Feasibility Study for a Joint Use Facility on the Union Pacific Railroad Property adjacent to the Historic Columbia River Highway in Downtown Mosier

September 2017

ODOT TGM DLCD
TRANSPORTATION AND GROWTH MANAGEMENT

Acknowledgements

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City of Mosier

Joint Use Facility Feasibility Study

Introduction

This study is intended to evaluate the feasibility of constructing a Joint-Use Facility ("JUF") on the 4-acre property currently owned by Union Pacific Railroad ("UPRR") along the north side of the Historic Columbia River Highway ("HCRH") in downtown Mosier. The shared uses of the facility would include the Mosier Fire Station, Mosier City Hall, and Community Use spaces. The goal is to test the anticipated building program, site conditions, economics and community support to determine if the JUF would be a good fit for this location. A successful project would improve Mosier's capability for local emergency response, improve its municipal operations and enhance the Mosier city center.

There are several goals the JUF is attempting to accomplish:

- Create an emergency response facility that is appropriately sized for the current and future needs of Mosier, and that provides all the necessary programmatic elements of a fully functional fire station. This includes interior space for training, facilities on-site for washing hoses and contaminated turn-outs, and enough apparatus bay area for the equipment that Mosier needs (including a ladder truck),
- Create an improved, right sized and more accessible City Hall that has the space it needs to best serve the Mosier community.
- Provide resources and a gathering location for community activities.
- Revitalize the Mosier downtown core as a key first piece to that development.
- Address the public parking needs for the downtown area by establishing a precedent for how parking is to be handled ahead of future development in the area.

Project Summary and History.

Several studies have taken place in Mosier looking at planning and visioning for the downtown core. Mosier has changed significantly over the past decades. The need for a JUF has increased as the city has developed over time. Growth and development has amplified the need for emergency equipment and training to serve the community adequately. Looking ahead, this need will only continue to grow. The intent of this study is to build upon the timeline of events that have led up to the present.

The following is a list of past studies that have taken place with a brief description of each and how they apply to the JUF. These are available for review by contacting Mosier City Administrative Office at www.cityofmosier.com:

1978 - Comprehensive Plan Survey:

Summary: Resulted in a 73% response in favor of seeing new businesses and services come to Mosier as long at the small-town feel could be maintained.

Application to JUF: A key project goal for the JUF will be for its program to integrate with the existing surrounding businesses. It will be a large facility, so another key goal will be to maintain a small town feel in how it is designed and integrated into the area.

1999 - 20/20 Visioning:

Summary: Responses from the community emphasized enjoyment of Mosier's rural town lifestyle, the natural environment, sustainability, community and Mosier's local strengths, including trails and views.

Application to JUF: The community aspect of the JUF has the opportunity to be a hub that will enhance the experience of both trailhead visitors and residents.

2001 - Cultural Resource Survey:

Summary: A cultural resources literature search and pedestrian survey took place and identified one historic-period archaeological site, with several cultural resources.

Application to JUF: This survey identified the historic area at the east end of the site which will establish the development boundary of the JUF.

2002 - Mosier Waterfront Park Plan:

Summary: Resulted in the planning of Rock Creek Park and the Waterfront Park Trail.

Application to JUF: The JUF will aim to integrate with current and future trail and park planning in the surrounding area.

2003 - Downtown and Local Street Network Plan:

Summary: Resulted in a streetscape plan addressing the growing volume of pedestrian, bicycle and vehicular traffic through Mosier.

Application to JUF: Along with updates that will be coming with the Mosier Transportation System Plan ("MTSP") update, the JUF will aim to integrate with goals that are established for enhancing the pedestrian, bicycle and vehicular paths through downtown Mosier.

2005 - Historic Columbia River Highway Master Plan:

Summary: The HCRW is listed in the National Register of Historic Places.

Application to JUF: With the proposed site located adjacent to the HCRH, its history will play an important role in planning how the facility will interact with it. The JUF will seek to become a new participant joining other key stops along the HCRH. The community use programming will be key to this.

2008 - Mosier Area Household Survey Results, Final Report, and Vision Booklet:

Summary: Priorities of responses included promoting the unique qualities of Mosier, highlighting community events, agriculture and history, and promoting Mosier as a sustainable community.

Application to JUF: Each of these goals will be considered in the planning and design of the JUF, including its community uses, reference to Mosier's history in the building design, and sustainable features in the facility.

2011 - Columbia River Gorge Natural Scenic Area Management Plan:

Summary: This plan is in place to establish a national scenic area, and to encourage the enhancement of the Columbia River Gorge resources. It also encourages economic growth to occur in existing urban areas within the Gorge.

Application to JUF: Though development within the City limits is exempt, the goal will be to design the Joint Use Facility respecting the standards set forth in the plan. Views of the JUF from the Gorge, and especially from I-84 will be studied closely. The goal will be for it to be appropriately designed for its larger context.

2011 - EPA Downtown and UPRR/Mosier Hub Properties Visioning:

Summary: A series of conceptual drawings were created of downtown Mosier, including a special focus on the UPRR property.

Application to JUF: This visioning effort resulted in sketches of a lively and vibrant downtown center. The JUF will be a key early piece in helping this vision to become reality.

2013 - Centennial Celebration and Visioning for Arts and Culture in Downtown Mosier:

Summary: Resulted in various downtown beautification projects, including local art in the parks and downtown core, a mapped art walk, and a public plaza.

Application to JUF: The JUF will be looking at ways to continue the art influence of Mosier though the display of historical local artifacts and art at the facility.

2014 - Mosier Gorge Hub Project Design Plan:

Summary: The new Mosier Hub will be a part of a community of bicycle hubs along the Historic Columbia River Highway. They will be a network of welcome centers, information centers, trailheads and rest areas for travelers.

Application to JUF: The new bicycle hub will be directly across the street from location currently planned for the JUF. This presents opportunities to connect the hub with community spaces and public restrooms planned for the facility.

2014 - UPRR Property Feasibility Study:

Summary: Feasibility analysis of the potential uses and limitations of the property currently owned by UPRR adjacent to the HCRH.

Application to JUF: This study produced the recommendation for a grant funded multi-use public building on the east end of the UPRR site to stimulate economic growth in downtown Mosier. This study will seek to validate that recommendation.

2014 - Mosier City Council Goals:

Summary: The City Council adopts goals to reflect the community vision and to guide decision-making at all levels of City government.

Application to JUF: The goal in the planning and implementation of the JUF will be to advance all seven City Council Goals:

1. Our City Supports and Encourages Arts and Culture.
2. Our City is a Leader in Environmental Sustainability.
3. Our City is Committed to Public Participation and Engagement.

4. Our City Invests in a Vibrant Downtown that Attracts and Retains Locally-Owned Businesses.
5. Our City is Prepared for Emergencies.
6. Our City Provides First-Rate Services.
7. Our City is Fiscally Responsible.

2015 - Portland State University Slow Mo' Main Street Concept Plan:

Summary: Students led the City of Mosier in a focused study of opportunities to create community along Mosier's Main Street, the Historic Columbia River Highway.

Application to JUF: Many of the goals of the Slo Mo Study, including the creation of a community centerpiece and a thriving downtown have directly influenced the planning for the community oriented features of the JUF.

2016 - Columbia River Gorge Transit Study:

Summary: This study aimed to identify transit solutions for both residents and visitors to the Gorge, and the potential to complement transit service between Portland and Hood River with stops at key Gorge destinations.

Application to JUF: With direct adjacency to the HCRH, the future Bicycle Hub across the street, and plans for public restrooms, the JUF has the potential to be an ideal transit hub location for Mosier.

2016 - Train Derailment:

Summary (Excerpts from press release on June 5, 2016): A Union Pacific train derailed mid-day on June 3 on tracks paralleling Interstate 84 in the town of Mosier, Oregon. Sixteen oil tankers derailed and three caught fire. There were no injuries and no structures were lost. Oil was offloaded from the remaining railcars to tank trucks, and the rail cars were removed from the site. Residents were evacuated in an area about one quarter mile around the incident. The Mosier waste water treatment plant and sewer lines were non-operational for a period of time because of damage from the train derailment. This resulted in a boil water order for the Mosier community as a precautionary measure in the event an untested well was used for fire suppression. Water and air monitoring was conducted. A light sheen of oil was observed about six feet offshore in the Columbia River at the mouth of Rock Creek. Approximately 1000 feet of containment boom was used to contain the sheen in addition to three lines of sorbent booms placed across the mouth of Rock Creek by UPRR to protect the waterways during response operations. Environmental crews worked to identify and control the source of the sheen. Federal, state, tribal and local authorities established a command center near the scene to coordinate response, cleanup and investigation into what happened. The Mosier exit was closed for a period of time to allow movement of emergency response vehicles and operations.

Application to JUF: The train derailment exposed critical gaps in Mosier's emergency response capabilities. Key gaps being the lack of facilities to train volunteers, house up-to-date equipment, as well as providing a base of operations for large incidents, regional planning and training events. The JUF would be the necessary first step to securing Mosier's future volunteer response capability.

2017 - Mosier Transportation System Plan Update:

> Summary: The MTSP will look at the Mosier downtown street network and seeks to identify design standards and improvements that will support community livability and economic vitality.
>
> Application to JUF: The frontage and connectivity of the JUF to the HCRH will integrate with the recommendations of the MTSP as a key early piece in the redevelopment of the area.

Site Selection History.

Beginning in late 2012, Mosier Fire District's Station Development Committee (SDC) has looked exhaustively at locations for a new fire station.

A priority was to replace the Fire District's current configuration of two facilities a half-mile apart with a single large facility with enough covered space to house all equipment and program needs well into the future.

The SDC quickly realized that there simply were not many tax lots, either inside City limits or within a half mile of town, large enough, level enough, and with good access for District needs. Among the sites considered:

- The current City station site (replace the current building with one with multi-levels).
- American Legion property between Washington and Main Streets.
- Gas station.
- A proposed mixed-use development spanning most of the block between Washington, Center, Hwy 30, and Third Ave.
- Then-vacant commercial lot at Hwy 30 and River Way Drive.
- A portion of Hood River Sand and Gravel property at the end of Mossy Rock Way.
- A joint-use facility on Grange property.
- A joint-use facility with the City on Union Pacific property north of Hwy 30 and between the Totem and Mosier Creek.
- Redevelopment of our shed at 344 State Road with purchase of land from adjacent orchard.
- Redevelopment of 344 State Road with land transferred from the County Road Operations yard.
- A joint-use agreement with the County in the Road Ops yard.
- Vacant land at the bottom of Carroll Road immediately south of Dry Creek.
- Vacant land just north of 688 Dry Creek Road.

Many of these were simply not options for a fire station -- not available, too small, poor access, or too costly to develop.

In 2014, the City of Mosier commissioned the first of two feasibility studies contemplating a proposed Joint Use Facility on the north side of Hwy 30, on land then owned by Union Pacific and under negotiation for sale to the City. No building plans resulted from this study, which focused rather on financial feasibility. The final report outlined a path to a finished JUF similar to the conclusions of this second feasibility study.

In late 2014, shortly after completion of the first feasibility study, the Fire District Board declined to participate further in the proposed JUF with the City and turned its attention to options in and around the County Road Operations Yard.

During 2015, the Fire District developed conceptual plans for several versions of a new main station in and around the Road Operations Yard, including one up Dry Creek Road on the same lot as the orchard adjoining the District's existing 344 State Road property.

Ultimately, each of these attempts to site and "right-size" a station ran into insurmountable problems, mainly the cost of land and/or site preparation, water supply, and the County's reluctance to allow uses which could potentially conflict with Road Operations.

In late 2015, the Fire District Board agreed to a recommendation from the SDC to participate in this second feasibility study of a JUF with the City. This study is entirely funded by a grant from the Transportation and Growth Management (TGM) Program, a joint program of the Oregon Department of Transportation and the Oregon Department of Land Conservation and Development, which took the better part of a year to transition from the initial award to a signed contract with a lead consultant. After initial hesitation about locating our main station so close to the railroad tracks, several selection factors drove the SDC's recommendation:

- The investigations by the District had made it clear that no other location in or around Mosier could compare in positive attributes of size, access, geographically central, water supply, topography, and visibility.
- A JUF in this location anchors and catalyzes long-planned transportation and economic development goals.
- Facility safety could be mitigated with engineering and design, as well as a suppression system to protect against railroad fires.
- A JUF in this location creates new commercial property and frees up existing property occupied by the City and Fire District for commercial use.
- In the end, Union Pacific is ready to donate the land for the Civic Center, eliminating considerable cost from the project.

Now, at the conclusion of this feasibility study, the Fire District Board has a range of choices for a station in a joint-use facility with the City which begin to look attainable, possibly without the need for a bond election.

The least expensive version of the Civic Center lowers cost by relocating Fire District program areas omitted from the larger, more expensive versions to the existing shed at 344 State Road (refer to Conceptual Floor Plans, Appendix B). This does not mean the District's initial one-station priority was a mistake. Rather the economic and political realities of that goal are less feasible than maintaining the two-facility configuration. The Fire District also benefits from having redundancy: if one facility becomes unusable District operations can quickly adapt.

This smaller version of Civic Center does not mean the City and Fire District should reconsider location. Locating the Civic Center on land the City and District would need to purchase, or abandoning the Civic Center in favor of the two governing bodies going their separate ways, adds costs that don't make sense given partial funding of the joint facility, including donation of the land.

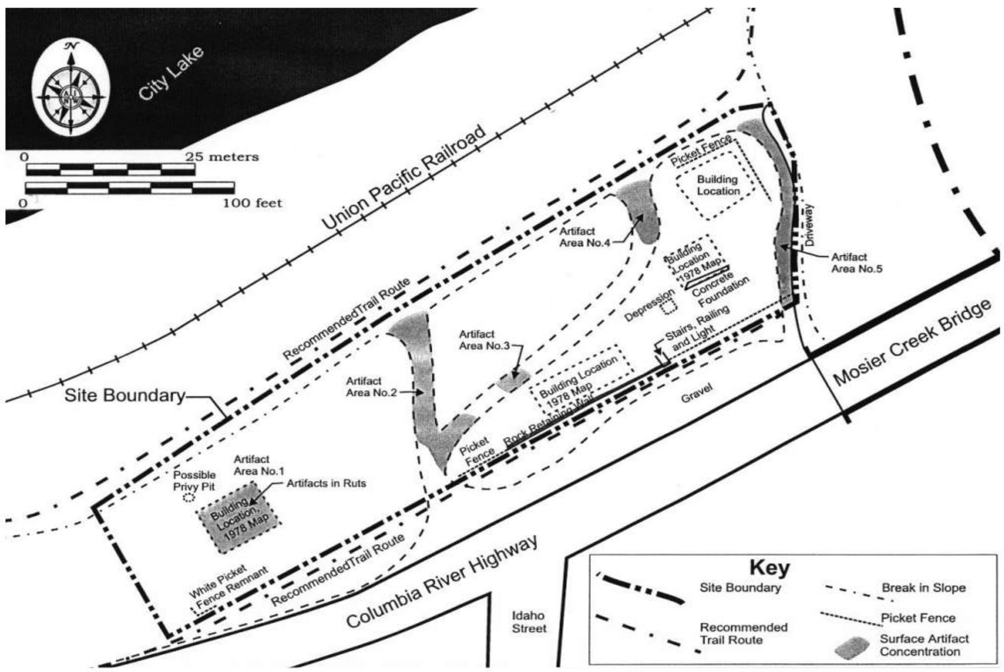
No location is without some down side. The main down side of the proposed Civic Center's location is proximity to the railroad tracks. This makes clear that things can be done to mitigate exposure to potential hazards. And by retaining the 344 State Road location as the Fire District's base for outdoor training, noise disruption caused by trains is eliminated, which is the other main drawback to the Civic Center location.

Site conditions that will affect feasibility.

Environmental constraints.

Archaeology.

The east portion of the project site has been determined to be a historical archaeological site. There were approximately 6 historic period railroad housing compound structures on the east end of the property. The JUF structure will be built to the west of this area. See figure below.



(Historic period Mosier Railroad site. Refer to 2001 Cultural Resource Survey)

The siting of the JUF will consider the future potential of the remaining property. Developing the site close to the archaeological boundary to the east will leave the maximum area available to the west for future development.

Geological Conditions.

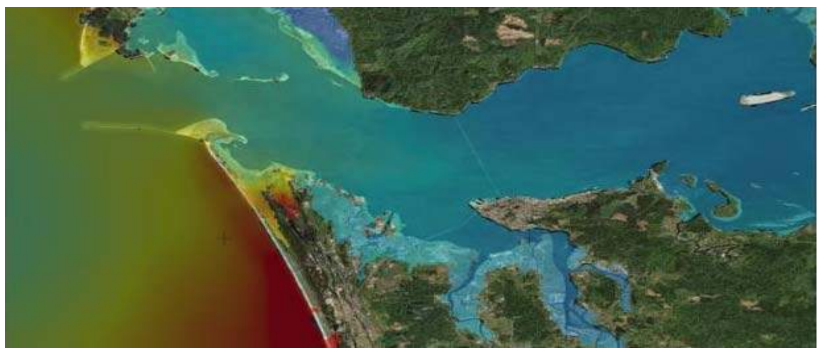
The soil conditions of a site can play an important role in determining feasibility. It will help establish the complexity needed out of the foundation system which can range from simple shallow footings, to complex deep footings. A site boring was done at the proposed site. Refer to Appendix D for the full geotechnical report.

Soil Conditions: The underground soil conditions have helped to define the necessary complexity for the foundation system that will be needed. The geotechnical engineer concluded that the results look promising. With hard basalt bedrock encountered at a depth of about 18 feet below existing grade. Overlaying the basalt was alluvial gravel that was typically dense. They anticipate that a conventional shallow foundation bearing on structural fill will be adequate for the JUF. Overall, the site appears suitable for the proposed JUF. These findings have been applied to the cost estimate.

Seismic/Flooding Hazard Study: The geotechnical report also addressed the potential for site-specific seismic hazards and concluded the following:

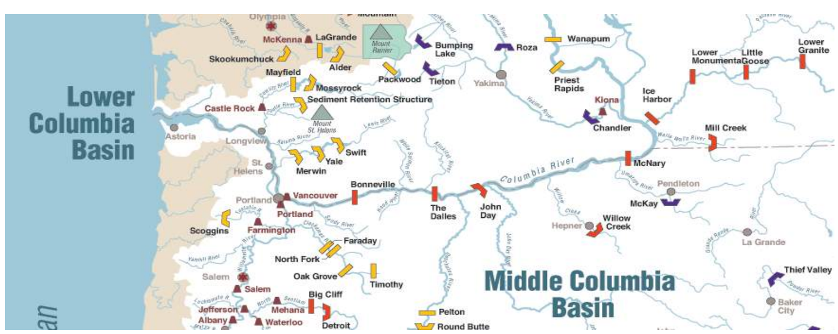
- The potential for seismically-induced liquefaction settlement at the site is very low.
- There is a very low risk of surface rupture from faulting.
- There is a very low risk of surface rupture from lateral spread.
- There is a low risk of slope instability from a design-level earthquake.
- There is a negligible risk of tsunami inundation at the project site.

  A study performed by engineers at Oregon State University in 2015 determined that in the event of a 9.0 magnitude earthquake and associated tsunami at the highest tide of the year, there would be no measurable rise in the river by river mile 50, near Longview, WA.



http://oregonstate.edu/ua/ncs/archives/2015/feb/study-outlines-impact-tsunami-columbia-river

- Dam failure due to seismic event: There are several dams that are upstream from Mosier on the Columbia River as part of the Middle Columbia Basin within the Pacific Northwest Reservoir System. The nearest dam upstream is The Dalles Dam, which opened in 1957. The Army Corp of Engineers Dam Safety Program has done a study of the threat posed by a major offshore earthquake in the Cascadia Subduction Zone to dams in Oregon and southern Washington. It concluded that though the dams were not built to meet that kind of a threat, they do not expect any of them to fail to the point of losing their reservoirs.



http://www.usace.army.mil/Missions/Civil-Works/Dam-Safety-Program/

Developmental constraints.

City Municipal Code.

The project site is zoned for Commercial Use, which allows Public Facilities as a conditional use per 15.02.070 in the City Municipal Code. There are a few key zoning items that will need to be addressed in the building design of the JUF:

Maximum Building Height (15.02.070, D-6b): For development north of Hwy 30, the maximum building height is 18 feet as measured from the top of pavement of Hwy 30. The JUF will seek to be as low profile as possible. It is planned as a single-story structure. The driving component to the building height will be the size of the apparatus bays, vertical clearance for the equipment, and providing the necessary roof slope above. If this exceeds 18 feet, a variance will be required.

Parking Regulations (15.03.130, H-2): For development north of Hwy 30, parking lots shall be located in the rear of the building. There is not enough depth on the JUF site for parking in the rear of the building due to the size of the facility along with grading limitations with the elevation dropping off as you move north from the highway. To provide ADA parking for the public use of the facility, this lot would need to be adjacent rather than behind the JUF. A variance will need to be requested for this.

Maximum Yard Setbacks (15.02.070, D-5): The maximum setback is 10 feet. The JUF conceptual site plan shows an entry plaza and the apron for the apparatus bays, which exceed this setback. The code does allow for this dimension to be increased "when a sidewalk, bicycle path, multi-use path and/or planting strip is provided between the building and front property line." The intent will be to coordinate pedestrian and bicycle pathways with the MTSP when the site plan is designed. A variance will be pursued for the depth of the concrete apron in front of the apparatus bays.

The goal of the JUF design will be to meet the requirements of the City Development Code. If a requirement cannot be met, a variance will be pursued. In preliminary discussions with the City Administrative Office, variances for the items listed above are reasonable due to the unique nature of the JUF project and site conditions.

Columbia River Gorge Commission development standards.

The JUF project is exempt from the Gorge development standards due to being within the Mosier city limits. However, it will be a goal of the JUF design process to come up with a solution that is respectful of the Gorge standards. The design will need to balance two things:

- Help with defining an identity for Mosier as travelers pass by on Interstate 84. One of the goals of revitalizing the downtown core is to help make Mosier a hub that visitors want to stop at. The JUF's visibility from the Interstate will play a part in this.
- Be respectful of the scenery of the Gorge and blend in with the surrounding context.

Standing out and blending in are two very different goals. These will need to be worked out in the design process so that the result is a facility that is rightly designed for its context.

UPRR adjacency and access requirements.

There will be site constraints due to the adjacency of the property to the UPRR tracks:

- A 50-foot setback line will be set as the limit of development for the JUF. This will be both for railroad access as well as safety reasons. This line sets the depth of the site between the HCRH and the tracks, which will come into play when discussing the fit of the fire apparatus bays and apron.
- An access easement will be provided that connects the HCRH and the track setback area. This is currently planned west of the proposed building footprint near where Main Street intersects the HCRH. This easement also is where the access drive is currently located to get to the lower parking area for trailhead visitors. The easement will not be in the way of the proposed site features of the JUF.
- A fence line will be established between the JUF and the tracks. The location is not finalized, but it is the City and Fire District's preference to have the fence line as far north as possible. The lower area of the site has the potential to be used as a parking area for trailhead visitors and community events, as well as for a staging area if there is an emergency event.

Though there will be unique constraints due to the adjacency of the UPRR tracks, these do not appear to have a significant impact to the feasibility of the site for the JUF.

Site suitability for the proposed Joint Use Facility.

On-site Parking / ADA

The goal of the JUF will be to provide enough parking on-site for the various needs of the facility. A small number of public parking spaces are planned at the west end. The required number of spaces will be based on 15.03.130, H-4a of the Development Code. This lot will provide the required number of accessible parking spaces for the public as well as a few spaces for visitors to the City Hall. This parking area would also serve as a loading and unloading area for events that occur in the community meeting space. It will be ideal to only provide the minimum amount of parking needed to prioritize the area along the HCRH as either built or open public use space. This will better meet the goal of creating a pedestrian friendly street edge. Trees and other landscaping can be provided as a buffer between the sidewalk and parking.

A possible use of the basement level space under the northwest corner of the JUF could be for covered parking.

EV Charging Station

Another potential use for the public parking area would be to provide an electric vehicle charging station. There may be partnership opportunities available to implement this. The parking space could still be used by other visitors to the JUF rather than being reserved for electric vehicles. This could be an opportunity for people visiting the Gorge to stop to charge their vehicle and while doing so, spend some time in the JUF, which is looking at ways to provide visitor's center-like amenities such as a local information area and the display of historical Mosier artifacts.

(example branded EV charging station)

Public Parking

There is potential for more parking if needed for larger events in the lower level gravel area. This zone is currently being used as parking for trailhead visitors and has room for a few hundred cars. Access to main level will need to be considered from this zone. A stair could be provided. An elevator or wheelchair lift would not be needed if the upper level lot meets the accessible parking requirements. This lower area will also serve as an emergency response mobilization area should future events occur.

This approach is based on a "Park Once" concept, where a single shared public lot for the surrounding businesses helps to relieve the requirement for each to provide their own parking. This is preferable to have a downtown core without numerous parking zones, which will provide a better pedestrian experience.

To the east of the JUF, a volunteer parking area will be provided. This could be a gravel lot because accessible parking will not be required, due to fire volunteers having an able bodied/fit for duty requirement. Gravel will help lessen the impact of this lot to the adjacent area, as well as minimize the storm water runoff.

Site Access.

The JUF as it is currently planned with three access points off the HCRH:

- A 24ft wide access drive to the public parking area at the west end of the facility.
- A 54ft wide curb cut for the concrete apron in front of the three primary apparatus bays.
- A24ft wide access drive that leads to the two expansion apparatus bays at the east end of the facility, as well as the fire volunteer parking area.

In preliminary conversations with ODOT, three driveways at the spacing shown would deviate from the spacing standard of 250 feet for this area. It was noted that a deviation could be applied for, and would likely go through due to the nature of the project.

It was also discussed that even though splitting the apparatus bays will create two access points, this will be preferred over what would be a 90ft long curb cut at the sidewalk. This would not be pedestrian friendly for those walking along HCRH.

Signalization was discussed as a possibility for the Fire Station at the intersection of the apparatus bays. ODOT noted they would not typically require this. Based on the current traffic patterns, it was determined that this would not be initially necessary. When the apparatus maneuver into the bays, they will need to back in off the HCRH. During these times, the fire department will have someone cover traffic control. The fire department may want to install warning signs or activated warning signs in the future, an if so, ODOT would participate in their design. As downtown Mosier develops, this need could change and the fire department will adjust accordingly.

Impacts to the HCRH.

Off-site improvements to the HCRH and surrounding areas are not yet a part of the JUF scope. These will be addressed as part of the MTSP, which is currently underway. The goal will be to have an improved pedestrian path along the HCRH, and the entry and plaza area in front of the JUF would coordinate with that. No changes are planned to the existing right-of-way of the HCRH.

In preliminary discussions with ODOT, it was determined that there are no plans currently to change the right-of-way as it passed through downtown Mosier alongside the project site. The JUF plans to respect the right-of-way and develop up to it. The area immediately adjacent to the boundary will be coordinated with the findings of the MTSP for how to address pedestrian and bicycle pathways along the HCRH.

Impacts to adjoining properties.

Traffic impacts.

Impacts to traffic from the JUF will not be significant. Trips to the site will primarily be by City Hall staff, Fire volunteers, visitors to the City Hall and Fire Station, and for the occasional community/special event.

Staffing: The current staffing for the City Hall is one full time and one part time employee. For the Fire Station, there will be the Fire Chief, and up to four volunteers. There may also be a part time janitor. This would be a total of 8 staff potentially at the JUF at a given time, resulting in a limited number of trips to and from the facility. It's also worth noting that these trips will be displaced from the trips to their current locations in town. No significant impact to the surrounding area.

Visitors: There will be a modest number of visitors to the City Hall as well as to the Fire Station. These are also infrequent and should be served well by the small public parking lot to the west of the JUF. No significant impact to the surrounding area.

Community Events: During community events, there may be a larger number of cars that visit the site. These can primarily park in the lower gravel parking area, which has capacity for hundreds of cars. There will be accessible parking at the upper lot adjacent to the JUF. They may be some congestion along HCRH before and after the event. If these are typically attended by the local community this should not be a problem. Moderate impact to the surrounding area.

View impacts.

Views impacts surrounding the site will be an important consideration to see what the impact will be looking to the north. Because the topography of Mosier raises as you move to the south, blocking views should not be significant. Views to the river and Gorge beyond will still be maintained over the new building. When directly across the HCRH, there will be locations where the previous open space will now be replaced with the JUF, but an important consideration is that as downtown Mosier grows, and if the community wants a downtown, then buildings will be built. Buildings will replace open space (and views).

(intersection of Oregon Street and HCRH, looking north)

There will be views of the JUF from the Interstate as travelers pass through Mosier. This has the potential to increase visibility for Mosier to passers-by which could have a desirable effect on increasing visitors and commerce. There will be a design opportunity to select a building form, color and materials that will have right amount of visibility, but also appear like the facility belongs within the Mosier context.

(view of site from Intestate 84 looking southeast)

Noise impacts.

Noise impacts should be not significant. Daily trips to the JUF will be equivalent to the current City Hall and Fire Station, but now will be further away from residences. Community events may produce some noise, but these will largely be attended by the community, so those would not be a nuisance.

Impacts to surrounding businesses.

Impacts to surrounding businesses will be considered as the program for the community oriented aspects of the JUF is refined. Beyond the Fire Station, City Hall, and public restrooms planned, there are potential conflicts for uses including rentable indoor community space, and offering coffee or a similar concession. The goal is for the JUF is to enhance opportunities for businesses to succeed downtown, not to compete with them. Mosier used to have a coffee house, and losing it was hard on the community. It is hard to predict if businesses will be successful, and the track record for coffee/restaurants has not been good in the past. The JUF could have the ability to flex as things come and go.

A goal for the JUF will be to come up with a set of bylaws for the affiliated uses of the building beyond the core uses

- What will be done to avoid conflict with surrounding businesses.
- Supplement business in the community when they are closed seasonally, or if they close their doors.
- Enhance businesses in the area not compete with them.
- Coffee kiosk shown is a placeholder, and could be something else. A local business could even run the kiosk (partnership rather than competition).

