



Notice of Application

Optional DNS Process

March 16, 2023

The City of Yelm has received a permit application for the following project.

Date of permit application: 8/25/2022 Date of determination of completeness: 3/3/2023

Date of notice of application: 3/16/2023 Comment due date: 3/30/2023 by 5 PM

Agency Contact: Yelm Public Services, planning@yelmwa.gov, (360) 400-5003

Agency File Number: 2022.0111

Proposal to develop an approximately 6.5-acre and 2.4-acre site into an indoor shooting range and outdoor ammunition storage area. Multiple phases are proposed for expansion of the indoor shooting range, more outdoor ammunition storage, and parking. The building located at 16910 State Route 507 SE, will remain as is. Ingress and egress will be on State Route 507 SE.

Location of proposal: 10502 Grove Rd. SE, Yelm, WA 98597, Parcel number: 64303100801; 16910 State Route 507 SE, Yelm, WA 98597, Parcel number: 64303100800

Project Applicant: Darian Murray, (206) 522-9510, dmurray@pacland.com

SEPA Environmental Review: The City of Yelm has reviewed the proposed project for probable adverse environmental impacts and expects to issue a Determination of Nonsignificance (DNS). This determination is based on the following findings and conclusions:

A gopher study, SEPA checklist, traffic scoping memo, and geotechnical report were all included in the submission. The information included has shown little effect on the environment and surrounding traffic.

The optional DNS process in WAC 197-11-355 is being used. **This may be your only opportunity to comment on the environmental impacts of the proposed project.**

Agencies, tribes, and the public are encouraged to review and comment on the proposed project and its probable environmental impacts. **Comments must be submitted by March 30, 2023 to the City of Yelm, 901 Rhoton Rd. NW, Yelm, WA 98597.**





The following conditions have been identified that may be used to mitigate the adverse environmental impacts of the proposal:

Required Permits: The following local, state and federal permits/approvals are needed for the proposed project:

Boundary Line Adjustment, Administrative Site Plan Review, Civil Review, Building Permit

Required Studies: Gopher study, geotechnical report, traffic impact analysis, stormwater report, elevation plans.

Existing Environmental Documents: N/A

Preliminary determination of the development regulations that will be used for project mitigation and consistency: Yelm Municipal Code, Building and Fire Code, Yelm Development Guidelines, and Stormwater Manual

Public Hearing – A public hearing is not required for this project

This project will be required to be consistent with all applicable development regulations and the City's Comprehensive Plan. Information necessary to analyze this proposal are on file with the City of Yelm, Planning and Building Department and may be reviewed online at https://www.ci.yelm.wa.us/. If you have any questions about this proposal, please contact the Planning and Building Department at Planning@YelmWA.gov for information.

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. <u>You may use "not applicable" or</u> <u>"does not apply" only when you can explain why it does not apply and not when the answer is unknown</u>. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to <u>all parts of your proposal</u>, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the <u>SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D)</u>. Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [HELP]

1. Name of proposed project, if applicable: Long Shot Gun Range Facility Expansion 2. Name of applicant: *PACLAND*

3. Address and phone number of applicant and contact person:

Applicant:

Darian Murray, Pacland Phone: 206-401-1849 Email: dmurray@pacland.com Address: 6814 Greenwood Ave N, Seattle, WA 98103

Contact:

Darian Murray, Pacland Phone: 206-401-1849 Email: dmurray@pacland.com Address: 6814 Greenwood Ave N, Seattle, WA 98103

4. Date checklist prepared: *August 12, 2022*

5. Agency requesting checklist: *The City of Yelm*

6. Proposed timing or schedule (including phasing, if applicable): Begin construction April 2023. The timing of the second phase is yet to be determined.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

Yes, the current project is expected to erect an approximately 37,000 square feet indoor gun range facility with associated utilities, parking, landscaping, and other requirements by the jurisdiction. The future additions would be an additional 23,500 square feet of building area as well as an expansion of the parking lot area to the east of the phase 1 building.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Geotech Report, Traffic Study, Habitat Study for Pocket Gophers

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. *None Known at this time*

10. List any government approvals or permits that will be needed for your proposal, if known. *City of Yelm Building Permit, City of Yelm Civil Plan Review, City of Yelm Site Plan Review, Boundary Line Adjustment. NPDES Permit coverage through the Department of Ecology.* 11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The project site is comprised of two parcels, one 2.4 acres and the other is 6.5 acres. The parcels will be adjusted to accommodate. This project will involve grading and clearing the existing undeveloped portion of the site mainly comprised of overgrown grasses, trees, and a few patches of concrete/gravel pads and construction of an approximately 36,860 square foot Long Shot Gun Range with a small retail space and 22 firing lanes, as well as associated parking lot, drive aisles, sidewalks, landscaping, utilities, and stormwater management facilities. The second phase will add approximately 23,500 sf of building with 12 additional firing lanes and additional parking.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

This proposal's location is best identified as the northeastern corner of the intersection of Grove Rd and WA 507 in Yelm, WA The address is 16910 WA-507 Yelm, WA. It is in the SE ¼ of Section 29 in Township 17 N, Range 02 E, W.M.. The parcel identification number is 64303100800 and 64303100801. The site is bordered by WA-507 SE to the south, by a residential parcel to the north, and by Grove Rd to the west, and by an undeveloped parcel to the east.

The legal description is as follows:

PARCEL I:

PARCEL A OF CITY OF YELM BOUNDARY LINE ADJUSTMENT NO. BLA-18-0371-YL, RECORDED JUNE 18, 2019 UNDER RECORDING NO. 4689116, IN THE OFFICIAL RECORDS OF THURSTON COUNTY, WASHINGTON.

PARCEL II:

PARCEL B OF CITY OF YELM BOUNDARY LINE ADJUSTMENT NO. BLA-18-0371-YL, RECORDED JUNE 18, 2019 UNDER RECORDING NO. 4689116, IN THE OFFICIAL RECORDS OF THURSTON COUNTY, WASHINGTON.

PARCEL III:

PARCEL C OF CITY OF YELM BOUNDARY LINE ADJUSTMENT NO. BLA-18-0371-YL, RECORDED JUNE 18, 2019 UNDER RECORDING NO. 4689116, IN THE OFFICIAL RECORDS OF THURSTON COUNTY, WASHINGTON.

B. Environmental Elements [HELP]

1. Earth [help]

a. General description of the site:

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other _____

b. What is the steepest slope on the site (approximate percent slope)? 7.9%

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Per the geotechnical report:

Topsoil was generally encountered in the upper 12 inches of existing grades at the test pit locations. Deeper or shallower pockets of topsoil may be locally encountered across the site. The topsoil was characterized by a dark brown color, minor root intrusions, and trace organic matter. Vegetation roots generally extended to depths of 10 to 24 inches.

Underlying topsoil, the native soil was classified primarily as medium dense well-graded and poorly graded gravel with sand (USCS: GW and GP, respectively). The moisture content at the time of exploration was characterized primarily as damp to moist. Native soil extended to the maximum exploration depth at each test pit location, which occurred between about 6.5 and 10 feet below the existing ground surface (bgs).

The proposed indoor range building can be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed and compacted on competent native soil.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

None identified or known

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

The expected earthwork for this project will be for clearing, grading, and structural fill. Total cut quantity is 2,276 cubic yards and the total fill is 4,578 cubic yards. Source of fill is to be determined.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Typical erosion expected with clearing, grading and construction activities will be mitigated by installation of erosion control measures per the City of Yelm requirements. The site will be stabilized at the completion of development, and it is not expected that the site use will cause any erosion once it is completed.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? *Approximately 35%* h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

We will implement typical temporary erosion control measures including and not limited to a stabilized construction entrance, silt fencing and inlet protection. If required, additional measures will be implemented.

2. Air [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Typical construction emissions from the work vehicles are expected as well as dust from construction activities. The site will be watered as necessary to mitigate the dust from the site.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

It is not expected that the site will be affected by any off-site sources of contributing emissions or odor.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

The site will be watered as necessary to mitigate the dust from the site.

3. Water [help]

- a. Surface Water: [help]
 - 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

There is not a waterbody that is on or in the immediate vicinity of the site.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

None is expected

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. *No*

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No

- b. Ground Water: [help]
 - Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. No
 - 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. No
- c. Water runoff (including stormwater):
 - 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. The runoff will collected from sidewalks, pavement, and other pollutant generating impervious surfaces and conveyed to the on-line storm drainage ponds. The site's runoff will be collected via sheet flow to curb and gutter then into catch basins on-site. Once in the catch basins, the drainage then flows down to a wet pond where it is treated then is routed to an infiltration pond where it is infiltrated into the existing soils. The site currently drains from the west of the property to the center of the east property line. The existing drainage patterns will be maintained.

2) Could waste materials enter ground or surface waters? If so, generally describe. *It is not expected that waste materials could enter the ground or surface water from our site.*

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

The proposed site improvements are expected to maintain any drainage patterns that will occur downstream of the site. The storm drainage will infiltrate 100% of the runoff collected on-site.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

The project will be paved and stabilized via permanent seeding/plantings where any exposed subgrade might be. Drainage patterns on site are managed via several stormwater BMPs. Storm ponds have been sized for the existing store and parking lot to the south of the proposed building.

4. Plants [help]

- a. Check the types of vegetation found on the site:
 - __X__deciduous tree: alder, maple, aspen, other
 - __X__evergreen tree: fir, cedar, pine, other
 - __X__shrubs
 - __X__grass
 - ____pasture
 - ____crop or grain
 - _____ Orchards, vineyards or other permanent crops.
 - _____ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
 - ____water plants: water lily, eelgrass, milfoil, other
 - ____other types of vegetation
- b. What kind and amount of vegetation will be removed or altered?

Groundcover, shrubs, some trees, and grass. About 3.9 acres will be altered.

c. List threatened and endangered species known to be on or near the site.

None Known at this time

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

None proposed at the time however the landscape layout will comply to the regulations set forth by the governing jurisdiction. Native plantings are to be included where feasible in the design.

e. List all noxious weeds and invasive species known to be on or near the site.

None Known at this time

5. Animals [help]

a. <u>List</u> any birds and <u>other</u> animals which have been observed on or near the site or are known to be on or near the site.

Examples include: birds: hawk_heron, eagle_songbirds, other: mammals: deer, bear, elk, beaver, other: Pocket Gopher (Not on site), squirrels fish: bass, salmon, trout, herring, shellfish, other

b. List any threatened and endangered species known to be on or near the site. *None Known*

c. Is the site part of a migration route? If so, explain.

None Known

d. Proposed measures to preserve or enhance wildlife, if any:

No measures are proposed

e. List any invasive animal species known to be on or near the site.

None Known

6. Energy and Natural Resources [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Electricity is expected to be used for general needs to the buildings and natural gas will be used for heating/general appliance purposes.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

It is not expected that this site will affect the potential use of solar energy because the site spaced away enough from neighboring structures nor does the proposal include the construction of a tall structure...

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

The buildings proposed for this project are to be designed to the latest energy code standards. No additional measures are to be proposed.

7. Environmental Health [help]

- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.
 - 1) Describe any known or possible contamination at the site from present or past uses.

There are not any known contaminants on-site.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

There are no known hazardous chemicals/ conditions in relation to the site.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

It is not expected that the site will be used to store, use, or produce any toxic and/or hazardous chemicals.

4) Describe special emergency services that might be required.

Typical emergency services are expected; medical, fire, and law enforcement.

5) Proposed measures to reduce or control environmental health hazards, if any: *The site will keep a spill prevention plan and operations and maintenance manual for major onsite spills. No major spills are expected to be a hazardous material.*

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Traffic from the surrounding streets are the main contributor to the overall produced noise near the site.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short term noise generated would be from the construction of the building and development of the site. These noises and others associated and not mentioned would be limited to hours of constructions set in place by The City of Yelm. Long term noise contribution would be expected from on-site activity from the users of the gun range and associated facilities onsite, vehicular traffic in the parking lot, maintenance equipment and any other associated machinery to the site.

3) Proposed measures to reduce or control noise impacts, if any:

Our understanding is the building structure will dampen the majority of the noise generated by the firing range.

8. Land and Shoreline Use [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The site is currently partially undeveloped and the surrounding parcels are commercially developed on the west, undeveloped to south and east sides of the property and residentially developed to the north. The overall development of the site should not affect the adjacent properties.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

This is not known

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

This is not expected

c. Describe any structures on the site. *The site currently has an existing 9,850 square foot building consisting of retail and storage space.*

d. Will any structures be demolished? If so, what? *No*

e. What is the current zoning classification of the site?

The zone is C-3 Large Lot Commercial

f. What is the current comprehensive plan designation of the site? *The Comprehensive plan designation is C-3 Large Lot Commercial*

g. If applicable, what is the current shoreline master program designation of the site? *Not applicable*

h. Has any part of the site been classified as a critical area by the city or county? If so, specify. *The site is classified as part of a critical aquifer recharge area.*

i. Approximately how many people would reside or work in the completed project? *That is unknown*

i. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

There are none to be proposed.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The site plan will conform to the City of Yelm's landscaping standards.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

None proposed

9. Housing [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Not applicable

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None will be eliminated

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable

10. Aesthetics [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

It is proposed that the exterior of the building is approximately 30' in height to the top of the parapet. The principal exterior building material is cement fiber paneling supported by a wooden frame structure.

b. What views in the immediate vicinity would be altered or obstructed?

The site will contain less natural features between the proposed building location and the right of way however the site is flat and not in an area with a lot of views to obstruct.

c. Proposed measures to reduce or control aesthetic impacts, if any:

None proposed. The building façade and materials will be designed up to code and regulations of the governing jurisdiction.

11. Light and Glare [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

On site lighting will be designed in accordance with the City of Yelm standards.

b. Could light or glare from the finished project be a safety hazard or interfere with views? *The design of the site is not expected to interfere views and safety.*

c. What existing off-site sources of light or glare may affect your proposal? No off-site light or glare is expected to impact this proposal. Landscape screening should minimize significant impacts.

d. Proposed measures to reduce or control light and glare impacts, if any: *The lighting plan will be designed in accordance with the City of Yelm standards. The landscape requirements per county code will also reduce any minor impacts.*

12. Recreation [help]

a. What designated and informal recreational opportunities are in the immediate vicinity? *There are various outdoor recreational opportunities within the area.*

b. Would the proposed project displace any existing recreational uses? If so, describe. $\it No$

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

No impacts on the existing recreational opportunities are anticipated. The indoor gun range will provide a recreational opportunity.

13. Historic and cultural preservation [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

None Known

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

None known or identified

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

Historical map research and GIS data.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

The design will promote the current conditions to remain if not improve post site development.

14. Transportation [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

This site's address is on a Washington state road, WA-507. The sites access locations are two full access driveways, one on WA-507, and the other on Grove Rd, the other street bordering the site.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

No

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

There are 55 proposed parking stalls, three of which would be ADA compliant, 3 for electric vehicles, and 3 compact spaces while the remainder would be standard.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

No

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

Per the traffic report generated for the total project, it is expected that there will be 43 total new weekday PM peak trips. Phase 1 would have 29 new PM peak trips and Phase 2 would have 14 new PM peak trips. The traffic scoping report by Transportation Engineers Northwest will be submitted with the Site Plan Approval documents.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe. No

h. Proposed measures to reduce or control transportation impacts, if any: *None proposed due to the maintained access points*

15. Public Services [help]

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

The project will result in a slight increase in need for all public services as the site will be commercial.

b. Proposed measures to reduce or control direct impacts on public services, if any. *None Proposed*

16. Utilities [help]

- a. Circle utilities currently available at the site: electricity natural gas water, refuse service telephone sanitary sewer septic system, other _____
- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

For electricity, the provider is listed as Puget Sound Energy. This utility is present at the frontage of the property on Grove Ed. Natural Gas is provided by Puget Sound Energy and the utility is present at that property frontage as well. Water service is to be provided by the City of Yelm. Telephone service will be provided by Xfinity or Consolidated Communications. Sanitary sewage systems are operated by the City of Yelm and there is a connection point onsite.

The overall construction activities related to the site include trenching, clearing, grading, backfilling, and all activity associated with paving.

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature:	- CAR	
Name of signee	Darian Murray	
Position and Agene	cy/Organization <u>PACLAND</u>	
Date Submitted:	8/23/22	

D. Supplemental sheet for nonproject actions [HELP]

(IT IS NOT NECESSARY to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Proposed measures to avoid or reduce such increases are:

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

3. How would the proposal be likely to deplete energy or natural resources?

Proposed measures to protect or conserve energy and natural resources are:

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Proposed measures to protect such resources or to avoid or reduce impacts are:

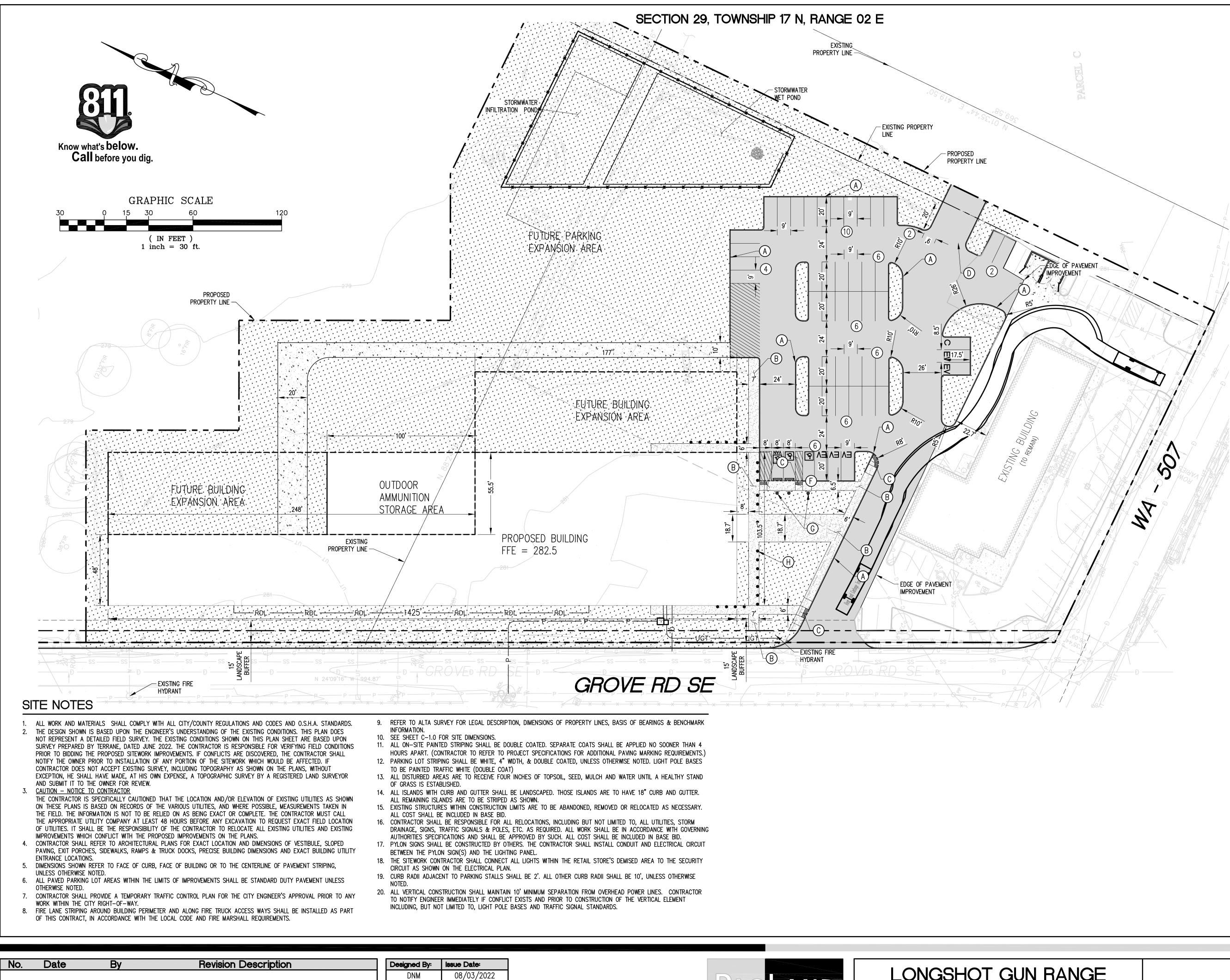
5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Proposed measures to avoid or reduce shoreline and land use impacts are:

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Proposed measures to reduce or respond to such demand(s) are:

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.



PERMIT

ENTITLEMENTS

10393015

Project No.:

Drawn By:

DNM

Checked By:

WFF



LONGSHOT GUN RANGE 16910 WA-507 SE YELM, WA

Seattle, WA 98103

T (206) 522-9510 www.PacLand.com

LEGEND

STANDARD ASPHALT PAVEMENT	
STANDARD CONCRETE SIDEWALK	
LANDSCAPED AREA	
CEMENT CONCRETE CURB	
CHAIN LINK FENCE	*************************************
PROPERTY LINE	
SIGN	
ACCESSIBLE PARKING STALL	S.
NUMBER OF PARKING STALLS PER ROW	#
COMPACT PARKING STALL	С
CONCRETE WHEEL STOP	_

CONSTRUCTION KEY NOTES

- (A) CEMENT CONCRETE TRAFFIC CURB
- (B) CONCRETE SIDEWALK
- C CONCRETE CURB RAMP WITH DETECTABLE WARNING SURFACE
- (D) TRASH ENCLOSURE (PER ARCHITECTURAL PLANS)
- E BICYCLE RACK
- $\overline{(F)}$ accessible parking stall and landing
- G ACCESSIBLE PARKING SIGN
- H BOLLARD

PARKING DATA

PARKING REQUIRED(BASED ON FUTURE BUILDING AREA)RANGE BUILDING $=$ MIN 1 STALL PER 10 OCCUPANTSTOTAL REQUIRED $=$ 20 STALLS(PROVIDED BY ARCHITECT)TOTAL STALLS $=$ 53 (1/550 SF)ACCESSIBLE STALLS $=$ 3
PARKING PROVIDED
STANDARD STALLS = 43 (3 STALLS WILL BE ELECTRIC VEHICLE STALLS)
COMPACT STALLS = 3 (2 STALLS WILL BE ELECTRIC VEHICLE STALLS)
$\underline{ACCESSIBLE STALLS} = 3$
TOTAL STALLS = 49
PARKING RATIO PROVIDED 1.00 / 313 SF BUILDING AREA(OCCUPIED) 1.00 / 752 SF BUILDING AREA(TOTAL)
MIN PARKING STALL DIMENSIONS
STANDARD STALLS = 9' X 20'
ACCESSIBLE STALLS = 8' X 20' (WITH 5' LANDING OR 8' LANDING FOR VAN ACCESSIBLE STALL)
COMPACT STALLS = 8.5' X 17.5'

SITE DATA

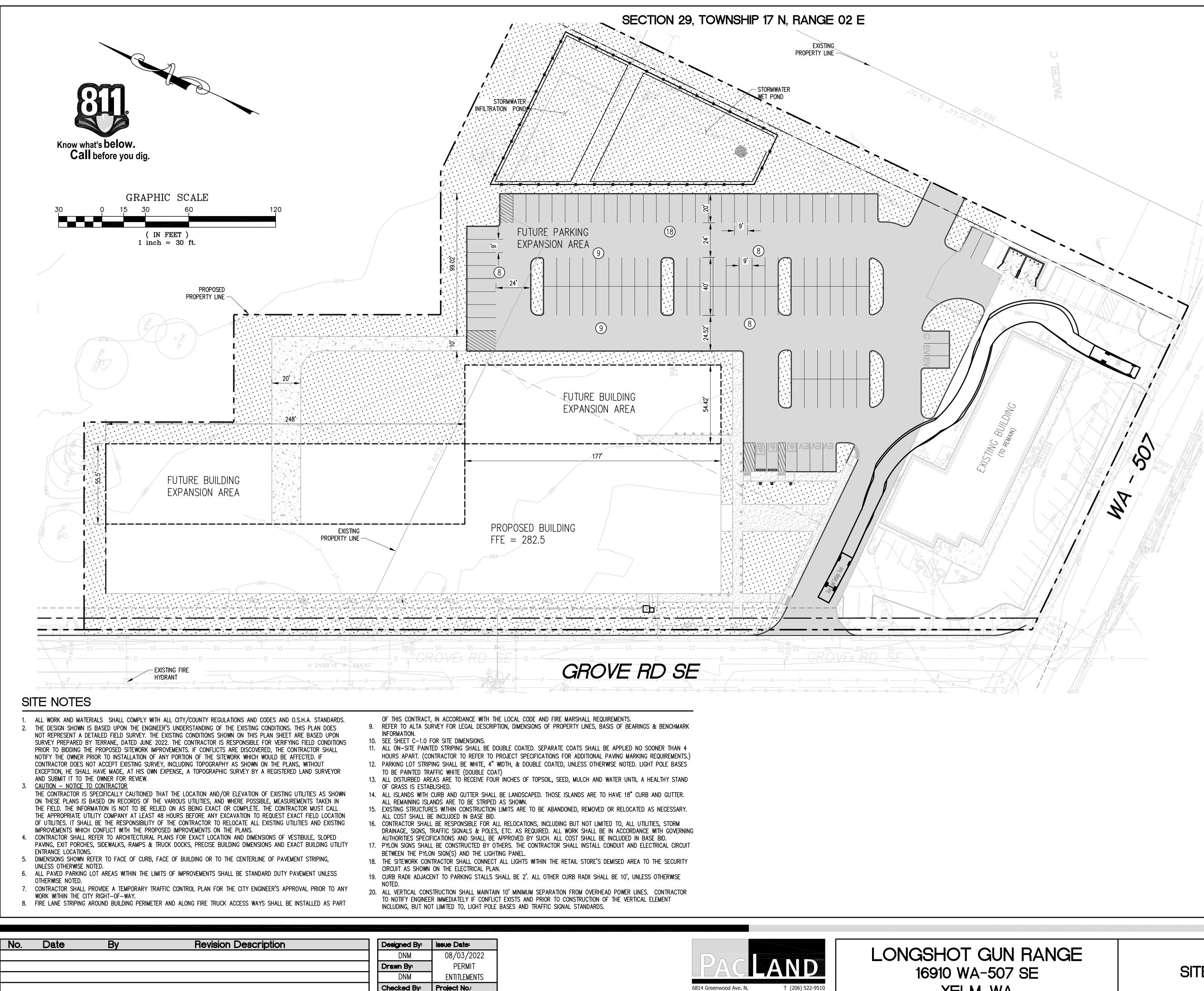
PARCEL ZONING:	C-3 LARGE LOT COMMERCIAL
PARCEL SIZE:	6.4 ACRES
LOT IMPERVIOUS	COVERAGE INFORMATION:
BUILDING	= 36,860 SF
SIDEWALK	= 5,945 SF
PAVEMENT	= 54,068 SF

BUILDING DATA

BUILDING FOOTPRINT: AREA=36,860 SF (PHASE 1)

SITE PLAN - PHASE 1

C-1.0



WFF

Project No.: 10393015

YELM, WA

Seattle, WA 98103

T (206) 522-9510 www.PacLand.com

LEGEND

STANDARD ASPHALT PAVEMENT	
STANDARD CONCRETE SIDEWALK	
LANDSCAPED AREA	
CEMENT CONCRETE CURB	
CHAIN LINK FENCE	— * * * * *
PROPERTY LINE	
SIGN	
ACCESSIBLE PARKING STALL	S
NUMBER OF PARKING STALLS PER ROW	(#)
COMPACT PARKING STALL	С
CONCRETE WHEEL STOP	

CONSTRUCTION KEY NOTES

- (A) CEMENT CONCRETE TRAFFIC CURB
- (B) CONCRETE SIDEWALK
- C CONCRETE CURB RAMP WITH DETECTABLE WARNING SURFACE
- (D) TRASH ENCLOSURE (PER ARCHITECTURAL PLANS)
- E BICYCLE RACK
- (F) accessible parking stall and landing
- G ACCESSIBLE PARKING SIGN
- (H) BOLLARD

PARKING DATA

PARKING REQUIRED (BASED ON FUTURE BUILDING AREA) RANGE BUILDING = MIN 1 STALL PER 10 OCCUPANTS TOTAL REQUIRED = 20 STALLS(PROVIDED BY ARCHITECT) TOTAL STALLS = 55 (1/530 SF) ACCESSIBLE STALLS = 3				
PARKING PROVIDED PHASE I:				
STANDARD STALLS=43(3 STALLS WILL BE ELECTRIC VEHICLE STALLS)COMPACT STALLS=3(2 STALLS WILL BE ELECTRIC VEHICLE STALLS)ACCESSIBLE STALLS=3TOTAL STALLS=49				
PHASE 2:REMOVED STALLS= 8 STANDARD STALLS= 60 COMPACT STALLS= 0 ACCESSIBLE STALLS= 0 TOTAL STALLS= 101				
PARKING RATIO PROVIDED 1.00 / 150 SF BUILDING AREA(OCCUPIED) 1.00 / 697 SF BUILDING AREA(TOTAL)				
MIN PARKING STALL DIMENSIONS STANDARD STALLS = 9' X 20' ACCESSIBLE STALLS = 8' X 20' (WITH 5' LANDING OR 8' LANDING FOR VAN ACCESSIBLE STALL)				
COMPACT STALLS = 8.5' X 17.5'				

SITE DATA

PARCEL ZONING: C-3 LARGE LOT COMMERCIAL PARCEL SIZE: 6.4 ACRES LOT IMPERVIOUS COVERAGE INFORMATION: BUILDING = 36,860 SF SIDEWALK = 5,945 SF PAVEMENT = 54,068 SF **BUILDING DATA**

BUILDING FOOTPRINT: AREA=36,860 SF (PHASE 1)

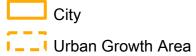
SITE PLAN - PHASE 2

C-1.0

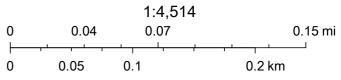
VICINITY MAP



August 23, 2022 Jurisdictions



Parcels



Maxar, Esri Community Maps Contributors, WA State Parks GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US



DATE:	July 15, 2022
Submitted To:	Crossroads at Yelm LLC
From:	Gary Cooper, Local Planning Solutions
Subject:	Mazama Pocket Gopher Survey Findings

This report has been completed following accepted protocols for determining the presence of Pocket Gophers. Conclusions made in this report are based on two site visits conducted at the required intervals as well as data research from the Thurston County Geodata website. Maps and summary reports obtained from both the Geodata site are included with this report.

This report covers three adjacent parcels. One parcel contains an indoor shooting range and a parking lot. The other two parcels appear to have been previously developed, as there are building slabs and hard-packed parking areas in various locations on both parcels. The properties primarily have very cobbly soils that are generally not hospitable to Mazama Pocket gophers. No mounds of any kind were observed during either field visit.

Survey Findings

No Mazama Gopher activity was observed on the property.

Property Information

Owner	Parcel #	Site Address	Acres
Mike McGraw & Marsha Matthiesen	64303100900	16930 State Route 507 SE	8.59
Crossroads at Yelm LLC	64303100800	16910 State Route 507 SE	2.4
Crossroads at Yelm LLC	64303100801	10502 Grove Road SE	6.6
TOTAL Acres			17.59

Field Visit Dates:

June 4, 2022 July 15, 2022

Page 1



Photo 1: Property aerial



Photo 2: Typical soils





Photo 3: Looking across parcels toward Grove Road:



Photo 4: Looking from shooting range over parcels toward WalMart.





Thurston Geodata Review

All 3 parcels are mapped as having Spanaway gravelly sandy loam 0-3%. This soil type is classified by Thurston County a "Preferred" soil for the Mazama Pocket Gopher.

Photo 5: Soils Indicator Map



Site Visit #1

The initial site visit was conducted on June 4th, 2022. No mounds of any kind were observed.

No Mazama Pocket Gopher mounds were observed on the parcels.

Site Visit #2

The second site visit was conducted on July 15, 2022, again following the accepted protocol. As with the initial survey, no gopher mounds were detected.



Photo 6: 1st Site Visit – GPS-tracked survey route



Photo 7: 2nd Site Visit – GPS-tracked survey route



NEXT PAGE



Conclusion

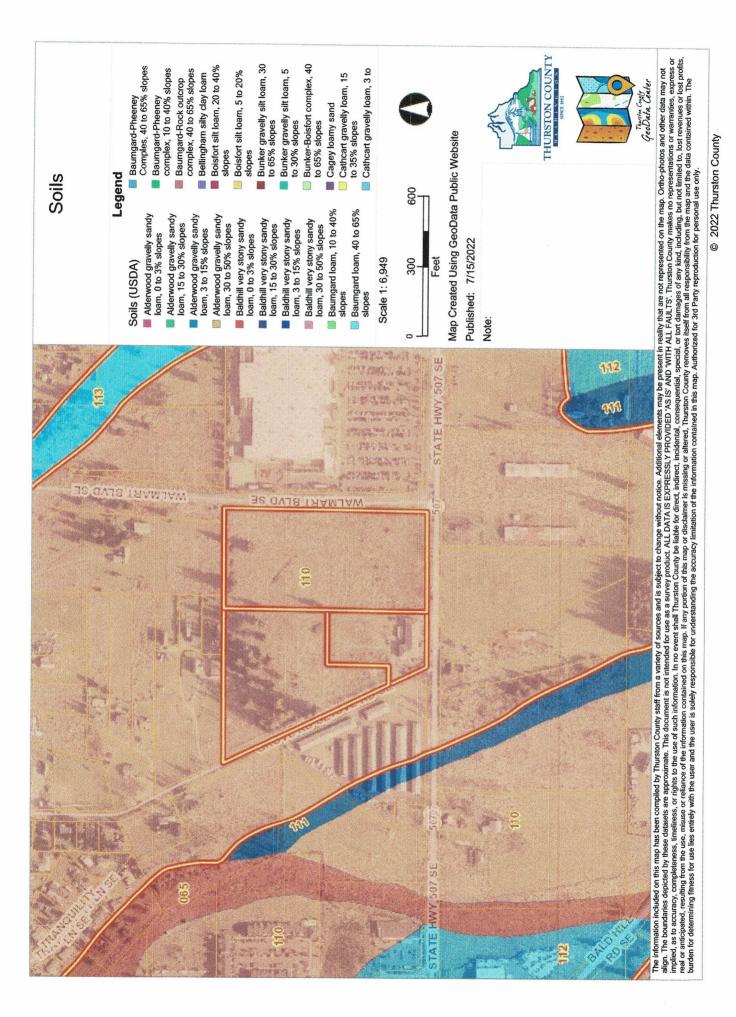
I have followed the established protocols to survey this property. Based on the results of 2 field visits, I conclude that there is presently no indication that the property is inhabited by the Mazama Pocket Gopher.

