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5.3.23 (Rev 1)

Rachael Brown
Planner

Kirstin Hofmann
Emergency Manager

City Of Puyallup
333 S. Meridian
Puyallup, WA 98371

Via e-mail:
KHofmann@puyallupwa.gov
rnbrown@puyallupwa.gov

Regarding: **Genesee Propane Bulk Plant R.1**
Construction Exemption – Exterior Propane Tank

Location: 412 23rd Street, Puyallup, WA

Per the Pre application development letter provided by City of Puyallup Development Services Center on Oct 21, 2021 the above proposed project is required to apply for an exemption to the Construction Prohibition for Volcanic Hazard Areas. The finding from the City of Puyallup is that the quantity of liquid propane (LPG) or 30,000 Gallons stored in an exterior tank is considered a “Hazardous Facility”.

The reason given is that if it were stored inside a building, it would cause said building to be defined as a hazardous (H Occupancy) facility. Thus, making it a “critical facility” per the City of Puyallup code {Critical Areas}.

This construction exemption must meet 3 criteria for approval by the Emergency Manager. These criteria and their responses follow:

- (a) *The critical facility has a satisfactory critical alert notification system in place which coordinates with the local and emergency monitoring system.*

The building construction plans shall incorporate a monitoring system that alerts the on site manager as well as a back up emergency contact via SMS or electronic communication for oncoming emergency and actions.

- (b) *The critical facility has an emergency evacuation plan which adequately demonstrates the ability to evacuate all expected occupants in a lahar situation to an acceptable area outside of the volcanic hazard lahar area, in coordination with city emergency plans.*

The tank is not occupied but the emergency plan will ensure the tank is secured prior to staff leaving the site in a lahar situation. The Maintenance and Emergency manual will provide all securing requirements and checklists.

- (c) *That the critical facility has procedures in place to ensure that the emergency evacuation plan is maintained over the life of the critical facility and that occupants of the critical facility are involved in periodic drills and/or other instruction regarding those emergency evacuation procedures.*

A facility maintenance and emergency manual will be kept on site at all times and updated as personnel changes throughout the life of the facility. The manual will be available for City inspection and review at any time.

The proposed propane tank poses no significant risk or additional need for emergency services during a lahar event. See sections [1] through [5] below discussing this project in relation to the lahar.

[1] Building Code:

Propane is considered a class of *Liquefied Petroleum Gases (LPG)* with an energy density less than Gasoline. The codes regarding the use proposed are:

- IBC as Amended by Puyallup and WA state
- IFC Chapter 61 Liquefied Petroleum Gases
- NFPA 58 Liquefied Petroleum Gas Code
- International Fuel Gas Code (valves, and emergency shut offs, etc)

Per the *IFC* LPG shall not be stored inside a building, thus there is no published quantity that triggers the hazardous facility requirement. The Authority Having Jurisdiction (AHJ) can determine an outside storage volume trigger per the IFC 6104.2. This quantity is yet to be defined by the jurisdiction for this use.

To match the code more closely, we assume that the tank itself is an “H” (Hazardous) Occupation, although it will not be occupied, and all controls and evacuation measures will be kept on site in the building for the H occupancy tank.

Per the IFC and NFPA 58 tanks of 30,000 gallons (water capacity) shall be stored a minimum of 50 feet from property lines that can be built upon. A 50’ setback for the tank is required for this project except along the Railroad right of way. There are other horizontal distance requirements, but the 50’ setback is the most stringent applied to this tank location and governs it’s placement. The other major consideration for propane tank location is distance from overhead power lines. This site will have underground power, with the nearest aerial power line on the west side of 23rd Avenue.

