurement standards), non-Federal entities must maintain written standards of conduct covering conflicts of interest and governing the performance of their employees engaged in the selection, award and administration of contracts. See paragraph F.04 of these Standard Terms (Requirements for Procurements).

.02 Nonprocurement Debarment and Suspension

Non-Federal entities must comply with the provisions of 2 C.F.R. Part 1326 (Nonprocurement Debarment and Suspension), which generally prohibit entities that have been debarred, suspended, or voluntarily excluded from participating in Federal nonprocurement transactions either through primary or lower tier covered transactions, and which set forth the responsibilities of recipients of Federal financial assistance regarding transactions with other persons, including subrecipients and contractors.

.03 Requirements for Subawards

a. The recipient or pass-through entity must require all subrecipients, including lower tier subrecipients, to comply with the terms and conditions of a DOC financial assistance award, including applicable provisions of the OMB Uniform Guidance (2 C.F.R. Part 200), and all associated Terms and Conditions set forth herein. See 2 C.F.R. § 200.101(b)(2) (Applicability to different types of Federal awards), which describes the applicability of 2 C.F.R. Part 200 to various types of Federal awards and §§ 200.331-333 (Subrecipient monitoring and management).

b. The recipient or pass through entity may have more restrictive policies for the RTC **waived** prior approvals (no-cost extensions, re-budgeting, etc.) for their subaward recipients. Such restrictive policies must be addressed in their subaward agreements and in accordance with §200.331.

.04 Requirements for Procurements

a. States. Pursuant to 2 C.F.R. § 200.317 (Procurements by states), when procuring property and services under this Federal award, a State must follow the same policies and procedures it uses for procurements from its non-Federal funds. The State must comply with 2 C.F.R. §§ 200.321 (Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms), 200.322 (Domestic preferences for procurements), and

200.323 (Procurement of recovered materials), and ensure that every purchase order or other contract includes any clauses required by 2 C.F.R. § 200.327 (Contract provisions).

b. Other Non-Federal Entities. All other non-Federal entities, including subrecipients of a State, must follow the procurement standards in 2 C.F.R. §§ 200.318 (General procurement standards) through 200.327 (Contract provisions) which include the requirement that non-Federal entities maintain written standards of conduct covering conflicts of interest and governing the performance of their employees engaged in the selection, award, and administration of contracts. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a Federal award if he or she has a real or apparent conflict of interest.

.05 Whistleblower Protections

This award is subject to the whistleblower protections afforded by 41 U.S.C. § 4712 (Enhancement of contractor protection from reprisal for disclosure of certain information), which generally provide that an employee or contractor (including subcontractors and personal services contractors) of a non-Federal entity may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing to a person or body information that the employee reasonably believes is evidence of gross mismanagement of a Federal award, subaward, or a contract under a Federal award or subaward, a gross waste of Federal funds, an abuse of authority relating to a Federal award or subaward or contract under a Federal award or subaward, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal award, subaward, or contract under a Federal award or subaward. These persons or bodies include:

- a. A Member of Congress or a representative of a committee of Congress.
- b. An Inspector General.
- c. The Government Accountability Office.
- d. A Federal employee responsible for contract or grant oversight or management at the relevant agency.
- e. An authorized official of the Department of Justice or other law enforcement agency.
- f. A court or grand jury.
- g. A management official or other employee of the contractor, subcontractor, or grantee who has the responsibility to investigate, discover, or address misconduct.

Non-Federal entities and contractors under Federal awards and subawards must inform their employees in writing of the rights and remedies provided under 41 U.S.C. § 4712, in the predominant native language of the workforce.

.06 Small Businesses, Minority Business Enterprises and Women's Business Enterprises

In accordance with 2 C.F.R. § 200.321 (Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms), the recipient must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. DOC encourages non-Federal entities to use small

businesses, minority business enterprises and women's business enterprises in contracts under financial assistance awards. The Minority Business Development Agency within the DOC will assist non-Federal entities in matching qualified minority business enterprises with contract opportunities. For further information visit MBDA's website at <http://www.mbda.gov>. If you do not have access to the Internet, you may contact MBDA via telephone or mail:

U.S. Department of Commerce
Minority Business Development Agency
Herbert C. Hoover Building
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230
(202) 482-0101

G. NATIONAL POLICY REQUIREMENTS

.01 United States Laws and Regulations

This award is subject to the laws and regulations of the United States. The recipient must comply with all applicable requirements of all other Federal laws, executive orders, regulations and policies governing this program.

.02 Non-Discrimination Requirements

No person in the United States may, on the ground of race, color, national origin, handicap, age, religion, or sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under, any program or activity receiving Federal financial assistance. The recipient agrees to comply with the non-discrimination requirements below:

a. Statutory Provisions

1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d *et seq.*) and DOC implementing regulations published at 15 C.F.R. Part 8 prohibiting discrimination on the grounds of race, color, or national origin under programs or activities receiving Federal financial assistance;
2. Title IX of the Education Amendments of 1972 (20 U.S.C. §§ 1681 *et seq.*) prohibiting discrimination on the basis of sex under Federally assisted education programs or activities;
3. The Americans with Disabilities Act of 1990 (42 U.S.C. §§ 12101 *et seq.*) prohibiting discrimination on the basis of disability under programs, activities, and services provided or made available by State and local governments or instrumentalities or agencies thereto, as well as public or private entities that provide public transportation;
4. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), and DOC implementing regulations published at 15 C.F.R. Part 8b prohibiting discrimination on the

basis of handicap under any program or activity receiving or benefiting from Federal assistance.

For purposes of complying with the accessibility standards set forth in 15 C.F.R. § 8b.18(c), non-federal entities must adhere to the regulations, published by the U.S. Department of Justice, implementing Title II of the Americans with Disabilities Act (ADA) (28 C.F.R. part 35; 75 FR 56164, as amended by 76 FR 13285) and Title III of the ADA (28 C.F.R. part 36; 75 FR 56164, as amended by 76 FR 13286). The revised regulations adopted new enforceable accessibility standards called the “2010 ADA Standards for Accessible Design” (2010 Standards), which replace and supersede the former Uniform Federal Accessibility Standards for new construction and alteration projects;

5. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 *et seq.*), and DOC implementing regulations published at 15 C.F.R. Part 20 prohibiting discrimination on the basis of age in programs or activities receiving Federal financial assistance; and
6. Any other applicable non-discrimination law(s).

b. Other Provisions

1. Parts II and III of E.O. 11246 (Equal Employment Opportunity, 30 FR 12319),³ which requires Federally assisted construction contracts to include the nondiscrimination provisions of §§ 202 and 203 of E.O. 11246 and Department of Labor regulations implementing E.O. 11246 (41 C.F.R. § 60-1.4(b)).
2. E.O. 13166 (65 FR 50121, Improving Access to Services for Persons with Limited English Proficiency), requiring Federal agencies to examine the services provided, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so LEP persons can have meaningful access to them. The DOC issued policy guidance on March 24, 2003 (68 FR 14180) to articulate the Title VI prohibition against national origin discrimination affecting LEP persons and to help ensure that non-Federal entities provide meaningful access to their LEP applicants and beneficiaries.
3. In accordance with E.O. 13798 and Office of Management and Budget, M-20-09 – Guidance Regarding Federal Grants, states or other public grantees may not condition sub-awards of Federal grant money in a manner that would disadvantage grant applicants based on their religious character.