Gary Cooper, Local Planning Solutions

7/15/2022

Date:

Signed:





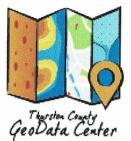
Data for Parcel No. 64303100800

Owner(s): CROSSROADS AT YELM LLC

Address:	4160 DOUGLAS BLVD
City:	GRANITE BAY
State:	CA, 95746
Site Address:	16910 STATE ROUTE 507 SE
Site City:	YELM
Site Zip:	98597
Section:	S29172E
Abbreviated Legal:	MC KENNA IRR TR L8 BLK 31 THAT PTN DAF BEG A
	X ELN SSH #5- H N419. 5F W233F
Usecode:	53
Tax Code Area:	170
Taxable:	Yes
Annual Tax:	View Property Taxes for Parcel
Property Type:	RTL
Total Acres:	2.4
Land Value:	View Assessor's Data for Parcel
Building Value:	View Assessor's Data for Parcel
Total Value:	View Assessor's Data for Parcel
Current Use:	Ν
Exemptions:	None
Wetlands:	Unknown
Flood Zone:	OUT
Flood of 1999:	Unknown
Winter Flooding of 1996:	Unknown
High Groundwater Flood Hazards:	Unknown
Zoning:	C-3
Commissioner District:	Gary Edwards - District 2
Historic Site:	No
Permitting Jurisdiction:	YELM
Jurisdiction of Influence:	Same as Permitting Jurisdiction
No Shooting Zone:	No
Animal Control:	Contact Animal Control (360-458-3244).
Weed Containment Zone:	No
Landslide Hazard Review Area - Slope A:	Unknown
Landslide Hazard Review Area - Slope B:	Unknown
Landslide Hazard Review Area - Slope C, D, E:	Not mapped by GeoData
Ground Water Sensitive Areas:	No
DNR Natural Heritage Data:	Unknown

Prairie Indicator Soils:	Yes - Check with Building Development Conter
Mazama Pocket Gopher Soils:	Yes - Check with Building Development Center
Mazama Pocket Gopher Solis. Mazama Pocket Gopher:	Yes - Check with Permitting Jurisdiction Near
Mazama Pocket Gopher Service Area:	
Oregon Vesper Sparrow:	Yelm Pocket Gopher East Unknown
Taylor's Checkerspot Butterfly:	
Oregon Spotted Frog:	Unknown
	Unknown
Marine Riparian Review Area - 300':	Unknown
Stream Riparian Review Area - 300':	Unknown
Wetland Review Area - 300':	Unknown
Shoreline Master Program and 100' Review Area:	No
FEMA Panel No.:	0362
Wellhead Protection Area:	Yes
Area of Groundwater Concern:	No
Elevated Nitrates:	Yes
Soil Type:	Spanaway gravelly sandy loam, 0 to 3% slopes
Hydric Soil:	Unknown
Watershed:	NISQUALLY RIVER
Water Service Area:	YELM, CITY OF
Water Resource Inventory Area (WRIA):	11
School Attendance District:	YELM
Elementary School:	FORT STEVENS
Elementary School: Middle School:	FORT STEVENS MILL POND AND YELM
-	
Middle School:	MILL POND AND YELM
Middle School: High School:	MILL POND AND YELM YELM
Middle School: High School: School Taxing District:	MILL POND AND YELM YELM View Assessor's Data for Parcel
Middle School: High School: School Taxing District: Fire Response District:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District: Medic Response District:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2 Residential outdoor burning is banned within the city
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District: Medic Response District:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District: Medic Response District: Residential Outdoor Burning:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2 Residential outdoor burning is banned within the city limits and urban growth areas.
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District: Medic Response District: Residential Outdoor Burning: Planning Region:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2 Residential outdoor burning is banned within the city limits and urban growth areas. 2
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District: Medic Response District: Residential Outdoor Burning: Planning Region: Census Tract:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2 Residential outdoor burning is banned within the city limits and urban growth areas. 2 012412
Middle School: High School: School Taxing District: Fire Response District: Unconsolidated Fire Response District: Fire Taxing District: Medic Response District: Residential Outdoor Burning: Planning Region: Census Tract: Radio or Cell Tower:	MILL POND AND YELM YELM View Assessor's Data for Parcel S.E. Thurston Fire Authority Yelm View Assessor's Data for Parcel M2 Residential outdoor burning is banned within the city limits and urban growth areas. 2 012412 No

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Owner(s):

MATTHIESEN, MARSHA A & MCGRAW, MICHAEL R

Address	
Address:	819 THE GREENS AVE
City: State:	NEWBERG
State:	OR, 97132
Site Address:	16930 STATE ROUTE 507 SE
Site City:	YELM
Site Zip:	98597
Section:	S29172E
Abbreviated Legal:	Section 29 Township 17 Range 2E Plat MCKENNA IRRIGATED
	TRACTS BLK 31 LT 9 Document 009/044 EX S 10F STATE HWY
l le se s de c	5-H
Usecode:	91
Tax Code Area:	170
Taxable:	Yes
Annual Tax:	View Property Taxes for Parcel
Property Type:	LND
Total Acres:	8.59
Land Value:	View Assessor's Data for Parcel
Building Value:	View Assessor's Data for Parcel
Total Value:	View Assessor's Data for Parcel
Current Use:	Ν
Exemptions:	None
Wetlands:	Unknown
Flood Zone:	OUT
Flood of 1999:	Unknown
Winter Flooding of 1996:	Unknown
High Groundwater Flood Hazards:	Unknown
Zoning:	C-3
Commissioner District:	Gary Edwards - District 2
Historic Site:	No
Permitting Jurisdiction:	YELM
Jurisdiction of Influence:	Same as Permitting Jurisdiction
No Shooting Zone:	No
Animal Control:	Contact Animal Control (360-458-3244).
Weed Containment Zone:	No
Landslide Hazard Review Area - Slope A:	Unknown
Landslide Hazard Review Area - Slope B:	Unknown
Landslide Hazard Review Area - Slope C, D, E:	Not mapped by GeoData
Ground Water Sensitive Areas:	No
DNR Natural Heritage Data:	Unknown
Prairie Indicator Soils:	Yes - Check with Building Development Center
Mazama Pocket Gopher Soils:	Yes - Check with Permitting Jurisdiction
Mazama Pocket Gopher:	Occupied
Mazama Pocket Gopher Service Area:	Yelm Pocket Gopher East
Oregon Vesper Sparrow:	Unknown
Taylor's Checkerspot Butterfly:	Unknown
Oregon Spotted Frog:	Unknown

Marine Riparian Review Area - 300':	Unknown
Stream Riparian Review Area - 300':	Unknown
Wetland Review Area - 300':	Unknown
Shoreline Master Program and 100' Review Area:	No
FEMA Panel No.:	0362
Wellhead Protection Area:	Yes
Area of Groundwater Concern:	No
Elevated Nitrates:	Yes
Soil Type:	Spanaway gravelly sandy loam, 0 to 3% slopes
Hydric Soil:	Unknown
Watershed:	NISQUALLY RIVER
Water Service Area:	Unknown
Water Resource Inventory Area (WRIA):	11
School Attendance District:	YELM
Elementary School:	FORT STEVENS
Middle School:	MILL POND AND YELM
High School:	YELM
School Taxing District:	
Fire Response District:	View Assessor's Data for Parcel
2. So the state first of the state in Construction and the Construction of the state in the s	S.E. Thurston Fire Authority
Unconsolidated Fire Response District:	Yelm
Fire Taxing District:	View Assessor's Data for Parcel
Medic Response District:	M2
Residential Outdoor Burning:	Residential outdoor burning is banned within the city limits and
	urban growth areas.
Planning Region:	2
Census Tract:	012412
Radio or Cell Tower:	No
Airport Zone:	No
Contamination:	Unknown

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Data for Parcel No. 64303100801

Owner(s): CROSSROADS AT YELM LLC

Address:	
	4160 DOUGLAS BLVD
City:	GRANITE BAY
State:	CA, 95746
Site Address:	10502 GROVE RD SE
Site City:	YELM
Site Zip:	98597
Section:	S29172E
Abbreviated Legal:	MC KENNA IRR TR L8 BLK 31 LESS PTN DAF BEG
	AT X ELN L8 & NL N SSH K
Usecode:	91
Tax Code Area:	170
Taxable:	Yes
Annual Tax:	View Property Taxes for Parcel
Property Type:	LND
Total Acres:	6.5
Land Value:	View Assessor's Data for Parcel
Building Value:	View Assessor's Data for Parcel
Total Value:	
Current Use:	View Assessor's Data for Parcel
Exemptions:	N
Wetlands:	None
	Unknown
Flood Zone:	OUT
Flood of 1999:	Unknown
Winter Flooding of 1996:	Unknown
High Groundwater Flood Hazards:	Unknown
Zoning:	C-3
Commissioner District:	Gary Edwards - District 2
Historic Site:	No
Permitting Jurisdiction:	YELM
Jurisdiction of Influence:	Same as Permitting Jurisdiction
No Shooting Zone:	No
Animal Control:	Contact Animal Control (360-458-3244).
Weed Containment Zone:	No
Landslide Hazard Review Area - Slope A:	Yes - Check with Permitting Jurisdiction
Landslide Hazard Review Area - Slope B:	Unknown
Landslide Hazard Review Area - Slope C, D, E:	Not mapped by GeoData
Ground Water Sensitive Areas:	No
DNR Natural Heritage Data:	Unknown

Prairie Indicator Soils:	Yes - Check with Building Dovelopment Conter
Mazama Pocket Gopher Soils:	Yes - Check with Building Development Center
Mazama Pocket Gopher:	Yes - Check with Permitting Jurisdiction Near
Mazama Pocket Gopher Service Area:	Yelm Pocket Gopher East
Oregon Vesper Sparrow:	Unknown
Taylor's Checkerspot Butterfly:	Unknown
Oregon Spotted Frog:	Unknown
Marine Riparian Review Area - 300':	Unknown
Stream Riparian Review Area - 300':	
Wetland Review Area - 300':	Unknown
	Unknown
Shoreline Master Program and 100' Review Area: FEMA Panel No.:	No
Wellhead Protection Area:	0362
Area of Groundwater Concern:	Yes
Elevated Nitrates:	No
Soil Type:	Yes
Hydric Soil:	Spanaway gravelly sandy loam, 0 to 3% slopes
Watershed:	
Water Service Area:	NISQUALLY RIVER
	YELM, CITY OF
Water Resource Inventory Area (WRIA):	11
School Attendance District:	YELM
Elementary School:	FORT STEVENS
Middle School:	MILL POND AND YELM
High School:	YELM
School Taxing District:	View Assessor's Data for Parcel
Fire Response District:	S.E. Thurston Fire Authority
Unconsolidated Fire Response District:	Yelm
Fire Taxing District:	View Assessor's Data for Parcel
Medic Response District:	M2
Residential Outdoor Burning:	Residential outdoor burning is banned within the city
	limits and urban growth areas.
Planning Region:	2
Census Tract:	012412
Radio or Cell Tower:	No
Airport Zone:	No
Contamination:	
Contamination.	Unknown

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2022 Thurston	County	Mazama	Pocket	Gopher	Screening	Field Form	
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Site Visit Date:	6/4/2022
	and the second se

Site News and Barriel #	- 44362100000 44202				
Site Name and Parcel #	Parcel #: $64303100900; 64303100800; 6430300801$				
	Project #:				
	Site/LandownersSEE REPORT				
How were the data collected?	Transect: Trimble Garmin Aerial				
(circle the method for each)	Mounds Trimble Garmin Aerial				
	Notes: <u><u><u>BPS</u>TRACKER</u></u>				
Field Team Personnel:	Name: FACH COOPER				
(Indicate all staff present, CIRCLE	Name: Gary Cooper Name:				
who filled out form)	Name:				
	Name.				
Others onsite (name/affiliation)					
others onsite (name/annation)					
Site visit #	1 st 2 nd Unable to screen				
(CIRCLE all that apply)	Notes:				
Do onsite conditions preclude the					
need for further visits?	Yes No				
	Dense woody cover that encompasses the entire site (trees/shrubs) that appears to preclude any potential MPG use.				
	Impervious Compacted Graveled Flooded Other				
	Notes:				
·					
Describes statistic for a l					
Describe visibility for mound detection:	Poor Fair (Good) Notes:				
Request mowing?	Yes No N/A Notes:				
(CIRCLE and DESCRIBE WHERE					
MOWING IS NEEDED and SHOW					
ON AERIAL PHOTO					

Mounds observed over the whole site are characteristic of:	MPG Mounds	Likely MPG Mounds	Indeterminate	Likely Mole Mounds	Mole Mounds		
Quantify or describe amount of each type and approx. # of mounds					0		
Group = 3 mounds or more							
	No MPG mounds (circle)						
MPG mounds in GPS?	None All	Most Sor	ne				
(CIRCLE and DESCRIBE)	Notes:						
If MPG mounds present, entered in GPS?	Yes No N/A						
Does woody vegetation onsite match aerial photo?	Yes No	- describe diffe	rences and show	/ on parcel ma	p/aerial:		
What portion(s) of the property (was screened?	All Part	- describe and	show on parcel	map/aerial:			
(CIRCLE and DESCRIBE)							
Notes -	Describe, and show on parcel map/aerial if applicable:						
Team reviewed and agreed to data recorded on form?	Yes No Notes:	Reviewed k	by initials: <u>GLC</u>	<u> </u>			
(CIRCLE, and EXPLAIN if "No")							

2022 Thurston County Mazama Pock	et Gopher Screening Field Form
----------------------------------	--------------------------------

2	Fie	ld	Form	Site \
•				

Visit Date: 7/15/2022

Site Name and Parcel # How were the data collected? (circle the method for each)	Parcel #: 64303100900;64303100800;64303100800 Project #:
Field Team Personnel: (Indicate all staff present, CIRCLE who filled out form)	Name: Name: Name:
Others onsite (name/affiliation) Site visit # (CIRCLE all that apply)	1 st 2 nd Unable to screen Notes:
Do onsite conditions preclude the need for further visits?	Yes No Dense woody cover that encompasses the entire site (trees/shrubs) that appears to preclude any potential MPG use. Impervious Compacted Graveled Flooded Other Notes:
Describe visibility for mound detection:	Poor Fair Good Notes:
Request mowing? (CIRCLE and DESCRIBE WHERE MOWING IS NEEDED and SHOW ON AERIAL PHOTO	Yes No N/A Notes:

		-			
Mounds observed over the whole site are characteristic of:	MPG Mounds	Likely MPG Mounds	Indeterminate	Likely Mole Mounds	Mole Mounds
Quantify or describe amount of each type and approx. # of mounds					Ø
Group = 3 mounds or more					
	No MPG moun	ds (circle))		
MPG mounds in GPS?	None All	Most Sor	me		
(CIRCLE and DESCRIBE)	Notes:				
If MPG mounds present, entered in GPS?	Yes No	N/A			
Does woody vegetation onsite match aerial photo?	Yes No	- describe diffe	rences and show	on parcel ma	ap/aerial:
What portion(s) of the property was screened?	All Part	- describe and	show on parcel	map/aerial:	
(CIRCLE and DESCRIBE)					
Notes -	Describe, and s	how on parcel n	nap/aerial if app	licable:	
×					
Team reviewed and agreed to data recorded on form?	Yes No Notes:	Reviewed b	by initials: GLC	^	
(CIRCLE, and EXPLAIN if "No")					



Geotechnical Engineering Construction Observation/Testing Environmental Services

> GEOTECHNICAL ENGINEERING STUDY PROPOSED LONG SHOT INDOOR RANGE EXPANSION 16910 STATE ROUTE 507 SOUTHEAST YELM, WASHINGTON

PA

ES-8688

15365 N.E. 90th Street, Suite 100 Redmond, WA 98052 (425) 449-4704 Fax (425) 449-4711 www.earthsolutionsnw.com

PREPARED FOR

PACLAND

July 26, 2022



Steven K. Hartwig, G.I.T. Staff Geologist



Henry T. Wright, P.E. Associate Principal Engineer

GEOTECHNICAL ENGINEERING STUDY PROPOSED LONG SHOT INDOOR RANGE EXPANSION 16910 STATE ROUTE 507 SOUTHEAST YELM, WASHINGTON

ES-8688

Earth Solutions NW, LLC 15365 Northeast 90th Street, Suite 100 Redmond, Washington 98052 Phone: 425-449-4704 | Fax: 425-449-4711 www.earthsolutionsnw.com

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you - assumedly a client representative - interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will <u>not</u> likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will <u>not</u> be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnicalengineering report did not read the report in its entirety. Do <u>not</u> rely on an executive summary. Do <u>not</u> read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnicalengineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform constructionphase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note* conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration* by including building-envelope or mold specialists on the design team. *Geotechnical engineers are <u>not</u> building-envelope or mold specialists.*



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July 26, 2022 ES-8688

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

PACLAND 6814 Greenwood Avenue North Seattle, Washington 98103

Attention: Mr. Darian Murray

Dear Mr. Murray:

Earth Solutions NW, LLC (ESNW), is pleased to present this geotechnical report to support the proposed project. Based on the results of our investigation, construction of the proposed indoor range expansion is feasible from a geotechnical standpoint. Our field observations indicate the site is primarily underlain by gravel glacial outwash deposits.

In our opinion, the proposed indoor range building can be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed and compacted on competent native soil. Based on our explorations, competent bearing soil for new foundation support is expected to begin at depths of about one to one and one-half feet below existing grades. Where encountered, loose or otherwise unsuitable subgrade areas should be compacted or overexcavated and replaced with structural fill.

Stormwater infiltration into the native gravel deposits if feasible from a geotechnical standpoint. ESNW should review final stormwater design plans and provided additional recommendations as necessary.

Pertinent geotechnical recommendations are provided in this study. We appreciate the opportunity to be of service to you on this project. Please call if you have any questions about this report or if we can be of further assistance.

Sincerely,

EARTH SOLUTIONS NW, LLC

Steven K. Hartwig, G.I.T. Staff Geologist

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GEOTECHNICAL ENGINEERING STUDY PROPOSED LONG SHOT INDOOR RANGE EXPANSION 16910 STATE ROUTE 507 SOUTHEAST YELM, WASHINGTON

ES-8688

INTRODUCTION

<u>General</u>

This geotechnical engineering study was prepared for the proposed Long Shot Indoor Range expansion to be constructed at 16910 State Route 507 Southeast, in Yelm, Washington. To complete this study, ESNW performed the following services:

- Test pits to characterize soil and near-surface groundwater conditions.
- Laboratory testing of soil samples collected at the test pit locations.
- Engineering analyses.

The following documents, maps, and codes were reviewed as part of our report preparation:

- Topographic and Boundary Survey, prepared by Terrane, dated June 6, 2022.
- Geologic Map of the Centralia Quadrangle, Washington, compiled by H.W. Schasse, dated 1987.
- Online Web Soil Survey (WSS), provided by the Natural Resources Conservation Service under the United States Department of Agriculture (USDA).
- Yelm Municipal Code (YMC) Chapter 18.21.100 Geologically Hazardous Areas.
- Thurston County Liquefaction Susceptibility Map, endorsed by the Washington State Department of Natural Resources, dated September 2004.
- 2019 Stormwater Management Manual for Western Washington (2019 SWMMWW).

Project Description

The subject site is located at 16910 State Route 507 Southeast in Yelm, Washington. We understand an expansion of the Long Shot Indoor Range facility is proposed by constructing a new building and parking area to the north of the existing facility.

At the time of report submission, specific building load plans were not available for review; however, based on our experience with similar developments, the proposed structure will likely be two to three stories and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be about 2 to 3 kips per linear foot. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

If the above design assumptions either change or are incorrect, ESNW should be contacted to review the recommendations provided in this report. ESNW should review final designs to confirm that our geotechnical recommendations have been incorporated into the plans.

SITE CONDITIONS

<u>Surface</u>

The subject site is located at 16910 State Route 507 Southeast in Yelm, Washington. The approximate location of the property is illustrated on Plate 1 (Vicinity Map). The site consists of two tax parcels (Thurston County Parcel No. 64303100-800 and -801), totaling about 8.9 acres. Per the referenced topographic survey, the existing topography is relatively level, with an estimated three to four feet of elevation change across the site. At the time of the June 2022 fieldwork, the subject site contained an undeveloped field to the north with vegetation consisting of grass and light brush, and the Long Shot Indoor Range building and parking lot area to the south.

<u>Subsurface</u>

An ESNW representative observed, logged, and sampled seven test pits on June 23, 2022. The test pits were excavated within accessible areas of the subject lots using a mini trackhoe and operator retained by ESNW. The test pits were completed to evaluate soil conditions, classify site soils, and characterize shallow groundwater conditions across the subject site.

The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil

Topsoil was generally encountered in the upper 12 inches of existing grades at the test pit locations. Deeper or shallower pockets of topsoil may be locally encountered across the site. The topsoil was characterized by a dark brown color, minor root intrusions, and trace organic matter. Vegetation roots generally extended to depths of 10 to 24 inches.

Native Soil

Underlying topsoil, the native soil was classified primarily as medium dense well-graded and poorly graded gravel with sand (USCS: GW and GP, respectively). The moisture content at the time of exploration was characterized primarily as damp to moist. Native soil extended to the maximum exploration depth at each test pit location, which occurred between about 6.5 and 10 feet below the existing ground surface (bgs).

Geologic Setting

The referenced geologic map resource indicates the site is underlain by Vashon outwash gravel deposits (Qdvg). The referenced WSS resource identifies Spanaway gravelly sandy loam as the primary underlying soil unit of the subject site. The Spanaway series soils are typically excessively drained soils that formed in glacial outwash plains. Based on the soil conditions encountered during the fieldwork, native soil on the subject site is consistent with the geologic setting of gravel glacial outwash as locally mapped.

Groundwater

Groundwater seepage was not observed in the test pits excavated during the June 2022 subsurface exploration. Nevertheless, groundwater may be encountered depending on the time of year earthwork activities occur and depth of excavations. Groundwater flow rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Geologically Hazardous Areas Review

To evaluate the presence of geologically hazardous areas, ESNW reviewed YMC Chapter 18.21.100 (Geologically Hazardous Areas). ESNW also reviewed the City of Yelm Critical Areas Map and the Thurston County GeoData resources to identify mapped critical areas with respect to geologic hazards. Geologically hazardous areas recognized by the YMC include erosion, landslide, and seismic hazard areas.

Based on our review, the site does not contain geologically hazardous areas as defined in Chapter 18.21.100 of the YMC or as mapped using the previously mentioned resources. The referenced liquefaction susceptibility map indicates the site maintains a very low susceptibility to liquefaction and, in our opinion, does not meet the definition of a seismic hazard area per the YMC. The subject site also does not meet the qualifications of erosion hazard areas or landslide hazard areas according to the definitions set forth in the YMC.

DISCUSSION AND RECOMMENDATIONS

<u>General</u>

Based on the results of our investigation, construction of the proposed project is feasible from a geotechnical standpoint. The primary geotechnical considerations for the proposal are associated with structural fill placement and compaction, utility trench support and backfill, drainage, foundation support, and temporary excavation support.

In our opinion, the proposed indoor range building can be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed and compacted on competent native soil. Based on our explorations, competent bearing soil for new foundation support is expected to begin at depths of about one to one and one-half feet below existing grades. Where encountered, loose or otherwise unsuitable subgrade areas should be compacted or overexcavated and replaced with structural fill.

Stormwater infiltration into the native gravel deposits if feasible from a geotechnical standpoint. ESNW should review final stormwater design plans and provided additional recommendations as necessary.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve mass site grading and related infrastructure improvements. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (where allowed by the presiding jurisdiction), and/or the use of select fill material will likely be necessary during construction.

Temporary Erosion Control

The following temporary erosion and sediment control (TESC) Best Management Practices (BMPs) are offered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placement of a geotextile fabric beneath the quarry spalls will provide greater stability, if needed.
- Silt fencing should be placed around the site perimeter.
- When not in use, soil stockpiles should be covered or otherwise protected.
- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.
- Dry soils disturbed during construction should be wetted to minimize dust.
- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans, should be incorporated into construction activities. TESC BMPs should be upkept and modified during construction as site conditions require and as approved by the site erosion control lead.

Excavations and Slopes

Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications are also provided:

•	Areas exposing groundwater seepage	1.5H:1V (Type C)
•	Loose soil	1.5H:1V (Type C)
•	Medium dense soil	1H:1V (Type B)

The presence of groundwater (if encountered) may cause localized sloughing of temporary slopes. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion and should maintain a gradient of 2H:1V or flatter.

In-situ and Imported Soil

In general, our field observations indicate on-site soils likely to be encountered during construction may be considered feasible for use as structural fill if the soil moisture content is at (or slightly above) the optimum level when compaction achievement is required. Successful use of on-site soils as structural fill will largely be dictated by the moisture content at the time of placement and compaction.

On-site soils that are dry of the optimum moisture content at the time of placement will require moisture conditioning (typically achieved by adding water) prior to compaction. Soils that are excessively over the optimum moisture content will require moisture conditioning (typically achieved through soil aeration) prior to compaction. It should be emphasized that soils should never be placed and compacted dry of the optimum moisture content.

Imported soil intended for use as structural fill should consist of a well-graded, granular soil with a moisture content that is at (or slightly above) the optimum level. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

•	Structural fill material	Granular soil
•	Moisture content	At or slightly above optimum
•	Relative compaction (minimum)	95 percent (Modified Proctor)
•	Loose lift thickness (maximum)	12 inches

The on-site soil may not be suitable for use as structural fill, unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Soil shall not be placed dry of the optimum moisture content and should be evaluated by ESNW during construction. With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. ESNW recommends removing any unsuitable material or debris from structural areas, if encountered.

Foundations

In our opinion, the proposed structure may be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed on competent native soil. Based on the conditions encountered during the subsurface exploration, competent bearing soil for new foundation support is expected beginning at depths of about one and one-half to two and one-half feet bgs. Where encountered, loose or otherwise unsuitable subgrade areas should be recompacted or overexcavated and replaced with structural fill.

Provided foundations will be supported as prescribed, the following parameters may be used for design:

Allowable soil bearing capacity	2,500 psf
Passive earth pressure	300 pcf (equivalent fluid)
Coefficient of friction	0.40
 Footing width (minimum) 	18 inches (continuous) 24 inches (isolated)
Footing depth (minimum)	18 inches (exterior) 12 inches (interior)

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factorof-safety of 1.5. With structural loading as expected, total settlement in the range of one inch and differential settlement of approximately one-half inch is anticipated. Most of the anticipated settlement should occur during construction when dead loads are applied.

Seismic Design

The 2018 International Building Code (2018 IBC) recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, the parameters and values provided below are recommended for seismic design per the 2018 IBC.

Parameter	Value
Site Class	D*
Mapped short period spectral response acceleration, $S_S(g)$	1.278
Mapped 1-second period spectral response acceleration, $S_1(g)$	0.461
Short period site coefficient, F _a	1.0
Long period site coefficient, Fv	1.839**
Adjusted short period spectral response acceleration, $S_{MS}(g)$	1.278
Adjusted 1-second period spectral response acceleration, $S_{M1}(g)$	0.848**
Design short period spectral response acceleration, $S_{DS}(g)$	0.852
Design 1-second period spectral response acceleration, $S_{D1}(g)$	0.565**

* Assumes medium dense native soil conditions, encountered to a maximum depth of 10 feet bgs during the June 2022 field exploration, remain medium dense to dense to at least 100 feet bgs.

** Values assume F_v may be determined using linear interpolation per Table 11.4-2 in ASCE 7-16.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structure should be supported on competent, firm, and unyielding subgrades comprised of competent native soil, compacted native soil, or compacted structural fill. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break consisting of at least four inches of free-draining crushed rock or gravel should be placed below each slab. The free-draining material should have a fines content of 5 percent or less (percent passing the Number 200 sieve, based on the minus three-quarter inch fraction). If relatively clean native gravel is exposed or used for backfill in the slab subgrade, additional capillary break material may not be warranted and can be evaluated by the geotechnical engineering during construction. In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is to be utilized, it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

Active earth pressure (unrestrained condition)	35 pcf (equivalent fluid)
At-rest earth pressure (restrained condition)	55 pcf
 Traffic surcharge* (passenger vehicles) 	70 psf (rectangular distribution)
Passive earth pressure	300 pcf (equivalent fluid)
Coefficient of friction	0.40
Seismic surcharge	8H psf**

* Where applicable.

** Where H equals the retained height (in feet).

The above design parameters are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. If drainage is not provided, hydrostatic pressure should be considered in the wall design.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications detailed in the *Site Preparation and Earthwork* section of this report. It is possible that soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas of unsuitable or yielding subgrade conditions may require remedial measures such as overexcavation and replacement with structural fill or thicker crushed rock sections prior to pavement.

For relatively lightly loaded pavements subjected to automobiles and occasional truck traffic, the following sections can be considered for preliminary design:

- Two inches of hot mix asphalt (HMA) placed over four inches of CRB, or;
- Two inches of HMA placed over three inches of asphalt treated base (ATB).

Heavier traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections can be considered for areas subject to occasional truck traffic:

- Three inches of HMA placed over six inches of crushed rock base (CRB), or;
- Three inches of HMA placed over four-and-one-half inches of ATB.

The HMA, CRB and ATB materials should conform to WSDOT specifications. The City of Yelm minimum pavement requirements may supersede our recommendations and may require thicker pavement sections.

Installation of pavement subgrade drainage should be considered in areas where inverted crown pavements are used and where unweathered glacial till is exposed at the pavement subgrade elevation. Such drainage measures can consist of finger drains at catch basin locations. A lack of subgrade drainage under the conditions described above will likely result in extremely accelerated distress to pavements in low areas.

<u>Drainage</u>

Groundwater seepage was not observed in the test pits excavated during the June 2022 subsurface exploration. Nevertheless, groundwater may be encountered depending on the time of year earthwork activities occur and depth of excavations. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, infiltration trenches, and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures or slopes. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Infiltration Feasibility

We understand on-site stormwater infiltration is being considered for the proposed project. An evaluation of infiltration feasibility and pertinent design recommendations are provided in this section.

Because the site is underlain by soil that was not consolidated by glacial advance, we used the Soil Grain Size Analysis Method outlined in the referenced 2019 SWMMWW, adopted by the City of Yelm, to determine infiltration design parameters. The following equation was utilized to determine an initial, uncorrected infiltration rate:

 $\log_{10}(K_{sat}) = -1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08f_{fines}$

The lowest initial uncorrected rate from the test pit samples was used and must be reduced by the correction factors outlined in the 2019 SWMMWW. Accordingly, the following parameters are recommended for infiltration design:

•	Initial K _{sat}	175.8 inches per hour
•	CF_{v} (site variability; number of locations tested)	0.33
•	CF _t (test method)	0.40
•	CF _m (degree of influent control)	0.90
•	Design K _{sat}	20.0 inches per hour

Discussion

Based on our field observations and analysis, the native soil is feasible for infiltration design from a geotechnical standpoint. We acknowledge that final site layouts and/or designs may affect infiltration feasibility, concerning maximum allowable setbacks from structures and property lines. Infiltration facilities should extend through the upper organic topsoil and at least one foot into the clean gravel and sand at depth. Clean gravel and should be encountered beginning at a depth of roughly one to two feet bgs across most of the site.

ESNW can provide further evaluation and recommendations for site BMPs as plans develop. ESNW should review final stormwater management plans to provide supplementary recommendations, as needed.

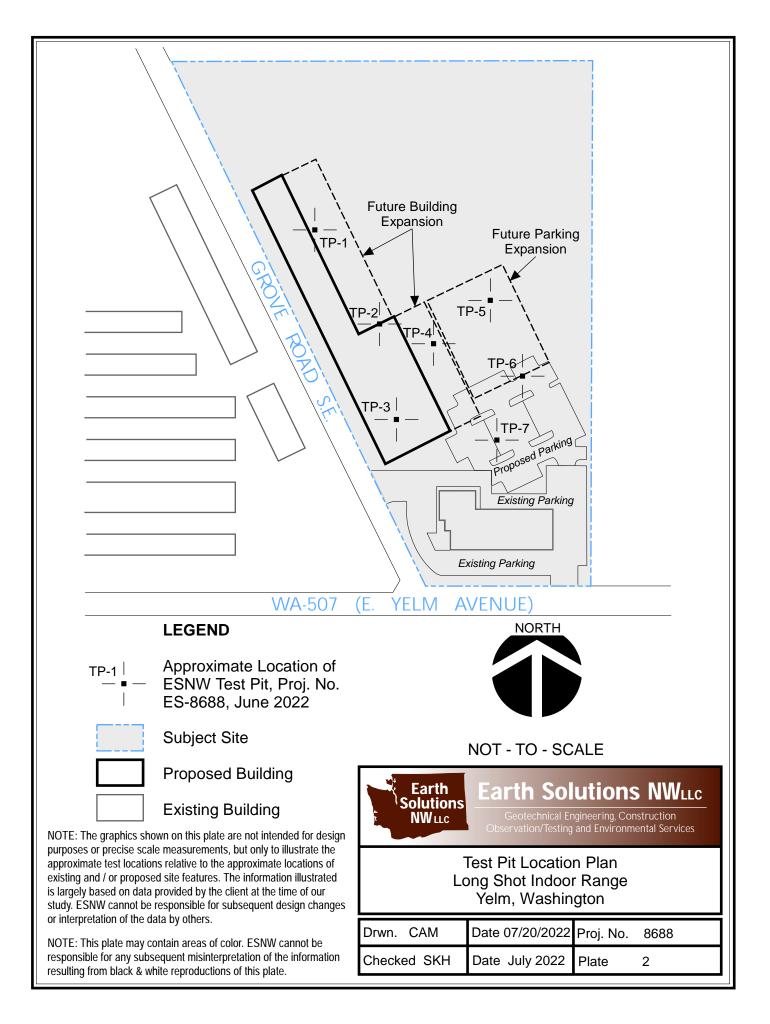
LIMITATIONS

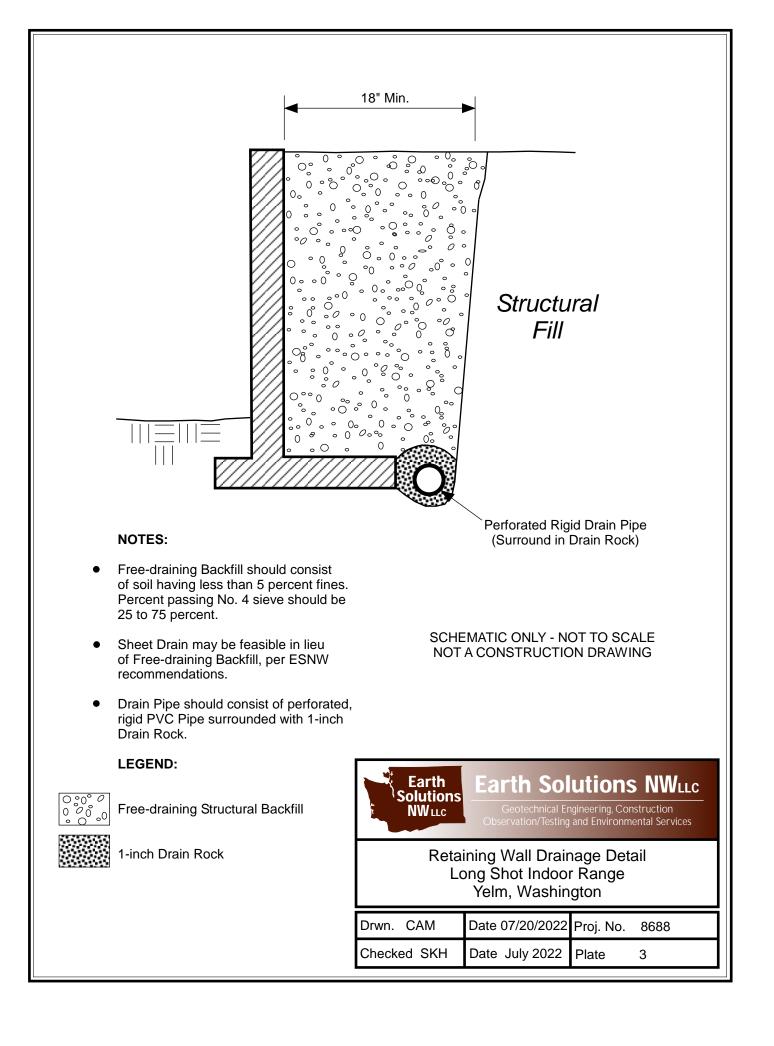
This study has been prepared for the exclusive use of PACLAND and their representatives. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. No warranty, express or implied, is made. Variations in the subsurface conditions observed at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this study if variations are encountered.