Infrastructure availability and provision.

The JUF site has been investigated for the availability of utilities. It has been confirmed with the City Engineer that utility access should not require major off-site improvements or service extensions. This is reflected in the conceptual cost estimate (Appendix E).

Storm water.

The footprint of the JUF and the surrounding pavement will create an impervious surface, creating run-off of storm water. This will be addressed in the proposed site plan by adding one or multiple storm water swales, which will allow the water to slowly percolate in the soil. This is a feasible approach due to the infiltration of the site, along with the available land around the building for them to be incorporate into the landscape. Test pits will be done as part of the schematic design phase to determine the calculations. Preliminarily, based on the roof area of the JUF, and from the surrounding pavement, the Civil Engineer has conservatively estimated that this area will be between 800 and 1,200sf. The swale depth would be 2ft. This is based on the areas currently shown in the Full Community floor plan option, as well as an allowance for some future impervious surfaces that could be added.

An alternate option to using swales would be to use storm water detention basins. These would not be preferred because they are harder to incorporate into the landscape, and potentially would need to be in a fenced off area.

Water service.

It has been confirmed that there is an 8-inch diameter water line stubbed out to the property north of Washington Street. There is also a 2-inch diameter water service connected to the main.

Fire water.

Fire flows at this location are estimated to be 1,500gpm. The fire flow rate required will be based on the building construction type, size and occupancy. Depending on the results, fire sprinklers may be required by the building official. Sprinklers are currently planned for in the conceptual cost estimate.

Sanitary sewer.

The City Engineer confirmed that although Mosier does not have a model for sewer system flow and capacity, there is a 10-inch diameter sewer pipeline in the HCRH. The JUF will have a limited number of plumbing fixtures, and based on conservative estimates for light commercial space, capacity for the existing line should be adequate.

Grading.

The property provided by UPRR is not flat. There is a grade change of approximately 15ft from the HCRH, down to the level of the railroad tracks. Large equipment like what will be housed in a Fire Station is best if it is located over a slab on grade. To accomplish this, a retaining wall will be needed around the footprint of the JUF, which will be backfilled with engineered fill. This will then create a buildable pad for the facility above. There will be costs associated with this, which are represented in the conceptual cost estimate (Appendix E).

There is potential to reserve a portion of the area below the JUF main level as a basement. This would be the northwest area, under the community spaces. This area would likely only be used as unconditioned storage/service space. It would not be considered public space, which would require elevator access. The estimate currently reflects no basement area. During schematic design, the cost benefit analysis will take place to determine the best approach for this lower area.

Building programming and footprint.

It was important for the feasibility analysis to develop the floor plan options beyond basic space plan (bubble) diagrams. What this did was provide a realistic scale understanding of how big the JUF footprint was going to be, and then to test how it will fit on the site. This included site access, because driveways, parking lots, and apparatus aprons take up a lot of space. The most significant portion of the program that would influence the fit on the property were the apparatus bays. There will be 5 bays, typically 18 feet wide by 48 feet deep, with one bay deeper at 65 feet. There will also be a 35-foot-deep concrete apron in front of the bays. This produces an area approximately 90 feet wide by 100 feet deep. It was challenging finding the best fit on the site due to the depth constraints (slightly more than 100 feet deep), as well as the grading constraints (grade drops off as much as 15 feet). Although backing in to the parking positions is not ideal, this arrangement became the preferred option based on the site proportions, grading and desired adjacencies between the bays and the rest of the JUF program. This layout does fit on the site, between the HCRH right-of-way, and the 50-foot setback line off of the railroad tracks. Refer to the attached conceptual floor plans, (Appendix B).

(conceptual floor plan with largest potential footprint)

Pedestrian and Bicycle access ways.

The JUF will be immediately adjacent to the HCRH, and any future bike lanes or pedestrian paths that will be along the edge of the Highway. This planning will be developed in response to the recommendations of the MTSP. There may be a trail running along the north edge of the property resulting from the planning of the 2002 Mosier Waterfront Park Plan. There will also be a future Bicycle Hub directly across from the JUF on the south side of the HCRH. The goal of the JUF will be to integrate with pedestrian and bicycle pathways near the site.

There are a few ways that the JUF plans to do this. Public restrooms are planned. These along with the potential for a small food or coffee cart vendor, library or museum display will hopefully make the JUF an attractive place for visitors to take a brief rest as they pass through or start a ride or hike in Mosier. Six lockable bicycle parking spaces are planned adjacent to the entry plaza to further encourage visitors.

For staff that may choose to bicycle to the JUF, a flex use space is planned at the west end of the building where indoor bicycle parking could be located.

The pedestrian path that will run along the south edge of the property will be enhanced by landscaping and street trees. These will create shade and help to visually shield pedestrians from vehicular travel and parking areas. The decision was made to rotate the two expansion apparatus bays at the east end of the JUF to reduce the width of the concrete apron where they cross. This was done to prioritize the pedestrian experience, as well as optimize the site grading.

Sustainability is one of the City Council goals, and it also will be for the design and planning of the JUF. Encouraging and enhancing bicycle and pedestrian access will be one of the ways that sustainability is prioritized.

Economic feasibility.

Project Cost.

See attached conceptual Building Options Cost Comparison for the JUF (Appendix E). Costs were based on the preliminary plans represented in this report and are meant to be a conceptual estimate to evaluate the overall feasibility of the project. It is based on historical cost data, applied to the preliminary plans, with assumptions and contingencies in place for unknowns that will be determined when the building is fully designed.

The project has been broken up into four options, one that is the fully programmed facility, two others that phase portions of the project for a later time to reduce the initial cost, and a fourth option that reduces the building size and relocates the remaining program to an alternate Fire District site.

- Full Joint Use Facility:

  This option has 5 apparatus bays and includes community space with a shared recreation room and a shared meeting space. This option "right sizes" the Fire Station and anticipates where the JUF will need to be to serve the future growth of Mosier, as well as respond to the preset needs and requests of the community.

- Expanded Joint Use Facility:

  This reduces the building program to an expanded version of the essential program by removing two apparatus bays and reducing the amount of shared community space to focus on the Fire Training Classroom.

- Essential Joint Use Facility:

  This represents the minimum square footage and programming necessary for a functioning Fire Station and City Hall.

- Essential Site Optimized Joint Use Facility:

  This option is similar to the Essential Facility in terms of its program and size, but rather than planning for future phases on this site, it moves the remaining program to Fire District site at 344 State Road. This allows the site to be optimized to the smaller facility, which saves in infrastructure costs of the larger building pad and retaining walls.

The goal will be to secure funding for the Full Joint Use Facility, but if the funding falls short, these options will help for moving forward to ensure that Mosier will get the emergency services facility it needs.

Project Funding.

With a project budget established, a target is now known for the pursuit of funding for the JUF. See attached funding narrative and matrix, which discusses the funding background, goals and next steps for the JUF (Appendix F). The matrix (and supporting narrative) attempt to summarize the funding categories, probability, and funding range estimate.

The funding goal will be to meet or exceed the project budget to minimize or eliminate the financial impact to local taxpayers. Should a local bond be needed, it will be capped based on the Mosier Fire District bond capacity, and the remaining balance will need to be raised by grants and other non-repayable sources. Refer to the Bond Narrative (Appendix G) which discussed this in more detail.

The determination of whether there will be enough available funding will be a key requirement and the primary challenge to the feasibility of the JUF.

Operational Costs.

Staffing

The initial costs to staff the JUF should be comparable to current City Hall and Fire Station staffing. For maintaining the facility, there will be a potential need for additional custodial staff due to the increase in square footage. How the community aspect of the facility is ultimately programmed will determine how soon this need will be required.

A key trigger for increased custodial cost will be the public restrooms adjacent to the JUF lobby. Currently, 6 fixtures (water closets and urinals) are planned, 3 men's and 3 women's (refer to the Conceptual Floor Plans, Appendix B). This can be mitigated initially by how often they are made open to the public. It will be important for the City and Fire District to have a clear written agreement defining the maintenance approach prior to opening the facility.

Utilities

There will be an increase in utility costs due to the large size of the facility and site. There will be design opportunities to lessen these impacts:

Electricity.

To reduce electricity cost, lighting can be installed with occupancy and daylight sensors so they turn off when not in use. Efficient LED fixture can be utilized.

HVAC.

There will be opportunities to efficiently zone the HVAC so that the apparatus bays are kept at an ideal temperature and not over heated or cooled. Operable windows can be utilized so air conditioning is not needed except at the hottest times of the year. The exterior envelope can be optimized to insulate the facility from hot or cold outside.

Water.

Drought resistant plantings can be utilized around the site so there is little to no irrigation water necessary. This would allow the site to blend into its natural surrounding area along with being water efficient. Plumbing fixtures installed can be low-flow. Also, due a large roof area, rainwater could be harvested for grey water uses (like irrigation or toilet flushing).

Solar

Another way to mitigate the increased cost of energy would be for the JUF to have a roof solar array. There are many programs that exist where the City and/or Fire District could partner with an energy company through a power purchase agreement, as well as take advantage of incentives to go solar through the Energy Trust of Oregon. The JUF could have as much as 7,000 square feet of optimal south facing roof area, which could significantly contribute toward or even eliminate energy costs. Solar companies are also now able to take advantage of smart metering so that excess energy captured at peak times can be tracked and applied toward energy costs year-round. Energy Trust of Oregon is a good place to start for finding a solar company to connect with and for guidance toward maximizing incentives and tax credits that are available. www.energytrust.org

(example solar array)

Operational Revenue.

There will be potential for operational revenue to offset the operating costs depending on the final programming for the JUF. Some sources that have been discussed have been renting out the use of the community meeting space, the kitchen, and the operating of a coffee kiosk in the main lobby space. Refer to Funding Narrative (Appendix F) for more information.

Community reception.

A presentation of the JUF plans to the Mosier Community took place on March 9, 2017. Feedback was generally very positive in support of the project. It is a very high priority of the JUF to have community support. The goal is for the facility to be an asset to the community and to enhance its surroundings.

Comments raised at the Community Presentation:

- Comment: "A library reading room would be a great addition. A place where there could be story time for kids." / also Book Groups.

  The JUF is planning for a reading and library shelving area in the "Fireside" entry of the facility. Seating could also be arranged to allow for story time activities.

- A resident from the local mobile park wondered if this would be a place she could go in an emergency. When she was evacuated from her home she did not have a place to go.

  The plan is for the JUF to be available as "a place to go to know where to go." The JUF will not be an emergency shelter, which would conflict with the space requirements needed as a command post operation for an emergency, but rather a place where residents can go and be given help and instructions for what to do.

- Will there be something for sound in the facility due to the proximity to the railroad tracks?

  The walls and windows of the JUF are planned to be acoustically designed as needed, and within the project budget, to help reduce the sound coming from the tracks.

- Are there safety concerns being so close to the tracks? What if another train derails?

  The JUF will be held a minimum of 50 feet back from the centerline of the railroad tracks. Although more space would be ideal, this will be a reasonable offset distance considering the site depth limitations. At the time of the derailment in 2016, the furthest distance that a box car travelled off the tracks was approximately 50 feet (about one car length).

(aerial view of train derailment)

Additionally, the apparatus bays will be shielded by the shop space on the north side, so if there was severe damage to that wall, the equipment would have protection.

- What is the nature of the adjacent archaeological site?

  Refer to environmental constraints section above.

- Can the recreation room be used as a shared fitness center for the community?

  The plan is to have the recreation room be made available for shared use by the community.

- What are the risks of building the facility in stages?

  The building would only be built in stages if necessary due to project funding limitations. It will be most efficient to build the entire facility at one time. Should it need to be done in phases, the necessary infrastructure will be planned so that the subsequent phases can be added as easily as possible. Financial planning and a process that goes with it will guide the decision on phases, so that the project does not run out of money after phase one, and be incomplete.

- How do we plan on using the space at the lower level under the building?

  There are various potential uses, including storage space, support space for the facility, or parking. It may also be the best choice to fill the area in behind retaining walls so that the JUF can sit on grade, which is ideal for large equipment. The basement area that would be best suited to be open will be the northwest zone under the community spaces. This will be further studied when the building is designed.

- Is this project really happening or is it just theoretical?

  The project is currently in the feasibility stage to determine if the site that is planned will be suitable.

- How can we keep the building from being so big? It is too big for Mosier.

  The footprint is the size it needs to function as a Joint Use Facility. There are ways to reduce the scale of its appearance by how you shape the building, its roof form, material selection and landscaping. This will be studied during the schematic design phase.

- Will the new building block views to the north?

  View impacts are discussed in the impacts to adjoining properties section of the report above.

- How tall will the building be?

  The building height will be a function of the size of the building along with the necessary roof slope that is best for weather protection. Refer to Developmental Constraints above, which discusses building height.

- Some local business owners were concerned that the community uses of the facility will conflict with what they are planning on providing to the community.

  Refer to impacts to surrounding business section above.

Other comments provided at the presentation:

- Move building to totem plaza space and then move totem further east.

  The entire available site has been considered for where to locate the JUF. Its current location has shown to be the best based on site proportions, adjacencies, and future flexibility.

- No parking for community events / Parking under building.

  Refer to the on-site parking section of this report for discussion on community event parking.

- Give $ to Mosier School.

  There is potential to have space in the JUF that the Mosier School could utilize. This could help address the schools need for space to run after school activities.

- Mosier museum!

  Museum space was mentioned by multiple people. The JUF will be planning in storage space for local Mosier artifacts, which can be brought out and displayed in the public areas on a rotating basis. Most items for display are smaller, such as newspapers and photos. There are a few larger items.

- Art space.

  Art display will be able to share with the museum display approach that is planned along the walls of the public areas of the JUF. Art display and/or teaching events could take place in the shared community spaces as well.

- Gym for community and fire volunteers / Community workout area for health, seniors, all of us / Exercise/weights area / Has been shown that exercise has huge benefit to public health.

  The recreation room is planned to be available for shared, informal use by the community.

- Meeting space with professional A/V for movies night.

  The Fire Training space will be equipped with Audio Visual equipment for training purposes. This could be adapted to use for movie nights and other community activities that would utilize A/V.

- Rainwater catchment/cistern for landscaping + non-potable uses.

  Sustainability is one of the Mosier City Council goals, and will also be one for the JUF.

- Wine tasting room under engine storage.

  The space potentially available at the lower level may not be well suited for this use. It could potentially be unconditioned storage or service space, but likely not for public use.

- Observation tower – Attraction for freeway passers-by.

The JUF design will consider its visibility to passers-by on the Interstate. It will attempt to accomplish two goals: Blend into its existing context, yet also stand out and catch the eye of freeway travelers.

- Keep it simple.

  The goal for the JUF will be to edit to the essentials in its building design. Simplicity can be beautiful, practical and cost-effective.

- Allow local business to help community.

  The JUF will aim to complement the local businesses around it and be a resource to the community.

- Have it look really nice – Proud to have in our town.

  Design aesthetics will be studied during the project schematic design process. The goal will be a design that is tied to its region and site.

- Concerns: How it will affect our taxes.

  There is potential for a local bond to contribute towards the cost of the JUF. It will be capped based on the bond capacity of the Mosier Fire District. Refer to the Funding Narrative for more information (Appendix F).

- Incorporate an electric car charging station.

  Refer to the on-site parking section of the report where the option of electric vehicle charging is discussed.

- Community room needs a good view and excellent soundproofing.

  The community room will look north to views of the Columbia Gorge. Sound resistant windows will be utilized to help mitigate sound from the trains.

Comments provided on Fire District website:

- "The conceptual layout is quite nice and would provide a sense of community and a focal point for visitors to the area. A couple of observations: 1. This would be a fairly expensive building in terms of annual operating costs (utilities, maintenance, cleaning, etc.) so in the feasibility review, be sure to evaluate the operating costs versus the current facilities and what the funding sources would be for those costs. 2. For a facility of this size, it would be helpful to have some commercial uses that would both be a revenue source from rent and bring people into the building. Whether that would take the form of a small convenience store, lunch counter, coffee bar, etc. that would have to be evaluated.

  Refer to the economics section of this report which discusses operating costs and potential operating revenue.

Comments from Fire Department Volunteer.

- The JUF will bring improvements to emergency response in the area. The Mosier Fire Department is volunteer based. This means that the response times are increased when volunteers are already at the Fire Station. Having a facility that meets the needs of the volunteers will increase the time they are on-site and ready to respond:

    The JUF will be better suited for volunteers to spend more time there with opportunities for exercise, reading, resting, and work space available to them, rather than needing to go off site for these activities.

    Volunteers will be able to wash their potentially contaminated turn-outs on site. This will also be safer for their families.

    Volunteers must currently take their hoses to Hood River to wash them. At the JUF this could be done on-site.

- In the past, donated equipment has been given away because there was not a location to store it in Mosier. The JUF will put the Mosier Fire District in a better position to receive and use donated emergency equipment to serve a growing city.
- Currently, there is no interior space to train volunteers. Apparatus bays must be emptied out to do training, which limits options. The JUF will provide the necessary indoor training space. Better trained volunteers will be better for Mosier's protection. This includes adequate meeting space for the entire volunteer staff. They do not all fit in the current Fire Office.

Conclusion.

There are many factors when considering the feasibility of building a Joint Use Facility that combines the program of the Mosier Fire Station, City Hall, and other Community Facilities on the property currently owned by UPRR north of the HCRH in downtown Mosier.

The history leading up the present has been an important series of studies and milestones that have culminated in the need for this facility on this site.

Much research has gone into various site selection options around Mosier. The property studied in this report has risen to the top as the best option for locating either the entire JUF, or the essential JUF functions with the remaining program off-site.

Site conditions of the property will be challenging due to the grading, site depth limitations, and proximity to the railroad tracks, but nothing that cannot be addressed in the planning, design and engineering of the JUF.

Community feedback for the project has been positive, as the community of Mosier understands and agrees with the goals that the JUF is attempting to meet: Provide a much-needed emergency services facility, consolidate other public use spaces, and provide community space that will enhance the Mosier downtown core.

Economics may prove to be the biggest hurdle for feasibility. With a limited amount available through a local bond, most of the project funding will need to come from outside sources. The good news is, as summarized in the Funding Narrative (Appendix F), the funds are out there to be obtained. It will take a diligent team effort to pursue.

With these challenges in mind, and after going through the feasibility process, we recommend the property currently owned by UPRR to be an acceptable location for the new Mosier Joint Use Facility.

Recommended Next Steps.

Form a Joint City Council and Fire District Board Committee to review the range of options for the Joint Use Facility and provide recommendation for moving forward, not exclusive of any separate review processes.

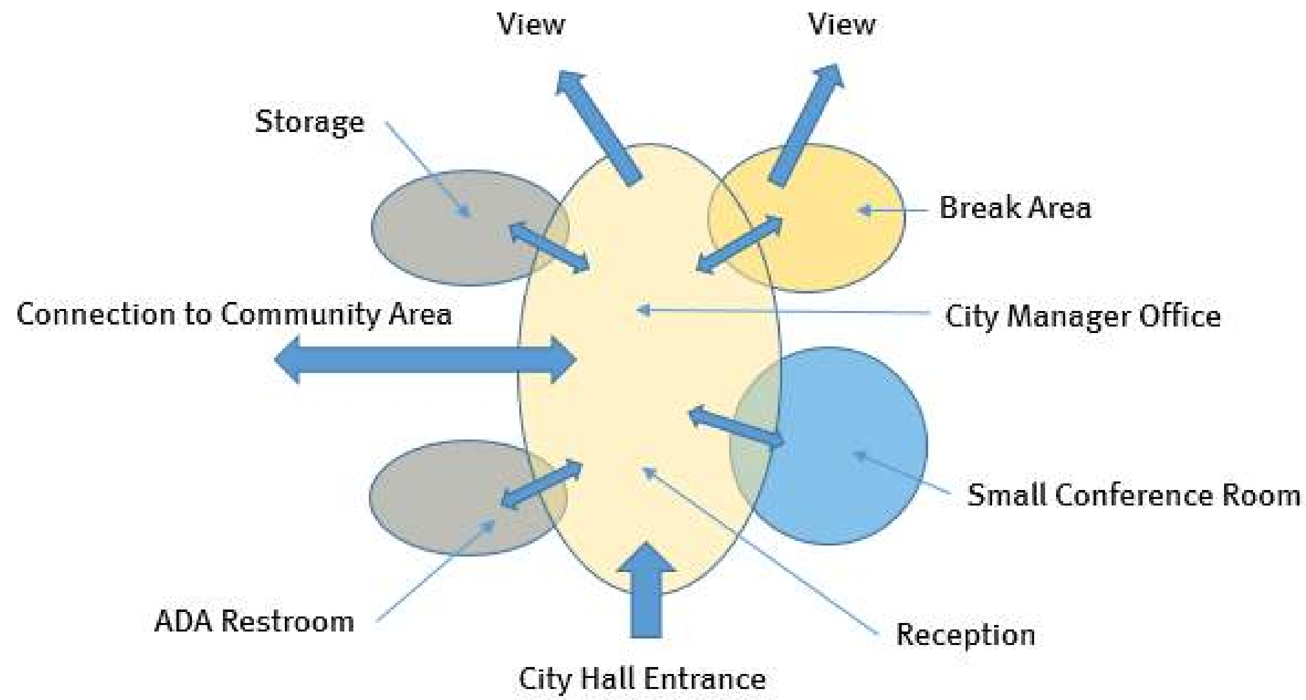
Finalize negotiations with UPRR to confirm level of financial participation, as well as to obtain ownership of the property.

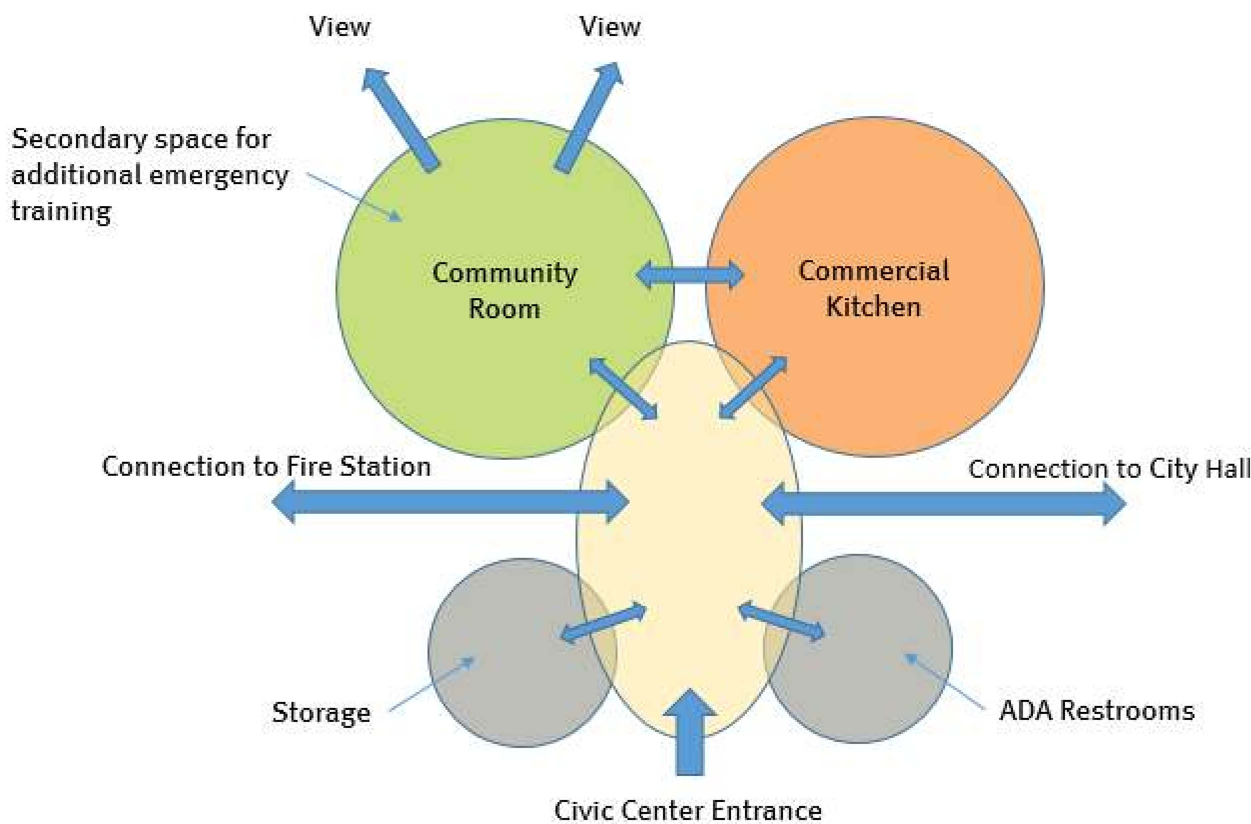
Secure funding for the Joint Use Facility. Refer to the Next Steps portion of the Funding Narrative for a recommended approach (Appendix F).

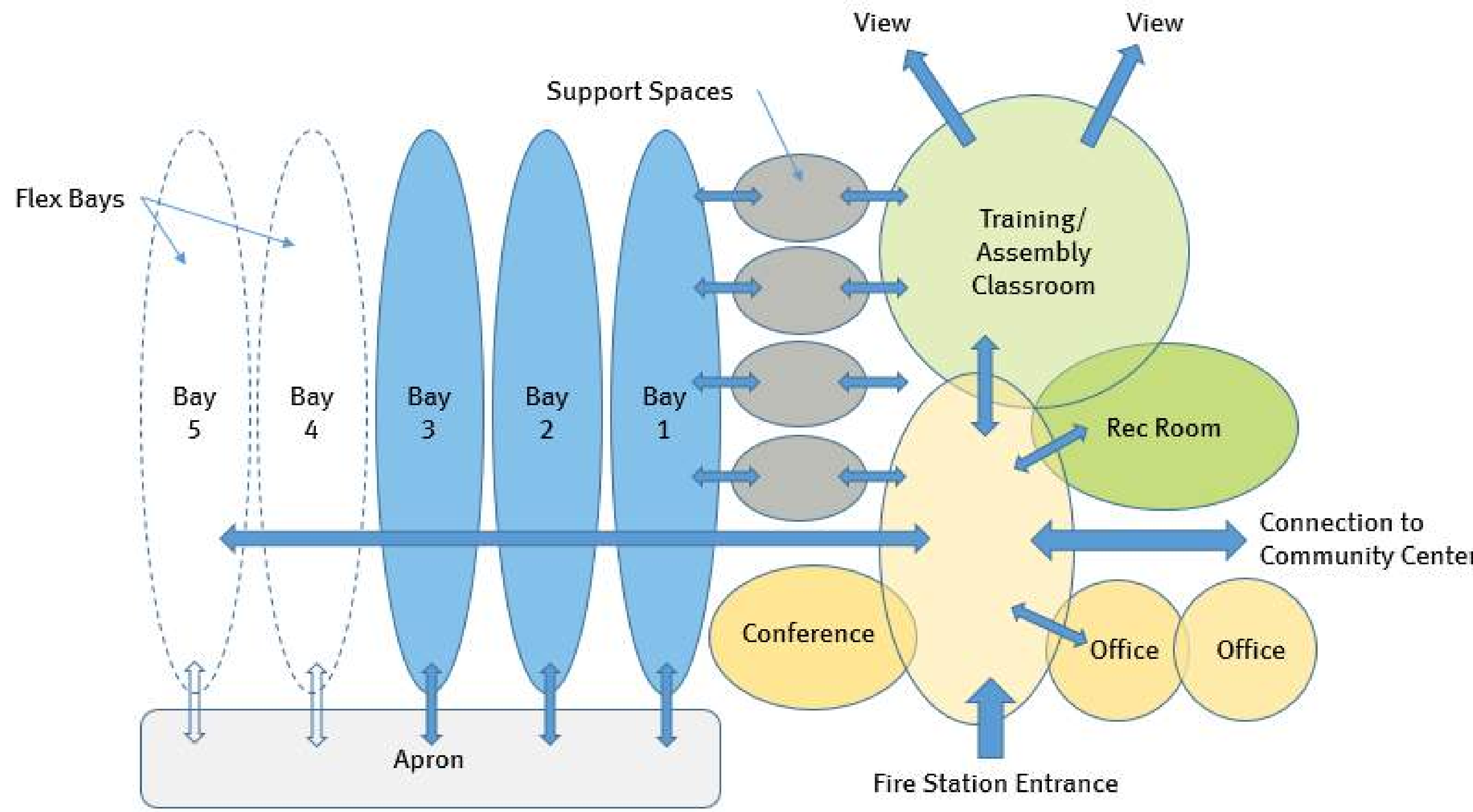
Obtain additional survey and geotechnical site information. Information that currently exists has been adequate for the feasibility study, but more will be needed for the design and engineering of the JUF.

