OAK HARBOR HEARING EXAMINER
MARCH 27, 2025, at 2:00 P.M.

City Hall Council Chambers
865 SE Barrington Drive
Oak Harbor, WA 98277

The Hearing Examiner and the public may attend virtually or in-person at City Hall, Council Chambers.

To participate virtually from your web browser, use the following link:
https://www.microsoft.com/en-us/microsoft-teams/join-a-meeting
Meeting ID: 294 187 676 289
Passcode: vy2h2s73

AGENDA

1. **Call to Order**

   a) **Oak Heights Preliminary Plat and Planned Residential Development (PRD) Project 2408-0047:**
   The applicant is proposing a 219-lot subdivision including a mix of 153 single-family lots and 66 duplex lots to be located at the southwest corner of SW 24th Avenue and State Route 20 on parcels R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, and R13210-364-1900.

2. **Adjourn**

Oak Heights Preliminary Plat, PRD and Associated Permits
Staff Report to Hearing Examiner

APPLICATION:

The Hearing Examiner will consider an application for a Preliminary Plat and PRD for a new subdivision consisting of 153 new single-family lots, 66 new duplex lots, new public roads and sidewalks, stormwater detention facilities, open spaces and associated utility improvements on approximately 36.7-acres of land.

PROJECT INFORMATION:

Applicant: Nicole Mecum, 11241 Slater Avenue NE, Suite 200, Kirkland, WA 98033

Property Owner: Oaks Village 135 LLC, PO Box 787, Anacortes, WA 98221

Address of proposal: Southwest corner of SW 24th Avenue and State Route 20

Parcel Numbers: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900

Comprehensive Plan Designation: Subject site is designated Low Intensity Residential.

Zoning Designation: All parcels are zoned R-1, "Single-Family Residential."

Site Area: 36.7 Acres

Density: 6.0 dwelling units per acre

Lots: 219

Open space provided: 6.2 acres

Application Presented for Action:
Project # 2408-0047: Preliminary Plat, Planned Residential Development (PRD), Landscape Plan

---

Exhibits:

Exhibit 2	Zoning and Vicinity Map
Exhibit 3	Application Materials
Exhibit 4	Public Comments
Exhibit 5	SEPA Materials
Exhibit 6	Public Noticing

SITE GEOGRAPHY

The subject location is an approximately 36.7-acre site consisting of five separate tax parcels, currently mostly undeveloped. In the past, a duplex and single-family home existed on the site, but most development has been cleared in anticipation of development. A previously approved Preliminary Plat and PRD from 2019 have expired, and the new property owner and developer have chosen to redesign the project and start the application process fresh.

Generally, the site is slightly sloped, with some variation within the parcels, allowing for drainage of the site to the east under SR 20. There are areas of localized wetlands that have been delineated and noted in the attached application materials. The applicant has shown the buffer on the preliminary plat and has utilized the appropriate averaging calculations to ensure development is located outside the required distance. No protected Garry Oak trees are known to exist within

the project boundaries. There are no steep slopes on the property.

To the north and east of the proposed subdivision lies mostly low-density residential properties. A residential project of similar density is currently under construction to the west of the site. South of the site are generally agricultural lands with scattered residences at very low densities.

City staff will review civil plans, geotechnical reports and stormwater analysis to ensure the proper construction of utilities and infrastructure. The Hearing Examiner will not be making a decision on those plans and documents.

Land uses abutting the site include the following (see Exhibit 2, Zoning and Vicinity Map):

	Existing Land Use	Zoning
North:	Mobile home park	City of Oak Harbor: R-3 and R-4
South:	Undeveloped land	Island County: "Oak Harbor – Residential"
East:	Single-family homes	City of Oak Harbor: R-1
West:	Single family subdivision under construction and undeveloped land	City of Oak Harbor: R-2 and Island County: "Oak Harbor – Residential"

ANALYSIS:
INTRODUCTION
Application materials are found in Exhibit 3.

The proposed development consists of platting 219 new residential lots split between 153 single-family and 66 zero lot line/duplex lots. As noted in the application materials, the single-family lots proposed for this project meet the dimensional standards of the R-1 district for lot size, setbacks and building coverage. The portion of the project consisting of zero lot line/duplexes will be subject to PRD variations from the R-1 standards analyzed below.

Also included in the proposal is the construction of new public streets connecting to the existing and future proposed road network. Associated sidewalks, stormwater facilities, utilities and landscaping are proposed as part of the preliminary plat. Open spaces are shown per the standards of the PRD code and protection areas designated for existing wetlands on the site. Approximately 16.9 percent of the total area of the proposed subdivision is set aside as open space.

ANNEXATION AGREEMENT

The City and the property owners at the time entered into an annexation agreement in September 2009. Listed below are some of the points covered by the agreement:

- The applicant must extend SW Eagle Vista Drive westerly from its intersection with State Route 20 to the western edge of the property.
- The applicant acknowledged that downstream facilities are insufficient to meet the needs of the development of the annexation area and agreed to be responsible for all costs associated with on-site and off-site drainage facilities.
- The applicant agreed to dedicate land for a public park and also provide for multi-use trail through the annexation area.

Eagle Vista Drive is shown as a through street from SR 20 to the western boundary line of the site.

Staff has determined that since the time of the annexation agreement, some of the drainage infrastructure has been addressed. The applicant has met the requirements of the annexation agreement through the plans submitted for this subdivision and PRD. Subsequent dedication of park land and detailed development of the trail will be addressed in the Civil Plan review and final plat review by staff.

Land to be dedicated to the city will be reviewed and addressed by City staff as part of the final plat process. Documents formalizing that transfer will be drafted and signed by both parties at that time. This will be included as a condition of approval for this Preliminary Plat.

Two tracts are set aside to protect the delineated wetlands on the site per the standards of the OHMC. Additional tracts are included for stormwater facilities and open space areas in the subdivision.

Landscaping is proposed on a landscape plan for the above-mentioned common areas, frontage buffers and street trees.

If approved, the Preliminary Plat, PRD and subsequent permits would allow the applicant to remove vegetation, grade and fill land, install streets, utilities, and other infrastructure in preparation for the construction of 219 residences.

APPLICATIONS UNDER REVIEW

The proposed development review before the Hearing Examiner includes an application for a Preliminary Plat, Planned Residential Development (PRD), Landscape Plan and associated documents. A SEPA checklist was submitted with the project application and staff issued a Mitigated Determination of Non-significance (MDNS) on February 14, 2025. Comments were submitted by the applicant and a revised MDNS issued on March 12, 2025. The Applicant has submitted all necessary information as per the filing requirements prescribed in the Oak Harbor Municipal Code (OHMC).

- Preliminary Plat – The document that sets lot dimensions, street locations, public improvements, and other specific details for the subdivision itself. The Preliminary Plat approval allows the applicant to begin construction of the public improvements in advance of receiving Final Plat Approval when those improvements are completed and inspected by the City.
- Building elevations – The Planned Residential Development process allows applicants to mix smaller lots, modified setbacks and other variations to the underlying R-1 zone district in exchange for higher-quality home design, designated open spaces, additional landscaping and other improvements. Building elevations allow for review against these standards.
- Landscape Plan – Because the proposed project is a PRD and includes an open space areas and stormwater facilities, and the OHMC includes standards for street trees, landscape perimeters and native vegetation requirements, the Hearing Examiner will review an overall landscape plan for the subdivision.

The following items were submitted as part of the Preliminary Plat process but are reviewed by City staff and do not require action by the Hearing Examiner.

- Transportation Concurrency – The traffic impact of new households on the greater community is considered through the review of Transportation Concurrency. Based on the number of homes proposed and the number of automobile trips those homes will be expected to generate, the applicant will be required to pay an impact fee.
- State Environmental Policy Act (SEPA) Checklist – The applicant provided a SEPA checklist describing the project, identifying potential impacts and possible mitigation for those impacts. The checklist asks for details regarding wetland areas, endangered species, and traffic impacts.

Preliminary Plat

Oak Harbor Municipal Code (OHMC 21.20.080) and state law establish criteria for the review of preliminary plats. OHMC 18.20.260 outlines the steps by which a preliminary plat is reviewed. The City evaluates the preliminary plat and takes comments in a public hearing. Below, staff is providing responses to the review criteria to assist in the decision-making process.

Inquiry will be made into the public use and interest to be served by the establishment of the subdivision and make written findings regarding the following (from OHMC 21.20.070):

(a) Whether appropriate provisions have been made for, but not limited to, the public health, safety and general welfare, for open spaces, drainage ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and schoolgrounds, and all other relevant facts, including sidewalks and other planning features that assure safe walking conditions for students who walk to and from school.

Response:

- Public health, safety and general welfare: The applicant proposes to promote the public health, safety and welfare by including provisions for water and sewer utility connections, a public roadway and pedestrian connections to serve the residents of the project, and infrastructure to treat and channel stormwater runoff to the public stormwater system. These systems serve the larger community as well, providing alternate access for vehicular traffic, pedestrians, and utility connections.

- Open spaces: There is no minimum open space requirement for preliminary plats, however it is required for a PRD subdivision. Those requirements will be addressed in the following PRD section of this staff report. In addition, the applicant will pay impact fees which will be used to construct new parks and park capital facilities within Oak Harbor to serve the residents of this subdivision.

- Drainage Ways: The applicant is proposing that stormwater runoff from roadways and other hard surfaces will be collected and conveyed on the site to an on-site stormwater treatment and storage system before it is released to the city stormwater system.

- Transit stops: Bus routes exist currently along State Route 20. The nearest designated bus stop is located near the northeastern corner of the site, serving travelers going in both directions on respective sides of the roadway. Pedestrian access will be provided by public sidewalks and a system of pathways in the subdivision.

- Potable water: Each lot within the subdivision will be connected to the City's public water system, which meets state quality requirements. The City has planned for and can accommodate the growth in population on the subject site to serve it with potable water.

- Sanitary wastes: Each lot within the site will be served by the City's sewer and solid waste services. The capacity to serve the proposed subdivision is accounted for in the City's wastewater collection and treatment system.

- Parks and recreation, playgrounds: As noted above, the annexation agreement requires the dedication of park land and provision of a multi-purpose path within the annexation area. This land will be required to be dedicated upon final plat approval following inspection of infrastructure constructed and documentation provided by the applicant. Near the proposed subdivision, the city trail system is accessible from the Scenic Heights trailhead and Fort Nugent Park are both within approximately ½ mile of the subdivision. The applicant will pay an impact fee to help offset the City's cost of providing park and recreation facilities.

- Schools and school grounds: The Oak Harbor School District will serve the residents and children of the proposed subdivision for educational needs from kindergarten through grade 12. The residents of the subdivision will contribute to the funding of the school district through the payment of property taxes.

(b) Whether the public use and interest will be served by the platting of the subdivision and dedications(s)

Response:

- The public interest for this property is represented in part by the City of Oak Harbor Comprehensive Plan, which designates this site to be within the Low-Intensity Residential land use category. According to the Comprehensive Plan, the low-intensity residential category is "intended to accommodate most of the residential uses and to support low-intensity uses such as religious institutions, care facilities, schools etc., that create healthy livable neighborhoods."

- The applicant is proposing to subdivide the site to allow for construction of 216 residential units at a density conforming to the underlying zone district. At approximately 6 units per acre, the project falls within the required 3 to 9 units per acre required under the R-1 zoning.

  The applicant is proposing public facilities to serve the lots such as public water and sewer, which will help ensure that the public interest is served through the provision of safe, efficient utilities and transportation.

Also submitted with the Preliminary Plat application were preliminary civil plans and other supporting documents. These documents will be reviewed by staff for compliance with OHMC and conformance with the Preliminary Plat and any modifications or updates shall be submitted by the applicant, reviewed by staff, and completed as a part of Final Plat approval.

Planned Residential Development (PRD)

The proposed project utilizes the planned residential development (PRD) district provisions in Oak Harbor Municipal Code (OHMC) 19.31. The purpose of the PRD is to create a process to promote diversity and creativity in site design, and to protect and enhance natural and community features.

The unique aspect of the PRD process is that it includes requirements for open space, allows for variations in lot sizes and street standards, requires architectural drawings demonstrating the character

of the proposed development and demonstration of superior design components such as landscaping and reduction of impervious surfacing materials. The submissions defining these components for the final PRD are in addition to those required for the Preliminary Plat.

Just the portion of the project consisting of zero lot line/duplexes will be subject to PRD variations from the R-1 standards but the applicant is including PRD-required mitigations throughout the project.

PRD Review Criteria

The PRD approval will require that development shall conform in all major respects with the submitted plan sets. The Hearing Examiner's review and action on PRD applications shall be based on the following criteria from OHMC 19.31.170:

(1) Aside from the specific regulations, requirements or standards proposed to be varied, the project otherwise meets the requirements of the Oak Harbor Municipal Code.

Response: The project meets the requirements set forth in the Oak Harbor Municipal Code.

(2) Critical areas should be preserved and incorporated into the open space of the PRD. Buffer averaging and buffer enhancements shall qualify as preservation if such is recommended in an approved critical areas report.

Response: There are known wetlands on the site that have been identified and delineated per the standards of the OHMC and other applicable regulations. Based on this information, the applicant proposes to preserve and protect those wetland areas by buffering development and providing proper stormwater treatment and drainage. City staff has reviewed and approves of the plans and will work with the developer to monitor the development in the area and ensure the proper protections and mitigation actions are taken. Based on a comment from the Washington Department of Ecology, additional information will be required to be provided by the applicant ensuring that the site is not intruding on wetland areas not addressed in the original application.

(3) If smaller lot sizes and dimensions or decreased setbacks are proposed from what is required by the underlying zoning, buildings on these lots must meet requirements (3)(a) through (c) of this section or requirement (3)(d) or requirement (3)(e) of this section:

(a) Garage walls facing the street must be no closer than the wall containing the main entrance, or to the edge of a covered porch or deck if provided.

(b) A garage door wall which faces the street must not be more than one-half of the facade width.

(c) The main entrance must be prominent, easily visible and directly accessible from the street frontage.

(d) No two adjacent buildings on the same side of the street may have the same front setback. Setbacks must alternate from building to building. Minimum front setback variation must be two feet or greater.

(e) Residential buildings are accessed from an alley at the rear of the lots.

Response: The applicant proposes zero-lot-line or duplex units on a portion of the site. To achieve this, a request to vary from the setback requirements of the underlying district is

proposed. Staff concurs with the requested process, as the provision of some duplex units in the development does not cause the project to exceed the allowed density of the underlying zoning, and is in compliance with, and follows the intent of the R-1 district – which is to provide low density housing in the community. The Comprehensive Plan combines the R-1, R-2 and R-3 zones as the same "low intensity residential" land use, providing a nexus to consider both R-1 (single family) and R-2 (duplex) development as consistent and complementary.

Setbacks for the proposed units will be a minimum of 5 feet on one side of the lot, zero on the other side, and 10 feet on both front and rear. Driveway lengths will be required to be at least 20 feet in length to allow for parking without impeding pedestrian or vehicular traffic. Lot dimensions and building coverage are requested to be varied as well, allowing for 25-foot-wide lots and 55% lot coverage. Additional landscaping is proposed in this portion of the plat to break up large areas of hardscape.

As noted in the applicant's PRD Compliance response, the buildings in these areas will include varied front setbacks to meet the criteria of (3)(d), thereby in compliance with this section.

(4) If nonresidential uses are included in the PRD, such uses shall be easily accessible to pedestrians, meaning that primary building entrances are oriented to the street and set back no more than 10 feet from the property line or a six-foot-wide pedestrian path is included connecting the nearest public sidewalk to the primary entrance of the secondary use.

Response: No such uses are proposed.

(5) Ten percent common open space is provided which complies with OHMC 19.31.110 through 19.31.130.

Response: The applicant has provided a mix of open spaces including active and passive spaces totaling 5.73 acres. With over 3.1 acres set aside as active and 2.5 acres as passive open *spaces, the overall total meets the standard of the OHMC.*

(6) The PRD shall comply with all of the following adopted standards:

> *(a) The requirements of OHMC Title 21, Subdivisions. Variations from the requirements in OHMC Title 21 may be requested and reviewed as part of the PRD application. Other than the specific standards being varied from, PRDs must meet all applicable standards of OHMC Title 21, including the general design standards (Chapter 21.50 OHMC) and the residential design standards (Chapter 21.60 OHMC).*

Response: Planning and Engineering staff review has found the application to be in compliance with the above-referenced sections. Minor variations may exist and will be addressed in the civil and construction phases of the project. Staff will ensure such details as number and location of specific trees, infrastructure, amenities and other items will be provided to meet standards set forth in the OHMC.

> *(b) The standards and requirements of this chapter. If there is a conflict between the standards of this chapter and the standards in OHMC Title 21, the standards in this chapter shall take precedence.*

Response: Staff will address this at the appropriate time if needed.

(c) The Oak Harbor comprehensive plan policies.

Response: The proposed use is consistent with Comprehensive Plan policies regarding housing and is compatible with the surrounding uses. The land use element of the Comprehensive Plan identifies specific land uses within the city to allow for the cohesive and logical growth of the city. These land use designations are intended to reduce potential conflicts between uses, provide appropriate connections and relationships with compatible uses, reduce encroachment upon NAS Whidbey, and provide sufficient land area for appropriate developments. The location of this plat has been identified as being appropriate for low-density residential uses to accommodate increases in population in Oak Harbor.

The zoning for the site of the plat is R-1 Single-Family Residential, which corresponds with the Comprehensive Plan land use designation. R-1 is the lowest density residential zone within the city. PRD developments and their allowed flexibility of particular zone district regulations are permitted in this location. The characteristics of the proposed plat (including density, lot configuration, setbacks, open space, etcetera) all meet the standards defined in the Comprehensive Plan and OHMC.

The portion of the plat with greater residential density is located near more densely zoned properties to the north and the SR 20 corridor, forming a logical transition from future multifamily development and the single family development proposed by this application.

(d) The design guidelines and regulations (DRG), if applicable.

Response: As a primarily single-family project, the DRG document does not apply. However, staff has reviewed the architecture of the buildings and found them to be compatible with the standards and requirements of the PRD section of the OHMC, which is the controlling document in this situation.

(e) All other standards adopted by the city of Oak Harbor, including engineering details and drawings.

Response: As noted above, the civil plans, building permits and other reviews and permits will be reviewed against appropriate regulations by staff.

(7) Applicants must meet either subsection (7)(a) or (b) of this section:

(a) Enhanced design which includes one or more of the following on each building within the development:

(i) A variety of exterior building materials such as brick, stucco, stone, and wood used as primary siding or as accent materials on front facades; or

(ii) Building articulation (offsetting walls, inclusion of windows, changes in material types) on side and rear walls of buildings; or

(iii) Side- or rear-loaded garages; or

(iv) Other applicant-proposed building design enhancements.

(b) Optional site design elements which includes one or more of the following:

(i) Low impact development stormwater techniques are employed on the site.

(ii) Ten percent or more of units within the development are qualified affordable housing as defined by OHMC 19.08.695.

(iii) Inclusion of a mix of residential and nonresidential uses within the development.

(iv) Fifteen percent or more of the gross area is open space.

(v) The project will not only preserve but enhance or rehabilitate the functions and values of a critical area of the site, such as significant woodlands, wildlife habitats, streams or wetlands, subject to the recommendations in an approved critical areas report. (Ord. 1567 § 2, 2010).

Response: The applicant has chosen to meet the standards of subsection (7)(b)(iii) by providing approximately 6.2 acres of open space – roughly 16.9% of the site. Staff notes that the design of the proposed buildings in the subdivision also meet the standards of (7)(a)(i) and (iv) by the inclusion of upgraded facades and landscaping in both the developed lots and tract areas. The proposed architectural elevations show a variety of materials including horizontal lap siding, board and batt, shingle siding and composition roofing. Building articulation is provided through the use of architectural variation, prominent front porches, gables on the second floor and selected recessed garages.

Landscape Plan

For subdivision plats, landscaping standards are set forth in OHMC 19.44 and 21.60 – the applicant has provided a Landscape Plan to show compliance with those standards. Primary design elements for this subdivision are the open space tracts, streetscape, entrance areas and road frontages, and perimeter.

On the eastern edge of the development along the SR 20 frontage, the applicant shows a 20-foot landscape buffer as required by the OHMC and DRG document standards for the State Highway Heritage Way landscape plan. Additional landscaping exists beyond that space as well, providing a significantly larger buffer than required.

Perimeter landscaping is provided in the form of a required buffer with trees spaced at 25 feet. This buffer shall be installed with the construction of the subdivision and not individually with single homes.

Native vegetation is provided per the standards of the OHMC and is concentrated in areas near the existing wetlands and walking paths. Other trees and landscaping are interspersed among the open space areas, with seating and other amenities provided.

Landscaping in the public rights-of-way is shown per the standards of the OHMC. Staff recommends native groundcovers rather than grass in park strips for ease of maintenance and reduced water need. Street trees will be required to be selected from the Seattle Department of Transportation Street Tree list and it is recommended to mix several species to limit potential disease spread or demise of all street trees in a worst case scenario.

Details may be subject to change slightly to allow for design flexibility, but the required elements will be required as part of the final subdivision approval and staff will inspect the site before final plat approval to ensure that they are included in the finished project.

Public Comment

Staff received a number of comments from the public after the initial notice of application (see comments in Exhibit 4). Several concerns were raised about the increase in traffic resulting from the construction of new homes in the vicinity. Staff points to the traffic study and future improvements to be constructed as a part of the subdivision development as well as future plans in place for SR 20 improvements by the Washington State DOT.

Other comments discussed potential contamination and pollution generation impacting neighboring wetland areas and drainages. All stormwater facilities are required to treat pollution and control flow per the Western Washington Stormwater Manual. Staff will work with the applicant during the civil review process and construction phases to ensure water quality standards are met.

Two comments referencing the same parcel brought up privacy concerns that will be mitigated through the application of PRD standards requiring a landscape buffer around the site as well as site fencing proposed by the applicant.

A potential connection to undeveloped land adjacent to the site was noted. Staff has included a requirement to confer with city staff to determine the viability of an additional connection to provide for a complete gridded street connection in that area.

SEPA Checklist

Staff reviewed the SEPA checklist as part of the project review and determined that minor negative impacts were to be expected, and appropriate mitigations could be utilized through the Mitigated Determination of Non-significance (MDNS) process. The MDNS was issued on February 14, 2025 and one comment from the applicant was received during the comment period asking for clarification and removal of language on phasing of the project. Staff issued a revised MDNS on March 12 without reference to phases and an appeal deadline of March 26. In the interim, a comment from Washington Department of Ecology was received regarding a potential wetland area not delineated. Staff has included this concern as a condition of approval. Other mitigations from the MDNS are included as conditions of approval for this preliminary plat to ensure compliance.

No further action regarding the SEPA determination is required.

REVIEW PROCESS SUMMARY

The Oak Harbor Municipal Code details the process by which a subdivision is approved. This staff report and supporting documents are designed to assist the City in making a decision that is rooted in Oak Harbor municipal requirements as well as State statute. The decision process includes the staff review of the application, preparation and presentation of the staff report, a public hearing, and subsequent decision. As outlined in OHMC 21.20.080, the effect of an approval is as follows:

1. The applicant may develop construction plans for the proposed improvements, based in "strict conformance with the approved preliminary plat, street and utility standards adopted by the city, and any special conditions required by the council."

2. The construction of said improvements are not to begin until all plans have been approved in writing by the City Engineer.

In plain language, the plans submitted for review and approval must meet the City's adopted standards, because if approved, the applicant is authorized to develop the construction plans based on those plans approved by the City.

CONCLUSION

Based on the information provided by the Applicant and the thorough review and analysis conducted through the application process, staff finds the Applicant has sufficiently addressed the requirements of the OHMC relating to the Preliminary Plat, PRD and Landscape plan, subject to the conditions of approval below.

LEGAL NOTICE – (see Exhibit 6)

A Notice of Application and notice to neighboring property owners were mailed and posted on September 9, 2025, and published on September 14, 2025. The Notice of Public Hearing for the Preliminary Plat and associated permits was posted on site, at City Hall and online, as well as mailed to adjacent property owners on March 7, 2025, and published in the Whidbey News Times on March 8, 2025.

PUBLIC COMMENTS

Public comments are available in Exhibit 4 and addressed by staff in the report above.

RECOMMENDED ACTION

Staff recommends that the Hearing Examiner conduct the public hearing and approve the above—referenced applications subject to the following conditions of approval:

CONDITIONS OF APPROVAL
OAK HEIGHTS PRELIMINARY PLAT, PRD, LANDSCAPE PLAN AND ASSOCIATED DOCUMENTS

Preliminary Plat

1. The applicant's final plat document, landscape plans, architectural design and associated permits shall be in general conformance with the approved preliminary plat drawings entitled "Oak Heights Preliminary Plat/PRD," and dated August 7, 2024 and attached as Exhibit 3.

2. Applicant shall coordinate with the United States Postal Service for approval of mailbox location(s).

3. Wetland buffering shall meet the standards of OHMC 20.24.030(5), including but not limited to the equalization of the area utilizing buffer averaging. Such buffer areas shall be posted and protected per the standards of OHMC 20.24.

4. The applicant shall coordinate with city staff to complete the dedication of a public park per the annexation agreement of September 2009.

PRD Standards

5. For zero lot line/duplex buildings, no two adjacent buildings on the same side of the street may have the same front setback. Setbacks must alternate from building to building. Minimum front setback variation must be two feet or greater.

6. Exterior design shall be in general conformance with the conceptual plans submitted by the applicant and included as part of Exhibit 3.

Landscaping

7. Landscaping shall be designed and installed per the standards of OHMC 19.46 and 19.31.

8. The applicant shall post a three-year maintenance bond to ensure landscaping completion and a minimum plant survival of 80 percent at the end of three years. The type of bond shall be approved by the City and must be submitted on forms supplied by the City of Oak Harbor. The approved bond shall be posted with the Development Services Department prior to the issuance of a building permit. The bond amount shall be 150 percent of a landscaping maintenance bid amount submitted and approved by the City. The bid amount must include labor and materials.

9. Any signage proposed for the subdivision is not approved with the Preliminary Plat and PRD. A separate sign permit shall be required and approved before any permanent signage including subdivision identification, is placed.

10. Perimeter landscaping is provided in the form of a required buffer with trees spaced at 25 feet and ground cover as per the standards of OHMC 19.46 and 19.31. This buffer shall be installed with the construction of the subdivision and not individually with single homes.

SEPA

11. Further field investigation be conducted to confirm the original conclusions from the submitted wetland report about the lack of a wetland area in the northeastern corner of the site.

12. The development of this property is subject to an Annexation Agreement (AFN #4260219) between the City and the property owners and requirements under such agreement shall be met.

13. The intersection of SR 20/SW 24th Avenue is forecast to operate at LOS F in the future prior to the development of the project. The project will contribute to additional total traffic and potential delay. To mitigate increased delay and improve accessibility to SR 20 for the project and surrounding area, improvements at two intersections will occur. The intersection improvements may include eliminating left turn movements at the intersection of SR 20/SW 24th Avenue; and the construction of a compact roundabout at the intersection of SR 20/SW Eagle Vista Avenue. These improvements will alleviate operational issues that are anticipated to occur regardless of the project and will be completed jointly by the developer and the City of Oak Harbor. The specific design of these improvements will occur through coordination with Oak Harbor and WSDOT. Upon approval of the compact roundabout the developer shall commence construction of the improvements. If approval of the plans/permit are unreasonably delayed, Certificates of Occupancy shall be issued with an appropriate surety bond for the cost of the compact roundabout provided by the Developer.

14. All improvements and measures included in the SEPA checklist to mitigate impacts and shall be implemented in accordance with the proposed phasing plans, and in accordance with the approved preliminary plat including but not limited to the following conditions:

a. Design and build channelization improvements, approved by Washington State Department of Transportation, at the intersection of SR 20 and SW 24th Avenue, and SR 20 and SW Eagle Vista Drive. Construction of improvements must be scheduled during low traffic seasons to minimize impacts to mobility and access.

b. Offsite drainage improvements proposed downstream shall be completed in Phase 1 development.

15. Wetland buffers to be maintained, averaged, and enhanced in accordance with the submitted Critical Areas Report and Habitat Management Plan

16. Landscape buffers along streets, detention basins, pathways, and the highway must be completed with each associated phase unless a delay is justified to target a specific planting season. Deferment shall be in accordance with OHMC 19.46.130.

17. Grading, land clearing, and other site work shall be in accordance with OHMC 12.30 and 19.47 and commence only after the preliminary plat has been approved.

18. The development will be required to utilize construction stormwater and erosion control BMPs in compliance with City of Oak Harbor and Department of Ecology requirements.

19. The applicant shall sign a copy of the City's Inadvertent Discovery Plan (IDP) and make a copy of the IDP available onsite during construction.

Clearing and Grading Plan

20. All BMPs shall be followed during clearing and grading of the property, and during the duration of the project as required by the approved civil drawings.

Plat Drawing

21. Prior to approval of final plat, the applicant is required to submit a copy of all proposed deed restrictions and covenants.

22. The applicant shall include dedication language on the face of the final plat as stated in OHMC 21.40.040.

Engineering

23. Applicant shall coordinate with city staff on a potential street and utility connection to undeveloped property in the vicinity of proposed lot 177.

24. Following approval of the preliminary plat by the city, the subdivider shall submit to the city engineer the applicable plans and other documents, review fees as set out in Title 21 and the city's fee schedule, and three complete sets of construction plans and specifications (sheet size 22 inches by 34 inches) prepared by an engineer registered in the state of Washington showing all improvements as required in granting the preliminary plat. Such plans must be submitted and approved by the city engineer prior to beginning any grading work on the site. OHMC 21.30.020(1)

25. All construction plans and specifications shall be in conformance with the city street and utility standards, as may be modified by this approval. The subdivider shall indicate, either on the plans or by separate document, the engineer retained to provide certification of all improvements. Approval shall expire five years from the date of initial preliminary plat approval. OHMC 21.30.020(2)

26. A performance bond in the amount of 112 percent of the cost to construct required and uninstalled improvements may be posted in lieu of the complete installation of improvements; provided, that such bond is recommended by the city engineer. All

deferred improvements shall be completed within two years from the date a bond has been accepted or the city will use securities to complete. The performance bond shall specify exactly what improvements are included, accompanied by a time schedule for completion. In lieu of the performance bond, the developer may provide for other security approved by the city council at the next regularly scheduled council meeting following the city engineer's approval of construction plans. OHMC 21.30.020(3)(c)

27. Before acceptance of the improvements by the city, a maintenance bond or other security acceptable to the city shall be posted by the developer jointly obligating the developer, or some other party acceptable to the city, and a security, acceptable to the city, guaranteeing these improvements from any defects caused by faulty workmanship, materials, or design or combination thereof for a period of two years from the date of written acceptance of the improvements. The amount of bond or other security requested shall be determined by the city engineer, but in no event shall the amount be less than 10 percent of the cost of the improvements. OHMC 21.30.020(3)(f)

28. Stormwater facilities are subject to final civil and construction plan review and may be subject to revisions based on submitted calculations and sizing of said facilities.

29. Transportation and park impact fees shall be paid before building permits are issued per the standards of OHMC 3.63.020.

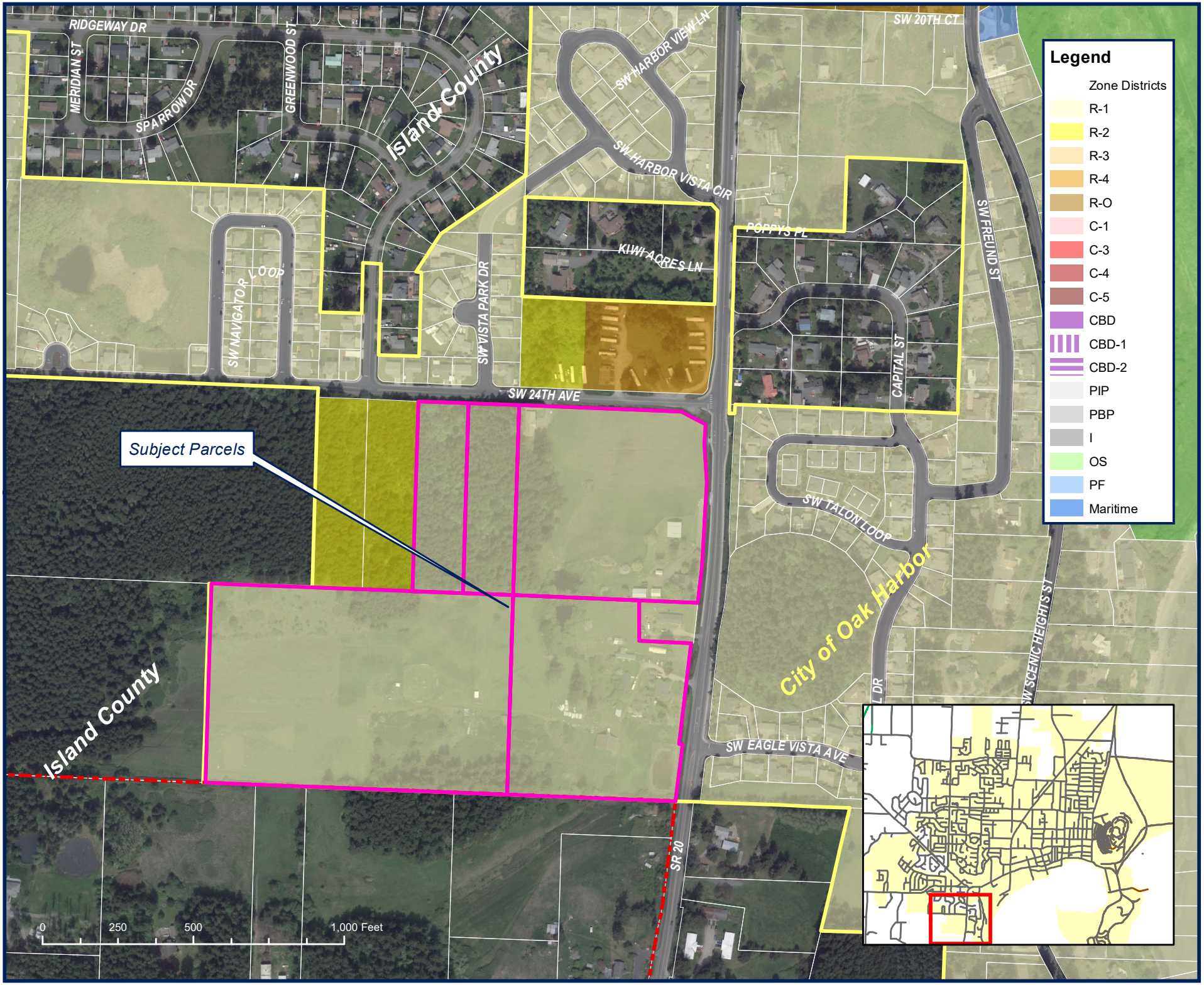


Exhibit 2 - Zoning and Vicinity Map

City of Oak Harbor
Development Services Department
865 SE Barrington Drive, Oak Harbor, WA 98277
http://www.oakharbor.org

Phone: 360-279-4510

Summary Application

Project Information

Project Name: Oak Heights Preliminary Plat / PRD

Project Address: 30433 SR-20, Oak Harbor, WA 98277

Description of Work: Preliminary Plat / PRD 36.69 acres into 219 residential lots for both single-family detached homes and duplex homes.

Assessor Parcel Number(s): R13210-295-1480; R13210-298-2300; R13210-362-2330; R13210-364-1730; R-13210-364-1900

Land Area (sq. ft. or acres): 36.69 Acres Zoning District: R-1

What is the Project Valuation (best guess, if necessary) $_____

Applicant Information

Applicant Name: SSHI, LLC dba D.R. Horton Attn: Clint Lucas

Address: 11241 Slater Avenue NE, Suite 200

City/State: Kirkland, WA Zip: 98033 Phone/Fax: 425-821-3400

Email: CBLucas@drhorton.com

Applicant's Interest to Property* (check one):

☒**Owner** ☐**Owner's Agent** ☐**Lessee** ☐**Contractor** ☐**Licensed Architect** ☐**Licensed Engineer**

☐**Other (specify)**_____

Primary Contact (if other than applicant)

Name: Nicole Mecum

Address: Same as above

City/State: _____ Zip: _____ Phone/Fax: _____

Email: NEMecum@drhorton.com

Property Owner(s) (if other than applicant)

Name: Same as Applicant

Address: _____

City/State: _____ Zip: _____ Phone/Fax: _____

Email: _____

*Documentation demonstrating authorization to sign applications on behalf of the Owner(s) is required.