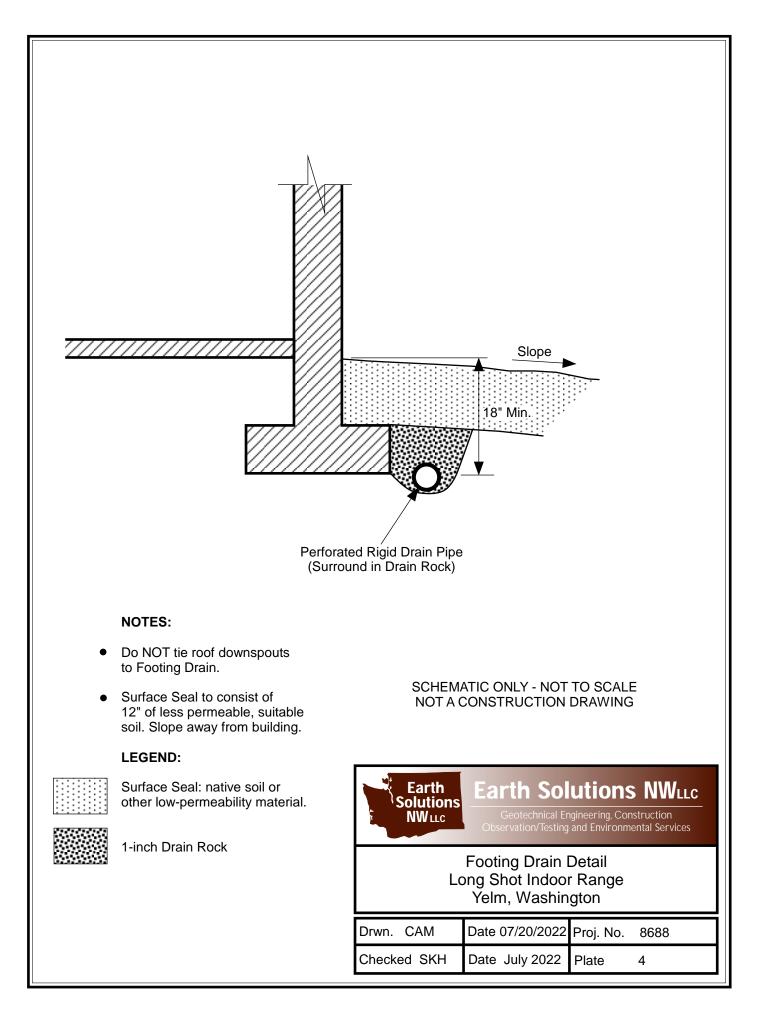
Additional Services

ESNW should have an opportunity to review final project plans with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction. Provided that ESNW is retained during construction, we can provide supplementary recommendations for subgrade preparation, as necessary, where differing soil conditions are encountered.









Appendix A

Subsurface Exploration Test Pit Logs

ES-8688

ESNW explored on-site soil and groundwater conditions on June 23, 2022. Seven test pits were excavated using a mini-trackhoe and operator retained by ESNW. The test pits were completed within accessible areas of the subject site. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pit logs are provided in this Appendix. The test pits were excavated to a maximum depth of approximately 10 feet bgs.

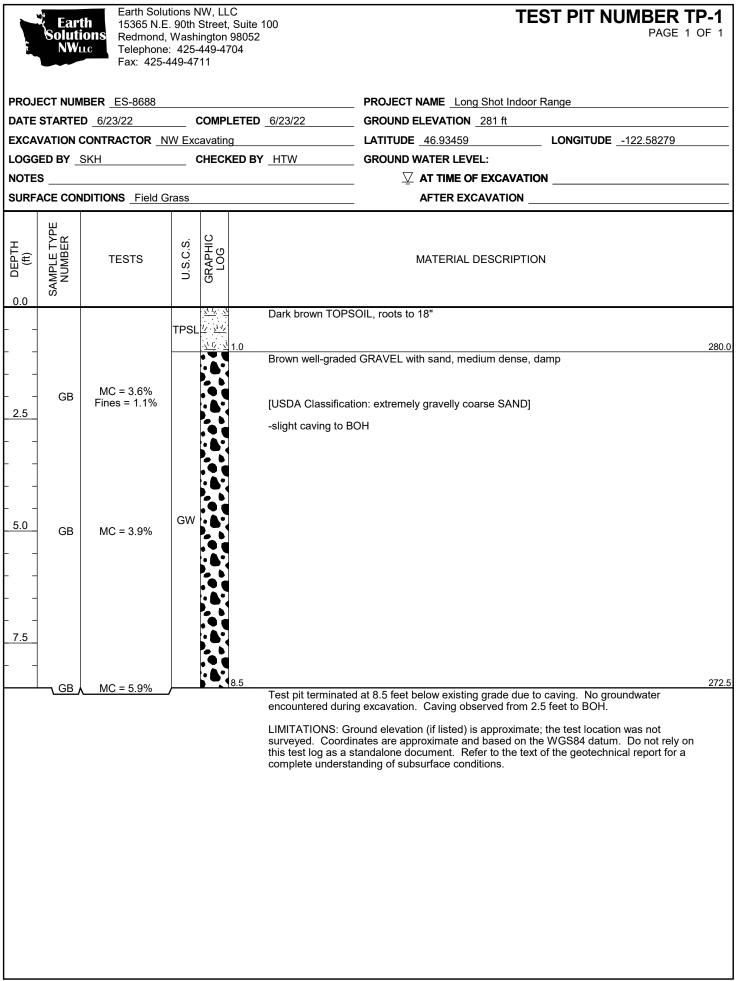
The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

Earth Solutions NWLLC SOIL CLASSIFICATION CHART

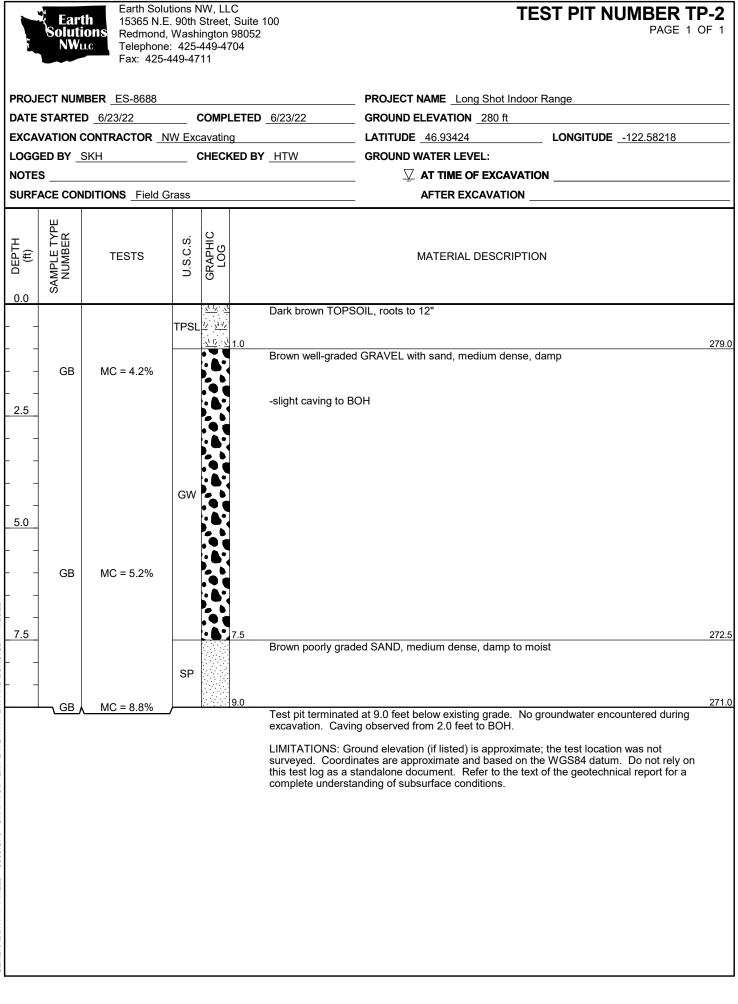
M	ONS	SYMBOLS		TYPICAL	
MAJOR DIVISIONS			GRAPH	LETTER	DESCRIPTIONS
	GRAVEL AND	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED SOILS	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
LARGER THAN NO. 200 SIEVE SIZE		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
FINE GRAINED SOILS				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
00120				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
SIZE				СН	INORGANIC CLAYS OF HIGH PLASTICITY
				ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HI	SOILS		PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

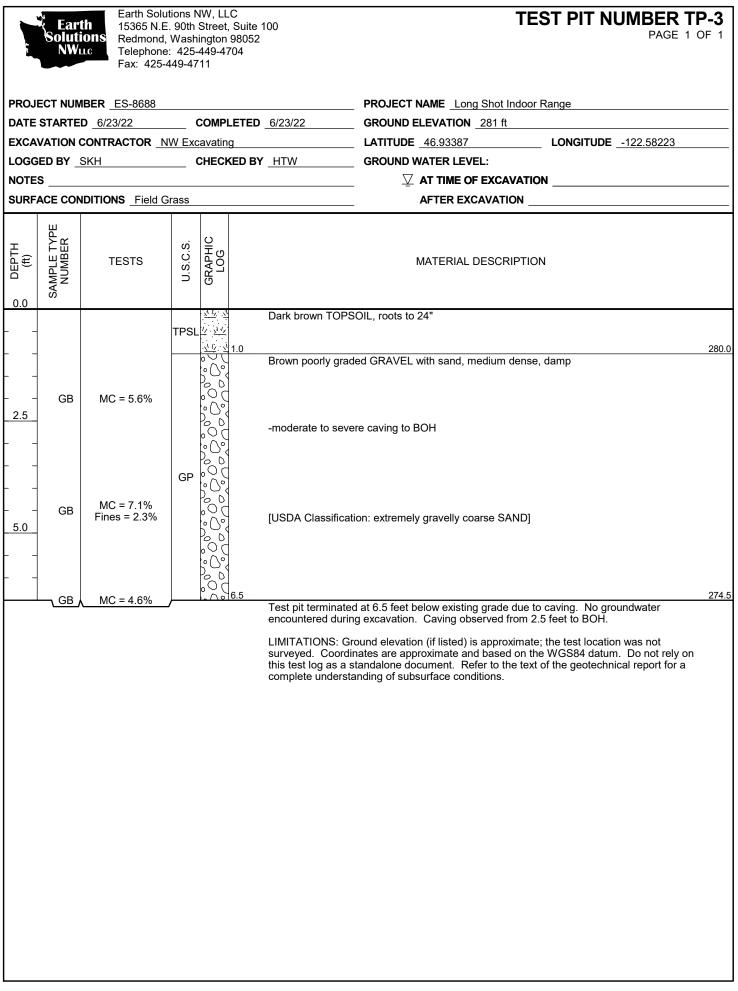
DUAL SYMBOLS are used to indicate borderline soil classifications.

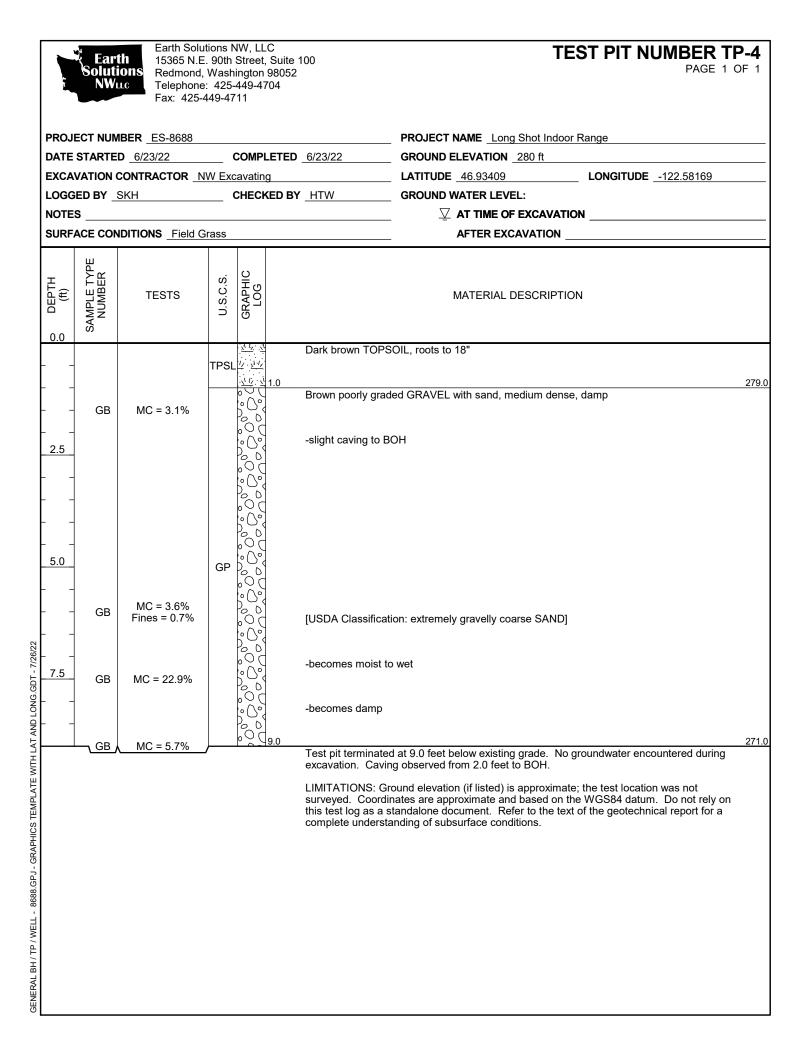
The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

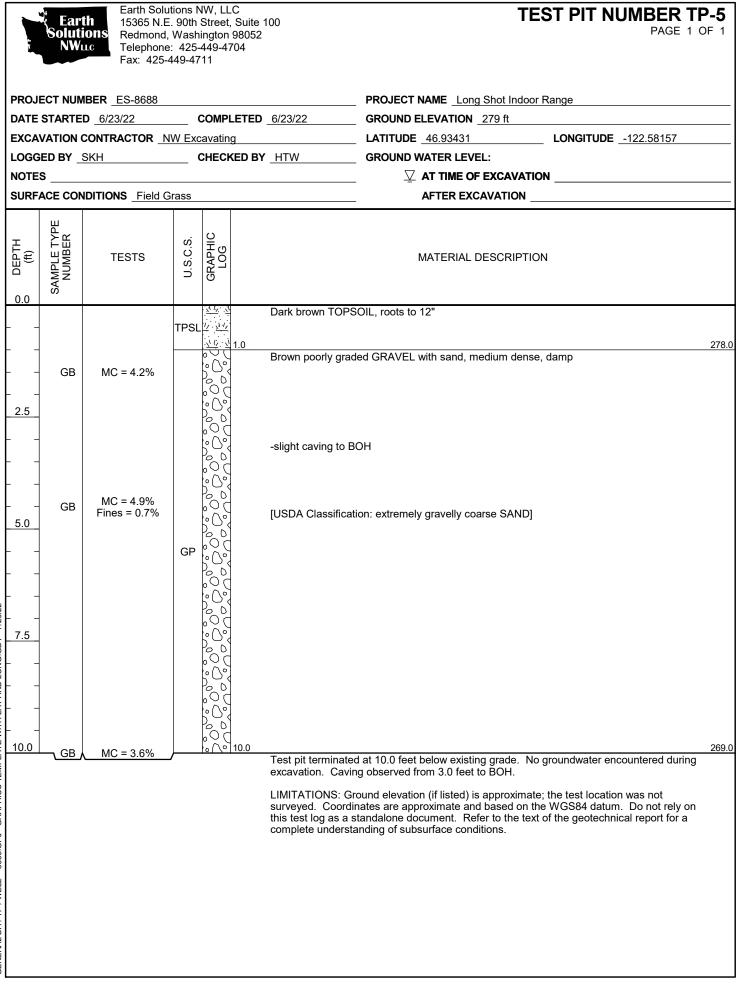


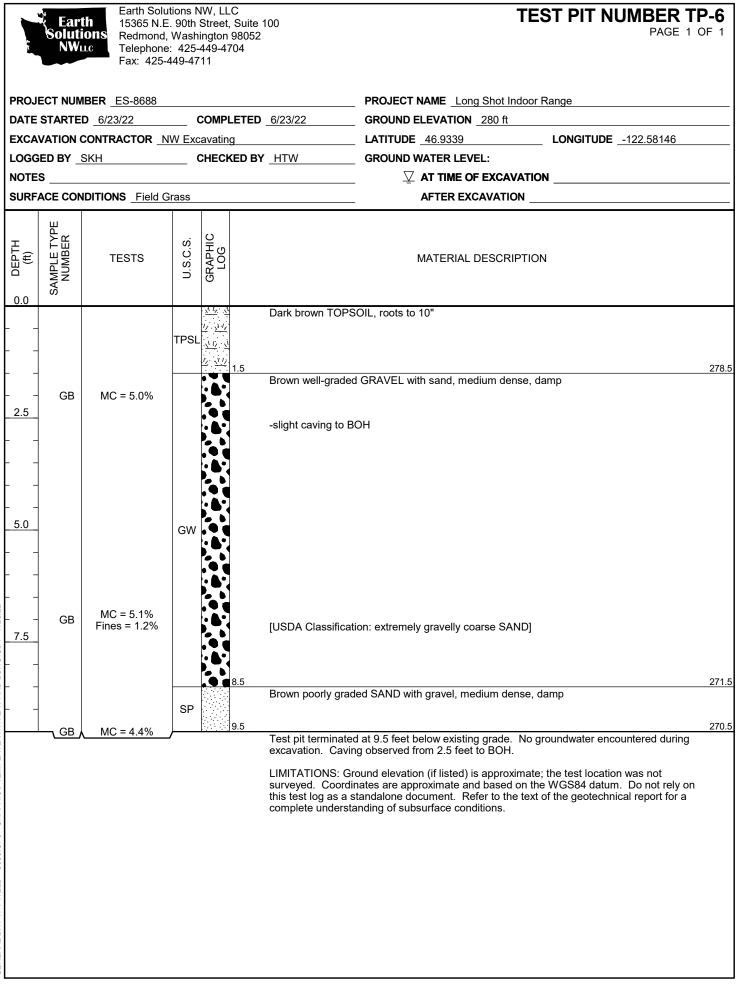
GENERAL BH / TP / WELL - 8688.GPJ - GRAPHICS TEMPLATE WITH LAT AND LONG.GDT - 7/26/22



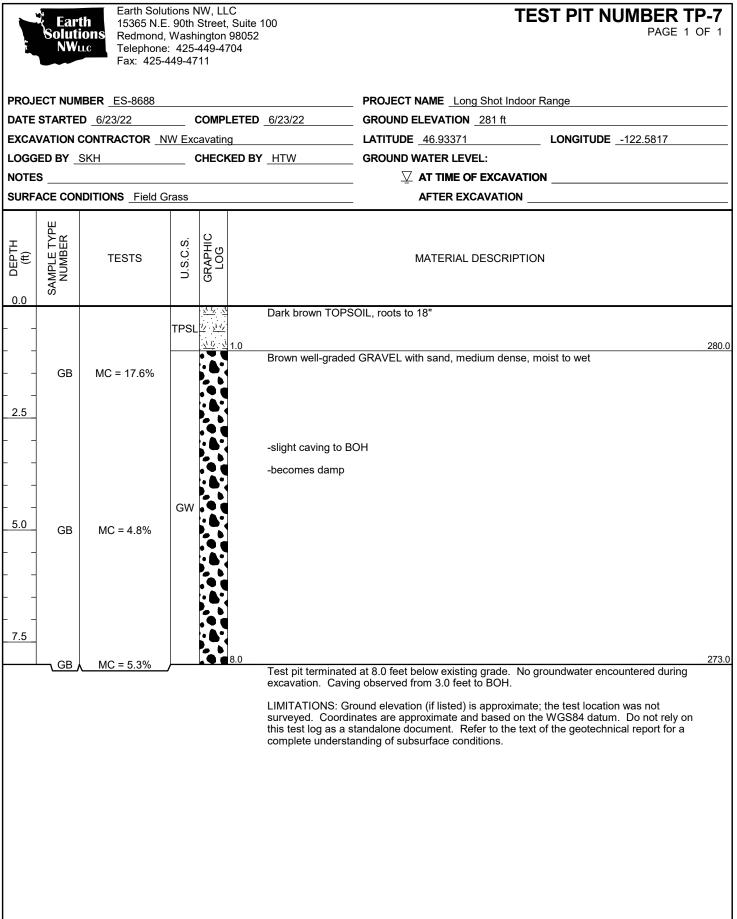








GENERAL BH / TP / WELL - 8688.GPJ - GRAPHICS TEMPLATE WITH LAT AND LONG.GDT - 7/26/22



Appendix B

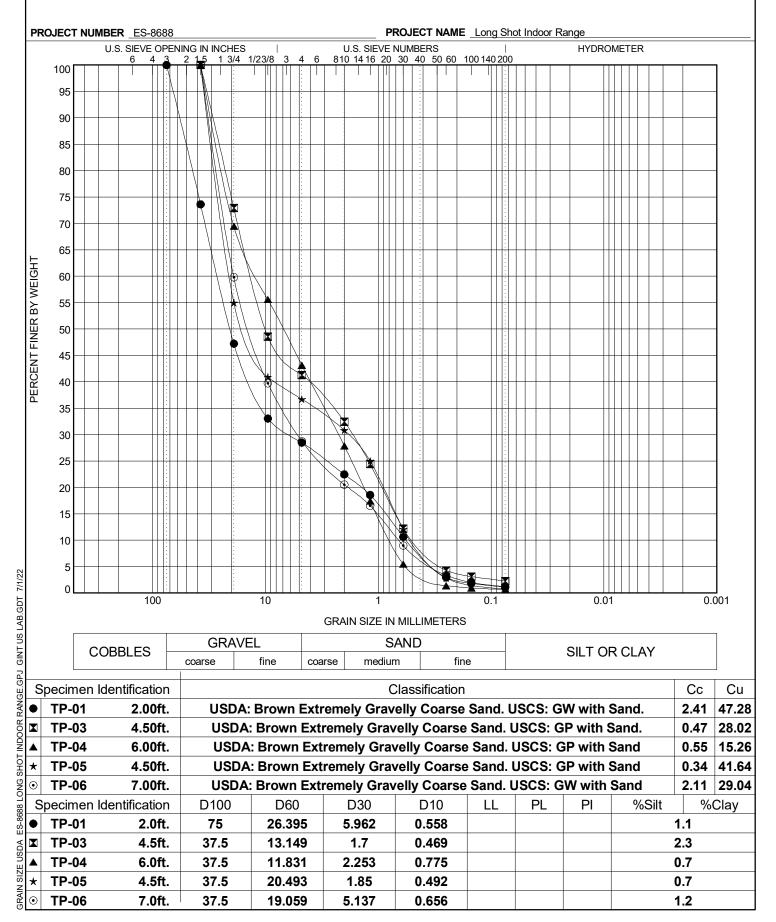
Laboratory Test Results

ES-8688



Earth Solutions NW, LLC 15365 N.E. 90th Street, Suite 100 Redmond, Washington 98052 Telephone: 425-449-4704 Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION



Report Distribution

ES-8688

EMAIL ONLY PACLAND 6814 Greenwood Avenue North Seattle, Washington 98103

Attention: Mr. Darian Murray

Long Shot Gun Range

16910 WA-507 SE Yelm, WA 98370 Parcel # 64303100800 and 64303100801

Stormwater Site Plan



Prepared By: Darian Murray Reviewed By: Bill Fortunato, P.E.

Prepared: August 2022

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EXECUTIVE SUMMARY

The proposed development is located at 16910 WA-507 SE in Yelm, Washington. The site is bordered by WA-507 SE to the south, by a residential parcel to the north, by Grove Rd to the west, and by an undeveloped parcel to the east.

This project will involve grading and clearing the existing undeveloped portion of the site. Site surface conditions are comprised of overgrown grasses, trees, and a few patches of concrete/gravel pads. The construction of an approximately 36,860 square foot facility will be for a small retail space and 22 firing lanes, as well as associated parking lot, drive aisles, sidewalks, landscaping, utilities, and stormwater management facilities. The complete development of the site will be in two phases, the second phase would include parking lot expansion in addition to two building expansion areas.

The property is zoned C-3 Large Lot Commercial, and the site lies within the Nisqually River Water shed. The City of Yelm is the governing agency for the project.

SECTION 1 – PROJECT OVERVIEW

<u>Location</u> 16910 WA-507 SE, Yelm, WA 98597

Section/Township/Range

SE 1/4, Section 29, Township 17 N, Range 02 E, W.M.

Parcel/Tax Lot(s) 260,973 = 6.06 acres

<u>City, County, State</u> Yelm, Thurston, Washington

Governing Agency

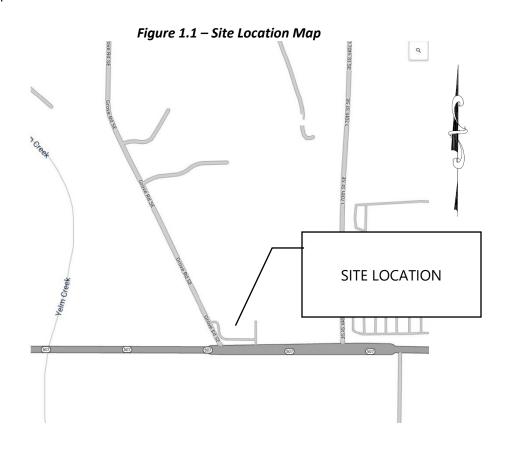
City of Yelm

<u>Design Criteria</u>

2019 Stormwater Management Manual for Western Washington

Drainage Basin

Nisqually River



<u>Soils</u>

A geotechnical report was prepared for the project by Earth Solutions NW, LLC., and is included as **Appendix F.** A Web Soil Survey from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has also been provided that generally characterizes the native on-site soils.

The geotechnical characterization of the on-site soils is summarized as follows in the Earth Solutions NW LLC report:

Topsoil

Topsoil was generally encountered in the upper 12 inches of existing grades at the test pit locations. Deeper or shallower pockets of topsoil may be locally encountered across the site. The topsoil was characterized by a dark brown color, minor root intrusions, and trace organic matter. Vegetation roots generally extended to depths of 10 to 24 inches.

Native Soil

Underlying topsoil, the native soil was classified primarily as medium dense well-graded and poorly graded gravel with sand (USCS: GW and GP, respectively). The moisture content at the time of exploration was characterized primarily as damp to moist. Native soil extended to the maximum exploration depth at each test pit location, which occurred between about 6.5 and 10 feet below the existing ground surface (bgs).

Per the Earth Solutions geotechnical report:

"In general, our field observations indicate on-site soils likely to be encountered during construction may be considered feasible for use as structural fill if the soil moisture content is at (or slightly above) the optimum level when compaction achievement is required. Successful use of on-site soils as structural fill will largely be dictated by the moisture content at the time of placement and compaction.

On-site soils that are dry of the optimum moisture content at the time of placement will require moisture conditioning (typically achieved by adding water) prior to compaction. Soils that are excessively over the optimum moisture content will require moisture conditioning (typically achieved through soil aeration) prior to compaction. It should be emphasized that soils should never be placed and compacted dry of the optimum moisture content."

"Groundwater seepage was not observed in the test pits excavated during the June 2022 subsurface exploration. Nevertheless, groundwater may be encountered depending on the time of year earthwork activities occur and depth of excavations. Groundwater flow rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months."

The Web Soil Survey identifies the entirety of the site as Spanaway gravelly sandy loam, 0 to 3 percent slopes. Per the summary of this soil type (provided in **Appendix F**), the capacity of the most limiting layer to transmit water is 20.0 inches per hour. Based on this information, infiltration is considered to be feasible for the project.

Existing Drainage Basins

The existing project area consists of a single drainage basin that currently flows northeast across the site. The developed portion of the basin flows via an underground system of pipes to a swale where the site runoff is infiltrated into the existing soils. The undeveloped portion of the site currently drains to the swale location onsite.

The upstream and downstream analysis of this basin will be described in detail in **Section 2**. An exhibit showing the existing conditions of the basin is provided in **Appendix B**.

Developed Drainage Basins

The developed site will be evaluated as a single drainage basin. Runoff from new, replaced, and existing impervious surfaces on the site will be collected and conveyed to a wet pond for treatment which will discharge into a proposed infiltration pond.

An exhibit showing the developed conditions is provided in **Appendix B**.

SECTION 2 – OFF-SITE ANALYSIS

<u>Upstream Analysis</u>

There are no upstream basins that contribute significant runoff to the project location. The area to be developed is bounded by on the south and west sides by city/state roadways and the bounded by an undeveloped site to the east, and a residential property to the north. Stormwater runoff within the public right-of-way is collected and managed separately from on-site runoff.

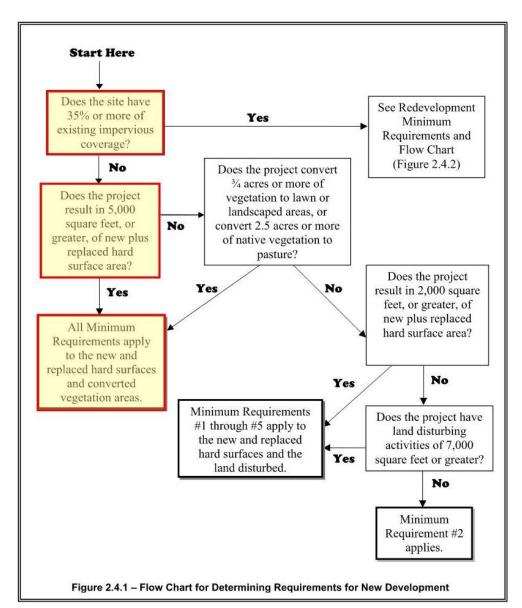
Downstream Analysis

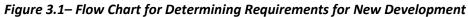
The property presently drains to the east side of the site, where runoff is collected in a storm drainage swale which then infiltrates into the soils.

In the mitigated condition, a network of curbs, gutters, catch basins, and underground pipes will collect surface water runoff throughout the site. The runoff will be treated onsite in a quality control BMP then routed to an infiltration pond onsite which will provide 100% infiltration and will be located along the northeast corner of the parcel. The stormwater management system has been sized to accommodate the existing and proposed impervious surfaces on-site. No downstream issues are anticipated.

SECTION 3 – CONDITIONS AND REQUIREMENTS

As stated above in the Executive Summary section of this report, the project will create greater than 5,000 square feet of new hard surfaces. Per the flow chart in Figure 3.1, all minimum requirements will apply to new and replaced hard surfaces.





Volume I – Minimum Technical Requirements – December 2014 2-5

The requirements have been met as follows:

Minimum Requirement #1: Preparation of Stormwater Site Plans

This project involves greater than 5,000 square feet of new impervious surface, thus, Minimum requirement #1 applies and a Stormwater Site Plan must be prepared for review by the local jurisdiction.

Response: This report has been prepared to address this requirement.

Minimum Requirement #2: Construction Stormwater Pollution Prevention

All erosion and sediment control measures shall be governed by the requirements of Department of Ecology's SWMMWW and the General Permit for Construction Stormwater. The thirteen elements as identified in the manual and provided below will be incorporated into the TESC plans:

Element 1:	Preserve Vegetation/Mark Clearing Limits
Element 2:	Establish Construction Access
Element 3:	Control Flow Rates
Element 4:	Install Sediment Controls
Element 5:	Stabilize Soils
Element 6:	Protect Slopes
Element 7:	Protect Drain Inlets
Element 8:	Stabilize Channels and Outlets
Element 9:	Control Pollutants
Element 10:	Control De-watering
Element 11:	Maintain BMPs
Element 12:	Manage the Project
Element 13:	Protect Low Impact Development BMPs
Element 11: Element 12:	Maintain BMPs Manage the Project

Response: Temporary Erosion and Sediment control plans have been prepared to address the elements identified. Since the project will result in greater than 1 acre of soil disturbance, a Stormwater Pollution Prevention Plan (SWPPP) will be required to obtain coverage under the NPDES Construction Stormwater General Permit prior to construction. See Section 6 of this report for a complete description of the construction and erosion control strategies being implemented.

Minimum Requirement #3: Source Control of Pollution

All known, available, and reasonable source control BMPs must be applied to all projects. Source control BMPs must be selected, designed, and maintained according to the SWMMWW.

Response: Source control BMPs will be implemented according to the standards outlined in Volume IV of the SWMMWW.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties. All outfalls require energy dissipation.

Response: Runoff from the area to be developed currently sheet flows to the east side of the property, where it flows into the existing ditch/swale. All runoff from proposed developed site will be treated, detained, and discharged into a proposed wet pond and infiltration pond that are proposed to go in the same location of the current discharge.

Minimum Requirement #5: On-site Stormwater Management

Projects shall employ On-site Stormwater Management BMPs in accordance with the following projects thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts.

Response: Because the project will include greater than 5,000 square feet of new impervious surfaces, on-site stormwater BMPs will be evaluated per the requirements of the SWMMWW. The review of on-site stormwater BMPs is addressed in Section 4 of this report.

The project is responsible for evaluating Best Management Practices per the SMMWW flow chart for determining MR #5 provided in Figure 3.2.

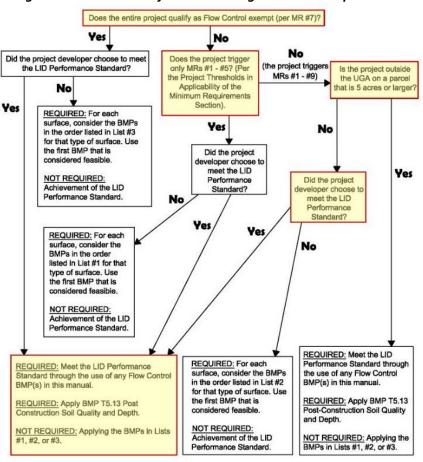


Figure 3.2 – Flow Chart for Determining LID MR #5 Requirements

Minimum Requirement #6: Runoff Treatment

Projects in which the total of effective, pollution-generating impervious surface (PGIS) is 5,000 SF or more in a threshold discharge area of the project require construction of stormwater treatment facilities. Projects in which the total of pollution-generating pervious surfaces (PGPS) is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site also require treatment facilities. 91% of the runoff volume of an approved continuous runoff model will be required to be treated for water quality. The project use is considered to be commercial, thus treatment facilities are required to provide Enhanced Treatment.

Response: The project includes greater than 5,000 square feet of new pollutant-generating impervious surfaces, and as such is responsible for providing water quality treatment. Because the project is a commercial development, Enhanced Treatment is required. Treatment will be provided upstream of the proposed infiltration pond via wet pond. Roof areas are considered as non-pollutant-generating and will be routed to a gravel trench system designed to fully infiltrate flows from the roof surfaces.