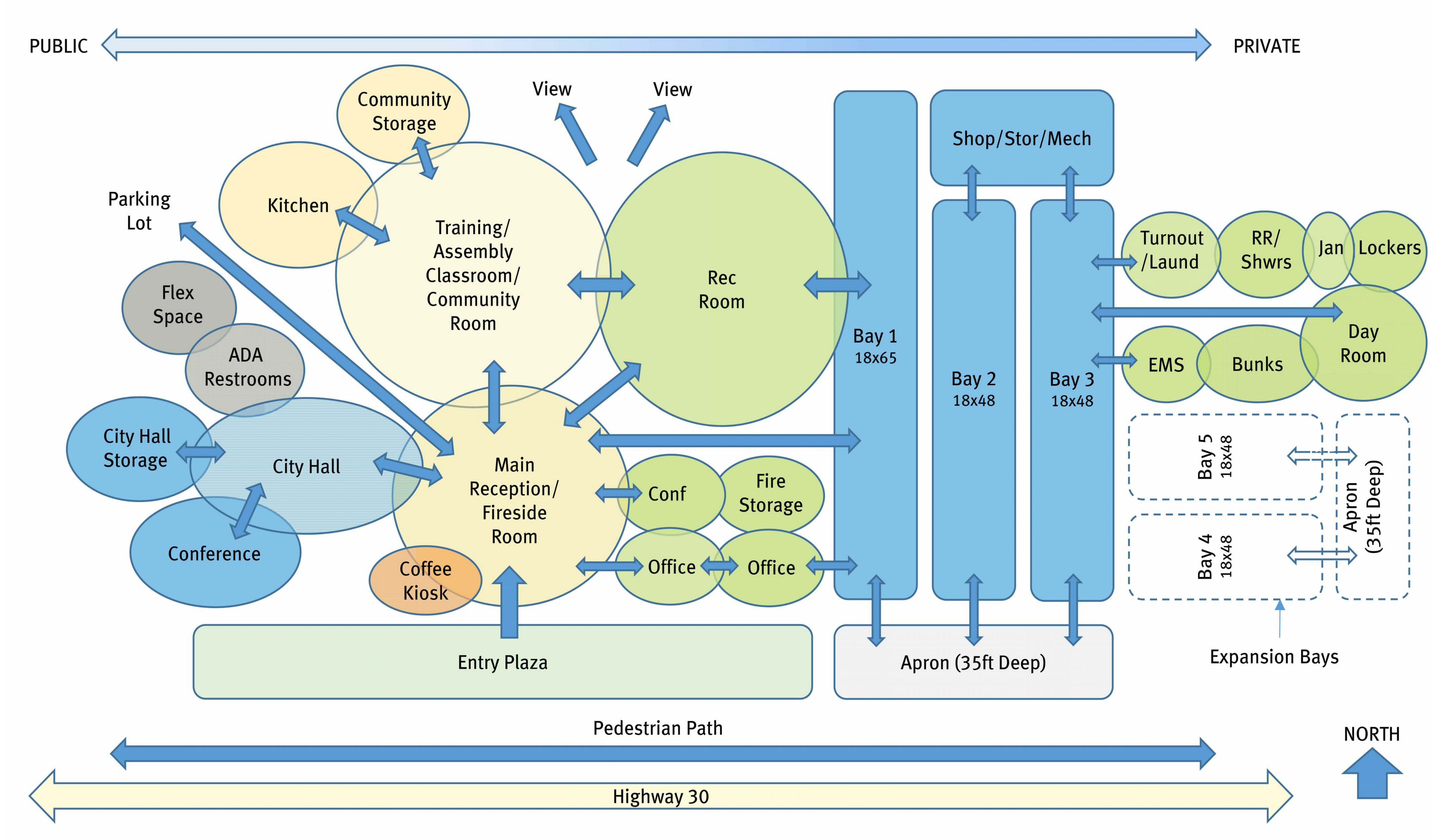
Assemble design team to establish schedule milestones, continue planning, programming and design refinement, explore design aesthetics, and refine project cost based on design results.

Appendix A - JUF Conceptual Space Diagrams


View
View
Storage
Break Area
Connection to Community Area
City Manager Office
Small Conference Room
ADA Restroom
Reception
City Hall Entrance


View
View
Secondary space for additional emergency training
Community Room
Commercial Kitchen
Connection to Fire Station
Connection to City Hall
Storage
ADA Restrooms
Civic Center Entrance


View
View
Support Spaces
Flex Bays
Training/ Assembly Classroom
Bay 5
Bay 4
Bay 3
Bay 2
Bay 1
Rec Room
Connection to Community Center
Conference
Office
Office
Apron
Fire Station Entrance


PUBLIC
PRIVATE
Community Storage
View
View
Kitchen
Training/ Assembly Classroom/ Community Room
Rec Room
Parking Lot
Flex Space
ADA Restrooms
City Hall Storage
City Hall
Conference
Main Reception/ Fireside Room
Coffee Kiosk
Conf
Fire Storage
Office
Office
Shop/Stor/Mech
Bay 1 18x65
Bay 2 18x48
Bay 3 18x48
Turnout /Laund
RR/ Shwrs
Jan
Lockers
Day Room
EMS
Bunks
Bay 5 18x48
Bay 4 18x48
Apron (35ft Deep)
Expansion Bays
Entry Plaza
Apron (35ft Deep)
Pedestrian Path
Highway 30
NORTH

Appendix B - JUF Conceptual Floor Plans


8/22/2017 1:52:32 PM
C:\Revit-local\Revit 2017 Local\16024 Mosier Joint Use Facility_hearchmoreland.rvt
FIRE RATED AND ACOUSTIC WALL ASSEMBLY FACING TRACKS
50 FT SETBACK FROM TRACKS
PROPANE BACKUP GENERATOR BELOW
KITCHEN CAN EXPAND IF COMMERICAL KITCHEN IS PURSUED
EXISTING LANDSCAPE
STORAGE 199 SF
COMMUNITY/ FIRE TRAINING CLASSROOM 1,227 SF
ROLL-UP DOOR/ OPERABLE WALL
RECREATION ROOM 861 SF
SHOP/ STORAGE/ MECH. 578 SF
UNISEX SHWR/TLT 96 SF
UNISEX TLT 86 SF
JANITOR 63 SF
KITCHEN 203 SF
POTENTIAL USES:
-FIRE TRAINING CLASSROOM
-CITY COUNCIL MEETINGS
-COURTROOM
-COMMUNITY EVENTS
-FACILITIES RENTAL
TURNOUT/ LAUNDRY 131 SF
LOCKER ROOM 165 SF
BAY 1 (18' x 65')
BAY 2 (18' x 48')
BAY 3 (18' x 48')
WOMENS 144 SF
MENS 113 SF
ESPRESSO CART
LOCKABLE MUSEUM STORAGE
DAY ROOM 371 SF
EMS 111 SF
BUNK 111 SF
BUNK 111 SF
KITCHENETTE
4
3
2
1
FLEX SPACE 102 SF
LIBRARY / ACTIVITY SHELVING / MUSEUM DISPLAY
CONF 194 SF
FIRE STOR 130 SF
STORAGE 102 SF
FIREPLACE/ HEARTH
VISITOR INFO
APPARATUS BAYS 4,650 SF
EXPANSION BAY 4 (18' x 48')
ADA PARKING / LOADING
MAIN RECEPTION/ FIRESIDE 871 SF (26' x 34')
CONF ROOM 112 SF
CITY HALL 217 SF
OFFICE 112 SF
OFFICE 112 SF
APRON
12' x 12' DOOR
RECEPTION WINDOWS
EXPANSION BAY 5 (18' x 48')
24'
LANDSCAPE
(6) SHORT TERM BIKE SPACES
LANDSCAPE
35'
APRON
ENTRY PLAZA
PEDESTRIAN PATH
LANDSCAPE
STREET TREES
54'
HIGHWAY 30
PROJECT NORTH
0' 2' 4' 8' 16'

Hennebery Eddy Architects

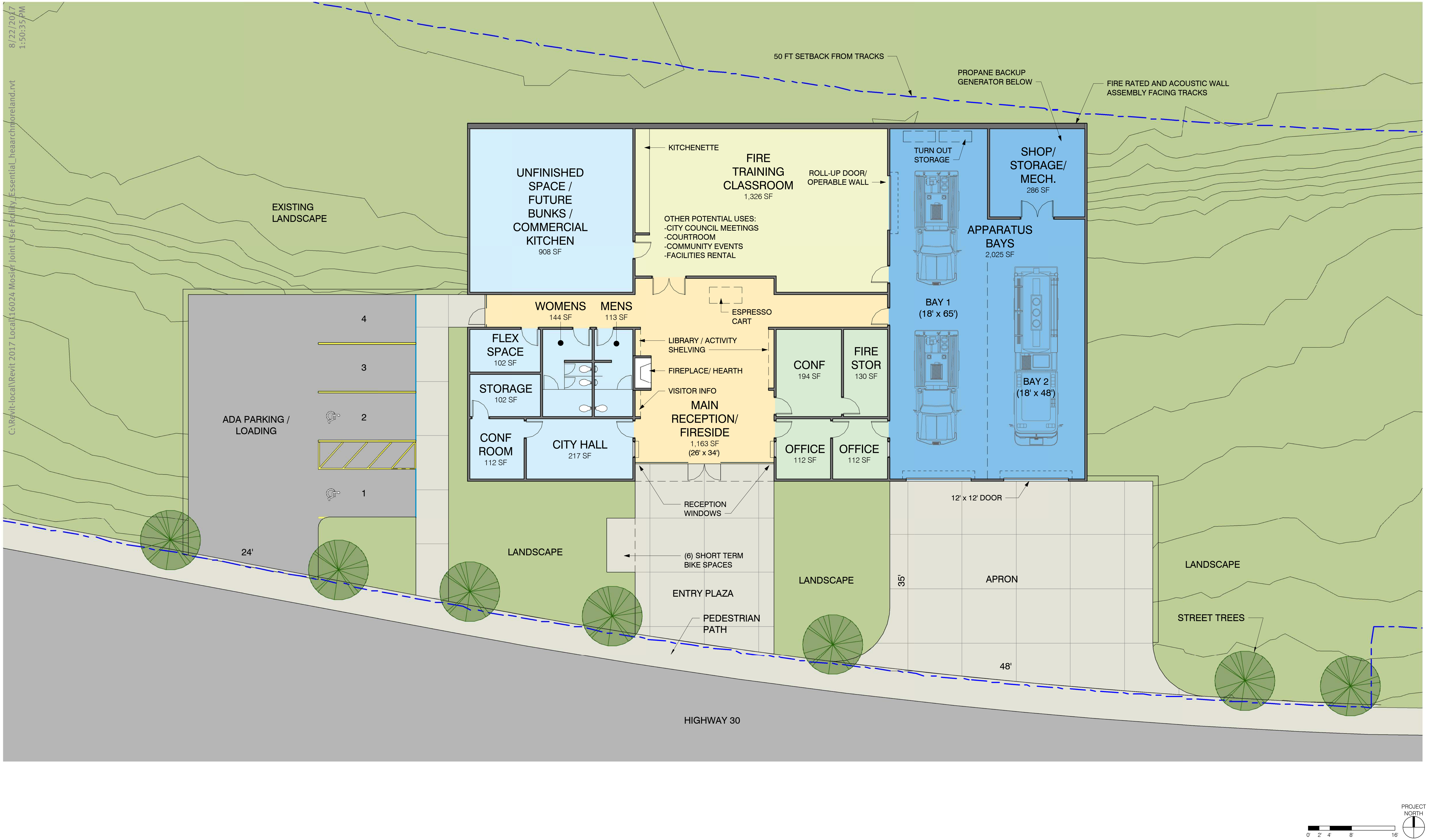
MOSIER FIRE DISTRICT | CITY OF MOSIER | JOINT USE FACILITY

EXPANDED - FLOOR PLAN

Hennebery Eddy Architects

MOSIER FIRE DISTRICT | CITY OF MOSIER | JOINT USE FACILITY

ESSENTIAL - FLOOR PLAN

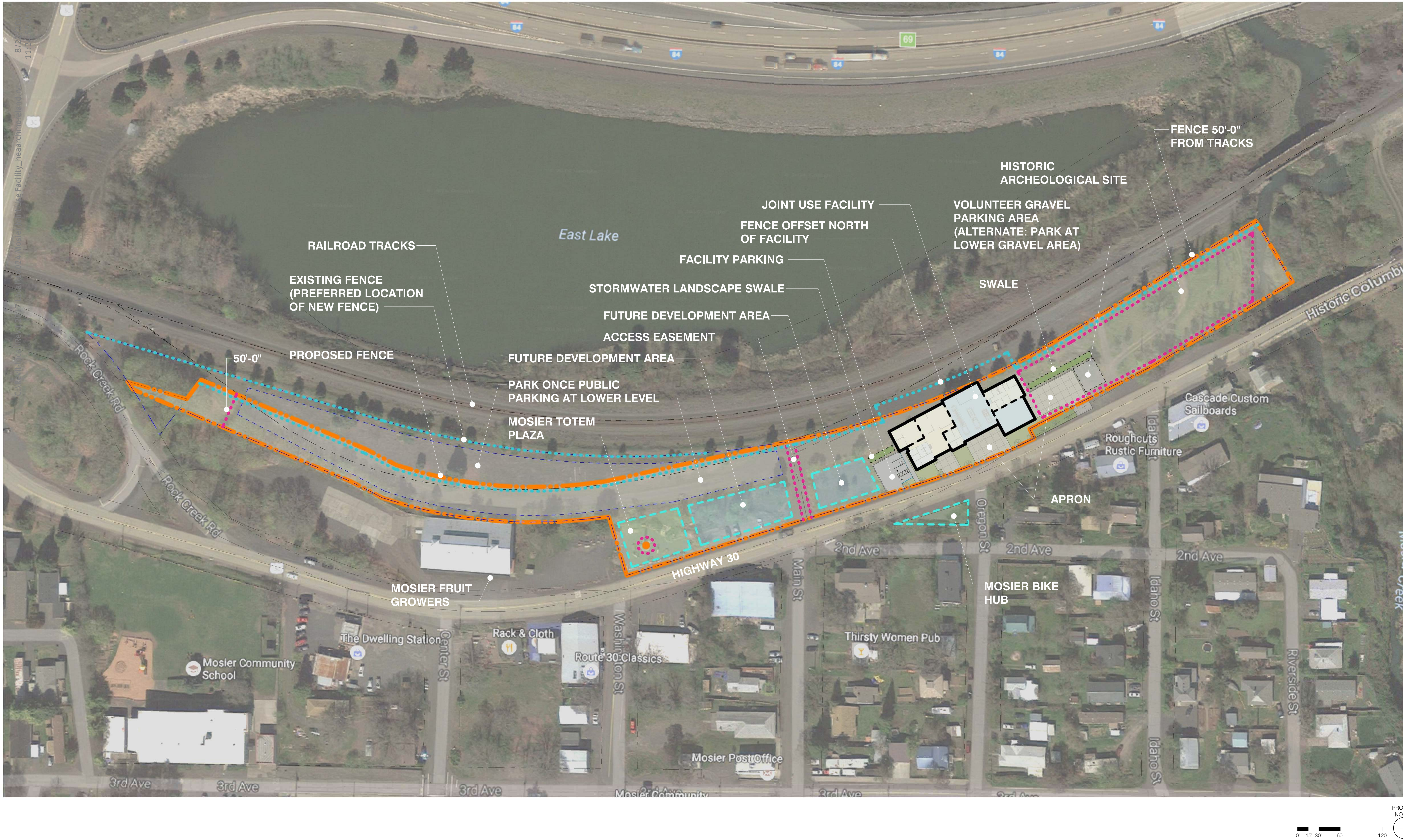


Hennebery Eddy Architects

MOSIER FIRE DISTRICT | CITY OF MOSIER | JOINT USE FACILITY

ESSENTIAL SITE OPTIMIZED - FLOOR PLAN

Appendix C - JUF Conceptual Site Plan



Hennebery Eddy
Architects

MOSIER FIRE DISTRICT | CITY OF MOSIER | JOINT USE FACILITY

OVERALL SITE PLAN
1" = 60' - 0"

Appendix D - Geotechnical Report

Carlson Geotechnical
A Division of Carlson Testing, Inc.
Phone: (503) 601-8250
Fax: (503) 601-8254

Bend Office	**(541) 330-9155**
Eugene Office	**(541) 345-0289**
Salem Office	**(503) 589-1252**
Tigard Office	**(503) 684-3460**

Report of
Geotechnical Feasibility &
Preliminary Site-Specific Seismic Hazards Study
Mosier Fire Station
North of the Intersection of Main Street and Highway 30
Mosier, Oregon

CGT Project Number G1604493

Prepared for

Mr. Scott Moreland
Hennebery Eddy Architects, Inc.
921 SW Washington Street Suite 250
Portland, Oregon 97205

April 25, 2017

Carlson Geotechnical
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Tigard Office **(503) 684-3460**

April 25, 2017

Mr. Scott Moreland
Hennebery Eddy Architects, Inc.
921 SW Washington Street Suite 250
Portland, Oregon 97205

Report of
Geotechnical Feasibility &
Preliminary Site-Specific Seismic Hazards Study
Mosier Fire Station
North of the Intersection of Main Street and Highway 30
Mosier, Oregon

CGT Project Number G1604493

Dear Mr. Moreland:

Carlson Geotechnical (CGT), a division of Carlson Testing, Inc. (CTI), is pleased to submit this report summarizing the results of our geotechnical feasibility and site-specific seismic hazards study for the proposed Mosier Fire Station project. The site is located north of the intersection of 1st Avenue and Main Street in Mosier, Oregon. We performed our work in general accordance with CGT Proposal GP7112R2, dated May 17, 2016. Written authorization for our services was received on October 7, 2016, in the form of Hennebery Eddy Architects, Inc., contract 16024. Scheduling of the project was delayed due to complications arising from obtaining an access permit for the site. Drilling took place on April 10, 2017.

We appreciate the opportunity to work with you on this project. Please contact us at 503.601.8250 if you have any questions regarding this report.

Respectfully Submitted,
CARLSON GEOTECHNICAL

CERTIFIED OREGON RYAN T HOUSER E1914 ENGINEERING GEOLOGIST
EXPIRES 12/1/17

REGISTERED PROFESSIONAL ENGINEER 15764 OREGON January 21, 1992 WILLIAM M. WEYRAUCH
EXPIRES: 6.30.18

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ATTACHMENTS

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1.0 INTRODUCTION

Carlson Geotechnical (CGT), a division of Carlson Testing, Inc. (CTI), is pleased to submit this report summarizing the results of our geotechnical feasibility and site-specific seismic hazards study for the proposed Mosier Fire Station project. The site is located north of the intersection of 1st Avenue (Highway 30) and Main Street in Mosier, Oregon, as shown on the attached Figure 1.

1.1 Project Information

CGT developed an understanding of the proposed project based on our correspondence with you and a review of draft Version 1.3 of the Statement of Work and Delivery for the Mosier Joint Use Facility, prepared by the Oregon Transportation and Growth Management Program (TGM).

Based on our review, we understand the project will include:

- Construction of a new fire station building. The client provided us with the current design concept, which is shown on Figure 2. We understand the size and location of the building have not been finalized. We understand the new building will be one- to two-stories, concrete framed, and will incorporate a slab-on-grade floor. The western portion of the new building may incorporate a daylight basement. No detailed structural information has been provided; however, we anticipate that maximum column, continuous wall, and uniform floor slab loads will be less than 60 kips, 4 kips per lineal foot (klf), and 200 pounds per square foot (psf), respectively.
- No grading plans have been provided. Based on conversations with the design team, we understand the site may be filled up to about 15 feet above existing grades. A retaining wall may be located along the northern portion of the site to accommodate site grading.
- Installation of appurtenant flexible and rigid pavements and underground utilities.
- We understand storm water collected from impervious surfaces may be discharged into an onsite infiltration system. Infiltration system design will rest with others. We understand infiltration testing will be performed during a later phase of the investigation.

1.2 Scope of Work

The purpose of this report is to provide an evaluation of the feasibility of constructing the proposed fire station at the site. We understand that additional geotechnical and geologic engineering services will be completed prior to developing final plans for the proposed fire station if the design team elects to pursue the project following the feasibility study.

Our scope of work for the feasibility study included the following:

- Contact the Oregon Utilities Notification Center and arrange for a private utility locating contractor to mark the locations of public utilities at the site within a 20-foot radius of our planned explorations.
- Obtain a right-of-way permit from the Oregon Department of Transportation (ODOT) for drilling adjacent to Highway 30.
- Explore subsurface conditions at the site by advancing one drilled boring to a depth of about 31 feet below ground surface (bgs) using a truck-mounted drill rig provided and operated by our drilling subcontractor. The field exploration is summarized in Appendix A.

- Classify the soils encountered in the boring in general accordance with the Visual-Manual procedure (ASTM D2488). Bedrock encountered in the boring was classified in general accordance with the ODOT Rock Classification Criteria.
- Collect representative disturbed and relatively undisturbed samples of the soils and rock encountered within the explorations in order to confirm our field classifications.
- Conduct a preliminary Site-Specific Seismic Hazards Study (SSSHS) in general accordance with the requirements of Section 1803.3.2 of the 2014 Oregon Structural Specialty Code (OSSC). The results of the SSSHS are presented in Appendix B.
- Provide this written report summarizing the results of our geotechnical feasibility investigation, preliminary site-specific seismic hazards study, and preliminary geotechnical recommendations for the project.

2.0 SITE DESCRIPTION

2.1 Site Geology

Based on available geologic mapping[1] of the area, the site is underlain by Holocene and Pleistocene alluvium over Tertiary Columbia River Basalt. See Section B.2.0 in Appendix B for further discussion.

2.2 Site Surface Conditions

The site consisted of about 1½-acres between Highway 30 (1st Avenue) to the south and the Union Pacific Railroad to the north. The site generally descended gently to the north below Highway 30 at gradients generally less than about 8 horizontal to 1 vertical (8H:1V), steepening to about 2H:1V near the base of the slope at the north end of the proposed building pad. A gravel-surfaced roadway crossed the northern portion of the proposed building pad parallel to the railroad tracks. Vegetation on the site consisted of grasses with scattered trees. Photographs of the site taken during our field investigation are attached as Figure 3.

2.3 Subsurface Conditions

2.3.1 Subsurface Investigation

Our subsurface investigation consisted of the advancement of one boring (B-1) completed on April 10, 2017. The scope of work for this feasibility study originally included advancing one boring at the approximate center of the proposed fire station. Due to complications regarding obtaining an access permit from the current property owner, Union Pacific Railroad, the boring was advanced in the ODOT right-of-way immediately adjacent to the site.

The approximate exploration location is shown on the Site Plan, attached as Figure 2. In summary, the boring was advanced to a depth of about 31 feet bgs and terminated in hard basalt bedrock. Details regarding the subsurface investigation and a log of the exploration are presented in Appendix A.

2.3.2 Soil

The following describes each of the subsurface materials encountered at the site.

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1 Ma, Madin, Duplantis, and Williams, 2012, Lidar-based Surficial Geologic Map and Database of the Greater Portland, Oregon, Area, Clackamas, Columbia, Marion, Multnomah, Washington, and Yamhill Counties, Oregon, and Clark County, Washington Oregon Department of Geology and Mineral Industries Open-File Report O-12-02.

2.3.2.1 Undocumented Fill

Undocumented Poorly Graded Gravel Fill (GP Fill): Undocumented poorly graded gravel fill was encountered at the surface of the boring. Undocumented fill refers to materials placed without (available) records of subgrade conditions or evaluation of compaction. The poorly graded gravel fill was typically gray, moist, angular, and up to about 2 inches in diameter. The undocumented fill extended to a depth of about ¼ foot bgs.

2.3.2.2 Alluvium

Silty Sand (SM): Underlying the undocumented fill was silty sand. The silty sand was typically loose, brown, moist, fine-grained, and extended to a depth of about 1½ feet bgs. The upper ¾-foot of the silty sand contained trace very fine roots.

Poorly Graded Sand with Gravel (SP): Underlying the silty sand was poorly graded sand with gravel, which was typically dense, brown to gray, moist, fine- to coarse-grained, and contained subangular gravel up to 1½ inches in diameter. This soil extended to a depth of about 3 feet bgs in the boring.

Poorly Graded Gravel with Sand (GP): Underlying the poorly graded sand with gravel was poorly graded gravel with sand. This soil was typically dense to very dense, brown to gray, moist, angular to subangular, up to about 1½-inches in diameter, and contained medium- to coarse grained sand. Based on drilling action, this soil contained a moderate amount of cobbles and boulders. This soil extended to a depth of about 18 feet bgs in the boring.

The silty sand (SM), poorly graded sand (SP), and poorly graded gravel (GP) were consistent with descriptions by others of Holocene and Pleistocene alluvium mapped in the vicinity of the site and discussed in Section B.2.0 in Appendix B.

2.3.2.3 Bedrock

Basalt Bedrock (RX): Underlying the alluvium was native basalt bedrock. The basalt bedrock was typically medium hard (R3), dark gray to black, highly fractured, and exhibited some secondary mineralization. Coring revealed very poor return and the core indicated a poor rock quality designation (RQD). We anticipate the RQD improves with increased depth below the surface of the basalt.

The basalt was consistent with descriptions by others of the Columbia River Basalt mapped within the vicinity of the site.

2.3.3 Groundwater

Groundwater was not encountered during our exploration on April 10, 2017. We researched available water well logs located within Section 1, Township 2 North, Range 11 East, Willamette Meridian, on the Oregon Water Resources Department (OWRD)[2] website. Our review indicated that groundwater levels in the area varied with surface elevations and ranged from about 30 to 100 feet bgs, and generally coincides with the

[2] Oregon Water Resources Department, 2017. Well Log Records, *accessed April 2017*, from OWRD web site: http://apps.wrd.state.or.us/apps/gw/well_log/.

surface of the nearby Columbia River. It should be noted the groundwater levels reported on the OWRD logs often reflect the purpose of the well, so water well logs may only report deeper, confined groundwater, while geotechnical or environmental borings will often report any groundwater encountered, including shallow, unconfined groundwater. Therefore, the levels reported on the OWRD well logs referenced above are considered generally indicative of local water levels and may not reflect actual groundwater levels at the project site.

3.0 SITE-SPECIFIC SEISMIC HAZARDS STUDY

3.1 Overview

We performed a Site-Specific Seismic Hazards Study for the site in accordance with Section 1803 of the 2014 Oregon Structural Specialty Code (OSSC). The complete results of our hazards study are presented in the attached Appendix B. The following conclusions highlight the results of our SSSHS:

- We conclude the potential for seismically-induced liquefaction settlement at the site is very low.
- We conclude there is a very low risk of surface rupture from faulting.
- We conclude there is a very low risk of surface rupture from lateral spread.
- We conclude there is a low risk of slope instability from a design-level earthquake.
- We conclude there is a negligible risk of tsunami/seiche inundation at this site.

3.2 Seismic Ground Motion Values

Earthquake ground motion parameters for the site were obtained based on the United States Geological Survey (USGS) Seismic Design Values for Buildings - Ground Motion Parameter Calculator[3]. The following table shows the recommended seismic design parameters for the site.

Table 1 Seismic Ground Motion Values

Parameter		Value
Mapped Acceleration Parameters	Spectral Acceleration, 0.2 second (S_s)	0.522g
	Spectral Acceleration, 1.0 second (S_1)	0.240g
Coefficients (Site Class C)	Site Coefficient, 0.2 sec. (F_a)	1.191
	Site Coefficient, 1.0 sec. (F_v)	1.560
Adjusted MCE Spectral Response Parameters	MCE Spectral Acceleration, 0.2 sec. (S_{MS})	0.622g
	MCE Spectral Acceleration, 1.0 sec. (S_{M1})	0.374g
Design Spectral Response Accelerations	Design Spectral Acceleration, 0.2 seconds (S_{DS})	0.415g
	Design Spectral Acceleration, 1.0 second (S_{D1})	0.249g
Seismic Design Category		D

4.0 CONCLUSIONS

The current assignment included a feasibility-level study. The limitations of this feasibility-level study should be considered before using the recommendations contained later in this report for design. Additional geotechnical investigation and review is recommended prior to final design.

[3] United States Geological Survey, 2017. Seismic Design Parameters determined using:, "U.S. Seismic Design Maps Web Application," *accessed April 2017*, from the USGS website *http://earthquake.usgs.gov*.

Based on the results of our field explorations and analyses, the site may be developed as described in Section 1.1, provided the recommendations presented in this report are incorporated into the design and development. We conclude the primary geotechnical considerations at this site are that cobbles, boulders, and bedrock that may be encountered at subgrade elevations. The near-surface soil (SM) contained a high fines content and is susceptible to disturbance during wet weather.

Geotechnical considerations for this project are summarized in the following sections.

4.1 Feasibility-Level Study

The feasibility-level effort of this study should be considered. CGT was only able to perform our feasibility exploration within the southeastern portion of the site due to access constraints. CGT recommends that we advance additional borings within the building footprint to determine subsurface conditions and to refine our recommendations for the proposed building. CGT will prepare a proposal to perform the additional explorations and geotechnical evaluation once the building location and facility layout has been finalized.

4.2 Cobbles and Boulders at Foundation/Floor Slab/Pavement Subgrade

Based on our explorations, the native alluvium contains cobbles and boulders. Depending on the final design elevations, cobbles and boulders may be encountered at design subgrade elevations for shallow foundations, floor slabs, or pavements. Structural elements placed directly on boulders and cobbles can result in uneven ground response. To minimize this potential, CGT recommends:

- Boulders encountered during foundation, floor slab, and pavement subgrade preparation should be removed in their entirety and replaced with granular structural fill.
- Foundation subgrades should be covered with a minimum of 3 inches of angular structural fill compacted to a well-keyed condition.

4.3 Basalt Bedrock at Foundation and Utility Subgrade

Basalt bedrock was encountered at a depth of about 18 feet in the exploratory boring. Due to the preliminary nature of our subsurface investigation (consisting of one boring), and the conceptual nature of the building design, we cannot currently determine if intact basalt bedrock will be encountered during development of the site. Foundation excavations for the proposed retaining wall along the north end of the site and utility installations <u>may</u> encounter basalt bedrock. The upper portion of the bedrock was highly fractured, and can likely be excavated using conventional earthwork equipment. If hard (unfractured) bedrock is encountered during construction, we anticipate that hydraulic hammering of the basalt will be required to facilitate removal.

5.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

The preliminary recommendations presented in this report are based on the information provided to us, results of our field investigation and analyses, laboratory data, and professional judgment. CGT has observed only a small portion of the pertinent subsurface conditions. The recommendations are based on the assumptions that the subsurface conditions do not deviate appreciably from those found during the field investigation. CGT should be consulted for further recommendations if the design of the proposed development changes and/or variations or undesirable geotechnical conditions are encountered during site development.

This report is considered preliminary, as we have not performed final subsurface investigation, or reviewed final grading plans, finished floor elevations, and detailed structural information for the development. We understand that future geotechnical work will include additional subsurface exploration and geotechnical evaluation.