³ As amended by E.O. 11375(32 FR 14303), E.O. 11478 (34 FR 12985), E.O. 12086 (43 FR 46501), E.O. 12107 (44 FR 1055), E.O. 13279 (F67 FR 77141), E.O. 13665 (79 FR 20749), and E.O. 13672 (79 FR 42971).

c. Title VII Exemption for Religious Organizations

Generally, Title VII of the Civil Rights Act of 1964, 42 U.S.C. §§ 2000e *et seq.*, provides that it is an unlawful employment practice for an employer to discharge any individual or otherwise to discriminate against an individual with respect to compensation, terms, conditions, or privileges of employment because of such individual's race, color, religion, sex, or national origin. However, Title VII, 42 U.S.C. § 2000e-1(a), expressly exempts from the prohibition against discrimination based on religion, "a religious corporation, association, educational institution, or society with respect to the employment of individuals of a particular religion to perform work connected with the carrying on by such corporation, association, educational institution, or society of its activities."

.03 LOBBYING RESTRICTIONS

a. Statutory Provisions

Non-Federal entities must comply with 2 C.F.R. § 200.450 (Lobbying), which incorporates the provisions of 31 U.S.C. § 1352; and OMB guidance and notices on lobbying restrictions. In addition, non-Federal entities must comply with the DOC regulations published at 15 C.F.R. Part 28, which implement the New Restrictions on Lobbying. These provisions prohibit the use of Federal funds for lobbying the executive or legislative branches of the Federal Government in connection with the award and require the disclosure of the use of non-Federal funds for lobbying. Lobbying includes attempting to improperly influence, meaning any influence that induces or tends to induce a Federal employee or officer to give consideration or to act regarding a Federal award or regulatory matter on any basis other than the merits of the matter, either directly or indirectly. Costs incurred to improperly influence are unallowable. See 2 C.F.R. § 200.450(b) and (c).

b. Disclosure of Lobbying Activities

Any recipient that receives more than \$100,000 in Federal funding and conducts lobbying with non-federal funds relating to a covered Federal action must submit a completed Form SF-LLL (Disclosure of Lobbying Activities). The Form SF-LLL must be submitted within 30 calendar days following the end of the calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed. The recipient must submit any required SF-LLL forms, including those received from subrecipients, contractors, and subcontractors, to the Grants Officer.

.04 Environmental Requirements

Environmental impacts must be considered by Federal decision makers in their decisions whether or not to approve: (1) a proposal for Federal assistance; (2) the proposal with mitigation; or (3) a different proposal having less adverse environmental impacts. Federal environmental laws require that the funding agency initiate an early planning process that considers potential impacts that projects funded with Federal assistance may have on the environment. Each non-Federal entity must comply with all environmental standards, to include those prescribed under

the following statutes and E.O.s and must identify to the awarding agency any impact the award may have on the environment. In some cases, award funds can be withheld by the Grants Officer under a specific award condition requiring the non-Federal entity to submit additional environmental compliance information sufficient to enable the DOC to make an assessment on any impacts that a project may have on the environment.

a. The National Environmental Policy Act (42 U.S.C. §§ 4321 *et seq.*)

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) implementing regulations (40 C.F.R. Parts 1500 through 1508) require that an environmental analysis be completed for all major Federal actions to determine whether they have significant impacts on the environment. NEPA applies to the actions of Federal agencies and may include a Federal agency's decision to fund non-Federal projects under grants and cooperative agreements when the award activities remain subject to Federal authority and control. Non-Federal entities are required to identify to the awarding agency any direct, indirect or cumulative impact an award will have on the quality of the human environment and assist the agency in complying with NEPA. Non-Federal entities may also be requested to assist DOC in drafting an environmental assessment or environmental impact statement if DOC determines such documentation is required, but DOC remains responsible for the sufficiency and approval of the final documentation. Until the appropriate NEPA documentation is complete and in the event that any additional information is required during the period of performance to assess project environmental impacts, funds can be withheld by the Grants Officer under a specific award condition requiring the non-Federal entity to submit the appropriate environmental information and NEPA documentation sufficient to enable DOC to make an assessment on any impacts that a project may have on the environment.

b. The National Historic Preservation Act (16 U.S.C. §§ 470 *et seq.*)

Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. § 470f) and the Advisory Council on Historic Preservation (ACHP) implementing regulations (36 C.F.R. Part 800) require that Federal agencies take into account the effects of their undertakings on historic properties and, when appropriate, provide the ACHP with a reasonable opportunity to comment. Historic properties include but are not necessarily limited to districts, buildings, structures, sites and objects. In this connection, archeological resources and sites that may be of traditional religious and cultural importance to Federally-recognized Indian Tribes, Alaskan Native Villages and Native Hawaiian Organizations may be considered historic properties. Non-Federal entities are required to identify to the awarding agency any effects the award may have on properties included on or eligible for inclusion on the National Register of Historic Places. Non-Federal entities may also be requested to assist DOC in consulting with State or Tribal Historic Preservation Officers, ACHPs or other applicable interested parties necessary to identify, assess, and resolve adverse effects to historic properties. Until such time as the appropriate NHPA consultations and documentation are complete and in the event that any additional information is required during the period of performance in order to assess project impacts on historic properties, funds can be withheld by the Grants Officer under a specific award condition requiring the non-Federal entity to

submit any information sufficient to enable DOC to make the requisite assessment under the NHPA.

Additionally, non-Federal entities are required to assist the DOC in assuring compliance with the Archeological and Historic Preservation Act of 1974 (54 U.S.C. § 312502 *et seq.*, formerly 16 U.S.C. § 469a-1 *et seq.*); Executive Order 11593 (Protection and Enhancement of the Cultural Environment, May 13, 1971); Executive Order 13006 (Locating Federal Facilities on Historic Properties in Our Nation's Central Cities, May 21, 1996); and Executive Order 13007 (Indian Sacred Sites, May 24, 1996).

c. Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands)

Non-Federal entities must identify proposed actions in Federally defined floodplains and wetlands to enable DOC to decide whether there is an alternative to minimize any potential harm.

d. Clean Air Act (42 U.S.C. §§ 7401 *et seq.*), Federal Water Pollution Control Act (33 U.S.C. §§ 1251 *et seq.*) (Clean Water Act), and Executive Order 11738 ("Providing for administration of the Clean Air Act and the Federal Water Pollution Control Act with respect to Federal contracts, grants or loans")