Table 6.4.1.1 Separation Distances Between Containers, Important Buildings, and Line of Adjoining Property That Can Be Built Upon

| Water Capacity per Container | | Minimum Distances | | | | | |
|------------------------------|----------------------------|--|----|------------------------|----------------|---------------------------------|-----|
| | | Mounded or Underground Containers ^a | | Aboveground Containers | | Between Containers ^b | |
| gal | m ³ | ft | m | ft | m | ft | m |
| <125 ^c | Previous <0.5 ^c | 10 | 3 | 0 ^d | 0 ^d | 0 | 0 |
| 125–250 | 0.5–1.0 | 10 | 3 | 10 | 3 | 0 | 0 |
| 251–500 | >1.0–1.9 | 10 | 3 | 10 | 3 | 3 | 1 |
| 501–2,000 | >1.9–7.6 | 10 | 3 | 25 ^c | 7.6 | 3 | 1 |
| 2,001–30,000 | >7.6–114 | 50 | 15 | 50 | 15 | 5 | 1.5 |
| 30,001–70,000 | >114–265 | 50 | 15 | 75 | 23 | | |
| 70,001–90,000 | >265–341 | 50 | 15 | 100 | 30 | | |
| 90,001–120,000 | >341–454 | 50 | 15 | 125 | 38 | | |
| 120,001–200,000 | >454–757 | 50 | 15 | 200 | 61 | | |
| 200,001–1,000,000 | >757–3,785 | 50 | 15 | 300 | 91 | | |
| >1,000,000 | >3,785 | 50 | 15 | 400 | 122 | | |

^aSee 6.4.2.1.

^bSee 6.4.4.5.

^cSee 6.4.4.4.

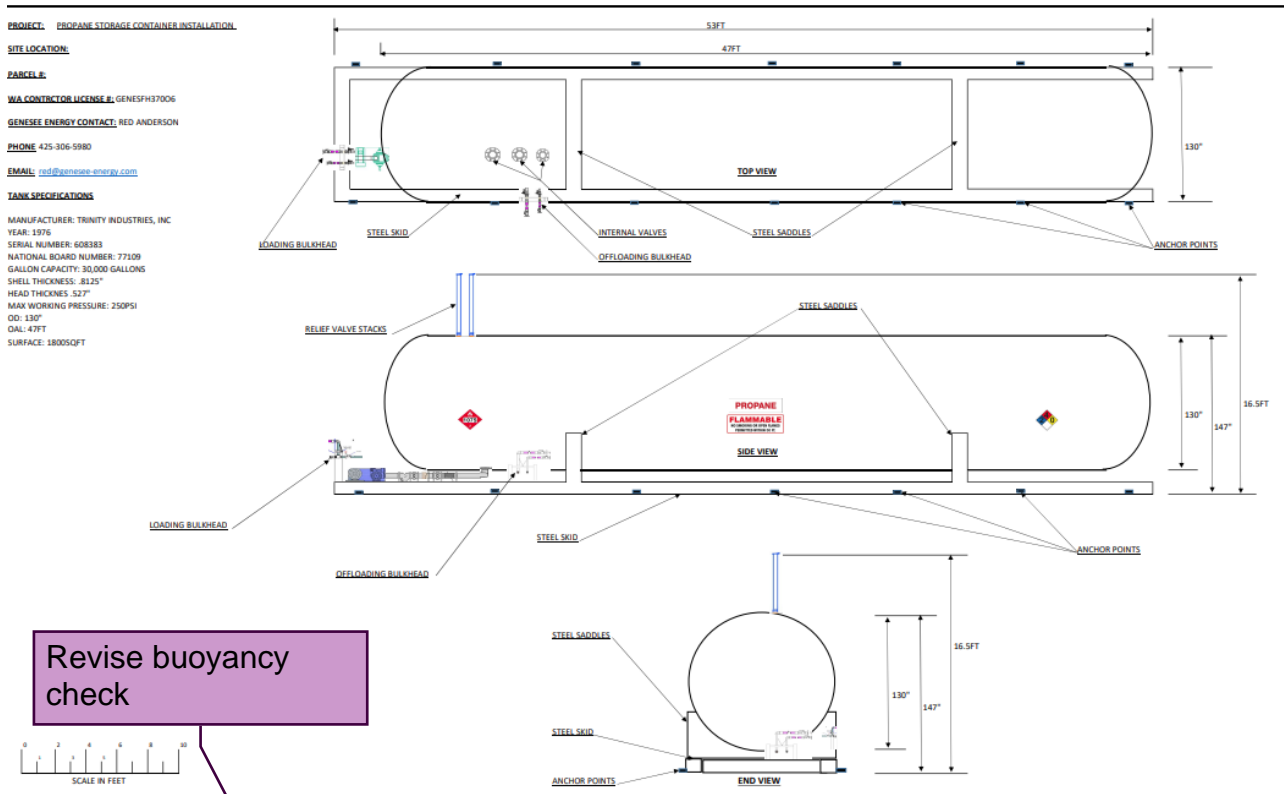
^dSee 6.4.4.1, 6.4.4.2, 6.4.4.3, and 6.4.4.4.