5.1 Site Preparation

5.1.1 Site Stripping

Existing vegetation, topsoil, and undocumented fills (GP Fill) should be removed from proposed building and pavement areas, and for a 5-foot-margin around such locations. Based on the results of our field explorations, stripping depths at the site are anticipated to extend to approximately ¼- to ½-foot bgs across the majority of the site. These materials may be deeper or shallower at locations away from our exploration. The geotechnical engineer or his representative should provide recommendations for actual stripping depths based on observations during site stripping. Stripped topsoil and rooted soils should be transported off-site for disposal, or stockpiled for later use in landscaped areas. Undocumented gravel fill (GP Fill) may be stockpiled for later re-use as structural fill, as discussed in Section 5.4.1.2.

5.1.2 Existing Utilities & Below-Grade Structures

All existing utilities at the site should be identified prior to excavation. Abandoned utility lines beneath the new building, pavements, and hardscaping features should be completely removed or grouted full. Soft, loose, or otherwise unsuitable soils encountered in utility trench excavations should be removed and replaced with structural fill in conformance with Section 5.4 this report. Buried structures (i.e. footings, foundation walls, retaining walls, slabs-on-grade, tanks, etc.), if encountered during site development, should be completely removed and replaced with structural fill in conformance with Section 5.4.

5.1.3 Erosion Control

Erosion and sedimentation control measures should be employed in accordance with applicable City, County, and State regulations.

5.2 Temporary Excavations

5.2.1 Overview

Conventional earthmoving equipment in proper working condition should be capable of making necessary excavations for the anticipated site cuts as described earlier in this report. While not currently planned or anticipated, excavations deeper than 18 feet may encounter basalt bedrock, which may require the use of hydraulic hammers and/or other specialized rock excavation equipment. We anticipate bedrock will be encountered at a shallower depth on the north end of the site. CGT recommends the future geotechnical investigation include borings along the length of the proposed retaining wall to be constructed along the north end of the site to identify depth to bedrock.

All excavations should be in accordance with applicable OSHA and state regulations. It is the contractor's responsibility to select the excavation methods, to monitor site excavations for safety, and to provide any shoring required to protect personnel and adjacent improvements. A “competent person”, as defined by OR-OSHA, should be on-site during construction in accordance with regulations presented by OR-OSHA. CGT’s current role on the project does not include review or oversight of excavation safety.

5.2.2 OSHA Soil Type

For use in the planning and construction of temporary excavations up to 10 feet in depth, an OSHA soil type of “C” can be used for the coarse-grained alluvial soils (SM, SP, GP) encountered near the surface of the site. We anticipate the upper portion of the basalt bedrock will be highly fractured, and an OSHA soil type of “C” should be used for planning purposes. If excavations encounter fresh (unfractured) basalt bedrock, the geotechnical engineer can provide additional recommendations regarding OSHA soil type.

5.2.3 Utility Trenches

Caving was observed within the native alluvial soils (SM, SP, GP) in the boring, and should be anticipated during earthwork. Additional instability may occur if the side walls are allowed to dry or if seepage occurs. If seepage undermines the stability of the trench, or if sidewall caving is observed during excavation, the sidewalls should be flattened or shored. If groundwater is present at the base of utility excavations, we recommend placing trench stabilization material at the base of the excavations. Trench stabilization material should be in conformance with Section 5.4.3.

5.2.4 Excavations Near Foundations

Excavations near footings should not extend within a 1½H:1V (horizontal:vertical) plane projected out and down from the outside, bottom edge of the footings. In the event excavation needs to extend below the referenced plane, temporary shoring of the excavation and/or underpinning of the subject footing may be required. The geotechnical engineer should be consulted to review proposed excavation plans for this design case to provide specific recommendations.

5.3 Wet Weather Considerations

For planning purposes, the wet season should be considered to extend from late September to late June. It is our experience that dry weather working conditions should prevail between early July and mid-September. Notwithstanding the above, soil conditions should be evaluated in the field by the geotechnical engineer or his representative at the initial stage of site preparation to determine whether the recommendations within this section should be incorporated into construction.

5.3.1 Overview

Due to its fines content, the near-surface silty sand (SM) is susceptible to disturbance during wet weather. Trafficability of these soils may be difficult, and significant damage to subgrade soils could occur, if earthwork is undertaken without proper precautions at times when the exposed soils are more than a few percentage points above optimum moisture content. For wet weather construction, site preparation activities may need to be accomplished using track-mounted equipment, loading removed material onto trucks supported on granular haul roads, or other methods to limit soil disturbance. The geotechnical engineer or his representative should evaluate the subgrade during excavation by probing rather than proof rolling. Soils that have been disturbed during site preparation activities, or soft or loose areas identified during probing, should be over-excavated to firm, stable subgrade, and replaced with granular structural fill in conformance with Section 5.4.2.

5.3.2 Geotextile Separation Fabric

CGT recommends that a geotextile separation fabric be placed as a barrier between the prepared subgrade and granular fill/base rock in areas of repeated or heavy construction traffic. The geotextile fabric should meet the requirements presented in the current Oregon Department of Transportation (ODOT) Standard Specification for Construction, Section 02320.

5.3.3 Granular Working Surfaces (Haul Roads & Staging Areas)

Haul roads subjected to repeated heavy, tire-mounted, construction traffic (e.g. dump trucks, concrete trucks, etc.) will require a minimum of 18 inches of granular material. For light staging areas, 12 inches of granular material should be sufficient. Additional granular material or geo-grid reinforcement may be recommended based on site conditions and/or loading at the time of construction. The granular material should be in conformance with Section 5.4.2 and have less than 5 percent material passing the U.S. Standard No. 200 Sieve. The prepared subgrade should be covered with geotextile fabric prior to placement of the granular material. The granular material should be placed in a single lift (up to 24 inches deep) and compacted using a smooth-drum, non-vibratory roller until well-keyed.

5.4 Structural Fill

The geotechnical engineer should be provided the opportunity to review all materials considered for use as structural fill (prior to placement). Samples of the proposed fill materials should be submitted to the geotechnical engineer a minimum of 5 business days prior their use on site[4]. The geotechnical engineer or his representative should be contacted to evaluate compaction of structural fill as the material is being placed. Evaluation of compaction may take the form of in-place density tests and/or proof roll tests with suitable equipment. Structural fill should be evaluated at intervals not exceeding every 2 vertical feet as the fill is being placed.

5.4.1 On-Site Soils – General Use

5.4.1.1 Silty Sand (SM)
Re-use of the on-site, native, silty sand (SM) as structural fill may be difficult because this soil is sensitive to small changes in moisture content and is difficult, if not impossible, to adequately compact during wet weather. We anticipate the moisture content of this soil will be higher than the optimum moisture content for satisfactory compaction. Therefore, moisture conditioning (drying) should be expected in order to achieve adequate compaction. If used as structural fill, this soil should be kept (or processed, if required) free of organic matter, debris, and particles larger than 1½ inches. When used as structural fill, this soil should be placed in lifts with a maximum thickness of about 8 inches at moisture contents within –1 and +3 percent of optimum, and compacted to not less than 92 percent of the material's maximum dry density, as determined in general accordance with ASTM D1557 (Modified Proctor).

5.4.1.2 Poorly Graded Gravel Fill (GP), Poorly Graded Sand (SP), Poorly Graded Gravel (GP)
Re-use of the on-site, relatively clean, granular native and fill soils as structural fill is feasible, provided these materials are kept clean of organics, debris, and particles larger than 4 inches in diameter. If reused as structural fill, these materials should be prepared in general accordance with Section 5.4.2.

If the on-site materials cannot be properly moisture-conditioned and/or processed, we recommend using granular material for structural fill.

[4] Laboratory testing for moisture density relationship (Proctor) is required. Tests for gradation may be required.

5.4.2 Granular Structural Fill – General Use

Granular structural fill should consist of angular pit or quarry run rock, crushed rock, or crushed gravel that is fairly well graded between coarse and fine particle sizes. The granular fill should contain no organic matter, debris, or particles larger than 2 inches, and have less than 5 percent material passing the U.S. Standard No. 200 Sieve. The percentage of fines can be increased to 12 percent of the material passing the U.S. Standard No. 200 Sieve if placed during dry weather, and provided the fill material is moisture-conditioned, as necessary, for proper compaction. Granular fill material should be compacted to not less than 95 percent of the material's maximum dry density, as determined in general accordance with ASTM D1557 (Modified Proctor). Proper moisture conditioning and the use of vibratory equipment will facilitate compaction of these materials.

Granular fill materials with high percentages of particle sizes in excess of 1½ inches are considered non-moisture-density testable materials. As an alternative to conventional density testing, compaction of these materials should be evaluated by proof roll test observation (deflection tests), where accepted by the geotechnical engineer.

5.4.3 Trench Base Stabilization Material

If groundwater is present at the base of utility excavations, trench base stabilization material should be placed. Trench base stabilization material should consist of a minimum of 1 foot of well-graded granular material with a maximum particle size of 4 inches and less than 5 percent material passing the U.S. Standard No. 40 Sieve. The material should be free of organic matter and other deleterious material, placed in one lift, and compacted until well-keyed.

5.4.4 Trench Backfill Material

Trench backfill for the utility pipe base and pipe zone should consist of granular material as recommended by the utility pipe manufacturer. In the absence of manufacturer recommendations, the trench backfill above the pipe zone should consist of well-graded granular material containing no organic matter or debris, have a maximum particle size of ¾ inch, and have less than 8 percent material passing the U.S. Standard No. 200 Sieve. As a guideline, trench backfill should be placed in maximum 12-inch-thick lifts. The earthwork contractor may elect to use alternative lift thicknesses based on their experience with specific equipment and fill material conditions during construction in order to achieve the required compaction. The following table presents recommended relative compaction percentages for utility trench backfill.

Table 2 Utility Trench Backfill Compaction Recommendations

Backfill Zone	Recommended Minimum Relative Compaction	
	Structural Areas[1]	Landscaping Areas
Pipe Base and Within Pipe Zone	90% ASTM D1557 or pipe manufacturer's recommendation	88% ASTM D1557 or pipe manufacturer's recommendation
Above Pipe Zone	92% ASTM D1557	90% ASTM D1557
Within 3 Feet of Design Subgrade	95% ASTM D1557	90% ASTM D1557

[1] Includes proposed building, pavement areas, structural fill areas, exterior hardscaping, etc.

5.5 Permanent Slopes

5.5.1 Overview

Permanent cut or fill slopes constructed at the site should be graded at 2H:1V or flatter. Constructed slopes should be overbuilt by a few feet depending on their size and gradient so that they can be properly compacted prior to being cut to final grade. The surface of all slopes should be protected from erosion by seeding, sodding, or other acceptable means. Adjacent on-site and off-site structures should be located at least 5 feet from the top of slopes.

5.5.2 Placement of Fill on Slopes

New fill should be placed and compacted against horizontal surfaces. Where existing slopes exceed 5H:1V (horizontal to vertical), the slopes should be keyed and benched prior to structural fill placement in general accordance with the attached Fill Slope Detail, Figure 4. If subdrains are needed on benches, subject to the review of the CGT geotechnical representative, they should be placed as shown on the attached Fill Slope Detail, Figure 4. In order to achieve well compacted slope faces, slopes should be overbuilt by a few feet and then trimmed back to proposed final grades. A representative from CGT should observe the benches, keyways, and associated subdrains, if needed, prior to placement of structural fill.

5.6 Shallow Foundations

5.6.1 Subgrade Preparation

Satisfactory subgrade support for shallow foundations can be obtained from the native, coarse-grained alluvium (SM, SP, GP), basalt bedrock, or new structural fill that is properly placed and compacted on these materials during construction. Boulders encountered during foundation excavation should be removed and replaced with granular structural fill. If footings will bear directly on the basalt bedrock (e.g. northern retaining wall footing), CGT recommends that a leveling coarse of at least 3 inches of granular structural fill (¾-inch maximum particle size) be placed on the bedrock prior to placing forms.

The geotechnical engineer or their representative should be contacted to observe subgrade conditions prior to placement of granular backfill. If soft, loose, or otherwise unsuitable soils are encountered, they should be over-excavated as recommended by the geotechnical representative at the time of construction. The resulting over-excavation should be brought back to grade with granular structural fill in conformance with Section 5.4.2. The maximum particle size of over-excavation backfill should be limited to 1½ inches generally and ¾ inch within 12 inches below structural elements. All granular pads for footings should be constructed a minimum of 6 inches wider on each side of the footing for every vertical foot of over-excavation.

5.6.2 Minimum Footing Width & Embedment

Minimum footing widths should be in conformance with the current OSSC. As a guideline, CGT recommends individual spread footings have a minimum width of 24 inches. We recommend continuous wall footings have a minimum width of 18 inches. All footings should be founded at least 18 inches below the lowest, permanent adjacent grade to develop lateral capacity and for frost protection.

5.6.3 Bearing Pressure & Settlement

Footings founded on the native dense, sand and gravel alluvium (SP, GP) as recommended above may be proportioned for a maximum allowable soil bearing pressure of 3,500 pounds per square foot (psf). Foundations bearing on the basalt bedrock may be proportioned for a maximum allowable soil bearing pressure of 5,000 psf. These bearing pressures are “net bearing pressures”, apply to the total of dead and long-term live loads, and may be increased by one-third when considering seismic or wind loads. For foundations founded as recommended above, total settlement of foundations is anticipated to be less than 1 inch. Differential settlements between adjacent columns and/or bearing walls should not exceed ½-inch. If an increased allowable soil bearing pressure is desired, the geotechnical engineer should be consulted.

5.6.4 Lateral Capacity

A maximum passive (equivalent fluid) earth pressure of 250 pounds per cubic foot (pcf) is recommended for design of footings confined by the native soils described above, or granular structural fill that is properly placed and compacted during construction. The recommended earth pressure was computed using a factor of safety of 1½, which is appropriate due to the amount of movement required to develop full passive resistance. In order to develop the above capacity, the following should be understood:

1. Concrete must be poured neat in excavations or the foundations must be backfilled with granular structural fill,
2. The adjacent grade must be level or rising,
3. The static ground water level must remain below the base of the footings throughout the year.
4. Adjacent floor slabs, pavements, or the upper 12-inch-depth of adjacent, unpaved areas should not be considered when calculating passive resistance.

An ultimate coefficient of friction equal to 0.45 may be used when calculating resistance to sliding for footings founded as recommended above.

5.6.5 Subsurface Drainage

For footings founded in the coarse grained, free-draining sand with gravel (SP) and gravel (GP), footing drains are not considered necessary. However, if footings are founded in fine-grained soils such as the silty sand encountered near the surface of the boring, placement of foundation drains is recommended at the outside base elevations of perimeter continuous wall footings. If used, foundation drains should consist of a minimum 4-inch diameter, perforated, PVC drainpipe wrapped with a non-woven geotextile filter fabric. The drains should be backfilled with a minimum of 2 cubic feet of open graded drain rock per lineal foot of pipe. The drain rock should also be encased in a geotextile fabric in order to provide separation from the surrounding soils. Foundation drains should be positively sloped and should outlet to a suitable discharge point. The geotechnical engineer or his representative should observe the drains prior to backfilling. Roof drains should not be tied into foundation drains.

5.7 Rigid Retaining Walls

5.7.1 Footings

Retaining wall footings should be designed and constructed in conformance with the recommendations presented in Section 5.6, as applicable.

5.7.2 Wall Drains

Regardless of the material type the wall retains or is founded on, we recommend placing a retaining wall drain at the base elevation of the heel of the retaining wall footing. Retaining wall drains should consist of a minimum 4-inch-diameter, perforated, HDPE (High Density Polyethylene) drainpipe wrapped with a non-woven geotextile filter fabric. The drains should be backfilled with a minimum of 2 cubic feet of open graded drain rock per lineal foot of pipe. The drain rock should be encased in a geotextile fabric in order to provide separation from the surrounding soils. Retaining wall drains should be positively sloped and should outlet to a suitable discharge point. The geotechnical engineer or his representative should be contacted to observe the drains prior to backfilling. Roof or area drains should not be tied into retaining wall drains.

5.7.3 Wall Backfill

Retaining walls should be backfilled with granular structural fill in conformance with Section 5.4.2 and contain less than 5 percent passing the U.S. Standard No. 200 Sieve. The backfill should be compacted to a minimum of 90 percent of the material's maximum dry density as determined in general accordance with ASTM D1557 (Modified Proctor). When placing fill behind walls, care must be taken to minimize undue lateral loads on the walls. Heavy compaction equipment should be kept at least "H" feet from the back of the walls, where "H" is the height of the wall. Light mechanical or hand tamping equipment should be used for compaction of backfill materials within "H" feet of the back of the walls.

5.7.4 Design Parameters & Limitations

For rigid retaining walls founded, backfilled, and drained as recommended above, the following table presents parameters recommended for design.

Table 3 Design Parameters for Rigid Retaining Walls

Retaining Wall Condition	Modeled Backfill Condition	Static Equivalent Fluid Pressure (S_A)	Seismic Equivalent Fluid Pressure (S_{AE})
Not Restrained from Rotation	Level (i = 0)	25 pcf	30 pcf
Restrained from Rotation	Level (i = 0)	44 pcf	50 pcf

Note 1: Refer to the attached Figure 5 for a graphical representation of static and seismic loading conditions. Seismic component of active thrust acts at 0.6H above the base of the wall.
Note 2: Seismic (dynamic) lateral loads were computed using the Mononobe-Okabe Equation as presented in the 1997 Federal Highway Administration (FHWA) design manual.

The above design recommendations are based on the assumptions that:

(1) The walls consist of concrete cantilevered retaining walls (β = 0 and δ = 24 degrees, see Figure 5).
(2) The walls are 10 feet or less in height.
(3) The backfill is drained and consists of granular structural fill (ϕ = 38 degrees).
(4) The grade behind the wall is level, or sloping down and away from the wall, for a distance of 10 feet or more from the wall (i = 0).
(5) The grade in front of the walls is level or sloping up for a distance of at least 5 feet from the wall.

Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project vary from these assumptions.

5.7.5 Surcharge Loads

Where present, surcharges from adjacent site features (i.e. buildings, slabs, pavements, vehicles, etc.) should be evaluated in design of retaining walls at the site. Methods for calculating lateral pressures on rigid retaining walls from strip, line, and vertical point loads are presented on the attached Figure 6.

5.8 Interior Floor Slabs

5.8.1 Subgrade Preparation

Satisfactory subgrade support for floor slabs constructed on grade, supporting up to 200 psf area loading, can be obtained from the native, coarse-grained alluvium (SM, SP, GP), basalt bedrock, or new structural fill that is properly placed and compacted on these materials during construction. Boulders encountered during foundation excavation should be removed and replaced with granular structural fill. The geotechnical engineer or his representative should observe floor slab subgrade soils to evaluate surface consistencies. If soft, loose, or otherwise unsuitable soils are encountered, they should be over-excavated as recommended by the CGT geotechnical representative at the time of construction. The resulting over-excavation should be brought back to grade with granular structural fill as described in Section 5.4.2.

5.8.2 Crushed Rock Base

Concrete floor slabs should be supported on a minimum 6-inch thick layer of crushed rock.

5.8.2.1 Floor Slabs in Non-Habitable Areas

Floor slab base rock under slabs in non-habitable areas (i.e., storage areas, exterior slabs, etc.) should consist of well-graded granular material (crushed rock) containing no organic matter or debris, have a maximum particle size of ¾-inch, and have less than 5 percent material passing the U.S. Standard No. 200 Sieve. Floor slab base rock should be placed in one lift and compacted to not less than 95 percent of the material's maximum dry density as determined in general accordance with ASTM D1557 (Modified Proctor). We recommend "choking" the surface of the base rock with fine sand just prior to concrete placement. Choking means the voids between the largest aggregate particles are filled with sand, but does not provide a layer of sand above the base rock. Choking the base rock surface reduces the lateral restraint on the bottom of the concrete during curing. Choking the base rock also reduces punctures in vapor retarding membranes due to foot traffic where such membranes are used.

5.8.2.2 Floor Slabs in Habitable Areas

Floor slab base rock in areas where radon gas mitigation is desired (i.e. under floor slabs within work areas and living spaces) should be supported on a minimum 6-inch-thick layer of gas-permeable base rock. The gas-permeable base rock should consist of open-graded crushed rock containing no organic matter or debris, with all material passing through a 2-inch sieve and retained on the ¼-inch sieve, in accordance with Section 1812.3.2, Bullet 1, of the 2014 OSSC.

Section 1812.3.3 of the 2014 OSSC recommends that a minimum 6-mil polyethylene sheeting (or 3-mil cross-laminated polyethylene sheeting), or equivalent material with equal or greater resistance to puncture, be placed on top of the gas-permeable base rock to act as a soil-gas-retarder. Placement and installation of this sheeting should be in conformance with that indicated in Section 1812.3.3 of the 2014 OSSC.

The geotechnical engineer or his representative should be contacted to observe gas-permeable base rock conditions prior to placement of the soil-gas-retarder.

5.8.3 Design Considerations

For floor slabs constructed as recommended, a modulus of subgrade reaction of 200 pounds per cubic inch (pci) is recommended for the design of the floor slab. Floor slabs constructed as recommended will likely settle less than ½-inch. For general floor slab construction, slabs should be jointed around columns and walls to permit slabs and foundations to settle differentially.

5.8.4 Subgrade Moisture Considerations

Liquid moisture and moisture vapor should be expected at the subgrade surface. The recommended crushed rock base is anticipated to provide protection against liquid moisture. Where moisture vapor emission through the slab must be minimized, e.g. impervious floor coverings, storage of moisture sensitive materials directly on the slab surface, etc., a vapor retarding membrane or vapor barrier below the slab should be considered. Factors such as cost, special considerations for construction, floor coverings, and end use suggest that the decision regarding a vapor retarding membrane or vapor barrier be made by the architect and owner.

If a vapor retarder or vapor barrier is placed below the slab, its location should be based on current American Concrete Institute (ACI) guidelines, ACI 302 Guide for Concrete Floor and Slab Construction. In some cases, this indicates placement of concrete directly on the vapor retarder or barrier. Please note that the placement of concrete directly on impervious membranes increases the risk of plastic shrinkage cracking and slab curling in the concrete. Construction practices to reduce or eliminate such risk, as described in ACI 302, should be employed during concrete placement.

5.9 Pavements

5.9.1 Subgrade Preparation

Satisfactory subgrade support for pavements constructed on grade can be obtained from the native, coarse-grained alluvium (SM, SP, GP), basalt bedrock, or new structural fill that is properly placed and compacted on these materials during construction. Boulders encountered during foundation excavation should be removed and replaced with granular structural fill. The geotechnical engineer or his representative should observe pavement subgrade soils to evaluate surface consistencies. If soft, loose, or otherwise unsuitable soils are encountered, they should be over-excavated as recommended by the CGT geotechnical representative at the time of construction. The resulting over-excavation should be brought back to grade with granular structural fill (subbase) as described in Section 5.4.2. Pavement subgrade surfaces should be crowned (or sloped) for proper drainage in accordance with specifications provided by the project civil engineer.

5.9.2 Traffic Classifications

Recognizing that traffic data has not been provided, CGT has considered two levels of traffic demand for review and design of pavement sections. We modeled the following design cases (traffic levels) developed from the Asphalt Pavement Association of Oregon (APAO):

- *APAO Level II (Light):* This design case considers typical ADTT of 2 to 7 per day over 20 years. Examples under this loading consist of residential streets and parking lots of less than 500 stalls. We anticipate this traffic loading will be appropriate for the proposed passenger vehicle parking stalls.
- *APAO Level III (Low Moderate):* This design case considers typical ADTT of 7 to 14 per day over 20 years. Examples under this loading consist of rural minor collector streets and parking lots of more than 500 stalls. We anticipate this traffic loading will be appropriate for the drive lane, exterior aprons and fire truck parking areas.

We recommend the owner and design team review the traffic levels presented above and select those that most accurately represent anticipated daily truck traffic for select new pavements.

5.9.3 Input Parameters

Designs of the hot mixed asphaltic concrete (HMAC) flexible pavement sections and the rigid Portland cement concrete (PCC) rigid slab section presented below were based on the parameters presented in the following table and design approaches from:

- The American Association of State Highway and Transportation Officials (AASHTO) 1993 “Design of Pavement Structures” manual,
- The Asphalt Pavement Association of Oregon (APAO) 2003 “Asphalt Pavement Design Guide”, and
- The Oregon Department of Transportation (ODOT) 2011 “Pavement Design Guide”.

If any of the items listed in Table 4 or Table 5 need to be revised, please contact us and we will reassess the pavement design sections presented below.

5.9.3.1 HMAC Analysis Inputs

Table 4 Input Parameters Used in HMAC Pavement Design

Input Parameter	Design Value[1]	Input Parameter		Design Value[1]
Pavement Design Life	20 years	Resilient Modulus[4]	Alluvium (SM, SP, GP)	10,000 psi
Annual Percent Growth	0 percent		Crushed Aggregate Base	22,500 psi
Serviceability	4.2 initial 2.5 terminal	Structural Coefficient[2]	Crushed Aggregate Base	0.10
Reliability[2]	75 percent		Asphalt	0.42
Standard Deviation[2]	0.49	Vehicle Traffic[5] (range in ESALs)	APAO Level II (Light) – Parking	Up to 50,000
Drainage Factor[3]	1.0		APAO Level III (Low Moderate) – Entrances and Drive Lanes	Up to 100,000

1 If any of the above parameters are incorrect, please contact us so that we may revise our recommendations, if warranted.
2 Value based on guidelines presented in Section 5.3 of the 2011 ODOT Pavement Design Guide and APAO manual.
3 Assumes good drainage away from pavement, base, and subgrade is achieved by proper crowning of subgrades.
4 Values based on experience with similar soils prepared as recommended in this report.
5 ESAL = Total 18-Kip equivalent single axle load. Traffic levels taken from Table 3.1 of APAO manual. If an increased traffic load is estimated, please contact us so that we may refine the traffic loading and revise our recommendations, if warranted.

5.9.3.2 PCC Pavements Analysis Inputs

Table 5 Input Parameters Used in PCC Pavement Design

Input Parameter	Design Value[1]	Input Parameter		Design Value[1]
Pavement Design Life	20 years	Modulus of Subgrade Reaction[4]	Alluvium (SM, SP, GP)	200 pci
Annual Percent Growth	0 percent			
Serviceability	4.2 initial 2.5 terminal	PCC Parameters[2]	Elastic Modulus	5,000 ksi
Reliability[2]	80 percent		Modulus of Rupture	0.7 ksi
Combined Standard Error[2]	0.49	Vehicle Traffic[5] (range in ESALs)	APAO Level III (Low Moderate) – Entrances, Drive Lanes, Aprons	Up to 100,000
Drainage Factor[3]	1.0			
Load Transfer Coefficient	3.0			

1 If any of the above parameters are incorrect, please contact us so that we may revise our recommendations, if warranted.
2 Value based on guidelines presented in the ODOT Pavement Design Guide.
3 Assumes good drainage away from pavement, base, and subgrade is achieved by proper crowning of subgrades.
4 Values based on experience with similar soils prepared as recommended in this report.
5 ESAL = Total 18-Kip equivalent single axle load. Traffic levels taken from Table 3.1 of APAO manual. If an increased traffic load is estimated, please contact us so that we may refine the traffic loading and revise our recommendations, if warranted.

5.9.4 Recommended Minimum Pavement Sections

5.9.4.1 Recommended Minimum Flexible Pavement Sections

The following table presents the minimum flexible pavement sections for the traffic levels indicated in the preceding table, based on the referenced design procedures.

Table 6 Recommended Minimum Flexible Pavement Sections

Material	APAO Traffic Loading	
	Level II	Level III
Asphalt Pavement (inches)	3½	4
Crushed Aggregate Base (inches)	8	8
Subgrade Soils	Prepared in accordance with Section 5.9.1.	

Note 1: Thicknesses shown assume dry weather construction. A thicker granular subbase section may be required in wet conditions in order to support construction traffic and protect the subgrade.
Note 2: Thicknesses shown assume subgrade is observed by geotechnical engineer representative prior to placement of separation fabric on alluvium (SM, SP, GP) subgrade.

5.9.4.2 Recommended Minimum Rigid Pavement Sections

The following table presents the minimum rigid pavement sections for the traffic levels indicated in the preceding table, based on the referenced design procedures.

Table 7 Recommended Minimum Rigid Pavement Sections

Material	APAO Traffic Loading
	Level III
PCC Slab (inches)	6
Crushed Aggregate Base (inches)	6
Subgrade Soils	Prepared in accordance with Section 5.9.1.

Note 1: Thicknesses shown assume dry weather construction. A thicker granular subbase section may be required in wet conditions in order to support construction traffic and protect the subgrade.
Note 2: Thicknesses shown assume subgrade is observed by geotechnical engineer representative prior to placement of separation fabric on alluvium (SM, SP, GP) subgrade.

5.9.5 Pavement Materials

Asphalt pavement and base course material should conform to the most current State of Oregon, Standard Specifications for Highway Construction. Place aggregate base in one lift, and compact to at least 95 percent of the material's maximum dry density as determined in general accordance with ASTM D1557 (Modified Proctor). HMAC pavement should be compacted to at least 91 percent of the material's theoretical maximum density as determined in general accordance with ASTM D2041 (Rice Specific Gravity).

5.10 Additional Drainage Considerations

Subsurface drains should be connected to the nearest storm drain, on-site infiltration system (to be designed by others) or other suitable discharge point. Paved surfaces and grading near or adjacent to the building should be sloped to drain away from the building. Surface water from paved surfaces and open spaces should be collected and routed to a suitable discharge point. Surface water should not be directed into foundation drains.

6.0 RECOMMENDED ADDITIONAL SERVICES

6.1 Design Review

Geotechnical design review of project plans is of paramount importance. As indicated previously, we recommend the geotechnical engineer be consulted to provide specific geotechnical recommendations for the building foundation system as plans are being developed to provide supplemental recommendations for design and construction.