Non-Federal entities must comply with the provisions of the Clean Air Act (42 U.S.C. §§ 7401 *et seq.*), Clean Water Act (33 U.S.C. §§ 1251 *et seq.*), and E.O. 11738 (38 FR 25161), and must not use a facility on the Excluded Parties List (EPL) (located on the System for Award Management (SAM) website, SAM.gov) in performing any award that is nonexempt under 2 C.F.R. § 1532, and must notify the Program Officer in writing if it intends to use a facility that is on the EPL or knows that the facility has been recommended to be placed on the EPL.

e. The Flood Disaster Protection Act (42 U.S.C. §§ 4002 *et seq.*)

Flood insurance, when available, is required for Federally assisted construction or acquisition in flood-prone areas. Per 2 C.F.R. § 200.447(a), the cost of required flood insurance is an allowable expense, if it is reflected in the approved project budget.

f. The Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*)

Non-Federal entities must identify any impact or activities that may involve a threatened or endangered species. Federal agencies have the responsibility to ensure that no adverse effects to a protected species or habitat occur from actions under Federal assistance awards and conduct the reviews required under the Endangered Species Act, as applicable.

g. The Coastal Zone Management Act (16 U.S.C. §§ 1451 *et seq.*)

Funded projects must be consistent with a coastal State's approved management program for the coastal zone.

h. The Coastal Barriers Resources Act (16 U.S.C. §§ 3501 *et seq.*)

Only in certain circumstances can Federal funding be provided for actions within a Coastal Barrier System.

i. The Wild and Scenic Rivers Act (16 U.S.C. §§ 1271 *et seq.*)

This Act applies to awards that may affect existing or proposed components of the National Wild and Scenic Rivers system.

j. The Safe Drinking Water Act of 1974, as amended, (42 U.S.C. §§ 300f *et seq.*)

This Act precludes Federal assistance for any project that the EPA determines may contaminate a sole source aquifer which threatens public health.

k. The Resource Conservation and Recovery Act (42 U.S.C. §§ 6901 *et seq.*)

This Act regulates the generation, transportation, treatment, and disposal of hazardous wastes, and provides that non-Federal entities give preference in their procurement programs to the purchase of recycled products pursuant to EPA guidelines.

l. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund) (42 U.S.C. §§ 9601 *et seq.*) and the Community Environmental Response Facilitation Act (42 U.S.C. § 9601 note *et seq.*)

These requirements address responsibilities related to hazardous substance releases, threatened releases and environmental cleanup. There are also reporting and community involvement requirements designed to ensure disclosure of the release or disposal of regulated substances and cleanup of hazards to state and local emergency responders.

m. Executive Order 12898 (“Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations”)

Federal agencies are required to identify and address the disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on low income and minority populations.

n. The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 *et seq.*)

Non-Federal entities must identify to DOC any effects the award may have on essential fish habitat (EFH). Federal agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with the National Marine Fisheries Service (NMFS) regarding the potential effects of their actions and respond in writing to NMFS recommendations. These recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH. In addition, NMFS is required to comment on any state agency activities that would impact EFH. Provided the specifications outlined in the regulations are met, EFH consultations will be incorporated into interagency

procedures previously established under NEPA, the ESA, Clean Water Act, Fish and Wildlife Coordination Act, or other applicable statutes.

o. Clean Water Act (CWA) Section 404 (33 U.S.C. § 1344)

CWA Section 404 regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as levees and some coastal restoration activities), and infrastructure development (such as highways and airports). CWA Section 404 requires a permit from the U.S. Army Corps of Engineers before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g., certain farming and forestry activities).

p. Rivers and Harbors Act (33 U.S.C. § 407)

A permit may be required from the U.S. Army Corps of Engineers if the proposed activity involves any work in, over or under navigable waters of the United States. Recipients must identify any work (including structures) that will occur in, over or under navigable waters of the United States and obtain the appropriate permit, if applicable.

q. The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), Bald and Golden Eagle Protection Act (16 U.S.C. § 668 *et seq.*), and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001)

Many prohibitions and limitations apply to projects that adversely impact migratory birds and bald and golden eagles. Executive Order 13186 directs Federal agencies to enter a Memorandum of Understanding with the U.S. Fish and Wildlife Service to promote conservation of migratory bird populations when a Federal action will have a measurable negative impact on migratory birds.

r. Executive Order 13112 (Invasive Species, February 3, 1999)

Federal agencies must identify actions that may affect the status of invasive species and use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them. In addition, an agency may not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere.

s. Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*)

During the planning of water resource development projects, agencies are required to give fish and wildlife resources equal consideration with other values. Additionally, the U.S.

Fish and Wildlife Service and fish and wildlife agencies of states must be consulted whenever waters of any stream or other body of water are “proposed or authorized, permitted or licensed to be impounded, diverted... or otherwise controlled or modified” by any agency under a Federal permit or license.

.05 OTHER NATIONAL POLICY REQUIREMENTS

a. Buy-American Preferences

Strengthening Buy-American Preferences for Infrastructure Projects. Recipients of covered programs (as defined in Executive Order 13858, 31 January 2019, and 2 C.F.R. §200.322 (Domestic preferences for procurements)) are hereby notified that they are encouraged to use, to the greatest extent practicable, iron and aluminum as well as steel, cement, and other manufactured products produced in the United States in every contract, subcontract, purchase order, or subaward that is chargeable under this Award.

b. Criminal and Prohibited Activities

1. The Program Fraud Civil Remedies Act (31 U.S.C. § 3801 *et seq.*), provides for the imposition of civil penalties against persons who make false, fictitious, or fraudulent claims to the Federal Government for money (including money representing grants, loans, or other benefits).
2. The False Claims Amendments Act of 1986 and the False Statements Accountability Act of 1996 (18 U.S.C. §§ 287 and 1001, respectively), provide that whoever makes or presents any false, fictitious, or fraudulent statement, representation, or claim against the United States must be subject to imprisonment of not more than five years and must be subject to a fine in the amount provided by 18 U.S.C. § 287.
3. The Civil False Claims Act (31 U.S.C. §§ 3729 - 3733), provides that suits can be brought by the government, or a person on behalf of the government, for false claims made under Federal assistance programs.
4. The Copeland Anti-Kickback Act (18 U.S.C. § 874), prohibits a person or organization engaged in a Federally supported project from enticing an employee working on the project from giving up a part of his compensation under an employment contract. The Copeland Anti-Kickback Act also applies to contractors and subcontractors pursuant to 40 U.S.C. § 3145.
5. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601 *et seq.*) and implementing regulations issued at 15 C.F.R. Part 11, which provides for fair and equitable treatment of displaced persons or persons whose property is acquired as a result of Federal or Federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

6. The Hatch Act (5 U.S.C. §§ 1501-1508 and 7321-7326), which limits the political activities of employees or officers of state or local governments whose principal employment activities are funded in whole or in part with Federal funds.