All Persons/Firms having an ownership interest in the property:

Name: _____ Phone: _____

Name: _____ Phone: _____

Name: _____ Phone: _____

Architect / Engineer:

Name: DHI Engineering, LLC Address: 11241 Slater Avenue NE, Suite 200

City/State: Kirkland, WA Zip: 98033 Phone/Fax: 425-821-3400

Email: Clund@dhiengineering.com

Architect / Engineer:

Name: _____ Address: _____

City/State: _____ Zip: _____ Phone/Fax: _____

Email: _____

Contractor:

Name of Business: _____

Contact Person: _____

Address: _____

City/State: _____ Zip: _____ Phone/Fax: _____

Email: _____

WA State Contractors License: _____

City of Oak Harbor Business License: _____

Authorization

I declare under penalty of the perjury laws that the information I have provided on this form/application is true, correct, and complete.

8/6/24

Applicant Signature* Date

*Documentation demonstrating authorization to sign applications on behalf of the Owner(s) is required.

Permit Type (check all that apply)

☐ Building ☒ Land Use ☐ Engineering ☐ Grading Only ☐ Land Clearing Only ☐ Demolition Only

☐ Residential Construction ☐ Commercial Construction

Permits Requested (check all that apply)

☐ Accessory Dwelling Unit	☐ Final Plat	☒ SEPA Review
☐ Annexation	☐ Grading	☒ Site Plan
☐ Appeal	☐ Land Clearing	☐ Short Plat
☐ Binding Site Plan	☐ Lot Combination	☐ Shoreline
☐ Boundary Line Adjustment	☐ Pre-Application	☒ Transportation Concurrency
☐ Civil Plan Review	☒ PRD	☐ Variance
☐ Conditional Use	☒ Preliminary Plat	☐ Zoning Code Text Amendment
☐ Other		

Are you requesting to process the applications individually per OHMC 18.20.360(1)?
☐ Yes ☒ No

Project Details (fill in all applicable sections)

Ground Disturbance: ☒ Yes ☐ No If yes, completes the following questions:

Is disturbance greater than 100 cubic yards? ☒ Yes ☐ No

Type of equipment to be used Tractor, Dozer, Backhoe, Roller, Water Truck

Total cubic yards of excavation 133,970 Total cubic yards of fill 129,320

Critical Areas:
Does the site contain a critical area as defined in OHMC 20.12.030(2) ☒ Yes ☐ No ☐ Unknown

If yes, please state critical area type(s) Two Wetlands both Type IV

Shoreline:
Is construction planned within 200 feet of ordinary high water? ☐ Yes ☒ No ☐ Unknown

Floodplain:
Is the project site/property/or portions of the property within a floodplain? ☐ Yes ☒ No ☐ Unknown

*Documentation demonstrating authorization to sign applications on behalf of the Owner(s) is required.

Stormwater:

Will the completed project result in 2,000 or more square feet of impervious surface? ☒Yes ☐No ☐Unknown

Total replaced new and impervious surface (in sq. ft) 968,687 square feet

What is the stormwater facility type(s) proposed to be used for the project? Water Quality / Detention within ponds

Project Details (fill in all applicable sections)

Land Clearing: ☒Yes ☐No If yes, complete the following questions:

Percentage of land to be cleared 93% Types of vegetation to be removed Pasture land, treed areas

Garry Oaks on the property? ☐Yes ☒No Estimated date of clearing April 2025

Type of equipment to be used TBD

Transportation Concurrency:

Licensed Traffic Engineer Dan McKinney - Transpo Phone 206-550-8795 Email dan.mckinney@transpogroup.com

Total length of public streets 6,115 feet Total length of private streets 790 feet of Access Tracts

Existing property use Vacant

Land Use Data:

Sq ft of new construction TBD

Existing property use Vacant

Proposed Property Use Residential

Housing Type Proposed Single-family detached & duplex

Proposed Number of Buildings 186

Number of Existing Dwelling Units None

Number of Proposed Dwelling Units 219

Number of Existing Parking Spaces None

Number of New Parking Spaces 1,022 spaces

Number of Existing Lots Five

Number of New Lots Proposed 214

Proposed Density 5.97 units per acre

*Documentation demonstrating authorization to sign applications on behalf of the Owner(s) is required.

DHI Engineering, LLC
11241 Slater Avenue NE
Suite 200
Kirkland, WA 98033
(425) 821-3400 x 5119

Oak Heights Preliminary Plat / PRD
Project Narrative
July 30, 2024

Applicant:	Nicole Mecum – D.R. Horton
	NEMecum@drhorton.com
Parce No:	R13210-295-1480
	R13210-298-2300
	R13210-362-2330
	R13210-364-1730
	R13210-364-1900
Site Acreage:	36.69 Acres
Existing Zoning:	R-1
Comp. Plan:	Low-Intensity Residential

Summary:
The Village at Garry Oaks project received MDNS on January 18, 2019, and Preliminary Plat approval on October 1, 2019, from the City of Oak Harbor. However, based on significant price increases related to site construction and other economic conditions, the project has not substantially progressed and was sold to D.R. Horton on March 15, 2024. D.R. Horton is seeking a new Preliminary Plat/PRD entitlement to include 219 residential units. The site has been designed to integrate single family detached homes on 40-foot wide and 50-foot-wide lots, as well as duplex homes on 25-foot wide and 30-foot-wide lots. 6.22 acres of open space will be provided including active and passive space, trails, and natural preserved areas. An additional 3.17 acres is also provided in stormwater ponds.

Deviation from Standard:
OHMC 19.31.040 acknowledges PRD applications for residential development and the approval thereof may involve variation in regulations, requirements and standards of the zone in which the project is located. The Oak Heights PRD has been designed with both single family detached and duplex units. The duplex lot widths have been reduced to 25 feet and 30 feet wide from the 40-foot wide standard in the R-1 zone. Furthermore, the lot coverage on the duplex lots is approximately 55%, which exceeds the 45% lot coverage in the R-1 zone.

The variations from the standards have been requested to facilitate the duplex units that will provide for a variety of housing options within the PRD while meeting the higher design and open space standards of the PRD. The overall site density is 5.97 units per acre, which is right in the middle of the permitted density range of 3 to 9 units per acre and is consistent with the provisions of the Comprehensive Plan.

Access:
Three points of vehicle access have been proposed for the site. An access via SR-20 at Eagle Vista Drive will be a 60-foot right of way and extend to the project's westerly boundary. An 8-foot-wide multi-use trail is proposed along one side of this roadway extension. A second vehicle access is proposed via SW 24th Avenue aligned with W Vista Park Drive. A third vehicle access is planned via SW 24th Avenue connecting to the recently developed Ridgeway Heights plat. In addition, a road stub has been planned to the west and

two additional stubs are planned to the south for future connections. A Traffic Analysis has been prepared by The Transpo Group evaluating the access locations, trip generation and intersection operations. Please refer to The Transpo Group report dated July 2024 for further details.

Water and Sewer:
Water and sewer service will be provided by the City of Oak Harbor. Water is planned to connect the water main in SW 24th Avenue and the water main in SR-20. A minimum 10" water main has been anticipated, looping through the community with 8" waterlines within residential streets. Sewer will flow via gravity throughout the plat and connect to the manhole in SR-20 at the intersection with SW Eagle Vista Avenue. According to the City of Oak Harbor, no deficiencies exist for water or sewer as long as a minimum 10" water main is provided in the PRD.

Storm:
A majority of the site drains to the east where two storm facilities have been proposed. A third pond has been proposed in the southwesterly portion of the property to accommodate that portion of the site draining southwest. Stormwater facilities will be designed to meet the City's current stormwater regulations. The outfall route from the easterly storm ponds will be consistent with the prior approval, utilizing the SR-20 culvert crossing plan and existing easements easterly of SR-20. The Southwesterly stormwater pond will implement dispersion along the southern boundary to release the water within its natural flow path location. In addition, a portion of stormwater from roofs will be routed to dispersion trenches to maintain wetland hydrology around Wetlands A and B.

Wetlands:
Wetlands A and B are known to exist on the property. Prior analysis associated with the approved preliminary plat concluded both wetlands were category IV with a 50-foot buffer. Wetland Resources conducted a field visit and prepared an updated Critical Area Report and Habitat Management Plan dated June 27, 2024, to re-evaluate the wetlands to ensure the wetland functions, values, and habitat scores have not changed. Wetland A was determined to have a habitat score of 15 and Wetland B a habitat score of 14. Both wetlands were categorized as Type IV with a 50-foot buffer. Please refer to the Wetland Resources Report for additional detail.

Recreation and Open Space:
6.22 acres of active recreation area and passive open space has been incorporated into the site design. Active open space along the SR-20 frontage within Tract I totaling 2.799 acres has been designed to include walking paths, resting locations with benches, and ample room for enhanced landscaping with the intention of planting Garry Oak trees in strategic locations. The trails in this area connect to the subdivision which includes walking paths around Wetlands A and B and a path connecting to the Plat of Ridgeway Heights adjacent to the west. A .336 acre active park area has been planned for Tract F and includes a children's play area, walking path, benches, landscaping, trash receptacle, etc. Tract H is .122 acre and is directly across the street from Tract F. While not meeting the width requirement for an active park, it provides a trail that connects to the trail system around Wetland A which connects to the trails in Tract I. Its location to the park in Tract F will

increase the feeling of open space at the intersection. The active open space meeting the provisions of OHMC 19.31.110 totals 3.135 acres.

Passive open space is provided in Tracts A and B which encompass the two on-site wetlands and their buffers. This passive open space totals 2.59 acres.

Additional open space has been provided in several other Tracts (including Tract H noted above) totaling.49 acre. These tracts contain trail segments and parks that do not meet the depth, width, or size requirement of OHMC to be counted as active park. The three stormwater ponds will be landscaped with native vegetation and provide an additional 3.17 acres of open space.

Project Phasing and Schedule:
D.R. Horton intends to commence site construction as soon as clear and grading permits can be issued. Ideally, the project will receive preliminary plat approval late in 2024 with early clear and grade approval in early spring 2025, final engineering approval in early summer of 2025. D.R. Horton intends to record the final plat in two phases (Phase 1 in spring/summer of 2026 and Phase 2 approximately 10 months later). The proposed phasing line is indicated on the preliminary plat map.

Project Team:
During the city review, if questions arise or additional information is needed, please reach out to Nicole Mecum as the primary contact. Additional team member contact information:

1. Applicant:

   SSHI LLC dba D.R. Horton
   11241 Slater Avenue NE, Suite 200
   Kirkland, WA 98033
   Attention: Nicole Mecum / Kathy Orni
   (425) 821-3400
   NEMecum@drhorton.com
   Keorni@drhorton.com

2. Civil Engineer:

   DHI Engineering, LLC
   11241 Slater Avenue NE, Suite 200
   Kirkland, WA 98033
   Attention: Colin Lund / Preston Longoni
   (425) 821-3400
   Clund@dhiengineering.com
   Pjlongoni@dhiengineering.com

3. Land Surveyor:

   Harmsen, LLC
   840 SE 8TH Avenue, Suite 102
   Oak Harbor, WA 98277
   Attention: Harley Pawley, P.L.S
   (360) 675-5973

4. Traffic Engineer:

   The Transpo Group
   12131 113th Avenue NE, Suite 2
   Kirkland, WA 98034
   Attention: Dan McKinney
   (425) 821-3665

5. Wetland Biologist:

   Wetland Resources
   9505 19th Avenue SE, Suite 106
   Everett, WA 98208
   Attention: Scott Brainard, PWS
   (425) 337-3174

DHI Engineering, LLC

DHI Engineering, LLC
11241 Slater Avenue NE
Suite 200
Kirkland, WA 98033
(425) 821-3400 x 5119

The Preliminary Plat/PRD of Oak Heights
Comprehensive Plan Analysis

July 30, 2024

Summary:

The Applicant has proposed a PRD associated with the Oak Heights preliminary plat. The intent of the PRD is to allow for a portion of the site to be developed with duplex housing to facilitate the creation of varying housing choices within the community. The site is Zoned R-1 (3-9 units per acre) and the Comprehensive Plan Land Use Designation of the property is Low-Intensity Residential (3 to 16 units per acre).

Overall Comprehensive Plan Analysis:

Chapter 3 of the City's Comprehensive Plan describes Land Use Elements and more specifically Land Use Distributions. Under the Low-Intensity Residential use it notes:

"The Low-Intensity Residential category is intended to accommodate most of the residential uses and to support low-intensity uses... Residential densities in this category range from a minimum of 3 units per acre to a maximum of 16 units per acre. This land use category is implemented by three zoning districts: Single Family Residential (R1), Limited Multifamily Residential (R2) and Multifamily Residential (R3)."

As noted, the site is zoned R-1 with a density range of 3 to 9 units per acre. The planned 219 units over the 36.69-acre site equated to 5.97 units per gross acre. This density is in the middle of the 3 to 9 density range permitted under the R-1 zone and well under the 16 units per acre maximum as specified in the Comprehensive Plan. Based on the city's Comprehensive Plan's description of the Low-Intensity Residential land Use, the planned 219 units is consistent with the existing Land Use Designation.

Chapter 6 of the City's Comprehensive Plan describes the Housing Elements. Under this section it notes:

"As part of the 2016 Update, Island County is considering policies to encourage more of the projected growth to occur within the UGA."

The Oak Heights project is located within the City's UGA and is consistent with the Island County's statement to encourage growth to occur within the City jurisdictions.

Chapter 3 Land Use Goals and Policies Analysis:

Goal 1 – Promote a healthy mix of uses.

Policy 1.a. – Encourage land use densities/intensities where services exist or are readily available.

The Oak Heights property will be served by sanitary sewer and domestic water. The site is also adjacent to SR-20, which provides bus service by Island Transit. The property is located less than one mile from a major shopping center in downtown Oak Harbor. Based on the existence of readily available services to the property, the planned densities are consistent with this policy.

Policy 1.d. – Promote areas for open space and recreational opportunities within residential development.

The project has been designed with 6.22 acres of open space comprised of active parks, passive open space, wetlands, and trails (excludes storm ponds). A large active open space area adjacent to the SR-20 frontage includes trails, landscaping, and seating areas. There is an opportunity to plant several Garry Oak trees in this area to reinforce the iconic tree presence within the city. At the recommendation of city Staff, the applicant will work with the Oak Harbor Garry Oak Society to source native trees. Tract F provides for active recreation for community members with the including of a children's play area, walking path, benches, landscaping, etc. A smaller park has been planned on Tract J.

The proposal includes approximately 5,038 linier feet of trails that connect through the open space areas, provides access around the wetland buffers, and connects to the adjacent plat of Ridgeway Heights adjacent to the westerly boundary.

Based on the open space, trails, and on-site recreation planned, the project meets the Comprehensive Plan Policy to provide open space and recreational opportunities within the residential development.

Goal 4 – Promote a diverse and affordable housing stock.

Policy 4.b. – Support land use changes that accommodate higher density residential uses where services and utilities are available.

As noted under Goal 1 above, the site will be served with sanitary sewer and domestic water. The site is also adjacent to SR-20, which provides bus service. The property is located less than one mile from a major shopping center in downtown Oak Harbor. Based on the existence of readily available services and utilities to the property, the PRD will allow a portion of the property to be developed with duplex units providing a

higher density and lower price-point than a traditional single family detached home. The proposed PRD is consistent with this Policy.

Chapter 6 – Housing Element Goals and Policies Analysis:

Goal 1 – Ensure that adequate opportunities exist for low and moderate-income families to obtain affordable housing.

Policy 1.a. Provide land use policies and development regulations that allow for a variety of housing types and residential lifestyles to accommodate households in varying income ranges.

The proposed PRD provides the opportunity for duplex housing to be constructed on a portion of the site. The inclusion of duplex homes provides a variety of housing types within the community at a lower price point. The proposed PRD is consistent with this Policy.

Policy 1.b. – Encourage alternative housing types from the standard single-family residences by using contemporary building and planning concepts, including apartments, condominiums, small lot, zero lot line, attached patio, townhouse, and manufactured housing.

The planned PRD provides the opportunity for duplex housing to be constructed on a portion of the site. The inclusion of duplex provides a variety of housing options on smaller lots with a zero-lot line on the common wall side. Half of the duplex units will have garages at the rear of the units and front doors that open onto open space or Wetland A. The proposal is consistent with this Policy.

Goal 3 – Identify and provide sufficient and appropriate land for housing.

3.b. – Allow for a range of densities to ensure maximum choice in housing options.

The proposed PRD will include two housing options comprised of single family detached homes and attached duplex homes within the Oak Heights project. The proposal is consistent with the Policy.

DHI Engineering, LLC

DHI Engineering, LLC
11241 Slater Avenue NE
Suite 200
Kirkland, WA 98033
(425) 821-3400 x 5119

Oak Heights PRD Compliance

July 30, 2024

Overview:
A Planned Residential Development (PRD) is proposed in connection with the Preliminary Plat of Oak Heights to support a community with a variety of housing options including single family detached homes and duplex units. The site is zoned R-1 which permits a density range of 3 to 9 units per acre. There is no minimum lot area but the zone does require a minimum lot width of 40 feet and a maximum lot coverage of 45 percent.

The proposed site plan provides for 153 single family detached single family homes and 66 duplex homes. The detached single family detached homes meet the criteria of the R-1 zone including minimum lot width and lot coverage. To accommodate the planned duplex units, a PRD has been proposed to deviate from the minimum lot width and lot coverage criteria. The overall site density is 5.97 units per acre, well within the 3 to 9 units per acre of the R-1 zone.

The PRD regulations offer regulatory flexibility in return for higher quality site and architectural design with the intent of encouraging the design of more complete and sustainable neighborhood environments consistent with the City of Oak Harbor's comprehensive plan. The PRD regulations allow and promote design flexibility, pedestrian-oriented development, interconnectivity among uses, sensitivity to natural environments and natural features, and the coordination of development with adequate public facilities.

Analysis of Criteria:
OHMC 19.31.100 – Common open space shall be provided for use as recreational, park or environmental amenity for the collective enjoyment by occupants of the PRD project, and designed as follows:

1. Common open space shall comprise at least 10 percent of the gross area of the PRD.
2. Common open space shall not include public or private streets, driveways, buffers, screens, perimeter landscaping, parking areas of the required or provided yards for buildings or structures.
3. Common open space shall meet the requirements of OHMC 19.31.110 and 19.31.120.

The gross site area of the PUD is 36.69 acres. Ten percent of the total site area is 3.67 acres. Common open space meeting the criteria of OHMC 19.31.110 and 19.31.120 include the following Tracts:
Active Area OHMC 19.31.110

- *Tract F – Active park* *0.336 acre*
- *Tract I – Active trail, landscaping, resting areas.* *2.799 acres*

Total Active Open Space meeting the criteria: ***3.135 acres***

Passive Area OHMC 19.13.120

- *Tract A – Wetland A* *2.02 acres*
- *Tract B - Wetland B* *0.57 acre*

Total Passive Open Space meeting the criteria: ***2.59 acres***

Total combined Active and Passive Open Space: ***5.73 acres***

Several other open spaces including 3.17 acres of stormwater ponds and .49 acre of trail segments and additional park area are provided but do not necessarily meet the criteria of OHMC 19.31.110 & 120 and therefore have not been added to the calculation above. Based on the above analysis, the PUD meets the Open Space General requirements of OHMC 19.31.100.

OHMC 19.31.110 – Open Space Active Areas:

1. A minimum of 50 percent of all required open space in a PRD shall be "active" open space. Active open space provides opportunities for physical activity to residents of the PRD. Active open space must meet the following requirements:
    a. Be a minimum of 5,000 square feet in size to be counted towards the minimum 10 percent common open space requirement.
    b. The space must also have a minimum width of 50 feet and depth of 90 feet.
    c. Have a minimum of 40 feet of frontage on a public street.

    Tract F is an active neighborhood park area. Tract F exceeds 5,000 square feet, exceeds a width of 50 feet and depth of 90 feet and greatly exceeds 40 feet of frontage on a public street.

    Tract I is located adjacent to SR-20 and provides for large open space areas including an active trail and seating areas. Tract I exceeds 5,000 square feet, exceeds a width of 50 feet and depth of 90 feet and greatly exceeds 40 feet of frontage on a public street.

    While several other open space and trail tracts are provided, Tract F and Tract I area totals 3.135 acres which exceeds the threshold of 50 percent (1.84 acres) of the required open space to be available for active recreation. Based on the above analysis, the PUD meets the Active Area requirements of OHMC 19.31.100 (1).

2. Active areas shall contain such accessory or complementary structures and improvements as are necessary and appropriate for the benefit and enjoyment of residents of the project and shall include at a minimum:
    a. Pedestrian-oriented lighting
    b. Seating
    c. Signage indicating the operational hours and rules for the use of the open space.

d. Trach cans; and
e. An activity center such as children's play structure, tennis court(s) basketball court(s), walking/bicycling path(s) or a trail head kiosk at the entrance of a trail system.

The active park area within Tract F is planned to contain a children's play structure, ample seating opportunities, public trash cans, and will be posted with park rules and hours as maintained by the Oak Heights HOA.

The active open space and trail contained in Tract I along the site's frontage will contain a trail network that provides a meandering trail connecting the future extension of Eagle Vista Drive to SW 24th Avenue. There are three planned resting area with benches planned along this trail system. In addition, this trail will connect to the trail planned around wetland A and will provide a trial connection westerly into the adjacent Ridgeway Heights neighborhood.

Based on the above analysis, the PUD meets the Active Area requirements of OHMC 19.31.100 (2).

3. Active open spaces must be visible and accessible to users and not hidden behind residential lots.

   All active open space areas have been designed with significant frontage on public roadways. No Active open space is hidden behind homes. The duplex homes fronting on the open space within Tract I will have the front of the home opening onto the open space. The proposed active open space meets the visible and accessible criteria.

4. Active open spaces must have pedestrian connections to both sides of a residential block on which they are located.

   The active park in Tract F has been planned with frontage on both sides of the park and a walking path connecting both sides of the residential block. Likewise, the active trail and open space within Tract I provides a trail connection between the extension of SW Eagle Vista Drive and SW 24th Avenue, as well as connection points within the plat. The proposed active open space meets the pedestrian connection requirements.

5. All active open spaces shall be privately owned and maintained by the homeowner's association in accordance with the requirements of OHMC 19.31.130.

   All active open space areas are intended to be owned and maintained by the Oak Heights Homeowner's Association. The active open space meets the requirement of HOA ownership and maintenance.

6. Trails can count as active open space, provided they meet the minimum design requirements specified in the parks, recreation and open space plan.

   The City of Oak Harbor Parks, Recreation, and Open Space Plan dated 2019 includes Trail Policies which provide recommendations for trail design requirements.

   Under the Trail Policies (c)(i) Pedestrian Trails should have a maximum grade of 20%, have a minimum tread width of 6 feet and be gravel or asphalt. All the planned trails have been designed with grades less than 20%, maintain a width of at least 6 feet and will be gravel and/or asphalt (soft surface and 5 feet wide within wetland buffers).

   Under the Trail Policies (c)(ii) Bicycle/Multiuse Trails should have a maximum grade of 10%, have a minimum tread width of 8 feet and be gravel or asphalt. The multiuse trails planned for one side of the extension of SW Eagle Vista Avenue, within Tract I, and other segment locations will maintain a grade of less than 10%, will be 8 feet wide and will be asphalt or concrete.

   The planned trails within the Oak Heights PRD meet the criteria contained within the City of Oak Heights Parks, Recreation, and Open Space plan.

7. Fifty percent of storm water ponds may count as open space within the PRD. However, no more than 25% of the required 10% common open space in a PRD may be stormwater pond.

   The stormwater ponds have not been counted towards the required open space. However, they will be landscaped with native vegetation and will provide 3.17 acres of additional open space beyond the open space requirements outlined above.

OHMC 19.31.110 – Open Space Passive Areas:

Passive open space is not active open space which preserves natural areas and natural vegetation and provides scenic amenities to a PRD. Passive open space shall meet the following minimum requirements:

1. Passive open space may be no more than 50 percent of the total required open space in PRD's

   The primary passive open space areas are contained in Tract A and Tract B (Wetlands Aand B and their respective buffers). This passive open space totals 2.59 acres which exceeds the 1.84 acres of open space required. This area will also remain in native vegetation.

2. Preserved natural areas such as wetlands, streams, and woodlands, may count as passive open space.

Wetlands A and B and their associated buffer's total 2.59 acres. The intent is to preserve the wetlands and their buffers (soft surface trail and wetland recharge dispersion may be located in the outer buffer area).

3. Passive open space may include open fields and landscaped areas which are held in common by the Homeowners Association, but which do not contain any other improvements.

   Wetlands A and B will be preserved and maintained by the Homeowner's Association.

4. Passive open space shall be maintained in conformance with OHMC 19.31.130.

   The Oak Heights Homeowners Association will own and maintain all open space areas within the project.

OHMC 19.31.140 – PRD Perimeter:

The perimeter of the PRD shall be designed so as to minimize architectural or land use incompatibility of the PRD on adjacent properties and, conversely, to minimize undesirable impact of adjacent land use and development characteristics on the PRD. A building set back of 20 feet shall apply to all exterior boundary lines of the project.

The site has been designed to ensure a 20-foot structure setback will be achieved along all exterior boundaries of the PRD.

OHMC 19.31.170 – PRD Review Criteria:

The city shall base its review of the proposed PRD upon the following criteria:

1. Aside from specific regulations, requirements or standards proposed to be varied, the project otherwise meets the requirements of Oak Harbor municipal code.

   The Applicant has elected to overlay the PRD across the entire project, even though the single family detached residential units would comply with the underlying R-1 zoning requirements. To achieve the duplex units, a PRD is necessary to permit a lot width reduction from 40 feet to 25 feet and 30 feet and to permit lot coverage up to 55% for the duplex lots as opposed to 45% coverage in the R-1 zone. This flexibility is consistent with meeting the PRD criteria as outlined in this analysis.

2. Critical areas should be preserved and incorporated into the open space of the PRD. Buffer averaging and buffer enhancement shall qualify as preservation if such is recommended in an approved critical area report.

   Wetlands A and B will be preserved with native vegetation. Additional open space has been provided around both wetlands. Wetland A is immediately adjacent to Tract I, a large open space area containing trails and landscaping. No

buffer averaging has been proposed. A soft surface trail and wetland recharge dispersion is planned in the outer edge of the wetland buffers as permitted by the OHMC.

3. If smaller lot sizes and dimensions or decreased setbacks are proposed from what is required by the underlying zoning, buildings on these lots must meet requirements (3)(a) through (c) of this section or requirement (3)(d) or requirement (3)(e) of this section.

   The applicant anticipates meeting this requirement by implementing Requirement (3)(d) which stipulates no two adjacent buildings on the same side of the street to have the same front setback on lots that do not meet the standards of the underlying R-1 zone (the duplex lots). The duplex lots have been designed with sufficient depth to allow for setback variation of at least 2 feet.

4. If nonresidential uses are included in the PRD, such uses shall be easily accessible to pedestrians, meaning that primary building entrances are oriented to the street and set back no more than 10 feet from the property line or a six-foot-wide pedestrian path is included connecting the nearest public sidewalk to the primary entrance of the secondary use.

   The proposed Oak Heights PRD does not include any non-residential uses. Therefore, this criterion is not applicable to this application.

5. Ten percent common open space is provided which complies with OHMC 19.31.110 through 19.31.130.

   Based on the open space analysis provided in previous sections of this analysis, the PRD complies with the open space requirements of OHMC 19.31.110 through 19.31.130,

6. The PRD shall comply with all of the following adopted standards:

   a. The requirements of OH MC title 21, subdivisions. Variations from the requirements in OHMC title 21 may be requested and reviewed as part of the PRD application. Other than the specific standards being varied from, PRD's must meet the applicable standards of OHMC title 21 including the general design standards (Chapter 21.50 OHMC and the residential design standards (Chapter 21.60 HMC)

      With the exception of the requested lot width reduction to 25 and 30 feet from the 40-foot-wide standard and the increase of lot coverage for the duplex units to 55% from the 45% standard, the project has been designed to comply with OHMC Title 21, including the general design standards and residential design standards.

b. The standards and requirements of this chapter.

This PRD Compliance assessment outlines how the Oak Heights PRD is compliant with the OHMC 19.31.

c. The Oak Harbor Comprehensive Plan policies.

Please refer to the document titled Comprehensive Plan Analysis submitted with this application for an analysis of the Oak Heights PRD compliance with the City's Comprehensive Plan.

d. The design guidelines and regulations, if applicable.

The PRD site layout including roadways, utilities, block length, trails, landscaping, stormwater management, etc. have been designed in compliance with OHMC 21.60 Residential Design Standards. In addition, the site also complies with the PRD standards of OHMC 19.31.

e. All other standards adopted by the city of Oak Harbor, including engineering details and drawings.

The site can meet the overall standards including engineering details and drawings. Final engineering plans will be prepared for review and approval following Preliminary Plat/PRD approval.

7. Applicants must meet either subsection (7)(a) or (b) of this section:
    a. Enhanced design which includes one or more of the following on each building within the development:
        i. A variety of exterior building materials such as brick, stucco, stone, and wood used as primary siding or as accent materials on the front facades; or
        ii. Building articulation (offsetting walls, inclusion of windows, changes in material types) on side and rear walls or buildings; or
        iii. Side or rear-loaded garages; or
        iv. Other applicant-proposed building design elements.

        The applicant has opted to meet the intent of this section utilizing option 7(b)(iii) below.

    b. Optional side design elements which include one or more of the following:
        i. Ten percent or more of the units within the development are qualified affordable housing as defined by OHMC 19.08.695.
        ii. Inclusion of a mix of residential and non-residential uses within the development.
        iii. Fifteen percent or more of the gross area is open space.

iv. The project will not only preserve but enhance or rehabilitate the function and values of a critical area of the site, such as significant Woodlands, wildlife habitats, streams or wetlands, subject to the recommendations and then approve critical area report.

In compliance with 7(b)(iii), the applicant has provided Open Space in Tract A, Tract B, Tract F, Tract G, Tract H, Tract I, Tract J, Tract O, and Tract T which totals 6.22 acres - 15 percent of the gross site acreage is 5.50 acres; therefore, the project is providing open space in excess of 15 percent requirement.

Additional open space is provided in three stormwater ponds that have not been included in the calculation above. The stormwater ponds will be landscaped with native vegetation. The project as designed exceeds the standard of 7(b)(iii) and is therefore consistent with these criteria.

MAIN FLOOR	710 SF
UPPER FLOOR	1015 SF
TOTAL	1725 SF
2 CAR GARAGE	388 SF
EXTENDED GARAGE	479 SF
3 CAR GARAGE	571 SF

5040
SHERWOOD

2 CAR GARAGE
ENVELOPE: 28'-0" x 42'-10 1/2"

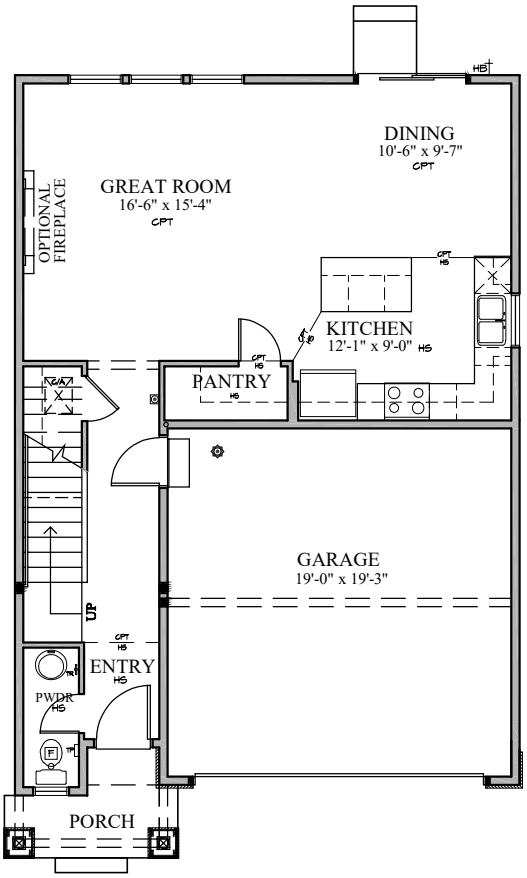
EXTENDED GARAGE
ENVELOPE: 33'-0" x 42'-10 1/2"

3 CAR GARAGE
ENVELOPE: 38'-0" x 42'-10 1/2"

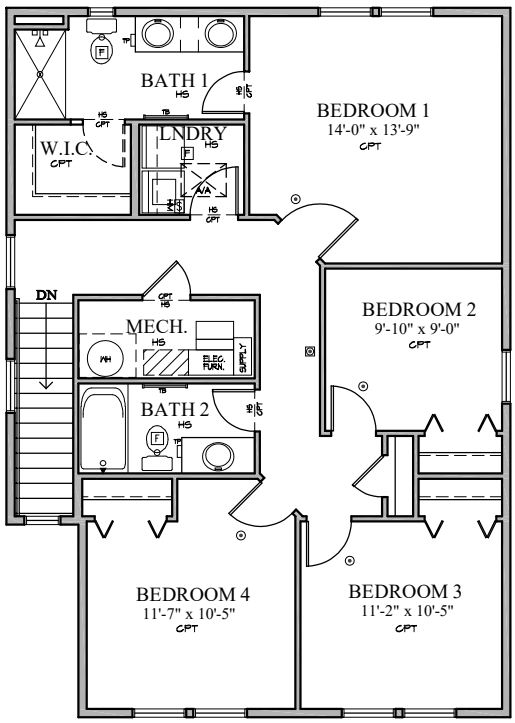
HOME FEATURES:

MAIN FLOOR
- GREAT ROOM
- DINING ROOM
- KITCHEN
- POWDER

UPPER FLOOR
- 4 BEDROOMS
- 2 BATHROOMS
- LAUNDRY



MAIN FLOOR PLAN



UPPER FLOOR PLAN



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 08/09/22

MAIN FLOOR	887 SF
UPPER FLOOR	973 SF
TOTAL	1860 SF
2 CAR GARAGE	371 SF
EXTENDED GARAGE	471 SF
3 CAR GARAGE	571 SF

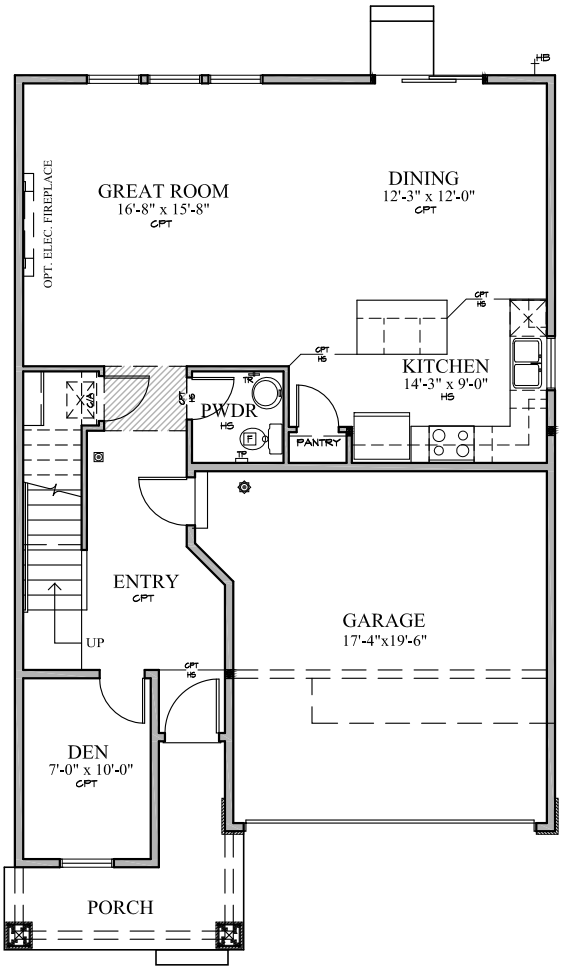
5050
BERKSHIRE

2 CAR GARAGE
ENVELOPE: 30'-0" x 48'-0"
EXTENDED GARAGE
ENVELOPE: 35'-0" x 48'-0"
3 CAR GARAGE
ENVELOPE: 40'-0" x 48'-0"

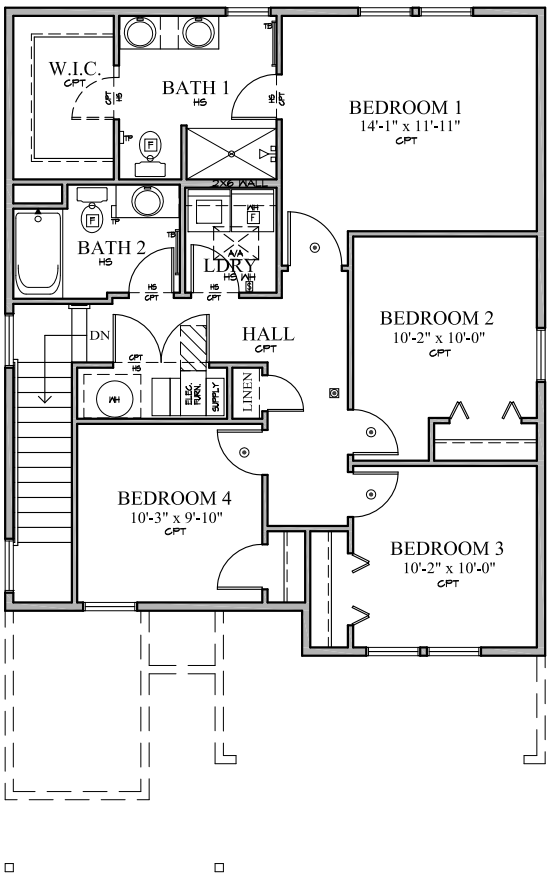
HOME FEATURES:

MAIN FLOOR
GREAT ROOM
DINING ROOM
KITCHEN
DEN
POWDER

UPPER FLOOR
4 BEDROOMS
2 BATHROOMS
LAUNDRY



MAIN FLOOR PLAN



UPPER FLOOR PLAN



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 10/12/21

MAIN FLOOR	860 SF
UPPER FLOOR	1190 SF
TOTAL	2050 SF
2 CAR GARAGE	440 SF
EXTENDED GARAGE	540 SF
3 CAR GARAGE	640 SF

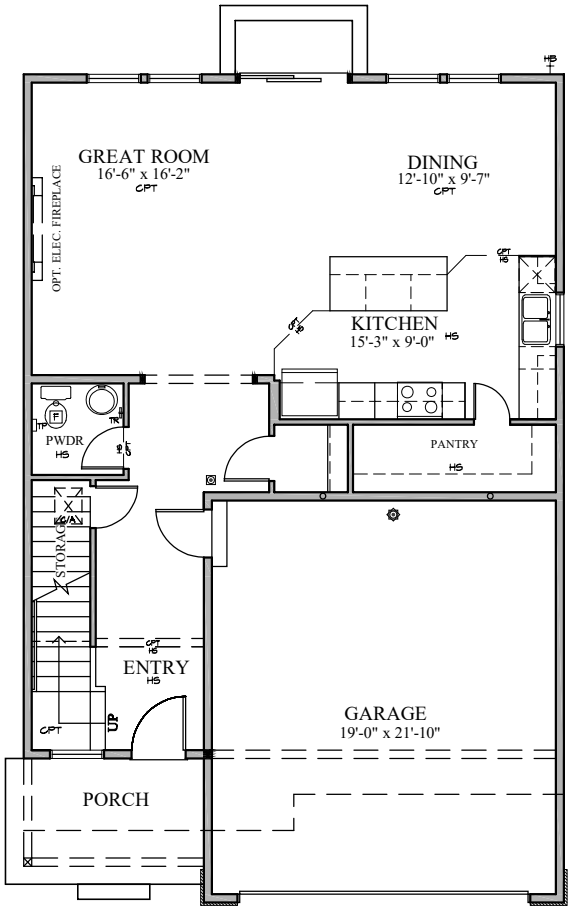
S110 (A,B,C)
HAWTHORNE

2 CAR GARAGE
ENVELOPE: 30'-0" x 46'-0"
EXTENDED GARAGE
ENVELOPE: 35'-0" x 46'-0"
3 CAR GARAGE
ENVELOPE: 40'-0" x 46'-0"

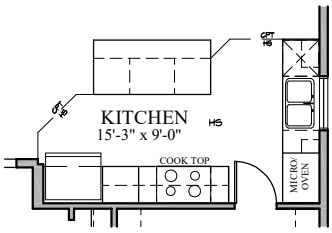
HOME FEATURES:

MAIN FLOOR
GREAT ROOM
DINING ROOM
KITCHEN
POWDER

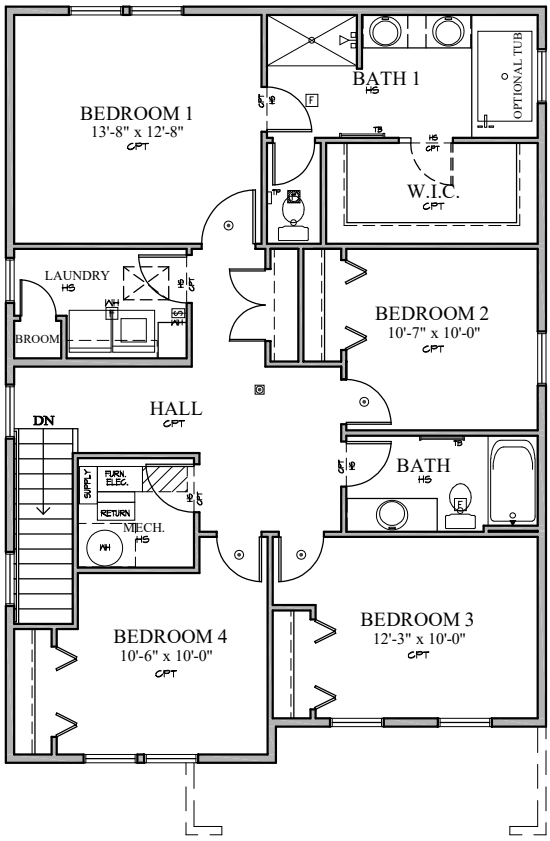
UPPER FLOOR
4 BEDROOMS
2 BATHROOMS
LAUNDRY



MAIN FLOOR PLAN



OPTIONAL
KITCHEN



UPPER FLOOR PLAN



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 10/24/22

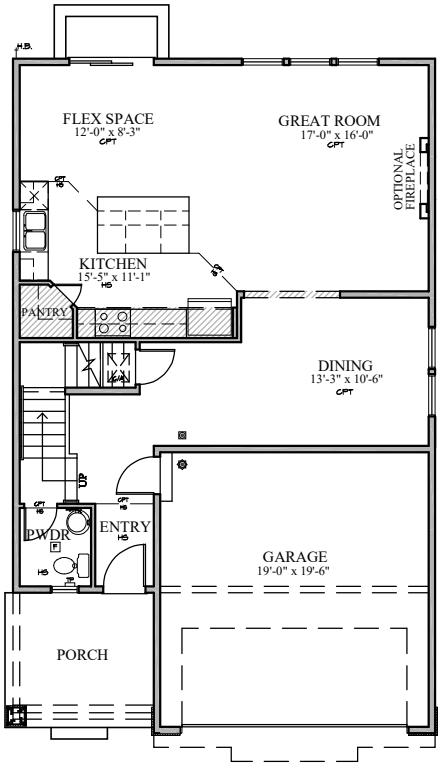
MAIN FLOOR	945 SF
UPPER FLOOR	1390 SF
TOTAL	2335 SF
2 CAR GARAGE	395 SF
EXTENDED GARAGE	486 SF
3 CAR GARAGE	578 SF

S130(A,B,C) CAMBRIDGE

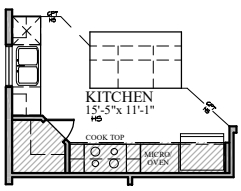
2 CAR GARAGE
ENVELOPE: 30'-0" x 48'-0"
EXTENDED GARAGE
ENVELOPE: 35'-0" x 48'-0"
3 CAR GARAGE
ENVELOPE: 40'-0" x 48'-0"

HOME FEATURES:

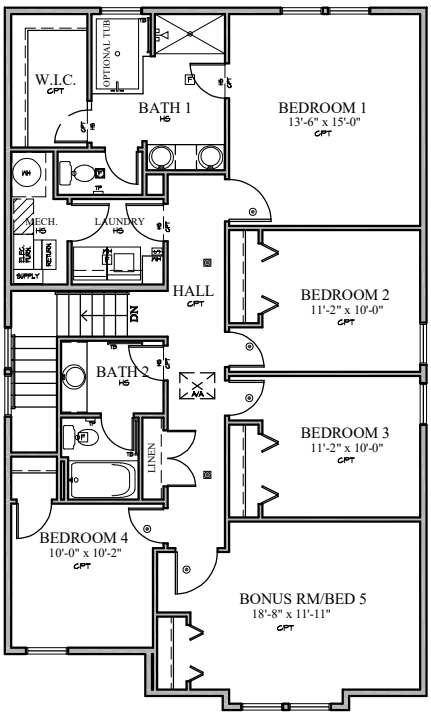
MAIN FLOOR	UPPER FLOOR
GREAT ROOM	4 BEDROOMS
DINING ROOM	2 BATHROOMS
KITCHEN	BONUS/BED 5
FLEX SPACE	LAUNDRY
POWDER	



MAIN FLOOR PLAN
('A', 'B' & 'C' SIM)



OPTIONAL
KITCHEN



UPPER FLOOR PLAN
('A', 'B' & 'C' SIM)



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 10/18/22

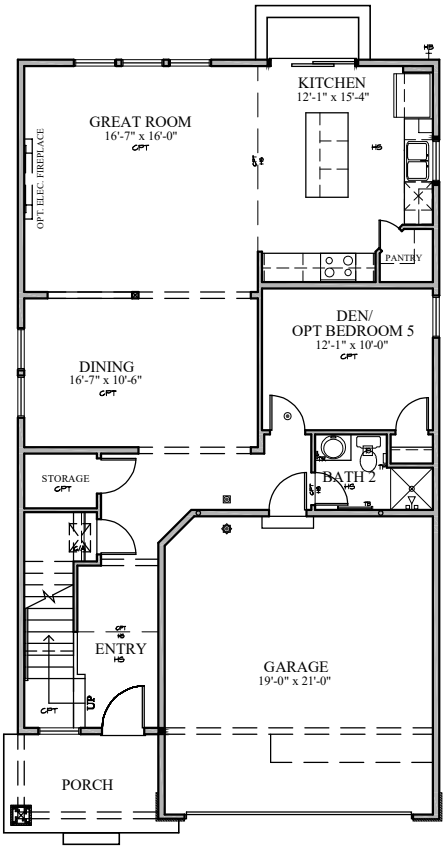
MAIN FLOOR	1139 SF
UPPER FLOOR	1396 SF
TOTAL	2535 SF
2 CAR GARAGE	421 SF
EXTENDED GARAGE	515 SF
3 CAR GARAGE	609 SF

S150 (A,B,C)
BALLARD

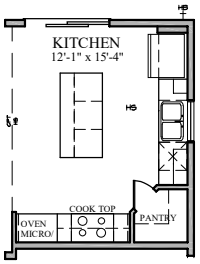
2 CAR GARAGE
ENVELOPE: 30'-0" x 54'-0"
EXTENDED GARAGE
ENVELOPE: 35'-0" x 54'-0"
3 CAR GARAGE
ENVELOPE: 40'-0" x 54'-0"

HOME FEATURES:

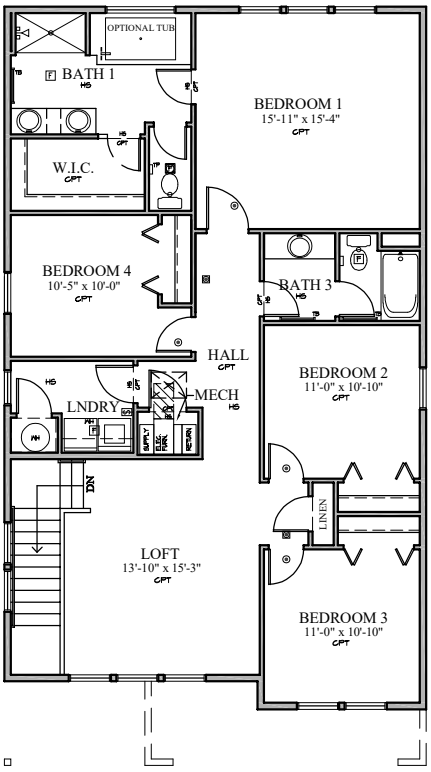
MAIN FLOOR	UPPER FLOOR
GREAT ROOM	4 BEDROOMS
DINING ROOM	2 BATHROOMS
KITCHEN	LOFT
3/4 BATH	LAUNDRY
DEN/BEDROOM	



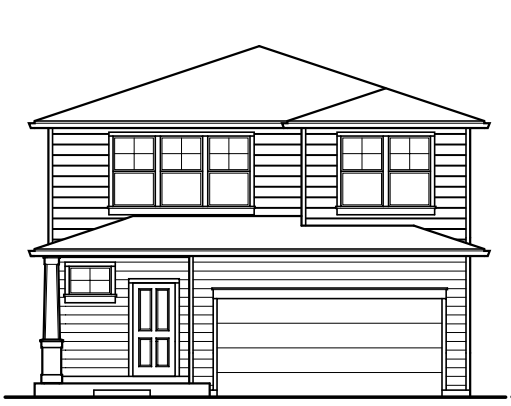
MAIN FLOOR PLAN



OPTIONAL
KITCHEN



UPPER FLOOR PLAN



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 9/16/22

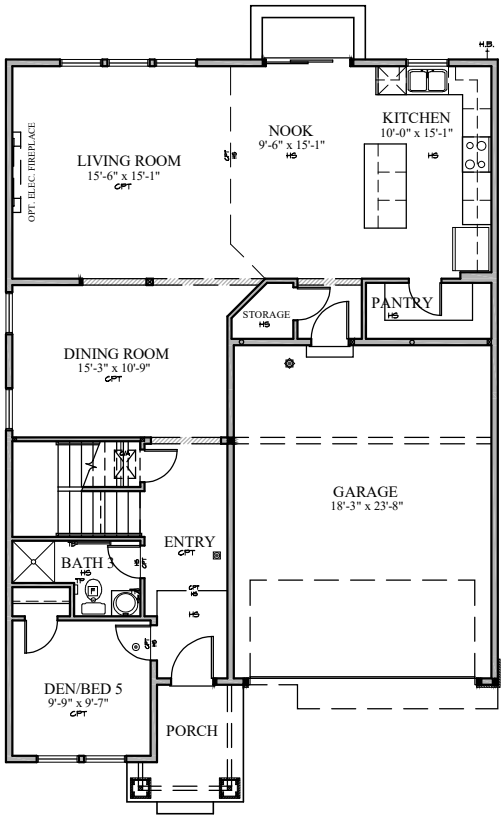
MAIN FLOOR	1163 SF
UPPER FLOOR	1542 SF
TOTAL	2705 SF
2 CAR GARAGE	454 SF
EXTENDED GARAGE	548 SF
3 CAR GARAGE	642 SF

W120 (A,B,C)
ASHLAND

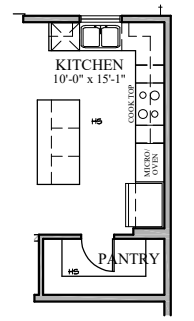
2 CAR GARAGE
ENVELOPE: 35'-0" x 52'-0"
EXTENDED GARAGE
ENVELOPE: 40'-0" x 52'-0"
3 CAR GARAGE
ENVELOPE: 45'-0" x 52'-0"

HOME FEATURES:

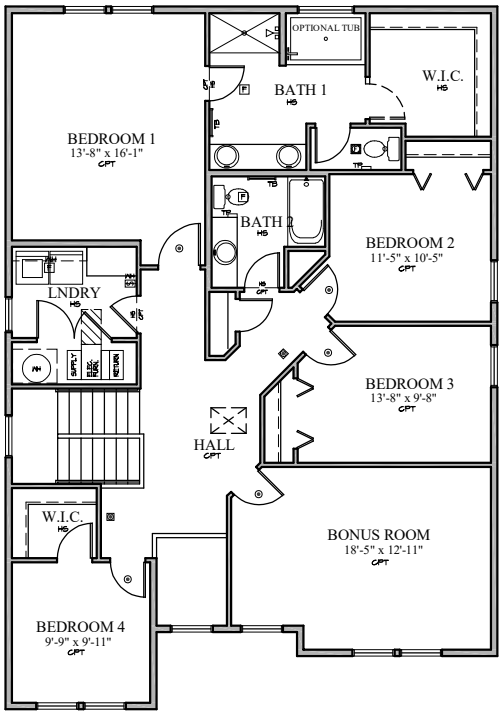
MAIN FLOOR	UPPER FLOOR
GREAT ROOM	4 BEDROOMS
DINING ROOM	2 BATHROOMS
KITCHEN	BONUS ROOM
NOOK	LAUNDRY
3/4 BATH	
DEN/BEDROOM	



MAIN FLOOR PLAN



OPTIONAL KITCHEN



UPPER FLOOR PLAN



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

9/20/22

WR40 PLAN
CALI

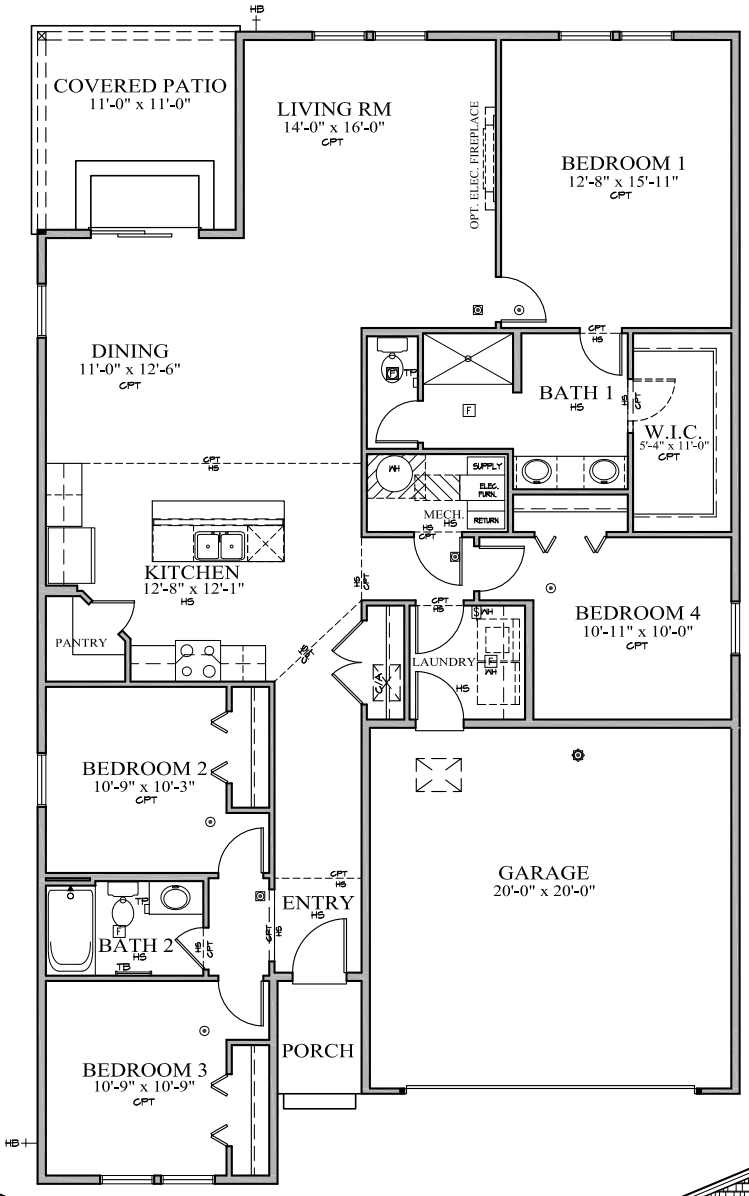
2 CAR GARAGE

ENVELOPE: 39'-0" x 64'-0"

MAIN FLOOR	1797 SF
TOTAL	1797 SF
2 CAR GARAGE	421 SF

HOME FEATURES:

MAIN FLOOR
- LIVING ROOM
- DINING ROOM
- KITCHEN
- LAUNDRY
- 2 BATHROOMS
- 4 BEDROOMS



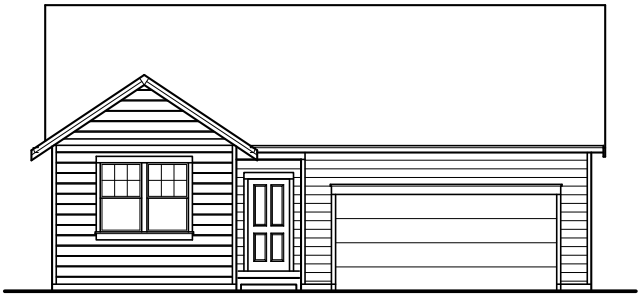
MAIN FLOOR PLAN



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 09/01/21

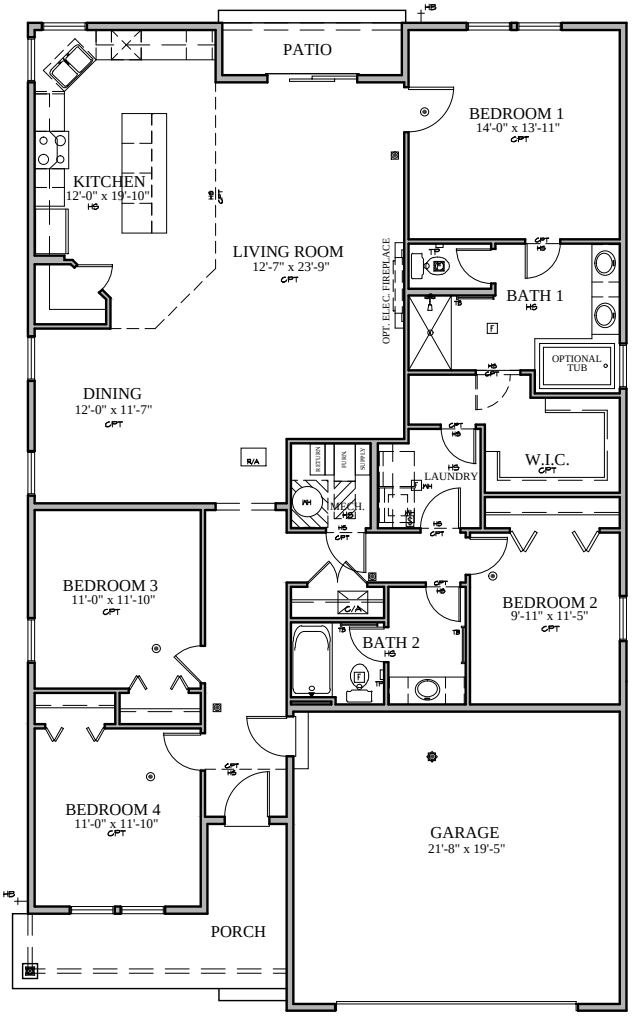
PLAN WR50
LAWSON

2 CAR GARAGE
ENVELOPE: 40'-0" x 66'-0"
3 CAR GARAGE OPTION
ENVELOPE: 50'-0" x 66'-0"

MAIN FLOOR	2003 SF
TOTAL	2003 SF
2 CAR GARAGE	451 SF

HOME FEATURES:

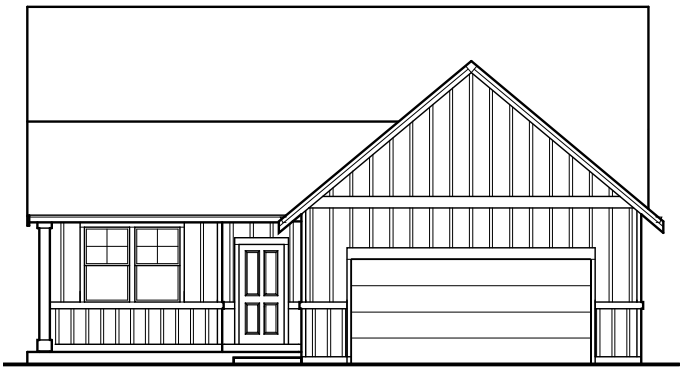
MAIN FLOOR
LIVING ROOM
DINING ROOM
KITCHEN
LAUNDRY
2 BATHROOMS
4 BEDROOMS



MAIN FLOOR PLAN



ELEVATION 'A'



ELEVATION 'C'



ELEVATION 'B'

SCALE: NTS

DATE: 06/19/23

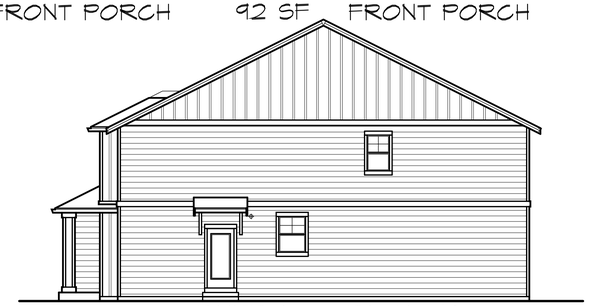
(UNIT 1)	
MAIN FLR	518 SF
UPPER FLR	901 SF
TOTAL	1419 SF
2 CAR GARAGE	430 SF
FRONT PORCH	92 SF

(UNIT 2)	
MAIN FLR	512 SF
UPPER FLR	887 SF
TOTAL	1399 SF
2 CAR GARAGE	430 SF
FRONT PORCH	80 SF

NAD5-TH
BIRCH / ALDER
2 CAR GARAGE (EACH UNIT)
ENVELOPE: 40' x 52'

HOME FEATURES (EACH UNIT):

MAIN FLOOR	UPPER FLOOR
GREAT ROOM	3 BEDROOMS
KITCHEN	LOFT
	2 BATHROOMS
	LAUNDRY



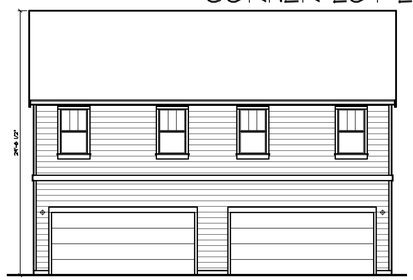
CORNER LOT RIGHT 'A'
CORNER LOT LEFT SIM.



CORNER LOT RIGHT 'B'
CORNER LOT LEFT SIM.



CORNER LOT RIGHT 'C'
CORNER LOT LEFT SIM.



BACK



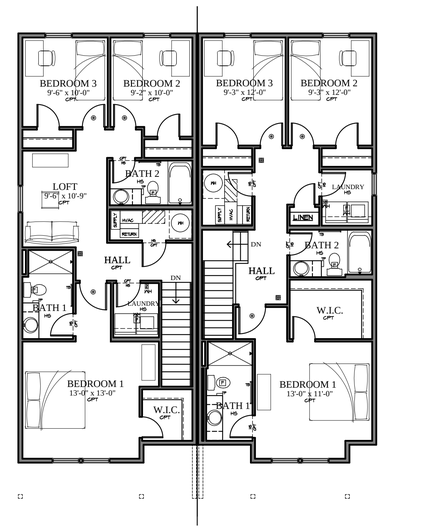
LEFT



UNIT 1 FRONT UNIT 2
ELEVATION 'C' (COTTAGE)



RIGHT



UPPER FLOOR PLAN



BACK



LEFT



UNIT 1 FRONT UNIT 2
ELEVATION 'B' (CRAFTSMAN)



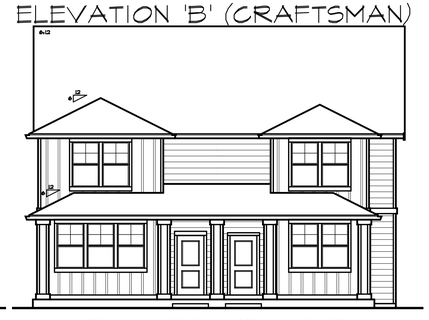
RIGHT



BACK



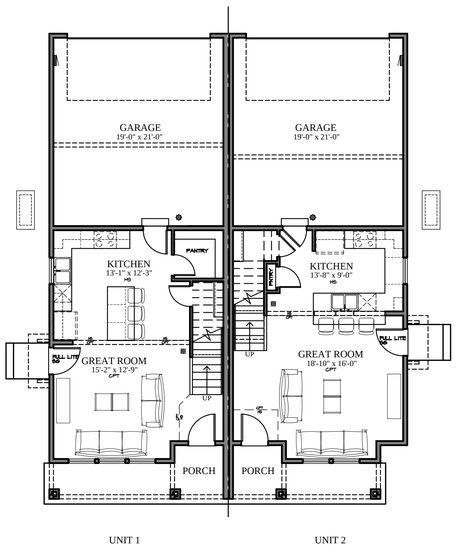
LEFT



UNIT 1 FRONT UNIT 2
ELEVATION 'A' (FARMHOUSE)



RIGHT



MAIN FLOOR PLAN

SCALE: NTS

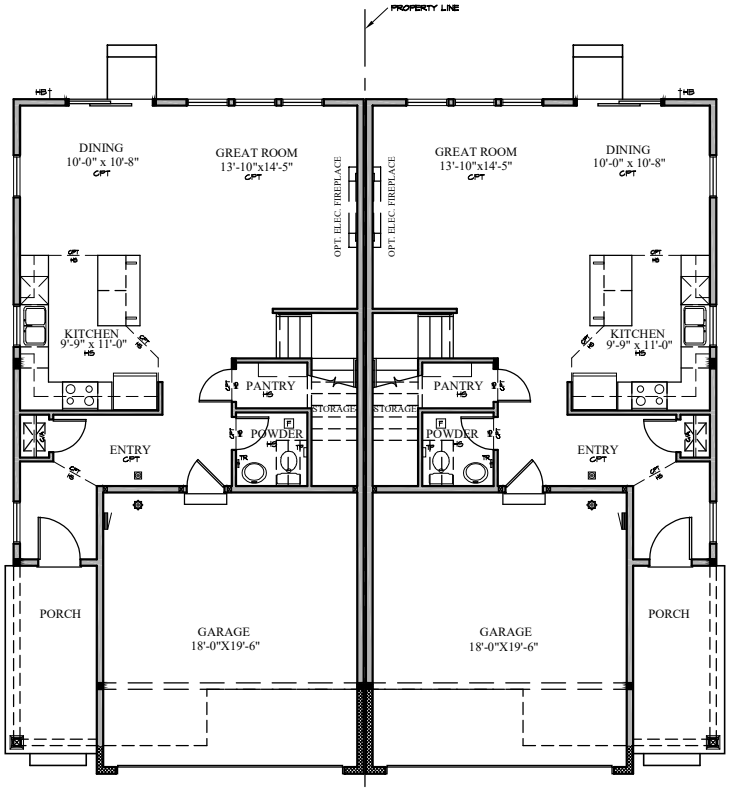
DATE: 05/15/24

MAIN FLOOR	731 SF
UPPER FLOOR	1040 SF
TOTAL	1771 SF
2 CAR GARAGE	378 SF

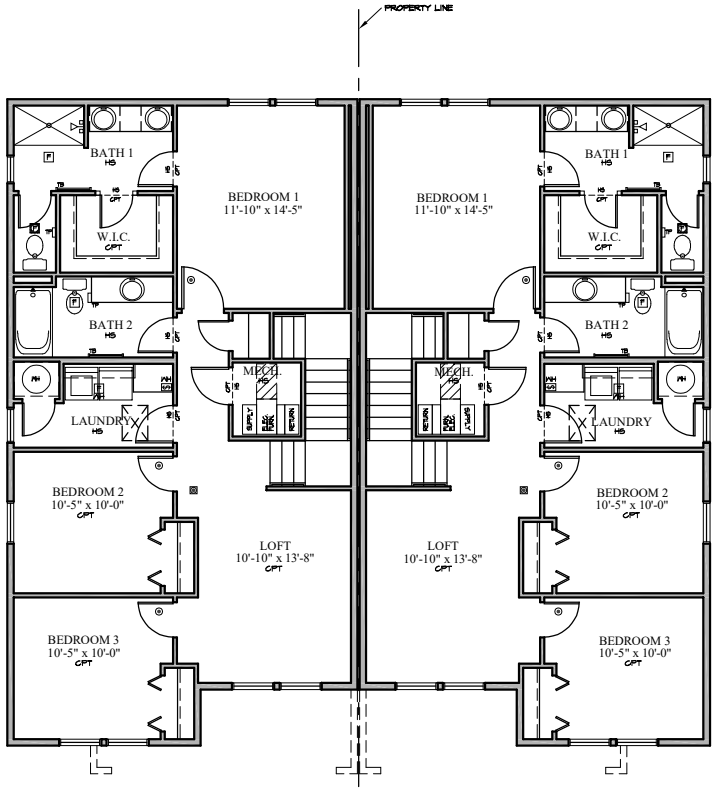
ND50
JUNIPER
2 CAR GARAGE
ENVELOPE: 50'-0" x 48'-0"

HOME FEATURES:

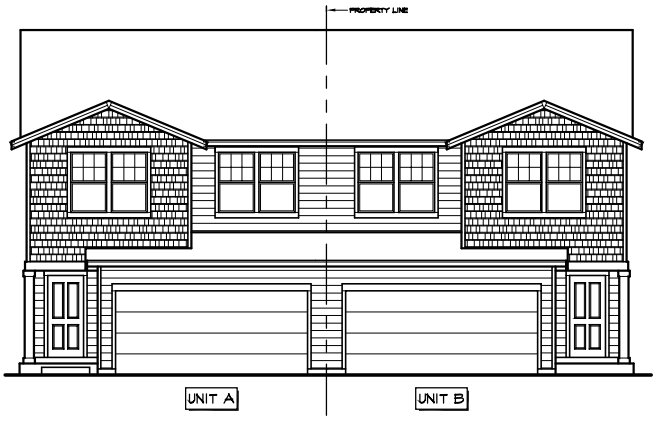
MAIN FLOOR	UPPER FLOOR
GREAT ROOM	3 BEDROOMS
DINING ROOM	2 BATHROOMS
KITCHEN	LOFT
POWDER	LAUNDRY



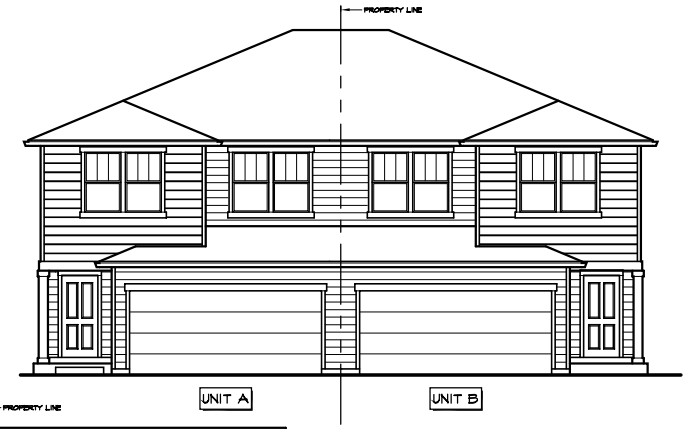
UNIT A — MAIN FLOOR PLAN — UNIT B



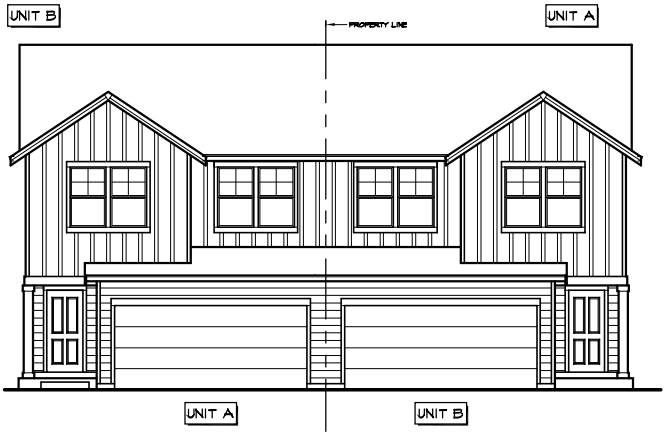
UNIT A — UPPER FLOOR PLAN — UNIT B



ELEVATION 'A'