Minimum Requirement #7: Flow Control

Projects must provide flow control to reduce the impacts of stormwater runoff from hard surfaces and land cover conversions. The requirement below applies to projects that discharge stormwater directly, or indirectly through a conveyance system, into a fresh waterbody. Stormwater discharges shall match 50% of the pre-developed 2-year peak flow up to the full 50-year peak flow. The pre-developed condition should match a forested land cover. Proper Flow Control BMPs shall be selected and designed according to the current SWMMWW.

Response: The proposed project will utilize an infiltration pond to infiltrate 100% of stormwater runoff from the required design storms into the onsite soils after treatment. Drainage calculations have been provided in **Appendix D**.

Minimum Requirement #8: Wetlands Protection

The thresholds identified in Minimum Requirement #6 and Minimum Requirement #7 shall also be applied for any discharge to wetlands.

Response: Per the City of Yelm GIS Wetlands Indicators Map, provided in **Appendix A**, no delineated wetlands exist in the vicinity of the project site.

Minimum Requirement #9: Operation and Maintenance

An operation and maintenance manual that is consistent with the provisions in the SWMMWW shall be provided for proposed stormwater facilities and BMPs, and the parties responsible for maintenance and operation shall be identified.

Response: The Operations and Maintenance of the storm water management system is detailed in the Operations and Maintenance section of this report.

SECTION 4 – ON-SITE STORMWATER MANAGEMENT, FLOW CONTROL, AND WATER QUALITY

Existing Site Hydrology

The existing project area consists of a single basin. The project area is primarily undeveloped with an existing developed portion which will remain. Table 4.1 provides a summary of the conditions of the existing basin. For the purposes of hydrologic modeling, the predeveloped condition shall be modeled as forested where appropriate per SWMMWW requirements.

Land Cover Description	Basin A
Pavement	0.57
Roof	0.19
Sidewalk	0.04
Landscaped	4.04
Total Project Area	4.84

Table 4.1 – Pre-Developed Conditions

Developed Site Hydrology

The developed conditions are shown below in Table 4.2, which were utilized in drainage calculations. An exhibit depicting the proposed developed conditions is provided in **Appendix B.** Surfaces to remain undisturbed during construction have been included in hydrologic modeling. Proposed roofs have been omitted as they will be treated and routed separately from the rest of the PGIS.

Land Cover Description	Basin A	
Pavement	1.26	
Roof	1.43	
Sidewalk	0.13	
Landscape	2.02	
Total Project Area	4.84	

Table 4.2 – Developed Conditions

Flow Control

Developed peak runoff rates were determined using the WWHM2012 modeling software, and are provided below in Table 4.3. These flow rates address the design flows infiltrating on-site after treatment and do not provide any discharge. Hydrologic modeling results can be found in **Appendix D**.

Table	4.3	Peak	Runoff	Rates
-------	-----	------	--------	-------

Basin A			
Event	Pre-Developed Peak Flow Rate (cfs)	Mitigated Peak Flow Rate (cfs)	
2-year	0.43274	0.0000	
5-year	0.64455	0.0000	
10-year	0.81485	0.0000	
25-year	1.06801	0.0000	
50-year	1.28573	0.0000	
100-year	1.53347	0.0000	

The proposed stormwater system consists of an infiltration pond. Per the WWHM flow control calculations in Appendix D, a pond area of 1,722 sqft is adequate to provide flow control for the site. The top of the proposed infiltration pond utilizes dimensions of 101.5' L (avg) x 47' W x 4' H. The area of the proposed pond (1,738 SF) exceeds the WWHM design (1,722 SF) and is thus adequate.

Water Quality

Per the SMMWW, the water quality facilities shall be sized to treat the 91st percentile of the 24-hour runoff model since the treatment structure is located upstream of the flow control facilities. For pollutant-generating areas, water quality shall be provided by a wet pond. The required water quality design volume is provided in the water quality section of **Appendix D**. Water quality design volume required for the basin is 0.3615 Ac-ft or 15,747 cuft.

	Water Quanty Design Volume	
Volume Quantities		
Required Volume	15,747 cuft	
Provided Volume	15,836 cuft	

Table 4.4 – Water Quality Design Volume

The designed wet pond is proposed to provide water quality treatment for the site. The pond is a 2-cell pond and must have a first cell which is 25%-35% of the total required volume of the system. That is fulfilled at a provided volume of 4,062. The provided volume of the total system of 15,836 cuft exceeds the calculated required volume of or 15,747 cuft thus the design is sufficient per the Department of Ecology.

SECTION 5 – CONVEYANCE ANALYSIS

Storm drainage pipes have been evaluated to confirm that they are able to convey the anticipated peak flow rate generated by the 25-year, 24-hour design storm event.

Design flows were generated utilizing the peak 25-year flow generated by the new and replaced surfaces, as calculated by a continuous runoff modeling program. The 25-year peak flow is 1.23 cubic feet per second (see **Appendix D** for results).

Per Figure 5.1 below, a 12" pipe sloped at 0.5% is adequate to convey the developed 25-year peak flow.

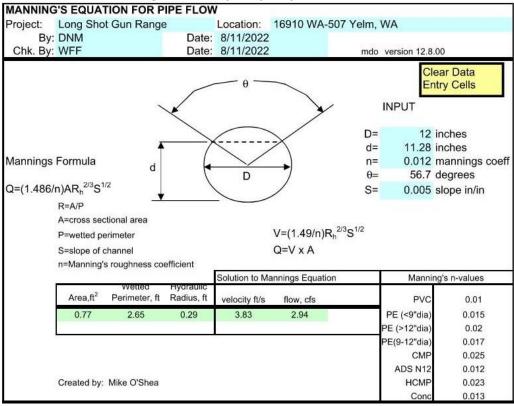


Figure 5.1 – Pipe Capacity Calculations

SECTION 6 – CSWPPP ANALYSIS AND DESIGN

All erosion and sediment control measures shall be governed by the requirements Department of Ecology's SWMMWW and the General Permit for Construction Storm Water (CSWGP). Since the project will cause greater than an acre of soil disturbance, a National Pollutant Discharge Elimination System (NPDES) Permit will be needed to obtain coverage under the Construction Stormwater General Permit.

A temporary erosion and sedimentation control plan has been prepared to assist the contractor in complying with these requirements. The Erosion and Sediment Control (ESC) plan is included along with the construction plans. Per Minimum Requirement #2, the following CSWPPP elements have been evaluated to determine both applicability and feasibility of each element.

Element 1: Preserve Vegetation/Mark Clearing Limits

Before beginning land disturbing activities, temporary fencing shall be installed around the perimeter of the project to clearly identify the project limits.

Element 2: Establish Construction Access

Entrance(s) shall be inspected regularly for track out – any sediment found shall be swept or shoveled from the pavement immediately.

Element 3: Control Flow Rates

A sediment trap is proposed to control flow rates during construction, as the portion of the site to be developed is less than 3 acres in size. Sizing of the sediment trap (BMP C240) is based on the 2-year predeveloped peak flow rate of 1.02 cubic feet per second, which is shown in the water quality (uninfluenced) analysis included in **Appendix D**.

Per the sizing methodology included in SMMWW, the required surface area of the sediment trap is equal to the 2-year developed peak flow rate multiplied by 2080. This results in a required surface area of 2,101 SF ($1.01 \times 2,080 = 2100.8$).

When stormwater infrastructure has been installed, construction stormwater may be directed to the wet pond and then the infiltration basin to provide flow control upon removal of the sediment trap. The upstream water quality unit should not be brought online until the site has been stabilized to prevent overburdening the unit with sediment during construction.

Element 4: Install Sediment Controls

Silt fence per BMP C233 shall be installed around the perimeter of the site where runoff has the potential to flow off-site. Inlet protection shall be installed in all existing catch basins that have the potential to receive runoff from the project site or construction activities. Inlet protection shall be installed per SWMMWW BMP C220.

Element 5: Stabilize Soils

Soils must not remain exposed and unworked for more than 7 days during the dry season (May 1 – September 30) or 2 days during the wet season (October 1 – April 30). Soils to remain unworked for longer than these specified periods shall be covered per BMP C123 Plastic Covering.

Element 6: Protect Slopes

No slopes exist within the project area that would warrant implementation of BMPs for this element.

Element 7: Protect Drain Inlets

Inlet protection shall be installed in all existing catch basins that have the potential to receive runoff from the project site or construction activities. Inlet protection shall be installed per SWMMWW BMP C220.

Element 8: Stabilize Channels and Outlets

There will be no discharge from the site. Pipe velocities are minimal, as pipe velocities will be less than 2 feet per second in the 100-year design event discharge. No additional outlet protection is proposed.

Element 9: Control Pollutants

No significant pollutants are anticipated during construction. The contractor shall implement concrete handling (BMP C151) and sawcutting and surfacing pollution prevention (BMP C152) as needed.

Element 10: Control Dewatering

Per the geotechnical report, groundwater was not present at the time of testing. Depending on seasonal groundwater fluctuations, dewatering may be required to facilitate construction of the stormwater system and connection to the existing sanitary sewer system.

Element 11: Maintain BMPs

All temporary and permanent erosion and sediment control BMPs shall be regularly inspected and repaired as needed to assure continued performance of their intended function in accordance with BMP specifications. All temporary BMPs shall be removed within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

Element 12: Manage the Project

The project shall be phased/sequenced in such a manner as to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, as identified in BMP C162 Scheduling. It is anticipated that sitework will be performed outside of the wet weather season.

Element 13: Protect Low Impact Development BMPs

No low impact development BMPs (e.g., permeable pavement, bioretention) are proposed. As such, no protection of LID BMPs is required during construction.

1. <u>Construction Sequence and Procedure</u>

The proposed development will include an erosion/sedimentation control plan designed to prevent sediment-laden run-off from leaving the site during construction. The erosion potential of the site is influenced by four major factors: soil characteristics, vegetative cover, topography, and climate. Erosion/sedimentation control is achieved by a combination of structural measures, cover measures, and construction practices that are tailored to fit the specific site.

The contractor will be responsible for implementing the following erosion control and storm water management control measures. The contractor may designate these tasks to certain subcontractors as they see fit, but the ultimate responsibility for implementing these controls and ensuring their proper functioning remains with the contractor. The order of activities will be as follows.

<u>Phase 1</u>

- 1. Prior to any construction work on the site, representatives from the City of Yelm must approve the storm water pollution prevention plan.
- 2. Mark clearing limits.
- 3. Install inlet protection to all existing catch basins.
- 4. Install perimeter fencing.
- 5. Begin clearing and grubbing operations. Clearing and grubbing done from October 1st through April 30th is authorized as long as there are erosion and sediment control measures.
- 6. Commence site grading.

<u>Phase 2</u>

- 1. Disturbed areas of the site where construction activity has ceased for more than 7 days between May 1 and September 30 or 2 days between October 1 and April 30 shall be temporarily seeded and watered.
- 2. Install storm drainage and curbs.
- 3. Prepare site for paving. Finalize pavement subgrade preparation.
- 4. Remove inlet protection around inlets and manholes no more than 48 hours prior to placing stabilized base course.
- 5. Install base material as required for pavement. Pave site. Do not pave over catch basins.
- 6. Complete final grading in non-parking areas and install permanent seeding and planting.
- 7. Remove fencing only after all paving is complete and exposed surfaces are stabilized.

2. <u>Temporary Soil Stabilization</u>

Temporary stabilization practices for this project include:

• Temporary seeding and planting of all unpaved areas using the hydro-mulching grass seeding technique (as needed).

Structural practices for this project include the following. Refer to the Erosion Control plans for specific locations and details:

• Inlet protection using fiber fabric.

Daily inspection of the erosion control measures will be required during construction. Any sediment buildup shall be removed and disposed offsite at an appropriate disposal facility.

Vehicle tracking of mud off-site shall be avoided. In the event that mud is tracked off site, it shall be swept and disposed of offsite on a daily basis.

Because vegetative cover is the most important form of erosion control, construction practices must adhere to stringent cover requirements. More specifically, the contractor will not be allowed to leave soils open for more than 7 days between May 1st and September 30th and 2 days between October 1st and April 30th. Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast. Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, and soil application of polyacrylamide.

3. <u>Permanent Erosion Control and Site Restoration</u>

Upon completion of the project, areas of the site that are not stabilized with paving, rooftops, or landscaping as shown on the site plans will be protected with either grass, ground cover/plantings or existing vegetation.

4. Inspection Sequence

The construction site operator will periodically inspect the site to evaluate how ESC measures are functioning and shall install or repair BMPs as needed based on site conditions to ensure erosion and sediment are controlled. Because the project does not disturb more than one acre, a certified erosion and sediment control lead will not be required.

5. <u>Control of Pollutants Other than Sediments</u>

Pollutants shall be controlled on the work site through the utilization of a centralized area for equipment. No significant pollutants are anticipated.

SECTION 7 – SPECIAL REPORTS AND STUDIES

The following Special Reports and Studies were used or have been completed for this project:

- FEMA FIRM Panel 362 of 625 Map number 53067C0362E dated October 16, 2012
- *Geotechnical Engineering Study,* provided by Earth Solutions NW, LLC, dated July 22, 2022

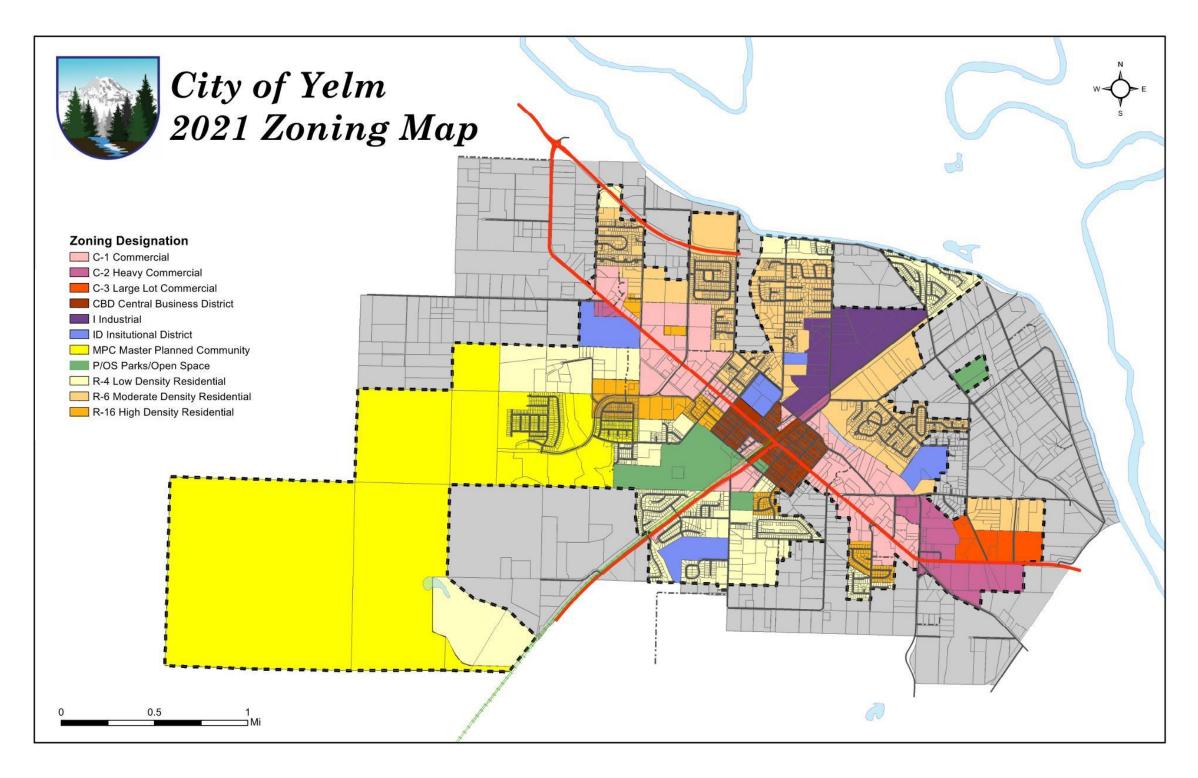
SECTION 8 – OTHER PERMITS

The following governmental approvals or permits will likely be required for this project:

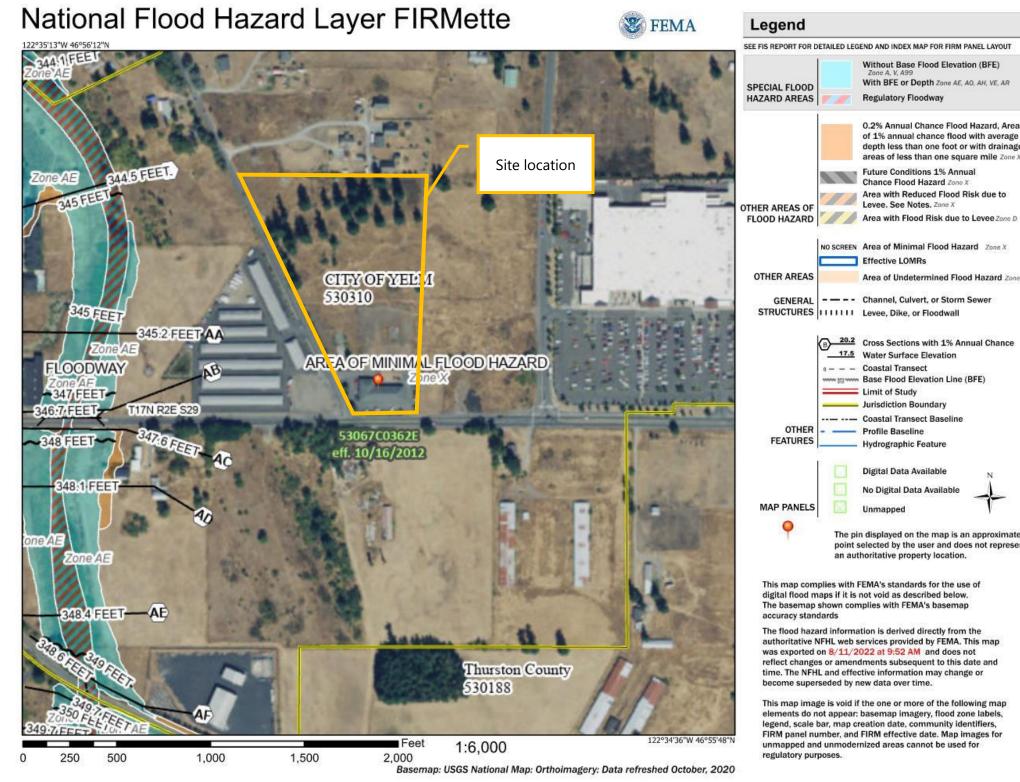
- City of Yelm Building Permit
- City of Yelm Civil Plan Review
- Department of Ecology General Permit Coverage (NOI)

APPENDIX A – FIGURES

City of Yelm Zoning Map



FEMA Flood Insurance Rate Map



Per the Flood Insurance Rate map, the project is located in Zone X, and is identified as being an area of minimal Flood Hazard.

Without Base Flood Elevation (BFE)

With BFE or Depth Zone AE, AO, AH, VE, AR

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X

Future Conditions 1% Annual

Area with Reduced Flood Risk due to

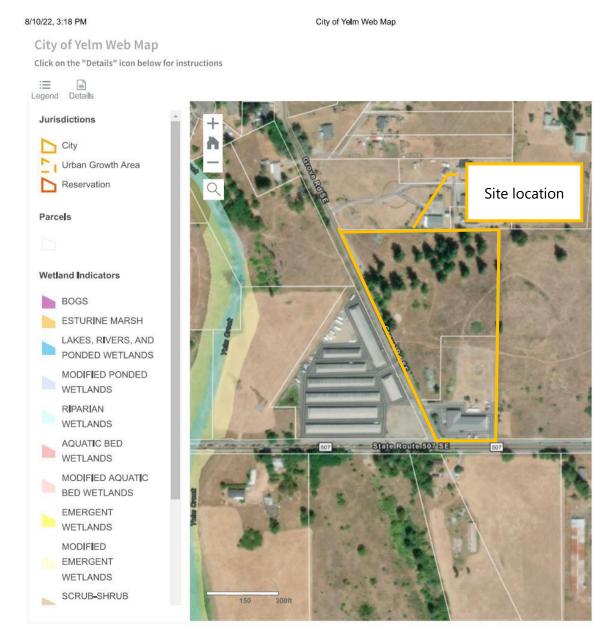
NO SCREEN Area of Minimal Flood Hazard Zone X

Area of Undetermined Flood Hazard Zone D

B 20.2 Cross Sections with 1% Annual Chance

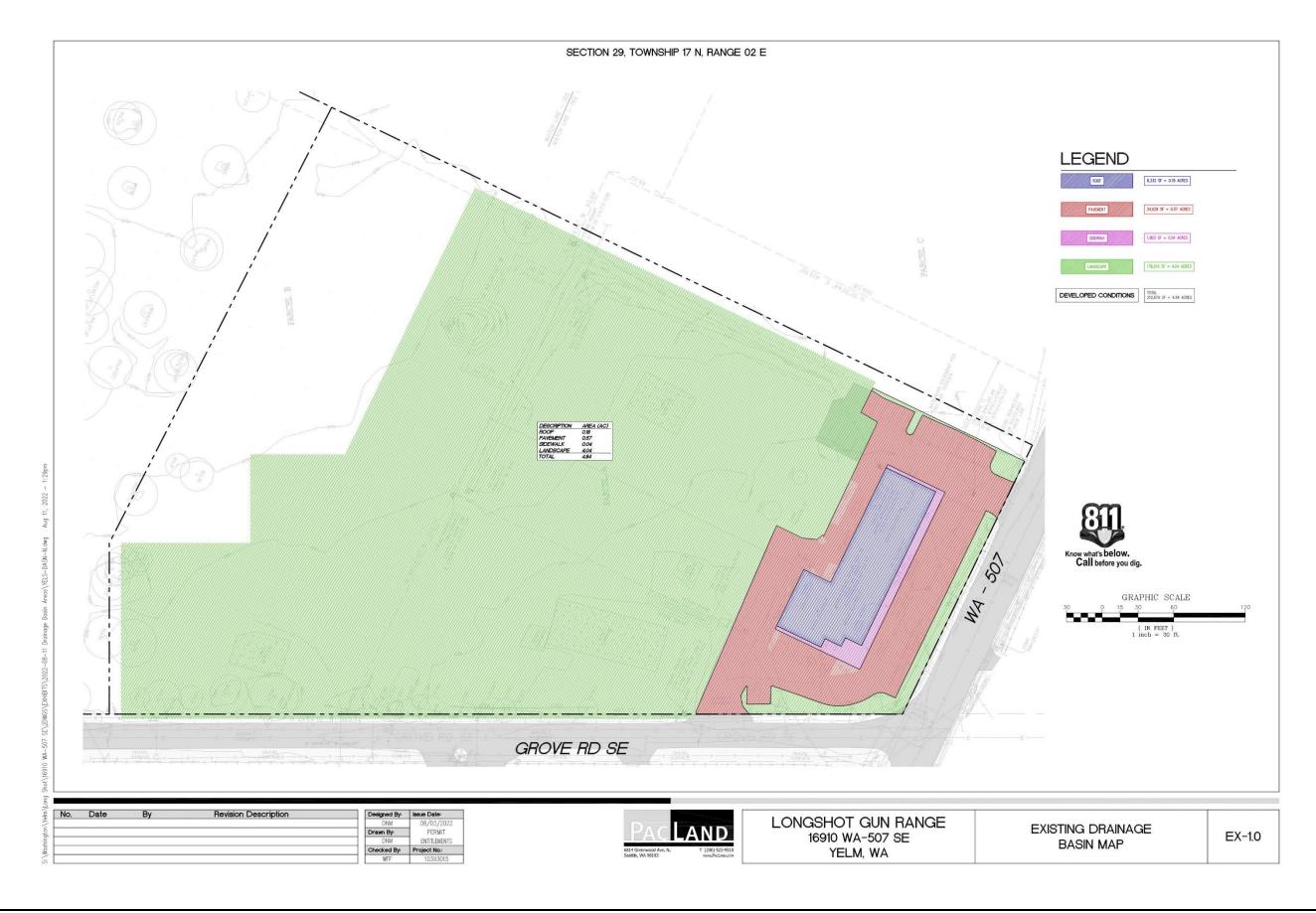
The pin displayed on the map is an approximate point selected by the user and does not represent

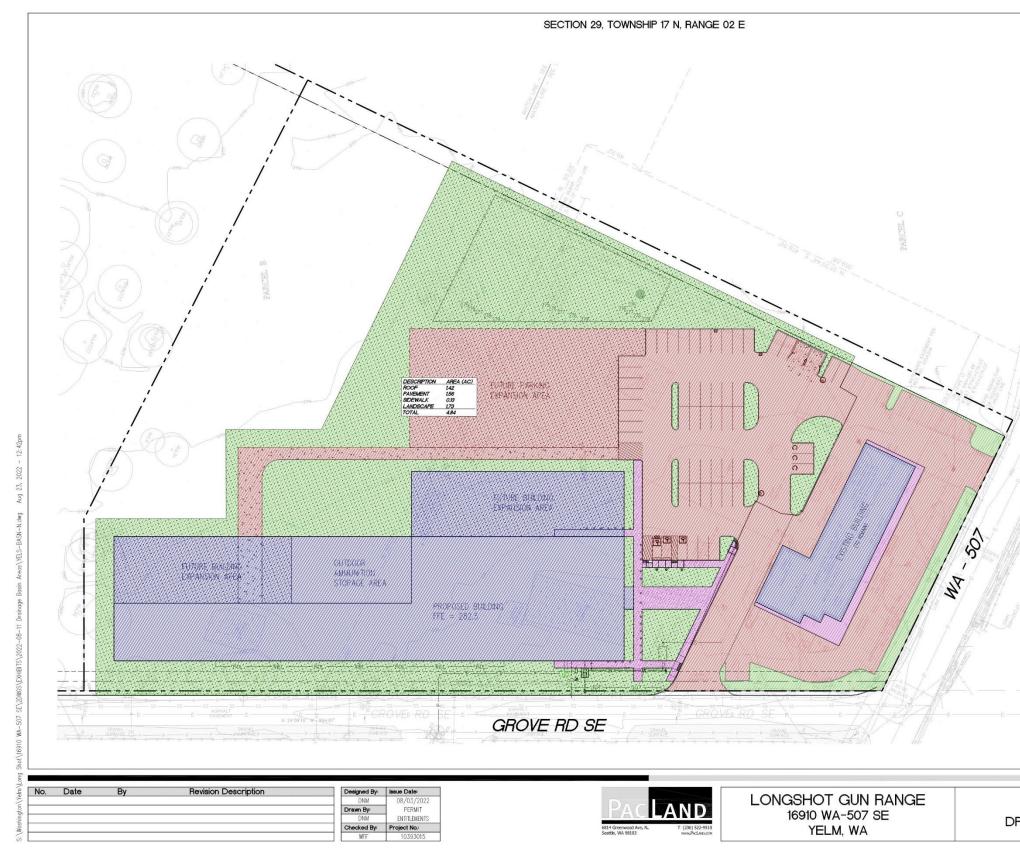
City of Yelm Wetland Indicators Map

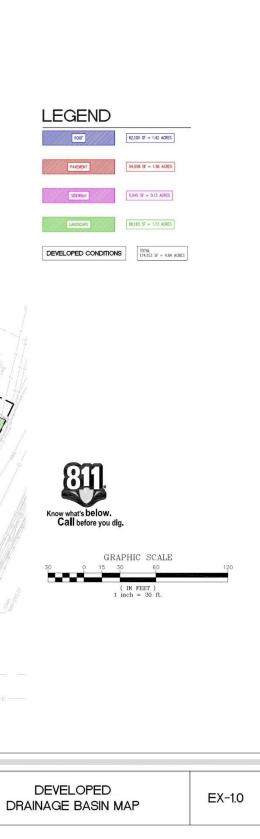


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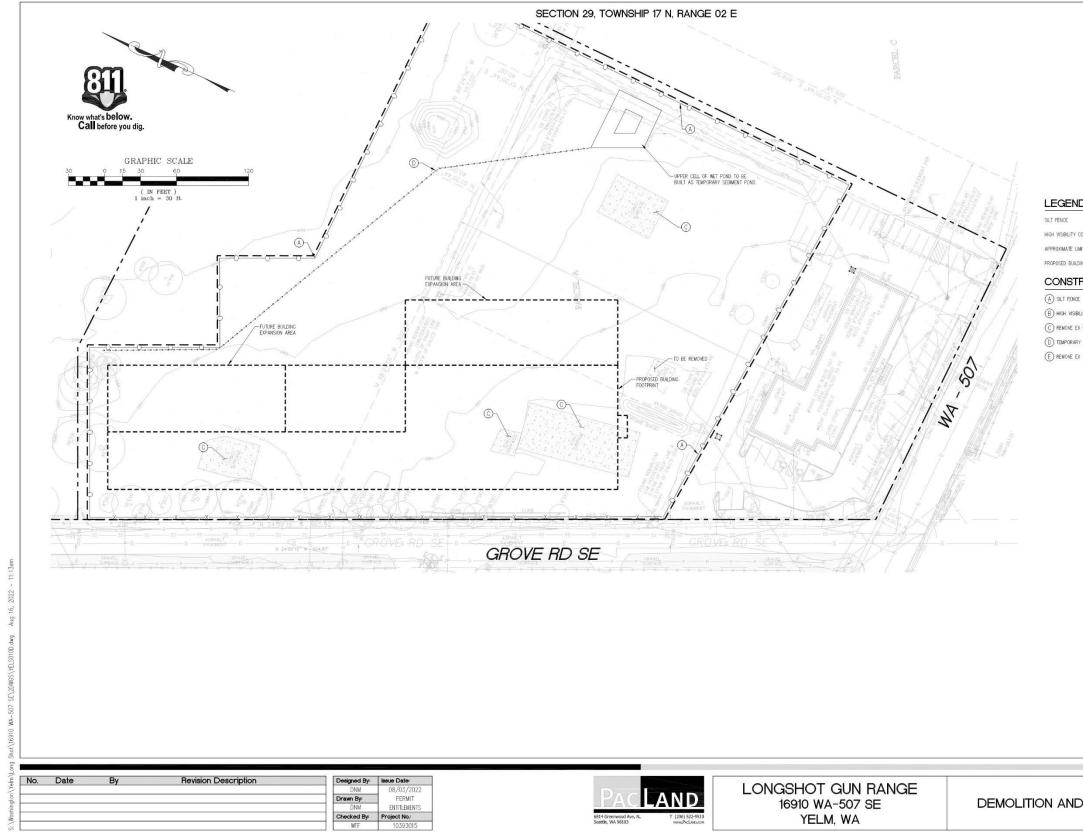
APPENDIX B – EXHIBITS



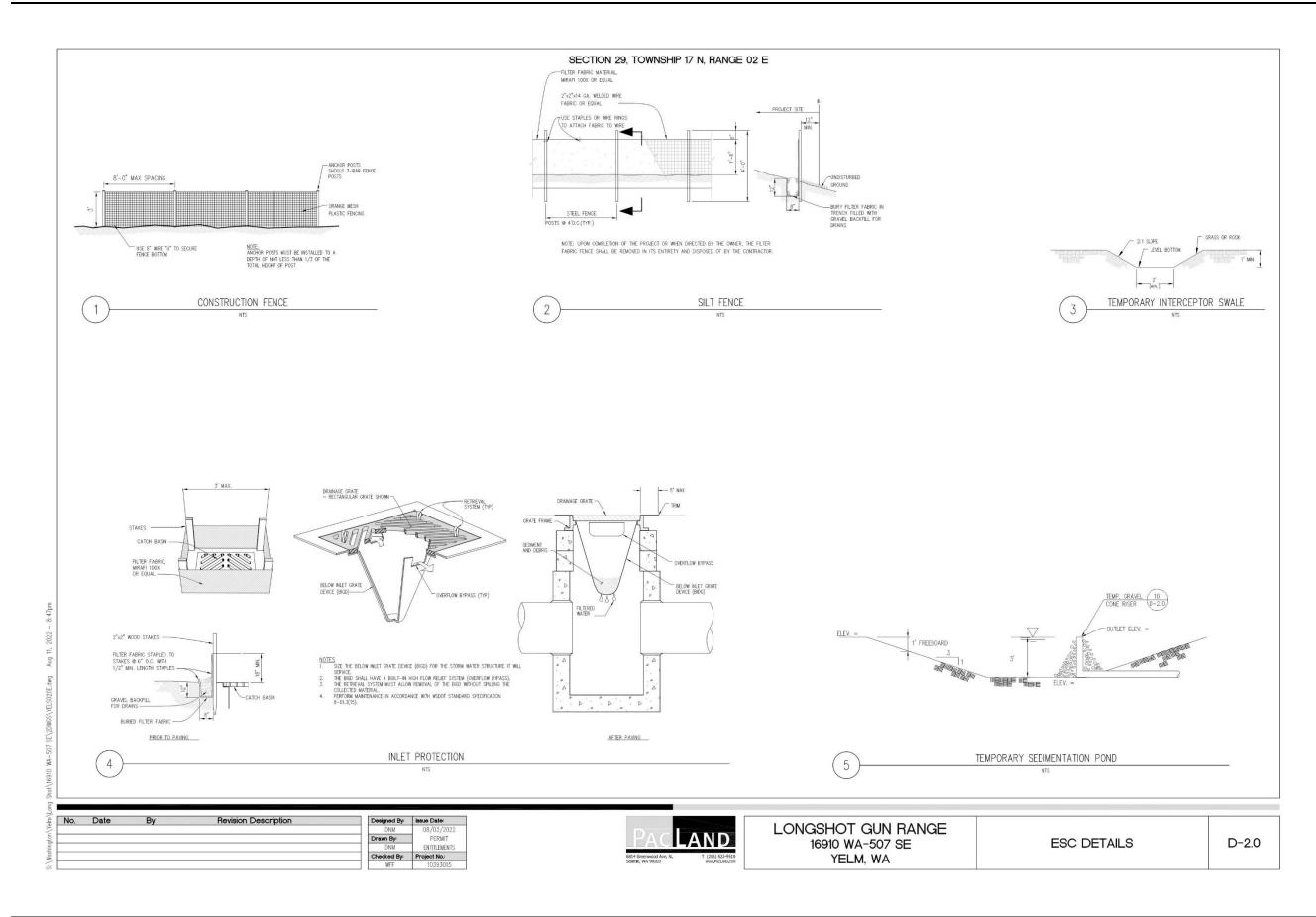


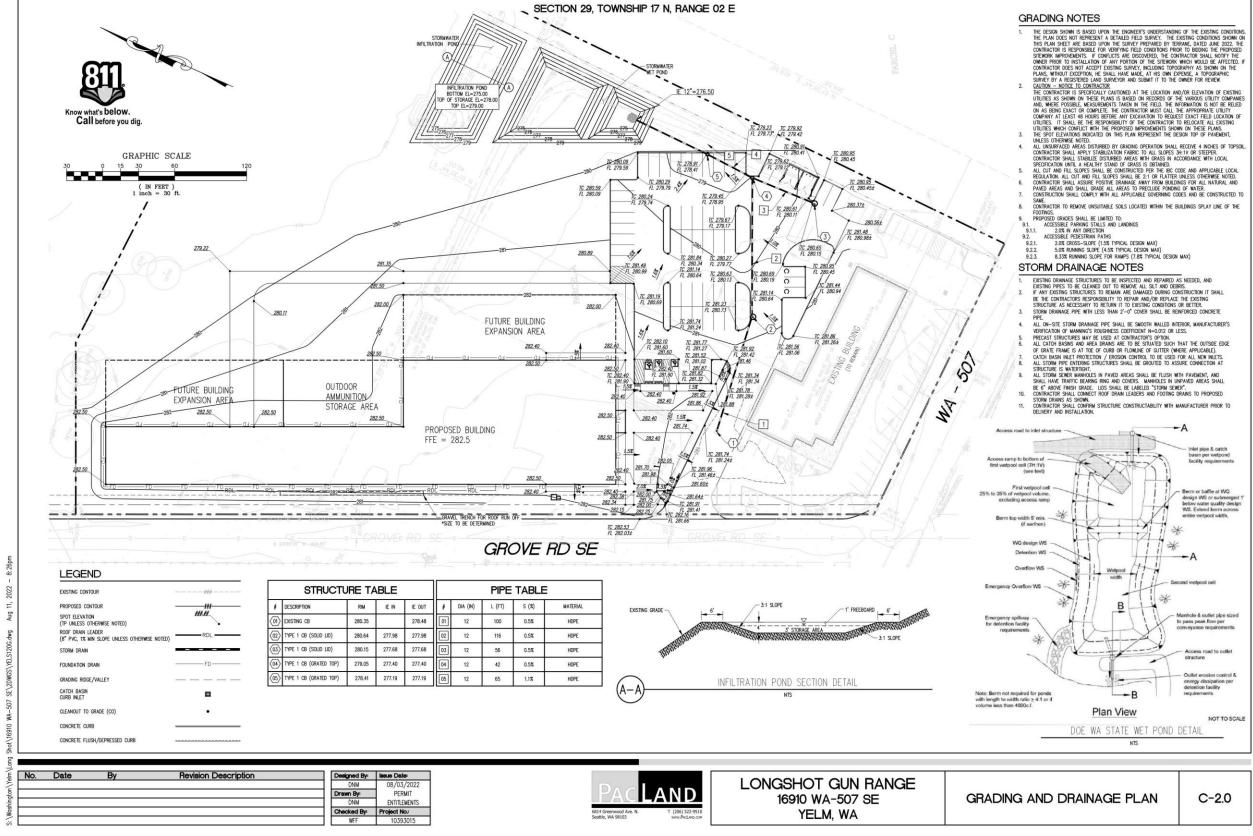


APPENDIX C – PLANS

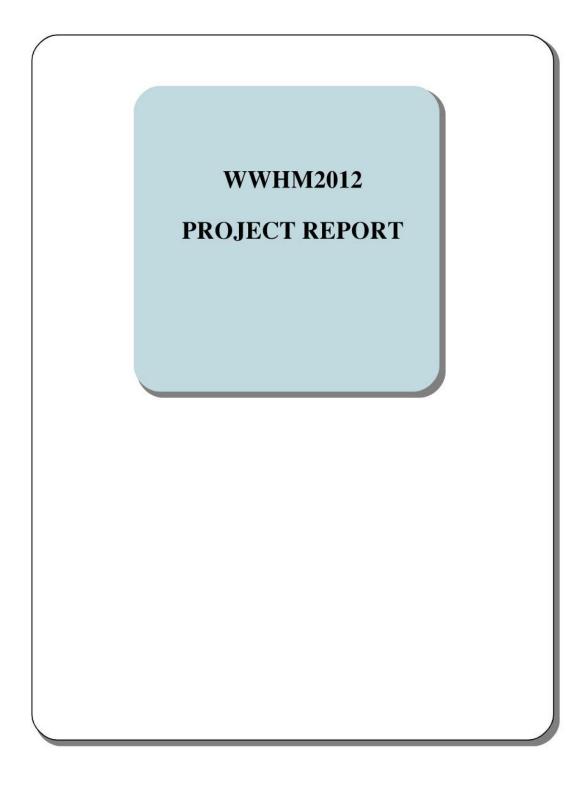


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JTY CONSTRUCTION FENCE CONCRETE SURFACE	
INTERCEPTOR SWALE TREE	
ESC PLAN	D-1.0