7. To ensure compliance with Federal law pertaining to financial assistance awards, an authorized representative of a non-Federal entity may be required to periodically provide certain certifications to the DOC regarding Federal felony and Federal criminal tax convictions, unpaid federal tax assessments, delinquent Federal tax returns and such other certifications that may be required by Federal law.

c. Drug-Free Workplace

The non-Federal entity must comply with the provisions of the Drug-Free Workplace Act of 1988 (41 U.S.C. § 8102) and DOC implementing regulations published at 2 C.F.R. Part 1329 (Requirements for Drug-Free Workplace (Financial Assistance)), which require that the non-Federal entity take certain actions to provide a drug-free workplace.

d. Foreign Travel

1. Each non-Federal entity must comply with the provisions of the Fly America Act (49 U.S.C. § 40118). The implementing regulations of the Fly America Act are found at 41 C.F.R. §§ 301-10.131 through 301-10.143.

2. The Fly America Act requires that Federal travelers and others performing U.S. Government-financed air travel must use U.S. flag air carriers, to the extent that service by such carriers is available. Foreign air carriers may be used only in specific instances, such as when a U.S. flag air carrier is unavailable or use of U.S. flag air carrier service will not accomplish the agency's mission.

3. One exception to the requirement to fly U.S. flag carriers is transportation provided under a bilateral or multilateral air transport agreement, to which the United States Government and the government of a foreign country are parties, and which the Department of Transportation has determined meets the requirements of the Fly America Act pursuant to 49 U.S.C. § 40118(b). The United States Government has entered into bilateral/multilateral "Open Skies Agreements" (U.S. Government Procured Transportation) that allow federal funded transportation services for travel and cargo movements to use foreign air carriers under certain circumstances. There are multiple "Open Skies Agreements" currently in effect. For more information about the current bilateral and multilateral agreements, visit the GSA [website](#). Information on the Open Skies agreements (U.S. Government Procured Transportation) and other specific country agreements may be accessed via the Department of State's [website](#).

4. If a foreign air carrier is anticipated to be used for any portion of travel under a DOC financial assistance award, the non-Federal entity must receive prior approval from the Grants Officer. When requesting such approval, the non-Federal entity must provide a justification in accordance with guidance provided by 41 C.F.R. § 301-10.142, which requires the non-Federal entity to provide the Grants Officer with the following: name; dates

of travel; origin and destination of travel; detailed itinerary of travel; name of the air carrier and flight number for each leg of the trip; and a statement explaining why the non-Federal entity meets one of the exceptions to the regulations. If the use of a foreign air carrier is pursuant to a bilateral agreement, the non-Federal entity must provide the Grants Officer with a copy of the agreement or a citation to the official agreement available on the GSA website. The Grants Officer must make the final determination and notify the non-Federal entity in writing (which may be done through the recipient in the case of subrecipient travel). Failure to adhere to the provisions of the Fly America Act will result in the non-Federal entity not being reimbursed for any transportation costs for which any non-Federal entity improperly used a foreign air carrier.

Note: When using code-sharing flights (two or more airlines having flight numbers assigned to the same flight) involving U.S. flag carriers and non-U.S. flag carriers, the airline symbol and flight number of the U.S. flag carrier must be used on the ticket to qualify as a U.S. flag carrier (e.g. "*Delta Airlines Flight XXXX, operated by KLM*"). Conversely, if the ticket shows "[*Foreign Air Carrier*] XXX, operated by Delta," that travel is using a foreign air carrier and is subject to the Fly America Act and must receive prior approval from the Grants Officer as outlined in paragraph G.05.d.4.

e. Increasing Seat Belt Use in the United States

Pursuant to E.O. 13043 (62 FR 19217), non-Federal entities should encourage employees and contractors to enforce on-the-job seat belt policies and programs when operating company-owned, rented, or personally owned vehicles.

f. Federal Employee Expenses and Subawards or Contracts Issued to Federal Employees or Agencies

1. Use of award funds (Federal or non-Federal) or the non-Federal entity's provision of in-kind goods or services for the purposes of transportation, travel, or any other expenses for any Federal employee may raise appropriation augmentation issues. In addition, DOC policy may prohibit the acceptance of gifts, including travel payments for federal employees, from non-Federal entities regardless of the source. Therefore, before award funds may be used by Federal employees, non-Federal entities must submit requests for approval of such action to the Federal Program Officer who must review and make a recommendation to the Grants Officer. The Grants Officer will notify the non-Federal entity in writing (generally through the recipient) of the final determination.
2. A non-Federal entity or its contractor may not issue a subaward, contract or subcontract of any part of a DOC award to any agency or employee of DOC or to other Federal employee, department, agency, or instrumentality, without the advance prior written approval of the DOC Grants Officer.

g. Minority Serving Institutions Initiative

Pursuant to E.O.s 13555 (White House Initiative on Educational Excellence for Hispanics) (75 FR 65417), 13592 (Improving American Indian and Alaska Native

Educational Opportunities and Strengthening Tribal Colleges and Universities) (76 FR 76603), and 13779 (White House Initiative to Promote Excellence and Innovation at Historically Black Colleges and Universities) (82 FR 12499), DOC is strongly committed to broadening the participation of minority serving institutions (MSIs) in its financial assistance programs. DOC's goals include achieving full participation of MSIs to advance the development of human potential, strengthen the Nation's capacity to provide high-quality education, and increase opportunities for MSIs to participate in and benefit from Federal financial assistance programs. DOC encourages all applicants and non-Federal entities to include meaningful participation of MSIs. Institutions eligible to be considered MSIs are listed on the Department of Education website.

h. Research Misconduct

The DOC adopts, and applies to financial assistance awards for research, the Federal Policy on Research Misconduct (Federal Policy) issued by the Executive Office of the President's Office of Science and Technology Policy on December 6, 2000 (65 FR 76260). As provided for in the Federal Policy, research misconduct refers to the fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. Research misconduct does not include honest errors or differences of opinion. Non-Federal entities that conduct extramural research funded by DOC must foster an atmosphere conducive to the responsible conduct of sponsored research by safeguarding against and resolving allegations of research misconduct. Non-Federal entities also have the primary responsibility to prevent, detect, and investigate allegations of research misconduct and, for this purpose, may rely on their internal policies and procedures, as appropriate, to do so. Non-Federal entities must notify the Grants Officer of any allegation that meets the definition of research misconduct and detail the entity's inquiry to determine whether there is sufficient evidence to proceed with an investigation, as well as the results of any investigation. The DOC may take appropriate administrative or enforcement action at any time under the award, up to and including award termination and possible suspension or debarment, and referral to the Commerce OIG, the U.S. Department of Justice, or other appropriate investigative body.

i. Research Involving Human Subjects

1. All proposed research involving human subjects must be conducted in accordance with 15 C.F.R. Part 27 (Protection of Human Subjects). No research involving human subjects is permitted under this award unless expressly authorized by specific award condition, or otherwise in writing by the Grants Officer.
2. Federal policy defines a human subject as a living individual about whom an investigator (whether professional or student) conducting research (1) Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or (2) Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens. Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