ELEVATION 'B'



ELEVATION 'C'

SCALE: NTS

DATE: 08/15/22

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

OAK HEIGHTS PRELIMINARY PLAT/PRD

OAK HARBOR, ISLAND COUNTY, WASHINGTON STATE

FOR

SSHI, LLC dba D.R. HORTON

AREA TABLE			AREA TABLE			AREA TABLE		
LOT	AREA (SF)	AREA (AC)	LOT	AREA (SF)	AREA (AC)	LOT	AREA (SF)	AREA (AC)
1	6,834	0.15	81	5,103	0.11	161	3,600	0.08
2	3,920	0.08	82	5,528	0.12	162	4,864	0.11
3	4,451	0.10	83	4,000	0.09	163	5,414	0.12
4	6,288	0.14	84	5,000	0.11	164	4,000	0.09
5	5,032	0.11	85	3,920	0.08	165	4,000	0.09
6	4,560	0.10	86	5,000	0.11	166	5,000	0.11
7	4,487	0.10	87	4,000	0.09	167	4,000	0.09
8	4,120	0.09	88	5,001	0.11	168	4,000	0.09
9	4,120	0.09	89	4,154	0.09	169	4,807	0.11
10	4,117	0.09	90	6,187	0.14	170	4,495	0.10
11	3,093	0.07	91	5,631	0.12	171	4,089	0.09
12	3,875	0.08	92	7,485	0.17	172	5,133	0.11
13	4,216	0.09	93	3,859	0.08	173	4,131	0.09
14	3,630	0.08	94	4,483	0.10	174	5,464	0.12
15	3,087	0.07	95	5,414	0.12	175	4,160	0.09
16	2,801	0.06	96	4,414	0.10	176	8,093	0.18
17	2,957	0.06	97	3,600	0.08	177	4,950	0.11
18	3,307	0.07	98	3,600	0.08	178	3,602	0.08
19	2,939	0.06	99	3,600	0.08	179	3,600	0.08
20	4,058	0.09	100	3,600	0.08	180	4,500	0.10
21	2,475	0.05	101	3,600	0.08	181	3,600	0.08
22	2,403	0.05	102	3,600	0.08	182	3,600	0.08
23	2,402	0.05	103	3,600	0.08	183	3,600	0.08
24	2,402	0.05	104	3,600	0.08	184	3,964	0.09
25	2,402	0.05	105	3,559	0.08	185	4,050	0.09
26	2,401	0.05	106	4,262	0.09	186	3,600	0.08
27	2,401	0.05	107	3,800	0.08	187	3,600	0.08
28	2,401	0.05	108	4,189	0.09	188	3,902	0.08
29	2,458	0.05	109	5,000	0.11	189	4,570	0.10
30	2,796	0.06	110	5,000	0.11	190	4,965	0.11
31	2,666	0.06	111	4,000	0.09	191	3,600	0.08
32	2,375	0.05	112	3,600	0.08	192	3,600	0.08
33	2,375	0.05	113	3,600	0.08	193	4,500	0.10
34	2,375	0.05	114	3,600	0.08	194	7,064	0.16
35	2,375	0.05	115	3,600	0.08	195	6,284	0.14
36	2,375	0.05	116	3,600	0.08	196	4,535	0.10
37	2,375	0.05	117	3,600	0.08	197	4,560	0.10
38	2,375	0.05	118	3,600	0.08	198	4,165	0.09
39	2,375	0.05	119	3,600	0.08	199	4,002	0.09
40	2,749	0.06	120	3,600	0.08	200	5,000	0.11
41	4,401	0.10	121	4,307	0.09	201	4,000	0.09
42	2,250	0.05	122	4,000	0.09	202	4,719	0.10
43	2,250	0.05	123	4,058	0.09	203	5,447	0.12
44	2,343	0.05	124	4,236	0.09	204	8,186	0.18
45	2,433	0.05	125	4,000	0.09	205	5,592	0.12
46	2,267	0.05	126	4,057	0.09	206	4,742	0.10
47	2,250	0.05	127	4,522	0.10	207	4,023	0.09
48	2,307	0.05	128	3,631	0.08	208	3,715	0.08
49	2,477	0.05	129	3,624	0.08	209	3,729	0.08
50	2,259	0.05	130	3,624	0.08	210	3,743	0.08
51	2,250	0.05	131	4,445	0.10	211	3,758	0.08
52	2,250	0.05	132	4,899	0.11	212	3,853	0.08
53	2,250	0.05	133	3,626	0.08	213	4,403	0.10
54	2,250	0.05	134	3,626	0.08	214	6,796	0.15
55	2,860	0.06	135	3,627	0.08	215	8,265	0.18
56	2,590	0.05	136	3,627	0.08	216	5,025	0.11
57	2,502	0.05	137	3,627	0.08	217	3,627	0.08
58	2,500	0.05	138	3,628	0.08	218	3,627	0.08
59	2,500	0.05	139	3,628	0.08	219	4,974	0.11
60	2,474	0.05	140	3,628	0.08	TR A	88,110	2.02
61	2,326	0.05	141	4,903	0.11	TR B	24,864	0.57
62	2,184	0.05	142	5,074	0.11	TR C	47,567	1.09
63	2,100	0.04	143	5,000	0.11	TR D	28,983	0.66
64	2,228	0.05	144	5,000	0.11	TR E	62,192	1.42
65	2,296	0.05	145	4,414	0.10	TR F	14,626	0.33
66	2,753	0.06	146	4,000	0.09	TR G	2,881	0.06
67	2,794	0.06	147	4,000	0.09	TR H	5,297	0.12
68	2,635	0.06	148	4,000	0.09	TR I	121,912	2.79
69	2,607	0.05	149	4,000	0.09	TR J	7,783	0.17
70	2,624	0.06	150	4,000	0.09	TR K	1,849	0.04
71	2,611	0.05	151	4,000	0.09	TR L	1,428	0.03
72	2,569	0.05	152	4,000	0.09	TR M	2,628	0.06
73	2,513	0.05	153	4,000	0.09	TR N	2,162	0.04
74	2,548	0.05	154	4,000	0.09	TR O	3,600	0.08
75	2,633	0.06	155	6,049	0.13	TR P	4,440	0.10
76	2,907	0.06	156	4,414	0.10	TR Q	2,000	0.04
77	5,660	0.12	157	3,600	0.08	TR R	1,128	0.02
78	5,409	0.12	158	3,600	0.08	TR S	7,370	0.16
79	4,735	0.10	159	4,500	0.10	TR T	1,876	0.04
80	4,427	0.10	160	3,600	0.08	ROW	320,900	7.36

PLAT/PARCEL INFORMATION

SITE ADDRESS	30433 STATE RTE 20 OAK HARBOR, WA 98277
TAX PARCEL NOs.	R13210-298-2300 (PARCEL D) R13210-364-1730 (PARCEL B) R13210-364-1900 (PARCEL A) R13210-364-2330 (PARCEL C) R13210-295-1480 (PARCEL E)
CURRENT ZONING	R1
PROPOSED ZONING	R1
TOTAL SITE AREA	1,598,841 SF 36.690 AC
EXISTING LOTS	5
PROP. SINGLE FAMILY LOTS	153
PROP. DUPLEX LOTS	66
TOTAL PROPOSED LOTS	219
MINIMUM DENSITY	3 DU/AC
MAXIMUM DENSITY	9 DU/AC
PROPOSED DENSITY	5.97 DU/AC
AVERAGE LOT SIZE	3,866 SF
LARGEST LOT	8,265 SF
SMALLEST LOT	2,100 SF
FRONT SETBACK	10 FT
GARAGE SETBACK	20 FT
REAR SETBACK	20 FT
SIDE SETBACK	5 FT
SIDE SETBACK (FLANKING STREET)	10 FT
PRD BOUNDARY SETBACK	20 FT

OPEN SPACE ANALYSIS

COMMON OPEN SPACE REQUIRED (10%)	3.669 AC
ACTIVE OPEN SPACE REQUIRED	1.835 AC
TRACT F	0.336 AC
TRACT I	2.799 AC
ACTIVE OPEN SPACE PROVIDED	3.135 AC
WETLAND TRACT A	2.023 AC
WETLAND TRACT B	0.571 AC
TRACT G	0.066 AC
TRACT H	0.122 AC
TRACT J	0.179 AC
TRACT O	0.082 AC
TRACT T	0.043 AC
PASSIVE OPEN SPACE PROVIDED	3.086 AC
TOTAL OPEN SPACE PROVIDED	6.221 AC
PERCENTAGE OF TOTAL SITE	17.0%

PARKING ANALYSIS

TOTAL PARKING REQUIRED (4.5 PER UNIT)	986 SPACES
ON-LOT PARKING PROVIDED (4 PER UNIT)	876 SPACES
PUBLIC PARKING PROVIDED (PARALLEL/HEAD IN)	146 SPACES
TOTAL PARKING PROVIDED	1,022 SPACES

EARTHWORK QUANTITIES

CUT	133,970 CY
FILL	129,320 CY
NET	4,650 CY CUT

NOTE: THIS ESTIMATE WAS PREPARED USING THE EXISTING AND FINISHED GRADES PROVIDED IN THESE PLANS. SUBGRADE AND STRIPPINGS NOT FACTORED IN. THIS IS AN ESTIMATE ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION COST ESTIMATES OR BIDDING PURPOSES. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR REVIEWING ALL AVAILABLE GEOTECHNICAL INFORMATION AND GENERATING THEIR OWN SET OF EARTHWORK ASSUMPTIONS AND QUANTITIES.

ROADWAY SUMMARY

SW VISTA PARK DRIVE	1,005 LF
SW EAGLE VISTA DRIVE	1,665 LF
SW RIDGEWAY DRIVE	660 LF
ROAD A	1,245 LF
ROAD B	555 LF
ROAD C	885 LF
ROAD D	100 LF

TEMPORARY VERTICAL BENCHMARKS

TBM A = REBAR & CAP AT NORTH EDGE OF PAVEMENT ALONG SW 24TH AVE
ELEV. = 172.24'

TBM B = SET 1/2" REBAR & CAP AT EXP JOINT AT WEST BOW OF HIGHWAY 20, OPPOSITE "FAIR WINDS CALM SEAS SIGN ±30' S OF CATCH BASIN TO NORTH"
ELEV. = 166.33'

VERTICAL INFORMATION DERIVED FROM MULTIPLE GPS OCCUPATIONS UTILIZING THE WASHINGTON STATE REFERENCE NETWORK.

SURVEY NOTES

BASIS OF BEARINGS: N 87°45'17" W ALONG THE SECTION LINE OF SW 24TH AVE. AS DEPICTED HEREON.

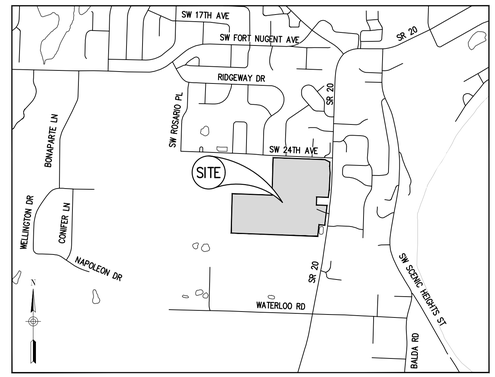
1. VERTICAL DATUM: NAVD88 (GEOID18) DERIVED FROM GNSS OBSERVATIONS AT THE TIME OF THIS SURVEY. ELEVATIONS REPORTED EXCEED NATIONAL MAPPING STANDARD'S ACCURACY OF WITHIN ONE HALF OF THE CONTOUR INTERVAL AS SHOWN HEREON.
2. THIS SURVEY WAS ACCOMPLISHED BY FIELD TRAVERSE WITH A 3-SECOND ELECTRONIC DIGITAL TOTAL STATION AND REAL-TIME KINEMATIC GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) DATA CORRECTED WITH THE WASHINGTON STATE REFERENCE NETWORK.
3. ALL DISTANCES ARE IN FEET AND DECIMALS THEREOF.
4. ALL CONTROLLING MONUMENTS SHOWN ARE OF RECORD, ARE LOCALLY ACCEPTED AS REPRESENTATIVE OF THEIR PURPORTED POSITIONS, AND WERE VISITED DURING THE COURSE OF THIS SURVEY UNLESS OTHERWISE NOTED.

SURVEY REFERENCES

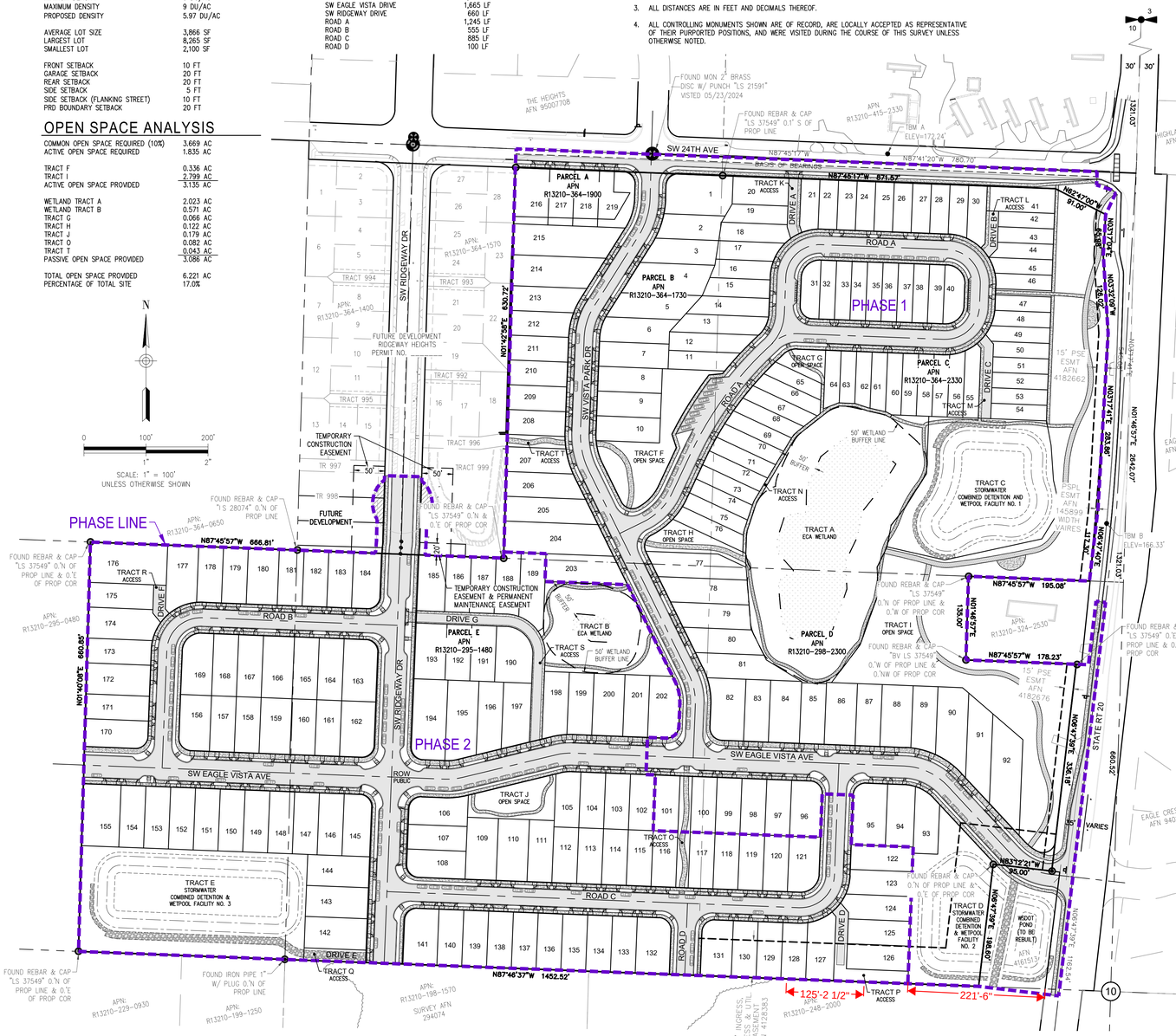
RECORD OF SURVEY AF#4550408
RECORD OF SURVEY AF#4453609

NATIVE GROWTH AREA ANALYSIS

TOTAL SITE AREA	36.69 AC
15% NATIVE GROWTH TARGET	5.50 AC
STORM POND TRACTS C, D, & E	3.17 AC
WETLAND/BUFFER TRACTS A& B	2.59 AC
NATIVE GROWTH AREA PROVIDED	5.76 AC



VICINITY MAP
SCALE: 1" = 1,200'


SW 24TH AVE
PARCEL A APN R13210-364-1900
PARCEL B APN R13210-364-1730
PARCEL C APN R13210-364-2330
PARCEL D APN R13210-298-2300
PARCEL E APN R13210-295-1480
PHASE 1
PHASE 2
PHASE LINE
ROAD A
ROAD B
ROAD C
ROAD D
DRIVE A
DRIVE B
DRIVE C
DRIVE D
DRIVE E
DRIVE F
DRIVE G
SW RIDGEWAY DR
SW VISTA PARK DR
SW EAGLE VISTA AVE
TRACT A ECA WETLAND
TRACT B ECA WETLAND
TRACT C STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 1
TRACT D STORMWATER COMBINED DETENTION & WETPOOL FACILITY NO. 2
TRACT E STORMWATER COMBINED DETENTION & WETPOOL FACILITY NO. 3
TRACT F OPEN SPACE
TRACT G OPEN SPACE
TRACT H OPEN SPACE
TRACT I OPEN SPACE
TRACT J OPEN SPACE
TRACT K ACCESS
TRACT L ACCESS
TRACT M ACCESS
TRACT N ACCESS
TRACT O ACCESS
TRACT P ACCESS
TRACT Q ACCESS
TRACT R ACCESS
TRACT S ACCESS
TRACT T ACCESS
WSDOT POND (TO BE REBUILT)
TEMPORARY CONSTRUCTION EASEMENT & PERMANENT MAINTENANCE EASEMENT
TEMPORARY CONSTRUCTION EASEMENT
FUTURE DEVELOPMENT RIDGEWAY HEIGHTS PERMIT NO.
FUTURE DEVELOPMENT
50' WETLAND BUFFER LINE
50' BUFFER
15' PSE ESMT AFN 4182662
15' PSE ESMT AFN 4182676
PSE ESMT AFN 145899 WIDTH VARIES
60' INGRESS, EGRESS, AND UTILITY EASEMENT AFN 4128383
FOUND MON 2" BRASS DISC W/ PUNCH "LS 21591" VISTED 05/23/2024
FOUND REBAR & CAP "LS 37549" 0.1' S OF PROP LINE
FOUND REBAR & CAP "LS 37549" 0.'N & 0.'E OF PROP COR
FOUND REBAR & CAP "LS 37549" 0.'E OF PROP LINE & 0.'N OF PROP COR
FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'W OF PROP COR
FOUND REBAR & CAP "LS 37549" 0.'NW OF PROP COR
FOUND IRON PIPE 1" W/ PLUG 0.'N OF PROP LINE
FOUND REBAR & CAP "LS 28074" 0.'N OF PROP LINE
N87°45'17"W 871.57'
N87°45'57"W 666.81'
N87°45'57"W 195.08'
N87°45'57"W 178.23'
N87°12'21"W 25.00'
N87°45'37"W 1452.52'
N01°42'56"E 630.72'
N01°40'08"E 660.85'
N01°46'57"E 1321.03'
N01°47'43"E 283.98'
N01°45'37"E 282.40'
N01°45'37"E 1321.37'
N87°44'00"W 91.00'
N87°44'00"W 347.40'
N87°44'00"W 347.40'
N87°43'36"E 358.18'
N87°43'36"E 1321.52'
N87°43'36"E 1321.52'
N87°43'36"E 1321.52

BOUNDARY & TOPO SURVEY LEGEND

- ADJACENT PROPERTY LINE
- EDGE OF ASPHALT
- FENCE LINE
- 290 10' CONTOUR LINE
- 288 2' CONTOUR LINE
- SD STORM DRAIN LINE
- SS SANITARY SEWER LINE
- W WATER LINE
- G GAS LINE
- OHP OVERHEAD POWER LINE
- OHT OVERHEAD COMM. LINE
- P UNDERGROUND POWER LINE
- CM UNDERGROUND COMM. LINE
- CONCRETE
- GRAVEL
- BRICK
- ROCKERY
- 1.0% SLOPE
- FOUND SECTION CORNER
- EXISTING SECTION CORNER
- FOUND QUARTER CORNER
- EXISTING QUARTER CORNER
- FOUND SURVEY MONUMENT
- FOUND SURVEY MARKER
- SET SURVEY MARKER
- FOUND NAIL & WASHER
- SET NAIL & WASHER
- BENCHMARK
- WETLAND FLAG
- TRAFFIC SIGN
- BOLLARD
- MAILBOX
- MAILBOX KIOSK
- CONIFEROUS TREE
- DECIDUOUS TREE
- CATCH BASIN TYPE I
- CATCH BASIN TYPE II
- STORM DRAIN MANHOLE
- YARD DRAIN
- STORM DRAIN CLEANOUT
- CULVERT END
- SANITARY SEWER MANHOLE
- SANITARY SEWER CLEANOUT
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- WATER VAULT
- WATER MANHOLE
- WATER BLOWOFF
- WATER AIR VAC
- FIRE DEPT CONNECTION
- HOSE BIB
- IRRIGATION METER
- IRRIGATION VALVE
- GAS VALVE
- GAS METER
- UTILITY POLE
- LIGHT POLE
- SIGNAL POLE
- GUY ANCHOR
- YARD LIGHT
- POWER CONDUIT
- POWER VAULT
- POWER METER
- POWER JUNCTION BOX
- POWER MANHOLE
- COMMUNICATIONS MANHOLE
- TELEPHONE PEDESTAL
- TV PEDESTAL

SITE & GRADING PLAN LEGEND

- PROPERTY LINE
- RIGHT OF WAY LINE
- CENTERLINE
- WETLAND LINE
- WETLAND BUFFER
- STEEP SLOPE
- STEEP SLOPE BUFFER
- BUILDING SETBACK LINE
- ROAD/ACCESS EASEMENT
- CURB LINE
- GUTTER LINE
- SAWCUT LINE
- ROAD MARKINGS
- SAFETY HAND RAIL
- METAL/SPLIT RAIL FENCE
- WOOD/CEDAR FENCE
- 290 10' CONTOUR LINE
- 288 2' CONTOUR LINE
- BUILDING PAD
- ASPHALT PAVEMENT
- GRIND AND OVERLAY LIMITS
- SIDEWALK/CONC. PATTERN
- GRAVEL PATTERN
- PED. PATH/TRAIL PRATTERN
- ROCKERY
- BLOCK WALL
- SOLDIER PILE WALL
- 1.0% SLOPE
- STREET LIGHT
- MB MAILBOX(S)
- SIGN(S)
- DRIVEWAY
- HANDICAP RAMP

EROSION CONTROL LEGEND

- SILT FENCE
- TREE RETENTION FENCE
- CONSTRUCTION FENCE
- TEMPORARY DISCHARGE PIPE
- INTERCEPTOR SWALES
- ROCK CHECK DAMS
- LIMITS OF DISTURBANCE
- CONSTRUCTION ENTRANCE
- INLET PROTECTION
- TEMPORARY STANDPIPE
- INLET PROTECTION
- 3:1 SLOPE DAGGER
- TEMP. SEDIMENT TRAP/POND

STORM DRAIN LEGEND

- STORM DRAIN PIPE
- STORM DRAIN SERVICE
- STORM DRAIN POND BOTTOM
- STORM DRAIN POND TOP
- STORM DRAIN POND BERM
- VAULT EXTERIOR WALL
- VAULT INTERIOR WALL
- VAULT/POND WATER LEVEL
- VAULT/POND LIVE/DEAD LINE
- STORM DRAIN EASEMENT
- STORM DRAIN BIO SWALES
- 10LF 8" PVC @ 2.0% STORM DRAIN TEXT
- STORM DRAIN PIPE FLOW ARROW
- STORM DRAIN MANHOLE
- STORM DRAIN CATCH BASIN
- STORM DRAIN CLEANOUT
- STORM DRAIN CULVERT END
- STORM DRAIN RIP RAP
- VAULT/POND LIVE/DEAD LINE

SANITARY SEWER LEGEND

- SANITARY SEWER PIPE
- SANITARY SEWER SERVICE
- SANITARY SEWER EASEMENT
- 10LF 8" PVC @ 2.0% SANITARY SEWER TEXT
- SEWER PIPE FLOW ARROW
- SANITARY SEWER MANHOLE
- SANITARY SEWER CLEANOUT

WATER LEGEND

- WATER MAIN PIPE
- WATER SERVICE LINE
- WATER EASEMENT
- 10LF 8" PVC @ 2.0% WATER TEXT
- BEND W/CONC. BLOCKING
- TEE W/CONC. BLOCKING
- END CAP W/CONC. BLOCKING
- GATE VALVE
- FIRE HYDRANT
- FIRE DEPT CONNECTION
- PRESSURE INDICATING VALVE
- WATER METER
- IRR IRRIGATION METER

DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

LEGEND & ABBREVIATIONS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI — STATE OF WASHINGTON — 25002 — REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED:	VALERIE GOODING	
DRAWN:	VALERIE GOODING	
CHECKED:	PRESTON LONGONI, P.E.	
APPROVED:	PRESTON LONGONI, P.E.	COLIN LUND, PRESIDENT PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.002

SHEET	OF
02	24

8/7/2024 1:57 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DRV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.002_LEGEND & ABBREVIATIONS.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

SEE SHEETS C.101, C.201, C.301, C.401 & L.101

SEE SHEETS C.102, C.202, C.302, C.402 & L.102

SEE SHEET C.431

SEE SHEET C.431

SEE SHEETS C.103, C.203, C.303, C.403 & L.103

N

0 80' 160'

1" 2"

SCALE: 1" = 80'

SW 24TH AVE

SW RIDGEWAY DR

SW VISTA PARK DR

SW EAGLE VISTA AVE

ROAD A

ROAD B

ROAD C

ROAD D

DRIVE A

DRIVE B

DRIVE C

DRIVE D

DRIVE E

DRIVE F

DRIVE G

STATE RT 20

PARCEL A
APN
R13210-364-1900

PARCEL B
APN
R13210-364-1730

PARCEL C
APN
R13210-364-2330

PARCEL D
APN
R13210-296-2300

PARCEL E
APN
R13210-295-1480

TRACT A
ECA WETLAND

TRACT B
ECA WETLAND

TRACT C
STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 1

TRACT D
STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 2

TRACT E
STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 3

TRACT F
OPEN SPACE

TRACT G
OPEN SPACE

TRACT H
OPEN SPACE

TRACT I
OPEN SPACE

TRACT J
OPEN SPACE

TRACT K
ACCESS

TRACT L
ACCESS

TRACT M
ACCESS

TRACT N
ACCESS

TRACT O
ACCESS

TRACT P
ACCESS

TRACT Q
ACCESS

TRACT R
ACCESS

TRACT S
ACCESS

50' WETLAND BUFFER LINE

50' BUFFER

FUTURE DEVELOPMENT
RIDGEWAY HEIGHTS
PERMIT NO.

FUTURE DEVELOPMENT

ROW PUBLIC

WSDOT POND
APN 4161513

THE HEIGHTS
AFN 9500708

HIGHLAND TRACE
AFN 283734

EAGLE CREST
AFN 9300506

EAGLE CREST - 2
AFN 9401633

APN R13210-415-2330

APN R13210-364-1570

APN R13210-364-1400

APN R13210-364-0650

APN R13210-295-0480

APN R13210-324-2530

APN R13210-229-0930

APN R13210-199-1250

APN R13210-198-1570

SURVEY AFN 294074

APN R13210-248-2000

TRACT 994

TRACT 995

TRACT 996

TRACT 997

TRACT 998

TRACT 999

TRACT 992

TRACT 993

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

COMPOSITE PLAN & SHEET LAYOUT
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI
STATE OF WASHINGTON
21602
REGISTERED PROFESSIONAL ENGINEER

08-07-2024

DESIGNED:	VALERIE GOODING	
DRAWN:	VALERIE GOODING	
CHECKED:	PRESTON LONGONI, P.E.	
APPROVED:	PRESTON LONGONI, P.E.	COLIN LUND, PRESIDENT PROJECT MANAGER

DATE
08-07-2024

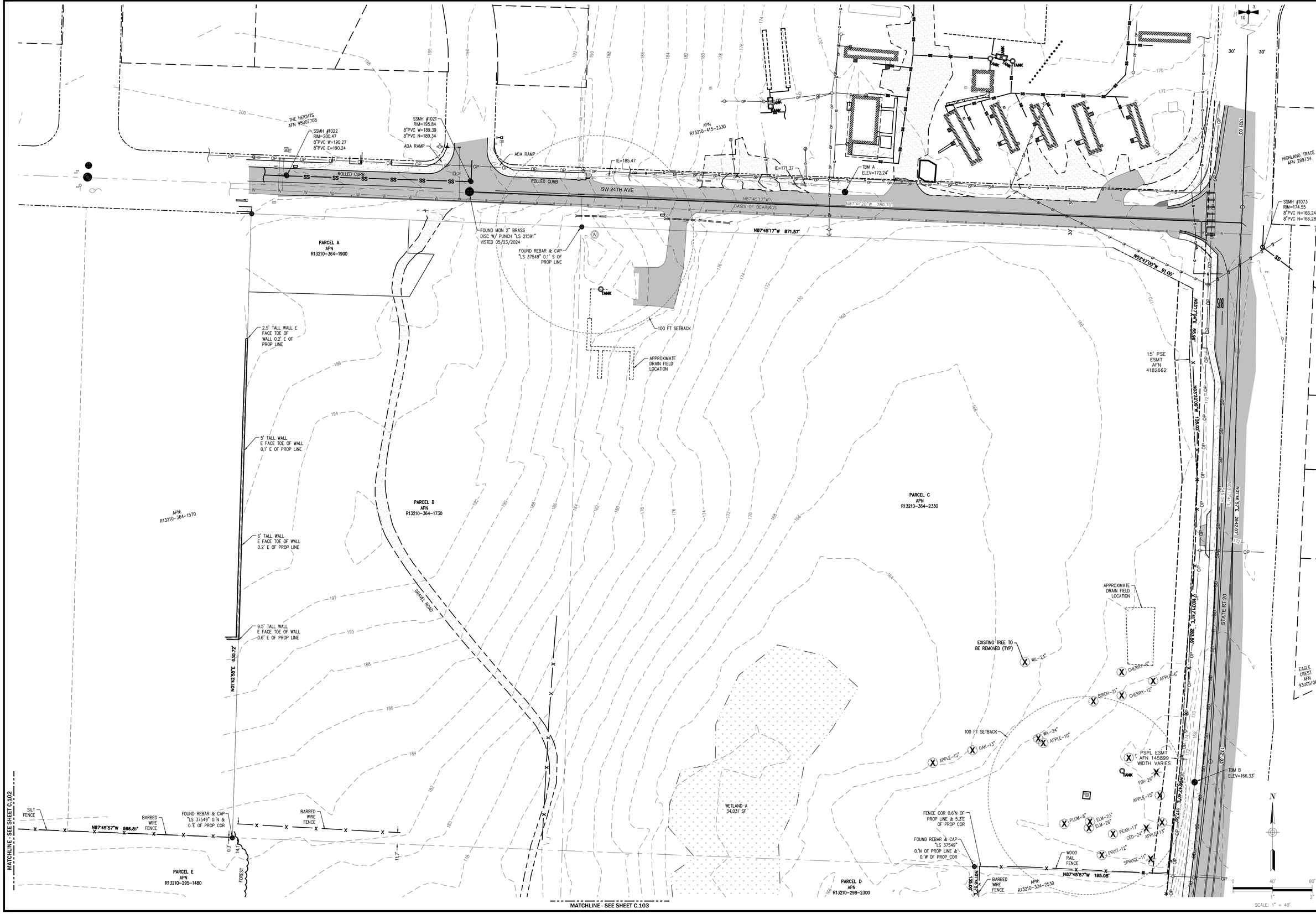
PERMIT NUMBERS

SHEET NUMBER
C.100

SHEET	OF
03	24

8/7/2024 1:59 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-01\V07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C100_OVERALL PRELIM PLAN.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.



DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

EXISTING CONDITIONS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRELIMINARY
KEVIN P. RAWLINSON
STATE OF WASHINGTON
21910
REGISTERED PROFESSIONAL LAND SURVEYOR
08/05/2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.
	COLIN LUND, PRESIDENT
	PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.101

SHEET	OF
04	24

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.101

MATCHLINE - SEE SHEET C.103

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'E OF PROP COR

FOUND REBAR & CAP "LS 28074" 0.'N OF PROP LINE

FOUND REBAR & CAP "LS 37549" 0.'N & 0.'E OF PROP COR

FOUND IRON PIPE 1" W/ PLUG 0.'N OF PROP LINE

BARBED WIRE FENCE

SILT FENCE

ELECTRIC HORSE FENCE

N87°45'57"W 666.81'

N01°42'58"E 630.72'

N01°40'08"E 660.85'

N87°46'37"W 1452.52'

21.1'

17.1'

0.5'

0.3'

14.1'

11.7'

5.3'

0.0'

0.6'

1.8'

8.3'

4.4'

APN: R13210-364-0650

APN: R13210-364-1400

APN: R13210-364-1570

APN: R13210-295-0480

APN: R13210-229-0930

APN: R13210-199-1250

APN: R13210-198-1570

APN: R13210-246-2000

PARCEL B APN R13210-364-1730

PARCEL C APN R13210-364-2330

PARCEL D APN R13210-298-2300

PARCEL E APN R13210-295-1480

WETLAND B 2,116 SF

FOREST

GRADE ROAD

60' INGRESS, EGRESS & UTIL. EASEMENT AFN 4128383

SURVEY AFN 294074

N

0 40' 80'

1" 2"

SCALE: 1" = 40'

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

EXISTING CONDITIONS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRELIMINARY

DESIGNED:	VALERIE GOODING	COLIN LUND, PRESIDENT
DRAWN:	VALERIE GOODING	PROJECT MANAGER
CHECKED:	PRESTON LONGONI, P.E.	
APPROVED:	PRESTON LONGONI, P.E.	