APPENDIX D – CALCULATIONS



General Model Information

Project Name:	Longshot Gun Range - Flow Control
Site Name:	LONGSHOT YELM
Site Address:	16910 WA-507
City:	YELM
Report Date:	8/16/2022
Gage:	Lake Lawrence
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year	
High Flow Threshold for POC1:	50 Year	
Low Flow Threshold for POC2:	50 Percent of the 2 Year	
High Flow Threshold for POC2:	50 Year	

Longshot Gun Range - Flow Control

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Page 2

Landuse Basin Data Predeveloped Land Use

A1 - AREA BEING DEVELOPED (PRE) Bypass: No

bypass.	INO	
GroundWater:	No	
Pervious Land Use C, Forest, Flat	acre 2.7	
Pervious Total	2.7	
Impervious Land Use	acre	
Impervious Total	0	
Basin Total	2.7	
Element Flows To: Surface	Interflow	Groundwater
	OB	

Longshot Gun Range - Flow Control

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Page 3

A2-EXISTING RUN ON (PRE) Bypass: No

Bypass:	NO
GroundWater:	No
Pervious Land Use C, Lawn, Flat	acre 0.11
Pervious Total	0.11
Impervious Land Use ROOF TOPS FLAT DRIVEWAYS FLAT SIDEWALKS FLAT	acre 0.19 0.57 0.04
Impervious Total	0.8
Basin Total	0.91



Longshot Gun Range - Flow Control

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Page 4

Basin 3 Bypass:	No
GroundWater:	No
Pervious Land Use C, Forest, Flat	acre 1.23
Pervious Total	1.23
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.23

Element Flows To: Surface Interflow

Groundwater

ORDANT

Longshot Gun Range - Flow Control

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Mitigated Land Use

A1 - AREA BEING Bypass:	DEVELOPED (POST) No
GroundWater:	No
Pervious Land Use C, Lawn, Flat	acre 1.51
Pervious Total	1.51
Impervious Land Use DRIVEWAYS FLAT SIDEWALKS FLAT	acre 1.08 0.09
Impervious Total	1.17
Basin Total	2.68
Element Flows To: Surface Trapezoidal Pond 1	Interflow Trapezoidal Pond 1
	allow

Longshot Gun Range - Flow Control

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A2-EXISTING RUN ON(POST)

Bypass:	No
GroundWater:	No
Pervious Land Use C, Lawn, Flat	acre 0.11
Pervious Total	0.11
Impervious Land Use ROOF TOPS FLAT DRIVEWAYS FLAT SIDEWALKS FLAT	acre 0.19 0.57 0.04
Impervious Total	0.8
Basin Total	0.91
Element Flows To:	

Element Flows To: Surface Trapezoidal Pond 1	Interflow Trapezoidal Pond	Groundwater
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Longshot Gun Range - Flow Control

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Future Roof Area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use ROOF TOPS FLAT	acre 1.23
Impervious Total	1.23
Basin Total	1.23

Element Flows To: Surface Interflow

Groundwater



Longshot Gun Range - Flow Control

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Routing Elements Predeveloped Routing

DRAM

Longshot Gun Range - Flow Control

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Mitigated Routing

Trapezoidal F Bottom Length: Bottom Width: Depth: Volume at riser Infiltration On Infiltration rate: Infiltration safet	head:	41.50 ft. 41.50 ft. 3 ft. 0.1041 acre-feet. 20	
Wetted surface Total Volume In Total Volume T Percent Infiltrate Total Precip Ap Total Evap Fror Side slope 1:	area On filtrated (ac-fi hrough Riser hrough Facilit ed: plied to Facili n Facility:	(ac-ft.): ty (ac-ft.): ty: 3 To 1	505.766 0.005 505.77 100 0
Side slope 2: Side slope 3: Side slope 4: Discharge Struc Riser Height: Riser Diameter: Element Flows Outlet 1	cture	3 To 1 3 To 1 3 To 1 2 ft. 12 in. 2	>
Pond F	Hydraulic Tab	Str	
Stage(feet)	Area(ac.)) *) Discharge(cf
3.0000 3.0333 3.0667 3.1000 3.1333 3.1667	0.039 0.039 0.040 0.040 0.041 0.041	0.000 0.001 0.002 0.004 0.005 0.006	0.000 0.000 0.000 0.000 0.000 0.000 0.000
3.2000 3.2333 3.2667 3.3000 3.3333	0.041 0.042 0.042 0.042 0.043 0.043	0.008 0.009 0.011 0.012 0.013	0.000 0.000 0.000 0.000 0.000 0.000

Stage(fee	et)	Area(ac.)	Volume(ac-ft.)		
3.0000		0.039	0.000	0.000	0.000
3.0333		0.039	0.001	0.000	0.805
3.0667		0.040	0.002	0.000	0.812
3.1000		0.040	0.004	0.000	0.820
3.1333		0.041	0.005	0.000	0.828
3.1667		0.041	0.006	0.000	0.836
3.2000		0.041	0.008	0.000	0.844
3.2333		0.042	0.009	0.000	0.852
3.2667		0.042	0.011	0.000	0.860
3.3000		0.043	0.012	0.000	0.868
3.3333		0.043	0.013	0.000	0.876
3.3667		0.043	0.015	0.000	0.884
3.4000		0.044	0.016	0.000	0.892
3.4333		0.044	0.018	0.000	0.900
3.4667		0.045	0.019	0.000	0.908
3.5000		0.045	0.021	0.000	0.916
3.5333		0.045	0.022	0.000	0.925
3.5667		0.046	0.024	0.000	0.933
3.6000		0.046	0.025	0.000	0.941
3.6333		0.047	0.027	0.000	0.950
3.6667		0.047	0.029	0.000	0.958
3.7000		0.047	0.030	0.000	0.966
3.7333		0.048	0.032	0.000	0.975
3.7667		0.048	0.033	0.000	0.983
3.8000		0.049	0.035	0.000	0.992
3.8333		0.049	0.037	0.000	1.001

Longshot Gun Range - Flow Control

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Longshot Gun Range - Flow Control

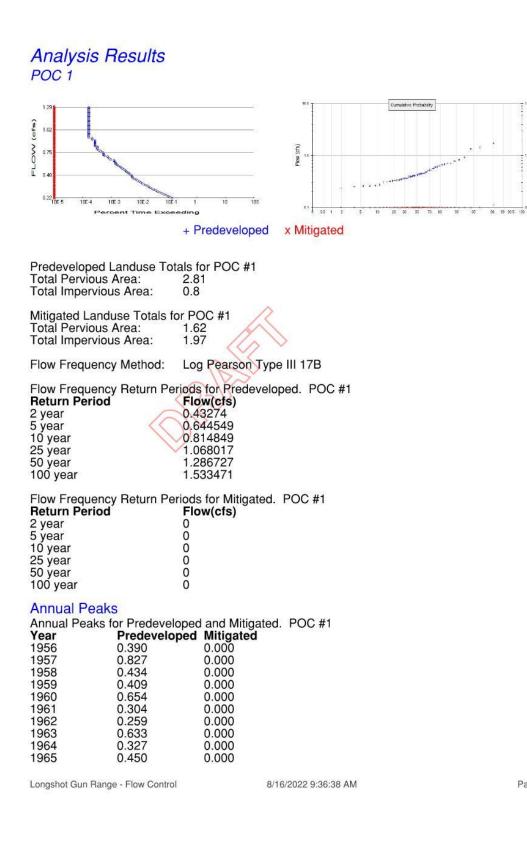
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5.8000	0.078	0.161	2.817	1.573
5.8333	0.078	0.164	2.875	1.584
5.8667	0.079	0.166	2.932	1.595
5.9000	0.079	0.169	2.988	1.606
5.9333	0.080	0.172	3.042	1.617
5.9667	0.080	0.174	3.096	1.628
6.0000	0.081	0.177	3.149	1.639
6.0333	0.081	0.180	3.201	1.650

OBAL

Longshot Gun Range - Flow Control

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1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006	0.323 0.403 0.274 0.258 0.331 0.361 0.475 0.348 0.924 0.440 0.413 0.446 0.398 0.479 0.318 0.594 0.366 0.602 0.406 0.360 0.559 0.454 0.234 0.263 1.444 0.263 1.444 0.707 0.422 0.230 0.388 0.524 0.508 0.366 0.363 0.336 0.336 0.336 0.336 0.336 0.336 0.336 0.336 0.336 0.336 0.336 0.336 0.324 0.250 1.336 1.728 0.709 0.524 0.783	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000 0.0000 0.0000	
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Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.7278	0.1116
2	1.4442	0.0000
3	1.3365	0.0000
4	0.9242	0.0000
1 2 3 4 5 6 7 8	0.8270	0.0000
6	0.7831	0.0000
7	0.7091	0.0000
8	0.7071	0.0000
9	0.6797	0.0000
10	0.6543	0.0000
11	0.6335	0.0000

Longshot Gun Range - Flow Control

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Longshot Gun Range - Flow Control

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Duration Flows The Facility PASSED

Flow(cfs) Predev Mit Percentage Pass/Fail 2565 0.2164 0 0 0.2272 2165 0 000 0.2380 1862 0 0.2488 1572 0.2596 1320 000000 0.2704 1114 0.2812 933 0.2921 790 0.3029 690 588 0.3137 0.3245 500 00000000 0.3353 436 0.3461 398 0.3569 356 0.3677 295 254 0.3785 0.3894 225 0.4002 197 0000000 0 0.4110 178 0 0.4218 155 0 0.4326 138 0 0.4434 118 0 0.4542 107 0 0 0.4650 101 0.4759 99 000 0 0.4867 94 0000 0.4975 84 77 70 0.5083 0 0.5191 00000 0.5299 62 000 0.5407 58 0.5515 51 0 Õ 0.5623 46 0.5732 42 000 000 39 0.5840 0.5948 33 000 0.6056 30 Õ 27 27 26 0.6164 000 Ō 0.6272 0 0.6380 24 23

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Water Quality

Water QualityWater Quality BMP Flow and Volume for POC #1On-line facility volume:0 acre-feetOn-line facility target flow:0 cfs.Adjusted for 15 min:0 cfs.Off-line facility target flow:0 cfs.Adjusted for 15 min:0 cfs.

ORAL

Longshot Gun Range - Flow Control

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LID Report

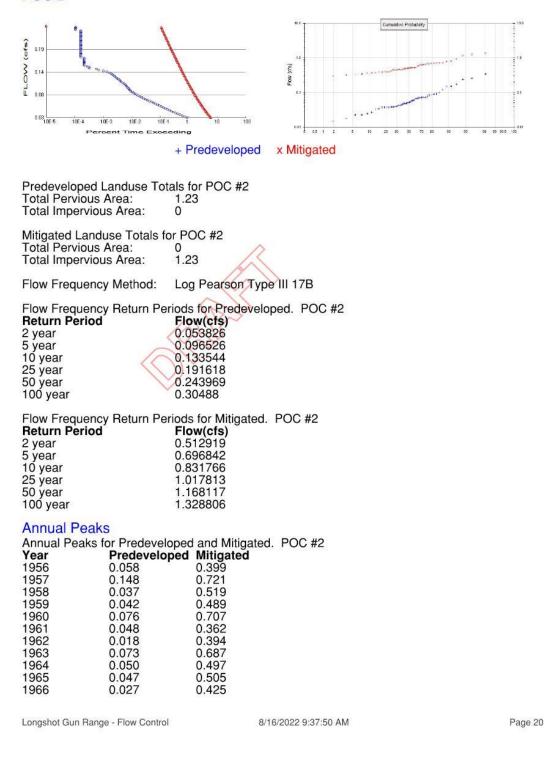
LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC		460.52				99.94			
Total Volume Infiltrated		460.52	0.00	0.00		99.94	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

OBAL

Longshot Gun Range - Flow Control

8/16/2022 9:37:07 AM

POC 2



1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008	0.054 0.040 0.024 0.045 0.058 0.084 0.071 0.038 0.060 0.014 0.052 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.072 0.043 0.022 0.091 0.066 0.034 0.037 0.022 0.038 0.068 0.089 0.068 0.089 0.063 0.083 0.083 0.037 0.039 0.014 0.070 0.033 0.039 0.014 0.070 0.033 0.039 0.014 0.070 0.033 0.039 0.014 0.070 0.033 0.044 0.070 0.055 0.022 0.038 0.068 0.089 0.068 0.037 0.039 0.014 0.070 0.033 0.037 0.039 0.014	0.481 0.317 0.333 0.395 0.370 0.461 0.384 0.776 0.524 0.448 0.646 0.523 0.687 0.389 0.630 0.524 0.921 0.494 0.463 0.643 0.458 0.268 0.340 1.242 0.638 0.504 0.300 0.448 0.682 0.597 0.529 0.792 0.447 0.516 0.464 0.524 0.370 1.173 1.369 0.718	\rightarrow
	d Annual Deales for		A:+:

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2 Rank Predeveloped Mitigated 1 03444 13690

1	0.3444	1.3690
2	0.2567	1.2418
2 3	0.2355	1.1726
4	0.1708	0.9206
5	0.1504	0.7917
6	0.1480	0.7755
7	0.1195	0.7213
8	0.0990	0.7180
9	0.0914	0.7119
10	0.0894	0.7067
11	0.0841	0.6871
12	0.0835	0.6866

Longshot Gun Range - Flow Control

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Longshot Gun Range - Flow Control

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Duration Flows

Longshot Gun Range - Flow Control

8/16/2022 9:38:16 AM

665444444444333333333333333333333333333	9779 9430 9119 8805 8475 8166 7882 7618 7324 7068 6808 6592 6358 6112 5901 5676 5477 5291 5088 4882 4717 4566 4408 4252 4128 3968 3830 3696 3591 3485 3368 3260 3150 3055 2948 2842 2736 2641 2563 2477 2401 2325	162983 157166 182380 220125 211875 204150 197050 190450 183100 176700 170200 164800 211933 203733 196700 189200 182566 176366 169600 162733 157233 157233 157200 146933 141733 157266 127666 127666 123200 119700 116166 112266 108666 105000 101833 98266 94733 91200 88033 85433 82566 80033 77500	두혜님 지원 문화가 아니는 한 문화가 아니 아니는 한 문화가 아니는 한 문화가 아니는 아니는 한 문화가 아니는 한 문 아니는 한 한 안에 아니는 한 안에 아니는 한 안에 아니는 한 한 문화가 아니는 한 문화가 아니는 한 문화가 아니는 한 문화가 아니는 한 한 안에 아니는 한 한 안에 아니는 한 안에 아니는 한 안에 아니는 한 한 안에 아니는 한 안에 아니는 한 한 안에 아니는 한 한 아니는 한 한 한 아니는 한 한 한 아니는 한 한 아니는 한 아이 아니는 한 아니는 한 아니는 한 아이에 아이들
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	4 4 4 4 4	6 9430 5 9119 4 8805 4 8475 4 8166 4 7882 4 7618 4 7324 4 7068	

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

year flow. The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Longshot Gun Range - Flow Control

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Water Quality

Water QualityWater Quality BMP Flow and Volume for POC #2On-line facility volume:0 acre-feetOn-line facility target flow:0 cfs.Adjusted for 15 min:0 cfs.Off-line facility target flow:0 cfs.Adjusted for 15 min:0 cfs.

DRAME

Longshot Gun Range - Flow Control

8/16/2022 9:38:16 AM

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

OBALL

Longshot Gun Range - Flow Control

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Model Default Modifications

Total of 0 changes have been made.

PERLND Changes No PERLND changes have been made.

IMPLND Changes No IMPLND changes have been made.

ORMAN

Longshot Gun Range - Flow Control

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Appendix Predeveloped Schematic

(PRE) 2.70ac		M23ac	3			
(PRE) 2.70ac	0.91ad					

Longshot Gun Range - Flow Control

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Mitigated Schematic

1 //	77		Area ST)	Roof			
SIZ	2 68ac	0.9120					
	Trapez Pond	oidal 1					

Longshot Gun Range - Flow Control

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RUN

Predeveloped UCI File

GLOBAL WWHM4 model simulation START 1955 10 01 END RUN INTERP OUTPUT LEVEL 3 0 END 2008 09 30 RESUME 0 RUN END GLOBAL 1 UNIT SYSTEM 1 FILES <File> <Un#> <-----File Name---->*** <-ID-> * * * Longshot Gun Range - Flow Control.wdm PreLongshot Gun Range - Flow Control.MES PreLongshot Gun Range - Flow Control.L61 PreLongshot Gun Range - Flow Control.L62 POCLongshot Gun Range - Flow Control1.dat POCLongshot Gun Range - Flow Control2.dat WDM 26 25 27 MESSU 28 30 31 END FILES OPN SEQUENCE INDELT 00:15 INGRP PERLND 10 PERLND 16 TMPLND 4 IMPLND 5 IMPLND 8 COPY 501 COPY 502 1 DISPLY DISPLY 2 END INGRP END OPN SEQUENCE DISPLY ISPLY-INFO1 # - #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND 1 A1 - AREA BEING DEVELOPED MAX 1 2 30 9 2 Basin 3 DISPLY-INF01 30 31 1 2 1 2 2 Basin 3 9 MAX END DISPLY-INFO1 END DISPLY COPY TIMESERIES # - # NPT NMN *** 1 501 1 502 7 1 1 1 END TIMESERIES END COPY GENER OPCODE # # OPCD *** END OPCODE PARM K *** # # END PARM END GENER PERLND GEN-INFO <PLS ><-----Name---->NBLKS Unit-systems Printer *** User t-series Engl Metr *** in out *** # - # in out * 1 1 27 0 1 10 C, Forest, Flat 16 C, Lawn, Flat END GEN-INFO 1 1 1 27 1 1 0 *** Section PWATER*** ACTIVITY Longshot Gun Range - Flow Control 8/16/2022 9:38:16 AM

ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *** 10 0 0 0 0 0 0 0 0 0 1 0 0 0 16 0 0 1 0 0 0 0 0 0 END ACTIVITY PRINT-INFO # - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***** 0 1 10 0 0 4 0 0 0 4 0 0 0 0 0 0 0 0 0 9 16 0 0 0 0 0 0 END PRINT-INFO PWAT-PARM1
 <PLS > PWATER variable monthly parameter value flags ***

 # - # CSNO RTOP UZFG VCS VUZ VNN VIFW VIRC VLE INFC HWT ***

 10
 0
 0
 0
 0
 0
 0

 16
 0
 0
 0
 0
 0
 0
 0
 0
 END PWAT-PARM1 PWAT-PARM2 <PLS > PWATE
- # ***FOREST PWATER input info: Part 2 *** LZSN INFILT LSUR SLSUR KVARY AGWRC 10 0 4.5 0.08 400 0.05 0.5 0.996 16 0 4.5 0.03 400 0.5 0.996 END PWAT-PARM2 PWAT-PARM3 PWATER input info: Part 3 <PLS > PWATE # - # ***PETMAX *** PETMIN INFEXP INFILD DEEPFR BASETP AGWETP 2 10 0 0 0 0 2 0 16 0 0 2 0 0 0 END PWAT-PARM3 PWAT-PARM4
 PWATER input info: Part 4

 CEFSC
 UZSN
 NSUR

 0.2
 0.5
 0.35

 0.1
 0.25
 0.25
 <PLS > # - # INTEW IRC LZETP *** 0.5 10 6 0.7 0.25 16 6 END PWAT-PARM4 VAT-STATE1 <PLS > *** Initial conditions at start of simulation ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 *** # - # *** CEPS SURS UZS IFWS LZS AGWS 0 0 0 0 2.5 1 0 0 0 0 0 2.5 1 PWAT-STATE1 GWVS 10 0 0 0 0 0 2.5 0 16 0 1 END PWAT-STATE1 END PERLND TMPLND GEN-INFO Unit-systems Printer *** <PLS ><---->Name----> User t-series Engl Metr *** # - # *** in out 27 4 ROOF TOPS/FLAT 1 0 1 1 5 DRIVEWAYS/FLAT 1 1 1 27 0 8 SIDEWALKS/FLAT 1 27 0 END GEN-INFO *** Section IWATER*** ACTIVITY # - # ATMP SNOW IWAT SLD IWG IQAL * * * 0 4 0 0 5 0 8 0 0 1 0 0 0 END ACTIVITY PRINT-INFO <ILS > ******** Print-flags ******** PIVL PYR Longshot Gun Range - Flow Control 8/16/2022 9:38:16 AM Page 31

ATMP SNOW IWAT SLD IWG IQAL ******* 4 0 0 4 0 0 0 1 9 9 5 0 0 4 0 0 0 1 8 0 0 4 0 0 0 1 9 END PRINT-INFO IWAT-PARM1 # CSNO RTOP VRS VNN RTLI *** 0 0 0 4 5 0 0 8 0 0 0 0 0 END IWAT-PARM1 IWAT-PARM2 IWATER input info: Part 2 *** <PLS > # - # *** LSUR SLSUR RETSC NSUR 400 0.01 0.1 0.1 4 0.1 5 400 0.01 0.1 8 400 0.01 0.1 0.1 END IWAT-PARM2 IWAT-PARM3 IWATER input info: Part 3 * * * <PLS > # - # ***PETMAX PETMIN 0 0 4 5 0 0 8 0 0 END IWAT-PARM3 IWAT-STATE1 %PLS > *** Initial conditions at start of simulation
- # *** RETS SURS SURS 0 4 0 5 0 8 0 0 END IWAT-STATE1 END IMPLND SCHEMATIC <-Target-> *** <-Source-> <--Area--> MBLK *** # <Name> <-factor-> <Name> # Tbl# A1 - AREA BEING DEVELOPED (PRE) *** PERLND 10 PERLND 10 2.7 COPY 501 12 2.7 COPY 501 13 A2-EXISTING RUN ON (PRE) *** PERLND 16 PERLND 16 0.11 COPY 501 12 0.11 COPY 501 13 IMPLND 4 0.19 COPY 501 15 IMPLND 5 0.57 COPY 501 15 8 IMPLND 0.04 COPY 501 15 Basin 3*** PERLND 10 PERLND 10 1.23 COPY 502 12 1.23 COPY 502 13 *****Routing***** END SCHEMATIĆ NETWORK <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***

<Ame> # <Name> # #<-factor->strg <Name> # # <Name> # # <Name> # # ***
COPY 501 OUTPUT MEAN 1 1 48.4 DISPLY 1 INPUT TIMSER 1
COPY 502 OUTPUT MEAN 1 1 48.4 DISPLY 2 INPUT TIMSER 1 <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> *** <Name> # <Name> # #<-factor->strg <Name> # # <Name> # # *** END NETWORK Longshot Gun Range - Flow Control 8/16/2022 9:38:16 AM Page 32

```
RCHRES
  GEN-INFO
    RCHRES Name Nexits Unit Systems Printer
# - #<----->Class Description Engl Metr LKFG
    RCHRES
                                                                                              ***
                                                                                              * * *
                                                   in out
  END GEN-INFO
   *** Section RCHRES***
  ACTIVITY
     # - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY
  PRINT-INFO
    END PRINT-INFO
  HYDR-PARM1
     RCHRES Flags for each HYDR Section
                                                                                              ***
              # - #
  END HYDR-PARM1
  HYDR-PARM2
              FTABNO LEN
  # - # FTABNO LEN
<----><---><---><-
                                          DELTH
                                                       STCOR
                                                                      KS
                                                                              DB50
                                                                                             ***
                                        ***
                                                                       -><---->
  END HYDR-PARM2
  END HYDR-FARFUL

HYDR-INIT

RCHRES Initial conditions for each HYDR section

# - # *** VOL Initial value of COLIND Initial value of OUTDGT

*** ac-ft for each possible exit for each possible exit

C---->C---> *** <--->C---> *** <--->C--->C--->
END RCHRES
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES
EXT SOURCES
EXT SOURCES

<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***

<Name> # <Name> # tem strg<-factor->strg <Name> # # <Name> # # 

WDM 2 PREC ENGL 0.857 PERLND 1 999 EXTNL PREC

WDM 2 PREC ENGL 0.857 IMPLND 1 999 EXTNL PREC

WDM 1 EVAP ENGL 0.76 PERLND 1 999 EXTNL PETINP

WDM 1 EVAP ENGL 0.76 IMPLND 1 999 EXTNL PETINP

WDM 1 EVAP ENGL 0.76 IMPLND 1 999 EXTNL PETINP
END EXT SOURCES
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
tem strg strg***
                                                                            ENGL REPL
                                                                            ENGL
                                                                                        REPL
END EXT TARGETS
MASS-LINK

    Volume>
    <-Grp> <-Member-><--Mult-->
    <Target>

    <Name>
    <Name> # #<-factor->
    <Name>

    MASS-LINK
    12

    PERLND
    PWATER SURO
    0.083333
    COPY

                                                                      <-Grp> <-Member->***
                                                                              <Name> # #***
                                0.083333
                                                                      INPUT MEAN
  END MASS-LINK 12
  MASS-LINK
                     13
PERLND PWATER IFWO 0.083333 COPY
                                                                      INPUT MEAN
  END MASS-LINK 13
Longshot Gun Range - Flow Control
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                                                                                                 Page 33
```

MASS-LINK 15 IMPLND IWATER SURO END MASS-LINK 15

0.083333 COPY

INPUT MEAN

END MASS-LINK

END RUN

OBALL

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Mitigated UCI File

RUN GLOBAL WWHM4 model simulation START 1955 10 01 RUN INTERP OUTPUT LEVEL 3 END 2008 09 30 0 0 RUN RESUME UNIT SYSTEM 1 1 END GLOBAL FILES <File> <Un#> <-----File Name----->*** <-ID-> * * * Longshot Gun Range - Flow Control.wdm MitLongshot Gun Range - Flow Control.MES MitLongshot Gun Range - Flow Control.L61 MitLongshot Gun Range - Flow Control.L62 POCLongshot Gun Range - Flow Control2.dat POCLongshot Gun Range - Flow Control1.dat WDM 26 25 27 MESSU 28 31 30 END FILES OPN SEQUENCE INDELT 00:15 INGRP PERLND 16 IMPLND 5 8 TMPLND IMPLND 4 RCHRES 1 COPY 502 COPY COPY 501 DISPLY 2 DISPLY 1 END INGRP END OPN SEQUENCE DISPLY DISPLY-INFO1 # - #<-------Title ->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND 2 Future Roof Area 1 Trapezoidal Pond MAX 22 31 9 1 Trapezoidal Pond 1 MAX 1 30 9 END DISPLY-INFO1 END DISPLY COPY TIMESERIES # - # NPT NMN *** 1 1 1 1 502 1 1 501 1 END TIMESERIES END COPY GENER OPCODE # # OPCD *** END OPCODE PARM # K *** # END PARM END GENER PERLND GEN-INFO <PLS ><----Name---->NBLKS Unit-systems Printer *** User t-series Engl Metr *** in out *** # - # in out 16 C, Lawn, Flat 1 1 27 0 1 1 END GEN-INFO *** Section PWATER*** ACTIVITY Longshot Gun Range - Flow Control 8/16/2022 9:38:16 AM Page 35

```
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
                       0 1 0
                                                     0 0 0
  END ACTIVITY
   PRINT-INFO
    # - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *********
16 0 0 4 0 0 0 0 0 0 0 0 1 9
   END PRINT-INFO
   PWAT-PARM1
    END PWAT-PARM1
   PWAT-PARM2
                  PWATER input info: Part 2

        <PLS >
        PWATER input info: rate

        # - # ***FOREST
        LZSN
        INFILT

        "c
        0
        4.5
        0.03

                                                                 LSUR
                                                                              SLSUR
                                                                                            KVARY
                                                                                                           AGWRC
                                                                   400
                                                                                0.05
                                                                                                0.5
                                                                                                           0.996
   END PWAT-PARM2
   PWAT-PARM3
   * * *
                                                               INFILD DEEPFR
                                                                                           BASETP
                                                                                                          AGWETP
                                                                                                                 0
   END PWAT-PARM3
   PWAT-PARM4
                     PWATER input info: Part 4
CEPSC UZSN NSUR
0.1 0.25 0,25
    <PLS > PWATER input info:
# - # CEPSC UZSN
16 0.1 0.25
                                                                INTEW
                                                                                 IRC
                                                                                            LZETP ***
                                                                                  0.5
                                                                                               0.25
                                                                      6
   END PWAT-PARM4
   PWAT-STATE1
    AGWS
                                                                                                             GWVS
                                         0
                                                       0
                                                                     0
                                                                                  2.5
    16
                          0
                                                                                                                 0
   END PWAT-STATE1
END PERLND
TMPLND
   GEN-INFO
     <PLS ><---->Name---->
                                              Unit-systems
                                                                    Printer ***
                   User t-series Engl Metr ***
      # - #
     5 DRIVEWAYS/FLAT
8 SIDEWALKS/FLAT
4 ROOF TOTAL
                                                      in out
                                                                               * * *
                                            1
                                                   1 1
                                                                   27
                                                                             0
                                                1
                                                       1
                                                               1
                                                                    27
                                                                             0
                                              1
               ROOF TOPS/FLAT
                                                       1
                                                               1
                                                                    27
                                                                             0
   END GEN-INFO
   *** Section IWATER***
   ACTIVITY

        # - # ATMP SNOW IWAT SLD
        IWG IQAL

        5
        0
        1
        0
        0

        8
        0
        1
        0
        0
        0

        4
        0
        0
        1
        0
        0
        0

                                                             * * *
   END ACTIVITY
   PRINT-INFO

      RINT-INFO

      <ILS > ******** Print-flags

      # - # ATMP SNOW IWAT

      S
      0

      0
      0

      0
      0

      0
      0

      0
      0

      0
      0

      0
      0

      0
      0

      0
      0

      0
      1

      9
      0

      0
      0

      0
      1

      9
      0

      0
      0

      0
      1

      9
      1

                                      0 0 0 0
0 0 0
            0 0 4
0 0 4
0 0 4
     8
                                                                      9
                                                           1
      4
                                        0
                                                0
                                                                      9
                                                       0
                                                               1
   END PRINT-INFO
   IWAT-PARM1
Longshot Gun Range - Flow Control
                                                    8/16/2022 9:38:16 AM
                                                                                                                  Page 36
```

<PLS > IWATER variable monthly parameter value flags *** # CSNO RTOP VRS VNN RTLI # -* * * 0 0 0 0 0 0 5 0 8 0 0 0 0 0 4 0 END IWAT-PARM1 IWAT-PARM2 <PLS > # - # *** IWATER input info: Part 2 *** LSUR SLSUR NSUR RETSC 5 400 0.01 0.1 0.1 8 400 0.01 0.1 0.1 4 400 0.01 0.1 0.1 END IWAT-PARM2 IWAT-PARM3 IWATER input info: Part 3 * * * <PLS > PETMIN # ***PETMAX # 5 0 0 8 0 0 4 0 0 END IWAT-PARM3 <PLS > *** Initial conditions at start of simulation # - # *** RETS SURG IWAT-STATE1 0 0 8 0 0 0 4 END IWAT-STATE1 END IMPLND SCHEMATIC <--Area--> MBLK * * * <-Source-> <-Target-> * * * # <-factor-> <Name> Tbl# <Name> # A1 - AREA BEING DEVELOPED (POST) *** PERLND 16 PERLND 16 1.51 RCHRES 2 1 1.51 RCHRES 1 3 IMPLND 5 1.08 RCHRES 1 5 IMPLND 8 0.09 RCHRES 1 5 A2-EXISTING RUN ON (POST) *** 0.11 2 PERLND 16 PERLND 16 RCHRES 1 RCHRES 0.11 1 3 0.19 IMPLND RCHRES 5 4 1 IMPLND 5 RCHRES 1 5 IMPLND 8 0.04 RCHRES 1 5 Future Roof Area*** IMPLND 4 1.23 COPY 502 15 *****Routing***** PERLND 16 1.51 COPY 1 12 TMPLND 1.08 COPY 15 5 1 IMPLND 8 0.09 COPY 1 15 PERLND 16 1.51 COPY 1 13 PERLND 16 0.11 COPY 1 12 IMPLND 4 0.19 COPY 1 15 IMPLND 5 0.57 COPY 1 15 IMPLND 8 0.04 COPY 1 15 PERLND 16 0.11 COPY 1 13 501 RCHRES 1 1 COPY 17 END SCHEMATIC NETWORK <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> *** <volume / Grp < Member / March India (India Cors)
</pre>
<volume / Wards / Member / March India (India Cors)
</pre>
<volume / Wards / Member / March India (India Cors)
</pre>
COPY 502 OUTPUT MEAN 1 1 48.4 DISPLY 1 *** INPUT TIMSER 1