3. DOC regulations at 15 C.F.R. Part 27 require that non-Federal entities maintain appropriate policies and procedures for the protection of human subjects. In the event it becomes evident that human subjects may be involved in this project, the non-Federal entity (generally through the recipient) must submit appropriate documentation to the Federal Program Officer for approval by the appropriate DOC officials. As applicable, this documentation must include:

- i. Documentation establishing approval of an activity in the project by an Institutional Review Board (IRB) under a Federal wide Assurance issued by Department of Health and Human Services or other Federal agency guidelines (*see also* 15 C.F.R. § 27.103);
- ii. Documentation to support an exemption for an activity in the project under 15 C.F.R. § 27.104(d);
- iii. Documentation of IRB approval of any modification to a prior approved protocol or to an informed consent form;
- iv. Documentation of an IRB approval of continuing review approved prior to the expiration date of the previous IRB determination; and
- v. Documentation of any reportable events, such as serious adverse events, unanticipated problems resulting in risk to subjects or others, and instances of noncompliance.

4. No work involving human subjects may be undertaken, conducted, or costs incurred and/or charged for human subjects research, until the appropriate documentation is approved in writing by the Grants Officer. In accordance with 15 C.F.R. § 27.118, if research involving human subjects is proposed after an award is made, the non-Federal entity must contact the Federal Program Officer and provide required documentation. Notwithstanding this prohibition, work may be initiated or costs incurred and/or charged to the project for protocol or instrument development related to human subjects research.

j. Care and Use of Live Vertebrate Animals

Non-Federal entities must comply with the Laboratory Animal Welfare Act of 1966, as amended, (Pub. L. No. 89-544, 7 U.S.C. §§ 2131 *et seq.*) (animal acquisition, transport, care, handling, and use in projects), and implementing regulations (9 C.F.R. Parts 1, 2, and 3); the Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*); Marine Mammal Protection Act (16 U.S.C. §§ 1361 *et seq.*) (taking possession, transport, purchase, sale, export or import of wildlife and plants); the Nonindigenous Aquatic Nuisance Prevention and Control Act (16 U.S.C. §§ 4701 *et seq.*) (ensure preventive measures are taken or that probable harm of using species is minimal if there is an escape or release); and all other applicable statutes pertaining to the care, handling, and treatment of warm-blooded animals held for research, teaching, or other activities supported by Federal financial assistance. No research involving vertebrate animals is permitted under any DOC financial assistance award unless authorized by the Grants Officer.

k. Management and Access to Data and Publications

1. In General. The recipient acknowledges and understands that information and data contained in applications for financial assistance, as well as information and data contained in financial, performance and other reports submitted by recipients, may be used by the DOC in conducting reviews and evaluations of its financial assistance programs. For this purpose, recipient information and data may be accessed, reviewed and evaluated by DOC employees, other Federal employees, Federal agents and contractors, and/or by non-Federal personnel, all of who enter into appropriate or are otherwise subject to confidentiality and nondisclosure agreements covering the use of such information. Recipients are expected to support program reviews and evaluations by submitting required financial and performance information and data in an accurate and timely manner, and by cooperating with DOC and external program evaluators. In accordance with 2 C.F.R. § 200.303(e), recipients are reminded that they must take reasonable measures to safeguard protected personally identifiable information and other confidential or sensitive personal or business information created or obtained relating to a DOC financial assistance award.
2. Scientific Data. Non-Federal entities must comply with the data management and access to data requirements established by the DOC funding agency as set forth in the applicable Notice of Funding Opportunity and/or in Specific Award Conditions.
3. Publications, Videos, and Acknowledgment of Sponsorship.
 - i. Publication of results or findings in appropriate professional journals and production of video or other media is encouraged as an important method of recording, reporting and otherwise disseminating information and expanding public access to federally-funded projects (*e.g.*, scientific research). Non-Federal entities must comply with the data management and access to data requirements established by the DOC funding agency as set forth in the applicable Notice of Funding Opportunity and/or in Specific Award Conditions.
 - ii. Non-Federal entities may be required to submit a copy of any publication materials, including but not limited to print, recorded, or Internet materials, to the funding agency.
 - iii. When releasing information related to a funded project, non-Federal entities must include a statement that the project or effort undertaken was or is sponsored by DOC and must also include the applicable financial assistance award number.
 - iv. Non-Federal entities are responsible for assuring that every publication of material based on, developed under, or otherwise produced pursuant to a DOC financial assistance award contains the following disclaimer or other disclaimer approved by the Grants Officer:

This [report/video/etc.] was prepared by [recipient name] using Federal funds under award [number] from [name of operating unit], U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do

not necessarily reflect the views of the [name of operating unit] or the U.S. Department of Commerce.

I. Homeland Security Presidential Directive

If the performance of this DOC financial assistance award requires non-Federal entity personnel to have routine access to Federally-controlled facilities and/or Federally-controlled information systems (for purpose of this term “routine access” is defined as more than 180 calendar days), such personnel must undergo the personal identity verification credential process. In the case of foreign nationals, the DOC will conduct a check with U.S. Citizenship and Immigration Services’ (USCIS) Verification Division, a component of the Department of Homeland Security (DHS), to ensure the individual is in a lawful immigration status and that he or she is eligible for employment within the United States. Any items or services delivered under a financial assistance award must comply with DOC personal identity verification procedures that implement Homeland Security Presidential Directive 12 (Policy for a Common Identification Standard for Federal Employees and Contractors), Federal Information Processing Standard (FIPS) PUB 201, and OMB Memorandum M-05-24. The recipient must ensure that its subrecipients and contractors (at all tiers) performing work under this award comply with the requirements contained in this term. The Grants Officer may delay final payment under an award if the subrecipient or contractor fails to comply with the requirements listed in the term below. The recipient must insert the following term in all subawards and contracts when the subaward recipient or contractor is required to have routine physical access to a Federally-controlled facility or routine access to a Federally-controlled information system:

The subrecipient or contractor must comply with DOC personal identity verification procedures identified in the subaward or contract that implement Homeland Security Presidential Directive 12 (HSPD-12), Office of Management and Budget (OMB) Guidance M-05-24, as amended, and Federal Information Processing Standards Publication (FIPS PUB) Number 201, as amended, for all employees under this subaward or contract who require routine physical access to a Federally-controlled facility or routine access to a Federally-controlled information system.

The subrecipient or contractor must account for all forms of Government-provided identification issued to the subrecipient or contractor employees in connection with performance under this subaward or contract. The subrecipient or contractor must return such identification to the issuing agency at the earliest of any of the following, unless otherwise determined by DOC: (1) When no longer needed for subaward or contract performance; (2) Upon completion of the subrecipient or contractor employee’s employment; (3) Upon subaward or contract completion or termination.

m. Compliance with Department of Commerce Bureau of Industry and Security Export Administration Regulations

1. This clause applies to the extent that this financial assistance award encompasses activities that involve export-controlled items.