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.102

SHEET	OF
05	24

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.101

MATCHLINE - SEE SHEET C.102

PARCEL B
APN
R13210-364-1730

PARCEL C
APN
R13210-364-2330

PARCEL D
APN
R13210-298-2300

PARCEL E
APN
R13210-295-1480

WETLAND A
34,031 SF

100 FT SETBACK

EXISTING TREE TO BE REMOVED (TYP)

WIL-24"
APPLE-10"
APPLE-15"
OAK-13"
PLUM-8"
ELM-23"
ELM-26"
PEAR-17"
APPLE-15"
FIR-29"
APPLE-15"
FRUIT-12"
SPRUCE-11"

PSPL ESMT
AFN 145899
WIDTH VARIES

15' PSE
ESMT
AFN
4182662

TANK

TBM B
ELEV=166.33'

WOOD
RAIL
FENCE

N87°45'57"W 195.08'

FENCE COR 0.6'N OF PROP LINE & 5.3'E OF PROP COR

FOUND REBAR & CAP
"LS 37549"
0.'N OF PROP LINE &
0.'W OF PROP COR

DRAIN FIELD

SEPTIC TANK

N01°45'57"E 135.00'

BARBED WIRE FENCE

APN:
R13210-324-2530

FOUND REBAR & CAP
"BV LS 37549"
0.'W OF PROP LINE &
0.'NW OF PROP COR

N87°45'57"W 178.23'

FENCE COR 6.1'E OF PROP LINE & 7.0'N OF PROP COR

FOUND REBAR & CAP
"LS 37549" 0.'E OF
PROP LINE & 0.'N OF
PROP COR

SIGN "SPEED LIMIT 50"

15' PSE
ESMT
AFN
4182676

N01°45'57"E 1321.05'

N01°45'57"E 264.07'

N01°45'57"E 336.18'

660.52'

STATE RT 20

VARIES

35'

TBM B
ELEV=166.33'

EAGLE CREST - 2
AFN 9401633

SW EAGLE VISTA AVE

SSMH #1173
RIM=138.59
8"PVC W=129.67
8"PVC E=129.05

SIGN

N83°12'21"W 95.00'

FOUND REBAR & CAP
0.'N OF PROP LINE &
0.'E OF PROP COR

SSMH #1180
RIM=137.84
8"PVC E=130.39

N00°47'39"E 198.60'

WSDOT
POND

AFN
4161513

60' INGRESS,
EGRESS & UTIL.
EASEMENT
AFN 4128383

CHAINLINK
FENCE

N87°46'37"W 1452.52'

APN:
R13210-248-2000

FOREST

FOREST

GRAVEL ROAD

N

0 40' 80'
1" 2"
SCALE: 1" = 40'

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

EXISTING CONDITIONS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRELIMINARY

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

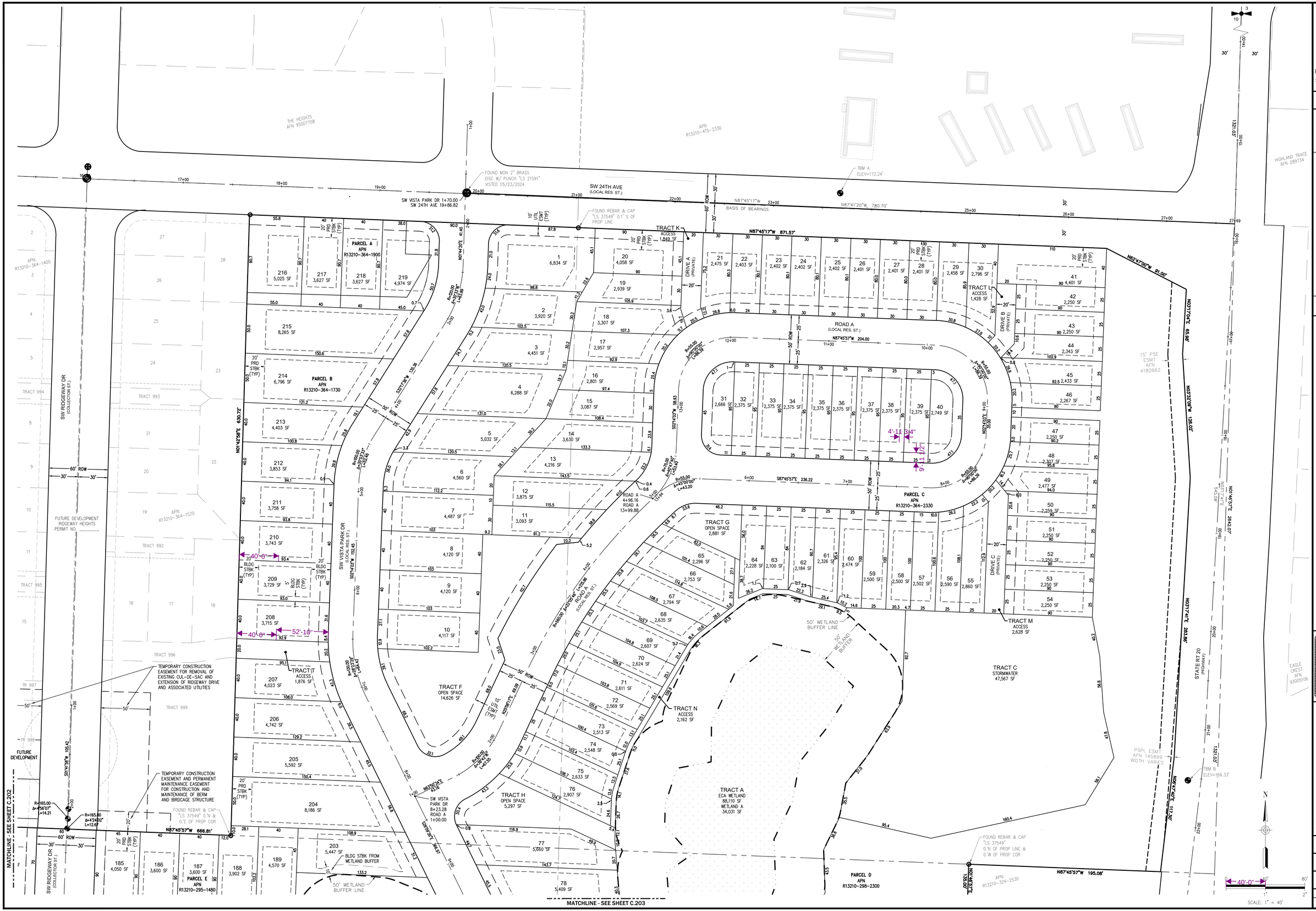
DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.103

SHEET	OF
06	24

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.



DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

PRELIMINARY PLAT
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

Preliminary
RILEY J. PARKER
STATE OF WASHINGTON
23804
REGISTERED PROFESSIONAL LAND SURVEYOR
08/06/2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

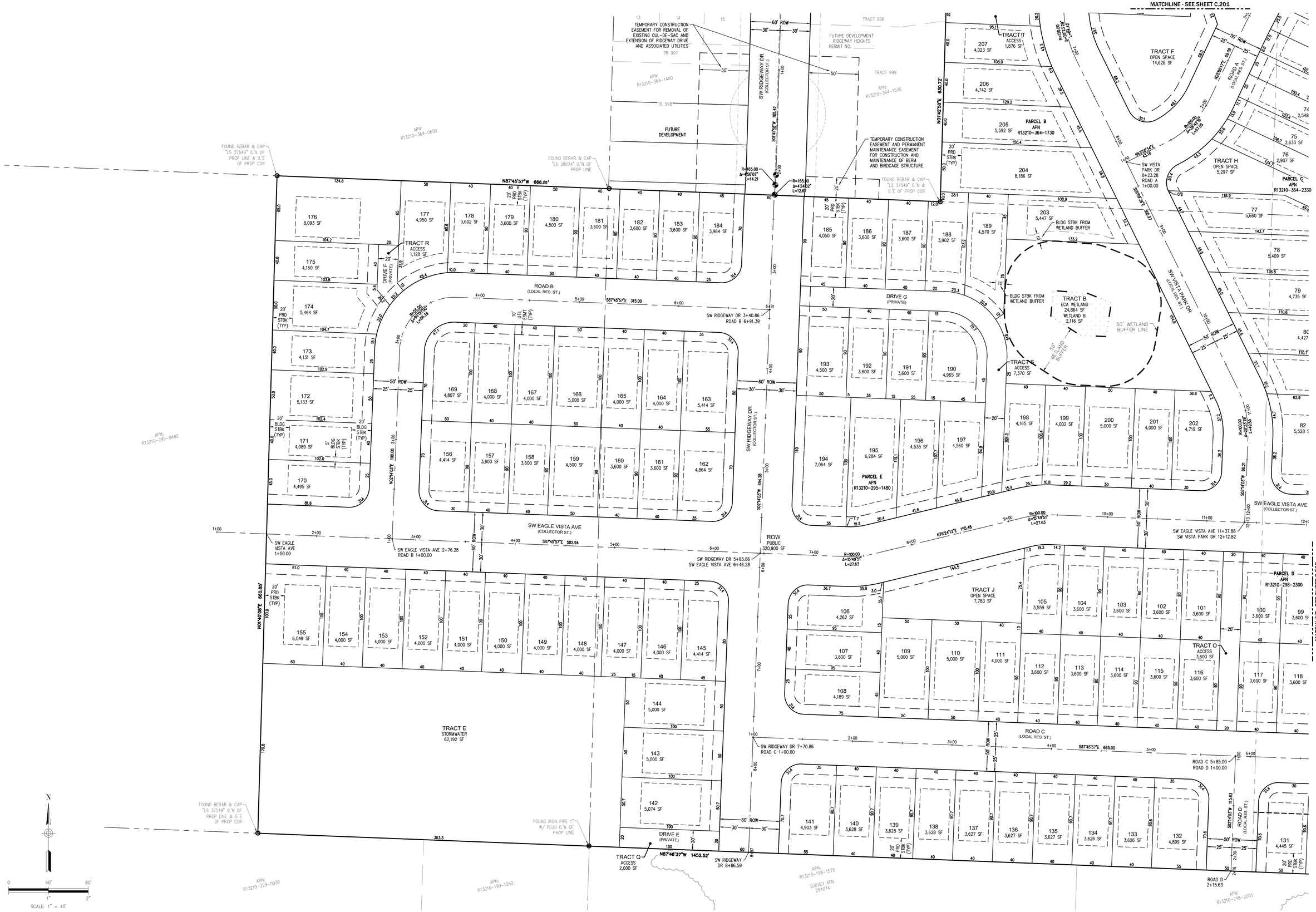
PERMIT NUMBERS

SHEET NUMBER
C.201

SHEET	OF
07	24

8/7/2024 2:02 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.201_PRELIMINARY PLAT.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.



DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO. 24001

REV	DESCRIPTION	DATE

PRELIMINARY PLAT
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRELIMINARY
STANLEY C. PARKER
REGISTERED PROFESSIONAL LAND SURVEYOR
08/06/2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.
PROJECT MANAGER	COLIN LUND, PRESIDENT

DATE 08-07-2024

PERMIT NUMBERS

SHEET NUMBER C.202

SHEET 08 OF 24

8/7/2024 2:50 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DRV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.201_PRELIMINARY PLAT.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.201

MATCHLINE - SEE SHEET C.202

PARCEL B APN R13210-364-1730

ROAD A (LOCAL RES. ST.)

TRACT H OPEN SPACE 5,297 SF

SW VISTA PARK DR 8+23.28 ROAD A 1+00.00

TRACT A ECA WETLAND 88,110 SF WETLAND A 34,031 SF

TR C STORMWATER 47,567 SF

PARCEL C APN R13210-364-2330

PSPL ESMT AFN 145899 WIDTH VARIES

TBM 'B' ELEV=186.33'

15' PSE ESMT AFN 4182662

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'W OF PROP COR

N87°45'57"W 195.08'

N01°46'57"E 135.00'

APN: R13210-324-2530

FOUND REBAR & CAP "BV LS 37549" 0.'W OF PROP LINE & 0.'NW OF PROP COR

FOUND REBAR & CAP "LS 37549" 0.'E OF PROP LINE & 0.'N OF PROP COR

N87°45'57"W 178.23'

15' PSE ESMT AFN 4182676

50' WETLAND BUFFER

50' WETLAND BUFFER LINE

TRACT I OPEN SPACE 121,912 SF

PARCEL D APN R13210-298-2300

SW VISTA PARK DR (LOCAL RES. ST.)

SW EAGLE VISTA AVE (COLLECTOR ST.)

S87°45'57"E 535.12

SW EAGLE VISTA AVE 11+37.88 SW VISTA PARK DR 12+12.82

SW EAGLE VISTA AVE 13+72.88 ROAD C 10+31.39

N00°46'57"E 336.18'

STATE RT 20 (HIGHWAY)

N00°46'57"E 660.52'

PARCEL E APN R13210-295-1480

ROAD C (LOCAL RES. ST.)

ROAD C 5+85.00 ROAD D 1+00.00

ROAD D (LOCAL RES. ST.)

ROAD D 2+15.63

DRIVE D (PRIVATE)

S02°14'03"W 115.63

S02°14'03"W 180.00

N02°14'03"E 180.00

N87°46'37"W 1452.52'

TRACT O ACCESS 3,600 SF

TRACT P ACCESS 4,440 SF

TRACT D STORMWATER 28,983 SF

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'E OF PROP COR

N83°12'21"W 95.00'

S83°12'21"E 95.00'

N83°12'21"W 95.00'

60' INGRESS, EGRESS & UTIL. EASEMENT AFN 4128383

AFN 4161513

EAGLE CREST - 2 AFN 9401163.3

SW EAGLE VISTA AVE (COLLECTOR ST.)

SW EAGLE VISTA AVE 18+16.99 STATE RT 20 27+25.69

APN: R13210-248-2000

16.2' @ 1 1/4"

| | | |

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.302

MATCHLINE - SEE SHEET C.303

SCALE: 1" = 40'

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

SITE & GRADING PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON GRADING & DEVELOPMENT LLC — 55602 — REGISTERED PROFESSIONAL ENGINEER — STATE OF WASHINGTON

08-07-2024

DESIGNED:	VALERIE GOODING	COLIN LUND, PRESIDENT
DRAWN:	VALERIE GOODING	PROJECT MANAGER
CHECKED:	PRESTON LONGONI, P.E.	
APPROVED:	PRESTON LONGONI, P.E.	

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.301

SHEET	OF
10	24

8/7/2024 2:03 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-000003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-000003_C-301_GRAD PLAN.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.301

MATCHLINE - SEE SHEET C.303

SCALE: 1" = 40'

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.302

SHEET	OF
11	24

08-07-2024

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

SITE & GRADING PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

8/7/2024 2:03 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DRV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.301_GRAD PLAN.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.301

MATCHLINE - SEE SHEET C.302

PARCEL B APN R13210-364-1730

PARCEL C APN R13210-364-2330

PARCEL D APN R13210-298-2300

PARCEL E APN R13210-295-1480

TRACT A ECA WETLAND [CLASSIFICATION] WETLAND A 34,031 SF

TRACT C STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 1 SEE SHEET C.431 FOR DETAIL

TRACT D STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 2 SEE SHEET C.431 FOR DETAIL

TRACT H OPEN SPACE

TRACT I OPEN SPACE

TRACT O ACCESS

TRACT P ACCESS

SW EAGLE VISTA AVE

SW VISTA PARK DR

ROAD A

ROAD C

ROAD D

DRIVE D

STATE RT 20

SOFT SURF TRAIL (TYP)

ASPHALT TRAIL (TYP)

CONC. WALK (TYP)

50' WETLAND BUFFER

50' WETLAND BUFFER LINE

PROPOSED CONTOUR (TYP)

EXISTING CONTOUR (TYP)

PSPL ESMT AFN 145899 WIDTH VARIES

15' PSE ESMT AFN 4182662

15' PSE ESMT AFN 4182678

60' INGRESS, EGRESS & UTIL. EASEMENT AFN 4128383

WSDOT POND SEE SHEET C.431 FOR DETAIL

STRUCTURAL PAD ELEVATION (TYP) 5' OF TOP SOIL TO BE ADDED AFTER BUILDING CONSTRUCTION

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'W OF PROP COR

FOUND REBAR & CAP "LS 37549" 0.'E OF PROP LINE & 0.'N OF PROP COR

FOUND REBAR & CAP "BV LS 17549" 0.'W OF PROP LINE & 0.'N OF PROP COR

SIGN SPEED LIMIT 50

TBM B ELEV=166.33'

EAGLE CREST – 2 AFN 9401163 3

APN: R13210-524-2530

APN: R13210-249-2000

N87°45'57"W 195.06'

N87°45'57"W 178.23'

N87°46'37"W 1452.52'

N03°12'21"W 95.00'

N01°46'57"E 264.07'

N01°46'57"E 135.00'

N01°46'57"E 1320.63'

N01°46'57"E 117.30'

N 36°47'30" E 336.18'

N 36°47'30" E 198.60'

660.52'

SCALE: 1" = 40'

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

SITE & GRADING PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI — STATE OF WASHINGTON — 55602 — REGISTERED PROFESSIONAL ENGINEER

08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

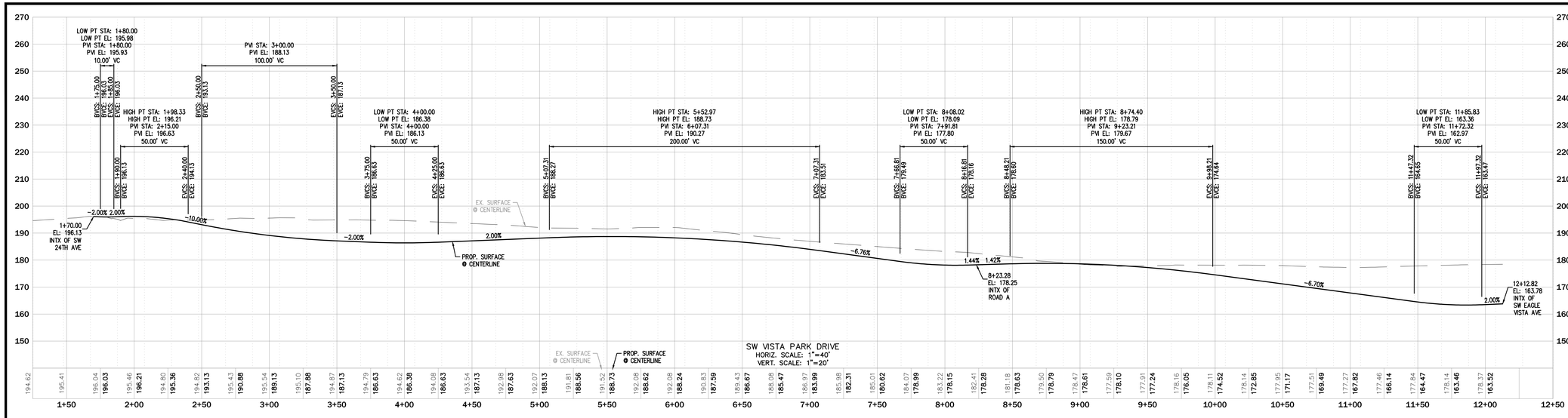
DATE
08-07-2024

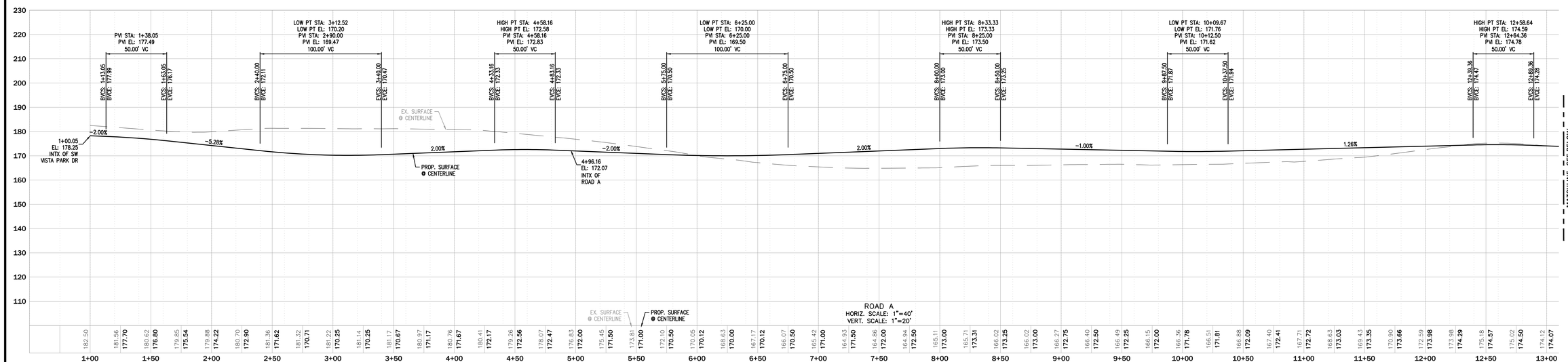
PERMIT NUMBERS

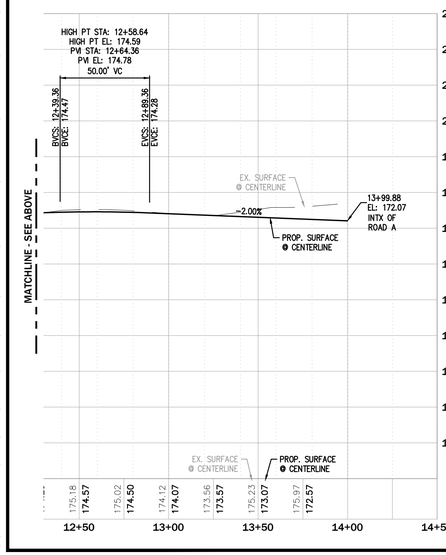
SHEET NUMBER
C.303

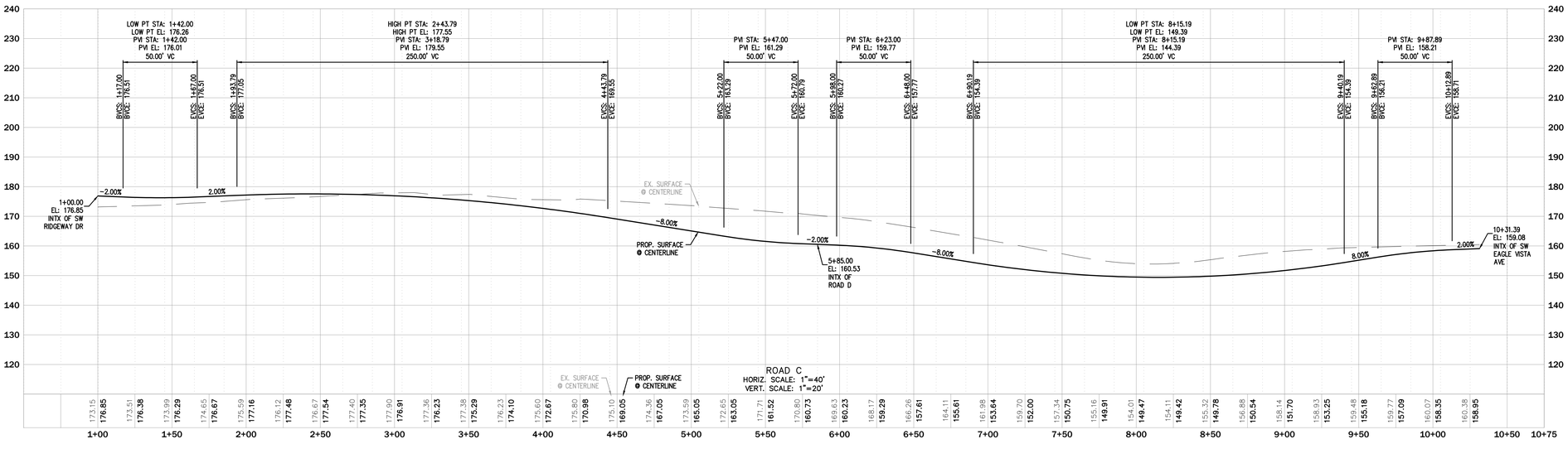
SHEET	OF
12	24

8/7/2024 2:03 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.301_GRAD PLAN.DWG









DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

ROAD PROFILES
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033



08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

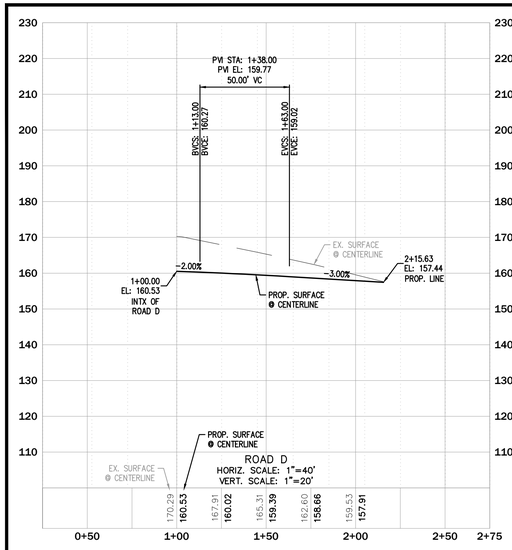
PERMIT NUMBERS

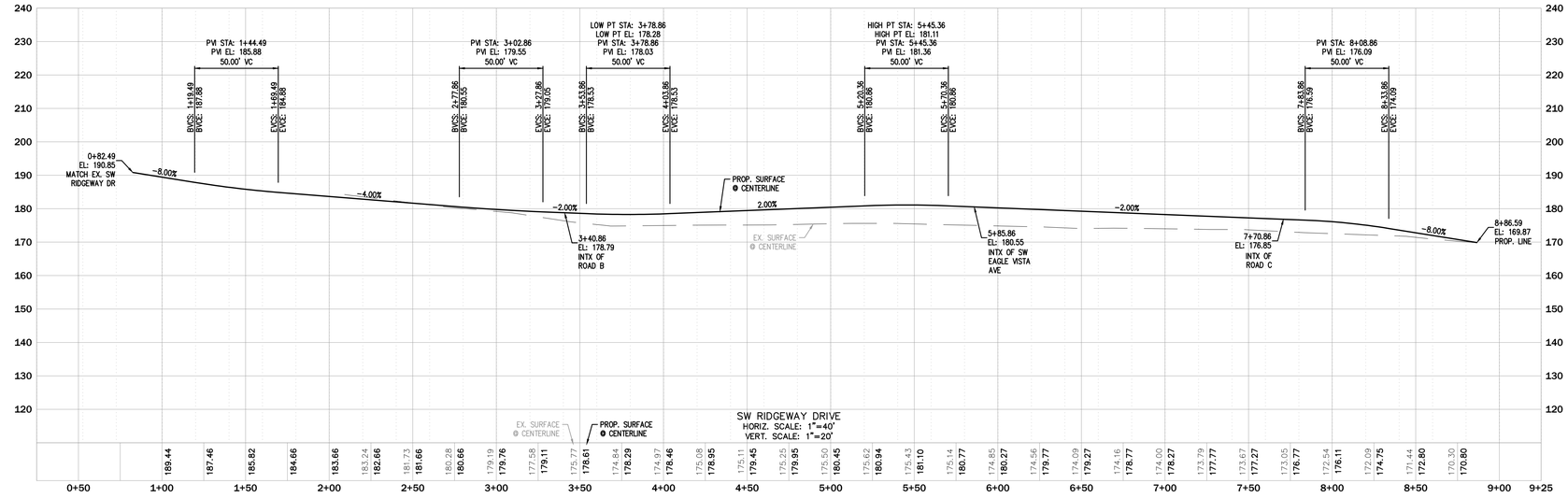
SHEET NUMBER
C.321

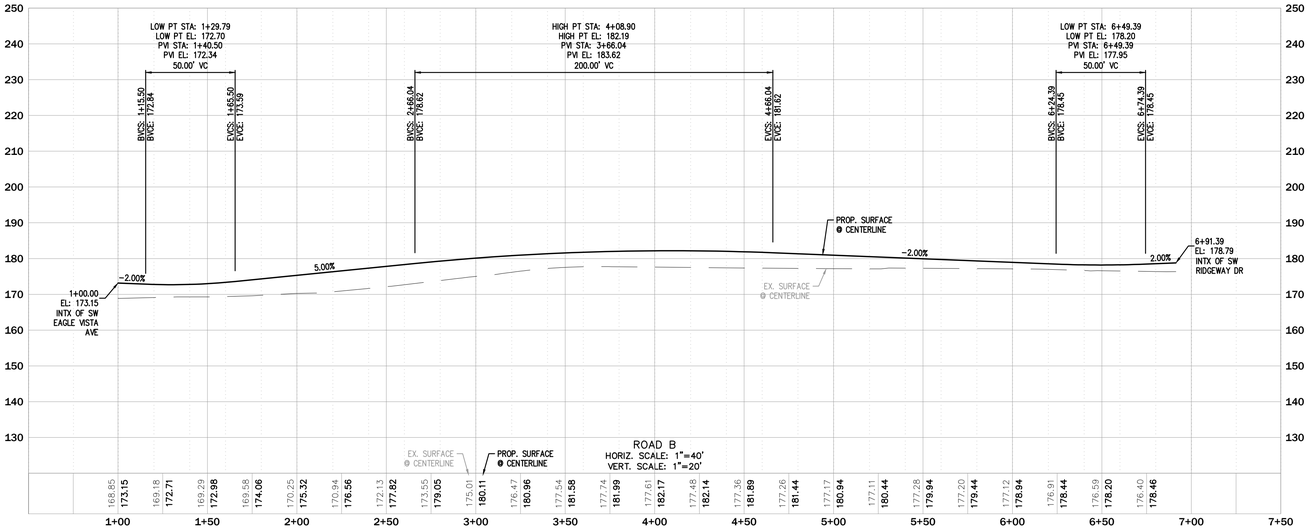
SHEET	OF
13	24

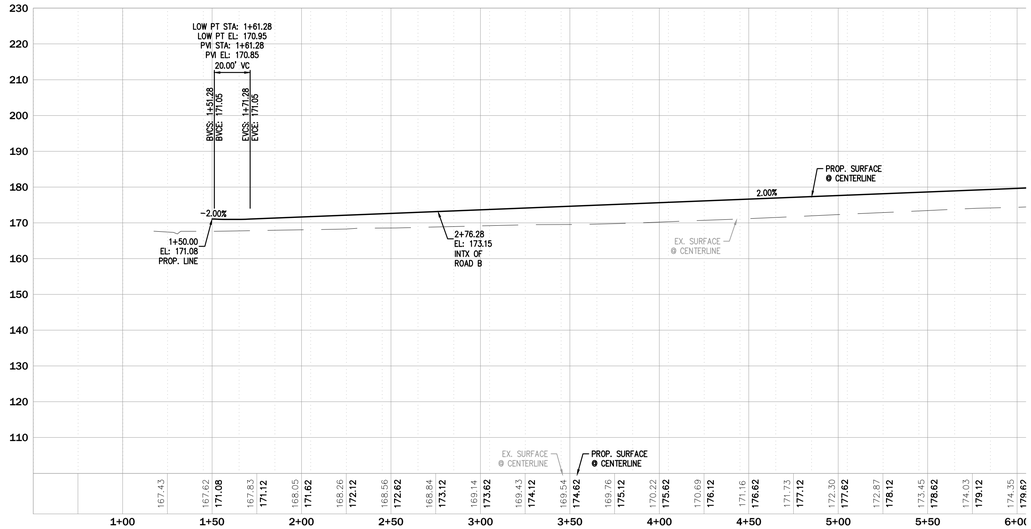
8/7/2024 2:05 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-RPLV7_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.321_ROAD PROFILES.DWG

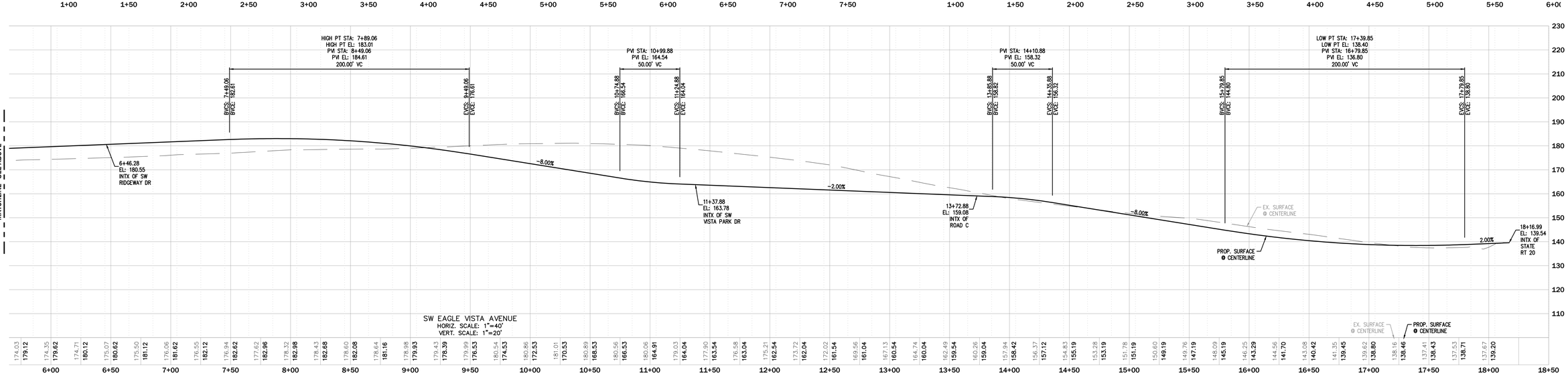
A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.











DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

ROAD PROFILES
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI
STATE OF WASHINGTON
25602
REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED:	VALERIE GOODING	
DRAWN:	VALERIE GOODING	
CHECKED:	PRESTON LONGONI, P.E.	
APPROVED:	PRESTON LONGONI, P.E.	
	COLIN LUND, PRESIDENT	PROJECT MANAGER

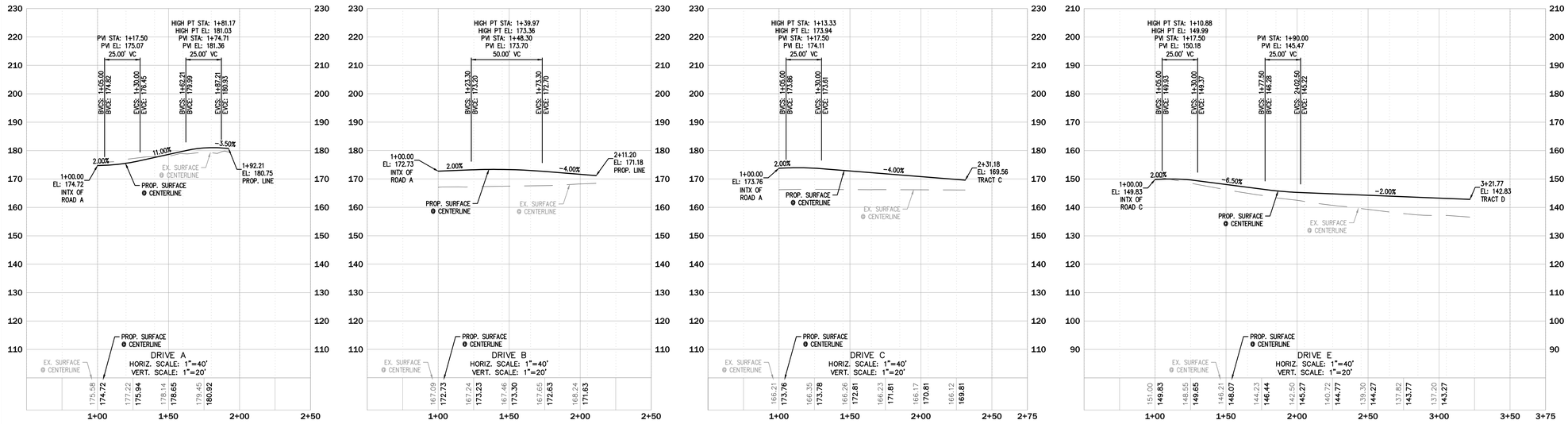
DATE
08-07-2024

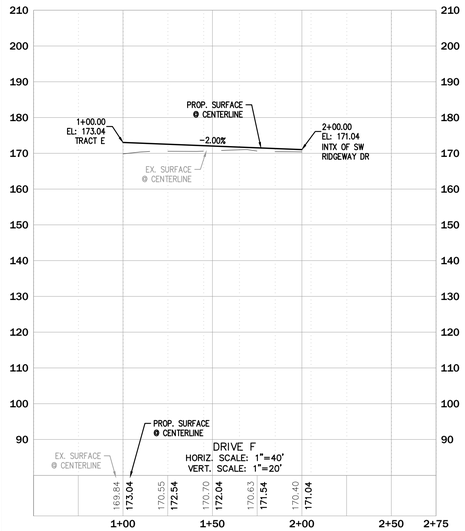
PERMIT NUMBERS

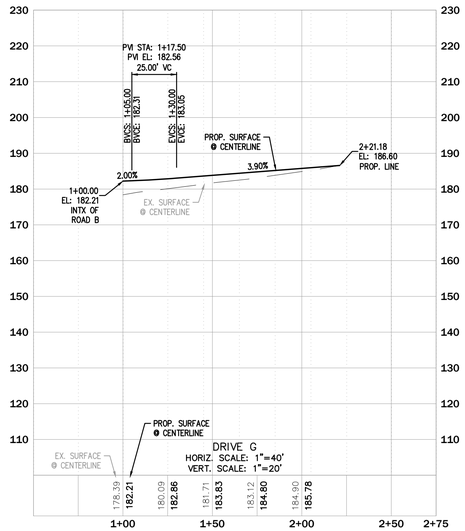
SHEET NUMBER
C.322

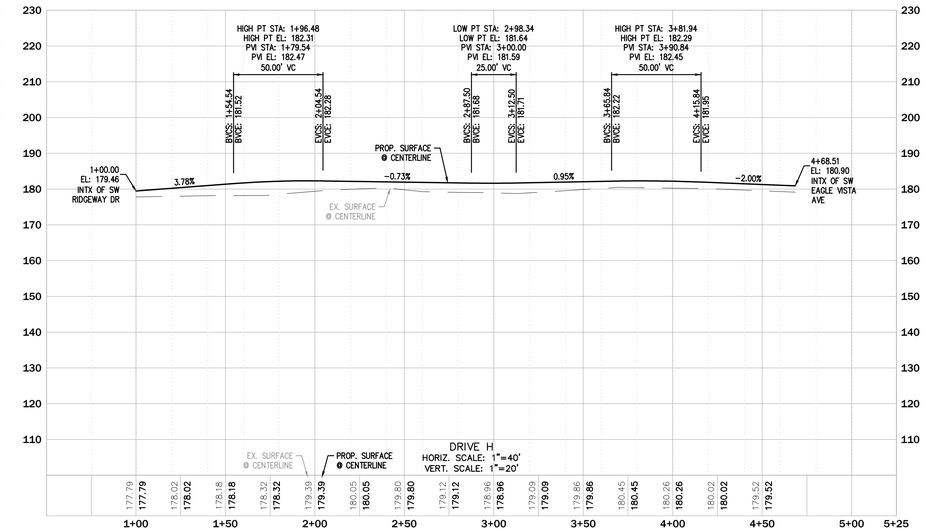
SHEET	OF
14	24

8/7/2024 2:07 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DRV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.321_ROAD PROFILES.DWG









DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

ROAD PROFILES
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON V. LONGONI — STATE OF WASHINGTON — 22000 — REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED: VALERIE GOODING
DRAWN: VALERIE GOODING
CHECKED: PRESTON LONGONI, P.E.
APPROVED: PRESTON LONGONI, P.E.
COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

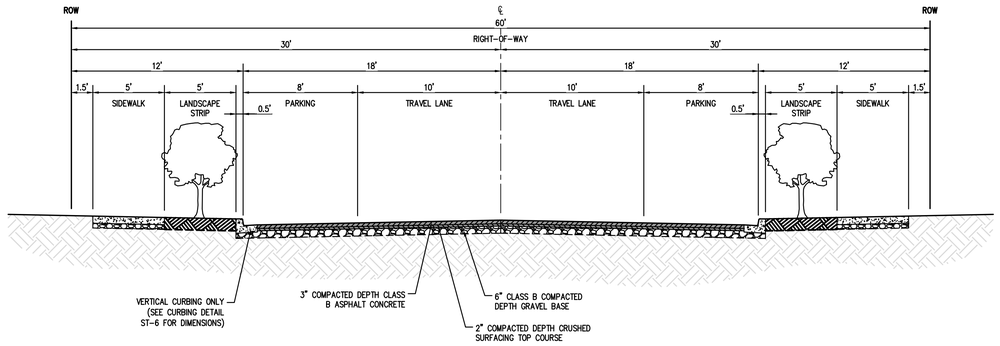
PERMIT NUMBERS

SHEET NUMBER
C.323

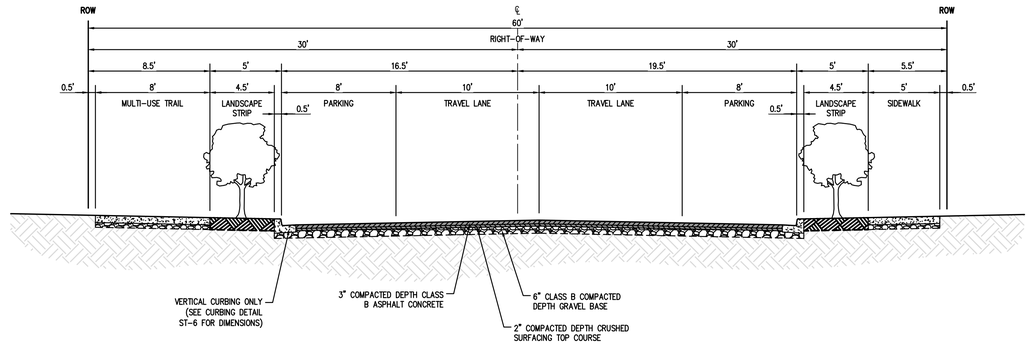
SHEET	OF
15	24

8/7/2024 2:08 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-OPV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.321_ROAD PROFILES.DWG

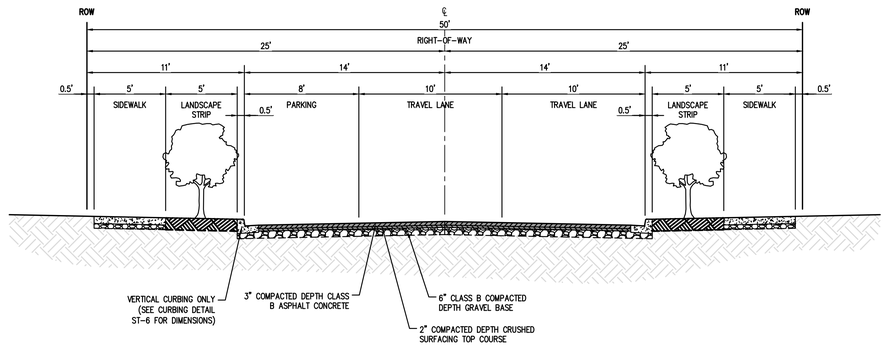
CROSS SECTION A–A: SW RIDGEWAY DRIVE



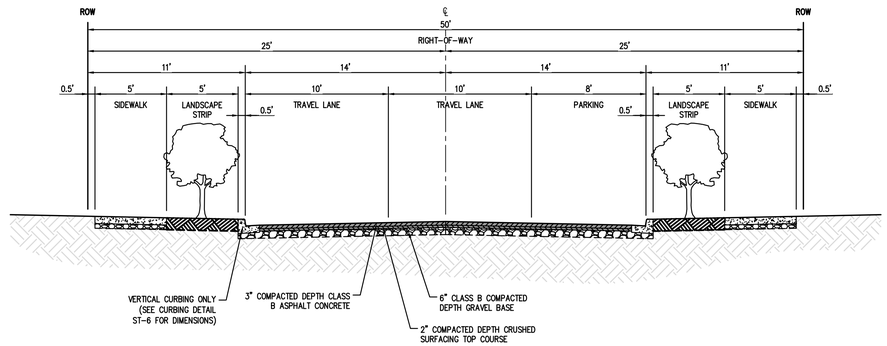
CROSS SECTION B–B: SW EAGLE VISTA AVENUE



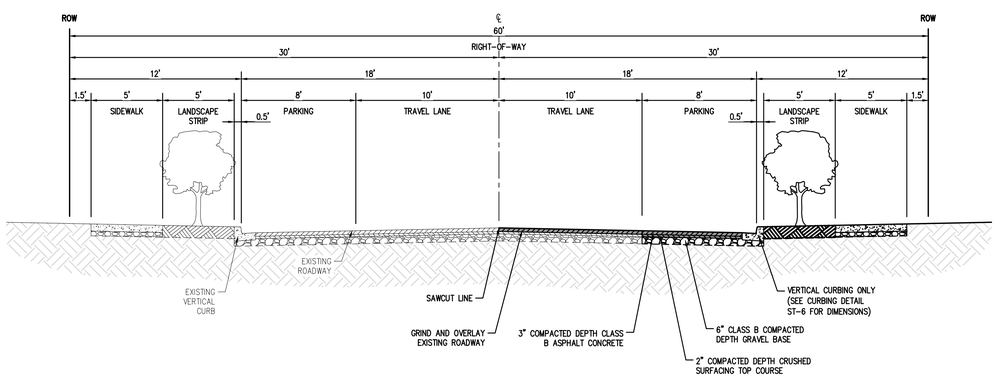
CROSS SECTION C–C: SW VISTA PARK DRIVE



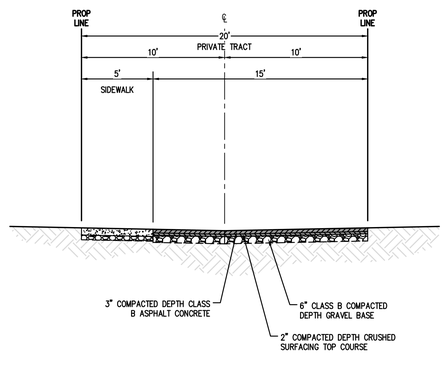
CROSS SECTION D–D: ROAD A



CROSS SECTION E–E: SW 24TH AVENUE



CROSS SECTION F–F: PRIVATE DRIVES



SIEVE SIZE	PERCENT PASSING	
	BASE COURSE	TOP COURSE
1–1/4" SQUARE	100	
3/4" SQUARE		100
5/8" SQUARE	50–80	
1/4" SQUARE	30–50	55–75
U.S. NO. 40	3–18	8–24
US.S NO. 200	7.5 MAX.	10.0 MAX.
% FRACTURE	75 MIN.	75 MIN.
SAND EQUIVALENT	35 MIN.	35 MIN.

NOTES:

1. ALL WORKMANSHIP INSTALLATION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY OF OAK HARBOR STANDARDS AND THE MOST RECENT COPY OF THE STATE OF WASHINGTON STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (WSDOT/APWA)

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

SITE & GRADING NOTES & DETAILS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI — 22602 — REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED: VALERIE GOODING
DRAWN: VALERIE GOODING
CHECKED: PRESTON LONGONI, P.E.
APPROVED: PRESTON LONGONI, P.E.
COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.331

SHEET 16 OF 24

8/7/2024 2:10 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-PRV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.331_GRADING NOTES & DETAILS.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.



DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

UTILITY PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON GATES & ELLIS LLP
STATE OF WASHINGTON
COLIN LUND
25602
REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.
	COLIN LUND, PRESIDENT PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
C.401

SHEET	OF
17	24

SCALE: 1" = 40'

8/7/2024 2:11 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.401_UTILITY PLAN.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.401

MATCHLINE - SEE SHEET C.403

FUTURE DEVELOPMENT RIDGEWAY HEIGHTS PERMIT NO. _____

FUTURE DEVELOPMENT

TEMPORARY CONSTRUCTION EASEMENT FOR REMOVAL OF EXISTING CUL-DE-SAC AND EXTENSION OF RIDGEWAY DRIVE AND ASSOCIATED UTILITIES

CONNECT TO EX. 10" WATER MAIN (TYP)

TEMPORARY CONSTRUCTION EASEMENT AND PERMANENT MAINTENANCE EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF BERM AND BIRDCAGE STRUCTURE

2' HIGH BERM @ PL

N87°45'57"W 666.81'

N01°47'36"E 830.74'

FOUND REBAR & CAP "LS 37549" 0.'N & 0.'E OF PROP COR

FOUND REBAR & CAP "LS 28074" 0.'N OF PROP LINE

FOUND REBAR & CAP "LS 37549" 0.'N & 0.'E OF PROP COR

N01°47'36"E 830.74'

N01°47'36"E 830.85'

APN: R13210-364-0650

APN: R13210-364-1400

APN: R13210-364-1570

APN: R13210-295-0480

APN: R13210-229-0930

APN: R13210-199-1250

APN: R13210-198-1570

APN: R13210-248-2000

SURVEY AFN 294074

FOUND IRON PIPE 1" W/ PLUG 0.'N OF PROP LINE

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'E OF PROP COR

TRACT R ACCESS

TRACT T ACCESS

TRACT S ACCESS

TRACT Q ACCESS

TRACT O ACCESS

TRACT E STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 3 SEE SHEET C.431 FOR DETAIL

TRACT F OPEN SPACE

TRACT H OPEN SPACE

TRACT J OPEN SPACE

TRACT B ECA WETLAND [CLASSIFICATION] WETLAND B 2,116 SF

50' WETLAND BUFFER LINE

50' WETLAND BUFFER

PARCEL B APN R13210-364-1730

PARCEL C APN R13210-364-2330

PARCEL D APN R13210-298-2300

PARCEL E APN R13210-295-1480

LOT DISPERSES TO WETLAND B FOR WETLAND RECHARGE SEE DRAINAGE REPORT FOR ADDITIONAL INFO.

LOT DISPERSES TO WETLAND A FOR WETLAND RECHARGE SEE DRAINAGE REPORT FOR ADDITIONAL INFO.

DRIVE F

ROAD B

DRIVE G

ROAD A

ROAD C

ROAD D

DRIVE E

SW RIDGEWAY DR

SW VISTA PARK DR

SW EAGLE VISTA AVE

ROW PUBLIC

8" WATER MAIN (TYP)

8" SANITARY SEWER (TYP)

12" STORM DRAIN (TYP)

12" STORM DRAIN OUTFALL PIPE

10" WATER MAIN (TYP)

FIRE HYD. (TYP)

FIRE HYDRANT COVERAGE CIRCLE (TYP)

N87°46'37"W 1452.52'

N

0 40' 80'

SCALE: 1" = 40'

8/7/2024 2:11 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C.401_UTILITY PLAN.DWG

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO. 24001

REV	DESCRIPTION	DATE

UTILITY PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI
STATE OF WASHINGTON
25602
REGISTERED PROFESSIONAL ENGINEER

08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE 08-07-2024

PERMIT NUMBERS

SHEET NUMBER C.402

SHEET 18 OF 24

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET C.401

MATCHLINE - SEE SHEET C.402

PARCEL B APN R13210-364-1730

PARCEL C APN R13210-364-2330

PARCEL D APN R13210-298-2300

PARCEL E APN R13210-295-1480

TR C STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 1 SEE SHEET C.431 FOR DETAIL

TRACT A ECA WETLAND [CLASSIFICATION] WETLAND A 34,031 SF

TRACT H OPEN SPACE

TRACT I OPEN SPACE

TRACT O ACCESS

TRACT P ACCESS

TRACT D STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 2 SEE SHEET C.431 FOR DETAIL

WSDOT POND SEE SHEET C.431 FOR DETAIL

ROAD A

ROAD C

ROAD D

DRIVE D

SW VISTA PARK DR

SW EAGLE VISTA AVE

STATE RT 20

50' WETLAND BUFFER

50' WETLAND BUFFER LINE

12" STORM DRAIN (TYP)

8" WATER MAIN (TYP)

8" SANITARY SEWER (TYP)

10" WATER MAIN (TYP)

FIRE HYD. (TYP)

FIRE HYDRANT COVERAGE CIRCLE (TYP)

LOT DISPERSES TO WETLAND A FOR WETLAND RECHARGE SEE DRAINAGE REPORT FOR ADDITIONAL INFO.

PSPL ESMT AFN 145899 WIDTH VARIES

15' PSE ESMT AFN 4182662

15' PSE ESMT AFN 4182676

60' INGRESS, EGRESS & UTIL. EASEMENT AFN 4128383

APN: R13210-324-2530

APN: R13210-248-2000

EAGLE CREST - 2 AFN 9401163

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'W OF PROP COR

FOUND REBAR & CAP "BV LS 37549" 0.'W OF PROP LINE & 0.'N OF PROP COR

FOUND REBAR & CAP "LS 37549" 0.'E OF PROP LINE & 0.'N OF PROP COR

N87°45'57"W 195.08'

N01°46'57"E 135.00'

N87°45'57"W 178.23'

N89°47'38"E 336.18'

N89°47'38"E 660.63'

N01°46'57"E 284.07'

N87°46'37"W 1452.52'

N8°12'21"W 95.00'

N89°47'38"E 198.60'

CONNECT TO EX. 8" WATER MAIN (TYP)
SSMH #1173
RIM=138.59
8"PVC W=129.67
8"PVC E=129.05

CONNECT TO EX.
SSMH #1180
RIM=137.84
8"PVC E=130.39

Bring this leader into the active layer

SIGN "SPEED LIMIT 50"

N

0 40' 80'

1" 2"

SCALE: 1" = 40'

8/7/2024 2:12 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DRV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C-401_UTILITY PLAN.DWG

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO. 24001

REV	DESCRIPTION	DATE

UTILITY PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI — STATE OF WASHINGTON — 26802 — REGISTERED PROFESSIONAL ENGINEER

08-07-2024

DESIGNED: VALERIE GOODING
DRAWN: VALERIE GOODING
CHECKED: PRESTON LONGONI, P.E.
APPROVED: PRESTON LONGONI, P.E.
COLIN LUND, PRESIDENT
PROJECT MANAGER

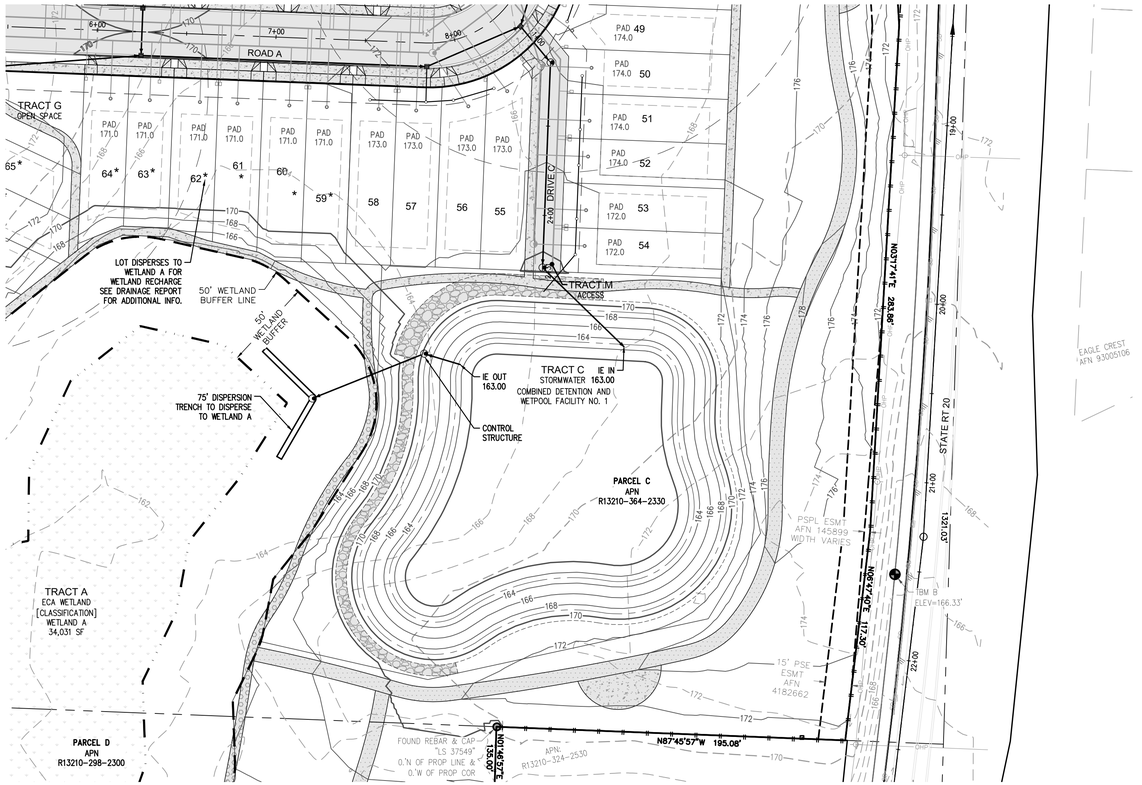
DATE 08-07-2024

PERMIT NUMBERS

SHEET NUMBER C.403

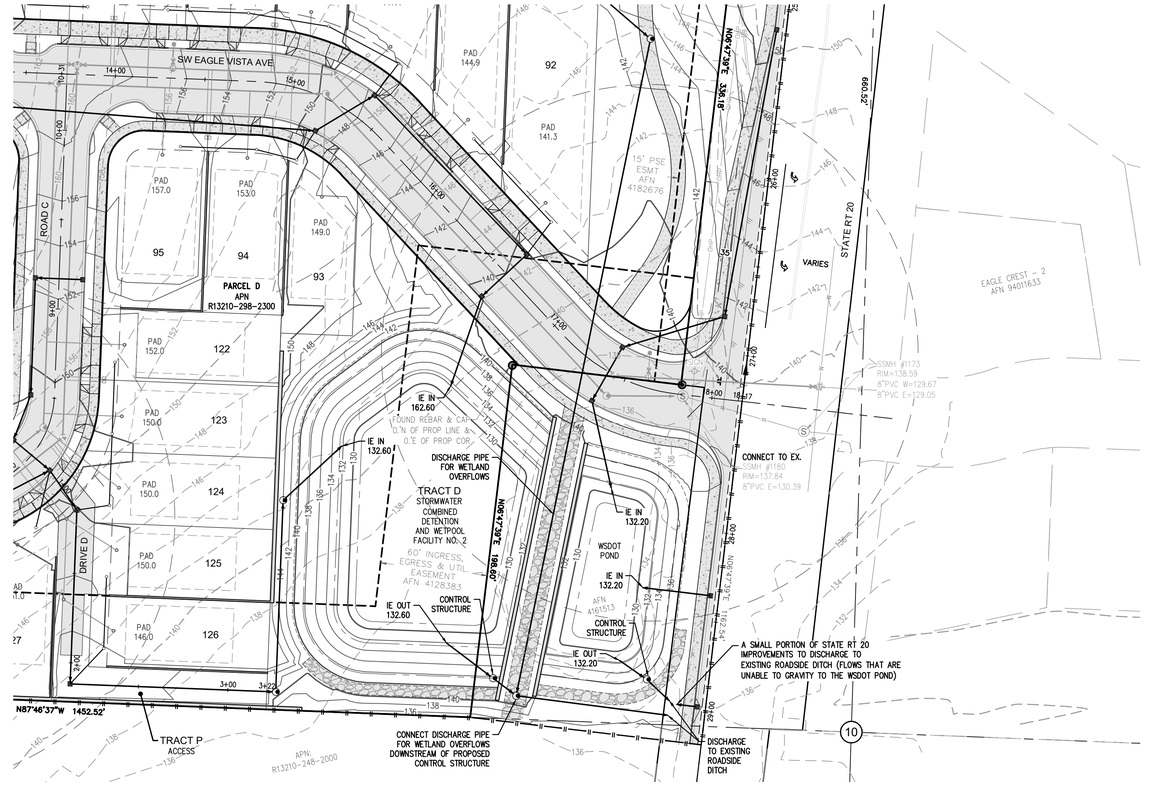
SHEET 19 OF 24

STORMWATER WETPOND NO. 1



POND 1
OUTLET ELEVATION: 163.00
LIVE STORAGE DEPTH: 6'
LIVE STORAGE VOLUME REQUIRED: 132,548 CF
LIVE STORAGE VOLUME PROVIDED: 146,436 CF
WATER QUALITY STORAGE DEPTH: 4'
WATER QUALITY VOLUME REQUIRED: 27,107 CF
WATER QUALITY VOLUME PROVIDED: >30,000 CF

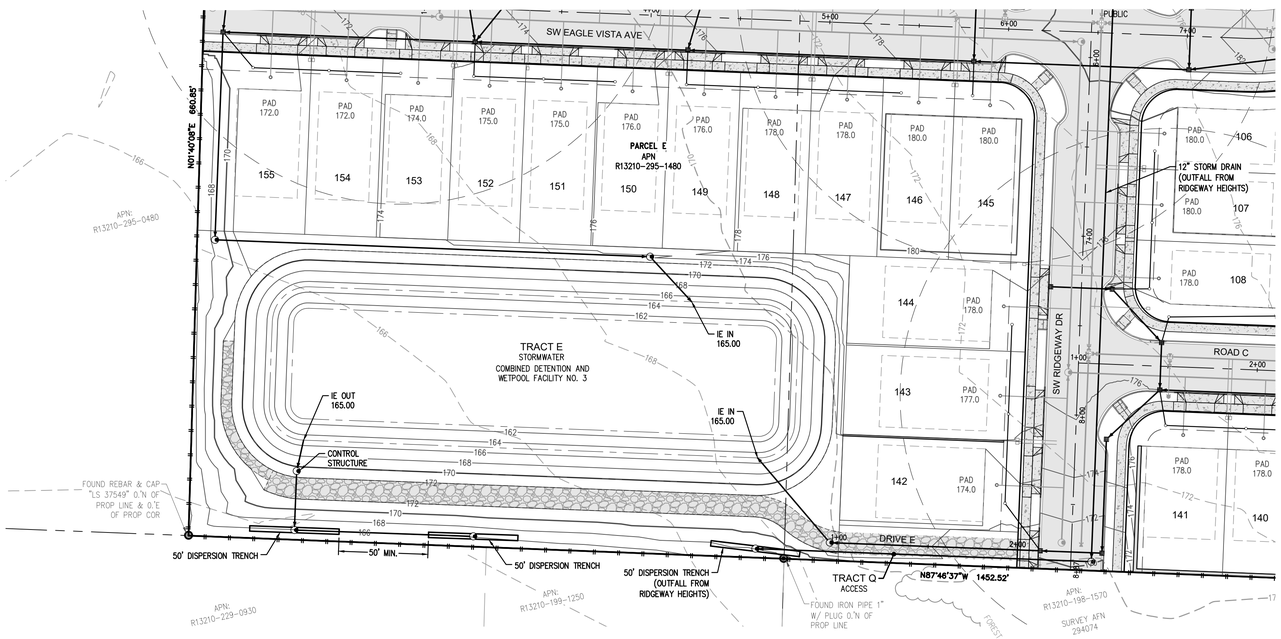
STORMWATER WETPOND NO. 2 AND WSDOT POND



POND 2
OUTLET ELEVATION: 132.60
LIVE STORAGE DEPTH: 5.7'
LIVE STORAGE VOLUME REQUIRED: 96,319 CF
LIVE STORAGE VOLUME PROVIDED: 99,677 CF
WATER QUALITY STORAGE DEPTH: 4'
WATER QUALITY VOLUME REQUIRED: 21,183 CF
WATER QUALITY VOLUME PROVIDED: >25,000 CF

WSDOT POND
OUTLET ELEVATION: 132.20
LIVE STORAGE DEPTH: 3.7'
LIVE STORAGE VOLUME REQUIRED: 21,610 CF
LIVE STORAGE VOLUME PROVIDED: 22,052 CF
WATER QUALITY STORAGE DEPTH: 4'
WATER QUALITY VOLUME REQUIRED: 5,515 CF
WATER QUALITY VOLUME PROVIDED: >8,000 CF

STORMWATER WETPOND NO. 3



POND 3
OUTLET ELEVATION: 165.00
LIVE STORAGE DEPTH: 5'
LIVE STORAGE VOLUME REQUIRED: 149,271 CF
LIVE STORAGE VOLUME PROVIDED: 152,535 CF
WATER QUALITY STORAGE DEPTH: 4'
WATER QUALITY VOLUME REQUIRED: 31,041 CF
WATER QUALITY VOLUME PROVIDED: >35,000 CF

N

0 40' 80'

1" 2"

SCALE: 1" = 40'

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO. 24001

REV	DESCRIPTION	DATE

UTILITY NOTES & DETAILS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON LONGONI — EXPIRES 10/6/2024 — STATE OF WASHINGTON — 22000 — REGISTERED PROFESSIONAL ENGINEER

08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE 08-07-2024

PERMIT NUMBERS

SHEET NUMBER C.431

SHEET 20 OF 24

8/7/2024 2:13 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DRV07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_C431_UTILITY NOTES & DETAILS.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

HERITAGE WAY LANDSCAPE PLAN NOTE

STATE RT 20 FRONTAGE IS SUBJECT TO THE HERITAGE WAY LANDSCAPE PLAN. A 20 FOOT LANDSCAPE AREA IS REQUIRED WITH TREES FROM THE FOLLOWING SPECIES PLANTED EVERY 30 FEET: LITTLE LEAF LINDEN, NORWAY MAPLE, RED MAPLE, SARGENT CHERRY OR SWEET GUM

SW 24TH AVE
SW RIDGEWAY DR
SW VISTA PARK DR
ROAD A
DRIVE A
DRIVE B
DRIVE C
PARCEL A APN R13210-364-1900
PARCEL B APN R13210-364-1730
PARCEL C APN R13210-364-2330
PARCEL D APN R13210-298-2300
PARCEL E APN R13210-295-1480
TRACT A ECA WETLAND [CLASSIFICATION] WETLAND A 34,031 SF
TRACT C STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 1 SEE SHEET C.431 FOR DETAIL
TRACT F OPEN SPACE
TRACT G OPEN SPACE
TRACT H OPEN SPACE
TRACT K ACCESS
TRACT L ACCESS
TRACT N ACCESS
TRACT T ACCESS
10 TOT LOT TO BE DETERMINED DURING FINAL ENGINEERING
REQUIRED 5' PERIMETER LANDSCAPING BUFFER PER OHMC 19.46.030 (TYP)
REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PUBLIC ROW (TYP)
REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN STORMWATER TRACTS (OUTSIDE OF REQUIRED BUFFER) (TYP)
REQUIRED 10' STORMWATER PERIMETER LANDSCAPING BUFFER PER OHMC 21.60.260 (TYP)
REQUIRED 20' LANDSCAPING BUFFER PER THE OAK HARBOR DESIGN REGULATIONS AND GUIDELINES (DRG) DOCUMENT (HERITAGE WAY LANDSCAPE PLAN) SEE NOTE THIS SHEET
REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PRIVATE TRACTS (TYP)
TEMPORARY CONSTRUCTION EASEMENT FOR REMOVAL OF EXISTING CUL-DE-SAC AND EXTENSION OF RIDGEWAY DRIVE AND ASSOCIATED UTILITIES
TEMPORARY CONSTRUCTION EASEMENT AND PERMANENT MAINTENANCE EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF BERM AND BIRDCAGE STRUCTURE
PROP. PARKING (TYP)
STREET TREE (TYP)
SIGHT TRIANGLE (TYP)
50' WETLAND BUFFER LINE
EXISTING TREE TO BE REMOVED (TYP)
LANDSCAPE BUFFER
BENCH (TYP)
PICNIC TABLE (TYP)
2' HIGH BERM @ PL
6' TALL WALL
5' TALL WALL
2.5' TALL WALL
9.5' TALL WALL
15' PSE ESMT APN 4182662
PSPL ESMT APN 145899 WIDTH VARIES
MATCHLINE - SEE SHEET L.102
MATCHLINE - SEE SHEET L.103
SCALE: 1" = 40'

DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO. 24001

REV	DESCRIPTION	DATE

LANDSCAPING PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON LONGONI LAND SURVEYOR 20802 REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.
	COLIN LUND, PRESIDENT PROJECT MANAGER

DATE 08-07-2024

PERMIT NUMBERS

SHEET NUMBER L.101

SHEET 21 OF 24

8/7/2024 2:15 PM C:\USERS\VGOODING\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\01_PRELIMINARY\01_SHEETS\2024-00003_L101_LANDSCAPE PLAN.DWG

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET L.101

MATCHLINE - SEE SHEET L.103

FUTURE DEVELOPMENT RIDGEWAY HEIGHTS PERMIT NO. _____

FUTURE DEVELOPMENT

TEMPORARY CONSTRUCTION EASEMENT FOR REMOVAL OF EXISTING CUL-DE-SAC AND EXTENSION OF RIDGEWAY DRIVE AND ASSOCIATED UTILITIES

TEMPORARY CONSTRUCTION EASEMENT AND PERMANENT MAINTENANCE EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF BERM AND BIRDCAGE STRUCTURE

2' HIGH BERM ℄ PL

TRACT R ACCESS

TRACT T ACCESS

TRACT S ACCESS

TRACT Q ACCESS

TRACT O ACCESS

TRACT F OPEN SPACE

TRACT H OPEN SPACE

TRACT J OPEN SPACE

TRACT B ECA WETLAND [CLASSIFICATION] WETLAND B 2,116 SF

50' WETLAND BUFFER LINE

50' WETLAND BUFFER

TRACT E STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 3 SEE SHEET C.431 FOR DETAIL

PARCEL B APN R13210-364-1730

PARCEL C APN R13210-364-2330

PARCEL D APN R13210-298-2300

PARCEL E APN R13210-295-1480

DRIVE F

DRIVE G

DRIVE E

ROAD A

ROAD B

ROAD C

ROAD D

SW RIDGEWAY DR

SW EAGLE VISTA AVE

SW EAGLE VISTA PARK DR

ROW PUBLIC

N87°45'57"W 666.81

N01°40'09"E 660.95

N87°46'37"W 1452.52

N01°43'34"E 439.72

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'E OF PROP COR

FOUND REBAR & CAP "LS 28074" 0.'N OF PROP LINE

FOUND REBAR & CAP "LS 37549" 0.'N & 0.'E OF PROP COR

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'E OF PROP COR

FOUND IRON PIPE 1" W/ PLUG 0.'N OF PROP LINE

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PUBLIC ROW (TYP)

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN ECA WETLAND TRACTS (TYP)

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PRIVATE TRACTS (TYP)

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN STORMWATER TRACTS (OUTSIDE OF REQUIRED BUFFER) (TYP)

REQUIRED 10' STORMWATER PERIMETER LANDSCAPING BUFFER PER OHMC 21.60.260 (TYP)

REQUIRED 5' PERIMETER LANDSCAPING BUFFER PER OHMC 19.46.030 (TYP)

LANDSCAPE BUFFER

PROP. PARKING (TYP)

STREET TREE (TYP)

SIGHT TRIANGLE (TYP)

PICNIC TABLE (TYP)

BENCH (TYP)

APN: R13210-364-0650

APN: R13210-364-1400

APN: R13210-364-1570

APN: R13210-295-0480

APN: R13210-229-0930

APN: R13210-199-1250

APN: R13210-198-1570

APN: R13210-248-2000

SURVEY AFN 294074

N

0 40' 80'

1" 2"

SCALE: 1" = 40'

8/7/2024 2:16 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_L101_LANDSCAPE PLANTING

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

LANDSCAPING PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON LONGONI
55602
REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.

COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
L.102

SHEET	OF
22	24

A PORTION OF THE SW & SW 1/4 OF THE NW 1/4 OF SECTION 10, TOWNSHIP 32 NORTH, RANGE 01 EAST, W.M.