^eSee 6.4.1.3.

NFPA 58 – Distance Table

[2] Tank Construction Discussion

Installation of Horizontal above ground tanks is regulated by NFPA 58 6.8.3. This project proposes an ASME rated skid tank. The proposed tank has 14 Anchor points and is required per the NFPA to be anchored to concrete or masonry foundation.



Revise buoyancy check

Proposed Tank cut sheet- 30,000 Gallons

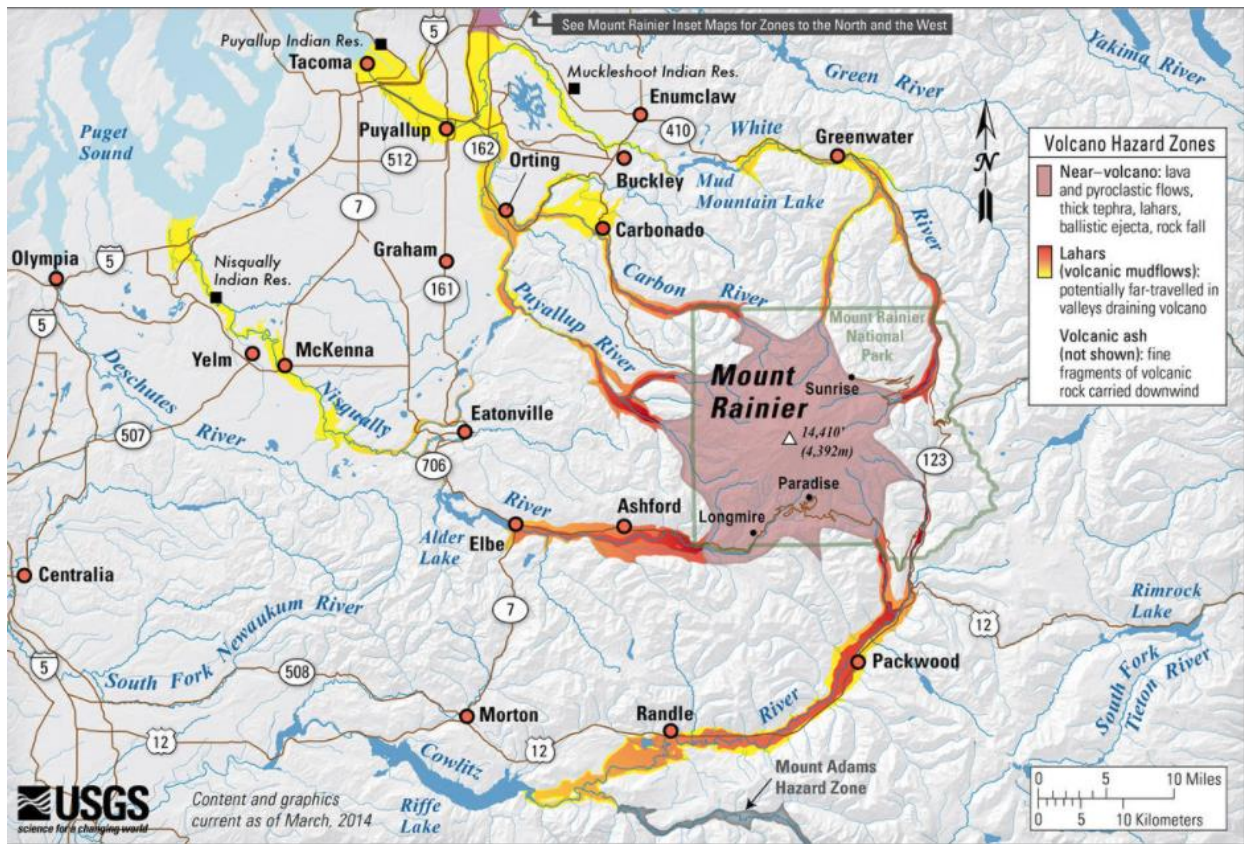
Due to the Lahar Zone (mud or flood flow) the proposed foundation is designed to resist buoyancy of the tank if the area is flooded. See section [3] for discussion of the flood.