2. In performing this financial assistance award, a non-Federal entity may participate in activities involving items subject to export control (export-controlled items) under the Export Administration Regulations (EAR). The non-Federal entity is responsible for compliance with all applicable laws and regulations regarding export-controlled items, including the EAR's deemed exports and re-exports provisions. The non-Federal entity must establish and maintain effective export compliance procedures at DOC and non-DOC facilities, including facilities located abroad, throughout performance of the financial assistance award. At a minimum, these export compliance procedures must include adequate restrictions on export-controlled items, to guard against any unauthorized exports, including in the form of releases or transfers to foreign nationals. Such releases or transfers may occur through visual inspection, including technology transmitted electronically, and oral or written communications.

3. Definitions

- i. Export-controlled items. Items (commodities, software, or technology), that are subject to the EAR (15 C.F.R. §§ 730-774), implemented by the DOC's Bureau of Industry and Security. These are generally known as "dual-use" items, items with a military and commercial application. The export (shipment, transmission, or release/transfer) of export-controlled items may require a license from DOC.
 - ii. Deemed Export/Re-export. The EAR defines a deemed export as a release or transfer of export-controlled items (specifically, technology or source code) to a foreign person (foreign national) in the U.S. Such release is "deemed" to be an export to the foreign person's most recent country of citizenship or permanent residency (see 15 C.F.R. § 734.13(a)(2) & (b)). A release may take the form of visual inspection or oral or written exchange of information. See 15 C.F.R. § 734.15(a). If such a release or transfer is made abroad to a foreign person of a country other than the country where the release occurs, it is considered a deemed re-export to the foreign person's most recent country of citizenship or permanent residency. See 15 C.F.R. § 734.14(a)(2). Licenses from DOC may be required for deemed exports or re-exports. An act causing the release of export-controlled items to a foreign person (e.g., providing or using an access key or code) may require authorization from DOC to the same extent that an export or re-export of such items to the foreign person would. See 15 C.F.R. § 734.15(b).
4. The non-Federal entity must secure all export-controlled items that it possesses or that comes into its possession in performance of this financial assistance award, to ensure that the export of such items, including in the form of release or transfer to foreign persons, is prevented, or licensed, as required by applicable Federal laws, E.O.s, and/or regulations, including the EAR.
5. As applicable, non-Federal entity personnel and associates at DOC sites will be informed of any procedures to identify and protect export-controlled items from unauthorized export.

6. To the extent the non-Federal entity wishes to release or transfer export-controlled items to foreign persons, the non-Federal entity will be responsible for obtaining any necessary licenses, including licenses required under the EAR for deemed exports or deemed re-exports. Failure to obtain any export licenses required under the EAR may subject the non-Federal entity to administrative or criminal enforcement. See 15 C.F.R. part 764.
7. Nothing in the terms of this financial assistance award is intended to change, supersede, or waive the requirements of applicable Federal laws, E.O.s or regulations.
8. Compliance with this term will not satisfy any legal obligations the non-Federal entity may have regarding items that may be subject to export controls administered by other agencies such as the Department of State, which has jurisdiction over exports and re-exports of defense articles and services subject to the International Traffic in Arms Regulations (ITAR) (22 C.F.R. §§ 120-130), including the release of defense articles to foreign persons in the United States and abroad.
9. The non-Federal entity must include the provisions contained in this term in all lower tier transactions (subawards, contracts, and subcontracts) under this financial assistance award that may involve research or other activities that implicate export-controlled items.

n. The Trafficking Victims Protection Act of 2000 (22 U.S.C. § 7104(g)), as amended, and the implementing regulations at 2 C.F.R. Part 175

The Trafficking Victims Protection Act of 2000 authorizes termination of financial assistance provided to a private entity, without penalty to the Federal Government, if any non-Federal entity engages in certain activities related to trafficking in persons. The DOC hereby incorporates the following award term required by 2 C.F.R. § 175.15(b):

Trafficking in persons.

a. Provisions applicable to a recipient that is a private entity.

1. *You as the recipient, your employees, subrecipients under this award, and subrecipients' employees may not—*
 - i. *Engage in severe forms of trafficking in persons during the period of time that the award is in effect;*
 - ii. *Procure a commercial sex act during the period of time that the award is in effect; or*
 - iii. *Use forced labor in the performance of the award or subawards under the award.*

2. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a subrecipient that is a private entity —

i. Is determined to have violated a prohibition in paragraph a.1 of this award term; or

ii. Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either— (A) Associated with performance under this award; or (B) Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 C.F.R. Part 180 (OMB Guidelines to Agencies on Governmentwide Debarment and Suspension – Nonprocurement), as implemented by DOC at 2 C.F.R. Part 1326 (Nonprocurement Debarment and Suspension).

b. Provision applicable to a recipient other than a private entity. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a subrecipient that is a private entity—

1. Is determined to have violated an applicable prohibition in paragraph a.1 of this award term; or

2. Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph a.1 of this award term through conduct that is either—

i. Associated with performance under this award; or

ii. Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 C.F.R. Part 180 (OMB Guidelines to Agencies on Governmentwide Debarment and Suspension – Nonprocurement), as implemented by DOC at 2 C.F.R. Part 1326, (Nonprocurement Debarment and Suspension).

c. Provisions applicable to any recipient.

1. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.

2. Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:

i. Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)), and

ii. Is in addition to all other remedies for noncompliance that are available to us under this award.

3. You must include the requirements of paragraph a.1 of this award term in any subaward you make to a private entity.

d. Definitions. For purposes of this award term:

1. “Employee” means either:

i. An individual employed by you or a subrecipient who is engaged in the performance of the project or program under this award; or

ii. Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

2. “Forced labor” means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

3. “Private entity”:

i. Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 C.F.R. § 175.25;

ii. Includes: (A) A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 C.F.R. § 175.25(b); and (B) A for-profit organization.

4. “Severe forms of trafficking in persons,” “commercial sex act,” and “coercion” have the meanings given at section 103 of the TVPA, as amended (22 U.S.C. § 7102).

o. The Federal Funding Accountability and Transparency Act (FFATA) (31 U.S.C. § 6101 note)

1. **Reporting Subawards and Executive Compensation.** Under FFATA, recipients of financial assistance awards of \$30,000 or more are required to report periodically on executive compensation and subawards, as described in the following term from 2 C.F.R. Part 170, Appendix A, which is incorporated into this award:

Reporting Subawards and Executive Compensation

a. Reporting of first-tier subawards.

1. **Applicability.** Unless you are exempt as provided in paragraph d. of this award term, you must report each action that equals or exceeds \$30,000 in Federal funds for a subaward

to a non-Federal entity or Federal agency (see definitions in paragraph e. of this award term).