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<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> *** <Name> # <Name> # #<-factor->strg <Name> # # END NETWORK <Name> # # *** RCHRES GEN-INFO RCHRES Name Nexits Unit Systems Printer # - #<---->Case I Ser T-series Engl Metr LKFG *** *** 1 Trapezoidal Pond-009 2 1 1 1 28 0 1 *** END GEN-INFO *** Section RCHRES*** ACTIVITY # - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG *** 1 0 0 0 0 0 0 0 0 END ACTIVITY PRINT-INFO HYDR-PARM1 END HYDR-PARM1 HYDR-PARM2 # - # FTABNO DELTH STCOR K5 1 1 0.01 0.0 3.0 0.5 KS DB50 *** *** ---> 0.0 END RCHRES SPEC-ACTIONS END SPEC-ACTIONS FTABLES

 TABLE
 1

 91
 5

 Depth
 Area
 Volume
 Outflow1
 Outflow2
 Velocity
 Travel Time***

 (ft)
 (acres)
 (acre-ft)
 (cfs)
 (cfs)
 (ft/sec)
 (Minutes)***

 0.000000
 0.039537
 0.000000
 0.000000
 0.000000
 0.000000

 0.033333
 0.039919
 0.001324
 0.000000
 0.805042

 0.100000
 0.040689
 0.004011
 0.000000
 0.812782

 0.100000
 0.040689
 0.004011
 0.000000
 0.820560

 0.133333
 0.041076
 0.005374
 0.000000
 0.828375

 0.166667
 0.041466
 0.006750
 0.000000
 0.836227

 0.200000
 0.41857
 0.008138
 0.000000
 0.842042

 0.266667
 0.422645
 0.010955
 0.000000
 0.860005

 0.300000
 0.43840
 0.013825
 0.000000
 0.868005

 0.333333
 0.043440
 0.013825
 0.000000
 0.884116

 0.366667
 0.043840
 0.015277
 0.000000
 0.882227

 </tbr FTABLE 1 0.366667 0.043840 0.015279 0.000000 0.884116 0.400000 0.044243 0.016747 0.000000 0.884116 0.400000 0.044243 0.016747 0.000000 0.892227 0.433333 0.044647 0.018229 0.000000 0.900375 0.466667 0.045053 0.019724 0.000000 0.908560 Longshot Gun Range - Flow Control 8/16/2022 9:38:16 AM Page 38

0.500000	0.045460	0.021232	0.000000	0.916782
0.533333	0.045870	0.022754	0.000000	0.925042
0.566667	0.046281	0.024290	0.000000	0.933338
0.600000 0.633333	0.046694 0.047110	0.025840	0.000000	0.941671 0.950042
0.666667	0.047526	0.028981	0.000000	0.958449
0.700000	0.047945	0.030572	0.000000	0.966894
0.733333 0.766667	0.048366 0.048788	0.032177 0.033796	0.000000	0.975375 0.983894
0.800000	0.049212	0.035430	0.000000	0.992449
0.833333	0.049638	0.037077	0.000000	1.001042
0.866667 0.900000	0.050066	0.038739 0.040415	0.000000	1.009671 1.018338
0.933333	0.050928	0.042105	0.000000	1.027042
0.966667	0.051361	0.043810	0.000000	1.035782
1.000000 1.033333	0.051796	0.045529 0.047263	0.000000	1.044560 1.053375
1.066667	0.052233	0.049012	0.000000	1.062227
1.100000	0.053113	0.050775	0.000000	1.071116
1.133333	0.053556	0.052552	0.000000	1.080042
1.166667 1.200000	0.054000	0.054345 0.056153	0.000000	1.089005 1.098005
1.233333	0.054895	0.057975	0.000000	1.107042
1.266667	0.055345	0.059812	0.000000	1.116116
1.300000 1.333333	0.055796	0.061665 0.063532	0.000000	1.125227 1.134375
1.366667	0.056705	0.065415	0.000000	1.143560
1.400000	0.057163	0.067312	0.000000	1.152782
1.433333 1.466667	0.057622 0.058083	0.069225	0.000000	<pre>\lambda 1.162042 1.171338</pre>
1.500000	0.058546	0.073098	0.000000	1.180671
1.533333	0.059010	0.075057	0.000000	1.190042
1.566667 1.600000	0.059477 0.059945	0.077032	0.000000	1.199449 1.208894
1.633333	0.060415	0.081028	>0.000000	1.218375
1.666667	0.060887	0.083050	0.000000	1.227894
1.700000 1.733333	0.061361	0.085087	0.000000	1.237449 1.247042
1.766667	0.062314	0.089210	0.000000	1.256671
1.800000	0.062794	0.091295	0.000000	1.266338
1.833333 1.866667	0.063275	0.093396 0.095513	0.000000	1.276042 1.285782
1.900000	0.064243	0.097647	0.000000	1.295560
1.933333	0.064729	0.099796	0.000000	1.305375
1.966667 2.000000	0.065218	0.101962 0.104144	0.000000	1.315227 1.325116
2.033333	0.066200	0.106342	0.064540	1.335042
2.066667	0.066694	0.108557	0.182234	1.345005
2.100000 2.133333	0.067190	0.110789 0.113037	0.333520	1.355005 1.365042
2.166667	0.068188	0.115301	0.703432	1.375116
2.200000	0.068689	0.117583	0.907676	1.385227
2.233333 2.266667	0.069192	0.119881 0.122196	1.115035 1.318080	1.395375 1.405560
2.300000	0.070204	0.124527	1.509672	1.415782
2.333333	0.070713	0.126876	1.683468	1.426042
2.366667 2.400000	0.071223	0.129241 0.131624	1.834531	1.436338 1.446671
2.433333	0.072250	0.134024	2.060036	1.457042
2.466667	0.072766	0.136441	2.138326	1.467449
2.500000 2.533333	0.073284	0.138875 0.141326	2.227125 2.300165	1.477894 1.488375
2.566667	0.074325	0.143795	2.370955	1.498894
2.600000	0.074849	0.146281	2.439693	1.509449
2.633333 2.666667	0.075374 0.075901	0.148785 0.151306	2.506546 2.571662	1.520042 1.530671
2.700000	0.076430	0.153845	2.635170	1.541338
2.733333	0.076961 0.077493	0.156402	2.697182	1.552042
2.766667 2.800000	0.077493	0.158976 0.161568	2.757800 2.817115	1.562782 1.573560

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2.833333 0.078 2.866667 0.079 2.900000 0.079 2.933333 0.080 2.966667 0.080 3.00000 0.081 END FTABLE 1 END FTABLE 1	102 0.1668 642 0.1694 184 0.1721 728 0.1747	06 2.932146 51 2.988001 15 3.042832 97 3.096691	1.595227 1.606116 1.617042			
EXT SOURCES <-Volume-> <membe <name> # <name> WDM 2 PREC WDM 2 PREC WDM 1 EVAP WDM 1 EVAP</name></name></membe 	<pre># tem strg ENGL ENGL ENGL</pre>		<-Target vols> <name> # # PERIND 1 999 IMPLND 1 999 PERIND 1 999 IMPLND 1 999</name>	EXTNL EXTNL EXTNL	<-Member-> * <name> # # * PREC PREC PETINP PETINP</name>	k ★ k ★
END EXT SOURCES						
RCHRES1HYDRRCHRES1HYDRRCHRES1HYDRCOPY1OUTPUTCOPY501OUTPUT	<pre><name> # # RO 1 1 O 1 1 O 2 1 STAGE 1 1 MEAN 1 1 MEAN 1 1 MEAN 1 1</name></pre>	<-factor->strg 1 1 48,4 48,4 48,4	<-Volume-> <mer <name> # <nar WDM 1000 FLO WDM 1001 FLO WDM 1002 FLO WDM 1003 STA WDM 701 FLO WDM 701 FLO WDM 801 FLO WDM 802 FLO</nar </name></mer 	me> W E W E G E W E W E W E	tem strg strg* NGL REPL NGL REPL	
MASS-LINK <volume> <-Grp> <name> MASS-LINK PERLND PWATER END MASS-LINK</name></volume>	2	<pre>Mult> <-factor-> 0.083333</pre>	<target> <name> RCHRES</name></target>	<-Grp>	<-Member->*** <name> # #***</name>	
MASS-LINK PERLND PWATER END MASS-LINK	3 IFWO 3	0.083333	RCHRES	INFLOW	IVOL	
MASS-LINK IMPLND IWATER END MASS-LINK	5 SURO 5	0.083333	RCHRES	INFLOW	IVOL	
MASS-LINK PERLND PWATER END MASS-LINK	12 SURO 12	0.083333	COPY	INPUT	MEAN	
MASS-LINK PERLND PWATER END MASS-LINK	13 IFWO 13	0.083333	COPY	INPUT	MEAN	
MASS-LINK IMPLND IWATER END MASS-LINK		0.083333	COPY	INPUT	MEAN	
MASS-LINK RCHRES OFLOW END MASS-LINK	17 OVOL 1 17		COPY	INPUT	MEAN	
END MASS-LINK						
END RUN						
Longshot Gun Range - Flo	ow Control	8/16/	2022 9:38:17 AM			Page 40

Predeveloped HSPF Message File

OBALL

Longshot Gun Range - Flow Control

8/16/2022 9:38:17 AM

Mitigated HSPF Message File

OBALL

Longshot Gun Range - Flow Control

8/16/2022 9:38:17 AM

Disclaimer

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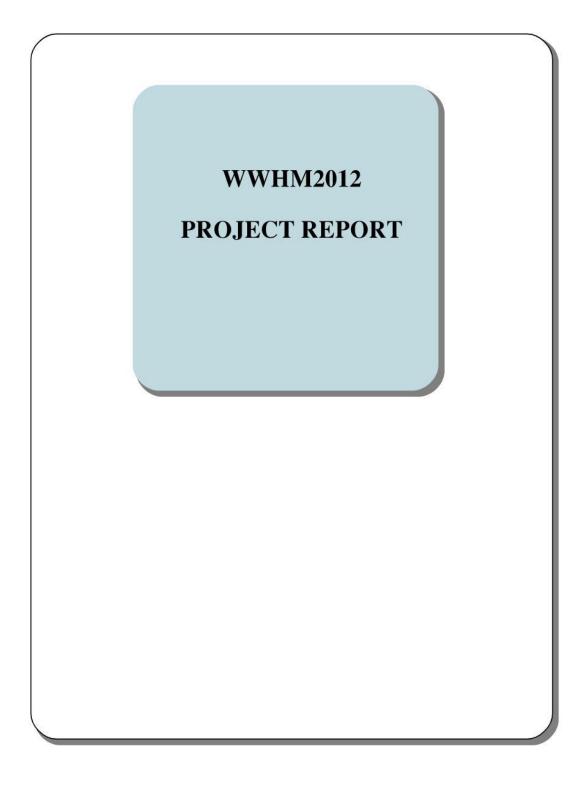
DRAME

Clear Creek Solutions, Inc. 6200 Capitol Blvd. Ste F Olympia, WA. 98501 Toll Free 1(866)943-0304 Local (360)943-0304

www.clearcreeksolutions.com

Longshot Gun Range - Flow Control

8/16/2022 9:38:17 AM



General Model Information

Project Name:	Long Shot Gun Range - WQ
Site Name:	LONGSHOT YELM
Site Address:	16910 WA-507
City:	YELM
Report Date:	8/16/2022
Gage:	Lake Lawrence
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year	
High Flow Threshold for POC1:	50 Year	
Low Flow Threshold for POC2:	50 Percent of the 2 Year	
High Flow Threshold for POC2:	50 Year	

Long Shot Gun Range - WQ

8/16/2022 8:55:34 AM

Landuse Basin Data Predeveloped Land Use

A1 - AREA BEING DEVELOPED (PRE) Bypass: No

bypass.	NO	
GroundWater:	No	
Pervious Land Use C, Forest, Flat	acre 2.7	
Pervious Total	2.7	
Impervious Land Use	acre	
Impervious Total	0	
Basin Total	2.7	
Element Flows To: Surface	Interflow	Groundwater
	OB	

Long Shot Gun Range - WQ

8/16/2022 8:55:34 AM

A2-EXISTING RUN ON (PRE) Bypass: No

Bypass:	NO
GroundWater:	No
Pervious Land Use C, Lawn, Flat	acre 0.11
Pervious Total	0.11
Impervious Land Use ROOF TOPS FLAT DRIVEWAYS FLAT SIDEWALKS FLAT	acre 0.19 0.57 0.04
Impervious Total	0.8
Basin Total	0.91



Long Shot Gun Range - WQ

8/16/2022 8:55:34 AM

ROOF AREA TO BE DEVELOPED

Bypass:	No
GroundWater:	No
Pervious Land Use C, Forest, Flat	acre 1.23
Pervious Total	1.23
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.23

Element Flows To: Surface Interflow

Groundwater

ORALI

8/16/2022 8:55:34 AM

Mitigated Land Use

A1 - AREA BEING DE Bypass:	VELOPE No	ED (POST)
GroundWater:	No	
Pervious Land Use C, Lawn, Flat	acre 1.51	
Pervious Total	1.51	
Impervious Land Use DRIVEWAYS FLAT SIDEWALKS FLAT	acre 1.08 0.09	
Impervious Total	1.17	
Basin Total	2.68	
Element Flows To: Surface Inte	erflow	Groundwater
<	SE	

Long Shot Gun Range - WQ

8/16/2022 8:55:34 AM

A2-EXISTING RUN ON(POST) Bypass: No

Bypass:	No
GroundWater:	No
Pervious Land Use C, Lawn, Flat	acre 0.11
Pervious Total	0.11
Impervious Land Use ROOF TOPS FLAT DRIVEWAYS FLAT SIDEWALKS FLAT	acre 0.19 0.57 0.04
Impervious Total	0.8
Basin Total	0.91



Long Shot Gun Range - WQ

8/16/2022 8:55:34 AM

Future Roof area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use DRIVEWAYS FLAT	acre 1.23
Impervious Total	1.23
Basin Total	1.23

Element Flows To: Surface Interflow

Groundwater



8/16/2022 8:55:34 AM

Routing Elements Predeveloped Routing

ORALI

Long Shot Gun Range - WQ

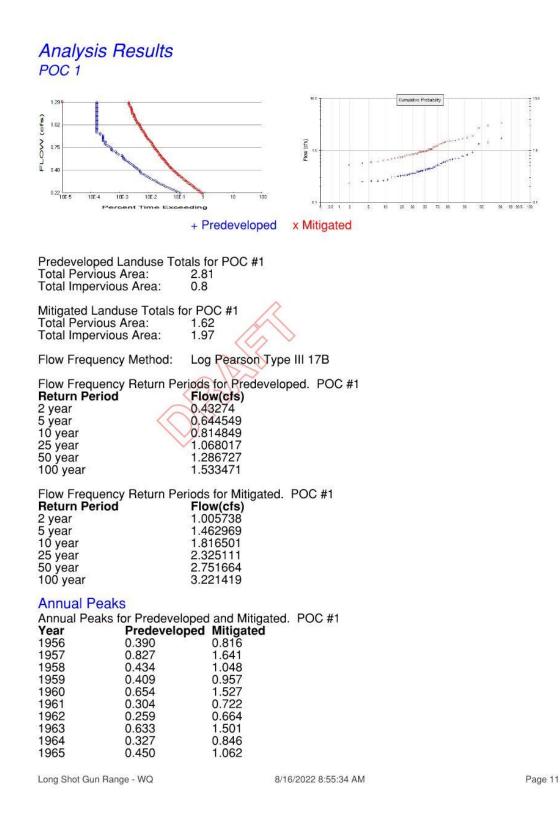
8/16/2022 8:55:34 AM

Mitigated Routing

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Long Shot Gun Range - WQ

8/16/2022 8:55:34 AM



1970 0.331 0.688 1971 0.361 0.737 1972 0.475 0.979 1973 0.348 0.745 1974 0.924 1.904 1975 0.440 1.066 1976 0.413 0.875 1977 0.446 1.221 1978 0.398 0.946 1979 0.479 1.350 1980 0.318 0.710 1981 0.594 1.407 1982 0.366 0.969 1983 0.602 1.527 1984 0.406 0.973 1985 0.360 0.879 1986 0.559 1.175 1987 0.454 0.945 1988 0.234 0.486 1989 0.263 0.592 1990 1.444 3.064 1991 0.707 1.456 1992 0.422 0.993 1993 0.230 0.528 1994 0.388 0.896 1995 0.524 1.337 1996 0.508 1.154 1997 0.433 0.943 1998 0.680 1.706 1999 0.363 0.847 2000 0.336 0.827 2001 0.306 0.809 2002 0.424 1.046 2003 0.250 0.643 2004 1.336 2.715 2005 1.728 3.391 2006 <t< th=""></t<>

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	
1	1.7278	3.3910
2	1.4442	3.0643
3	1.3365	2.7146
4	0.9242	1.9036
2 3 4 5 6 7	0.8270	1.7402
6	0.7831	1.7061
7	0.7091	1.6406
8	0.7071	1.5654
9	0.6797	1.5273
10	0.6543	1.5267
11	0.6335	1.5007

Long Shot Gun Range - WQ

8/16/2022 8:56:01 AM

12 0.6024 1.4563 13 0.5937 1.4070 14 0.5593 1.3496 15 0.5243 1.3367 16 0.5240 1.2527 17 0.5078 1.2213 18 0.4786 1.1749 19 0.4753 1.1540 20 0.4539 1.0659 21 0.4498 1.0625 22 0.4460 1.0477 23 0.4397 1.0456 24 0.4341 0.9931 25 0.4334 0.9793 26 0.4236 0.9731 27 0.4221 0.9692 28 0.4130 0.9452 31 0.4062 0.9452 31 0.4030 0.9427 32 0.3978 0.9348 33 0.3902 0.8955 34 0.3881 0.8795 35 0.3662 0.8753 36 0.3630 0.8472 37 0.3608 0.8461 38 0.3596 0.8273 39 0.3480 0.8161 40 0.3362 0.7447 43 0.3230 0.7368 44 0.3181 0.7219 45 0.3065 0.7097 46 0.3041 0.6882 47 0.2586 0.6045 50 0.2581 0.5923 51 0.22501 0.5710 52 0.2336 0.5279 53 0.2298 0.4858	3456789012345678901234567890123456789012	0.5593 0.5243 0.5240 0.5078 0.4786 0.4753 0.44539 0.4498 0.4460 0.4397 0.4341 0.4334 0.4236 0.4221 0.4130 0.4091 0.4062 0.4030 0.3978 0.3902 0.3881 0.3662 0.3630 0.3608 0.3596 0.3480 0.3596 0.3230 0.3612 0.3230 0.3181 0.3065 0.3041 0.2743 0.2586 0.2581 0.2501 0.2336	$\begin{array}{c} 1.3496\\ 1.3367\\ 1.2527\\ 1.2213\\ 1.1749\\ 1.1540\\ 1.0659\\ 1.0625\\ 1.0477\\ 1.0456\\ 0.9931\\ 0.9793\\ 0.9793\\ 0.9731\\ 0.9692\\ 0.9574\\ 0.9461\\ 0.9452\\ 0.9427\\ 0.9348\\ 0.8955\\ 0.8753\\ 0.8472\\ 0.8461\\ 0.8273\\ 0.8161\\ 0.8273\\ 0.8161\\ 0.8273\\ 0.8161\\ 0.8273\\ 0.8161\\ 0.8094\\ 0.7801\\ 0.7447\\ 0.7368\\ 0.7219\\ 0.7097\\ 0.6882\\ 0.6645\\ 0.6432\\ 0.6045\\ 0.5923\\ 0.5710\\ 0.5279\\ \end{array}$	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
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Long Shot Gun Range - WQ

8/16/2022 8:56:01 AM

Duration Flows

Flow(cfs) 0.2164 0.2272 0.2380 0.2488 0.2596 0.2704 0.2812 0.2921 0.3029 0.3137 0.3245 0.3353 0.3461 0.3569 0.3677 0.3785 0.3894 0.4002 0.4110 0.4218 0.4432 0.4434 0.4542 0.4650 0.4759 0.5623 0.5732 0.5623 0.5732 0.5623 0.5732 0.5623 0.5732 0.5840 0.5948 0.6056 0.6164 0.6272 0.6380 0.6488 0.6596 0.6164 0.6272 0.6380 0.6488 0.6596 0.6164 0.6272 0.6380 0.6488 0.6596 0.6705 0.6813 0.6921 0.7029 0.7137 0.7245 0.7353 0.7461 0.7570 0.7678	Predev 2565 2165 1862 1572 1320 1114 933 790 690 588 500 436 398 356 295 254 225 197 178 155 138 118 107 101 99 94 84 77 70 62 58 51 46 42 33 30 27 27 26 24 23 18 16 15 14 10 10 99 94 84 77 062 58 51 16 15 138 118 107 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 101 99 94 84 77 100 101 99 94 84 77 100 101 99 94 84 77 100 101 99 94 84 77 100 101 99 94 84 77 100 99 94 84 77 100 99 94 84 77 100 99 94 84 77 100 99 94 84 77 100 99 94 84 77 100 99 94 84 77 27 26 24 23 18 107 101 99 94 84 77 27 26 24 23 83 83 83 83 83 83 83 83 83 83 83 83 83	$\begin{array}{c} \text{Mit} \\ 15706 \\ 14043 \\ 12764 \\ 11469 \\ 10333 \\ 9276 \\ 8398 \\ 7616 \\ 6949 \\ 6265 \\ 5707 \\ 5163 \\ 4657 \\ 4260 \\ 3886 \\ 3529 \\ 3247 \\ 2944 \\ 2706 \\ 2457 \\ 2251 \\ 2070 \\ 1896 \\ 1747 \\ 1619 \\ 1497 \\ 1370 \\ 1262 \\ 1181 \\ 1104 \\ 1031 \\ 973 \\ 909 \\ 855 \\ 820 \\ 769 \\ 727 \\ 678 \\ 629 \\ 591 \\ 560 \\ 527 \\ 492 \\ 474 \\ 452 \\ 426 \\ 406 \\ 378 \\ 359 \\ 340 \\ 321 \\ 308 \\ \end{array}$	Percentage 612 648 685 729 782 832 900 964 1007 1065 1141 1184 1170 1317 1389 1443 1494 1520 1585 1631 1754 1771 1729 1635 1592 1630 1638 1687 1780 1777 1907 1976 2035 2102 2330 2423 2511 2329 2273 2333 2962 3013 3042 3690 3780 3590 3400 3566 3850	Fail Fail Fail Fail Fail Fail Fail Fail
	8 7 6			

Long Shot Gun Range - WQ

8/16/2022 8:56:01 AM

$\begin{array}{ccccccc} 0.8002 & 6 \\ 0.8110 & 6 \\ 0.8218 & 6 \\ 0.8326 & 5 \\ 0.8434 & 5 \\ 0.8543 & 5 \\ 0.8651 & 5 \\ 0.8759 & 5 \\ 0.8975 & 5 \\ 0.8975 & 5 \\ 0.9083 & 4 \\ 0.9191 & 4 \\ 0.9299 & 3 \\ 0.9408 & 3 \\ 0.9516 & 3 \\ 0.9516 & 3 \\ 0.9624 & 3 \\ 0.9732 & 3 \\ 0.9840 & 3 \\ 0.9732 & 3 \\ 0.9840 & 3 \\ 0.9948 & 3 \\ 1.0056 & 3 \\ 1.0164 & 3 \\ 1.0272 & 3 \\ 1.0381 & 3 \\ 1.0489 & 3 \\ 1.0597 & 3 \\ 1.0705 & 3 \\ 1.0705 & 3 \\ 1.0705 & 3 \\ 1.0921 & 3 \\ 1.1029 & 3 \\ 1.1354 & 3 \\ 1.1354 & 3 \\ 1.1462 & 3 \\ 1.1570 & 3 \\ 1.1786 & 3 \\ 1.1786 & 3 \\ 1.1786 & 3 \\ 1.1786 & 3 \\ 1.2219 & 3 \\ 1.2219 & 3 \\ 1.2219 & 3 \\ 1.2435 & 3 \\ 1.2543 & 3 \\ 1.2543 & 3 \\ 1.2651 & 3 \\ 1.2759 & 3 \\ 1.2867 & 3 \\ \end{array}$	$\begin{array}{c} 271\\ 259\\ 244\\ 225\\ 207\\ 193\\ 184\\ 177\\ 170\\ 161\\ 152\\ 149\\ 144\\ 136\\ 126\\ 118\\ 116\\ 111\\ 108\\ 104\\ 98\\ 97\\ 90\\ 82\\ 79\\ 75\\ 72\\ 71\\ 64\\ 62\\ 56\\ 54\\ 52\\ 52\\ 51\\ 50\\ 50\\ 48\\ 46\\ 44\\ 41\\ 40\\ 40\\ \end{array}$	4516 4316 4066 4500 4140 3859 3680 3540 3400 3220 3800 3725 4800 4533 4200 3933 3866 3700 3600 3466 3266 3233 2633 2633 2633 2633 2633	Fail Fail Fail Fail Fail Fail Fail Fail
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The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

year flow. The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Long Shot Gun Range - WQ

8/16/2022 8:56:02 AM

Water Quality

Water QualityWater Quality BMP Flow and Volume for POC #1On-line facility volume:0.3615 acre-feetOn-line facility target flow:0.3508 cfs.Adjusted for 15 min:0.3508 cfs.Off-line facility target flow:0.1945 cfs.Adjusted for 15 min:0.1945 cfs.

OBAL

Long Shot Gun Range - WQ

8/16/2022 8:56:02 AM

LID Report

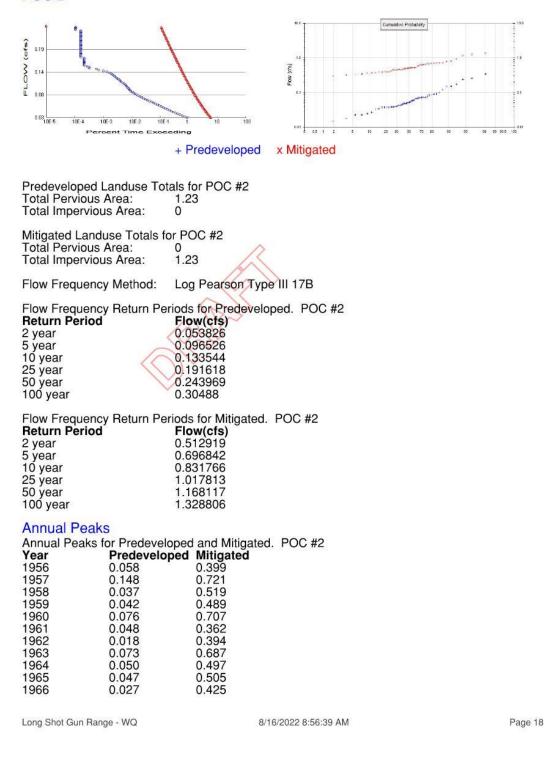
LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated		Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

OBAL

Long Shot Gun Range - WQ

8/16/2022 8:56:02 AM

POC 2



1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008	0.054 0.040 0.024 0.045 0.058 0.084 0.048 0.171 0.038 0.060 0.014 0.052 0.043 0.072 0.043 0.072 0.043 0.070 0.053 0.022 0.091 0.066 0.034 0.022 0.091 0.066 0.034 0.022 0.091 0.066 0.034 0.022 0.037 0.022 0.037 0.022 0.038 0.068 0.022 0.037 0.022 0.038 0.068 0.022 0.037 0.022 0.038 0.068 0.037 0.022 0.038 0.068 0.037 0.022 0.038 0.068 0.037 0.022 0.038 0.068 0.037 0.039 0.014 0.070 0.033 0.037 0.039 0.014 0.070 0.033 0.048	0.481 0.317 0.333 0.395 0.370 0.461 0.384 0.776 0.524 0.448 0.646 0.523 0.687 0.389 0.630 0.524 0.921 0.494 0.463 0.643 0.643 0.458 0.268 0.340 1.242 0.638 0.504 0.300 0.448 0.682 0.597 0.529 0.792 0.447 0.516 0.464 0.524 0.370 1.173 1.369 0.712 0.576 0.718
nankeu P	minual reaks	N

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2 Rank Predeveloped Mitigated 1 0,3444 1,3690

1	0.3444	1.3690
1 2 3 4	0.2567	1.2418
3	0.2355	1.1726
4	0.1708	0.9206
5	0.1504	0.7917
6 7	0.1480	0.7755
7	0.1195	0.7213
8	0.0990	0.7180
9	0.0914	0.7119
10	0.0894	0.7067
11	0.0841	0.6871
12	0.0835	0.6866

Long Shot Gun Range - WQ

8/16/2022 8:57:04 AM

Long Shot Gun Range - WQ

8/16/2022 8:57:04 AM

Duration Flows

Long Shot Gun Range - WQ

8/16/2022 8:57:04 AM

665444444444333333333333333333333333333	9779 9430 9119 8805 8475 8166 7882 7618 7324 7068 6808 6592 6358 6112 5901 5676 5477 5291 5088 4882 4717 4566 4408 4252 4128 3968 3830 3696 3591 3485 3368 3820 3696 3150 3055 2948 2842 2736 2641 2563 2477	162983 157166 182380 220125 211875 204150 197050 190450 183100 176700 170200 164800 211933 203733 196700 189200 182566 176366 166733 157233 157233 152200 146933 157233 152200 146933 141733 137600 132266 123200 119700 116166 123200 119700 116166 123200 119700 116166 123200 119700 116166 123200 119700 116166 123200 119700 116166 12266 123200 119700 116166 12266 123200 119700 116166 12266 123200 119700 116166 12266 123200 119700 116166 12266 123200 119700 116166 12266 123200 119700 116166 12266 123200 119700 11833 98266	Fail Fail Fail Fail Fail Fail Fail Fail
3 3 3 3 3 3 3 2 2 2 2	2736 2641 2563 2477 2401 2325 2247 2169 2091	91200 88033 85433 82566 80033 77500 112350 108450 104550	Fail Fail Fail
	5 4 4 4	5 9119 4 8805 4 8475 4 8166 4 7882 4 7618 4 7324	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

year flow. The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Long Shot Gun Range - WQ

8/16/2022 8:57:04 AM

Water Quality

Water QualityWater Quality BMP Flow and Volume for POC #2On-line facility volume:0 acre-feetOn-line facility target flow:0 cfs.Adjusted for 15 min:0 cfs.Off-line facility target flow:0 cfs.Adjusted for 15 min:0 cfs.

ORALI

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated		Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

OBAL

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes No PERLND changes have been made.

IMPLND Changes No IMPLND changes have been made.