6.2 Observation of Construction

Satisfactory earthwork, foundation, floor slab, and pavement performance depends to a large degree on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during subsurface explorations, and recognition of changed conditions often requires experience. We recommend that qualified personnel visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those observed to date and anticipated in this report. We recommend the geotechnical engineer or their representative attend a pre-construction meeting coordinated by the contractor and/or developer. The project geotechnical engineer or their representative should provide observations and/or testing of at least the following earthwork elements during construction:

- Site Stripping and Demolition
- Subgrade Preparation for Shallow Foundations, Retaining Walls, Structural Fills, Floor Slabs, and Pavements
- Compaction of Structural Fill, Retaining Wall Backfill, and Utility Trench Backfill
- Compaction of Base Rock for Floor Slabs & Pavements
- Compaction of HMAC for Pavements

It is imperative that the owner and/or contractor request earthwork observations and testing at a frequency sufficient to allow the geotechnical engineer to provide a final letter of compliance for the earthwork activities.

7.0 LIMITATIONS

We have prepared this report for use by the owner/developer and other members of the design and construction team for the proposed development. The opinions and preliminary recommendations contained within this report are not intended to be, nor should they be construed as a warranty of subsurface conditions, but are forwarded to assist in the planning and design process.

We have made observations based on our explorations that indicate the soil conditions at only those specific locations and only to the depths penetrated. These observations do not necessarily reflect soil types, strata thickness, or water level variations that may exist between or away from our explorations. If subsurface conditions vary from those encountered in our site explorations, CGT should be alerted to the change in conditions so that we may provide additional geotechnical recommendations, if necessary. Observation by experienced geotechnical personnel should be considered an integral part of the construction process.

The owner/developer is responsible for ensuring that the project designers and contractors implement our recommendations. When the design has been finalized, prior to releasing bid packets to contractors, we recommend that the design drawings and specifications be reviewed by our firm to see that our recommendations have been interpreted and implemented as intended. If design changes are made, we request that we be retained to review our conclusions and recommendations and to provide a written modification or verification. Design review and construction phase testing and observation services are beyond the scope of our current assignment, but will be provided for an additional fee.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Geotechnical engineering and the geologic sciences are characterized by a degree of uncertainty. Professional judgments presented in this report are based on our understanding of the proposed construction, familiarity with similar projects in the area, and on general experience. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared; no warranty, expressed or implied, is made. This report is subject to review and should not be relied upon after a period of three years

MOSIER FIRE STATION - MOSIER, OREGON
Project Number G1604493

FIGURE 1

Site Location

Map created with TOPO!™, © 2006 National Geographic Holdings
USGS 7.5 Minute Topographic Map Series, White Salmon, Oregon Quadrangle, 1994.

Township 2 North, Range 11 East, Section 1 Willamette Meridian

Latitude: 45.68407° North
Longitude: 121.39666° West

1 Inch = 2,000 feet

0 2000 4000

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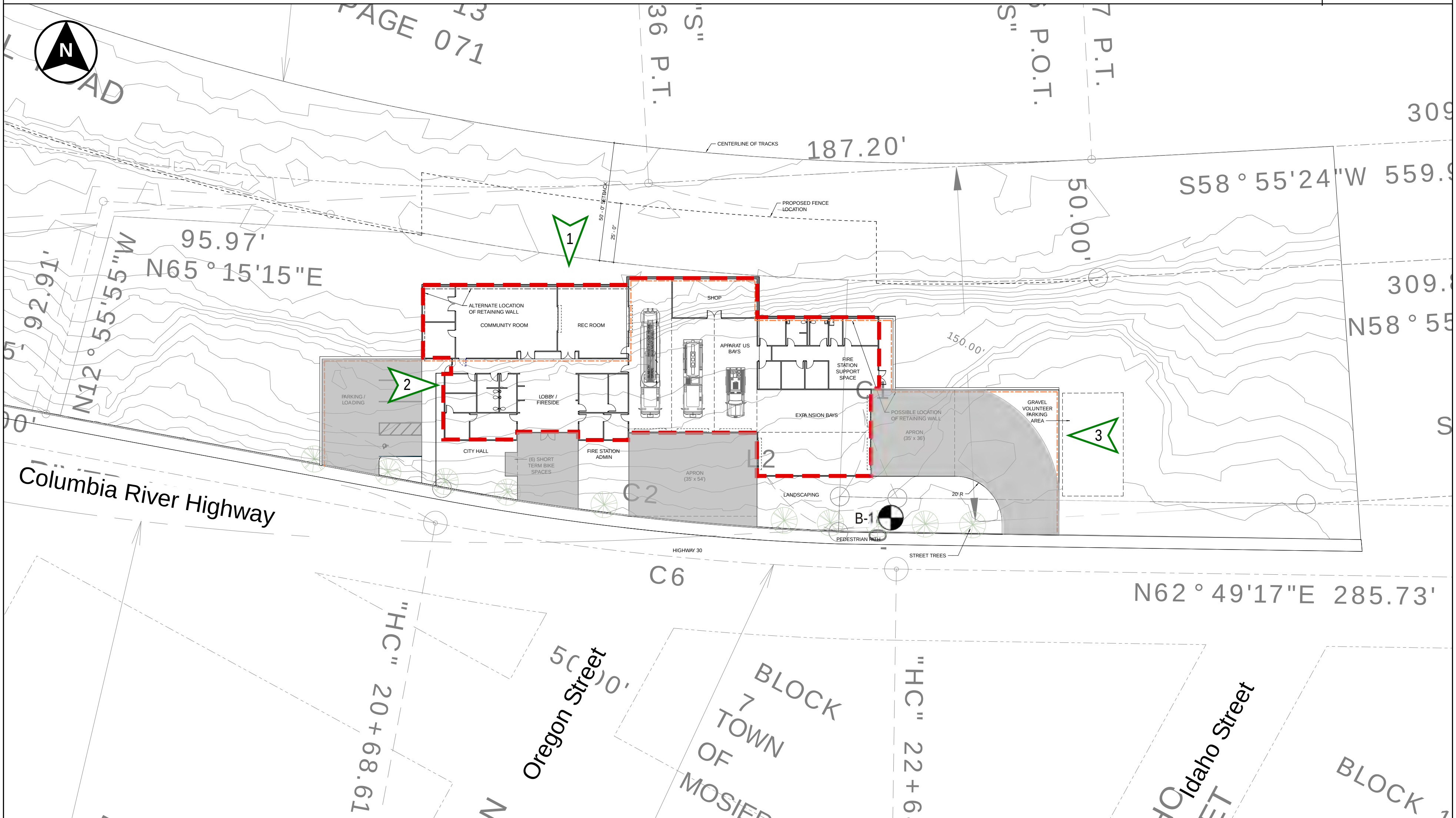
MOSIER FIRE STATION - MOSIER, OREGON
Project Number G1604493

FIGURE 2

Site Plan



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Drafted by: RTH

LEGEND

Proposed fire station footprint

Proposed pavement footprint

B-1 Drilled boring

Orientation of site photographs shown on Figure 3

1 Inch = 60 Feet

0 60 120

NOTES: Drawing based on observations made while on site and Floor Plan prepared by Hennebery Eddy Architects, dated March 9, 2017. All locations should be considered approximate.

MOSIER FIRE STATION - MOSIER, OREGON Project Number G1604493	FIGURE 3 Site Photographs

Photograph 1

Photograph 2

Photograph 3

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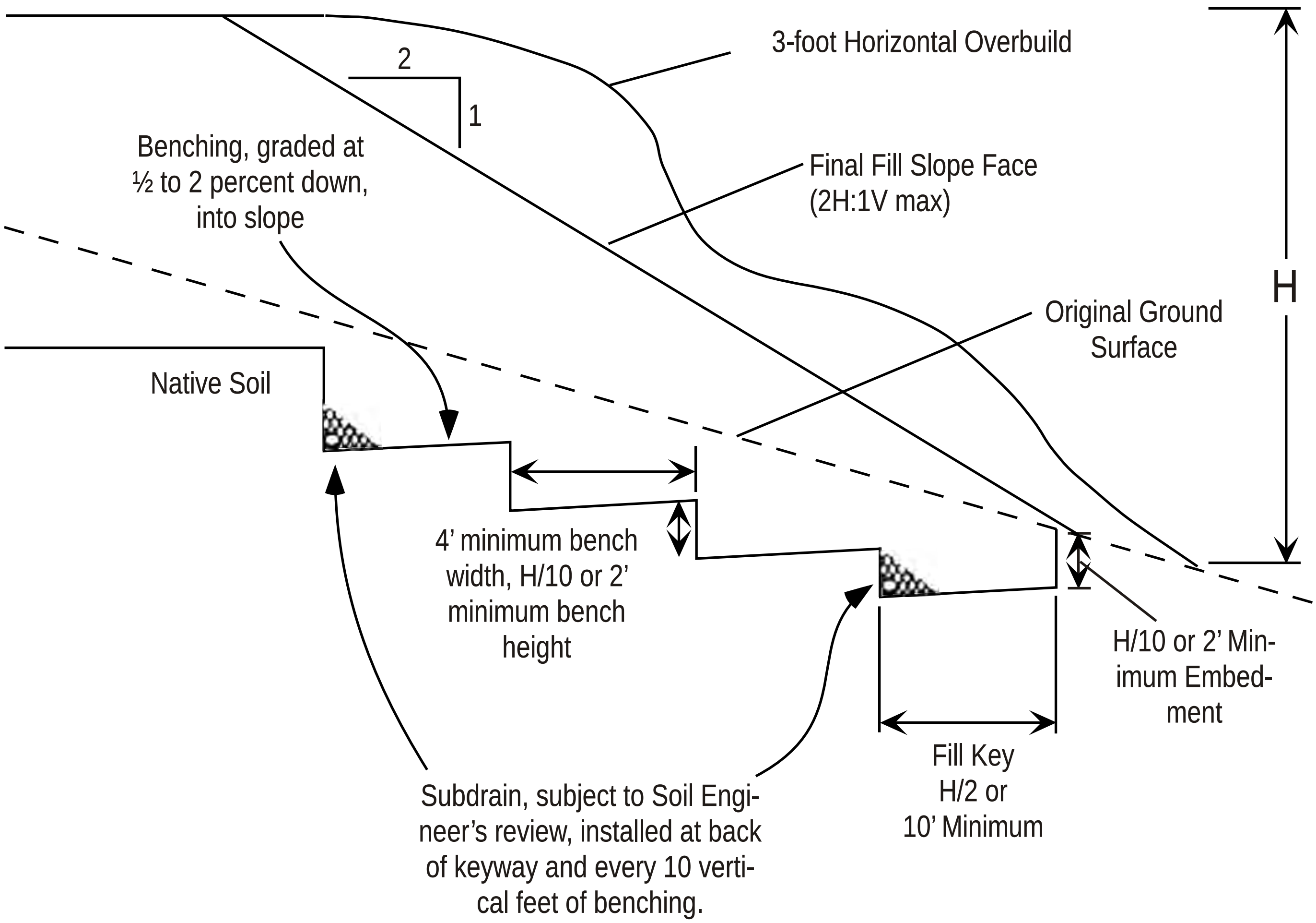
See Figure 2 for approximate photograph locations and directions. Photographs were taken at the time of our fieldwork.

MOSIER FIRE STATION - MOSIER, OREGON *Project Number G1604493*	**FIGURE 4** **Fill Slope Detail**



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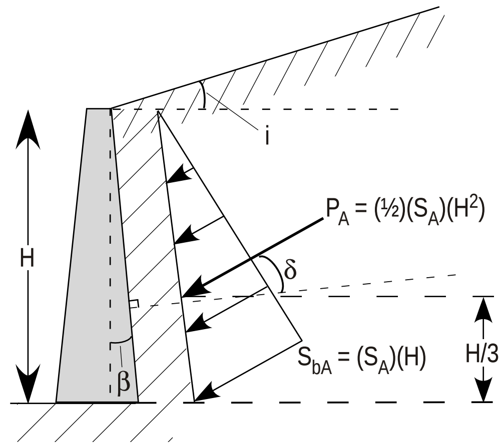
NOTE: Surfaces to receive fill with slopes steeper than 5H:1V (horizontal:vertical) should be benched and keyed as shown.

MOSIER FIRE STATION - MOSIER, OREGON
Project Number G1604493

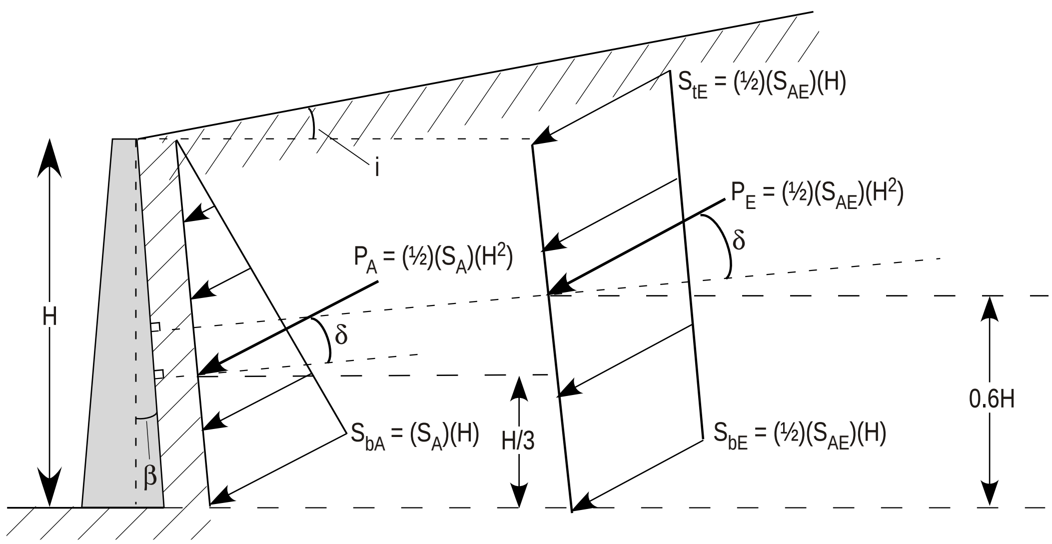
FIGURE 5
Retaining Walls

ACTIVE LATERAL PRESSURE DISTRIBUTION

STATIC LOADING CONDITIONS



SEISMIC LOADING CONDITIONS



LEGEND

P_A = Static active thrust force acting at a triangular distribution on wall (lb/ft^3)

P_E = Dynamic component of active thrust force acting at a uniform distribution on wall (lb/ft)

i = Slope of backfill (degrees)**

S_A = Active (static) component of equivalent fluid pressure (lb/ft^3)*

S_{tE} = Active earth pressure (dynamic) at the top of the wall (lb/ft^3)

S_{bA} = Active earth pressure (static) at the bottom of the wall (lb/ft^3)

ϕ = Internal angle of friction for backfill (degrees)**

δ = Angle from normal of back of wall (degrees). Based on friction developing between wall and backfill**

β = Slope of back of wall (degrees)**

S_{AE} = Dynamic component of equivalent fluid pressure (lb/ft^3)*

S_{bE} = Active earth pressure (dynamic) at bottom of the wall (lb/ft^3)*

*Refer to report text for calculated values **Refer to report text for modeled/assumed values

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Notes

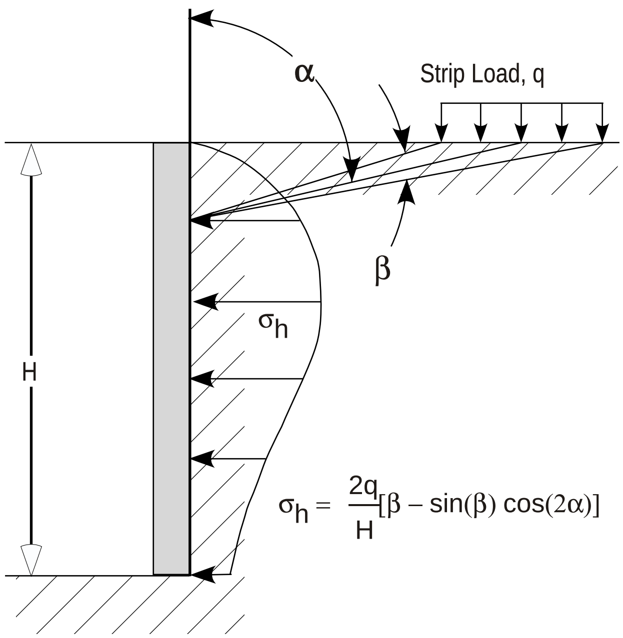
1. Uniform pressure distribution of seismic loading is based on empirical evaluations [Sherif et al, 1982 and Whitman, 1990].
2. Placement of seismic resultant force at 0.6H is based on wall behavior and model test results [Whitman, 1990].

MOSIER FIRE STATION - MOSIER, OREGON
Project Number G1604493

FIGURE 6

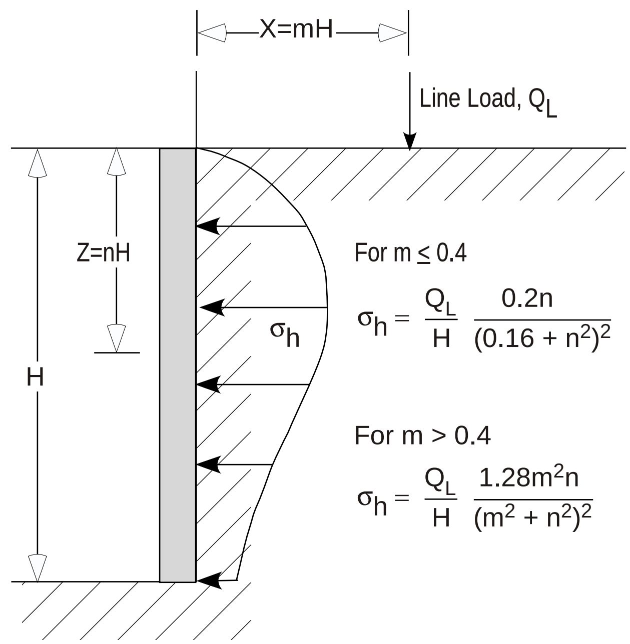
Retaining Wall Surcharge

STRIP LOAD PARALLEL TO WALL[1]



$$\sigma_h = \frac{2q}{H}[\beta - \sin(\beta)\cos(2\alpha)]$$

LINE LOAD PARALLEL TO WALL[2]



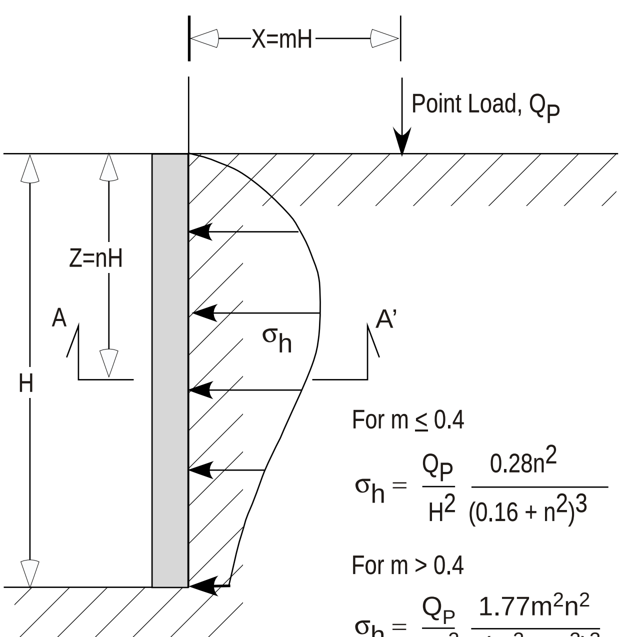
For $m \leq 0.4$

$$\sigma_h = \frac{Q_L}{H}\frac{0.2n}{(0.16 + n^2)^2}$$

For $m > 0.4$

$$\sigma_h = \frac{Q_L}{H}\frac{1.28m^2n}{(m^2 + n^2)^2}$$

VERTICAL POINT LOAD[2]



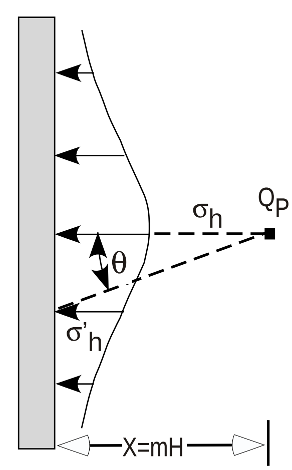
For $m \leq 0.4$

$$\sigma_h = \frac{Q_P}{H^2}\frac{0.28n^2}{(0.16 + n^2)^3}$$

For $m > 0.4$

$$\sigma_h = \frac{Q_P}{H^2}\frac{1.77m^2n^2}{(m^2 + n^2)^3}$$

Section A - A'



$$\sigma'_h = \sigma_h \cos^2(1.1\,\theta)$$

Notes: 1. Das, Principles of Geotechnical Engineering, 1990 Edition.
2. NAVFAC Design Manual 7.06.

Refer to the referenced design manuals for additional guidance. Contact CGT if there are any questions with modeling surcharge loads.

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Appendix A: Subsurface Investigation

Mosier Fire Station
North of the Intersection of Main Street and Highway 30
Mosier, Oregon

CGT Project Number G1604493

April 25, 2017

Prepared For:

Mr. Scott Moreland
Hennebery Eddy Architects, Inc.
921 SW Washington Street Suite 250
Portland, Oregon 97205

Prepared by
Carlson Geotechnical

A.1.0 OVERVIEW

Our feasibility-level field investigation consisted of advancing one boring on April 10, 2017. The approximate boring location is shown on the Site Plan, attached to the geotechnical report as Figure 2. The boring location shown therein was determined based on measurements from existing site features (trees, roadway centerline, etc.) and should be considered approximate. A summary of subsurface conditions encountered is presented in Section 2.3 the geotechnical report. Surface elevation indicated on the log was determined from the topographic map provided by the client and shown on Figure 2 attached to the geotechnical report and is approximate.

A.2.0 SUBSURFACE EXPLORATION

A.2.1 Drilled Boring

The boring (B-1) was advanced at the site to a depth of about 31 feet bgs using a CME-75 truck-mounted drill rig provided and operated by our subcontractor, Western States Soil Conservation of Hubbard, Oregon. The boring was advanced using the mud rotary drilling technique. SPTs, described on Figure A1, were conducted at 2½- to 3-foot intervals to a depth of about 18 feet bgs in the boring, where bedrock was encountered. Rock coring was performed from 18 feet to the termination depth of the boring. Upon completion, the borings were backfilled with granular bentonite. Drilling waste (cuttings and drilling fluids) were drummed and removed from the site.

A.3.0 MATERIAL CLASSIFICATION & SAMPLING

Soil samples were obtained at selected intervals in the borings using the SPT split-spoon sampler and HQ-size rock-core sampler, detailed in Figure A1. A qualified member of CGT's staff collected the samples and logged the soils in general accordance with the ASTM D2488 (Visual-Manual Procedure) and ODOT Rock Classification Criteria. Explanations of these classification systems are attached as Figures A2 and A3. The SPT and core samples were stored in sealable plastic bags and transported to our soils laboratory for further examination and testing. Our geotechnical staff visually examined all samples in order to refine the initial field classifications.

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FIGURE A1

Exploration Key

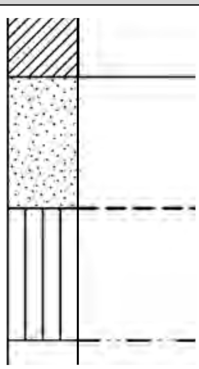
GEOTECHNICAL LABORATORY TESTING

PL — MC — LL	Atterberg limits (plasticity) test results (ASTM D4318). PL = Plastic Limit. LL = Liquid Limit. MC= Moisture Content (ASTM D2216)
☐ FINES CONTENT (%)	Percentage passing the U.S. Standard No. 200 Sieve (ASTM D1140)

SAMPLING

GRAB	**Grab** sample
SPT	**Standard Penetration Test** (SPT), which consists of driving a 2-inch, outside-diameter, split-spoon sampler into the undisturbed formation with repeated blows of a 140-pound, automatic hammer falling a vertical distance of 30 inches (ASTM D1586). The number of blows (N-value) required to drive the sampler the last 12 inches of an 18-inch sample interval is used to characterize the soil consistency or relative density. The drill rig was equipped with an automatic hammer to conduct the SPTs. The hammer efficiency, “raw” (uncorrected) and N_{60} (normalized) SPT N-values are noted on the boring logs.
MC	**Modified California** (MC), a 3-inch, outside-diameter, split-spoon sampler (ASTM D3550). Sampling consistent with SPT sampling method described above. Sampler diameter correction factor of 0.44 applied to blowcount to calculate equivalent SPT N_{60} value per Lacroix and Horn, 1973.
CORE	**Rock Coring** interval
SH	**Shelby Tube** (SH), a 3-inch, inner-diameter, thin-walled, steel tube push sampler (ASTM D1587) used to collect relatively undisturbed samples of fine-grained soils.
WDCP	**Wildcat Dynamic Cone Penetrometer** (WDCP) test, which consists of driving 1.1-inch diameter, steel rods with a 1.4-inch diameter, cone tip into the ground using a 35-pound drop hammer with a 15-inch free-fall height. The number of blows required to drive the steel rods is recorded for each 10 centimeters (3.94 inches) of penetration. The blow count for each interval is then converted to the corresponding SPT N_{60} values.
DCP	**Dynamic Cone Penetrometer** (DCP) test, which consists of driving a 20-mm diameter, hardened steel cone on 16-mm diameter steel rods into the ground using a 10-kg drop hammer with a 460-mm free-fall height. The depth of penetration in millimeters is recorded for each drop of the hammer.
POCKET PEN. (tsf)	**Pocket Penetrometer** test, which is a hand-held instrument that provides an approximation of the unconfined compressive strength in tons per square foot (tsf) of cohesive, fine-grained soils.

CONTACTS



Observed (measured) contact between soil or rock units.

Inferred (approximate) contact between soil or rock units.

Transitional (gradational) contact between soil or rock units.

ADDITIONAL NOTATIONS

Italics	Denotes drilling or digging action.
{ Braces }	Interpretation of material origin / geologic formation (e.g. { Base Rock } or { Columbia River Basalt })

Classification of Terms and Content

NAME: Group Name and Symbol
Relative Density or Consistency
Color
Moisture Content
Plasticity
Other Constituents
Other: Grain Shape, Approximate Gradation
Organics, Cement, Structure, Odor, etc.
Geologic Name or Formation

USCS Grain Size

Fines		<#200 (.075 mm)
Sand	Fine Medium Coarse	#200 - #40 (.425 mm) #40 - #10 (2 mm) #10 - #4 (4.75)
Gravel	Fine Coarse	#4 - 0.75 inch 0.75 inch - 3 inches
Cobbles		3 to 12 inches; scattered <15% est. numerous >15% est.
Boulders		> 12 inches

Relative Density or Consistency

Granular Material		Fine-Grained (cohesive) Materials				
SPT N-Value	Density	SPT N-Value	Torvane tsf Shear Strength	Pocket Pen tsf Unconfined	Consistency	Manual Penetration Test
		<2	<0.13	<0.25	Very Soft	Thumb penetrates more than 1 inch
0 - 4	Very Loose	2 - 4	0.13 - 0.25	0.25 - 0.50	Soft	Thumb penetrates about 1 inch
4 - 10	Loose	4 - 8	0.25 - 0.50	0.50 - 1.00	Medium Stiff	Thumb penetrates about ¼ inch
10 - 30	Medium Dense	8 - 15	0.50 - 1.00	1.00 - 2.00	Stiff	Thumb penetrates less than ¼ inch
30 - 50	Dense	15 - 30	1.00 - 2.00	2.00 - 4.00	Very Stiff	Readily indented by thumbnail
>50	Very Dense	>30	>2.00	>4.00	Hard	Difficult to indent by thumbnail

Moisture Content

Dry: Absence of moisture, dusty, dry to the touch

Damp: Some moisture but leaves no moisture on hand

Moist: Leaves moisture on hand

Wet: Visible free water, likely from below water table

	Plasticity	Dry Strength	Dilatancy	Toughness
ML	Non to Low	Non to Low	Slow to Rapid	Low, can't roll
CL	Low to Medium	Medium to High	None to Slow	Medium
MH	Medium to High	Low to Medium	None to Slow	Low to Medium
CH	Medium to High	High to Very High	None	High

Structure

Stratified: Alternating layers of material or color >6 mm thick

Laminated: Alternating layers < 6 mm thick

Fissured: Breaks along definite fracture planes

Slickensided: Striated, polished, or glossy fracture planes

Blocky: Cohesive soil that can be broken down into small angular lumps which resist further breakdown

Lenses: Has small pockets of different soils, note thickness

Homogeneous: Same color and appearance throughout

Visual-Manual Classification

Major Divisions			Group Symbols	Typical Names
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravels: 50% or more *retained* on the No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel/sand mixtures, little or no fines
			GP	Poorly-graded gravels and gravel/sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel/sand/silt mixtures
			GC	Clayey gravels, gravel/sand/clay mixtures
	Sands: More than 50% *passing* the No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly-graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand/silt mixtures
			SC	Clayey sands, sand/clay mixtures
Fine-Grained Soils: 50% or more Passes No. 200 Sieve	Silt and Clays Low Plasticity Fines		ML	Inorganic silts, rock flour, clayey silts
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silt and organic silty clays of low plasticity
	Silt and Clays High Plasticity Fines		MH	Inorganic silts, clayey silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils

Table 22: Scale of Relative Rock Weathering

Designation	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1-inch into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Weathered	Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock fabric may be evident. May be reduced to soil with hand pressure.