MATCHLINE - SEE SHEET L.101

MATCHLINE - SEE SHEET L.102

PARCEL B APN R13210-364-1730

TRACT H OPEN SPACE

TRACT A ECA WETLAND [CLASSIFICATION] WETLAND A 34,031 SF

TR C STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 1 SEE SHEET C.431 FOR DETAIL

EXISTING TREE TO BE REMOVED (TYP)

LANDSCAPE BUFFER

PARCEL C APN R13210-364-2330

PSE ESMT AFN 145899 WIDTH VARIES

15' PSE ESMT AFN 4182682

BENCH (TYP)

PICNIC TABLE (TYP)

REQUIRED 20' LANDSCAPING BUFFER PER THE OAK HARBOR DESIGN REGULATIONS AND GUIDELINES (DRG) DOCUMENT (HERITAGE WAY LANDSCAPE PLAN) SEE NOTE THIS SHEET

HERITAGE WAY LANDSCAPE PLAN NOTE

STATE RT 20 FRONTAGE IS SUBJECT TO THE HERITAGE WAY LANDSCAPE PLAN. A 20 FOOT LANDSCAPE AREA IS REQUIRED WITH TREES FROM THE FOLLOWING SPECIES PLANTED EVERY 30 FEET: LITTLE LEAF LINDEN, NORWAY MAPLE, RED MAPLE, SARGENT CHERRY OR SWEET GUM

N87°45'57"W 195.08'

FOUND REBAR & CAP "LS 37549" 0.'N OF PROP LINE & 0.'W OF PROP COR

N01°46'57"E 135.00'

APN: R13210-324-2530

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PRIVATE TRACTS (TYP)

FOUND REBAR & CAP "BV LS 37549" 0.'W OF PROP LINE & 0.'NW OF PROP COR

FOUND REBAR & CAP "LS 37549" 0.'E OF PROP LINE & 0.'N OF PROP COR

N87°45'57"W 178.23'

PARCEL D APN R13210-298-2300

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PUBLIC ROW (TYP)

SIGHT TRIANGLE (TYP)

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PUBLIC ROW (TYP)

REQUIRED 20' LANDSCAPING BUFFER PER THE OAK HARBOR DESIGN REGULATIONS AND GUIDELINES (DRG) DOCUMENT (HERITAGE WAY LANDSCAPE PLAN) SEE NOTE THIS SHEET

SW EAGLE VISTA AVE

STREET TREE (TYP)

PARCEL E APN R13210-295-1480

TRACT O ACCESS

PROP. PARKING (TYP)

ROAD A

ROAD C

ROAD D

DRIVE D

SHASTA PARK DR

50' WETLAND BUFFER

50' WETLAND BUFFER LINE

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN ECA WETLAND TRACTS (TYP)

LANDSCAPE BUFFER

FOUND REBAR & CAP 0.'N OF PROP LINE & 0.'E OF PROP COR

N87°32'21"W 95.00'

N01°46'57"E 196.60'

TRACT D STORMWATER COMBINED DETENTION AND WETPOOL FACILITY NO. 2 SEE SHEET C.431 FOR DETAIL

60' INGRESS, EGRESS & UTIL EASEMENT AFN 4128383

WSDOT POND SEE SHEET C.431 FOR DETAIL

AFN 4161513

N87°46'37"W 1452.52'

REQUIRED 5' PERIMETER LANDSCAPING BUFFER PER OHMC 19.46.030 (TYP)

108'-8"

TRACT P ACCESS

REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN STORMWATER TRACTS (OUTSIDE OF REQUIRED BUFFER) (TYP)

REQUIRED 10' STORMWATER PERIMETER LANDSCAPING BUFFER PER OHMC 21.60.260 (TYP)

LANDSCAPE BUFFER

48'-11"

APN: R13210-248-2000

EAGLE CREST - 2 AFN 9401161633

STATE RT 20

VARIES

660.52'

N01°47'38"E 336.18'

N01°47'38"E 284.07'

N01°47'38"E 117.30'

1320.07'

SPEED LIMIT 50

10

N

0 40' 80'

1" 2"

SCALE: 1" = 40'

8/7/2024 2:18 PM C:\USERS\VCOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-DR\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_L101_LANDSCAPE PLAN.DWG

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO. 24001

REV	DESCRIPTION	DATE

LANDSCAPING PLAN
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON LONGONI
STATE OF WASHINGTON
20802
REGISTERED PROFESSIONAL ENGINEER

08-07-2024

DESIGNED:	VALERIE GOODING
DRAWN:	VALERIE GOODING
CHECKED:	PRESTON LONGONI, P.E.
APPROVED:	PRESTON LONGONI, P.E.
	COLIN LUND, PRESIDENT PROJECT MANAGER

DATE 08-07-2024

PERMIT NUMBERS

SHEET NUMBER L.103

SHEET 23 OF 24

GENERAL NOTES

ALL ROUGH GRADING SHALL BE POSITIVE, DRAINING AWAY FROM ALL STRUCTURES.

ALL STONES LARGER THAN 1.5" DIAMETER SHALL BE REMOVED FROM THE GROWING MEDIUM.

TOPSOIL SHALL BE PROVIDED IN ACCORDANCE TO BMP T5.13 WSDOE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON.

ALL BED AREAS TO RECEIVE 2" OF FINE GROUND FIR OR HEMLOCK BARK, COMPOSITION MULCHES ARE NOT AN ACCEPTABLE ALTERNATIVE.

TREES AND SHRUBS ARE TO BE PLANTED AT A DEPTH 3/4" HIGHER THAN THE LEVEL THAT THEY WERE FROWN IN THE NURSERY.

BARK MULCH IS NOT TO BE PLACED ABOVE THE ROOT CROWN.

ALL PLANTS SHALL AT LEAST CONFORM TO THE MINIMUM STANDARDS ESTABLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN.

LAWN AREAS ARE TO BE HYDROSEEDED PER MANUFACTURER'S SPECIFICATIONS, OR EQUIVALENT. REMOVE ALL STONES LARGER THAN 1" FROM LAWN AREAS.

EQUIVALENT PLANT MATERIAL SUBSTITUTIONS MAY BE ALLOWED WITH PRIOR APPROVAL BY THE LANDSCAPE ARCHITECT.

IF THE SITE WORK IS DIFFERENT THAN SHOWN ON THE LANDSCAPE PLAN, OR POOR SOILS AND DEBRIS ARE DISCOVERED, REQUIRING CHANGES TO THE LANDSCAPE PLAN, CONTACT THE LANDSCAPE ARCHITECT FOR INSTRUCTION.

THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE LANDSCAPE DURING INSTALLATION, UNTIL FINAL ACCEPTANCE BY THE OWNER'S REPRESENTATIVE.

THE LANDSCAPE CONTRACTOR SHALL WARRANTY ALL MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR, FROM THE TIME OF FINAL ACCEPTANCE.

DURING THE WARRANTY PERIOD, THE LANDSCAPE CONTRACTOR WILL NOT BE RESPONSIBLE FOR PLANT DEATH CAUSED B UNUSUAL CLIMATIC CONDITIONS, VANDALISM, THEFT, FIRE, OR POOR MAINTENANCE PRACTICES. THE LANDSCAPE ARCHITECT SHALL HAVE SOLE AUTHORITY TO DETERMINE THE CAUSE OF DEATH.

PLANTING PLAN TAKES PRECEDENT WHEN THERE IS A DISCREPANCY BETWEEN PLANT QUANTITIES IN THE PLANT SCHEDULE AND THE PLAN.

OHMC 19.46.080 MAINTENANCE NOTES

MAINTENANCE OF REQUIRED LANDSCAPE AREAS.

(1) MAINTENANCE OF CULTIVATED AREAS.

(A) GENERAL. THE OWNER OF LAND SUBJECT TO THIS CHAPTER SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF SAID LAND IN GOOD CONDITION SO AS TO PRESENT A HEALTHY, NEAT, AND ORDERLY LANDSCAPE AREA.

(B) MAINTENANCE OF PLANTS. ALL LANDSCAPING AND SCREENING AREAS SHALL BE MAINTAINED IN A HEALTHY, GROWING CONDITION. BROKEN, DEAD, OR DYING TREES, SHRUBS, OR OTHER PLANTS SHALL BE REPLACED. ALL LANDSCAPING AND SCREENING SHALL BE KEPT FREE OF TRASH AND WEEDS.

(C) TREE REMOVAL. IT SHALL BE THE RESPONSIBILITY OF EACH PRIVATE PROPERTY OWNER TO REMOVE ANDY DEAD, DISEASED, OR DANGEROUS TRESS OR SHRUBS, OR PART THEREOF, LOCATED ON PRIVATE PROPERTY WHICH OVERHANG OR INTERFERE WITH TRAFFIC CONTROL DEVICES, PUBLIC SIDEWALKS, RIGHTS-OF-WAY, OR PROPERTY OWNED BY THE CITY. THE CITY SHALL HAVE THE AUTHORITY TO ORDER THE REMOVAL AND POSSIBLE REPLACEMENT OF ANY SUCH TREES OR SHRUBS.

(D) PRUNING.

(I) ALL PRUNING SHOULD BE ACCOMPLISHED ACCORDING TO GOOD HORTICULTURAL STANDARDS. TREES SHALL BE PRUNED ONLY AS NECESSARY TO PROMOTE HEALTH GROWTH;

(II) UNLESS SPECIAL APPROVAL IS PROVIDED, TREES SHALL BE ALLOWED TO ATTAIN THEIR NORMAL SIZE AND SHALL NOT BE SEVERELY PRUNED OR "HAT RACKED" IN ORDER TO PERMANENTLY MAINTAIN GROWTH AT A REDUCED HEIGHT;

(III) TREES MAY BE PERIODICALLY PRUNED OR THINNED IN ORDER TO REDUCE THE LEAF MASS AND STIMULATE FURTHER BRANCHING.

(E) MOWING. GRASS SHALL BE MOWN AS REQUIRED IN ORDER TO ENCOURAGE DEEP ROOT GROWTH AND THEREFORE THE PRESERVATION OF IRRIGATION WATER.

(F) EDGING. ALL ROADWAYS, CURBS, AND SIDEWALKS SHALL BE EDGED WHEN NECESSARY IN ORDER TO PREVENT ENCROACHMENT FROM THE ADJACENT GRASS AREAS.

POWER TRIMMERS SHALL NOT BE USED TO TRIM GRASSES AROUND TREES SINCE THEY WILL QUICKLY REMOVE BARK CAUSING DETERIORATION AND EVENTUAL DEATH OF THE TREE.

(G) WATERING. ALL WATERING OF PLANTED AREAS SHALL BE MANAGED SO AS TO:
(I) MAINTAIN HEALTHY FLORA;
(II) MAKE PLANT MATERIAL MORE DROUGHT-TOLERANT;
(III) AVOID EXCESSIVE TURF GROWTH;
(IV) MINIMIZE FUNGUS GROWTH;
(V) STIMULATE DEEP ROOT GROWTH;
(VI) MINIMIZE LEACHING OF FERTILIZERS;
(VII) MINIMIZE COLD DAMAGE.

WATERING OF PLANTS AND TREES SHOULD ALWAYS BE IN SUFFICIENT AMOUNTS TO THOROUGHLY SOAK THE ROOT BALL OF THE PLANT AND THE SURROUNDING AREA, THEREBY PROMOTING DEEP ROOT GROWTH AND DROUGHT TOLERANCE.

WHENEVER POSSIBLE, AUTOMATIC IRRIGATION SYSTEMS SHOULD BE INSTALLED AND OPERATION SHOULD OCCUR BETWEEN THE HOURS OF 4:00 MIDNIGHT AND 6:00 A.M. IRRIGATION DURING THESE HOURS HELPS TO REDUCE FUNGUS GROWTH AND LOSS OF WATER DUE TO EVAPORATION

IF AN IRRIGATION SYSTEM IS INSTALLED IT SHALL BE REGULARLY MAINTAINED TO ELIMINATE WASTE OF WATER DUE TO LOSS OF HEADS, BROKEN PIPES, OR MISJUDGED NOZZLES.

TREES WITHIN VISION CLEARANCE TRIANGLE (30' OF A STREET INTERSECTION AND 25' OF A DRIVEWAY) NEED TO BE LIMBED UP TO 8' ABOVE THE GROUND,

OHMC 21.60.260 STORMWATER PONDS - LANDSCAPING

LANDSCAPING SHALL BE REQUIRED FOR ALL STORMWATER PONDS WITHIN SUBDIVISIONS AND SHORT PLATS. THE PURPOSE OF THE LANDSCAPING IS TO IMPROVE VISUAL QUALITY. THE FOLLOWING STANDARDS SHALL APPLY TO THE LANDSCAPING FOR STORMWATER PONDS:

(1) A LANDSCAPE PLAN THAT MEETS THE STANDARDS OF THIS SECTION AND THE DOE (DEPARTMENT OF ECOLOGY) STORMWATER MANUAL SHALL BE DESIGNED BY A LANDSCAPE ARCHITECT CERTIFIED IN THE STATE OF WASHINGTON AND SUBMITTED AS PART OF THE PRELIMINARY PLAT OR THE PRELIMINARY APPLICATION.

(2) A PERIMETER LANDSCAPE AREA, A MINIMUM 10 FEET WIDE, IS REQUIRED ADJACENT TO ALL STORMWATER PONDS AND SHALL BE PLACED IN A TRACT OWNED AND MAINTAINED BY AN ASSOCIATION OF HOMEOWNERS. THIS AREA SHALL BE DELINEATED ON THE FACE OF THE PLAT AND ASSOCIATED LANDSCAPE PLAN. THE PERIMETER LANDSCAPE AREA SHALL INCLUDE:
(A) EVERGREEN GROUND COVER, SHRUBS AND BUSHES, TO PROVIDE 100 PERCENT COVER OF THE PERIMETER AREA WITHIN TWO YEARS. NATIVE SPECIES AND LOW-MAINTENANCE VARIETIES ARE PREFERRED.
(B) A MIX OF EVERGREEN AND DECIDUOUS TREES TO PROVIDE VISUAL INTEREST WITH A PLANTING DENSITY OF AT LEAST ONE TREE FOR EVERY 250 SQUARE FEET OF LANDSCAPE PERIMETER.
(C) EXISTING VEGETATION MAY BE USED TO FULFIL THE LANDSCAPING REQUIREMENTS. HOWEVER, ALL TREES WHICH POSE A SAFETY HAZARD AND ARE SUBJECT TO WINDTHROW MUST BE REMOVED.
(D) TRAILS OR PEDESTRIANS PATHS ARE ALLOWED NEAR THE POND; PROVIDED, THAT THE SIDE SLOPES OF THE POND ARE THREE TO ONE OR FLATTER OR SAFETY FENCING IS PROVIDED AROUND THE POND. IF A TRAIL OR PEDESTRIAN PATH IS INCLUDED AROUND THE STORMWATER FACILITY, THE AREA OUTSIDE THE TRAIL OR PEDESTRIAN PATH BUY WITHIN THE 10-FOOT LANDSCAPE AREA MUST HAVE 100 PERCENT GROUNDCOVER WITHIN TWO YEARS.

(3) ALL LANDSCAPING FOR STORMWATER PONDS SHALL BE PLACED IN A TRACT AND MAINTAINED ACCORDING TO INDUSTRY STANDARDS BY A HOMEOWNERS' ASSOCIATION. IF STORMWATER PONDS ARE NOT MAINTAINED BY THE HOMEOWNERS' ASSOCIATION TO PROVIDE FOR THE NECESSARY MINIMUM TREATMENT/DETENTION FUNCTIONS AND THE POND TRACT, INCLUDING LANDSCAPING, IN NOT BEING MAINTAINED, THE CITY MAY CHOOSE TO PERFORM NECESSARY MAINTENANCE OF THE FACILITY AND BILL THE HOMEOWNERS' ASSOCIATION FOR THE COST.

(4) ANY LANDSCAPING PROVIDED SHALL BE ABOVE THE FREEBOARD WATER LEVEL.

COMBINED DETENTION & WETPOOL FACILITY NO. 1
10' BUFFER AREA = 7,890 SF / 250 SF = 32 TREES REQUIRED
32 TREES PROVIDED

COMBINED DETENTION & WETPOOL FACILITY NO. 2
10' BUFFER AREA = 4,600 SF / 250 SF = 19 TREES REQUIRED
20 TREES PROVIDED

COMBINED DETENTION & WETPOOL FACILITY NO. 3
10' BUFFER AREA = 9,675 SF / 250 SF = 39 TREES REQUIRED
40 TREES PROVIDED

COMBINED DETENTION & WETPOOL WSDOT FACILITY
10' BUFFER AREA = 2,810 SF / 250 SF = 12 TREES REQUIRED
12 TREES PROVIDED

OHMC 19.46.140 NATIVE VEGETATION STANDARDS

R1 = 15% NATIVE VEGETATION REQUIREMENT
SITE AREA: 1,598,841 SF OR 36.69

1,598,841 SF x 15% = 239,826 SF OF NATIVE VEGETATION REQUIRED

NATIVE VEGETATION AREA PROVIDED: 251,716 SF

TREE DENSITY = 1 PER 600 SF REQUIRED

251,716 SF / 600 SF = 420 TREES

XX TREES PROVIDED

OHMC 19.46.030 PERIMETER LANDSCAPING

C. PLANTING REQUIREMENTS
I. A MINIMUM OF FOUR TREES SHALL BE PLANTED FOR EVERY 100 LINEAR FEET, OR FRACTION THEREOF, OF PERIMETER PLANTING AREA;
II. SHRUBS AND GROUND COVER PLANTINGS SHALL BE IN QUANTITIES AND SPACING THAT WILL PROVIDE FOR 80 PERCENT GROUND COVERAGE WITHIN THREE YEARS.

NORTH PERIMETER LENGTH = XXX FEET
LENGTH NOT OCCUPIED BY DRIVEWAYS/ROADS = XXX FT
YYY / 100 x 4 = XX TREES REQUIRED
XX TREES PROVIDED

OHMC 19.46.050 (6) VISIBILITY TRIANGLE

ALONG STREET FRONTAGES, WITHIN 30 FEET OF AN ALLEY OR UNSIGNALIZED STREET INTERSECTION, OR WITHIN 25 FEET OF A DRIVEWAY, NO SHRUB SHALL BE HIGHER THAN 30 INCHES FROM STREET GUTTER GRADE AND NO TREE SHALL HAVE BRANCHES OR FOLIAGE BELOW EIGHT FEET ABOVE STREET LEVEL. AT SIGNALIZED INTERSECTIONS THE CONDITIONS OF THIS SECTION SHALL NOT BE NECESSARY, BUT IT SHALL BE REQUIRED THAT ONLY DECIDUOUS TREES BE LOCATED AT SIGNALIZED INTERSECTIONS. UNDER NO CIRCUMSTANCES SHALL LANDSCAPING INTERFERE WITH SIGHT DISTANCE VISIBILITY.

LANDSCAPING LEGEND

- REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PUBLIC ROW
- REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN PRIVATE TRACTS
- REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN ECA WETLAND TRACTS
- REQUIRED GROUNDCOVER SUITABLE FOR LANDSCAPED AREAS WITHIN STORMWATER TRACTS (OUTSIDE OF REQUIRED BUFFER)
- REQUIRED 10' STORMWATER PERIMETER LANDSCAPING BUFFER PER OHMC 21.60.260
- REQUIRED 5' PERIMETER LANDSCAPING BUFFER PER OHMC 19.46.030
- REQUIRED 20' LANDSCAPING BUFFER PER THE OAK HARBOR DESIGN REGULATIONS AND GUIDELINES (DRG) DOCUMENT (HERITAGE WAY LANDSCAPE PLAN)

NOTE: GROUNDCOVER IS NOT REQUIRED WITHIN THE DRIPLINE OF ANY SHRUB OR EVERGREEN TREE OR WITHIN A TWO FOOT RADIUS OF A DECIDUOUS TREE TRUNK

DHI
DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE

LANDSCAPING NOTES & DETAILS
OAK HEIGHTS PRELIMINARY PLAT / PRD

SSHI, LLC dba D.R. HORTON
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

PRESTON J. LONGONI — STATE OF WASHINGTON — 43002 — REGISTERED PROFESSIONAL ENGINEER
08-07-2024

DESIGNED: VALERIE GOODING
DRAWN: VALERIE GOODING
CHECKED: PRESTON LONGONI, P.E.
APPROVED: PRESTON LONGONI, P.E.
COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
08-07-2024

PERMIT NUMBERS

SHEET NUMBER
L.131

SHEET	OF
24	24

8/7/2024 2:17 PM C:\USERS\VGOOD\ONEDRIVE\DESKTOP\PROJECTS\D.R. HORTON\2024-00003-OPV\07_ENGINEERING\03_PRELIMINARY\01_SHEETS\2024-00003_L131_LANDSCAPE NOTES & DETAILS.DWG

GEOTECHNICAL ENGINEERING REPORT

PREPARED BY:

THE RILEY GROUP, INC.
17522 BOTHELL WAY NORTHEAST
BOTHELL, WASHINGTON 98011

PREPARED FOR:

D.R. HORTON
11241 SLATER AVENUE NORTHEAST, #200
KIRKLAND, WASHINGTON 98033

RGI PROJECT NO. 2024-165-1

OAK HEIGHTS PLAT
1105 SOUTHWEST 24TH AVENUE
OAK HARBOR, WASHINGTON

JUNE 28, 2024

June 28, 2024

Nicole Mecum
D.R. Horton
11241 Slater Avenue Northeast, #200
Kirkland, Washington 98033

Subject: **Geotechnical Engineering Report**
Oak Heights Plat
1105 Southwest 24th Avenue
Oak Harbor, Washington
RGI Project No. 2024-165-1

Dear Nicole Mecum:

As requested, The Riley Group, Inc. (RGI) has performed a Geotechnical Engineering Report (GER) for the Oak Heights Plat located at 1105 Southwest 24th Avenue, Oak Harbor, Washington. Our services were completed in accordance with our proposal dated May 22, 2024 and authorized by you on May 28, 2024. The information in this GER is based on our understanding of the proposed construction, and the soil and groundwater conditions encountered in the test pits completed by RGI at the site on June 26, 2024, and review of five test pit logs excavated at the site by Materials Testing and Consulting (MTC) on May 15, 2017.

RGI recommends that you submit the project plans to RGI for a general review so that we may confirm that the recommendations in this GER are interpreted and implemented properly in the plans. RGI also recommends that a representative of our firm be present on site during portions of the project construction to confirm that the soil and groundwater conditions are consistent with those that form the basis for the engineering recommendations in this GER.

If you have any questions or require additional information, please contact us.

Respectfully submitted,

THE RILEY GROUP, INC.

State of Washington 2698 Licensed Geologist
06/28/2024
ERIC L. WOODS

Eric L. Woods, LG
Senior Project Geologist

KRISTINA MARIE WELLER STATE OF WASHINGTON 33182 REGISTERED PROFESSIONAL ENGINEER
06/28/2024

Kristina M. Weller, PE
Principal Geotechnical Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION 1

3.0 FIELD EXPLORATION AND LABORATORY TESTING 1
3.1 Field Exploration 1
3.2 Laboratory Testing 2

4.0 SITE CONDITIONS 2
4.1 Surface 2
4.2 Geology 2
4.3 Soils 3
4.4 Groundwater 3
4.5 Seismic Considerations 3
4.6 Geologic Hazard Areas 3

5.0 DISCUSSION AND RECOMMENDATIONS 4
5.1 Geotechnical Considerations 4
5.2 Earthwork 5
5.2.1 Erosion and Sediment Control 5
5.2.2 Stripping 6
5.2.3 Excavations 6
5.2.4 Site Preparation 6
5.2.5 Structural Fill 7
5.2.6 Cut and Fill Slopes 8
5.2.7 Wet Weather Construction Considerations 9
5.3 Foundations 9
5.4 Retaining Walls 10
5.5 Slab-on-Grade Construction 10
5.6 Drainage 11
5.6.1 Surface 11
5.6.2 Subsurface 11
5.6.3 Infiltration 11
5.7 Utilities 11
5.8 Pavements 12

6.0 ADDITIONAL SERVICES 12

7.0 LIMITATIONS 13

LIST OF FIGURES AND APPENDICES

Figure 1 ..... Site Vicinity Map
Figure 2 ..... Geotechnical Exploration Plan
Figure 3 ..... Retaining Wall Drainage Detail
Figure 4 ..... Typical Footing Drain Detail
Appendix A ..... Field Exploration and Laboratory Testing

Executive Summary

This Executive Summary should be used in conjunction with the entire Geotechnical Engineering Report (GER) for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the GER must be read in its entirety for a comprehensive understanding of the items contained herein. Section 7.0 should be read for an understanding of limitations.

RGI's geotechnical scope of work included the advancement of 10 test pits to approximate depths of 4 to 10 feet below existing site grades, and review of 5 test pit logs prepared by MTC.

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

Soil Conditions: The soils encountered during field exploration include loose to medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel with trace to some silt, over dense to very dense silty sand with gravel glacial till and sand with varying amounts of silt and gravel advance outwash.

Groundwater: Light groundwater seepage was encountered at two locations at depths of 3 to 4 feet during our subsurface exploration.

Foundations: Foundations for the proposed residences may be supported on conventional spread footings bearing on native soil or structural fill.

Slab-on-grade: Slab-on-grade floors and slabs for the proposed residences can be supported on native soil or structural fill.

1.0 Introduction

This Geotechnical Engineering Report (GER) presents the results of the geotechnical engineering services provided for the Oak Heights Plat in Oak Harbor, Washington. The purpose of this evaluation is to assess subsurface conditions and provide geotechnical recommendations for the construction of a 219 lot residential plat with associated stormwater facilities, utilities, roadways, and landscape areas. Our scope of services included field explorations, laboratory testing, engineering analyses, and preparation of this GER.

The recommendations in the following sections of this GER are based upon our current understanding of the proposed site development as outlined below. If actual features vary or changes are made, RGI should review them in order to modify our recommendations as required. In addition, RGI requests to review the site plans when available to verify that our project understanding is correct and that our recommendations have been properly interpreted and incorporated into the project design.

2.0 Project description

The project site is located at 1105 Southwest 24th Avenue in Oak Harbor, Washington. The approximate location of the site is shown on Figure 1.

The site is currently undeveloped pasture and forest. RGI understands the site will be developed with a 219 lot residential plat with associated stormwater facilities, utilities, roadways, and landscape areas. Site stormwater will be routed to three detention ponds.

Based on our experience with similar construction, RGI anticipates that the proposed buildings will be supported on perimeter walls with bearing loads of two to six kips per linear foot. Slab-on-grade floor loading of 150 pounds per square foot (psf) are expected.

3.0 Field Exploration and Laboratory Testing

3.1 Field Exploration

On June 26, 2024, RGI observed the excavation of 10 test pits. RGI also reviewed 5 test pit logs prepared by MTC for test pits excavated at the site on May 15, 2017. The approximate exploration locations are shown on Figure 2.

Field logs of each exploration were prepared by the geotechnical engineer or geologist that continuously observed the excavation. These logs included visual classifications of the materials encountered during excavation as well as our interpretation of the subsurface conditions between samples. The test pits logs included in Appendix A represent an interpretation of the field logs and include modifications based on laboratory observation and analysis of the samples.

3.2 LABORATORY TESTING

During the field exploration, a representative portion of each recovered sample was sealed in containers and transported to our laboratory for further visual and laboratory examination. Selected samples retrieved from the test pits were tested for moisture content and grain size analysis to aid in soil classification and provide input for the recommendations provided in this GER. The results and descriptions of the laboratory tests are enclosed in Appendix A.

4.0 Site Conditions

4.1 SURFACE

The subject site is comprised of five parcels totaling approximately 36.69 acres in size. The site is bound to the north by Southwest 24th Avenue, to the east by State Route 20, to the south by undeveloped pasture and forest, and to the west by undeveloped pasture and forest, and a residential development currently under construction.

The site is comprised of undeveloped pasture and forest. Several residences have been removed from the site. The site slopes generally southeast with a total elevation change of approximately 62 feet across the property. Several wetlands are located in the central portion of the property. The site is vegetated with grass, mixed brush and scattered trees.

4.2 GEOLOGY

Review of the *Geologic Map of the Oak Harbor, Crescent Harbor, and part of the Smith Island 7.5-minute Quadrangles, Island County, Washington,* by Joe D. Dragovich, etc. (2005) indicates that several soil deposits are mapped within the property. The northwestern and southeastern portions of the site are mapped as Vashon Stade Till (Map Unit Qgt_v), which is a compact mixture of clay, silt, sand, and gravel deposited by the Vashon ice sheet, and may underlie the entire site at depth.

The east-central portion of the site is mapped as Gravel deposits ($Qgog_e$), which is pebble cobble gravel to pebbly cobbly sand with sand lenses. Much of the northern portion of the site is mapped as Diamicton (Qgi_e), which is an ice-contact deposit comprised of sandy silty pebble gravel to bouldery gravelly sandy silt, and much of the western portion of the site is mapped as Moraine deposits ($Qgim_e$), which is an ice-contact deposit comprised of bouldery cobble gravel with sand interbeds. Soils surrounding the wetlands in the central portion of the site are mapped as Peat (Qp), which is peat and organic sediments in bogs and wetlands. The above descriptions are generally similar to the findings in our field explorations.

4.3 SOILS

The soils encountered during field exploration include loose to medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel with trace to some silt, over dense to very dense silty sand with gravel (glacial till) and sand with varying amounts of silt and gravel (advance outwash).

More detailed descriptions of the subsurface conditions encountered are presented in the test pits included in Appendix A. Sieve analysis was performed on six selected soil samples. Grain size distribution curves are included in Appendix A.

4.4 GROUNDWATER

Light groundwater seepage was encountered at two locations at depths of 3 to 4 feet during our subsurface exploration.

It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the explorations were performed. In addition, perched water can develop within seams and layers contained in fill soils or higher permeability soils overlying less permeable soils following periods of heavy or prolonged precipitation. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the logs. Groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.5 GEOLOGIC HAZARD AREAS

Regulated geologically hazardous areas include erosion, landslide, earthquake, or other geological hazards. Based on review of the Oak Harbor Geologic Hazards map, the site does not contain geologically hazardous areas.

4.6 SEISMIC CONSIDERATIONS

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in water pressure induced by vibrations from a seismic event. Liquefaction mainly affects geologically recent deposits of fine-grained sands that are below the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction, thus reducing or eliminating the soil's strength.

RGI reviewed the results of the field and laboratory testing and assessed the potential for liquefaction of the site's soil during an earthquake. Since the site is underlain by glacial till and glacially consolidated deposits and lacks an established shallow groundwater table, RGI considers that the possibility of liquefaction during an earthquake is minimal.

Based on the International Building Code (IBC), RGI recommends the follow seismic parameters for design.

Table 1 IBC

Parameter	2018 Value
Site Soil Class[1]	D[2]
Site Latitude	48.2788
Site Longitude	-122.6720
Short Period Spectral Response Acceleration, S_S (g)	1.35
1-Second Period Spectral Response Acceleration, S_1 (g)	0.485
Adjusted Short Period Spectral Response Acceleration, S_{MS} (g)	1.35
Adjusted 1-Sec Period Spectral Response Acceleration, S_{M1} (g)	0.88
Numeric seismic design value at 0.2 second; S_{DS}(g)	0.9
Numeric seismic design value at 1.0 second; S_{D1}(g)	0.587

1. Note: In general accordance with Chapter 20 of ASCE 7-16, the Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.

2. Note: ASCE 7-16 require a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope of our services does not include the required 100 foot soil profile determination. Test pits extended to a maximum depth of 10.5 feet, and this seismic site class definition considers that similar soil continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

3. Note: In accordance with ASCE 11.4.8, a ground motion hazard analysis is not required for the following cases:

- Structures on Site Class E sites with S_S greater than or equal to 1.0, provided the site coefficient Fa is taken as equal to that of Site Class C.
- Structures on Site Class D sites with S_1 greater than or equal to 0.2, provided that the value of the seismic response coefficient Cs is determined by Eq. 12.8-2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for $T_L \geq T > 1.5T_s$ or Eq. 12.8-4 for $T > T_L$.
- Structures on Site Class E sites with S_1 greater than or equal to 0.2, provided that T is less than or equal to T_s and the equivalent static force procedure is used for design.

The above exceptions do not apply to seismically isolated structures, structures with damping systems or structures designed using the response history procedures of Chapter 16.

5.0 Discussion and Recommendations

5.1 Geotechnical Considerations

Based on our study, the site is suitable for the proposed construction from a geotechnical standpoint. Foundations for the proposed residences can be supported on conventional spread footings bearing on native soil or structural fill. Slab-on-grade floors and pavements can be similarly supported.

Detailed recommendations regarding the above issues and other geotechnical design considerations are provided in the following sections. These recommendations should be incorporated into the final design drawings and construction specifications.

5.2 EARTHWORK

Earthwork is to include excavating stormwater facilities, grading the lots and roadways, installing utilities, excavating footings, and backfilling foundations.

5.2.1 EROSION AND SEDIMENT CONTROL

Potential sources or causes of erosion and sedimentation depend on construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. The impacts on erosion-prone areas can be reduced by implementing an erosion and sedimentation control plan. The plan should be designed in accordance with applicable city and/or county standards.

RGI recommends the following erosion control Best Management Practices (BMPs):

- Scheduling site preparation and grading for the drier summer and early fall months and undertaking activities that expose soil during periods of little or no rainfall
- Retaining existing vegetation whenever feasible
- Establishing a quarry spall construction entrance
- Installing siltation control fencing or anchored straw or coir wattles on the downhill side of work areas
- Covering soil stockpiles with anchored plastic sheeting
- Revegetating or mulching exposed soils with a minimum 3-inch thickness of straw if surfaces will be left undisturbed for more than one day during wet weather or one week in dry weather
- Directing runoff away from exposed soils and slopes
- Minimizing the length and steepness of slopes with exposed soils and cover excavation surfaces with anchored plastic sheeting (Graded and disturbed slopes should be tracked in place with the equipment running perpendicular to the slope contours so that the track marks provide a texture to help resist erosion and channeling. Some sloughing and raveling of slopes with exposed or disturbed soil should be expected.)
- Decreasing runoff velocities with check dams, straw bales or coir wattles
- Confining sediment to the project site
- Inspecting and maintaining erosion and sediment control measures frequently (The contractor should be aware that inspection and maintenance of erosion control BMPs is critical toward their satisfactory performance. Repair and/or replacement of dysfunctional erosion control elements should be anticipated.)

Permanent erosion protection should be provided by reestablishing vegetation using hydroseeding and/or landscape planting. Until the permanent erosion protection is established, site monitoring should be performed by qualified personnel to evaluate the effectiveness of the erosion control measures. Provisions for modifications to the erosion

control system based on monitoring observations should be included in the erosion and sedimentation control plan.

5.2.2 STRIPPING

Stripping efforts should include removal of pavements, vegetation, organic materials, and deleterious debris from areas slated for building, pavement, and utility construction. The test pits encountered 3 to 12 inches of topsoil and rootmass. Deeper areas of stripping may be required in forested or heavily vegetated areas of the site.

5.2.3 EXCAVATIONS

All temporary cut slopes associated with the site and utility excavations should be adequately inclined to prevent sloughing and collapse. The site soils consist of loose to very dense sand with varying amounts of silt and gravel and silty sand with trace to some gravel.

Accordingly, for excavations more than 4 feet but less than 20 feet in depth, the temporary side slopes should be laid back with a minimum slope inclination of 1.5H:1V (Horizontal:Vertical) in the loose to medium dense deposits and the dense to very dense sand deposits, and 0.75H:1V in the dense to very dense glacial till. If there is insufficient room to complete the excavations in this manner, or excavations greater than 20 feet in depth are planned, using temporary shoring to support the excavations should be considered. For open cuts at the site, RGI recommends:

- No traffic, construction equipment, stockpiles or building supplies are allowed at the top of cut slopes within a distance of at least five feet from the top of the cut
- Exposed soil along the slope is protected from surface erosion using waterproof tarps and/or plastic sheeting
- Construction activities are scheduled so that the length of time the temporary cut is left open is minimized
- Surface water is diverted away from the excavation
- The general condition of slopes should be observed periodically by a geotechnical engineer to confirm adequate stability and erosion control measures

In all cases, however, appropriate inclinations will depend on the actual soil and groundwater conditions encountered during earthwork. Ultimately, the site contractor must be responsible for maintaining safe excavation slopes that comply with applicable OSHA or WISHA guidelines.

5.2.4 SITE PREPARATION

RGI anticipates that some areas of loose or soft soil will be exposed upon completion of stripping and grubbing. Proofrolling and subgrade verification should be considered an essential step in site preparation. After stripping, grubbing, and prior to placement of structural fill, RGI recommends proofrolling building and pavement subgrades and areas to

receive structural fill. These areas should moisture conditioned and compacted to a firm and unyielding condition in order to achieve a minimum compaction level of 95 percent of the modified proctor maximum dry density as determined by the American Society of Testing and Materials D1557-09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557).

Proofrolling and adequate subgrade compaction can only be achieved when the soils are within approximately ± 2 percent moisture content of the optimum moisture content. Soils which appear firm after stripping and grubbing may be proofrolled with a heavy compactor, loaded double-axle dump truck, or other heavy equipment under the observation of an RGI representative. This observer will assess the subgrade conditions prior to filling. The need for or advisability of proofrolling due to soil moisture conditions should be determined at the time of construction. In wet areas it may be necessary to hand probe the exposed subgrades in lieu of proofrolling with mechanical equipment.

If fill is placed in areas of the site where existing slopes are steeper than 5:1 (Horizontal:Vertical), the area should be benched to reduce the potential for slippage between existing slopes and fills. Benches should be wide enough to accommodate compaction and earth moving equipment, and to allow placement of horizontal lifts of fill.

Subgrade soils that become disturbed due to elevated moisture conditions should be overexcavated to reveal firm, non-yielding, non-organic soils and backfilled with compacted structural fill. In order to maximize utilization of site soils as structural fill, RGI recommends that the earthwork portion of this project be completed during extended periods of warm and dry weather if possible. If earthwork is completed during the wet season (typically November through May) it will be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork will require additional mitigative measures beyond that which would be expected during the drier summer and fall months.

5.2.5 Structural Fill

Once stripping, clearing and other preparing operations are complete, cuts and fills can be made to establish desired lot and roadway grades. Prior to placing fill, RGI recommends proof-rolling as described above.

RGI recommends fill below the foundation and floor slab, behind retaining walls, and below pavement and hardscape surfaces be placed in accordance with the following recommendations for structural fill.