Tank Buoyancy Check

Volume of Tank = 30,000 Gallon * 0.134 CF/Gal = 4,020 CF
 Buoyancy Displaced Area = 4,020 CF * 62.4 Lb/CF = 212,160 LB
 Weight of LP (assume 25% full) = 30,000 Gal * 0.25 * 4.24 LB Per Gal = 31,800 LB
 Weight of Tank (7/8" thick Steel – 17' Circumference) = 800 Sf * 35 Lb/SF = 28K
 Weight of Skids = 53FT * 2 skids* 26 Lb/FT = 2,756 LB
 Minimum Foundation Weight = 212,160 LB – 31,800 LB - 28,000 LB – 2,756 LB = 150,000 LB
 Concrete Weight = 150 PCF, thus 1000 CF foundation required
 Foundation Area = 60' X 12' = 720 SF
 Min Thickness = 1.34 FT or 16"

To ensure floatation and movement of the tank during a Lahar mud flow or significant flood, the tank foundation must be 16" thick, or thicker as required by the Geotech for other loading.

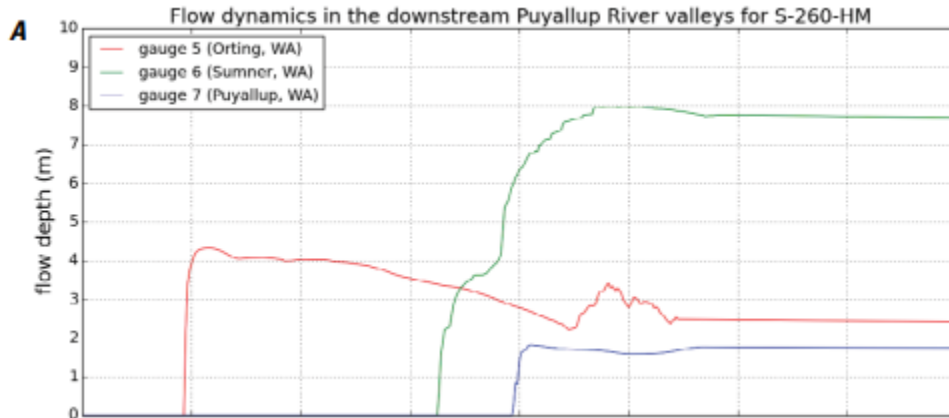
[3] Lahar Discussion



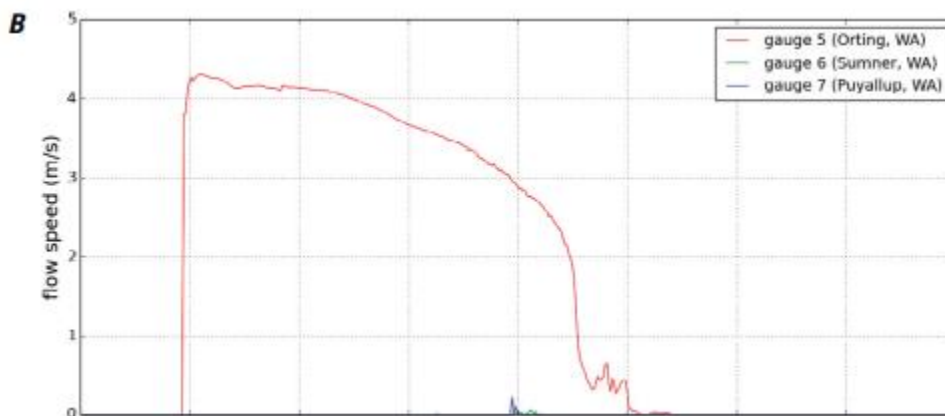
USGS Map of Mt Rainier Lahars

Per USGS *SEDIMENTOLOGY, BEHAVIOR AND HAZARDS OF DEBRIS FLOW AT MT. RAINIER, WASHINGTON*. The most probable recurrence of a maximum lahar (Case 1) is a debris avalanche with a lahar runout that could reach the Puget Sound Lowland with a probability of 500 to 1000 years. The “Electron Mudflow” would be the most notable of these for the Puyallup basin according to USGS.

In 2021 USGS produced *OFR 2021–1118: Modeling the Dynamics of Lahars that Originate as Landslides on the West Side of Mount Rainier*. Which modeled flows from a major eruption and hypothetical Gauge Station (7) is closest to the project site. The maximum flow depth is 2 meters. This is highly unlikely as the flow will be widespread in the flat areas surrounding this project, however is at least an indication that area could be inundated and base our hazard calculation on it. The debris flow depth graph follows:



The speed of flow at hypothetical Gauge Station (7) is roughly zero. The report states that most debris will have settled out long before reaching Puyallup. The velocity map graph is below.