2. *Where and when to report.*

- i. You must report each obligating action described in paragraph a.1. of this award term to <http://www.fsrs.gov>.
- ii. For subaward information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)

3. *What to report.* You must report the information about each obligating action that the submission instructions posted at <http://www.fsrs.gov> specify.

b. Reporting Total Compensation of Recipient Executives for non-Federal entities.

1. *Applicability and what to report.* You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if—

- i. the total Federal funding authorized to date under this Federal award equals or exceeds \$30,000 as defined in 2 C.F.R. § 170.320;

- ii. in the preceding fiscal year, you received—

(A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 C.F.R. § 170.320 (and subawards), and

(B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 C.F.R. § 170.320 (and subawards); and,

- iii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. § 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)

2. *Where and when to report.* You must report executive total compensation described in paragraph b.1. of this award term:

- i. As part of your registration profile found at the System for Award Management (SAM) website located at <https://www.sam.gov>.

- ii. By the end of the month following the month in which this award is made, and annually thereafter.

c. Reporting of Total Compensation of Subrecipient Executives.

1. *Applicability and what to report.* Unless you are exempt as provided in paragraph d. of this award term, for each first-tier non-Federal entity subrecipient under this award, you shall report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if—

- i. in the subrecipient's preceding fiscal year, the subrecipient received—

- (A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 C.F.R. § 170.320 (and subawards) and,

- (B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and

- ii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>).

See also 2 C.F.R. § 200.300(b).

2. *Where and when to report.* You must report subrecipient executive total compensation described in paragraph c.1. of this award term:

- i. To the recipient.

- ii. By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (i.e., between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. Exemptions. If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report: i. Subawards, and ii. The total compensation of the five most highly compensated executives of any subrecipient.

e. **Definitions.** For purposes of this award term:

1. *Federal Agency means a Federal agency as defined at 5 U.S.C. 551(1) and further clarified by 5 U.S.C. 552(f).*
2. *Non-Federal entity means all of the following, as defined in 2 C.F.R. Part 25:*
 - i. *A Governmental organization, which is a State, local government, or Indian tribe;*
 - ii. *A foreign public entity;*
 - iii. *A domestic or foreign nonprofit organization; and,*
 - iv. *A domestic or foreign for-profit organization.*
3. *Executive means officers, managing partners, or any other employees in management positions.*
4. *Subaward:*
 - i. *This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.*
 - ii. *The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see 2 C.F.R § 200.331).*
 - iii. *A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.*
5. *Subrecipient means a non-Federal entity or Federal agency that:*
 - i. *Receives a subaward from you (the recipient) under this award; and*
 - ii. *Is accountable to you for the use of the Federal funds provided by the subaward.*
6. *Total compensation means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and includes the following (for more information see 17 C.F.R. § 229.402(c)(2)):*
 - i. *Salary and bonus.*
 - ii. *Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.*

- iii. *Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.*
- iv. *Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.*
- v. *Above-market earnings on deferred compensation which is not tax-qualified.*
- vi. *Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.*

2. **System for Award Management (SAM) and Universal Identifier Requirements** -- as described in 2 C.F.R. Part 25, Appendix A, which is incorporated into this award:

System for Award Management (SAM) and Universal Identifier Requirements

a. ***Requirement for System for Award Management.*** *Unless you are exempted from this requirement under 2 C.F.R. § 25.110, you as the recipient must maintain current information in the SAM. This includes information on your immediate and highest level owner and subsidiaries, as well as on all of your predecessors that have been awarded a Federal contract or Federal financial assistance within the last three years, if applicable, until you submit the final financial report required under this Federal award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently if required by changes in your information or another Federal award term.*

b. ***Requirement for Unique Entity Identifier.*** *If you are authorized to make subawards under this Federal award, you:*

- 1. *Must notify potential subrecipients that no entity (see definition in paragraph c of this award term) may receive a subaward from you until the entity has provided its Unique Entity Identifier to you.*
- 2. *May not make a subaward to an entity unless the entity has provided its Unique Entity Identifier to you. Subrecipients are not required to obtain an active SAM registration, but must obtain a Unique Entity Identifier.*

c. ***Definitions for purposes of this term:***

- 1. *SAM means the Federal repository into which a recipient must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the SAM Internet site (currently at <https://www.SAM.gov>).*

2. *Unique Entity Identifier means the identifier assigned by SAM to uniquely identify business entities.*
3. *Entity includes non-Federal entities as defined at 2 C.F.R. § 200.1 and also includes all of the following, for purposes of this part:*
 - i. *A foreign organization;*
 - ii. *A foreign public entity;*
 - iii. *A domestic for-profit organization; and*
 - iv. *A Federal agency.*
4. *Subaward has the meaning given in 2 C.F.R § 200.1.*
5. *Subrecipient has the meaning given in 2 C.F.R § 200.1.*

See also 2 C.F.R. § 200.300(b).

p. Recipient Integrity and Performance Matters (Appendix XII to 2 C.F.R. Part 200)

Reporting of Matters Related to Recipient Integrity and Performance

1. **General Reporting Requirement.** If the total value of your currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds \$10,000,000 for any period of time during the period of performance of this Federal award, then you as the recipient during that period of time must maintain the currency of information reported to the System for Award Management (SAM) that is made available in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System (FAPIIS)) about civil, criminal, or administrative proceedings described in paragraph 2 of this award term and condition. This is a statutory requirement under section 872 of Public Law 110-417, as amended (41 U.S.C. 2313). As required by section 3010 of Public Law 111-212, all information posted in the designated integrity and performance system on or after April 15, 2011, except past performance reviews required for Federal procurement contracts, will be publicly available.
2. **Proceedings About Which You Must Report.** Submit the information required about each proceeding that:
 - i. Is relating to the award or performance of a grant, cooperative agreement, or procurement contract from the Federal Government;
 - ii. Reached its final disposition during the most recent five-year period; and

iii. Is one of the following:

- (A) A criminal proceeding that resulted in a conviction, as defined in paragraph 5 of this award term and condition;
- (B) A civil proceeding that resulted in a finding of fault and liability and payment of a monetary fine, penalty, reimbursement, restitution, or damages of \$5,000 or more;
- (C) An administrative proceeding, as defined in paragraph 5 of this award term and condition, that resulted in a finding of fault and liability and your payment of either a monetary fine or penalty of \$5,000 or more or reimbursement, restitution, or damages in excess of \$100,000; or
- (D) Any other criminal, civil, or administrative proceeding if:
 - I. It could have led to an outcome described in paragraph 2.c.(1), (2), or (3) of this award term and condition;
 - II. It had a different disposition arrived at by consent or compromise with an acknowledgment of fault on your part; and
 - III. The requirement in this award term and condition to disclose information about the proceeding does not conflict with applicable laws and regulations.

3. Reporting Procedures. Enter in the SAM Entity Management area the information that SAM requires about each proceeding described in paragraph 2 of this award term and condition. You do not need to submit the information a second time under assistance awards that you received if you already provided the information through SAM because you were required to do so under Federal procurement contracts that you were awarded.