ORMAN

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

Appendix Predeveloped Schematic

7	7		NO BE DEVE	AREA LOPEE			
	(PRE) 2.70ac	0.91ad	1.23ac				

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

Mitigated Schematic

POST 2.68ac		Fallunia areia IST)	Roof			
POST 2.68ac	0.91ac					

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

RUN

Predeveloped UCI File

GLOBAL WWHM4 model simulation START 1955 10 01 END RUN INTERP OUTPUT LEVEL 3 0 2008 09 30 END RESUME 0 RUN END GLOBAL 1 UNIT SYSTEM 1 FILES <File> <Un#> <-----File Name----->*** <-ID-> * * * Long Shot Gun Range - WQ.wdm WDM 26 PreLong Shot Gun Range - WQ.MES PreLong Shot Gun Range - WQ.L61 25 27 MESSU PreLong Shot Gun Range - WQ.L62 POCLong Shot Gun Range - WQ1.dat 28 30 POCLong Shot Gun Range - WQ2.dat 31 END FILES OPN SEQUENCE INDELT 00:15 INGRP PERLND 10 PERLND 16 TMPLND 4 IMPLND 5 IMPLND 8 COPY 501 COPY 502 1 DISPLY DISPLY 2 END INGRP END OPN SEQUENCE DISPLY DISPLY-INF01 DISPLY-INFO1 # - #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND 1 A1 - AREA BEING DEVELOPED MAX 1 2 30 9 2 ROOF AREA TO BE DEVELOPED MAX 1 2 31 9 END DISPLY-INFO1 END DISPLY COPY TIMESERIES # - # NPT NMN *** 1 1 501 1 502 1 1 1 1 END TIMESERIES END COPY GENER OPCODE # # OPCD *** END OPCODE PARM K *** # # END PARM END GENER PERLND GEN-INFO <PLS ><-----Name---->NBLKS Unit-systems Printer *** User t-series Engl Metr *** in out *** # - # in out * 1 1 27 0 1 10 C, Forest, Flat 16 C, Lawn, Flat END GEN-INFO 1 1 1 27 1 1 0 *** Section PWATER*** ACTIVITY Long Shot Gun Range - WQ 8/16/2022 8:57:05 AM

ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *** 10 0 0 0 0 0 0 0 0 0 1 0 0 0 16 0 0 1 0 0 0 0 0 0 0 END ACTIVITY PRINT-INFO # - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***** 0 1 10 0 0 4 0 0 0 4 0 0 0 0 0 0 0 0 0 9 16 0 0 0 0 0 0 END PRINT-INFO PWAT-PARM1
 <PLS > PWATER variable monthly parameter value flags ***

 # - # CSNO RTOP UZFG VCS VUZ VNN VIFW VIRC VLE INFC HWT ***

 10
 0
 0
 0
 0
 0
 0

 16
 0
 0
 0
 0
 0
 0
 0
 0
 END PWAT-PARM1 PWAT-PARM2 <PLS > PWATE
- # ***FOREST PWATER input info: Part 2 *** LZSN INFILT LSUR SLSUR KVARY AGWRC 10 0 4.5 0.08 400 0.05 0.5 0.996 16 0 4.5 0.03 400 0.5 0.996 END PWAT-PARM2 PWAT-PARM3 PWATER input info: Part 3 <PLS > PWATE # - # ***PETMAX *** PETMIN INFEXP INFILD DEEPFR BASETP AGWETP 2 10 0 0 2 0 0 0 16 0 0 2 0 0 0 END PWAT-PARM3 PWAT-PARM4
 PWATER input info: Part 4

 CEFSC
 UZSN
 NSUR

 0.2
 0.5
 0.35

 0.1
 0.25
 0.25
 <PLS > # - # INTEW IRC LZETP *** 0.5 10 6 0.7 0.25 16 6 END PWAT-PARM4 VAT-STATE1 <PLS > *** Initial conditions at start of simulation ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 *** # - # *** CEPS SURS UZS IFWS LZS AGWS 0 0 0 0 2.5 1 0 0 0 0 0 2.5 1 PWAT-STATE1 GWVS 10 0 0 0 0 0 2.5 0 16 0 1 END PWAT-STATE1 END PERLND TMPLND GEN-INFO Unit-systems Printer *** <PLS ><---->Name----> User t-series Engl Metr *** # - # *** in out 27 4 ROOF TOPS/FLAT 1 0 1 1 5 DRIVEWAYS/FLAT 1 1 1 27 0 8 SIDEWALKS/FLAT 1 27 0 END GEN-INFO *** Section IWATER*** ACTIVITY # - # ATMP SNOW IWAT SLD IWG IQAL *** 0 4 0 0 0 5 8 0 0 1 0 0 0 END ACTIVITY PRINT-INFO <ILS > ******* Print-flags ******* PIVL PYR Long Shot Gun Range - WQ 8/16/2022 8:57:05 AM Page 29

ATMP SNOW IWAT SLD IWG IQAL ******* 4 0 0 4 0 0 0 1 9 9 5 0 0 4 0 0 0 1 8 0 0 4 0 0 0 1 9 END PRINT-INFO IWAT-PARM1 # CSNO RTOP VRS VNN RTLI *** 0 0 0 0 4 5 0 0 8 0 0 0 0 0 END IWAT-PARM1 IWAT-PARM2 IWATER input info: Part 2 *** <PLS > # - # *** LSUR SLSUR RETSC NSUR 400 0.01 0.1 0.1 4 0.1 0.1 5 400 0.01 8 400 0.01 0.1 0.1 END IWAT-PARM2 IWAT-PARM3 IWATER input info: Part 3 * * * <PLS > # - # ***PETMAX PETMIN 0 0 4 5 0 0 8 0 0 END IWAT-PARM3 IWAT-STATE1 %PLS > *** Initial conditions at start of simulation
- # *** RETS SURS SURS 0 4 0 5 0 8 0 0 END IWAT-STATE1 END IMPLND SCHEMATIC <-Target-> *** <-Source-> <--Area--> MBLK *** # <Name> <-factor-> <Name> # Tbl# A1 - AREA BEING DEVELOPED (PRE) *** PERLND 10 PERLND 10 2.7 COPY 501 12 2.7 COPY 501 13 A2-EXISTING RUN ON (PRE) *** PERLND 16 0.11 COPY 501 12 PERLND 16 0.11 COPY 501 13 IMPLND 4 0.19 COPY 501 15 IMPLND 5 0.57 COPY 501 15 8 COPY IMPLND 0.04 501 15 ROOF AREA TO BE DEVELOPED*** PERLND 10 PERLND 10 1.23 COPY 502 12 1.23 COPY 502 13 *****Routing***** END SCHEMATIĆ NETWORK <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***

<Ame> # <Name> # #<-factor->strg <Name> # # <Name> # # <Name> # # ***
COPY 501 OUTPUT MEAN 1 1 48.4 DISPLY 1 INPUT TIMSER 1
COPY 502 OUTPUT MEAN 1 1 48.4 DISPLY 2 INPUT TIMSER 1 <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> *** <Name> # <Name> # #<-factor->strg <Name> # # <Name> # # *** END NETWORK Long Shot Gun Range - WQ 8/16/2022 8:57:05 AM Page 30

```
RCHRES
  GEN-INFO
    RCHRES Name Nexits Unit Systems Printer
# - #<----->Class Description Engl Metr LKFG
    RCHRES
                                                                                          ***
                                                                                           * * *
                                                 in out
  END GEN-INFO
  *** Section RCHRES***
  ACTIVITY
     # - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY
  PRINT-INFO
    END PRINT-INFO
  HYDR-PARM1
     RCHRES Flags for each HYDR Section
                                                                                          ***
             # - #
  END HYDR-PARM1
  HYDR-PARM2
             FTABNO LEN
  # - # FTABNO LEN
<----><---><---><-
                                        DELTH
                                                    STCOR
                                                                   KS
                                                                           DB50
                                                                                          ***
                                      ***
                                                                     -><---->
  END HYDR-PARM2
  END HYDR-FARFUL

HYDR-INIT

RCHRES Initial conditions for each HYDR section

# - # *** VOL Initial value of COLIND Initial value of OUTDGT

*** ac-ft for each possible exit for each possible exit

C---->C---> *** <--->C---> *** <--->C--->C--->
END RCHRES
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target Vols> <-Grp> <-remove
<Name> # <Name> # tem strg<-factor->strg <Name> # # <Name>
WDM 2 PREC ENGL 0.857 PERLND 1 999 EXTNL PREC
WDM 2 PREC ENGL 0.857 IMPLND 1 999 EXTNL PREC
WDM 1 EVAP ENGL 0.76 PERLND 1 999 EXTNL PETINP
WDM 1 EVAP ENGL 0.76 IMPLND 1 999 EXTNL PETINP
                                                                          <Name> # # ***
END EXT SOURCES
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
tem strg strg***
                                                                         ENGL REPL
                                                                         ENGL
                                                                                     REPL
END EXT TARGETS
MASS-LINK

    Volume>
    <-Grp> <-Member-><--Mult-->
    <Target>

    <Name>
    <Name> # #<-factor->
    <Name>

    MASS-LINK
    12

    PERLND
    PWATER SURO
    0.083333
    COPY

                                                                   <-Grp> <-Member->***
                                                                           <Name> # #***
                               0.083333
                                                                   INPUT MEAN
  END MASS-LINK 12
  MASS-LINK
                    13
PERLND PWATER IFWO 0.083333 COPY
END MASS-LINK 13
                                                                   INPUT MEAN
Long Shot Gun Range - WQ
                                           8/16/2022 8:57:05 AM
                                                                                             Page 31
```

MASS-LINK 15 IMPLND IWATER SURO END MASS-LINK 15

0.083333 COPY

INPUT MEAN

END MASS-LINK

END RUN

ORALI

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RUN

Mitigated UCI File

GLOBAL WWHM4 model simulation START 1955 10 01 END RUN INTERP OUTPUT LEVEL 3 0 END 2008 09 30 RESUME 0 RUN 1 END GLOBAL UNIT SYSTEM 1 FILES <File> <Un#> <-----File Name---->*** <-ID-> * * * Long Shot Gun Range - WQ.wdm WDM 26 MitLong Shot Gun Range - WQ.MES MitLong Shot Gun Range - WQ.L61 25 27 MESSU MitLong Shot Gun Range - WQ.L62 POCLong Shot Gun Range - WQ1.dat 28 30 POCLong Shot Gun Range - WQ2.dat 31 END FILES OPN SEQUENCE INDELT 00:15 INGRP PERLND 16 IMPLND 5 8 TMPLND IMPLND 4 COPY 501 COPY 502 DISPLY 1 DISPLY 2 END INGRP END OPN SEQUENCE DISPLY DISPLY-INFO1 A1 - AREA BEING DEVELOPED MAX 1 31 2 9 2 Future Roof area MAX 1 END DISPLY-INFO1 END DISPLY COPY TIMESERIES # - # NPT NMN *** 501 502 1 1 END TIMESERIES END COPY GENER OPCODE # # OPCD *** END OPCODE PARM 4 # K *** END PARM END GENER PERLND GEN-INFO <PLS ><-----Name---->NBLKS Unit-systems Printer *** # - # User t-series Engl Metr *** in out *** 16 C, Lawn, Flat 27 0 1 1 1 1 END GEN-INFO *** Section PWATER*** ACTIVITY # - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *** 6 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 16 Long Shot Gun Range - WQ 8/16/2022 8:57:05 AM Page 33

```
END ACTIVITY
  PRINT-INFO
    16
  END PRINT-INFO
  PWAT-PARM1

        <PLS > PWATER variable monthly parameter value flags ***

        # - # CSNO RTOP UZFG VCS VUZ VNN VIFW VIRC VLE INFC HWT ***

        16
        0
        0
        0
        0
        0
        0

  END PWAT-PARM1
  PWAT-PARM2
   ***
                                                    LSUR
                                                              SLSUR
                                                                         KVARY
                                                                                     AGWRC
   16
                                                     400
                                                               0.05
                                                                         0.5
                                                                                     0.996
  END PWAT-PARM2
  PWAT-PARM3
  PWAT-PARM3<PLS >PWATER input info: Part 3# - # ***PETMAXPETMIN16002
                                                  INFILD DEEPFR
                                                                        BASETP
                                                                                    AGWETP
                                                                                          0
                                                                   0
  END PWAT-PARM3
  PWAT-PARM4
   <PLS >
                PWATER input info: Part 4

    # - #
    CEPSC
    UZSN
    NSUB

    .6
    0.1
    0.25
    0.25

                                                   INTEW
                                                                IRC
                                                                         LZETP ***
   16
                                                                           0.25
                                                       6
                                                                 0.5
  END PWAT-PARM4
  PWAT-STATE1
   WAT-STATE1

<PLS > *** Initial conditions at start of simulation

ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***

# - # *** CEPS SURS UZS IFWS LZS AGWS

16 0 0 0 0 0 2.5 1

ND PWAT-STATE1
                                                                                      GWVS
   16
  END PWAT-STATE1
END PERLND
IMPLND
  GEN-INFO
                                    Unit-systems Printer ***
    <PLS ><---->Name---->
                           User t-series Engl Metr ***
    # - #
                                          in out
1 1 27
                                                               ***
    5 DRIVEWAYS/FLAT
                                      1
                                                             0
                                              1
1
   8 SIDEWALKS/FLAT
4 ROOF TOPS/FLAT
                                           1
                                                      27
                                      1
                                                             0
                                                      27
                                      1
                                            1
                                                  1
                                                             0
  END GEN-INFO
  *** Section IWATER***
  ACTIVITY
    # - # ATMP SNOW IWAT SLD IWG IQAL
                                                * * *
             0
                                            0
    8
                                      0
                                            0
    4
                                      0
                                            0
  END ACTIVITY
    INT-INFO
<ILS > ******* Print-flags ******* PIVL PYR
# - # ATMP SNOW IWAT SLD IWG IQAL ********
0 0 4 0 0 0 1 9
  PRINT-INFO
            8
                                                        9
                                                  1
    4
                                                  1
                                                        9
  END PRINT-INFO
  IWAT-PARM1
    # CSNO RTOP VRS VNN RTLI ***
Long Shot Gun Range - WQ
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                                                                                          Page 34
```

5 0 0 0 0 0 8 0 0 0 0 0 0 4 0 0 0 0 END IWAT-PARM1 IWAT-PARM2 IWATER input info: Part 2 *** <PLS > # - # *** LSUR SLSUR RETSC NSUR 400 0.01 0.1 0.1 8 400 0.01 0.1 0.1 4 400 0.01 0.1 0.1 END IWAT-PARM2 IWAT-PARM3 IWATER input info: Part 3 *** <PLS > IWATE. # - # ***PETMAX PETMIN 0 0 5 8 0 0 4 0 0 END IWAT-PARM3 IWAT-STATE1 # +** Initial conditions at start of simulation
- # *** RETS SURS SURS 0 0 5 8 0 0 4 0 0 END IWAT-STATE1 END IMPLND SCHEMATIC --Area--factor-> * * * MBLK <-Source-> <-Target-> *** <Name> # <Name> # Tbl# A1 - AREA BEING DEVELOPED (POST) PERLND 16 PERLND 16 1.51 COPY 501 12 1.51 501 COPY 13 IMPLND 5 8 1.08 COPY 501 15 0.09 IMPLND COPY 501 15 A2-EXISTING RUN ON (POST) *** PERLND 16 PERLND 16 501 0.11 COPY 12 0.11 COPY 501 13 COPY TMPLND 4 5 501 0.19 15 IMPLND COPY 0.57 501 15 IMPLND 8 0.04 COPY 501 15 Future Roof area*** 1.23 COPY 502 15 IMPLND 5 *****Routing***** END SCHEMATIC NETWORK <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***

Copy 501 OUTPUT MEAN 1 1 48.4 DISPLY 1 INPUT TIMSER 1

Copy 502 OUTPUT MEAN 1 1 48.4 DISPLY 2 INPUT TIMSER 1 <-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> *** <Name> # </br><Name> # #<Name> # #<Name> # #<Name> # # *<-factor->strg # #<Name> # # *** END NETWORK RCHRES GEN-INFO Nexits Unit Systems Printer +++ RCHRES Name ----> User T-series Engl Metr LKFG *** # - #<----in out * * * END GEN-INFO *** Section RCHRES*** Long Shot Gun Range - WQ 8/16/2022 8:57:05 AM Page 35

```
ACTIVITY
    END ACTIVITY
  PRINT-INFO
    END PRINT-INFO
  HYDR-PARM1
    END HYDR-PARM1
  HYDR-PARM2
              FTABNO
                           LEN
                                   DELTH STCOR
                                                               KS
                                                                         DB50
                                                                                     * * *
    # - #
  <-----><-----><----->
                                                                                    ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES Initial conditions for each HYDR section
# - # *** VOL Initial value of COLIND Initial value of OUT
*** ac-ft for each possible exit for each possible exit
                                                            Initial value of OUTDGT
  <---->
                           <---><---><---><-
                                                            <---><--->
  END HYDR-INIT
END RCHRES
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES
EXT SOURCES
EXT SOURCES

<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***

<Name> # <Name> # tem strg<-factor->strg <Name> # # <Name> # # 

*** wDM 2 PREC ENGL 0.857 PERLND 1 999 EXTNL PREC

WDM 2 PREC ENGL 0.857 IMPLND 1 999 EXTNL PREC

WDM 1 EVAP ENGL 0.76 PERLND 1 999 EXTNL PETINP

WDM 1 EVAP ENGL 0.76 IMPLND 1 999 EXTNL PETINP
END EXT SOURCES
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name> #<Name> # <-factor->strg<Name> # <Name> temCOPY1OUTPUTMEAN148.4WDM701FLOWENGLCOPY501OUTPUTMEAN148.4WDM801FLOWENGLCOPY2OUTPUTMEAN148.4WDM702FLOWENGLCOPY502OUTPUTMEAN148.4WDM802FLOWENGLCOPY502OUTPUTMEAN148.4WDM802FLOWENGL
                                                                      tem strg strg***
                                                                      ENGL
                                                                                 REPL
                                                                                 REPL
                                                                                 REPL
                                                                                REPL
END EXT TARGETS
MASS-LINK
            <Volume> <-Grp> <-Member-><--Mult-->
                                                               <-Grp> <-Member->***
                                                                      <Name> # #***
<Name>
  MASS-LINK
                             0.083333
PERLND
        PWATER SURO
                                               COPY
                                                                INPUT MEAN
  END MASS-LINK 12
MASS-LINK
PERLND P
                  13
  ERLND PWATER IFWO 0.083333
END MASS-LINK 13
                                               COPY
                                                                INPUT MEAN
MASS-LINK
IMPLND I
                   15
                          0.083333
           IWATER SURO
                                               COPY
                                                               INPUT MEAN
  END MASS-LINK 15
Long Shot Gun Range - WQ
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                                                                                        Page 36
```

END MASS-LINK END RUN

OBALL

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

Predeveloped HSPF Message File

OBALL

Long Shot Gun Range - WQ

8/16/2022 8:57:05 AM

Mitigated HSPF Message File

OBALL

Long Shot Gun Range - WQ

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DRAME

Clear Creek Solutions, Inc. 6200 Capitol Blvd. Ste F Olympia, WA. 98501 Toll Free 1(866)943-0304 Local (360)943-0304

www.clearcreeksolutions.com

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APPENDIX E – OPERATIONS AND MAINTENANCE

Long Shot Gun Range

16910 WA-507 Yelm, WA 98370 Parcel # 64303100800 and 64303100801

Operations & Maintenance Manual



6814 Greenwood Avenue N Seattle, WA 98103 (206) 522-9510

Prepared By: Darian Murray Reviewed By: Bill Fortunato, P.E.

Maintain Stormwater Facilities

The owner or operator of the project shall be responsible for maintaining the stormwater facilities in accordance with local requirements. A copy of this maintenance and operations manual shall be retained on-site or within reasonable access to the site and shall be transferred with the property to any new owner. A log of maintenance activities that indicate what actions were taken shall be kept and be available for inspection by the City of Yelm upon request.

The following maintenance program is recommended for this project:

Appendix V-A: BMP Maintenance Tables

Ecology intends the facility-specific maintenance standards contained in this section to be conditions for determining if maintenance actions are required as identified through inspection. Recognizing that Permittees have limited maintenance funds and time, Ecology does not require that a Permittee perform all these maintenance activities on all their stormwater BMPs. We leave the determination of importance of each maintenance activity and its priority within the stormwater program to the Permittee. We do expect, however, that sufficient maintenance will occur to ensure that the BMPs continue to operate as designed to protect ground and surface waters.

Ecology doesn't intend that these measures identify the facility's required condition at all times between inspections. In other words, exceedance of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the Permittee shall adjust inspection and maintenance schedules to minimize the length of time that a facility is in a condition that requires a maintenance action.

Maintenance Com- ponent	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Trash & Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site
	Poisonous Veget- ation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance per- sonnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordin- ate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
General	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and homets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance and inspection access or interferes with main- tenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other bene- ficial uses (e.g., alders for firewood).
		If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized using appropriate erosion control measure(s); e.g.,rock reinforcement, planting of grass, compaction.
		Any erosion observed on a compacted berm embankment.	If erosion is occurring on compacted berms a licensed engineer in the state of Washington should be con- sulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise spe- cified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.

Table V-A.1: Maintenance Standards - Detention Ponds

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Table V-A.1: Maintenance	Standards -	Detention	Ponds	(continued)
Table V-M. L. Maintenance	Stanuarus - I	Detention	runus	(continueu)

Maintenance Com- ponent	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Liner (if Applic- able)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Ponds Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation If settlement is apparent, measure berm to determine amount of settlement Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to con- tinue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
Spillway and Berms over 4 feet in height	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to con- tinue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Over- flow/Spillway	Emergency Over- flow/Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any expos- ure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

Table V-A.2: Maintenance Standards - Infiltration

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Per- formed
	Trash & Debris	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
General	Poisonous/Noxious Vegetation	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
General	Contaminants and Pol- lution	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
	Rodent Holes	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events.	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.

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Table V-A.2: Maintenance Standards	- Infiltration	(continued)
-------------------------------------------	----------------	-------------

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Per- formed
		(A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
Emergency Overflow Spillway	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
and Berms over 4 feet in height.	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
Emergency overnow opinway	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Deten- tion Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

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Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Com- ponent	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
General	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tank- s/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

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Table V-A.5: Maintenance Standards - Catch Basins	
----------------------------------------------------------	--

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is per- formed
	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
General	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Mis- alignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pol- lution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
Catch Basin Cover	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance per- son.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows main- tenance person safe access.
	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
Metal Grates	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
(If Applicable)	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

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Table V-A.11: Maintenance Standards - Wetponds

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Water level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control tur- bulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Accumulation that exceeds 1 CF per 1000-SF of pond area.	Trash and debris removed from pond.
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accu- mulation in Pond Bot- tom	Sediment accumulations in pond bottom that exceeds the depth of sed- iment zone plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
General	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil per- sist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Bern dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

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Table V-A.18: Maintenance Standards - Catch Basin Inserts

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
General	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
General	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

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Stormwater BMP Inspection and Maintenance Log

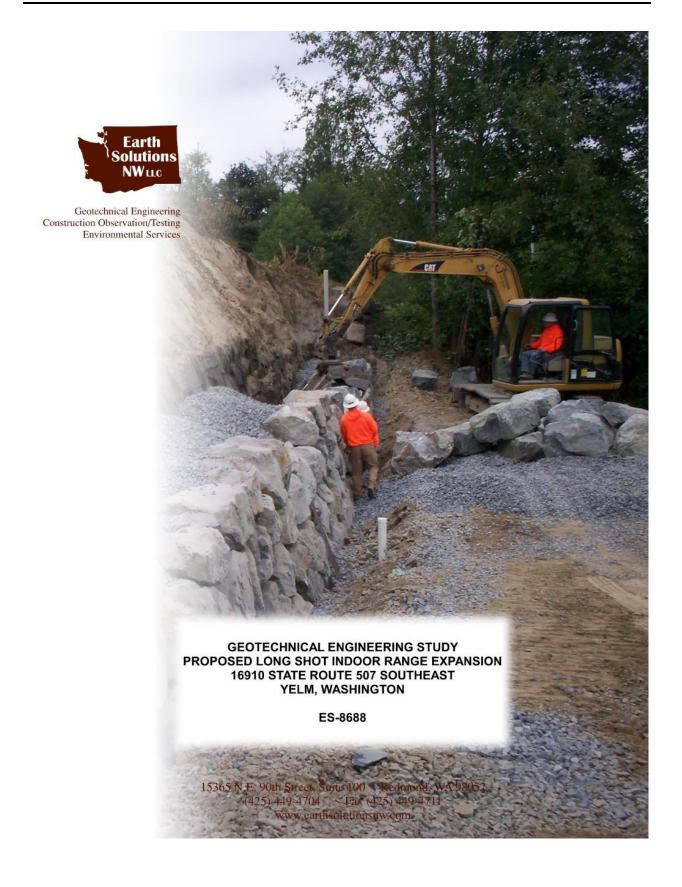
Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality, and start a new log at that time.

- BMP ID# Always use ID# from the Operation and Maintenance Manual.
- Inspected by Note all inspections and maintenance on this form, including the required independent annual inspection.
- Cause for inspection Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.
- Exceptions noted Note any condition that requires correction or indicates a need for maintenance.
- Comments and actions taken Describe any maintenance done and need for follow-up.

APPENDIX F – GEOTECHNICAL ENGINEERING STUDY



PREPARED FOR

PACLAND

July 26, 2022



Steven K. Hartwig, G.I.T. Staff Geologist

GEOTECHNICAL ENGINEERING STUDY PROPOSED LONG SHOT INDOOR RANGE EXPANSION 16910 STATE ROUTE 507 SOUTHEAST YELM, WASHINGTON

ES-8688

Earth Solutions NW, LLC 15365 Northeast 90th Street, Suite 100 Redmond, Washington 98052 Phone: 425-449-4704 | Fax: 425-449-4711 www.earthsolutionsnw.com

^{07/26/2022}

Henry T. Wright, P.E. Associate Principal Engineer

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you - assumedly a client representative - interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will <u>not</u> likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will <u>not</u> be adequate to develop geotechnical design recommendations for the project.

Do <u>not</u> rely on this report if your geotechnical engineer prepared it: • for a different client;

- · for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it;
 e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnicalengineering report did not read the report in its entirety. Do <u>not</u> rely on an executive summary. Do <u>not</u> read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and
- the desired performance criteria;the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnicalengineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- · confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note* conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are <u>not</u> building-envelope or mold specialists.



Telephone: 301/565-2733 e-mail: info@geoprofessional.org www.geoprofessional.org

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July 26, 2022 ES-8688 Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

PACLAND 6814 Greenwood Avenue North Seattle, Washington 98103

Attention: Mr. Darian Murray

Dear Mr. Murray:

Earth Solutions NW, LLC (ESNW), is pleased to present this geotechnical report to support the proposed project. Based on the results of our investigation, construction of the proposed indoor range expansion is feasible from a geotechnical standpoint. Our field observations indicate the site is primarily underlain by gravel glacial outwash deposits.

In our opinion, the proposed indoor range building can be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed and compacted on competent native soil. Based on our explorations, competent bearing soil for new foundation support is expected to begin at depths of about one to one and one-half feet below existing grades. Where encountered, loose or otherwise unsuitable subgrade areas should be compacted or overexcavated and replaced with structural fill.

Stormwater infiltration into the native gravel deposits if feasible from a geotechnical standpoint. ESNW should review final stormwater design plans and provided additional recommendations as necessary.

Pertinent geotechnical recommendations are provided in this study. We appreciate the opportunity to be of service to you on this project. Please call if you have any questions about this report or if we can be of further assistance.

Sincerely,

EARTH SOLUTIONS NW, LLC

Steven K. Hartwig, G.I.T. Staff Geologist

15365 N.E. 90th Street, Suite 100 • Redmond, WA 98052 • (425) 449-4704 • FAX (425) 449-4711

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GEOTECHNICAL ENGINEERING STUDY PROPOSED LONG SHOT INDOOR RANGE EXPANSION 16910 STATE ROUTE 507 SOUTHEAST YELM, WASHINGTON

ES-8688

INTRODUCTION

General

This geotechnical engineering study was prepared for the proposed Long Shot Indoor Range expansion to be constructed at 16910 State Route 507 Southeast, in Yelm, Washington. To complete this study, ESNW performed the following services:

- Test pits to characterize soil and near-surface groundwater conditions.
- Laboratory testing of soil samples collected at the test pit locations.
- Engineering analyses.

The following documents, maps, and codes were reviewed as part of our report preparation:

- Topographic and Boundary Survey, prepared by Terrane, dated June 6, 2022.
- Geologic Map of the Centralia Quadrangle, Washington, compiled by H.W. Schasse, dated 1987.
- Online Web Soil Survey (WSS), provided by the Natural Resources Conservation Service under the United States Department of Agriculture (USDA).
- Yelm Municipal Code (YMC) Chapter 18.21.100 Geologically Hazardous Areas.
- Thurston County Liquefaction Susceptibility Map, endorsed by the Washington State Department of Natural Resources, dated September 2004.
- 2019 Stormwater Management Manual for Western Washington (2019 SWMMWW).

Project Description

The subject site is located at 16910 State Route 507 Southeast in Yelm, Washington. We understand an expansion of the Long Shot Indoor Range facility is proposed by constructing a new building and parking area to the north of the existing facility.

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At the time of report submission, specific building load plans were not available for review; however, based on our experience with similar developments, the proposed structure will likely be two to three stories and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be about 2 to 3 kips per linear foot. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

If the above design assumptions either change or are incorrect, ESNW should be contacted to review the recommendations provided in this report. ESNW should review final designs to confirm that our geotechnical recommendations have been incorporated into the plans.

SITE CONDITIONS

Surface

The subject site is located at 16910 State Route 507 Southeast in Yelm, Washington. The approximate location of the property is illustrated on Plate 1 (Vicinity Map). The site consists of two tax parcels (Thurston County Parcel No. 64303100-800 and -801), totaling about 8.9 acres. Per the referenced topographic survey, the existing topography is relatively level, with an estimated three to four feet of elevation change across the site. At the time of the June 2022 fieldwork, the subject site contained an undeveloped field to the north with vegetation consisting of grass and light brush, and the Long Shot Indoor Range building and parking lot area to the south.

Subsurface

An ESNW representative observed, logged, and sampled seven test pits on June 23, 2022. The test pits were excavated within accessible areas of the subject lots using a mini trackhoe and operator retained by ESNW. The test pits were completed to evaluate soil conditions, classify site soils, and characterize shallow groundwater conditions across the subject site.

The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil

Topsoil was generally encountered in the upper 12 inches of existing grades at the test pit locations. Deeper or shallower pockets of topsoil may be locally encountered across the site. The topsoil was characterized by a dark brown color, minor root intrusions, and trace organic matter. Vegetation roots generally extended to depths of 10 to 24 inches.

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Native Soil

Underlying topsoil, the native soil was classified primarily as medium dense well-graded and poorly graded gravel with sand (USCS: GW and GP, respectively). The moisture content at the time of exploration was characterized primarily as damp to moist. Native soil extended to the maximum exploration depth at each test pit location, which occurred between about 6.5 and 10 feet below the existing ground surface (bgs).

Geologic Setting

The referenced geologic map resource indicates the site is underlain by Vashon outwash gravel deposits (Qdvg). The referenced WSS resource identifies Spanaway gravelly sandy loam as the primary underlying soil unit of the subject site. The Spanaway series soils are typically excessively drained soils that formed in glacial outwash plains. Based on the soil conditions encountered during the fieldwork, native soil on the subject site is consistent with the geologic setting of gravel glacial outwash as locally mapped.

Groundwater

Groundwater seepage was not observed in the test pits excavated during the June 2022 subsurface exploration. Nevertheless, groundwater may be encountered depending on the time of year earthwork activities occur and depth of excavations. Groundwater flow rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Geologically Hazardous Areas Review

To evaluate the presence of geologically hazardous areas, ESNW reviewed YMC Chapter 18.21.100 (Geologically Hazardous Areas). ESNW also reviewed the City of Yelm Critical Areas Map and the Thurston County GeoData resources to identify mapped critical areas with respect to geologic hazards. Geologically hazardous areas recognized by the YMC include erosion, landslide, and seismic hazard areas.

Based on our review, the site does not contain geologically hazardous areas as defined in Chapter 18.21.100 of the YMC or as mapped using the previously mentioned resources. The referenced liquefaction susceptibility map indicates the site maintains a very low susceptibility to liquefaction and, in our opinion, does not meet the definition of a seismic hazard area per the YMC. The subject site also does not meet the qualifications of erosion hazard areas or landslide hazard areas according to the definitions set forth in the YMC.

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DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed project is feasible from a geotechnical standpoint. The primary geotechnical considerations for the proposal are associated with structural fill placement and compaction, utility trench support and backfill, drainage, foundation support, and temporary excavation support.

In our opinion, the proposed indoor range building can be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed and compacted on competent native soil. Based on our explorations, competent bearing soil for new foundation support is expected to begin at depths of about one to one and one-half feet below existing grades. Where encountered, loose or otherwise unsuitable subgrade areas should be compacted or overexcavated and replaced with structural fill.

Stormwater infiltration into the native gravel deposits if feasible from a geotechnical standpoint. ESNW should review final stormwater design plans and provided additional recommendations as necessary.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve mass site grading and related infrastructure improvements. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (where allowed by the presiding jurisdiction), and/or the use of select fill material will likely be necessary during construction.

Temporary Erosion Control

The following temporary erosion and sediment control (TESC) Best Management Practices (BMPs) are offered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placement of a geotextile fabric beneath the quarry spalls will provide greater stability, if needed.
- Silt fencing should be placed around the site perimeter.
- · When not in use, soil stockpiles should be covered or otherwise protected.
- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.
- Dry soils disturbed during construction should be wetted to minimize dust.
- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

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Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans, should be incorporated into construction activities. TESC BMPs should be upkept and modified during construction as site conditions require and as approved by the site erosion control lead.

Excavations and Slopes

Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications are also provided:

•	Areas exposing groundwater seepage	1.5H:1V (Type C)
•	Loose soil	1.5H:1V (Type C)
•	Medium dense soil	1H:1V (Type B)

The presence of groundwater (if encountered) may cause localized sloughing of temporary slopes. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion and should maintain a gradient of 2H:1V or flatter.

In-situ and Imported Soil

In general, our field observations indicate on-site soils likely to be encountered during construction may be considered feasible for use as structural fill if the soil moisture content is at (or slightly above) the optimum level when compaction achievement is required. Successful use of on-site soils as structural fill will largely be dictated by the moisture content at the time of placement and compaction.

On-site soils that are dry of the optimum moisture content at the time of placement will require moisture conditioning (typically achieved by adding water) prior to compaction. Soils that are excessively over the optimum moisture content will require moisture conditioning (typically achieved through soil aeration) prior to compaction. It should be emphasized that soils should never be placed and compacted dry of the optimum moisture content.

Imported soil intended for use as structural fill should consist of a well-graded, granular soil with a moisture content that is at (or slightly above) the optimum level. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

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Structural Fill

Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

Structural fill material	Granular soil
Moisture content	At or slightly above optimum
Relative compaction (minimum)	95 percent (Modified Proctor)
 Loose lift thickness (maximum) 	12 inches

The on-site soil may not be suitable for use as structural fill, unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Soil shall not be placed dry of the optimum moisture content and should be evaluated by ESNW during construction. With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. ESNW recommends removing any unsuitable material or debris from structural areas, if encountered.

Foundations

In our opinion, the proposed structure may be supported on conventional continuous and spread footing foundations bearing on competent native soil, recompacted native soil, or new structural fill placed on competent native soil. Based on the conditions encountered during the subsurface exploration, competent bearing soil for new foundation support is expected beginning at depths of about one and one-half to two and one-half feet bgs. Where encountered, loose or otherwise unsuitable subgrade areas should be recompacted or overexcavated and replaced with structural fill.

Provided foundations will be supported as prescribed, the following parameters may be used for design:

•	Allowable soil bearing capacity	2,500 psf
•	Passive earth pressure	300 pcf (equivalent fluid)
•	Coefficient of friction	0.40
•	Footing width (minimum)	18 inches (continuous) 24 inches (isolated)
•	Footing depth (minimum)	18 inches (exterior) 12 inches (interior)

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A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factorof-safety of 1.5. With structural loading as expected, total settlement in the range of one inch and differential settlement of approximately one-half inch is anticipated. Most of the anticipated settlement should occur during construction when dead loads are applied.

Seismic Design

The 2018 International Building Code (2018 IBC) recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, the parameters and values provided below are recommended for seismic design per the 2018 IBC.

Parameter	Value
Site Class	D*
Mapped short period spectral response acceleration, $S_S(g)$	1.278
Mapped 1-second period spectral response acceleration, $S_1(g)$	0.461
Short period site coefficient, Fa	1.0
Long period site coefficient, Fv	1.839**
Adjusted short period spectral response acceleration, $S_{MS}(g)$	1.278
Adjusted 1-second period spectral response acceleration, $S_{M1}(g)$	0.848**
Design short period spectral response acceleration, $S_{DS}(g)$	0.852
Design 1-second period spectral response acceleration, S _{D1} (g)	0.565**

* Assumes medium dense native soil conditions, encountered to a maximum depth of 10 feet bgs during the June 2022 field exploration, remain medium dense to dense to at least 100 feet bgs.

** Values assume F_v may be determined using linear interpolation per Table 11.4-2 in ASCE 7-16.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structure should be supported on competent, firm, and unyielding subgrades comprised of competent native soil, compacted native soil, or compacted structural fill. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break consisting of at least four inches of free-draining crushed rock or gravel should be placed below each slab. The free-draining material should have a fines content of 5 percent or less (percent passing the Number 200 sieve, based on the minus three-quarter inch fraction). If relatively clean native gravel is exposed or used for backfill in the slab subgrade, additional capillary break material may not be warranted and can be evaluated by the geotechnical engineering during construction. In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is to be utilized, it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the specifications of the manufacturer.

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Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

Active earth pressure (unrestrained condition)	35 pcf (equivalent fluid)
At-rest earth pressure (restrained condition)	55 pcf
 Traffic surcharge* (passenger vehicles) 	70 psf (rectangular distribution)
Passive earth pressure	300 pcf (equivalent fluid)
Coefficient of friction	0.40
Seismic surcharge	8H psf**

* Where applicable.

** Where H equals the retained height (in feet).

The above design parameters are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. If drainage is not provided, hydrostatic pressure should be considered in the wall design.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications detailed in the *Site Preparation and Earthwork* section of this report. It is possible that soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas of unsuitable or yielding subgrade conditions may require remedial measures such as overexcavation and replacement with structural fill or thicker crushed rock sections prior to pavement.

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For relatively lightly loaded pavements subjected to automobiles and occasional truck traffic, the following sections can be considered for preliminary design:

- Two inches of hot mix asphalt (HMA) placed over four inches of CRB, or;
- Two inches of HMA placed over three inches of asphalt treated base (ATB).