Table 23: Scale of Relative Rock Hardness

Term	Hardness Designation	Field Identification	Approximate Unconfined Compressive Strength
Extremely Soft	R0	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.	<100 psi
Very Soft	R1	Crumbles under firm blows with point of geology pick. Can be peeled by pocket knife. Scratched with finger nail.	100-1000 psi
Soft	R2	Can be peeled by pocket knife with difficulty. Cannot be scratched with finger nail. Shallow indention made by firm blow of geology pick.	1000-4000 psi
Medium Hard	R3	Can be scratched by knife or pick. specimen can be fractured with a single firm blow of hammer/geology pick.	4000-8000 psi
Hard	R4	Can be scratched with knife or pick only with difficulty. Several hard blows required to fracture specimen.	8000-16000 psi
Very Hard	R5	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.	>16000 psi

Table 24: Stratification Terms

Term	Characteristics
Laminations	Thin beds (<1cm).
Fissle	Tendency to break along laminations.
Parting	Tendency to break parallel to bedding, any scale.
Foliation	Non-depositional, e.g., segregation and layering of minerals in metamorphic rock.

Tables adapted from the 1987 Soil and Rock Classification Manual, Oregon Department of Transportation.

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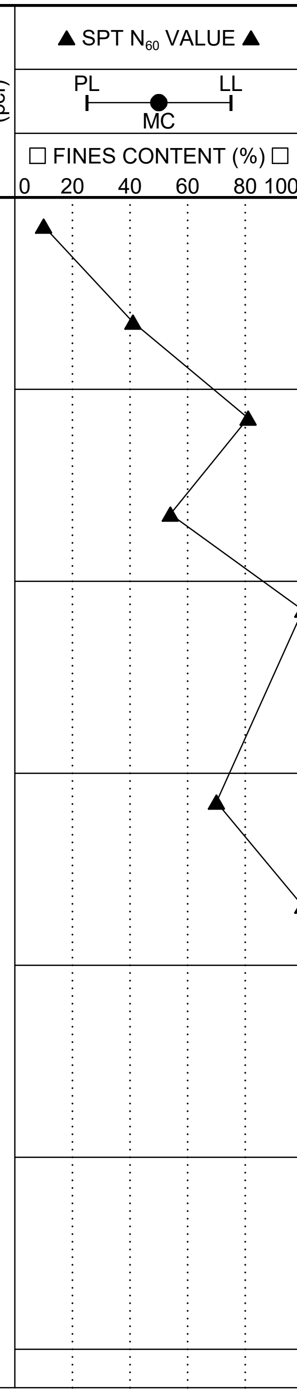
FIGURE A4

Boring B-1

CLIENT Hennebery Eddy Architects
PROJECT NAME Mosier Fire Station
PROJECT NUMBER G1604493
PROJECT LOCATION 1st Ave, Mosier, Oregon
DATE STARTED 4/10/17
GROUND ELEVATION 115 ft
ELEVATION DATUM See Figure 2
WEATHER Rain, ~44°F
SURFACE Gravel
LOGGED BY MDI
REVIEWED BY RTH
DRILLING CONTRACTOR Western States Soil Conservation
SEEPAGE ---
EQUIPMENT Truck Mounted CME 75
GROUNDWATER AT END ---
DRILLING METHOD Mud Rotary with Tricone Bit
GROUNDWATER AFTER DRILLING ---

ELEVATION (ft)	GROUP SYMBOL	MATERIAL DESCRIPTION
115	GP FILL	**POORLY GRADED GRAVEL FILL:** Gray, moist, angular, up to about 2 inches in diameter.
	SM	**SILTY SAND:** Loose, brown, moist, fine-grained, trace very fine roots. No roots below about ½ foot bgs.
	SP	**POORLY GRADED SAND WITH GRAVEL:** Dense, brown gray, moist, fine- to coarse-grained, subangular gravel up to 1½ inches in diameter, some pieces of broken rock.
	GP	**POORLY GRADED GRAVEL WITH SAND, COBBLES, AND BOULDERS:** Dense to very dense, brown to gray, moist, angular to subangular, up to 1½ inches in diameter, medium- to coarse-grained sand. Caving observed at 15 feet bgs. Very moist below about 15 feet bgs.
	RX	**BASALT:** Medium hard (R3), dark gray to black, slightly weathered, highly fractured, some secondary mineralization.

SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N_{SPT} VALUE)	N_{60} VALUE ETR_{Hammer} = 92.6%	DRY UNIT WT. (pcf)
SPT 1	44	6-5-4 (9)	10	
SPT 2	56	10-15-20 (35)	41	
SPT 3	44	17-33-37 (70)	81	
SPT 4	44	15-14-33 (47)	54	
SPT 5	56	13-46-54 (100)	100	
SPT 6	17	50		
SPT 7	39	17-28-25 (53)	70	
SPT 8	27	28-50/5"	100	
CORE 9	50 (0)			
CORE 10	0			
CORE 11	0			
CORE 12	0			



- Boring terminated at 31 feet bgs.
- No groundwater observed.
- Boring loosely backfilled with bentonite.

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Salem Office **(503) 589-1252**
Tigard Office **(503) 684-3460**

Appendix B: Preliminary Site-Specific Seismic Hazards Study

Mosier Fire Station
North of the Intersection of Main Street and Highway 30
Mosier, Oregon

CGT Project Number G1604493

April 25, 2017

Prepared For:

Mr. Scott Moreland
Hennebery Eddy Architects, Inc.
921 SW Washington Street Suite 250
Portland, Oregon 97205

Prepared by
Carlson Geotechnical

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ATTACHMENTS

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B.1.0 INTRODUCTION

Based on the information provided, we understand the proposed building will be classified as an "Essential Facility" per Oregon Revised Statutes (ORS) 455.447. Accordingly, a Site-Specific Seismic Hazards Study (SSSHS) is required for the project in accordance with Section 1803.3.2 of the 2014 OSSC. This appendix presents the results of the preliminary SSSHS conducted as part of the geotechnical feasibility study for the proposed project. This study should therefore be considered preliminary until future planned subsurface exploration, additional analyses, and final facility designs have been completed.

B.2.0 GEOLOGIC SETTING

B.2.1 Regional Geology

The site is located within the Columbia River Gorge on the northern edge of the Cascade Mountains. The Cascade volcanism was triggered during the Eocene when the Farallon plate began subducting beneath the North American plate. Andesitic lavas and tuffs erupting from the western Cascades covered the region. Flood basalts of the Columbia River Basalt Group covered the region in the middle Miocene (approximately 17 million years ago), filling low areas between the Western Cascade volcanoes. Volcanism decreased in the late Miocene (about 7 million years ago). The Western Cascades were subjected to additional uplift, mild folding, and faulting between 4 and 5 million years ago[1]. Coincident with uplift, the ancestral Columbia River began to cut a canyon in the same general area as the present Columbia River Gorge. Following the westward tilting of the Western Cascades, the eruption of numerous large shield volcanoes during the Pliocene on the east side of the Cascade Range resulted in creating the High Cascades. The High Cascades are composed primarily of basalt, interspersed with tuffs and ash-flows. Glaciation during the Pleistocene eroded the volcanoes into horns and arêtes, and redistributed volcanic sediments into the surrounding basins. Many of the High Cascade Volcanoes are considered active or potentially active.

B.2.2 Site Geology

Based on available geologic mapping[2], of the area, the site is underlain by Holocene and Pleistocene alluvium, generally consisting of unconsolidated gravel, sand, silt, and clay. The alluvium was deposited by the ancestral Columbia River, and generally was deposited directly on bedrock. The mapping indicates the alluvium is underlain by Columbia River Basalt, which extends to thousands of feet below the site.

Subsurface geology at the site is described in greater detail in Section B.4.1 below.

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[1] Orr, Elizabeth L. and Orr, William N., Geology of Oregon, fifth edition. Kendall/Hunt Publishing Company, 2000.

[2] McClaughry, J.D., Wiley, T.J., Conrey, R.M., Jones, C.B., and Lite, K.E., 2012, Digital Geologic Map of the Hood River Valley, Hood River and Wasco Counties, Oregon: Oregon Department of Geology and Mineral Industries, Open-File Report O-2012-03, scale 1:36,000.

B.2.3 Landslide Hazard Mapping

Review of the Statewide Landslide Information Database for Oregon (SLIDO)[3] shows the site is located within a mapped landslide that underlies the entire City of Mosier. SLIDO references the geologic map contained within the 1982 "Geologic and Neotectonic evaluation of North-Central Oregon: The Dalles 1 degree by 2 degree quadrangle[4]" as the source of the mapped landslide. This geologic map is very small scale (covers a very large area), so therefore does not show the Mosier area in much detail. Subsequent refinements to geologic mapping of the area, including the map referenced in the preceding section, show the mapped landslide as an alluvial fan at the mouth of Rock Creek at the west end of Mosier. These alluvial fan deposits do not extend into the area of the site. Based on our observations and results of the soil boring, it is our opinion that the more recent geologic map is representative of the geologic materials present at the site, and that the site is not located within the ancient landslide..

B.3.0 GROUND MOTION HAZARD ANALYSIS

The geological and geotechnical data developed within the geotechnical report were used to evaluate the ground motion response of the project site to various earthquake sources and events. The ground motion hazard analysis addresses the following seismic hazards for the site in accordance with Section 1803.7 of the OSSC:

- Ground Shaking;
- Liquefaction;
- Lateral Spread;
- Earthquake-induced Landsliding;
- Inundation from Tsunami / Seiche; and
- Surface Rupture due to Fault Displacement.

The analysis was based on procedures presented in Section 1613.3.4 of the 2014 OSSC and Section 11.4 of American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures (ASCE 7-10). A site-specific response analysis could be performed to develop a site-specific design response spectrum at the owner's discretion, if desired, for an additional fee.

B.3.1 Earthquake Sources and Seismicity

The site is located in a tectonically active area that may be affected by crustal earthquakes, large subduction zone earthquakes, or earthquakes caused by faulting within the subducting slab (intraplate earthquakes).

B.3.1.1 <u>Crustal Sources</u>

Crustal earthquakes typically occur at depths ranging from 15 to 40 kilometers bgs[5]. According to the United States Geological Survey Quaternary fault and fold database[6], nearby seismic sources capable of

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3 Oregon Department of Geology and Mineral Industries, 2017. Statewide Landslide Information Database for Oregon (SLIDO), *accessed April 2017*, from DOGAMI web site: http://www.oregongeology.org/sub/slido/index.htm.

4 Bela, J.L., 1982, Geologic and neotectonic evaluation of north-central Oregon: The Dalles 1 degree x 2 degree quadrangle: Oregon Department of Geology and Mineral Industries, Geological Map Series 27, scale 1:250,000.

5 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

producing damaging earthquakes in this region include Horse Heaven Hills, Columbia Hills Structures, Faults Near The Dalles, Unnamed faults on Tygh Ridge, Hood River fault zone, Eagle Creek fault, and the Bull Run fault. Details of each of these faults are provided in the following sections. Refer to Table B2 presented in Section B.3.1.4 of this appendix for the approximate distance and direction to these faults from the project site.

B.3.1.1.1 *Horse Heaven Hills (USGS 567)*

The Horse Heaven Hills structures form one of the longest fault and fold system in the Yakima Fold Belt, measuring approximately 179 kilometers in length. The structures generally consist of north trending anticlines that are likely underlain by south-dipping thrust faults. The fault has poor exposure, so dip estimates from 30 to 60 degrees are typically used. No direct evidence for activity during the Quaternary has been identified, therefore, the probability of activity is considered low.

B.3.1.1.2 *Columbia Hills Structures (USGS 568)*

The Columbia Hills structures generally consist of a series of south-verging anticlines located in the southern portion of the Yakima Fold Belt, which are cut by north-dipping reverse faults. These faults are in turn offset by younger, northwest-trending faults active during the Quaternary. No direct evidence for activity of the Columbia Hills Structures (i.e. additional deformation) during the Quaternary has been identified, therefore, the probability of activity is considered low.

B.3.1.1.3 *Faults near The Dalles (USGS 580)*

Faults near The Dalles are northwest-striking, right-lateral strike-slip and minor normal faults located in south-central Washington. These faults were primarily active during the Miocene and Pliocene near the southern margin of the Yakima fold belt. One of the faults may offset Quaternary basalt, suggesting at least some Quaternary displacement. The Faults near The Dalles are considered potentially active, with a slip rate of less than 0.2 mm per year.

B.3.1.1.4 *Unnamed Faults on Tygh Ridge (USGS 850)*

The Unnamed Faults on Tygh Ridge consist of a 26-kilometer-long group of east-west-trending reverse faults which parallel the end of Tygh Ridge and the Tygh Ridge anticline. These faults offset Miocene Columbia River Basalt, however, no definitive evidence of Quaternary displacement has been documented, suggesting low slip rates and long recurrence intervals.

B.3.1.1.5 *Hood River Fault Zone (USGS 866)*

The Hood River fault zone consists of a 47-km long series of north-south trending, west dipping, subparallel, normal faults located on the east side of Mount Hood and along the Hood River Valley to the Columbia River. The Hood River fault zone makes up the eastern margin of a half-graben in the High Cascades of Oregon. The Hood River fault zone significantly offsets Miocene Columbia River Basalt Group and Pliocene volcanic rocks, and suggests some offset during the Quaternary. As such, the Hood River fault zone is considered to be active.

B.3.1.1.6 *Eagle Creek Fault (USGS 867)*

The Eagle Creek fault consists of an 8–kilometer-long thrust fault located in the northern portion of the High Cascade geologic province in Oregon. The Eagle Creek fault is likely part of the Yakima fold belt of south-central Washington. The Eagle Creek fault offsets Miocene-aged Columbia River Basalt and

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[6] U.S. Geological Survey, 2017. Quaternary fault and fold database for the United States, *accessed April 2017*, from USGS web site: http://earthquakes.usgs.gov/regional/qfaults/.

Pliocene volcanics, and aerial photograph analysis suggests that some displacement may have occurred during the Quaternary. The lack of well-documented Quaternary displacement has resulted in a classification of potentially active.

B.3.1.1.7 *Bull Run Fault (USGS 868)*

The Bull Run fault consists of a 9-kilometer-long, northeast-striking, thrust fault located in the northern portion of the High Cascade geologic province in Oregon. The Bull Run fault is likely part of the Yakima fold belt of south-central Washington, and offsets Miocene Columbia River Basalt and Pliocene volcanics. The lack of well documented Quaternary displacement has resulted in a classification of potentially active.

B.3.1.2 Cascadia Subduction Zone Seismic Sources

The Cascadia Subduction Zone (CSZ) is a 1,100-kilometer-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continental plate at a rate of about 3 to 4 centimeters per year[7]. The fault trace is located off of the coast of southern British Columbia, Washington, Oregon, and northern California; approximately 300 kilometers west of the site (see attached Figure B1).

Two primary sources of seismicity are associated with the CSZ: relatively shallow earthquakes that occur on the interface between the two plates (Subduction Zone earthquakes), and deep earthquakes that occur along faults within the subducting Juan de Fuca plate (intraplate earthquakes).

B.3.1.2.1 *Subduction Zone Earthquakes*

Large subduction zone (megathrust) earthquakes occur within the upper approximate 30 kilometers of the contact between the two plates[8]. As the Juan de Fuca Plate subducts beneath the North American Plate through this zone, the plates are locked together by friction[9]. Stress slowly builds as the plates converge until the frictional resistance is exceeded, and the plates rapidly slip past each other resulting in a "megathrust" earthquake. The United States Geologic Survey estimates megathrust earthquakes on the CSZ may have magnitudes up to M9.2.

Geologic evidence indicates a recurrence interval for major subduction zone earthquakes of 250 to 650 years, with the last major event occurring in 1700[10,11]. The eastern margin of the seismogenic portion of the Cascadia Subduction zone is located approximately 180 kilometers west of the site, as shown on Figure B1.

B.3.1.2.2 *Intraplate Earthquakes*

Below about 30 kilometers, the plate interface does not appear to be locked by friction, and the plates slowly slide past each other. The curvature of the subducted plate increases as the advancing edge moves east, creating extensional forces within the plate. Normal faulting occurs in response to these

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7 DeMets, C., Gordon, R.G., Argus, D.F., Stein, S., 1990. Current plate motions: Geophysical Journal International, v. 101, p. 425-478.

8 Pacific Northwest Seismic Network, 2017. Pacific Northwest Earthquake Sources Overview, *accessed April 2017,* from PNSN web site, http://pnsn.org/outreach/earthquakesources/.

9 Pacific Northwest Seismic Network, 2017. Pacific Northwest Earthquake Sources Overview, *accessed April 2017,* from PNSN web site, http://pnsn.org/outreach/earthquakesources/.

10 Atwater, B.F., 1992. Geologic evidence for earthquakes during the past 2,000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

11 Peterson, C.D., Darienzo, M.E., Burns, S.F., and Burris, W.K., 1993. Field trip guide to Cascadia paleoseismic evidence along the northern California coast: evidence of subduction zone seismicity in the central Cascadia margin. Oregon Department of Geology and Mineral Industries, Oregon Geology, Vol. 55, p. 99-144.

extensional forces. This region of maximum curvature and faulting of the subducting plate is where large intraplate earthquakes are expected to occur, and is located at depths ranging from 30 to 60 kilometers[12,13,14]. Intraplate earthquakes within the Juan de Fuca plate generally have magnitudes less than M7.5[15].

The 2001 M6.8 Nisqually earthquake near Olympia, Washington, occurred within this seismogenic zone at a depth of 52 kilometers. The eastern margin of the intraplate seismogenic zone is located approximately 85 kilometers west of the site, as shown on Figure B1.

B.3.1.3 <u>Characteristic Earthquake Magnitude</u>

The maximum characteristic earthquake magnitude is defined as the largest earthquake that could be expected to be generated by a specific seismic source, independent of recurrence interval.

B.3.1.3.1 *<u>Historical Earthquakes</u>*

The Pacific Northwest is a seismically active area. Epicenters for historic earthquakes[16] in western Oregon from 1841 to 2002 are shown on Figure B1. The majority of these earthquakes are shallow (crustal) in nature, with a lesser amount of intraplate sources. No large-scale subduction-zone earthquakes occurred during this period.

Based on the historical record and crustal faulting models of the region, the maximum earthquake for crustal sources within the Pacific Northwest is estimated to be M5.75[17] (independent of recurrence interval). Similarly, the maximum earthquake for an intra-slab source on the subducting Juan De Fuca plate is estimated to be M7.5 to M7.7.

B.3.1.3.2 *<u>Empirical Determination of Characteristic Earthquake</u>*

Another method for estimating the characteristic earthquake that a particular seismic source could generate is by using empirical relationships between earthquake magnitude and fault rupture length[18]. Based on these relationships, the size of historical earthquakes, and the thickness of seismogenic crust in the region, the maximum earthquake magnitude expected from crustal sources is M6.0 to M6.6[19]. Based on the likely thin nature of the Juan de Fuca Plate, and comparing the historic seismicity along the intraplate area with other similar intraplate regions, the estimated maximum magnitude earthquake for intraplate sources is M7.0 to M7.5[20,21]. Similarly, based on magnitude versus rupture area relationships

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12 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

13 Geomatrix Consultants, 1993. Seismic margin Earthquake For the Trojan Site: Final Unpublished Report For Portland General Electric Trojan Nuclear Plant, Rainier, Oregon, May 1993.

14 Kirby, Stephen H., Wang, Kelin, Dunlop, Susan, 2002, The Cascadia Subduction Zone and Related Subduction Systems—Seismic Structure, Intraslab Earthquakes and Processes, and Earthquake Hazards: U.S. Geological Survey Open-File Report 02-328, 182 pp.

15 Cascadia Region Earthquake Workshop, 2008. Cascadia Deep Earthquakes. Washington Division of Geology and Earth Resources, Open File Report 2008-1.

16 Niewendorp, Clark A., and Neuhaus, Mark E., Map of Selected Earthquakes for Oregon,1841 through 2002 by Oregon Department of Geology and Mineral Industries, OFR O-03-02.

17 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

18 Bonilla, M.G., R. K. Mark, and J.J. Lienkaemper, 1984, Statistical relations among earthquake magnitude, surface rupture length, and surface fault displacement: Bulletin of the Seismological Society of America, V. 74, p. 2379-2411.

19 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, Project No. 2442.

20 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, Project No. 2442.

for subduction zone earthquakes worldwide, the maximum magnitude of a CSZ earthquake is estimated to be M8.0 to M9.2[22,23]. These magnitudes are also reflected in the probabilistic analyses used by U.S. Geological Survey.

B.3.1.3.3 Code Specified Design Earthquake

Section 1803.3.2.1 of the 2014 Oregon Structural Specialty Code[24] (OSSC) indicates specific minimum requirements for earthquake magnitudes to be used in seismic analyses, which are summarized in the following table:

Table B1 OSSC Minimum Design Earthquake

Seismic Source	Minimum Design Earthquake
Shallow Crustal Faults	6.0
Cascadia Subduction Zone – Subducting Plate (Intraplate)	7.0
Cascadia Subduction Zone – Interface (Subduction Zone)	8.5

B.3.1.4 Seismic Sources in the Vicinity of the Site

Table B2 shows the previously discussed faults (Section B.3.1.1), the characteristic earthquake magnitude for each, and the distance and direction of the fault from the site.

21 Pacific Northwest Seismic Network website, http://pnsn.org/outreach/earthquakesources/
22 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, Project No. 2442.
23 Pacific Northwest Seismic Network, 2017. Pacific Northwest Earthquake Sources Overview, *accessed April 2017,* from PNSN web site, http://pnsn.org/outreach/earthquakesources/.
24 International Code Council, Inc., 2014. 2014 Oregon Structural Specialty Code. Based on the 2012 International Building Code.

Table B2 Fault, Characteristic Earthquake Magnitude, and Distance from Site.

USGS Fault No.	Earthquake Source	Char Mag	Type of Fault	USGS Fault Class[1]	Fault Orientation (strike & dip)	Approximate Earthquake depth (km)	Fault Trace Distance (km) & Direction from Site	Notes
580	Faults Near The Dalles	7.00	Right Lateral Strike Slip	A	N38W 90 (vertical)	15 to 40 km	Within fault zone: nearest strand located 6.8 km NE	3
866	Hood River fault zone	6.30	Normal	A	N31W 70-90 S	15 to 40 km	7 km SW	3
568	Columbia Hills Structures	7.20	Thrust	B	N75E 30 to 60 N	15 to 40 km	13 km E	3
867	Eagle Creek fault	7.00	Thrust	B	N44E 29S	15 to 40 km	35 km W	3
567	Horse Heaven Hills	7.14	Thrust	B	N90W 60 S	15 to 40 km	40 km NE	2
850	Unnamed faults on Tygh Ridge	6.00	Reverse	B	N83E unknown dip	15 to 40 km	45 km SSE	3,4
868	Bull Run fault	7.00	Thrust	B	N4E 12SE	15 to 40 km	45 km WSW	3
	CSZ - Intraplate	7.00	Normal	A	N30W 10 to 20 E	30 to 60 km	86 km W (to east edge of seismogenic zone)	3
	CSZ	9.0 8.3	Mega-Thrust	A	N30W 10 to 20 E	<30 km	182 km W (to east edge of seismogenic zone)	3,5

1 USGS Fault Classes from USGS Earthquake Hazards Program, 2008 National Seismic Hazard Maps
Class A: Fault with convincing evidence of Quaternary activity (ACTIVE)
Class B: Fault that requires further study in order to confidently define their potential as possible sources of earthquake-induced ground motion (POTENTIALLY ACTIVE)

2 Characteristic earthquake magnitude from USGS Earthquake Hazards Program, 2008 National Seismic Hazard Maps – Fault Parameters

3 Characteristic earthquake magnitude from USGS Quaternary Fault and Fold Database of the United States

4 Characteristic earthquake magnitude from Section 1803.3.2.1 of the 2014 OSSC - Design Earthquake.

5 Models of earthquake magnitude assign variable magnitudes for different portions of the Cascadia Subduction Zone, so multiple magnitudes are provided.

B.4.0 SEISMIC SITE CLASS

B.4.1 Geologic Profile

The basic geologic profile of the site is shown on Inset 1, and consists of:

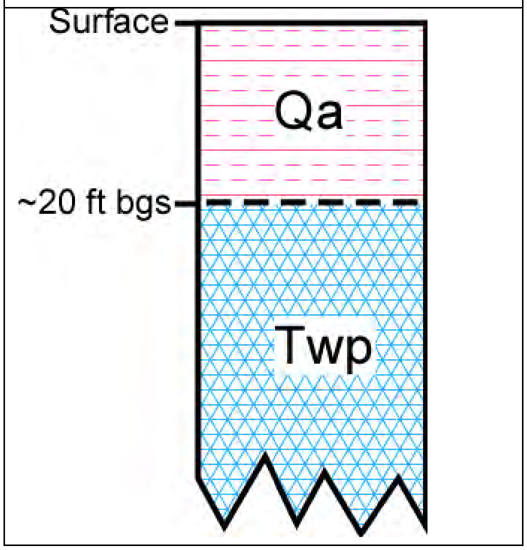
Alluvium (Qa): Based on drilled boring, available geologic mapping of the area[25], and review of local water well logs, the site is underlain by approximately 18 feet of Holocene and Pleistocene alluvium. The alluvium was deposited by the ancestral Columbia River and generally consists of gravel, sand, silt and clay. The map indicates that the alluvium was typically deposited directly onto the underlying bedrock.

Columbia River Basalt (Twp): According to the geologic map of the area, the site is underlain by the Priest Rapids member of the Tertiary Columbia River Basalt. The Columbia River Basalt consists of

[25] McClaughry, J.D., Wiley, T.J., Conrey, R.M., Jones, C.B., and Lite, K.E., 2012, Digital Geologic Map of the Hood River Valley, Hood River and Wasco Counties, Oregon: Oregon Department of Geology and Mineral Industries, Open-File Report O-2012-03, scale 1:36,000.

numerous fine-grained lava flows that primarily erupted from fissures in eastern Washington and Oregon and western Idaho during the Miocene Epoch (23.8 to 5.3 million years ago). Many individual flows are interbedded with thin paleosols formed during periods of volcanic inactivity. A thick residual soil often forms on the Columbia River Basalt, and is the result of in-place weathering of the basalt. The Columbia River Basalt maintains vertical slopes of hundreds of feet in height in the Columbia River Gorge. When the lava cooled, the shrinkage of the lava into basalt resulted in joint sets (weakness planes) that are nearly vertical. This results in the characteristic "columnar" appearance to the cliff faces in the Columbia River Gorge.

Inset 1: Geologic Profile



B.4.2 Site Class Determination

The determination of the seismic site class is based on subsurface data in accordance with Chapter 20 of the ASCE 7-10. CGT used Standard Penetration Test (SPT) N-values for determination of the site classification for this project. The SPT subsurface exploration method is described in the geotechnical investigation report. Chapter 20 of ASCE 7-10 requires that the stiffness of the soils be measured or reasonably estimated for the upper 100 feet bgs.

Boring B-1 was advanced to a depth of about 31 feet bgs. Basalt bedrock was first encountered at a depth of about 18 feet bgs, and extended to the total depth drilled, about 31 feet bgs. The basalt bedrock was consistent with the Columbia River Basalt mapped in the area of the site. Mapping indicates the basalt extends to depths greater than one thousand feet bgs in the area of the site. In accordance with Section 20.4.2 of ASCE 7-10, a SPT N-value of 100 was used to represent the refusal conditions (50+ SPT blows for less than 6 inches of penetration) met at the deepest SPT measurement. To satisfy code requirements, we extrapolated this N-value to a depth of 100 feet bgs. The results of the site class calculations are shown in the following table.

Table B3 Calculation for Determination of Site Classification

Bottom Depth (feet)	Soil Type	Field SPT (N_i)	Layer Thickness [d_i] (feet)	d_i/N_i
1.5	SM	9	1.5	0.17
4	SP	35	2.5	0.07
6.5	GP	70	2.5	0.04
9	GP	47	2.5	0.05
11.5	GP	100	2.5	0.03
14	GP	100	2.5	0.03
16.5	GP	53	2.5	0.05
18.9	RX	100	2.4	0.02
100	RX	100	81.1	0.81
TOTALS			**100.0**	**1.27**

Geometric Mean:
(ASCE 7-10 Section 20.4.2
Equation 40.4.-2)

$$\overline{N} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{N_i}} = \mathbf{78.74}$$

Based on the guidelines presented in Table 20.3-1 in Chapter 20 of the ASCE 7-10, the project site is designated as Site Class C.

B.5.0 SEISMIC GROUND MOTION VALUES

Earthquake ground motion parameters for the site were obtained based on the United States Geological Survey (USGS) Seismic Design Maps application[26]. The following table shows the recommended seismic design parameters for the site.

Table B4 Seismic Ground Motion Values

Parameter		Value
Mapped Acceleration Parameters	Spectral Acceleration, 0.2 second (S_s)	0.522g
	Spectral Acceleration, 1.0 second (S_1)	0.240g
Coefficients (Site Class C)	Site Coefficient, 0.2 sec. (F_a)	1.191
	Site Coefficient, 1.0 sec. (F_v)	1.560
Adjusted MCE Spectral Response Parameters	MCE Spectral Acceleration, 0.2 sec. (S_{MS})	0.622g
	MCE Spectral Acceleration, 1.0 sec. (S_{M1})	0.374g
Design Spectral Response Accelerations	Design Spectral Acceleration, 0.2 seconds (S_{DS})	0.415g
	Design Spectral Acceleration, 1.0 second (S_{D1})	0.249g

Based on Section 1613.3.5 of the 2014 OSSC, the site falls into a Seismic Design Category D.

[26] United States Geological Survey, 2017. Seismic Design Parameters determined using:, “U.S. Seismic Design Maps Web Application,” *accessed April 2017*, from the USGS website https://earthquake.usgs.gov/designmaps/us/application.php.

The recommendations presented above were based on design procedures presented in Section 11.4 of ASCE 7-10. A site-specific response analysis could be performed to develop a site-specific design response spectrum at the owner's discretion, if desired, for an additional fee.