The lateral load utilized to design the tank for shipping, and earthquake loads is far higher than any debris or velocity loads from the Lahar simulation. The only load possible is floatation, and while the 2m flow would not fully submerge the tank it is conservative for design.

The USGS Report “*Volcano Hazards from Mount Rainier, Washington (1998) 98-428*” is utilized by Pierce County emergency services for the lahar maps utilized for Emergency Services and preparedness. Under Hazard Zonation the report states that

Case II flows have a typical recurrence interval near the lower end of the 100- to 500-year range. The annual probability of such a flow is therefore close to 1 percent for the volcano as a whole, so for planning purposes Case II flows are analogous to the 100-year flood commonly considered in engineering practice. Some Case II flows have inundated flood plains.

Case II flows likely match the 500-year flood and FEMA has already modeled the 500 year flood in the area, it does not reach the project site. See Attachment 1 for the USGS flood map, the 500-year flow shown in light blue ends at the building material yard near Deer Creek.

Lahar events are not made of water, they are made of mud flow. Revise all references to a lahar event as consisting of water.

[4] Propane Explosivity during Lahar

Pressurized Liquid Propane (LPG) is stored at -45 degrees Fahrenheit. Above that temperature propane boils off to vapor. Propane vapor is not a pollutant according to EPA, or toxic in air according to CDC.

Propane Explosions are extremely rare as they are typically due to having a tank leak and flame entering the tank and causing the internal pressure to explode the tank. In the situation of a Lahar mud/flood flow the chances for ignition are negligible as the tank will be surrounded by water. The Maintenance and Emergency plan will ensure that the tank is secured prior to the Lahar. ASME rated tanks all have relief valve systems to ensure that tank pressure does not reach the point of tank explosion.

Propane leaks, as noted above vaporize when exposed to air. There is no environmental risk from a propane spill as the half life of propane vapor is 14 days and liquid propane cannot exist in the ambient environment.