Heavier traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections can be considered for areas subject to occasional truck traffic:

- Three inches of HMA placed over six inches of crushed rock base (CRB), or;
- Three inches of HMA placed over four-and-one-half inches of ATB.

The HMA, CRB and ATB materials should conform to WSDOT specifications. The City of Yelm minimum pavement requirements may supersede our recommendations and may require thicker pavement sections.

Installation of pavement subgrade drainage should be considered in areas where inverted crown pavements are used and where unweathered glacial till is exposed at the pavement subgrade elevation. Such drainage measures can consist of finger drains at catch basin locations. A lack of subgrade drainage under the conditions described above will likely result in extremely accelerated distress to pavements in low areas.

Drainage

Groundwater seepage was not observed in the test pits excavated during the June 2022 subsurface exploration. Nevertheless, groundwater may be encountered depending on the time of year earthwork activities occur and depth of excavations. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, infiltration trenches, and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures or slopes. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Infiltration Feasibility

We understand on-site stormwater infiltration is being considered for the proposed project. An evaluation of infiltration feasibility and pertinent design recommendations are provided in this section.

PACLAND	ES-8688
July 26, 2022	Page 10

Because the site is underlain by soil that was not consolidated by glacial advance, we used the Soil Grain Size Analysis Method outlined in the referenced 2019 SWMMWW, adopted by the City of Yelm, to determine infiltration design parameters. The following equation was utilized to determine an initial, uncorrected infiltration rate:

 $\log_{10}(K_{sat}) = -1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08f_{fines}$

The lowest initial uncorrected rate from the test pit samples was used and must be reduced by the correction factors outlined in the 2019 SWMMWW. Accordingly, the following parameters are recommended for infiltration design:

Initial K _{sat}	175.8 inches per hour
• CF_v (site variability; number of locations tested)	0.33
• CFt (test method)	0.40
• CFm (degree of influent control)	0.90
Design K _{sat}	20.0 inches per hour

Discussion

Based on our field observations and analysis, the native soil is feasible for infiltration design from a geotechnical standpoint. We acknowledge that final site layouts and/or designs may affect infiltration feasibility, concerning maximum allowable setbacks from structures and property lines. Infiltration facilities should extend through the upper organic topsoil and at least one foot into the clean gravel and sand at depth. Clean gravel and should be encountered beginning at a depth of roughly one to two feet bgs across most of the site.

ESNW can provide further evaluation and recommendations for site BMPs as plans develop. ESNW should review final stormwater management plans to provide supplementary recommendations, as needed.

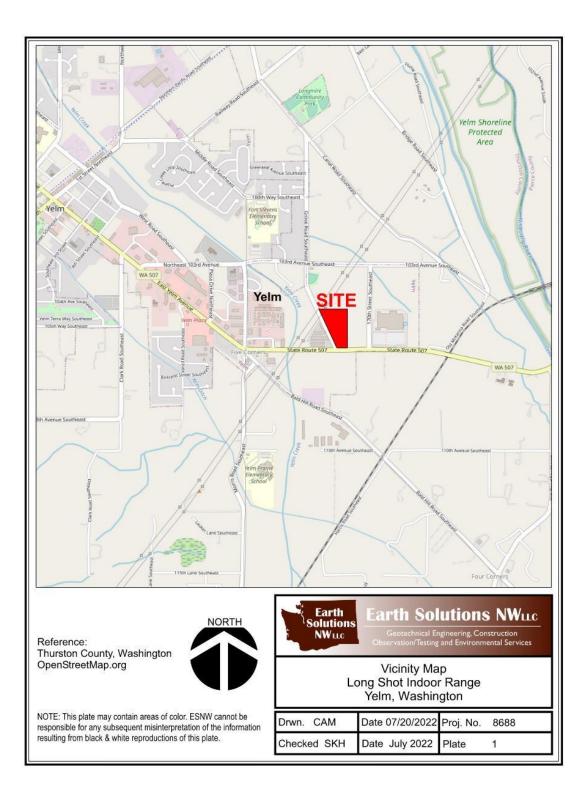
LIMITATIONS

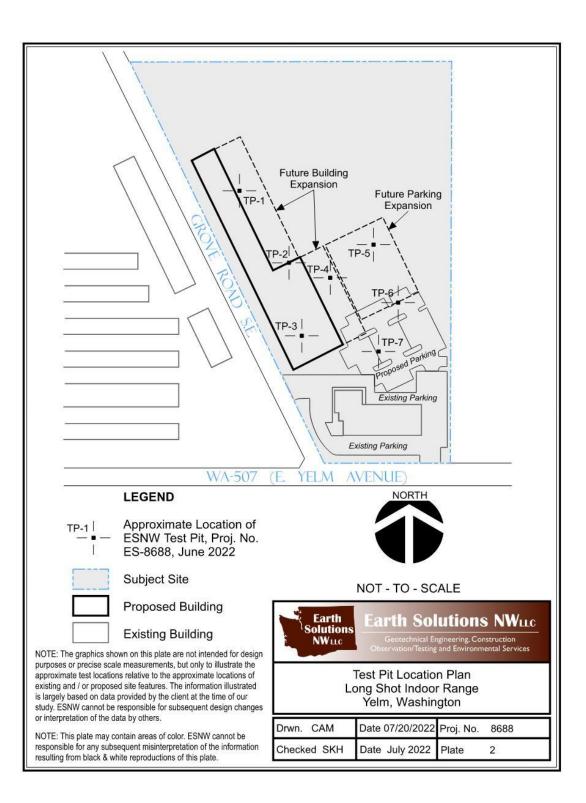
This study has been prepared for the exclusive use of PACLAND and their representatives. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. No warranty, express or implied, is made. Variations in the subsurface conditions observed at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this study if variations are encountered.

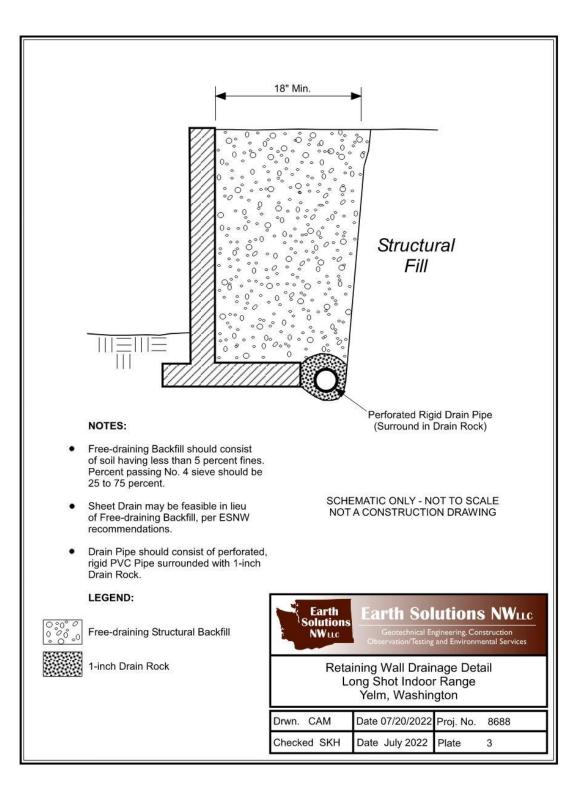
PACLAND July 26, 2022 ES-8688 Page 11

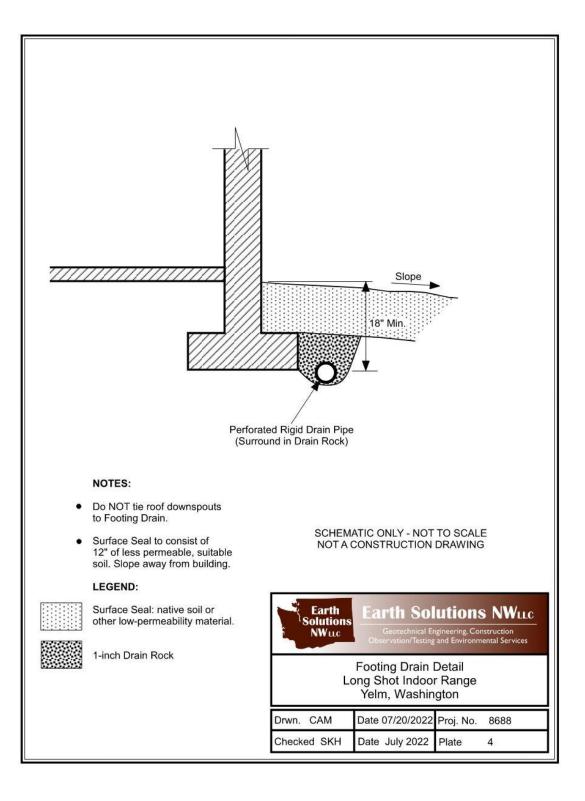
Additional Services

ESNW should have an opportunity to review final project plans with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction. Provided that ESNW is retained during construction, we can provide supplementary recommendations for subgrade preparation, as necessary, where differing soil conditions are encountered.









Appendix A

Subsurface Exploration Test Pit Logs

ES-8688

ESNW explored on-site soil and groundwater conditions on June 23, 2022. Seven test pits were excavated using a mini-trackhoe and operator retained by ESNW. The test pits were completed within accessible areas of the subject site. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pit logs are provided in this Appendix. The test pits were excavated to a maximum depth of approximately 10 feet bgs.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

	301	L CLASSIF			
м	AJOR DIVISI	ONS	2 1987/00/00/2012/00/2018/00/2018	BOLS	TYPICAL
			GRAPH	LETTER	DESCRIPTIONS
	GRAVEL AND	CLEAN GRAVELS			WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED SOILS	MORE THAN 50% OF COARSE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	FRACTION RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND	CLEAN SANDS		sw	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SANDY SOILS	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
	FRACTION PASSING ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
				ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
30123				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE				МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		СН	INORGANIC CLAYS OF HIGH PLASTICITY
				ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
н	GHLY ORGANIC S	SOILS	<u> </u>	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Earth Solutions NWLLC SOIL CLASSIFICATION CHART

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

	Eart Soluti NW	000S Redmond	utions NW, LLC E. 90th Street, Si Washington 98 9: 425-449-4704 449-4711	052	TEST PIT NUMBER TP-1 PAGE 1 OF 1
DATE EXCA LOGG NOTE	STARTE VATION (ED BY _ S		COMPLE	TED _6/23/22	PROJECT NAME Long Shot Indoor Range GROUND ELEVATION 281 ft LATITUDE 46.93459 LONGITUDE GROUND WATER LEVEL: Image: Comparison of the excavation im
0. DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG		MATERIAL DESCRIPTION
 	GB GB	MC = 3.6% Fines = 1.1% MC = 3.9%	GW) Brown well-grade	3OIL, roots to 18" d GRAVEL with sand, medium dense, damp tion: extremely gravelly coarse SAND] 3OH
	GB_	MC = 5.9%		Test pit terminate encountered durir LIMITATIONS: G surveyed. Coordi this test log as a s	272.5 ad at 8.5 feet below existing grade due to caving. No groundwater ng excavation. Caving observed from 2.5 feet to BOH. round elevation (if listed) is approximate; the test location was not inates are approximate and based on the WGS84 datum. Do not rely on standalone document. Refer to the text of the geotechnical report for a anding of subsurface conditions.

	Eart Soluti NWL	h 15365 N.I ONS Redmond Ic Telephon	utions NW, LLC E. 90th Street, St , Washington 98 e: 425-449-4704 449-4711	052	TEST PIT NUMBER TP PAGE 1 OI	
DATE EXCA LOGG NOTE	STARTEI VATION (iED BY S		COMPLET	TED _6/23/22	PROJECT NAME Long Shot Indoor Range GROUND ELEVATION 280 ft LATITUDE 46.93424 LONGITUDE -122.58218 GROUND WATER LEVEL:	
O DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG		MATERIAL DESCRIPTION	
 2.5	GB	MC = 4.2%	TPSL 22 21.0		d GRAVEL with sand, medium dense, damp	279.0
 	GB	MC = 5.2%	GW			
<u>7.5</u> 			SP 7.5	Brown poorly grad	led SAND, medium dense, damp to moist	272.5
	<u> </u>	<u>MC = 8.8%</u>	<u>) </u>	Test pit terminated excavation. Cavir LIMITATIONS: Gr surveyed. Coordii this test log as a s	d at 9.0 feet below existing grade. No groundwater encountered during ng observed from 2.0 feet to BOH. ound elevation (if listed) is approximate; the test location was not nates are approximate and based on the WGS84 datum. Do not rely on tandalone document. Refer to the text of the geotechnical report for a anding of subsurface conditions.	271.0

	Eart Soluti NW	000S Redmond,	tions NW, LL 90th Street, Washington 9: 425-449-47 449-4711	Suite 100 98052	TEST PIT NUMBER TP-3 PAGE 1 OF
DATE EXCA LOGG NOTE	STARTE	CONTRACTOR N	IW Excavating	ETED <u>6/23/22</u>	PROJECT NAME Long Shot Indoor Range GROUND ELEVATION 281 ft LATITUDE 46.93387 GROUND WATER LEVEL: ✓ ✓ AT TIME OF EXCAVATION AFTER EXCAVATION
o. (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG		MATERIAL DESCRIPTION
 <u>2.5</u>	GB	MC = 5.6%			ed GRAVEL with sand, medium dense, damp
 <u>5.0</u> 	GB	MC = 7.1% Fines = 2.3%	G G G G G G G G G G G G G G G G G G G		on: extremely gravelly coarse SAND]
	- <u></u> <u>G</u> B J	MC = 4.6%	لاميا لر	Test pit terminated encountered during LIMITATIONS: Gro surveyed. Coordir this test log as a sl	27. I at 6.5 feet below existing grade due to caving. No groundwater g excavation. Caving observed from 2.5 feet to BOH. bound elevation (if listed) is approximate; the test location was not lates are approximate and based on the WGS84 datum. Do not rely on tandalone document. Refer to the text of the geotechnical report for a inding of subsurface conditions.

	Ear Soluti NW	001S Redmond,	itions NW, LL 90th Street Washington 9: 425-449-4 449-4711	, Suite 100 98052	TEST PIT NUMBER TP-4 PAGE 1 OF 1
DATE EXCA LOGG NOTE	STARTE VATION (ED BY _ S		COMP	LETED <u>6/23/22</u>	PROJECT NAME Long Shot Indoor Range GROUND ELEVATION 280 ft LATITUDE 46.93409 BROUND WATER LEVEL: Image:
o (ft) (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG		MATERIAL DESCRIPTION
 <u>2.5</u> 	GB	MC = 3.1%		1.0 Brown poorly grad -slight caving to B	led GRAVEL with sand, medium dense, damp
 <u>- 5.0</u> 	GB	MC = 3.6% Fines = 0.7%	6 6 6	USDA Classificat	ion: extremely gravelly coarse SAND]
<u>7.5</u>	GB	MC = 22.9%		-becomes damp	y wet
	<u>GB</u>	MC = 5.7%		Test pit terminated excavation. Cavir LIMITATIONS: Gr surveyed. Coordii this test log as a s	271.0 d at 9.0 feet below existing grade. No groundwater encountered during ng observed from 2.0 feet to BOH. ound elevation (if listed) is approximate; the test location was not nates are approximate and based on the WGS84 datum. Do not rely on tandalone document. Refer to the text of the geotechnical report for a anding of subsurface conditions.

	Eart Soluti NW	ONS Redmond	E. 90th 3 , Washi e: 425-4	Street, Su ngton 980 449-4704		TEST PIT NUMBER TP-5 PAGE 1 OF 1
DATE EXCA LOGG NOTE	STARTE VATION (ED BY _ S		0	avating CHECKED	ED _6/23/22	PROJECT NAME Long Shot Indoor Range GROUND ELEVATION 279 ft LATITUDE 46.93431 LONGITUDE -122.58157 GROUND WATER LEVEL: ✓ AT TIME OF EXCAVATION
O DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
	GB	MC = 4.2%				d GRAVEL with sand, medium dense, damp
 	GB	MC = 4.9% Fines = 0.7%	GP		-slight caving to BC	on: extremely gravelly coarse SAND]
 <u>10.0</u>	— <u>, GB</u>	MC = 3.6%			Test pit terminated excavation. Caving LIMITATIONS: Gro surveyed. Coordina this test log as a sta	269.0 at 10.0 feet below existing grade. No groundwater encountered during gobserved from 3.0 feet to BOH. und elevation (if listed) is approximate; the test location was not ates are approximate and based on the WGS84 datum. Do not rely on andalone document. Refer to the text of the geotechnical report for a nding of subsurface conditions.

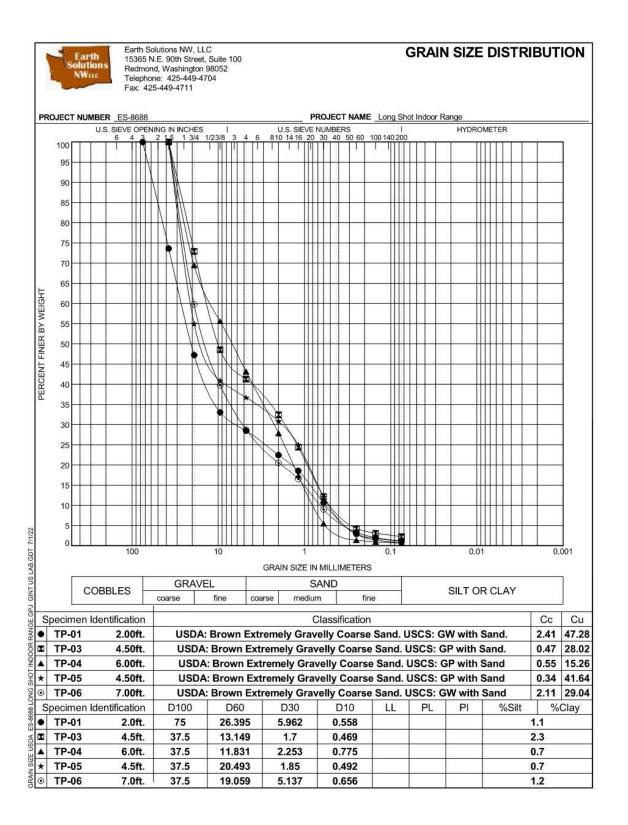
	Ear Soluti NW	001S Redmond	, Washingto e: 425-449-	et, Suite 100 on 98052	TEST PIT NUMBER TP-6 PAGE 1 OF 1
DATE EXCA LOGG NOTE	STARTE		W Excavat	PLETED _ 6/23/22	PROJECT NAME Long Shot Indoor Range GROUND ELEVATION _280 ft LATITUDE _46.9339 GROUND WATER LEVEL: Q AT TIME OF EXCAVATION
O DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC	20	MATERIAL DESCRIPTION
 	GB	MC = 5.0% MC = 5.1% Fines = 1.2%	GW	USDA Classifica	tion: extremely gravelly coarse SAND]
	- <u></u>	MC = 4.4%	SP	9.5 Test pit terminate excavation. Cavi LIMITATIONS: G surveyed. Coord this test log as a	270.5 ad at 9.5 feet below existing grade. No groundwater encountered during ing observed from 2.5 feet to BOH. around elevation (if listed) is approximate: the test location was not linates are approximate and based on the WGS84 datum. Do not rely on standalone document. Refer to the text of the geotechnical report for a tanding of subsurface conditions.

	Eart Soluti NW	ONS Redmond	E. 90th , Wash e: 425-	Street, S ington 9 449-470	Buite 100 TEST FTI NOMBER TP 8052 PAGE 1 OI	
DATE EXCA LOGG NOTE	STARTE VATION (ED BY _ S	CONTRACTOR 1	((COMPLE avating CHECKE	PROJECT NAME Long Shot Indoor Range ETED 6/23/22 GROUND ELEVATION 281 ft LATITUDE 46.93371 LONGITUDE -122.5817 ED BY HTW GROUND WATER LEVEL:	
O DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
 <u>2.5</u>	GB	MC = 17.6%	TPSL	<u>不</u> 不 <u> </u>	Dark brown TOPSOIL, roots to 18" 0 Brown well-graded GRAVEL with sand, medium dense, moist to wet -slight caving to BOH	280.0
 - <u>-</u> 	GB	MC = 4.8%	GW		-becomes damp	
	<u></u> GB_	MC = 5.3%		8	0 Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation. Caving observed from 3.0 feet to BOH. LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.	<u>273.0</u>

Appendix B

Laboratory Test Results

ES-8688



Report Distribution

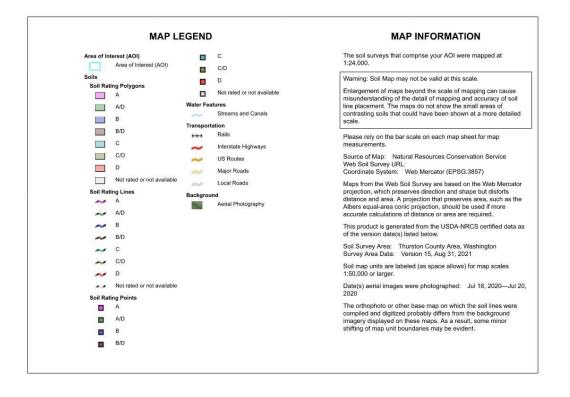
ES-8688

EMAIL ONLY PACLAND 6814 Greenwood Avenue North Seattle, Washington 98103

Attention: Mr. Darian Murray



Hydrologic Soil Group—Thurston County Area, Washington



USDA Natural Resources Conservation Service Web Soil Survey National Cooperative Soil Survey 8/10/2022 Page 2 of 4 Hydrologic Soil Group—Thurston County Area, Washington

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
110	Spanaway gravelly sandy loam, 0 to 3 percent slopes	A	7.4	100.0%
Totals for Area of Inter	est		7.4	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

SDA Natural Resources Conservation Service Web Soil Survey National Cooperative Soil Survey 8/10/2022 Page 3 of 4 Hydrologic Soil Group—Thurston County Area, Washington

Component Percent Cutoff: None Specified Tie-break Rule: Higher



Natural Resources Conservation Service Web Soil Survey National Cooperative Soil Survey 8/10/2022 Page 4 of 4

MEMORANDUM

DATE:	August 10, 2022
TO:	City of Yelm
FROM:	Spenser Haynie TENW
SUBJECT:	Traffic Scoping Memo Long Shot Indoor Range Expansion – Yelm, WA TENW Project No. 2022-183

This memorandum documents the preliminary traffic information for the proposed Long Shot Indoor Range Expansion project for the purpose of establishing a scope of work for the Traffic Impact Analysis (TIA). This memo includes a project description and trip generation estimate.

Project Description

The existing Long Shot Indoor Range site is located at 16910 SR 507 in Yelm as shown in the Attachment A Site Vicinity Map. The existing site includes a 9,850 square foot (SF) building consisting of retail and storage space. The proposed expansion project is anticipated to be built in two (2) phases. Full buildout of the proposed expansion is expected to include 34 shooting bays (22 shooting bays in Phase 1 + 12 shooting bays in Phase 2).

Vehicular access to/from the existing Long Shot Indoor Range site is currently provided by two (2) full access driveways: one (1) each on Grove Road SE and SR 507. No changes to vehicular access are proposed as part of the proposed expansion project. A preliminary site plan is provided in **Attachment B**.

Project Trip Generation

The most recent version of the Institute of Transportation Engineers (ITE) *Trip Generation Manual* does not include a land use category for a shooting range. Therefore, trip generation estimates for the proposed project were based on an alternative approach using Land Use Code (LUC) 432 (Golf Driving Range). A golf driving range was assumed to be comparable to a shooting range based on the general operational characteristics of both (similarity between the independent variable of shooting bays and driving tees, the presence of a "pro shop or small refreshment facility" per the ITE definition, general hours of operation, etc).

Based on the addition of 34 shooting bays, the resulting weekday PM peak hour trip generation estimate associated with the full buildout of the proposed Long Shot Indoor Range Expansion project is summarized in **Table 1**. Detailed estimates are included in **Attachment C**.

These estimates are likely conservative in that no reductions were made to account for existing customers who currently use the existing facility without the range and would therefore already be at the facility without generating new vehicle trips.

Long Shot Indoor Range - Trip Generation Summary							
	New Trips Generated						
Time Period	In	Out	Total				
Weekday PM Peak Hour	19	24	43				

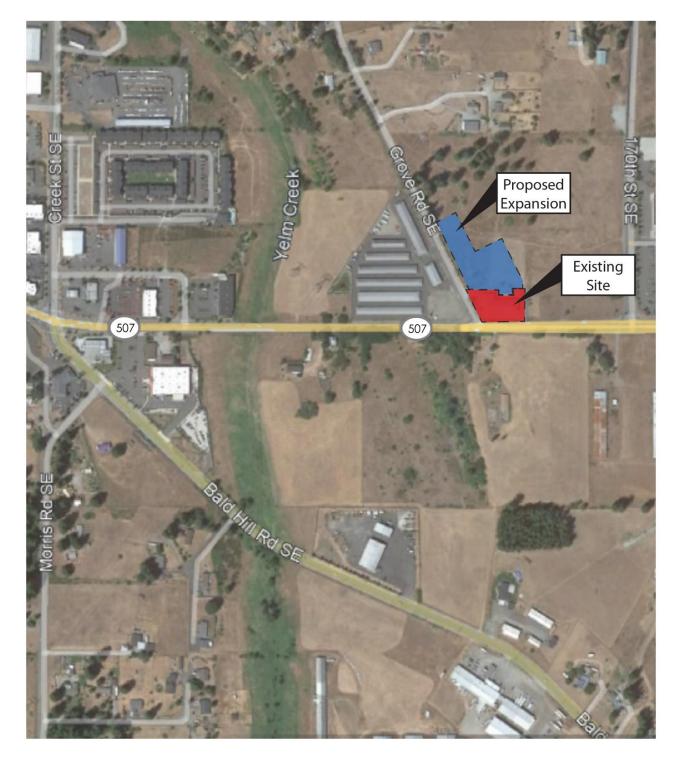
Table 1

Next Steps

Upon your review of the above trip generation, we would like to confirm if any additional traffic impact analysis would be required to complete your review of the proposed Long Shot Indoor Range project.

If you have any questions regarding the information presented in this Traffic Scoping Memo, please contact me at (206) 390-7253 or <u>spenser@tenw.com</u>.

- Darian Murray Pacland CC: Chris Forster, PE – TENW
- Attachments A. Project Site Vicinity
 - B. Preliminary Site Plan
 - C. Trip Generation Calculations





Attachment A: Project Site Vicinity





Attachment B: Preliminary Site Plan

ATTACHMENT C

Trip Generation Calculations

Long Shot Indoor Range (Yelm) Weekday Trip Generation Summary

		ITE	Trip Rate or	Directional Distribution		Trips Generated		
Land Use	Units ¹	LUC ^{2, 3}	Equation ²	In	Out	In	Out	Total
PM PEAK HOUR								
Proposed Use:								
Shooting Range	34 Bays	432	1.25	45%	55%	19	24	43
				New PM Pea	k Hour Trips =	19	24	43

<u>Notes:</u> ' Bays = Shooting Bays.

² Based on Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, 2021.

³ There is no Land Use Code (LUC) for a shooting range. LUC 432 (Golf Driving Range) was assumed to be a comparable land use type.



LONG SHOT INC.

LONG SHOT INDOOR RANGE

SITE VICINITY



DEFERRED SUBMITTALS

(REQUIRED FOR BUILDING PERMIT)

SUBMITTAL 1 SUBMITTAL 2 2.

BUILDING ENVELOPE

THE PROJECT OWNER/DEVELOPER WILL ENGAGE THE SERVICES OF A THIRD PARTY INSPECTOR TO INSPECT THE EXTERIOR ENVELOPE DURING THE COURSE OF CONSTRUCTION FOR COMPLIANCE WITH THE BUILDING ENCLOSURE DESIGN AND FILE INSPECTION REPORT TO JURISDICTION. IF REQUIRED, PRIOR TO FINAL OCCUPANCY, SUBMIT A FOLLOW-UP REPORT TO JURISDICTION NOTING CORRECTIVE MEASURES TAKEN.

THE COMPLETED BUILDING SHALL BE TESTED, AND THE AIR LEAKAGE RATE OF THE BUILDING ENVELOPE SHALL NOT EXCEED 0.25 CFM/FT2 AT A PRESSURE DIFFERENTIAL OF 0.3 INCHES WATER GAUGE (2.0 L/S X M2 AT 75 PA) AT THE UPPER 95 PERCENT CONFIDENCE INTERVAL IN ACCORDANCE WITH ASTM E 779 OR AN EQUIVALENT METHOD APPROVED BY THE CODE OFFICIAL. A REPORT THAT INCLUDES THE TESTED SURFACE AREA, FLOOR AREA, AIR BY VOLUME, STORIES ABOVE GRADE, AND LEAKAGE RATES SHALL BE SUBMITTED TO THE BUILDING OWNER AND THE CODE OFFICIAL. IF THE TESTED RATE EXCEEDS THAT DEFINED HERE BY UP TO 0.15 CFM/FT2, A VISUAL INSPECTION OF THE AIR BARRIER SHALL BE CONDUCTED, AND ANY LEAKS NOTED SHALL BE SEALED TO THE EXTENT PRACTICABLE. AN ADDITIONAL REPORT IDENTIFYING THE CORRECTIVE ACTIONS TAKEN TO SEAL AIR LEAKS SHALL BE SUBMITTED TO THE BUILDING OWNER AND THE CODE OFFICIAL AND ANY FURTHER REQUIREMENT TO MEET THE LEAKAGE AIR RATE WILL BE WAIVED. IF THE TESTED RATE EXCEEDS 0.40 CFM/FT2, CORRECTIVE ACTIONS MUST BE MADE, AND THE TEST COMPLETED AGAIN. A TEST ABOVE 0.40 CFM/FT2 WILL NOT BE ACCEPTED.

**SEE SITE PLAN FOR ADDITIONAL INFORMATION. SEE CODE REVIEW SHEET A-003 FOR MORE INFORMATION.

SHEET LIST	
ARCHITECTURAL	
A-001	COVER SHEET
A-002	ABBREVIATIO
A-003	CODE REVIEW
A-004	EGRESS PLAN
A-101	SITE PLAN
A-102	SITE FEATURES
A-200	FOUNDATION
A-201	PLAN - FLOOI
A-202	ENLARGED PI
A-203	ENLARGED PI
A-204	REFLECTED C
A-205	REFLECTED C
A-206	ROOF PLAN
A-301	ELEVATIONS
A-401	BUILDING SEC
A-501	WALL SECTIO
A-502	WALL SECTIO
A-503	WALL SECTIO
A-504	WALL SECTIO
A-505	ENTRY CANO
A-506	STAIRS
A-601	ASSEMBLIES
A-602	ENVELOPE DE
A-603	GENERAL DE
A-701	INTERIOR ELE
A-702	INTERIOR ELE
A-801	SCHEDULES
A-802	SPECIFICATIC
A-803	SPECIFICATIC

A-A-901

BUILDING INFORMATION

BUILDING DESCRIPTION: NEW INDOOR SHOOTING RANGE SHOOTING RANGE BUILDING, INCLUDING A 100 METER AND 25 METER RANGE, PRO-SHOP, STORAGE/LOCKER, GUN MAINTENANCE, AND TRAINING FACILITIES.

MODEL CODE: CONSTRUCTION TYPE: NUMBER OF STORIES: **BUILDING HEIGHT:** OCCUPANCY TYPE:

BUILDING AREA:

SITE AREA:

2018 IBC VA 28' (TO TOP OF PARAPET) M, B, S-1, A-3 (MIXED USE)

16910 STATE ROUTE 507 SE, YELM, 98597 SITE ADDRESS:

PARCEL #'s: SOUTH PARCEL: 64303100800 NORTH PARCEL: 64303100801

ABBREVIATED LEGAL DESCRIPTIONS: MC KENNA IRR TR L8 BLK 31 THAT PTN DAF BEG AT X ELN SSH #5- H N419. 5F W233F MC KENNA IRR TR L8 BLK 31 LESS PTN DAF BEG AT X ELN L8 & NL N SSH K

JURISDICTION: CITY OF YELM

MASTER FILE # _ LAND USE APPROVAL ON

**SEE SITE PLAN FOR ADDITIONAL INFORMATION

DESIGN TEAM

<u>OWNER:</u> LONG SHOT INC. 16910 STATE ROUTE 507 YELM, WA 98597

CONTACT: JASON PEARSON PHONE: 360-400-4010 EMAIL: EVP@LONGSHOTIR.CC

ARCHITECT: THOMAS ARCHITECTURE STUD 525 COLUMBIA ST SW OLYMPIA, WA 98501 PHONE: 360-915-8775

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CIVIL ENGINEER/LANDSCAPE PACLAND 6814 GREENWOOD AVE N SEATTLE, WA 98103 PHONE: 206-522-9510

CONTACT: BILL FORTUNATO EMAIL: BFORTUNATO@PACLA

STRUCTURAL ENGINEER: PCS STRUCTURAL SOLUTIONS 1250 PACIFIC AVE, SUITE 701 TACOMA, WA 98402

CONTACT: JEFF KLEIN PHONE: 253-383-2729 EMAIL: JKLEIN@PCS-STRUCTURAL.COM

36,860 SF

387,684 SF (8.9 ACRES)

ONS & SYMBOLS

)n plan OR 1 PLAN - FLOOR 1 PLAN - FLOOR 2 CEILING PLAN - FLOOR 1 CEILING PLAN - FLOOR 2

ONS ONS SNC ONS OPY

Details ETAILS EVATIONS EVATIONS

IONS IONS PERSPECTIVES

MECHANICA M1.01 M1.02 M1.03 M1.04 <u>ELECTRICA</u> M1.01 M1.02 M1.03

M1.04 **STRUCTURAL** M1.01 M1.02 M1.03 M1.04

FIRST FLOOR PLAN SECOND FLOOR PLAN THIRD FLOOR PLAN FOURTH FLOOR PLAN

FIRST FLOOR PLAN SECOND FLOOR PLAN THIRD FLOOR PLAN FOURTH FLOOR PLAN

FIRST FLOOR PLAN SECOND FLOOR PLAN THIRD FLOOR PLAN FOURTH FLOOR PLAN



O \sim Т \mathbf{S}

	HULTZ BHU 1111 FAWCETT AVE, SUITE 100 TACOMA, WA 98402
ОМ	CONTACT: RICK HULTZ PHONE: 253-383-3257 EMAIL: RICKH@HULTZBHU.COM
DIOS	<u>ELECTRICAL ENGINEER:</u> CROSS ENGINEERS 923 MARTIN LUTHER KING JR WAY TACOMA, WA 98405 PHONE: 253-759-0118
A.COM	CONTACT: SCOTT KELLY EMAIL: SCOTTK@CROSSENGINEERS.COM
E ARCHITECT:	<u>RANGE DESIGNER:</u> INVERIS TRAINING SOLUTIONS 296 BROGDON RD SUWANEE, GA 30024 PHONE: 612-710-3031
AND.COM	CONTACT: ELTON STEELE EMAIL: ELTON.STEELE@INVERISTRAINING.COM
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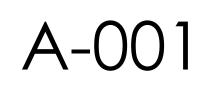
MECHANICAL ENGINEER:

Project No: 2212

DESIGN DEVELOPMENT

JULY 25, 2022

COVER SHEET



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