B.6.0 SEISMIC HAZARDS

B.6.1 Liquefaction

In general, liquefaction occurs when deposits of loose/soft, saturated, cohesionless soils, generally sands and silts, are subjected to strong earthquake shaking. If these deposits cannot drain quickly enough, pore water pressures can increase, approaching the value of the overburden pressure. The shear strength of a cohesionless soil is directly proportional to the effective stress, which is equal to the difference between the overburden pressure and the pore water pressure. When the pore water pressure increases to the value of the overburden pressure, the shear strength of the soil reduces to zero, and the soil deposit can liquefy. The liquefied soils can undergo rapid consolidation or, if unconfined, can flow as a liquid. Structures supported by the liquefied soils can experience rapid, excessive settlement, shearing, or even catastrophic failure.

The susceptibility of sands, gravels, and sand-gravel mixtures to liquefaction is typically assessed based on penetration resistance, as measured using SPTs, CPTs, or Becker Hammer Penetration tests (BPTs). For fine-grained soils, susceptibility to liquefaction is evaluated based on penetration resistance and plasticity, among other characteristics. Criteria for identifying non-liquefiable, fine-grained soils are constantly evolving. Current practice to identify non-liquefiable, fine-grained soils is based on plasticity characteristics of the soils, as follows: (1) liquid limit greater than 47 percent, (2) plasticity index greater than 20 percent, and (3) moisture content less than 85 percent of the liquid limit[27].

The Oregon Department of Geology and Mineral Industries' Oregon Statewide Geohazards Viewer[28] shows a high hazard for liquefaction for the site and immediate vicinity. The liquefaction hazard zone corresponds to the mapped landslide described in Section B.2.3. As discussed above, the landslide hazard map was based on an earlier small-scale map. Subsequent mapping has further refined the landslide hazard as being located further to the west and not including the site.

The materials encountered in our boring are considered non-liquefiable within the depths explored based on the dense consistencies of the alluvium and hard bedrock. Assuming geologic conditions encountered in the boring are consistent across the site, we conclude there is a very low risk for seismically-induced liquefaction settlement at the site.

B.6.2 Surface Rupture

B.6.2.1 Faulting

As discussed above, the site is situated in a region of the country characterized by extensive faulting and known for seismic activity. However, no known faults are mapped on or immediately adjacent to the site.

---

27 Seed, R.B. et al., 2003. Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework. Earthquake Engineering Research Center Report No. EERC 2003-06.

28 Oregon Department of Geology and Mineral Industries, 2017. Oregon Statewide Geohazards Viewer, *accessed April 2017*, from DOGAMI web site: http://www.oregongeology.org/sub/hazvu/index.htm.

Therefore, the risk of surface rupture impacting the proposed development at the site due to faulting is considered very low.

B.6.2.2 Lateral Spread

Surface rupture due to lateral spread can occur on sites underlain by liquefiable soils that are located on or immediately adjacent to slopes steeper than about 3 degrees (20H:1V), and/or adjacent to a free face, such as a stream bank or the shore of an open body of water. During lateral spread, the materials overlying the liquefied soils are subject to lateral movement downslope or toward the free face. Recognizing the lack of liquefiable materials at the site, we characterize the risk of surface rupture due to lateral spread as very low.

B.6.3 Slope Stability

Due to the gently sloping site and generally dense nature of the alluvium encountered within the exploratory boring and hard underlying basalt bedrock, we conclude the risk of seismically-induced slope instability is low.

B.6.4 Tsunami/Seiche Inundation

The site is geographically distant from the Oregon coast and therefore not at risk of inundation from a tsunami occurring in the Pacific Ocean.

The term seiche refers to oscillating standing waves that can produce dramatic changes in water level over relatively short periods of time and can cause inundation of nearby areas. A seiche can be generated in enclosed or partially enclosed bodies of water by atmospheric conditions or seismic activity. The site is located near the Columbia River, which could produce a seismically-induced seiche. However, the proposed development will be constructed at least 20 feet above the elevation of the river and well above the potential seiche zone. Accordingly, the hazard associated with seiche inundation at the site is considered negligible.

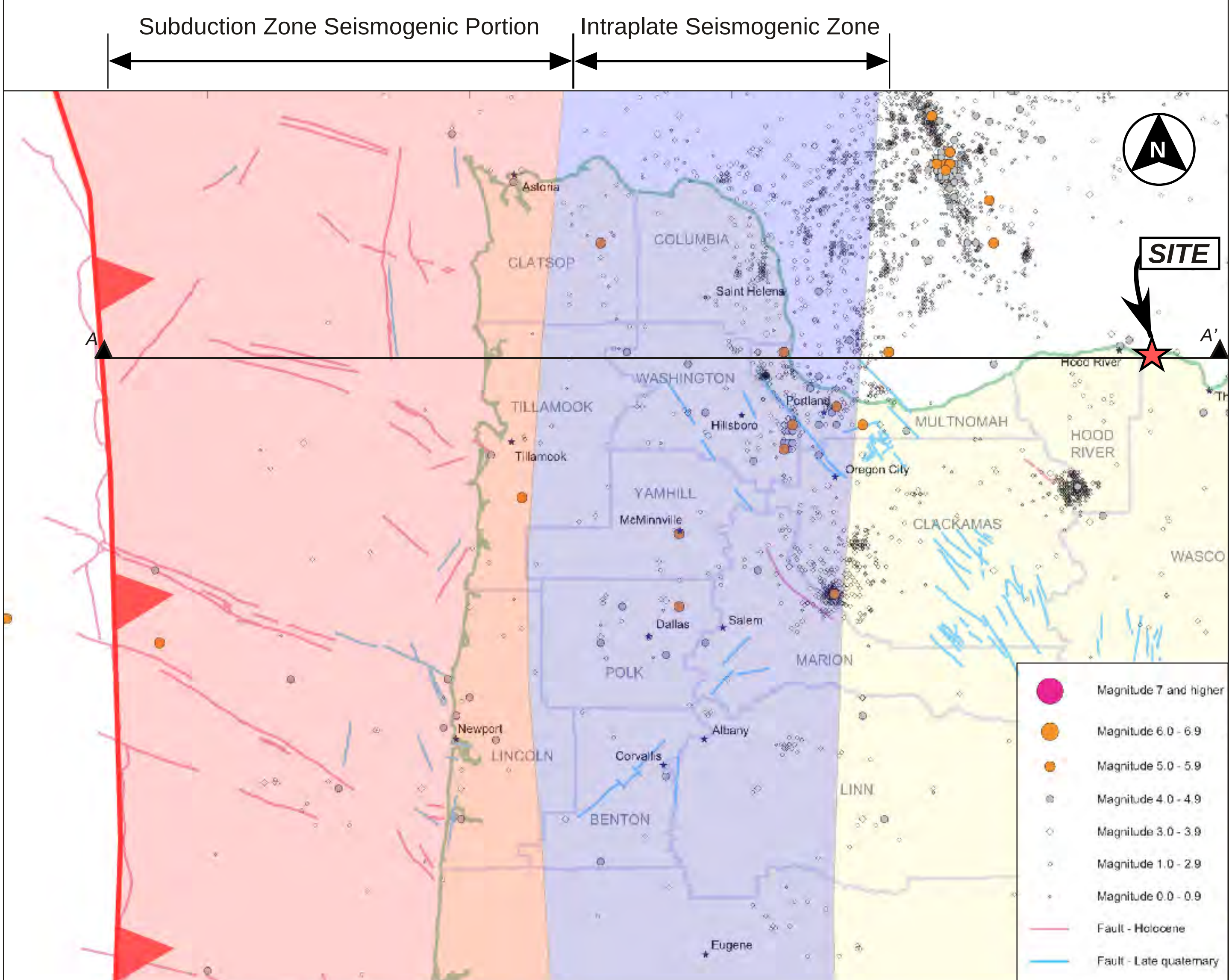
B.7.0 REPORT SUBMITTAL

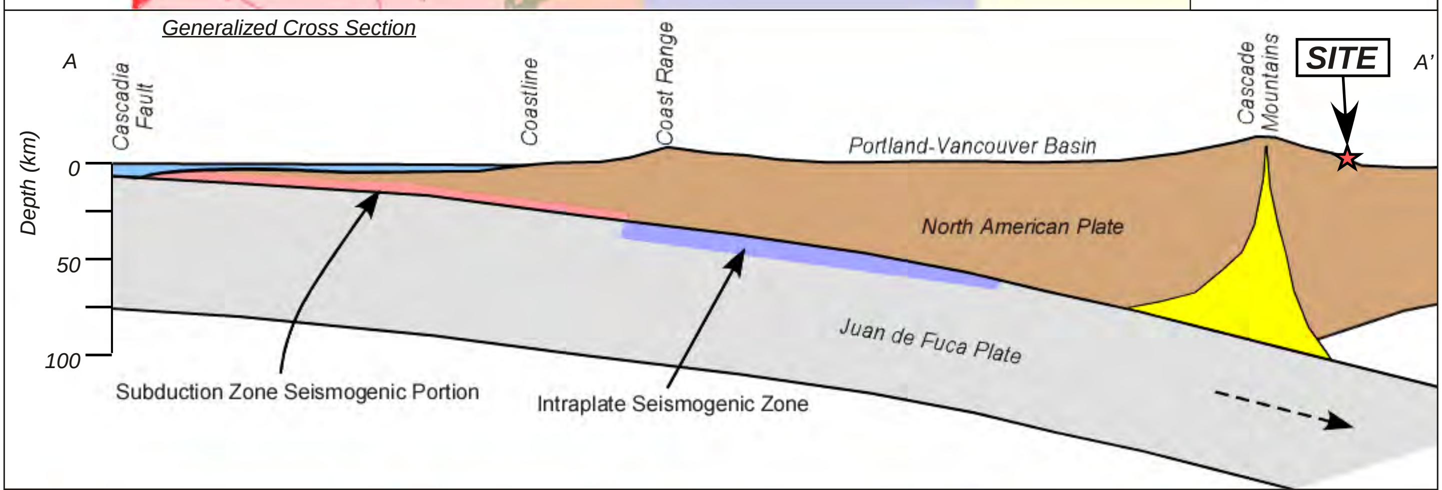
According to Section 1803.9 of the 2014 OSSC[29], the applicant should submit one copy of the Site-Specific Seismic Hazards Study to the building permit issuing agency (the jurisdiction), and one copy to the Oregon Department of Geology and Mineral Industries (DOGAMI). The DOGAMI report can be submitted to the following address:

DOGAMI – Site Specific Seismic Hazards Study
Administrative Offices
800 NE Oregon Street #28, Suite 965
Portland, Oregon 97232

[29] International Code Council, Inc., 2014. 2014 Oregon Structural Specialty Code. Based on the 2012 International Building Code.

MOSIER FIRE STATION - MOSIER, OREGON Project Number G1604493	FIGURE B1 Regional Seismicity





CARLSON GEOTECHNICAL 503-601-8250

- McCrory, Blair, Oppenheimer, and Walter, 2004. Depth to the Juan de Fuca slab beneath the Cascadia subduction margin - A 3-D model for storing earthquakes: U.S. Geological Survey Data Series 91.
- Niewendorp, Clark A., and Neuhaus, Mark E., Map of Selected Earthquakes for Oregon,1841 through 2002 by Oregon Department of Geology and Mineral Industries, OFR O-03-02.

Scale 1 Inch = 50 kilometers

0 50 100

Appendix E - Project Cost Narrative and Estimate

Total Project Cost Summary

The conceptual total project cost of the Mosier Joint Use Facility has been estimated based on the site plan and different floor plan options (Appendix B and C). Also refer to the side-by-side comparison of costs on the following page for comparison along with descriptions below:

Total Construction Cost:

Supporting cost information has been provided in the pages that follow to establish a conceptual construction cost for the JUF. This information has been applied to all four plan options to better understand the target cost for each.

Soft Costs:

These are on top of the construction estimate and include surveys, insurance, system development charges, and engineering fees. This also can include site acquisition costs, but with the property donation, the percentage can be reduced. We are currently using 25%.

Contingency:

Considering the attached estimate is on conceptual plans without a full building design, a 10% estimate contingency has been included in the construction cost for potential unknowns that may arise.

Total Project Cost:

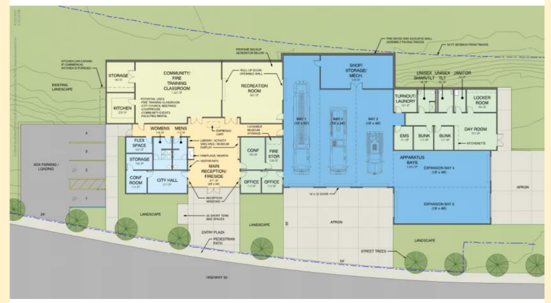
The total project cost range of the 4 options as shown represents the cost to have the JUF move in ready and operational.

Cost Alternatives and Supporting Information:

Following the Building Options Cost Comparison sheet is the supporting information that was used to develop the project budget. There was an initial estimate based on quantities and unit costs of the JUF with assumptions made about materials and other elements that have not yet been designed. Then following is a revised cost summary after some value engineering changes were made as summarized. After the summary sheets is the supporting information. These were then applied to the various floor plan options to arrive at the cost summary on the following page.

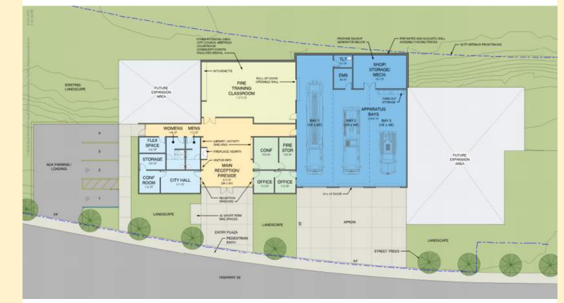
921 SW WASHINGTON STREET SUITE 250
PORTLAND OREGON 97205
503 227 4860 TEL
503 227 4920 FAX
www.henneberyeddy.com

Expanded Community Fire Station / City Hall



Expanded Fire Station + City Hall

Essential Fire Station + City Hall



Essential Site Optimized Fire Station + City Hall

	Cost Per SF	Expanded Community Fire Station / City Hall SF	Expanded Community Fire Station / City Hall Cost	Expanded Fire Station + City Hall SF	Expanded Fire Station + City Hall Cost	Essential Fire Station + City Hall SF	Essential Fire Station + City Hall Cost	Essential Site Optimized Fire Station + City Hall SF	Essential Site Optimized Fire Station + City Hall Cost
Sitework (On-Site) - Grading / Utilities / Paving	$39.83		$489,312		$489,312		$489,312		$296,734
Site Retaining Walls / Import Struct. Fill	$19.72		$242,260		$242,260		$242,260		$146,914
Building Shell - Pre-Engineered Metal Building	$107.00	12285	$1,314,495	9285	$993,495	7685	$822,295	7450	$797,150
Interior Finish - Level #1 (Unfinished)	$12.50	6860	$85,750	5035	$62,938	3495	$43,688	3355	$41,938
Interior Finish - Level #2 (Entry + Community Rm)	$105.00	2720	$285,600	2720	$285,600	2720	$285,600	2720	$285,600
Interior Finish - Level #3 (Administration)	$70.00	2705	$189,350	1530	$107,100	1470	$102,900	1375	$96,250
Base Construction Cost			$2,606,767		$2,180,704		$1,986,054		$1,664,585
Escalation (10.5%)			$273,711		$228,974		$208,536		$174,781
Contingency (10% of Base + Escalation)			$288,048		$240,968		$219,459		$183,937
Total Construction Cost			$3,168,525		$2,650,646		$2,414,049		$2,023,303
Soft Costs (25%)			$792,131		$662,662		$603,512		$505,826
Total Project Cost			**$3,960,656**		**$3,313,308**		**$3,017,561**		**$2,529,129**

Initial Conceptual Estimate

City of Mosier - Joint Use Facility
CONCEPTUAL ESTIMATE SUMMARY

April 10, 2017

		Site	Building	TOTAL
	SF	56,975	7,485	
Sitework - Off Site Utilities / Street Improvements				$0
Sitework (On-Site) - Grading / Utilities / Paving		$6.33	$48.20	$360,767
Site Retaining Walls / Import Struct. Fill		$6.51	$49.54	$370,827
Building shell			$137.62	$1,030,072
Interior Finishes			$70.85	$530,348
TOTAL ESTIMATED CONSTRUCTION COSTS			$306.21	$2,292,014
Conceptual Estimate Contingency:		10%	$30.62	$229,201
Total Conceptual Cost Estimate			**$336.84**	**$2,521,215**

ALTERNATE COST ITEMS

Alt. #1 - Modify plan to expanded joint use facility (8,784 SF) - ADD	$344,235
Alt. #2 - Modify plan to full joint use facility (12,260 SF) - ADD	$1,332,225

Revised Conceptual Estimate

City of Mosier - Joint Use Facility
CONCEPTUAL ESTIMATE SUMMARY

June 2, 2017

	Site	*Building*	*TOTAL*
SF	*56,975*	*12,285*	
Sitework - Off Site Utilities / Street Improvements			$0
Sitework (On-Site) - Grading / Utilities / Paving	*$8.59*	*$39.83*	$489,304
Site Retaining Walls / Import Struct. Fill	*$4.25*	*$19.72*	$242,290
Building shell - Pre Engineered Metal Building		*$107.00*	$1,314,495
Interior Finish - Level #1 - Unfinished (6,860 SF)		*$12.50*	$85,750
Interior Finish - Level #2 (2,720 SF)		*$105.00*	$296,100
Interior Finish - Level #3 (2,705 SF)		*$70.00*	$189,350
TOTAL ESTIMATED CONSTRUCTION COSTS		*$213.05*	$2,617,289
Escalation Allowance (36 months)	10.5%		$274,815
Conceptual Estimate Contingency:	10%		$289,210
Total Conceptual Cost Estimate		***$258.96***	$3,181,314

Notes

1 The budget for imported structural fill has been reduced by $129,000 to account for fill material to be supplied and delivered to the site by ODOT. This assumes the material is an acceptable structural fill.

2 The budget for the building shell assumes the structural framing and envelope system is constructed utilizing a pre-engineered metal building system and standard commercial doors, windows and MEP systems.

3 The interior finish budgets are based on the following areas as defined by HEA Architects:

Interior Finish Areas

- Level #1
- Level #2
- Level #3

CONSTRUCTION BUDGET FOR:

Project: City of Mosier - Joint Use Facility
Owner: City of Mosier

CLARIFICATIONS & EXCLUSIONS

The following clarifications are intended to qualify and identify specific items included or not included in the above referenced construction proposal prepared by CS Construction:

STANDARD EXCLUSIONS:

1 Payment / Performance Bond and Builder's Risk Insurance policy unless noted otherwise.
2 Plan Check Fees, Permit Fees, System Development Charges (SDC's)
3 All Architectural, Engineering and Development Fees are to be paid by the Owner.
4 Hazardous soils survey and abatement (if required).
5 Demolition and removal of existing underground storage tanks (if any).
6 Utility connection charges and fees including all franchise and public utility services.
7 Acceleration/off hours working.
8 All Code required Special Inspections & Testing including Geotechnical testing.
9 All equipment and furnishings are by Owner unless noted otherwise..
10 Commissioning of Mechanical, Electrical, Plumbing systems unless noted otherwise.
11 Interior and exterior signage, except for restrooms and code related signage.
12 Temporary power, gas, sewer and water services to the job trailer / site to be paid by the Owner.

PROJECT SPECIFIC CLARIFICATIONS:

1 The budget is based on the preliminary plans prepared by Hennebery Eddy Architects titled "City of Mosier Joint Use Facility" dated February 15, 2017. This budget is based on preliminary plans and is a conceptual estimate intended to evaluate the overall feasibility of the project. This budget is based on historical cost data and is not a contract to complete the work, nor is it a guarantee of the total project costs.

2 The Sitework budget assumes domestic water, sewer, power and gas services are stubbed to the property and can easily be extended without the need for major offsite improvements and service extensions.

3 The budget excludes any and all off-site improvements including but not limited to: street modifications, sidewalks, curbs, signage, stripping and utility extensions.

4 The base budget is for the "Essential" joint use facility only. See the alternate pricing summary for pricing on the "Expanded" Joint Use Facility and the "Full Community" Joint Use Facility.

5 The budget for the foundation system assumes the north, west and east perimeters of the building and parking envelope are constructed utilizing a 10" cast-in-place concrete wall and all new foundations / floor systems are to be slab-on-grade.

Supporting Estimate Information

City of Mosier - Joint Use Facility
SITEWORK BUDGET

April 10, 2017

Description	Quantity	Unit	Unit Cost	Item Detail $	Item $	Division $
DIVISION 1 - GENERAL CONDITIONS						**$50,713**
General Conditions	**1**	**ITEM**			**$50,713**	
General Conditions Pro-rate	8.0%	1	$633,915	$50,713		
DIVISION 2 - SITEWORK						**$633,915**
Excavation:						
Erosion / Traffic Control					**$3,599**	
Initial Erosion Control	56,974	GSA	$0.02	$1,139		
Maintenance of Erosion Control	1	lsum	$750.00	$750		
Traffic Control	56,974	GSA	$0.03	$1,709		
Wet Condition Premium Items					**$1,900**	
Access Roads / Tire Knock-Off	50	CY	$20.00	$1,000		
Staging Area	45	CY	$20.00	$900		
Mass Grading					**$254,981**	
Mobilization	1	EA	$3,500.00	$3,500		
Demolition of Existing Structures	Excluded - None Shown					
Clear & Grub Site	56,974	ISF	$0.09	$5,128		
Excavation & Embankment	2,165	CY	$18.00	$38,970		
Import Borrow	10,655	CY	$16.85	$179,537		
Subgrade Preparation	22,025	ISF	$0.45	$9,911		
Screen / Reuse On-Site Material	2,110	CY	$8.50	$17,935		
Structural Excavation					**$29,222**	
Struct. Excavation/Backfill - Structure	75	CY	$55.00	$4,125		
Struct. Excavation / Backfill - Retaining Wall	306	CY	$55.00	$16,830		
Building Pad Prep - 6"	7,485	SF	$0.95	$7,111		
Sidewalk / Site Conc. Baserock / Prep	1,217	SF	$0.95	$1,156		
Site Utilities:						
Storm System					**$38,250**	
8"	50	LF	$28.00	$1,400		
6"	650	LF	$22.00	$14,300		
4" Storm Piping	125	LF	$18.00	$2,250		
Catch Basins	5	EA	$950.00	$4,750		
Drainage Swales	650	SF	$12.00	$7,800		
Rain drain Intertie Piping	8	EA	$225.00	$1,800		
Drywell at Swale	0	EA	$0.00	$0		
Perimeter Foundation Drain	350	LF	$17.00	$5,950		
Sanitary Sewer					**$21,945**	
6" sewer line (assumes service is at site)	75	LF	$40.00	$3,000		
Joint Utility Trench	75	LF	$55.00	$4,125		
Oil Water Separator	1	EA	$4,500.00	$4,500		
2000 Gallon Septic Tank	Excluded					
Underslab Trenching	410	LF	$12.00	$4,920		
Cleanouts	2	EA	$400.00	$800		
Manhole	1	EA	$2,650.00	$2,650		

City of Mosier - Joint Use Facility
SITEWORK BUDGET

April 10, 2017

Description	Quantity	Unit	Unit Cost	Item Detail $	Item $	Division $
Street Tap / Fittings / Patch	1	EA	$1,950.00	$1,950		
Water System					**$27,800**	
2" domestic water line	75	LF	$24.00	$1,800		
6.0" fire water line	75	LF	$65.00	$4,875		
Fire Hydrants	1	EA	$2,750.00	$2,750		
6" Fire DDC/FDC Assembly & Vault	1	IT	$12,500.00	$12,500		
Domestic Water Meter Vault Assembly	1	IT	$750.00	$750		
Chlorinate & Test Waterline	1	ALLOW	$500.00	$500		
Irrigation Water Meter	1	IT	$500.00	$500		
Street Tap	0	EA	$0.00	$0		
Trench & Backfill from Meter	75	LF	$29.00	$2,175		
Cut / Patch Street & Traffic Control	1	ALLOW	$1,950.00	$1,950		
Site Electrical					**$21,386**	
Site Lighting	56,974	ISF	$0.15	$8,546		
Conduit for Site Lighting	260	LF	$14.00	$3,640		
Trench & Backfill	75	LF	$22.00	$1,650		
2" Conduit	75	LF	$12.00	$900		
3" Conduit	75	LF	$14.00	$1,050		
4" Conduit	150	LF	$16.00	$2,400		
Transformer / Vault	1	EA	$3,200.00	$3,200		
Asphalt Paving:						
Baserock	**1**	**ITEM**			**$5,650**	
8" Base - Truck Apron	2,058	SF	$1.55	$3,190		
6" Base - AC Paving / Parking	1,968	SF	$1.25	$2,460		
Asphalt Paving	**1**	**ITEM**			**$5,641**	
2.0" A.C. - One Lift	1,968	SF	$1.85	$3,641		
Asphalt Patching	1	ALLOW	$2,000.00	$2,000		
Site Concrete:						
Sidewalks / Retaining Walls	**1**	**ITEM**			**$169,168**	
Sidewalk Onsite - Standard	1,217	SF	$4.90	$5,963		
Retaining Walls - Footing	230	CY	$270.00	$62,100		
Retaining Walls - Wall	86	CY	$1,050.00	$90,300		
Drive Approach	2,058	ISF	$5.25	$10,805		
Equipment / Trash Enclosure Pads	**1**	**ITEM**			**$1,470**	
Equipment Pads	120	ISF	$4.90	$588		
Trash Enclosure Pads	180	ISF	$4.90	$882		
Curbing	**1**	**ITEM**			**$1,008**	
Cast-In-Place Curbing	72	LF	$14.00	$1,008		
Pavement Marking & Signage	**1**	**ITEM**			**$1,420**	
Pavement Marking	4	STL	$55.00	$220		
Handicap Signage	1	STL	$450.00	$450		

City of Mosier - Joint Use Facility
SITEWORK BUDGET

April 10, 2017

Description	Quantity	Unit	Unit Cost	Item Detail $	Item $	Division $
Monument Sign Base	1	EA	$750.00	$750		
Landscape / Irrigation	**1**	**ITEM**			**$23,752**	
Topsoil	172	CY	$16.00	$2,752		
Landscape / Irrig - Typical	8,400	ISF	$2.50	$21,000		
Fencing	**1**	**ITEM**			**$16,224**	
6' Chain Link	676	LF	$24.00	$16,224		
Site Furnishings	**1**	**ITEM**			**$8,250**	
Bike Rack	4	EA	$225.00	$900		
Benches	2	EA	$1,250.00	$2,500		
Trash Receptacle	1	EA	$600.00	$600		
Flag Pole	1	EA	$2,250.00	$2,250		
Planters	1	EA	$2,000.00	$2,000		
Site Structures	**1**	**ITEM**			**$2,250**	
Trash/Recycle Enclosure - Chainlink	1	EA	$2,250.00	$2,250		
Subtotal Estimated Sitework Costs				$684,628	**$684,628**	**$684,628**

Contractor Fee	4.0%	**$27,385**
Subtotal		**$712,013**
Liability Insurance / Performance Bonds	2.75%	**$19,580**
TOTAL ESTIMATED SITEWORK COSTS		**$731,594**

Legend of Unit Measurements:

BSF *Building Square Feet*
CY *Cubic Yard*
EA *Each*
LBS *Pounds*
LF *Lineal Feet*
ISF *Item Square Feet*
IT *Item*
WK *Week*
SF *Square Feet*

City of Mosier - Joint Use Facility
Shell Budget

April 10, 2017

Description	Qty	Unit	Unit Cost	Item Detail $	Item $	Division $
DIVISION 1 - GENERAL CONDITIONS						$63,062
General Conditions	1	ITEM			$63,062	
General Conditions Pro-rate	7.0%	1	$900,884	$63,062		
DIVISION 2 - SITEWORK						$2,150
Sitework	1	ITEM			$2,150	
Layout / Batterboards	1	Allow	$2,150.00	$2,150		
DIVISION 3 - CONCRETE						$109,500
Footings & Foundations	1	ITEM			$36,677	
Footings & Foundations	7,485	SF	$4.90	$36,677		
Building Slabs	1	ITEM			$38,115	
Slab on Grade - 4" (Office Areas)	49	CY	$315.00	$15,435		
Slab on Grade - 6" (Apparatus Bay)	72	CY	$315.00	$22,680		
Concrete Reinforcement	1	ITEM			$20,953	
Reinforcing Steel - Slab / Footings / Walls	14,970	LBS	$1.25	$18,713		
Anchor Bolts / Hold Dows	140	EA	$16.00	$2,240		
Miscellaneous	1	ITEM			$13,756	
Material Handling / Forklift	12	WKS	$480.00	$5,760		
Concrete Sealer / Hardener	7,485	SF	$0.35	$2,620		
Sawcut Control Joints	2,240	LF	$0.65	$1,456		
Epoxy Control Joints	2,240	LF	$1.75	$3,920		
DIVISION 4 - MASONRY						$22,835
Exterior Masonry Skin	1	ITEM			$22,835	
4" CMU Veneer (48" Tall)	1,150	ISF	$16.00	$18,400		
Brick Masonry	Excluded					
Precast Head / Sill Trim	230	LF	$9.50	$2,185		
Material Handling / Forklift	1	EA	$2,250.00	$2,250		
DIVISION 5 - METALS						$49,777
Structural Steel	1	ITEM			$33,902	
Structural Steel Supply	7,485	ISF	$2.85	$21,332		
Structural Steel Erection	128	HRS	$65.00	$8,320		
Steel Erection Supplies / Bracing	1	Allow	$2,000.00	$2,000		
Erection Equipment	1	EA	$2,250.00	$2,250		
Architectural Steel	1	ITEM			$15,875	
Steel Canopies	65	LF	$225.00	$14,625		
HVAC Screen Support Structure	1	IT	$1,250.00	$1,250		
DIVISION 6 - CARPENTRY						$309,280
Rough Framing	1	ITEM			$235,044	
Rough Framing - Labor & Materials	7,485	ISF	$29.85	$223,427		
Material Handling / Forklift / Safety	1	EA	$7,500.00	$7,500		
Blocking and Backing	7,485	BSF	$0.55	$4,117		
Exterior Finish Carpentry	1	ITEM			$71,242	
Fascia	514	LF	$16.00	$8,220		
Siding (Hardi Reveal)	5,626	ISF	$7.85	$44,164		