4. Reporting Frequency. During any period when you are subject to the requirement in paragraph 1 of this award term and condition, you must report proceedings information through SAM for the most recent five-year period, either to report new information about any proceeding(s) that you have not reported previously or affirm that there is no new information to report. Recipients that have Federal contract, grant, and cooperative agreement awards with a cumulative total value greater than \$10,000,000 must disclose semiannually any information about the criminal, civil, and administrative proceedings.

5. Definitions. For purposes of this award term and condition:

- i. Administrative proceeding means a non-judicial process that is adjudicatory in nature to make a determination of fault or liability (e.g., Securities and Exchange Commission Administrative proceedings, Civilian Board of Contract Appeals proceedings, and Armed Services Board of Contract Appeals proceedings). This includes proceedings at the Federal and State level but only in connection with performance of a Federal contract or grant. It does not include audits, site visits, corrective plans, or inspection of deliverables.

ii. Conviction, for purposes of this award term and condition, means a judgment or conviction of a criminal offense by any court of competent jurisdiction, whether entered upon a verdict or a plea, and includes a conviction entered upon a plea of nolo contendere.

iii. Total value of currently active grants, cooperative agreements, and procurement contracts includes:

(A) Only the Federal share of the funding under any Federal award with a recipient cost share or match; and

(B) The value of all expected funding increments under a Federal award and options, even if not yet exercised.

q. Never Contract with the Enemy (2 C.F.R Part 183; 2 C.F.R. § 200.215)

Under 2 C.F.R. § 200.215 (Never contract with the enemy) Federal awarding agencies and recipients are subject to the regulations implementing Never Contract with the Enemy in 2 C.F.R. Part 183. These regulations affect covered contracts, grants and cooperative agreements that are expected to exceed \$50,000 within the period of performance, are performed outside the United States and its territories, and are in support of a contingency operation in which members of the Armed Forces are actively engaged in hostilities.

1. **Applicability.** This term applies only to recipients of covered grants or cooperative agreements, as defined in 2 C.F.R. § 183.35 Definitions.

2. **Requirements.** As applicable, recipients must fulfill the requirements as described in the following terms from 2 C.F.R. Part 183, Appendix A, which is incorporated into this award:

a. Term 1. Prohibition on Providing Funds to the Enemy.

1. *The recipient must—*

- i. *Exercise due diligence to ensure that none of the funds, including supplies and services, received under this grant or cooperative agreement are provided directly or indirectly (including through subawards or contracts) to a person or entity who is actively opposing the United States or coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities, which must be completed through 2 CFR Part 180.300 prior to issuing a subaward or contract and;*
- ii. *Terminate or void in whole or in part any subaward or contract with a person or entity listed in SAM as a prohibited or restricted source pursuant to subtitle E of Title VIII of the NDAA for FY 2015, unless the Federal awarding agency provides written approval to continue the subaward or contract.*

2. *The recipient may include the substance of this clause, including this paragraph (1), in subawards under this grant or cooperative agreement that have an estimated value over \$50,000 and will be performed outside the United States, including its outlying areas.*

3. *The Federal awarding agency has the authority to terminate or void this grant or cooperative agreement, in whole or in part, if the Federal awarding agency becomes aware that the recipient failed to exercise due diligence as required by paragraph (1) of this clause or if the Federal awarding agency becomes aware that any funds received under this grant or cooperative agreement have been provided directly or indirectly to a person or entity who is actively opposing coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities*

b. Term 2. Additional Access to Recipient Records.

1. *In addition to any other existing examination-of-records authority, the Federal Government is authorized to examine any records of the recipient and its subawards or contracts to the extent necessary to ensure that funds, including supplies and services, available under this grant or cooperative agreement are not provided, directly or indirectly, to a person or entity that is actively opposing United States or coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities, except for awards awarded by the Department of Defense on or before Dec 19, 2017 that will be performed in the United States Central Command (USCENTCOM) theater of operations*

2. *The substance of this clause, including this paragraph (2), is required to be included in subawards or contracts under this grant or cooperative agreement that have an estimated value over \$50,000 and will be performed outside the United States, including its outlying areas.*

r. Prohibition on certain telecommunications and video surveillance services or equipment (Public Law 115-232, section 889; 2 C.F.R. § 200.216)

(a) Recipients and subrecipients are prohibited from obligating or expending loan or grant funds to:

- (1) Procure or obtain,
- (2) Extend or renew a contract to procure or obtain, or
- (3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

- (i). For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- (ii). Telecommunications or video surveillance services provided by such entities or using such equipment.
- (iii). Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

(b) In implementing the prohibition under Public Law 115-232, section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.

(c) See Public Law 115-232, section 889 for additional information.

(d) See also §200.471.

s. Federal Financial Assistance Planning During a Funding Hiatus or Government Shutdown

This term sets forth initial guidance that will be implemented for Federal assistance awards in the event of a lapse in appropriations, or a government shutdown. The Grants Officer may issue further guidance prior to an anticipated shutdown.

1. Unless there is an actual rescission of funds for specific grant or cooperative agreement obligations, non-Federal entities under Federal financial assistance awards for which funds have been obligated generally will be able to continue to perform and incur allowable expenses under the award during a funding hiatus. Non-Federal entities are advised that ongoing activities by Federal employees involved in grant or cooperative agreement administration (including payment processing) or similar operational and administrative work cannot continue when there is a funding lapse. Therefore, there may be delays, including payment processing delays, in the event of a shutdown.

2. All award actions will be delayed during a government shutdown; if it appears that a non-Federal entity's performance under a grant or cooperative agreement will require agency involvement, direction, or clearance during the period of a possible government shutdown, the Program Officer or Grants Officer, as appropriate, may attempt to provide such involvement, direction, or clearance prior to the shutdown or advise non-Federal entities that such involvement, direction, or clearance will not be forthcoming during the shutdown. Accordingly, non-Federal entities whose ability to withdraw funds is subject to prior agency approval, which in general are non-Federal entities that have been designated high risk, non-Federal entities under construction awards, or are otherwise limited to reimbursements or subject to agency review, will be able to draw funds down from the relevant Automatic Standard Application for Payment (ASAP) account only if agency approval is given and coded into ASAP prior to any government shutdown or closure. This limitation may not be lifted during a government shutdown. Non-Federal entities should plan to work with the Grants Officer to request prior approvals in advance of a shutdown wherever possible. Non-Federal entities whose authority to draw down award funds is restricted may decide to suspend work until the government reopens.
3. The ASAP system should remain operational during a government shutdown. Non-Federal entities that do not require any Grants Officer or agency approval to draw down advance funds from their ASAP accounts should be able to do so during a shutdown. The 30-day limitation on the drawdown of advance funds will still apply notwithstanding a government shutdown (see section B.02.b.1 of these terms).