Provide manufacturer's specification sheets and construction details for relief valve system

[5] Emergency Services Requirements

The focus of this exemption is that emergency services will be required for many other areas of the City of Puyallup during a lahar event. This tank and foundation will be designed and sited such that it will not move during a lahar flood, and cannot be contacted with live power during the lahar event. The maintenance and emergency plan will ensure that power to the facility is turned off until such time as it can be safely powered. The emergency plan is attached.

Prior to completion of construction and issuance of a Certificate of Occupancy, the facility will require installation of an emergency alert and alarm system that is attached to regional emergency monitoring system.

Further, should a lahar event happen it is highly likely that residences and commercial buildings throughout the Puyallup river valley will be without power for a significant amount of time. Having another local source of LPG will provide heating and cooking gas for many homes and businesses during power outages

Clarify which emergency alert system that this facility will be connected to? There are several.

Conclusion

It is our opinion that installation of the propane tanks in the area proposed create no significant risk for explosion, or additional requirements for emergency services. The tank provides a resource for propane in the aftermath of a lahar type event.

If you have any questions please do not hesitate to call or email.

Very Truly Yours,

A handwritten signature in blue ink, appearing to read 'R. Moore', with a horizontal line extending to the right.

Ryan Moore, PE
Vector Engineering, Inc.
360.352.2477

cc: file

Attachments

- 1- Emergency Plan
- 2- FEMA Flood Map

PUYALLUP BULK PLANT – EMERGENCY EVACUATION PLAN

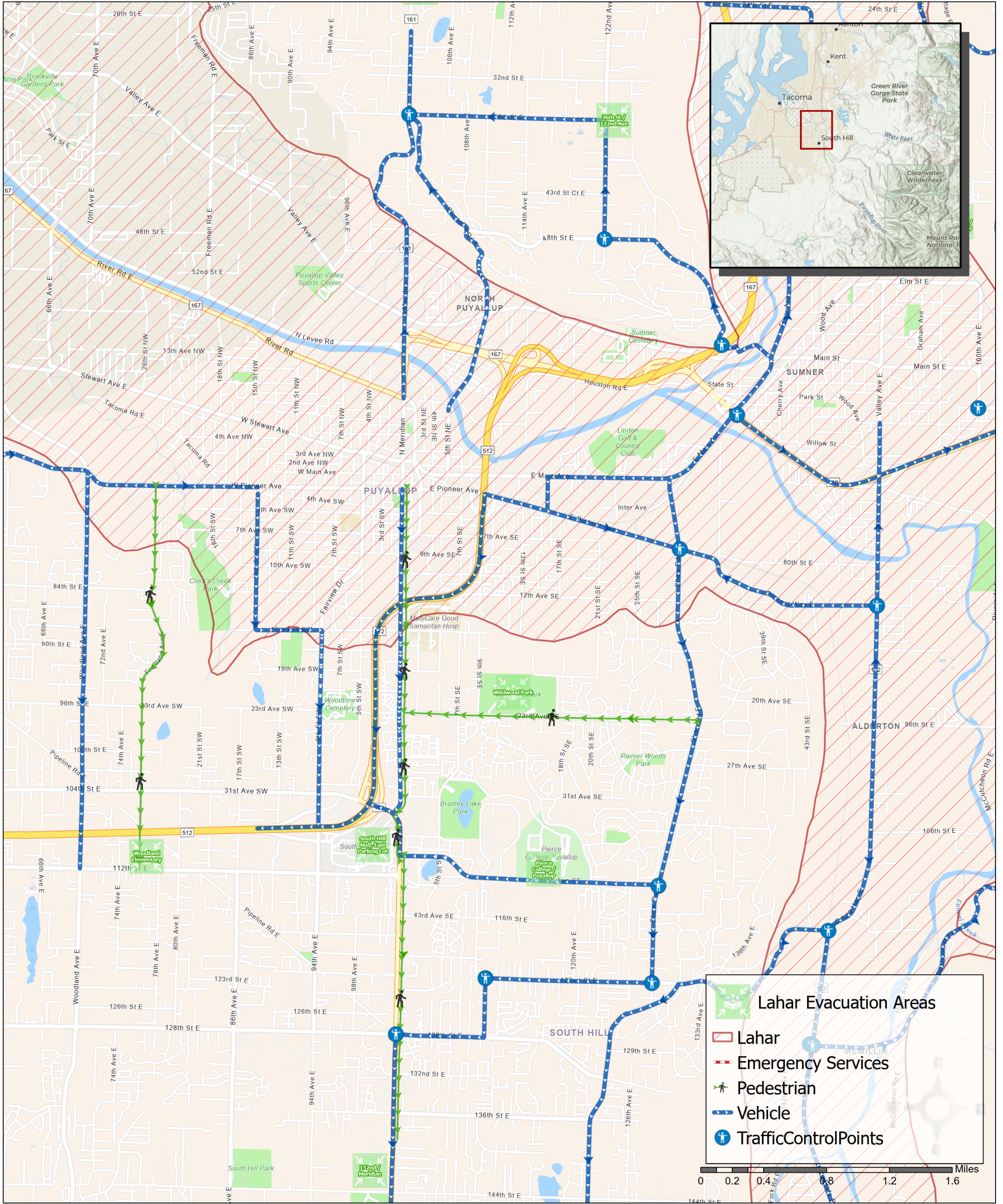
The building site will host 2, two to 4 personnel, 2 in office full time and partial time mechanics/service staff in the shop and work area. Emergency plan is as follows:

1. Alert everyone in the office: Use the office intercom or public announcement system to inform everyone about the emergency situation and provide instructions on how to evacuate the building safely.
2. Evacuate the office: Once everyone is aware of the emergency, evacuate the office in an orderly fashion. Ensure that everyone takes their personal belongings and any important documents with them.
3. Call emergency services: As soon as you have evacuated the office, call emergency services and provide them with all the necessary details about the situation. Tell them the exact location of the facility and provide them with any other relevant information.
4. Secure the propane tank facility: If it is safe to do so, secure the propane tank facility. Turn off any valves, switches, or other equipment that could pose a risk. If necessary, follow the instructions provided on any emergency shut-off procedures that may be posted.
5. Move to a safe location: Once you have secured the propane tank facility, meet at a safe location away from the building. This could be a nearby parking lot, park, or other open space. Make sure everyone is accounted for and wait for emergency services to arrive. In the case of a large scale emergency, Lahar or other, proceed to the City of Puyallup evacuation route, following Inter Avenue. See attached map.
6. Follow instructions: Once emergency services arrive, follow their instructions carefully. They will provide you with guidance on what to do next and ensure that everyone is safe.

Clarify step 4 of emergency evacuation plan. Which valves and switches have to be turned off to ensure safety? Could these valves and switches be automatically shut off via a signal from the emergency warning system?

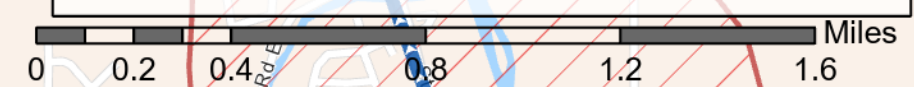
Emergency Operations Center Lahar Evacuation Route