City of Mosier - Joint Use Facility
Shell Budget

April 10, 2017

Description	Qty	Unit	Unit Cost	Item Detail $	Item $	Division $
Running Trims (Doors, Windows, Corners)	1,644	ISF	$7.50	$12,330		
Soffits	960	SF	$6.80	$6,528		
Misc. Carpentry	**1**	**ITEM**			**$2,994**	
Small Tools / Equipment / Consumables	7,485	ISF	$0.40	$2,994		
DIVISION 7 - THERMAL & MOISTURE PROTECTION						**$112,384**
Sheetmetal	**1**	**ITEM**			**$10,826**	
Exterior Flashing	1,233	LF	$4.50	$5,549		
Gutters / Downspouts	411	LF	$7.00	$2,877		
Roof Accessories	3	EA	$400.00	$1,200		
Downspout Connections / Scuppers	6	EA	$200.00	$1,200		
Roofing	**1**	**ITEM**			**$59,436**	
Metal Roofing	9,144	SF	$6.50	$59,436		
Thermal Insulation	**1**	**ITEM**			**$30,416**	
Roof Insulation - Thermal	9,144	ISF	$1.55	$14,173		
Wall Insulation - Thermal	6,576	ISF	$1.32	$8,680		
Vapor Barrier / Tyvek	6,576	ISF	$1.15	$7,562		
Caulking / Firestopping / Waterproofing	**1**	**ITEM**			**$9,835**	
Ext. Caulking - Siding / Trim	1,233	LF	$1.75	$2,158		
Waterproofing - Membrane	1	Allow	$2,500.00	$2,500		
Waterproofing - Ice & Water Sheild	1,644	Allow	$1.35	$2,219		
Waterproofing - Blueskin / Fortiflash	1,972	Allow	$1.50	$2,958		
Firestopping / Intumescent Coatings	Excluded - TBD based on code					
Fireproofing	Excluded - TBD based on code					
Miscellaneous	**1**	**ITEM**			**$1,871**	
Equipment / Scaffolding	7,485	BSF	$0.25	$1,871		
DIVISION 8 - DOORS & WINDOWS						**$106,510**
Exterior Doors, Storefront & Vestibule	**1**	**ITEM**			**$27,150**	
Hollow Metal Exterior Doors	2	LVS	$1,350.00	$2,700		
Overhead Doors	3	EA	$8,150.00	$24,450		
Windows	**1**	**ITEM**			**$76,860**	
Storefront Window System	1,315	ISF	$54.00	$71,010		
Automatic Entry System / ADA Access	1	ALLOW	$1,550.00	$1,550		
Storefront Entry Doors	2	EA	$2,150.00	$4,300		
Roof / Attic Access	**1**	**ITEM**			**$2,500**	
Access Hatch with Built-In Roof Ladder	1	EA	$2,500.00	$2,500		
DIVISION 9 - FINISHES						**$27,259**
Painting	**1**	**ITEM**			**$16,459**	
Exterior Painting	6,576	ISF	$2.25	$14,796		
Masonry Sealer / Waterproofing	950	ISF	$1.75	$1,663		
Misc. Finishes	**1**	**ITEM**			**$10,800**	
Progressive Cleanup / Final Cleaning	24	WKS	$450.00	$10,800		

City of Mosier - Joint Use Facility
Shell Budget

April 10, 2017

Description	Qty	Unit	Unit Cost	Item Detail $	Item $	Division $
DIVISION 10 - Specialties						**$650**
Specialties	**1**	**ITEM**			**$650**	
Knox Box	1	EA	$650.00	$650		
DIVISION 15 - MECHANICAL						**$104,402**
Plumbing	**1**	**ITEM**			**$27,735**	
Sewer Under Slab	230	LF	$30.00	$6,900		
Gas Piping	125	LF	$19.00	$2,375		
Floor Drains	6	EA	$1,250.00	$7,500		
Oil Water Separator	0	Allow	$0.00	$0		
Domestic Water Supply	280	LF	$17.00	$4,760		
Roof Drain Hub / Connection	0	EA	$0.00	$0		
Break Room Fixtures	0	EA	$0.00	$0		
Restroom Fixtures	0	EA	$0.00	$0		
Hot Water Heater	1	EA	$3,200.00	$3,200		
HVAC Equipment Connections	0	EA	$0.00	$0		
Hose Bibs	4	EA	$750.00	$3,000		
Hydronic Snowmelt System	Excluded - Verify design intent					
Fire Sprinklers	**1**	**ITEM**			**$16,467**	
Building Shell	7,485	BSF	$2.20	$16,467		
HVAC	**1**	**ITEM**			**$60,200**	
Gas Fired Unit Heaters	2	EA	$2,250.00	$4,500		
HVAC Split System (Equipment)	4,456	ISF	$12.50	$55,700		
DIVISION 16 -ELECTRICAL						**$56,138**
Shell	**1**	**ITEM**			**$56,138**	
Electrical Service / Distribution	7,485	BSF	$7.50	$56,138		
Subtotal Estimated Shell Costs				$963,946	$963,946	**$963,946**
Contractor Fee	4.0%					**$38,558**
Subtotal						**$1,002,504**
Liability Insurance / Performance Bonds	2.75%					**$27,569**
TOTAL ESTIMATED COSTS						**$1,030,072**
Shell Cost Per Square Foot	7,485	BSF		**$137.62**		

Legend of Unit Measurements:

BSF	*Building Square Feet*	***WK***	*Week*
CY	*Cubic Yard*	***SF***	*Square Feet*
EA	*Each*		
LBS	*Pounds*		
LF	*Lineal Feet*		
ISF	*Item Square Feet*		
IT	*Item*		

City of Mosier - Joint Use Facility
Interior Finishes Budget

April 10, 2017

Description	Qty	Unit	Unit Cost	Item Detail $	Item $	Division $
DIVISION 1 - GENERAL CONDITIONS						**$36,763**
General Conditions	**1**	**ITEM**			**$36,763**	
General Conditions Pro-rate	8.0%	1	$459,539	$36,763		
DIVISION 5 - METALS						**$5,436**
Miscellaneous	**1**	**ITEM**			**$5,436**	
Wall Partition Supports / Arch Steel	453	LF	$12.00	$5,436		
DIVISION 6 - CARPENTRY						**$80,980**
Rough Carpentry	**1**	**ITEM**			**$25,368**	
Interior Wall Framing	7,248	ISF	$3.50	$25,368		
Interior Finish Carpentry	**1**	**ITEM**			**$53,962**	
Wood Base - Entry	125	LF	$9.50	$1,188		
Wainscot / Chair Rail - Training Room	736	ISF	$5.45	$4,011		
Light Coves	1	ALLOW	$2,500.00	$2,500		
Window Sills - MDF	220	LF	$11.00	$2,420		
Ceilings / Soffits - Entry	625	SF	$8.75	$5,469		
Misc. Interior Trims	1	ALLOW	$3,500.00	$3,500		
Cabinetry - Base Cabinets	75	LF	$180.00	$13,500		
Cabinetry - Base/ Upper Cabinets	55	LF	$225.00	$12,375		
Cabinetry - Restroom Vanity	3	EA	$1,500.00	$4,500		
Cabinetry - Reception Desk	1	ALLOW	$3,000.00	$3,000		
Closet Shelving	1	ALLOW	$1,500.00	$1,500		
Misc. Carpentry	**1**	**ITEM**			**$1,650**	
Small Tools / Equipment / Consumables	1	ALLOW	$1,650.00	$1,650		
DIVISION 7 - THERMAL & MOISTURE PROTECTION						**$3,760**
Caulking / Firestopping / Waterproofing	**1**	**ITEM**			**$3,760**	
Int. Caulking - Window/Door Openings	1,680	LF	$0.75	$1,260		
Firestopping	1	Allow	$2,500.00	$2,500		
DIVISION 8 - DOORS & WINDOWS						**$52,230**
Windows	**1**	**ITEM**			**$10,700**	
Relights	140	ISF	$40.00	$5,600		
Pass Through Window	60	ISF	$55.00	$3,300		
Mirrors	60	ISF	$30.00	$1,800		
Doors	**1**	**ITEM**			**$41,530**	
Hollow Metal Frames / Doors	21	Ea	$1,430.00	$30,030		
Roll Up Door at Training Room	1	Ea	$3,500.00	$3,500		
Access Doors	4	Ea	$2,000.00	$8,000		
DIVISION 9 - FINISHES						**$132,052**
Gypsum Wallboard / Metal Wall Framing	**1**	**ITEM**			**$40,546**	
Hat Channel / Furring (Sound Walls)	5,648	ISF	$0.75	$4,236		
Gypsum Wallboard - Walls	21,072	ISF	$1.55	$32,662		
Gypsum Wallboard - Ceilings	466	ISF	$3.00	$1,398		
Gypsum Wallboard - Draftstops	1	ALLOW	$1,500.00	$1,500		
GWB - Rated Fire Assemblies	1	ALLOW	$750.00	$750		

City of Mosier - Joint Use Facility
Interior Finishes Budget

April 10, 2017

Description	Qty	Unit	Unit Cost	Item Detail $	Item $	Division $
Suspended Acoustical Ceiling	3,790	ISF	$3.15	$11,939		
Suspended Soffits / Acoustical Panels	1	ALLOW	$2,500.00	$2,500		
Flooring / Tile / Countertops	1	ITEM			$52,439	
Carpet	2,511	ISF	$3.65	$9,165		
Tile - Ceramic	282	ISF	$22.00	$6,204		
Tile - Wall Wainscot	1	ALLOW	$4,000.00	$4,000		
Epoxy Flooring (Apparatus Bay)	3,610	ISF	$3.50	$12,635		
LVP Flooring (Entry / Hallways)	1,097	ISF	$7.85	$8,611		
Rubber Base	1,359	ISF	$2.85	$3,873		
Solid Surface Countertops	1	ALLOW	$7,500.00	$7,500		
Seal Tile & Stone	450	ISF	$1.00	$450		
Painting	1	ITEM			$23,168	
Int. Painting- Drywall	7,485	ISF	$3.00	$22,455		
FRP Paneling	250	ISF	$2.85	$713		
Misc. Finishes	1	ITEM			$15,900	
Progressive Cleanup / Final Cleaning	16	Wks	$450.00	$7,200		
Drop Boxes / Dump Fees	12	Allow	$350.00	$4,200		
Temporary Heating	1	Allow	$4,500.00	$4,500		
DIVISION 10 - Specialties						$24,985
Specialties	1	ITEM			$24,985	
Tack Boards / Bulletin Boards	6	EA	$450.00	$2,700		
Whiteboards	6	EA	$335.00	$2,010		
Projection Screens	2	EA	$1,500.00	$3,000		
Lockers	Excluded - Verify if Required					
Benches / Accessories	Excluded - Verify if Required					
Mailboxes	Excluded - Verify if Required					
Folding Partitions	Excluded - Verify if Required					
Furniture Partitions	Excluded - Verify if Required					
Storage Shelving / Metal Racking	Excluded - Verify if Required					
Signage / Directories	Excluded - Verify if Required					
Walk-off Entry Mat's - Recessed	Excluded - Verify if Required					
Corner Guards	Excluded - Verify if Required					
Louvers	4	EA	$750.00	$3,000		
Fire Extinguishers / Cabinets	4	EA	$350.00	$1,400		
Toilet Room Accessories	3	EA	$425.00	$1,275		
Toilet Room Partitions	4	EA	$1,650.00	$6,600		
Fire Places	1	EA	$5,000.00	$5,000		
DIVISION 11 - Equipment						$5,650
Equipment	1	ITEM			$5,650	
Security / Access Control Equipment	1	ALLOW	$2,150.00	$2,150		
Automotive / Shop Equip.	Excluded - Verify if Required					
Vehicle Exhaust System	Excluded - Verify if Required					
Break Room Appliances	1	ALLOW	$3,500.00	$3,500		
Laundry Equipment	Excluded - Verify if Required					
Athletic Equipment	Excluded - Verify if Required					
DIVISION 12 - FURNISHINGS						$6,500
Furnishings	1	ITEM			$6,500	

City of Mosier - Joint Use Facility
Interior Finishes Budget

April 10, 2017

Description	Qty	Unit	Unit Cost	Item Detail $	Item $	Division $
Window Coverings	1	ALLOW	$6,500.00	$6,500		
Modular Office Furniture	Excluded - By Owner					
In Wall Seating / Bleachers	Excluded - By Owner					
DIVISION 15 - MECHANICAL						$70,850
Plumbing	1	ITEM			$26,150	
Toilet Room Fixtures	11	EA	$1,650.00	$18,150		
Mop Sinks	1	EA	$950.00	$950		
Drinking Fountains	1	EA	$2,250.00	$2,250		
Break Room Fixtures	2	EA	$900.00	$1,800		
HVAC Equipment Connections	4	EA	$750.00	$3,000		
Fire Sprinklers	1	ITEM			$3,743	
Tenant Improvement Drops	7,485	BSF	$0.50	$3,743		
HVAC	1	ITEM			$40,957	
HVAC Split System (Distribution)	4,456	ISF	$7.00	$31,192		
Restroom Venting	3	EA	$750.00	$2,250		
Apparatus Bay Venting	3,029	EA	$2.25	$6,815		
Appliance / Kitchen Equip. Venting	1	EA	$700.00	$700		
DIVISION 16 -ELECTRICAL						$77,096
Electrical - Interior Finishes	1	ITEM			$77,096	
Power Distribution	7,485	BSF	$3.15	$23,578		
Lighting	7,485	BSF	$3.75	$28,069		
Electrical Equip. Connections	7,485	BSF	$0.65	$4,865		
Low Voltage - Fire Alarm	7,485	BSF	$1.15	$8,608		
Low Voltage - Security	7,485	BSF	$0.35	$2,620		
Low Voltage - Voice / Data System	7,485	BSF	$1.25	$9,356		
Subtotal Estimated Shell Costs				$510,740	$496,302	$496,302
Contractor Fee	4.0%					$19,852
Subtotal						$516,154
Liability Insurance / Performance Bonds	2.75%					$14,194
TOTAL ESTIMATED COSTS						$530,348

Shell Cost Per Square Foot	7,485	BSF		$70.85

Legend of Unit Measurements:

BSF	*Building Square Feet*	***WK***	*Week*
CY	*Cubic Yard*	***SF***	*Square Feet*
EA	*Each*		
LBS	*Pounds*		
LF	*Lineal Feet*		
ISF	*Item Square Feet*		
IT	*Item*		

Appendix F - Funding Narrative

Mosier Joint Use Facility Funding Options and Implementing Strategy

Prepared by The Farkas Group

Project Description and Purpose

Mosier's Joint Use Facility (JUF), will be located on 4 acres along the Historic Columbia River Highway in downtown Mosier, and comprises approximately 12,000 square feet of building space. The facility will include a Fire Station with 5 fire apparatus bays, a City Hall, and spaces that will share use with the community such as a large meeting room with kitchen, recreation room, and a fireside reception area.

The JUF will serve as an essential local, regional and state complex. It benefits the City of Mosier with more efficient and capable fire suppression and prevention capacity, improved municipal operations, and provision of a multi-purpose community facility. The JUF also provides a significant regional and state asset that enhances ability to more quickly respond to the kinds of rail accidents and other disastrous events that could have long lasting impacts to people, property, the environment and the economy of the larger area.

Developing such a facility in times when public resources alone are insufficient to provide levels of service required for communities, presents a significant but achievable challenge. The most viable road to securing needed resources will require making a compelling case for preventative investment and traveling the path to public-private partnerships.

This section of the JUF report provides a robust but not thorough list of public and private funding options that offer differing levels of possible funding as well as varied degrees of achievability. While the various funding options are bundled based on their probability for success, they also show high and low range dollar estimates. This is done to help the Fire District and City make more informed strategic decisions about which sources to pursue, the likely amount of effort it will take to reap these financial returns and how to get started (recognizing that the community is already pursing some of these).

The Case for Preventative Investment

Need alone is no longer sufficient to secure funds for important projects. There are simply too many worthy projects out there and too few public dollars available. To succeed in attracting competitive public and private resources Mosier needs a compelling story – and it has one.

In June 2016, Mosier narrowly missed the worst consequences of an oil train derailment and fire just yards from our School. We led the news cycle internationally for a few days due to the iconic hazard. By some miracle, there were no serious lasting damages and no injuries, and the community rallied to what so far has been a happy ending, all things considered.

But the Mosier oil train disaster exposed critical gaps in our capabilities. Our emergency services were unprepared for the scale and complexity. One of the key gaps is a lack of facilities to train volunteers and house up-to-date equipment, as well as providing a base of operations for large incidents and regional planning and training events. The JUF is conceived as the necessary first step to securing our future volunteer response capability: if we build it, they will come. We hope never to have another rail incident in Mosier, but it is without doubt that we will continue to have large wild fires and other emergencies which require a robust capability for which the JUF is our keystone.

Union Pacific has offered to donate land it owns to the City for construction of the JUF, and is in negotiations with the City for additional financial contributions. The City and Fire District have identified a preliminary list of funds within their current control that would also be dedicated to the JUF. This demonstration of local public commitment and corporate response is the basis for leveraging these resources to achieve what will be needed to build and equip a facility the benefits the region and state as well as local community.

One way to present the case is the counter factual. If a high quality 21st century JUF can't be built due to a lack of sufficient funding, then what happens to the disaster risk level and costs to address future disasters that would be borne by all levels of government and private parties affected? Instead of investing approximate $3M to $4M in blended public (local, state and federal) and private (corporate, foundation, individual) funds now, governments might well be paying five to ten times that amount per incident depending on the nature of accidents that could occur as rail traffic carrying volatile materials continues to grow.

A more affirmative approach, however, would involve recognizing lessons learned from the most recent accident, and agreeing to share the costs of providing a facility and equipment now – before another incident and before the costs of materials, labor and financing escalate too much further. Construction costs have risen approximate dramatically over the past five years, and interest rates on bonds (among other borrowing types) are likely to continue moving upwards after years of hovering at very low levels.

Funding Options by Source, Likelihood and Dollar Range

The matrix on the following page has been informed by previous funding explorations the City and Fire District have examined, as well as more recent investigations of possible sources within the past few months. This is not intended to be a comprehensive list. Readers are encouraged to throw their ideas into the mix. It also is not a predictive list of actual dollars that can be secured from any one source. Instead it offers a variety of realistic public and private funding sources that have potential to bring a range of dollars to the table. A high and low amount has been provided for each source as an example of what might be achievable. While the current dollar range is built on data such as recent examples for similar projects, or potential dollar amounts shared by fund providers, it is also possible that actual amounts could be more or less than what's listed given competition for funding and real dollars available in funding cycles.

Source	Category	Probability	Funding Option - High	Funding Option - Low	Grant / Non-repayable	Loan
Fire District Bonds	Local	High	$750,000	$500,000	X	
Fire District Levy Cash	Local	High	$35,000	$25,000	X	
Fire District Retained Earn	Local	High	$200,000	$100,000	X	
Naming Rights	Private	High	$150,000	$50,000	X	
UP Foundation Grant	Private	High	$75,000	$25,000	X	
Land Sale Proceeds	Local	High	$200,000	$75,000		
Corporate/HNWI Donations	Private	High	$250,000	$75,000	X	
ODOT access grants	State	Medium	$100,000	$25,000	X	
State Earmark	State	Medium	$900,000	$500,000	X	
Infrastructure Loan (Mosier Fire District)	State	Medium	$400,000	$100,000		X
Infrastructure Loan (City of Mosier)	State	Medium	TBD	TBD		X
UP Corporate Funding	Private	Medium	$600,000	$350,000	X	
Meyer Mem Trust	Foundation	Medium	$100,000	$50,000	X	
Ford Family Foundation	Foundation	Medium	$100,000	$50,000	X	
Crowd Funding	Private	Medium	$100,000	$50,000	X	
OR Main Street Revitalization	State	Medium	$100,000	$50,000	X	
USDA Rural Facilities Loan (Mosier Fire District)	Federal	Low	$500,000	$100,000		X
Swindell's Charitable Trust	Foundation	Low	$35,000	$20,000	X	
Infrastructure Grant	State	Low	$75,000	$25,000	X	
Oregon Community Foundation	Foundation	Low	$50,000	$25,000	X	
Murdock Trust	Foundation	Low	$75,000	$25,000	X	
Collins Trust	Foundation	Low	$50,000	$25,000	X	
Federal Earmark	Federal	Low	$100,000	$50,000	X	
Tribal Gant	Private	Low	$100,000	$25,000	X	
High Total			**$1,660,000**	**$850,000**		
Medium Total			**$2,000,000**	**$1,175,000**		
Low Total			**$985,000**	**$295,000**		
Sum Total			**$4,645,000**	**$2,320,000**		

The matrix lists possible local, state, and federal resources, as well as a range of private sources. It highlights in differing colors the likelihood of realizing any funds from each source, and suggests a high and low dollar amount for each one. It also indicates which sources are effectively grants (i.e., no repayment required) versus loans that must be repaid (of which there are only two on this list).

Each source and contact for it is further described in Appendix A.

Next Steps / Where do we go from here

There's no one perfected path to funding success. Each community needs to find and pursue a process that's realistic given the challenge involved and resources (people and time) available. Mosier has already begun pursuing a few funding option to varying degrees (e.g., looking into Fire District bonds and other agency funds, negotiations with Union Pacific).
One option suggested for Mosier is to set up a small (3 – 5 member) task force (could be chaired or co-chaired) by a senior person in the Fire District, and/or the City, or a respected community resident. Key here is to assure that there is one staff person from either the Fire District or City to coordinate and track the multiple pursuits. The task force would be charged with several actions:

1. Reach agreement on project objectives (what you want built and when) for the JUF (primary, and back up in case funding goals aren't achieved). This includes refining your compelling story, who you need to share it with, and how you want to share it (as it may require differing emphases for different funding sources)

2. Sort through the list of sources provided (add to or subtract from it if desired) and decide which ones are worth pursuing. The committee would do more research into these, and based on criteria it adopts such as likelihood of being secured and dollar amounts available, prioritize a pursuit schedule

3. Assign task force members (and/or have the key staff person depending on circumstances) to make contacts with each fund provider and identify the process/effort necessary to pursue the potential funds. Some sources will require drafting and submitting competitive applications which largely would be handled by the key staff person. The task force will need to assess process and funding delivery schedules for these to assure they line up with the project.

4. A number of these sources will require ongoing communications whether for negotiations (e.g., with Union Pacific), lobbying (e.g., with state legislators), or running a campaign (e.g., bond measures and crowd funding). Point persons will need to be assigned leadership roles for each of these. In some cases that person may not be a task force member, but would be recruited to serve because of her or his expertise and available time

5. Conduct status checks on funding applications submitted to make sure progress is being made and any questions that come up are effectively addressed.

6. Arrange progress reports and announcements for achieving milestones (celebrate your successes and share these with the community)

Exhibit A: Funding Source Explanation and Contact Info

1. **Fire District Funds (Bonds, Levy Cash and Retained Earnings):**

   The Fire District could issue bonds up to a certain limit (in this case under $1Million for the JUF). If approved by most of the voters these funds (which would be paid for by a yet to be determined increase in property taxes) would be applied to the new facility. District Levy Cash are dollars retained from previous levies that are not yet committed to other District projects. Retained earnings are also yet uncommitted FD funds that could be used for the JUF. Refer to the Bond Narrative (Appendix G), which summarizes the potential impacts of a bond to the local tax base.
   Contact: Jim Appleton, mosierfire@gmail.com

2. **Naming Rights:**

   These are opportunities to assign a name to various components of the JUF for a fee paid by individuals or corporations (e.g., MODA Center, Providence Park, Schnitzer Art Museum). Naming rights can be applied to the building, in addition to individual rooms for various fees.
   Contact: Jim Appleton, mosierfire@gmail.com

3. **Union Pacific Foundation:**

   UP has a foundation that awards grants to a range of projects. Their sweet spot appears to be around $50,000.
   Contact: Union Pacific Foundation, 402-544-5600

4. **State of Oregon Special Public Works Fund Loan:**

   This is one of only two loan funds on the list. SPWF loans can be secured for eligible public facilities (buildings and infrastructure). Applications are made through Infrastructure Fund's Regional Development Officer. These funds must be repaid based on terms agreed to by both the giving and receiving parties so a repayment source would need to be identified s The fund does have significant resources and receiving a loan for several hundred thousand dollars would be within grasp.
   Contact: Carolyn Meece, Regional Development Officer, 503-704-1311

5. **Oregon Department of Transportation State Funded Local Projects:**

   These ODOT SFLPs funds are available for access improvements to public buildings off of state highways. Since Mosier's main street is a state highway and the JUF a public facility, these funds could help pay for roadways or walkways associated with the JUF.
   Contact: Scott Adams, 541-957-3636

6. **State Earmark:**

   This refers to state funding that can be secured by convincing state legislators that your project merits receiving special dollars that are then put into the state's bi annual budget. Mosier is currently pursuing these funds:
   Contact: Terry Moore, moore@econw.com

7. **Land Sale Proceeds:**

   These are dollars secured when public agencies sell a piece of property and then can apply the cash received to new projects. Mosier has such assets and the City has expressed interest in selling parcels.
   Contact: Kathy Fitzpatrick, mosiercityhall@mosierwinet.com

8. **Union Pacific Corporate Funds:**

   These are dollars that may be secured from the UP company to help pay for the JUF. The amount of funds securable depends on the abilities of Team Mosier to make a convincing case to UP via negotiations of the benefits to the City and Fire District by making a generous contribution. Mosier is currently engaged in negotiations.
   Contact: Terry Moore, moore@econw.com

9. **Corporate and High Net Worth Individuals (HNWIs) Donations:**

   These are gifts made by companies and individuals to projects they want to support. Unlike naming rights, these gifters do not receive naming or any other special rights for their contributions. Donations are mostly in dollars, though they also may be gifts in the form of land or equipment. If land is received it can be sold or ground leased to secure additional revenue for the project.
   Contacts: Start with HNWIs known to task force members or others you associate with, as well as corporations where you have some connection (these may include local or national firms with a presence in the region such as Les Schwab, Umqua Bank, Google or Facebook, or firms that may have interest in the equipment or operations associated with the JUF such as Tesla's interest in electric vehicles).
   Contacts: In this case the task force could, as a starting point, assemble a list of individual and corporate contacts based on knowledge and associations members currently have. This list could be augmented by reaching out to a broader network of individuals and organizations (private and public) throughout the region or by retaining a professional fund raiser.

10. **Foundations and Trusts:**

   These are entities that have set up ongoing endowments from which they are required to distribute funds annually to eligible project or programs according to their authorizing statutes and guidelines. Each foundation and trust has its own list of eligible projects, maximum dollar amounts to be allocated, and schedules for applications. Applications for funding usually require a detailed project description, why the funds are needed, amount of funds requested, identification of funds already secured (many of these entities prefer to invest in project that already have significant commitments such as bond, public grants, or corporate dollars).
   Contacts for the listed entities are:
   Meyer Memorial Trust -503 -228-5512; Ford Family Foundation – 541-957-5574; Swindells Charitable Trust, Donna Wecker 503-222-0689; Murdock Trust – 360-694-8415; Collins Foundation – 503-227-7171; Oregon Community Foundation – 503-227-6846

11. **Crowd Funding:**

    This is a mechanism used to raise funds for private as well as public projects from a broach cross section of investor and/ donors around the nation or world. Private projects seek investors looking for financial return on their dollars. Public and non-profit projects seek donated funds for causes, projects and programs that people who believe in these are willing to support. Millions of dollars have been raised for public and non-profit projects such as community centers, parks, zoos, arts organizations, etc. Since crowd funding has evolved various crowd funding web sites have been created and effectively used by individuals or organizations seeking donations from where ever folks have access to a computer.
    Contact: GoFundMe and Crowdrise websites

12. **Oregon Main Street Revitalization Program:**

    This is a state funded operation that supports improvements to main streets in smaller Oregon communities that stimulate further private investment. Eligible projects include public and private buildings (rehabbed and new) that enhance the quality of a main street experience. Grants are up to $100,000 and require matching dollars. Given the location and proposed quality of the JUF Mosier should be eligible for a potential grant.
    Contact: OregonHeritage.com

13. **Oregon Special Public Works Fund Grants:**

    These are highly competitive limited funds awarded to eligible public facilities and infrastructure projects sourced by the Infrastructure Fund. Mosier would have to make a compelling case that the JUF is addressing a significant need essential for community and/or economic development of the area. In Mosier's situation, it would be having a facility capable of addressing another major train derailment on tracks that will be experiencing transporting more dangerous materials. These derailments would negatively impact the area's economic and community development
    Contact: 503-986-0123

14. **Federal Earmark:**

    These are funds coming from congressional agreed to budgets where dollars have been specifically designated for a project, in Mosier's case it would be the JUF. Earmarks are difficult to secure given the competition for projects and they require earning support of the Congress. But they start with convincing your own congressman that the JUF is a compelling enough project to merit these funds.
    Contact: Congressman Greg Walden, 202-225-6730

15. **Tribal Grants:**

    There are native tribes that may have interest in granting funds to the JUF (e.g., Umatilla, Warm Springs) The reason for this would be that the JUF enhances ability to protect the Columbia River environment where tribes have fishing and other rights, from the impacts (economic as well as environmental) of harmful accidents.
    Contact: Umatilla Tribe – 541-276-3165; Warm Springs Tribe – 541-553-1161

Appendix G - Bond Narrative

Bond Narrative

The Bond Narrative will outline the potential impacts of a bond for Mosier residents should the Joint City Council and Fire District Board Committee elect to pursue.

The need for a bond will be based on the amount of funding that is raised for the Joint Use Facility along with the cost associated with the final decision of the Committee for how the project will move forward.

This will be provided at a later time and inserted into this document.