City of
Puyallup



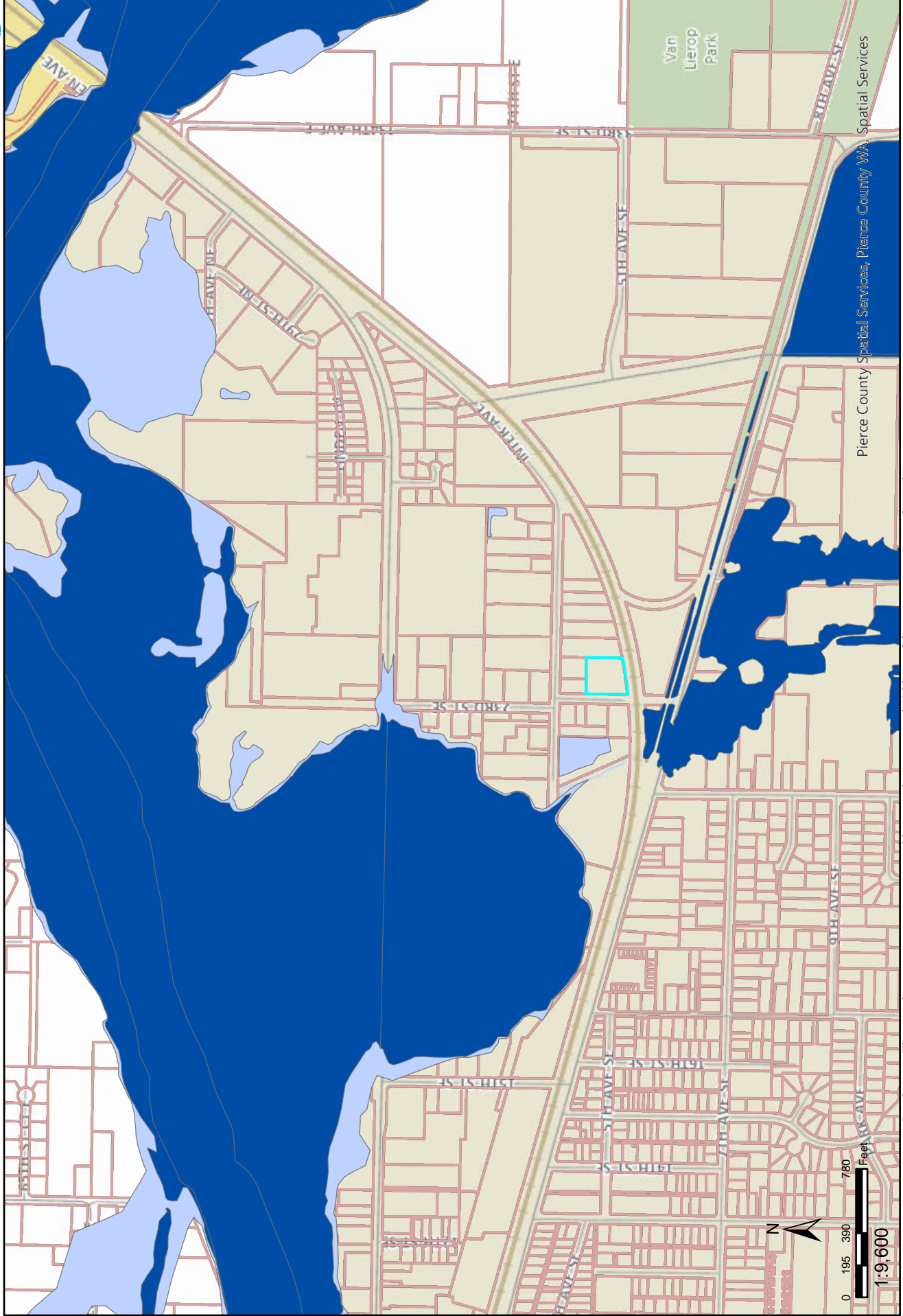
Lahar Evacuation Areas

- Lahar
- Emergency Services
- Pedestrian
- Vehicle
- TrafficControlPoints





FEMA 100-yr & 500-yr Flood Limits



Disclaimer: The map features are approximate and have not been surveyed. Additional features not yet mapped may be present. Pierce County assumes no liability for variations ascertained by formal survey.

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Pierce County Spatial Services, Pierce County WA, Spatial Services