The suitability of excavated site soils and import soils for compacted structural fill use will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the U.S. No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more

difficult or impossible to achieve. Soils containing more than about 5 percent fines cannot be consistently compacted to a dense, non-yielding condition when the moisture content is more than 2 percent above or below optimum. Optimum moisture content is that moisture that results in the greatest compacted dry density with a specified compactive effort.

Non-organic site soils are only considered suitable for structural fill provided that their moisture content is within about two percent of the optimum moisture level as determined by ASTM D1557. Excavated site soils may not be suitable for re-use as structural fill depending on the moisture content and weather conditions at the time of construction. If soils are stockpiled for future reuse and wet weather is anticipated, the stockpile should be protected with plastic sheeting that is securely anchored.

Even during dry weather, moisture conditioning (such as, windrowing and drying) of site soils to be reused as structural fill may be required. Even during the summer, delays in grading can occur due to excessively high moisture conditions of the soils or due to precipitation. If wet weather occurs, the upper wetted portion of the site soils may need to be scarified and allowed to dry prior to further earthwork, or may need to be wasted from the site.

If on-site soils are or become unusable, it may become necessary to import clean, granular soils to complete site work. Prior to use, an RGI representative should observe and test all materials imported to the site for use as structural fill. Structural fill materials should be placed in uniform loose layers not exceeding 12 inches and compacted to 95 percent of the maxim dry density. The soil's maximum density and optimum moisture should be determined by ASTM D1557.

Placement and compaction of structural fill should be observed by RGI. A representative number of in-place density tests should be performed as the fill is being placed to confirm that the recommended level of compaction is achieved. The silty sand and sandy silt soils should be moisture conditioned such that they are 2 to 4 points over optimum moisture prior to placement.

5.2.6 CUT AND FILL SLOPES

All permanent cut and fill slopes should be graded with a finished inclination no greater than 2H:1V. The interior slopes of the detention ponds must be graded with a slope gradient no steeper than 3H:1V, unless fenced. Upon completion of construction, the slope face should be trackwalked, compacted and vegetated, or provided with other physical means to guard against erosion. All fill placed for slope construction should meet the structural fill requirements as described in Section 5.2.5.

Final grades at the top of the slopes must promote surface drainage away from the slope crest. Water must not be allowed to flow in an uncontrolled fashion over the slope face. If

it is necessary to direct surface runoff towards the slope, it should be controlled at the top of the slope, piped in a closed conduit installed on the slope face, and taken to an appropriate point of discharge beyond the toe of the slope.

5.2.7 WET WEATHER CONSTRUCTION CONSIDERATIONS

RGI recommends that preparation for site grading and construction include procedures intended to drain ponded water, control surface water runoff, and to collect shallow subsurface seepage zones in excavations where encountered. It will not be possible to successfully compact the subgrade or utilize on-site soils as structural fill if accumulated water is not drained prior to grading or if drainage is not controlled during construction.

Attempting to grade the site without adequate drainage control measures will reduce the amount of on-site soil effectively available for use, increase the amount of select import fill materials required, and ultimately increase the cost of the earthwork phases of the project. Free water should not be allowed to pond on the subgrade soils. RGI anticipates that the use of berms and shallow drainage ditches, with sumps and pumps in utility trenches, will be required for surface water control during wet weather and/or wet site conditions.

5.3 FOUNDATIONS

Following site preparation and grading, the proposed residences can be supported on conventional spread footings bearing on native soil or structural fill. Loose, organic, or other unsuitable soils may be encountered in the proposed building footprint. If unsuitable soils are encountered, they should be overexcavated and backfilled with structural fill.

Perimeter foundations exposed to weather should be at a minimum depth of 18 inches below final exterior grades. Interior foundations can be constructed at any convenient depth below the floor slab. Finished grade is defined as the lowest adjacent grade within 5 feet of the foundation for perimeter (or exterior) footings and finished floor level for interior footings.

Table 2 Foundation Design

Design Parameter	Value
Allowable Bearing Capacity	2,000 psf[1]
Friction Coefficient	0.30
Passive pressure (equivalent fluid pressure)	250 pcf[2]

1. psf = pounds per square foot
2. pcf = pounds per cubic foot

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. For short-term loads, such as wind and seismic, a 1/3 increase in this allowable

capacity may be used. At perimeter locations, RGI recommends not including the upper 12 inches of soil in the computation of passive pressures because they can be affected by weather or disturbed by future grading activity. The passive pressure value assumes the foundation will be constructed neat against competent soil or backfilled with structural fill as described in Section 5.2.5. The recommended base friction and passive resistance value includes a safety factor of about 1.5.

With spread footing foundations designed in accordance with the recommendations in this section, maximum total and differential post-construction settlements of 1 inch and 1/2 inch, respectively, should be expected.

5.4 RETAINING WALLS

If retaining walls are needed for the residences or ponds, RGI recommends cast-in-place concrete walls be used. Modular block walls may be used for grade changes in other areas.

The magnitude of earth pressure development on retaining walls will partly depend on the quality of the wall backfill. RGI recommends placing and compacting wall backfill as structural fill. Wall drainage will be needed behind the wall face. A typical retaining wall drainage detail is shown in Figure 3.

With wall backfill placed and compacted as recommended, level backfill and drainage properly installed, RGI recommends using the values in the following table for design.

Table 3 Retaining Wall Design

Design Parameter	Value
Active Earth Pressure (unrestrained walls)	35 pcf
At-rest Earth Pressure (restrained walls)	50 pcf

For seismic design, an additional uniform load of 7 times the wall height (H) for unrestrained walls and 14H in psf for restrained walls should be applied to the wall surface. Friction at the base of foundations and passive earth pressure will provide resistance to these lateral loads. Values for these parameters are provided in Section 5.3.

5.5 SLAB-ON-GRADE CONSTRUCTION

RGI recommends that the concrete slab be placed on top of medium dense native soil or structural fill. Immediately below the floor slab, RGI recommends placing a four-inch thick capillary break layer of clean, free-draining sand or gravel that has less than five percent passing the U.S. No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab.

Where moisture by vapor transmission is undesirable, an 8- to 10-millimeter thick plastic membrane should be placed on a 4-inch thick layer of clean gravel. For the anticipated floor slab loading, we estimate post-construction floor settlements of 1/4- to 1/2-inch.

5.6 DRAINAGE

5.6.1 SURFACE

Final exterior grades should promote free and positive drainage away from the residences area. Water must not be allowed to pond or collect adjacent to foundations. For non-pavement locations, RGI recommends providing a minimum drainage gradient of 3 percent for a minimum distance of 10 feet from the building perimeter. In paved locations, a minimum gradient of 1 percent should be provided unless provisions are included for collection and disposal of surface water adjacent to the structure.

5.6.2 SUBSURFACE

RGI recommends installing perimeter foundation drains. A typical footing drain detail is shown on Figure 4. The foundation drains and roof downspouts should be tightlined separately to an approved discharge facility. Subsurface drains must be laid with a gradient sufficient to promote positive flow to a controlled point of approved discharge.

5.6.3 INFILTRATION

Soils suitable for infiltration were encountered at the site, however, they are generally underlain at a shallow depth by impermeable glacial till. Permeable pavement and shallow infiltration may be feasible depending on the final site grades.

5.7 UTILITIES

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) specifications. For site utilities located within the right-of-ways, bedding and backfill should be completed in accordance with City of Oak Harbor specifications.

In accordance with the city standards, trench backfill shall be gravel backfill meeting the WSDOT Standard Specifications 9-03.19. Trench backfill should be placed and compacted as structural fill, as described in Section 5.2.5. Where utilities occur below unimproved areas, suitable native soils may be used and the degree of compaction can be reduced to a minimum of 90 percent of the soil's maximum density as determined by the referenced ASTM D1557.

5.8 PAVEMENTS

Pavement subgrades should be prepared as described in Section 5.2 and as discussed below. Regardless of the relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. The subgrade should be proof-rolled with heavy construction equipment to verify this condition.

5.8.1 FLEXIBLE PAVEMENTS

With the pavement subgrade prepared as described above, RGI recommends the following pavement sections for areas paved with flexible asphalt concrete surfacing.

- **For local residential**: 3 inches of Hot Mix Asphalt (HMA) over 2 inches of Crushed Surfacing Top Course (CSTC) over 6 inches of Crushed Surfacing Base Course (CSBC)

5.8.2 CONCRETE PAVEMENTS

With the pavement subgrade prepared as described above, RGI recommends the following pavement sections for parking and drive areas paved with concrete surfacing.

- **For concrete sidewalks**: 6 inches of concrete over 4 inches of CSBC

The paving materials used should conform to the WSDOT specifications for HMA, concrete paving, and 9-03.9(3) Crushed Surfacing.

Long-term pavement performance will depend on surface drainage. A poorly-drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability.

For optimum pavement performance, surface drainage gradients of no less than 2 percent are recommended. Also, some degree of longitudinal and transverse cracking of the pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

6.0 Additional Services

RGI is available to provide further geotechnical consultation throughout the design phase of the project. RGI should review the final design plans in order to verify that earthwork and foundation recommendations have been properly interpreted and incorporated into project design and construction.

RGI is also available to provide geotechnical engineering and construction observation services during construction. The integrity of the earthwork and construction depends on proper site preparation and procedures. In addition, engineering decisions may arise in the field in the event that variations in subsurface conditions become apparent.

7.0 Limitations

This GER is the property of RGI, D.R. Horton, and its designated agents. Within the limits of the scope and budget, this GER was prepared in accordance with generally accepted geotechnical engineering practices in the area at the time this GER was issued. This GER is intended for specific application to the Oak Heights Plat project in Oak Harbor, Washington, and for the exclusive use of D.R. Horton and its authorized representatives. No other warranty, expressed or implied, is made. Site safety, excavation support, and dewatering requirements are the responsibility of others.

The scope of services for this project does not include either specifically or by implication any environmental or biological (for example, mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, we can provide a proposal for these services.

The analyses and recommendations presented in this GER are based upon data obtained from the explorations performed on site. Variations in soil conditions can occur, the nature and extent of which may not become evident until construction. If variations appear evident, RGI should be requested to reevaluate the recommendations in this GER prior to proceeding with construction.

It is the client's responsibility to see that all parties to the project, including the designers, contractors, subcontractors, are made aware of this GER in its entirety. The use of information contained in this GER for bidding purposes should be done at the contractor's option and risk.

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

On June 26, 2024, RGI observed field explorations using a mini excavator. We documented subsurface soil conditions at the site by observing the excavation of 10 test pits to a maximum depth of 10.5 feet below existing grade. RGI also reviewed 5 test pit logs prepared by MTC for previous test pits excavated at the site on May 15, 2017. The test pit locations are shown on Figure 2. The test pit locations were approximately determined by measurements from existing property lines and paved roads.

A geologist/engineer from our office observed the field exploration and classified the soil conditions encountered, maintained a log of each test exploration, obtained representative soil samples, and observed pertinent site features. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS).

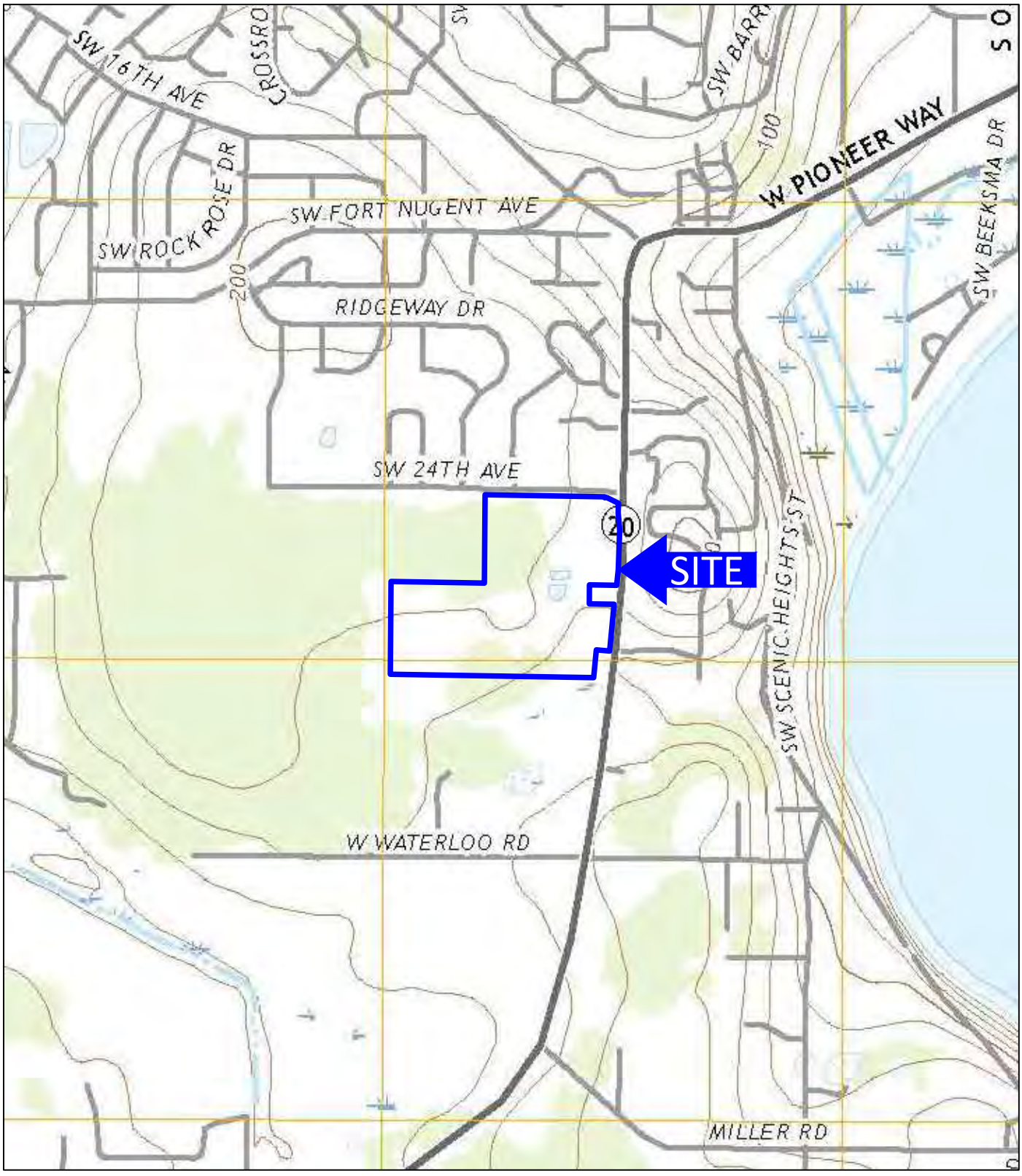
Representative soil samples obtained from the explorations were placed in closed containers and taken to our laboratory for further examination and testing. As a part of the laboratory testing program, the soil samples were classified in our in house laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described below.

Moisture Content Determinations

Moisture content determinations were performed in accordance with ASTM D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216) on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. The moisture content of typical sample was measured and is reported on the test pit logs.

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analyses was determined using D6913-04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis (ASTM D6913) on six of the samples.



USGS, 2020, Oak Harbor, Washington
7.5-Minute Quadrangle

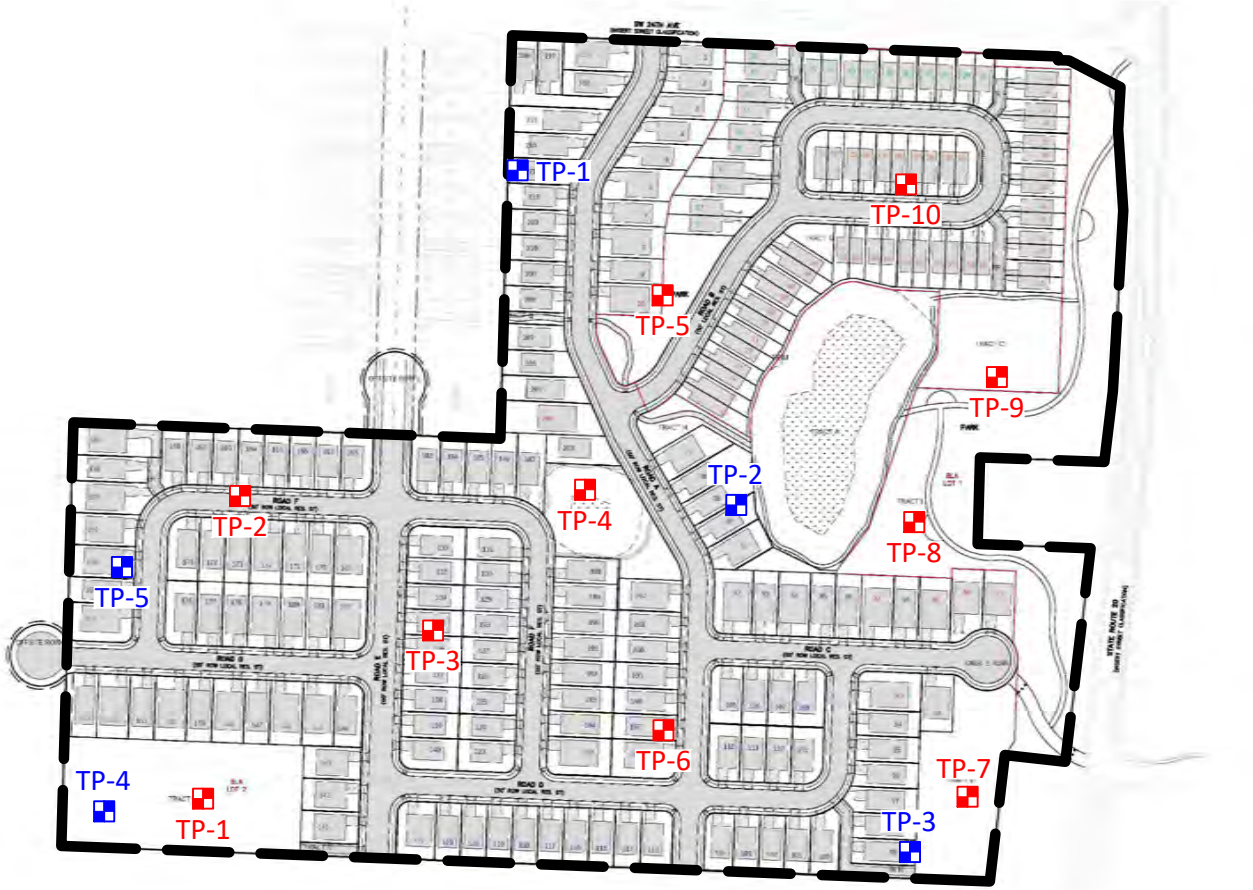
Approximate Scale: 1"=1000'

0 500 1000 2000

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Oak Heights Plat		Figure 1
RGI Project Number: 2024-165-1	Site Vicinity Map	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		



= Test pit locations by RGI, 06/26/2024

= Test pit locations by Materials Testing & Consulting, Inc., 05/15/2017

= Site boundary

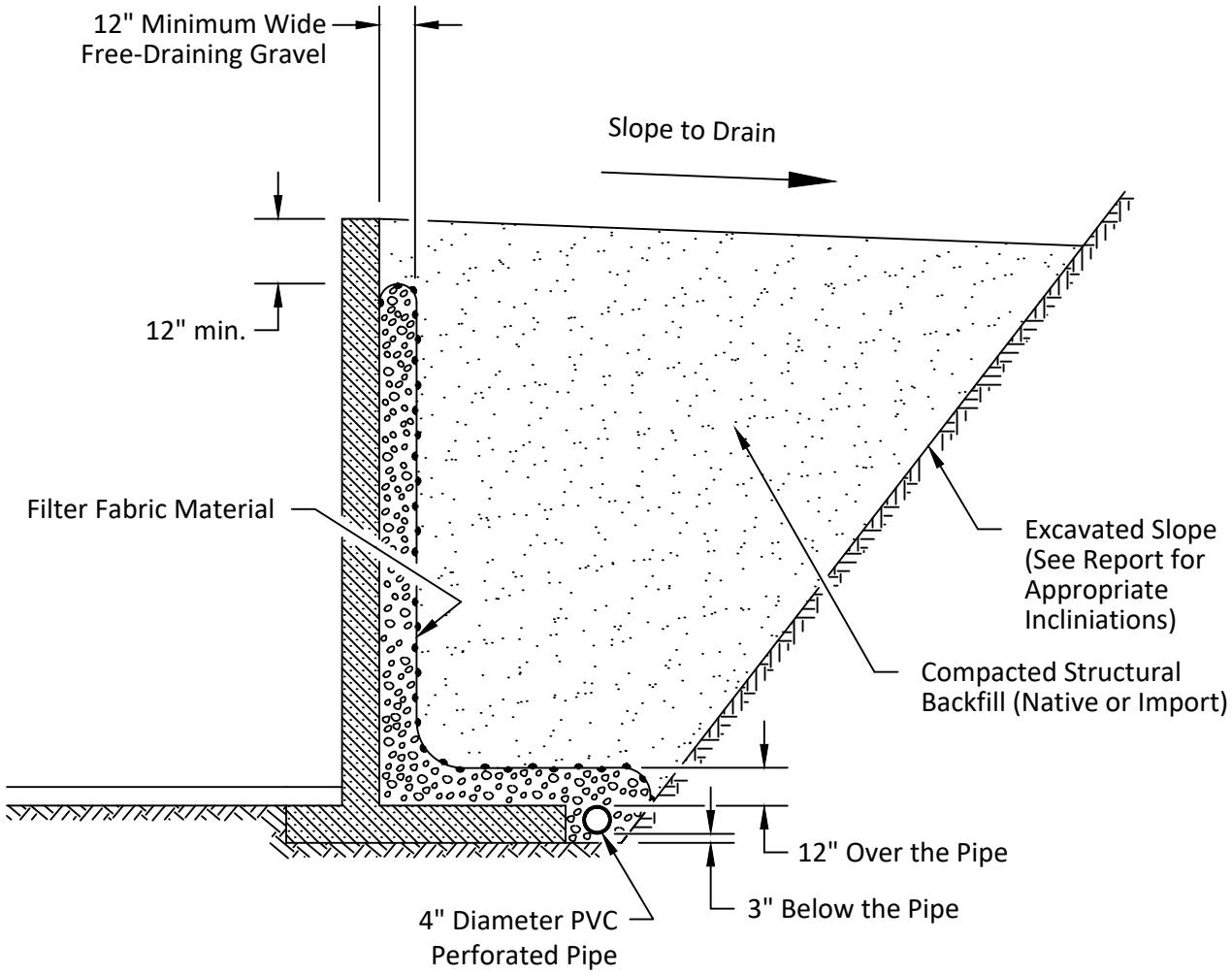
Approximate Scale: 1" = 300'

0 150 300 600

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

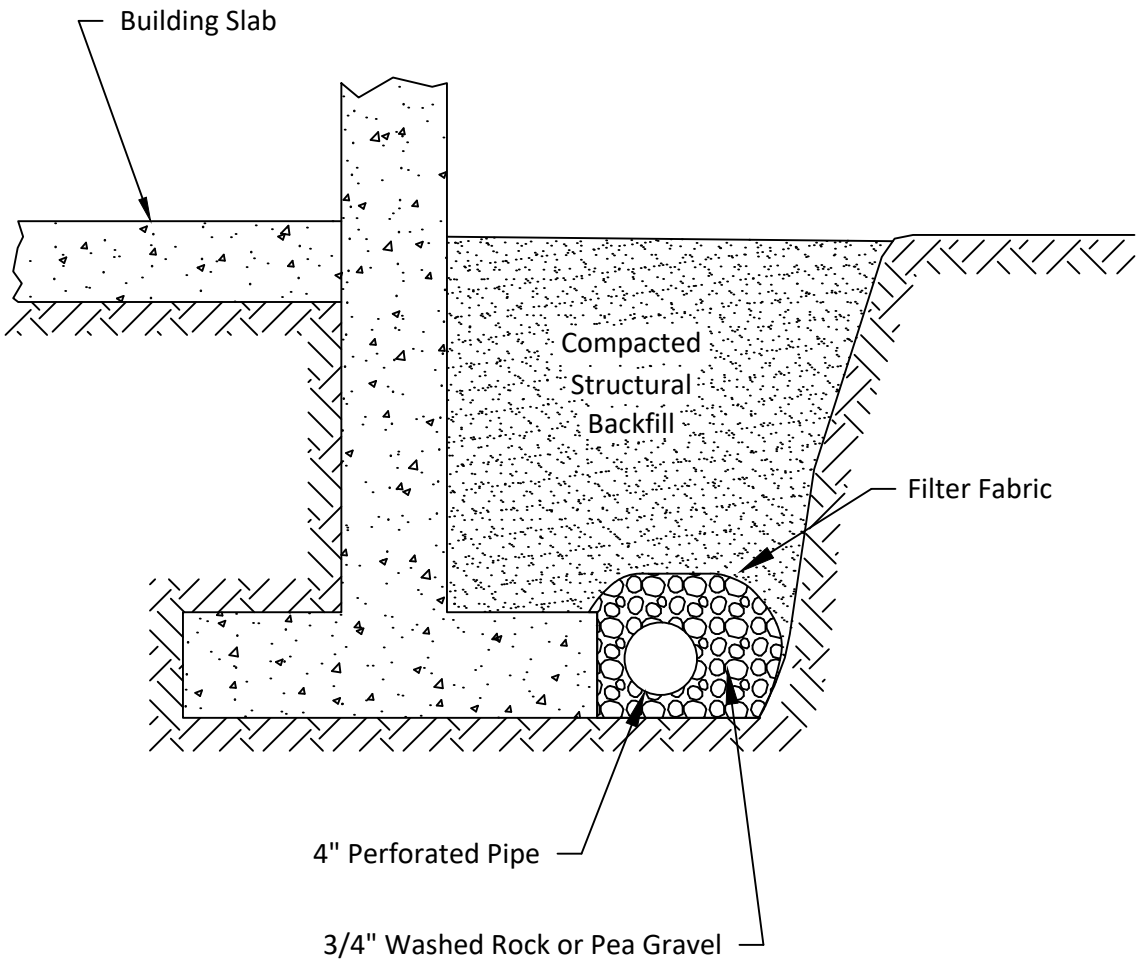
Oak Heights Plat		Figure 2
RGI Project Number: 2024-165-1	Geotechnical Exploration Plan	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		



Not to Scale

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Oak Heights Plat		Figure 3
RGI Project Number: 2024-165-1	Retaining Wall Drainage Detail	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		



Not to Scale

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Oak Heights Plat		Figure 4
RGI Project Number: 2024-165-1	Typical Footing Drain Detail	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

On June 26, 2024, RGI observed field explorations using a mini excavator. We documented subsurface soil conditions at the site by observing the excavation of 10 test pits to a maximum depth of 10.5 feet below existing grade. RGI also reviewed 5 test pit logs prepared by MTC for previous test pits excavated at the site on May 15, 2017. The test pit locations are shown on Figure 2. The test pit locations were approximately determined by measurements from existing property lines and paved roads.

A geologist/engineer from our office observed the field exploration and classified the soil conditions encountered, maintained a log of each test exploration, obtained representative soil samples, and observed pertinent site features. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS).

Representative soil samples obtained from the explorations were placed in closed containers and taken to our laboratory for further examination and testing. As a part of the laboratory testing program, the soil samples were classified in our in house laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described below.

Moisture Content Determinations

Moisture content determinations were performed in accordance with ASTM D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216) on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. The moisture content of typical sample was measured and is reported on the test pit logs.

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analyses was determined using D6913-04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis (ASTM D6913) on six of the samples.

Project Name: **Oak Heights Plat** Project Number: **2024-165-1** Client: **D. R. Horton**	Test Pit No.: TP-1

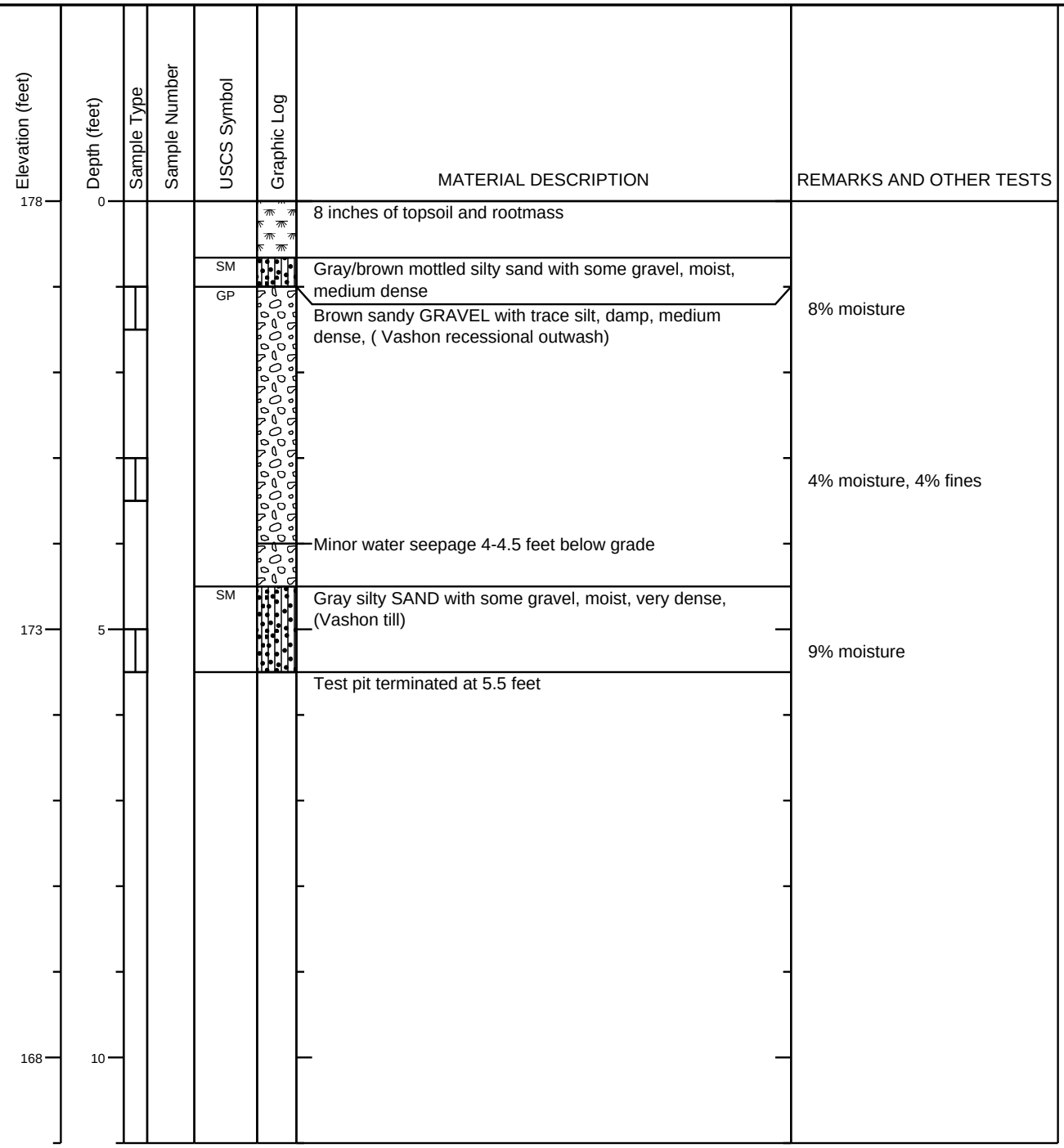
Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **10 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **168**
Groundwater Level: **Minor seepage at 3.25 feet below grade**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
168	0					4 inches of topsoil and rootmass	
				SM		Brown silty SAND with trace gravel, moist, loose	
				SM		Gray/brown mottled silty SAND with some gravel and cobles, moist, medium dense, rust staining,	19% moisture
						Minor water seepage	
				SM		Gray silty SAND with some gravel, moist, very dense, (Vashon till)	10% moisture, 34% fines
163	5						9% moisture
				SM		Gray silty SAND, moist, very dense, (Vashon till)	11% moisture, 40% fines
158	10					Terminated at 10 feet, refusal due to either the density of soils, or a large boulder	

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-2

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **5.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Minor seepage at 4 feet below grade**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat** Project Number: **2024-165-1** Client: **D. R. Horton**	Test Pit No.: TP-3

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **4 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

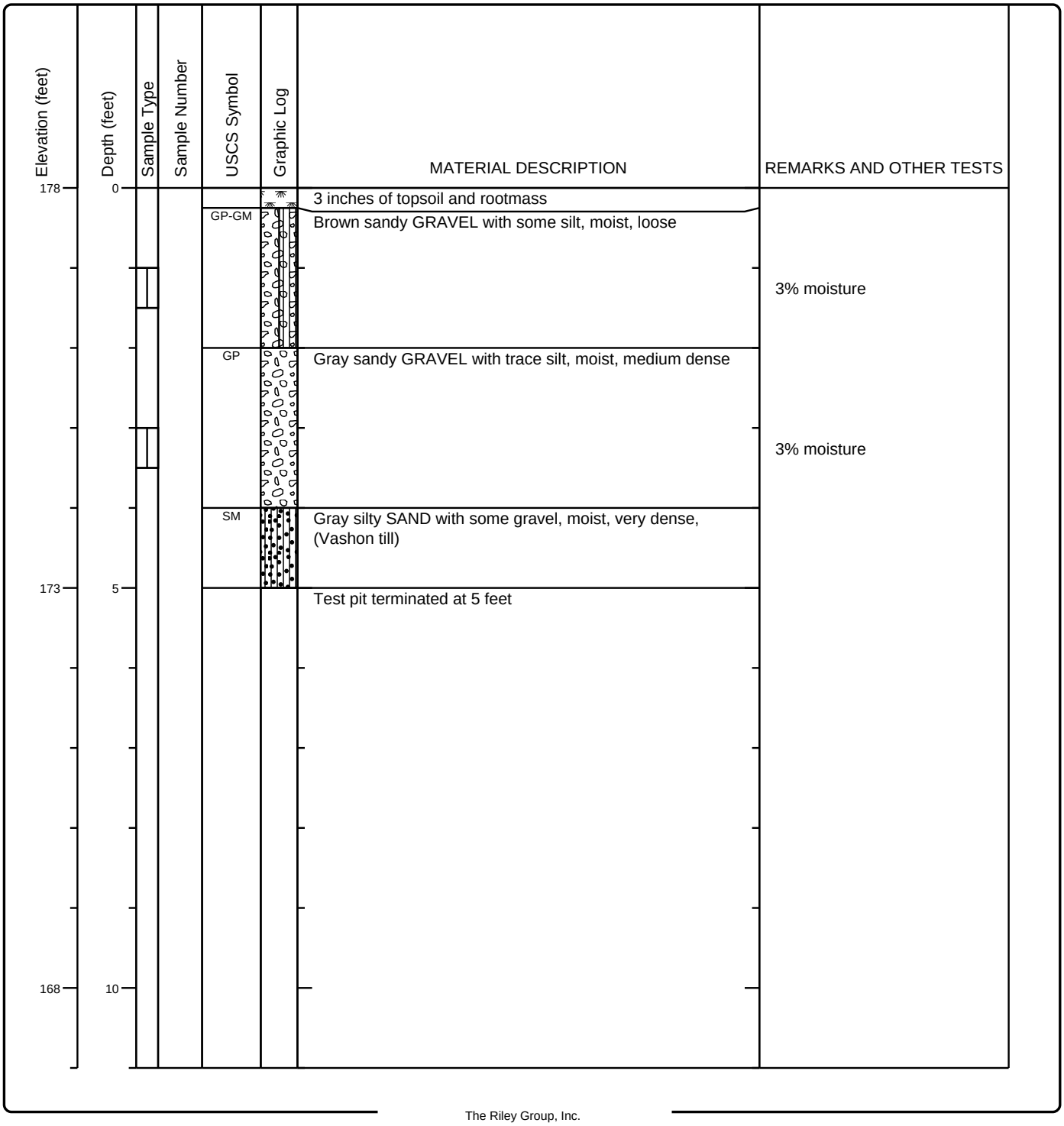
Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
178	0					8 inches of topsoil and rootmass	
				SM		Brown silty SAND with some gravel, moist, medium dense, (Weathered Vashon till)	8% moisture
				SM		Gray silty SAND with some gravel, moist, very dense, (Vashon till)	9% moisture
						Test pit terminated at 4 feet	
173	5						
168	10						

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-4

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

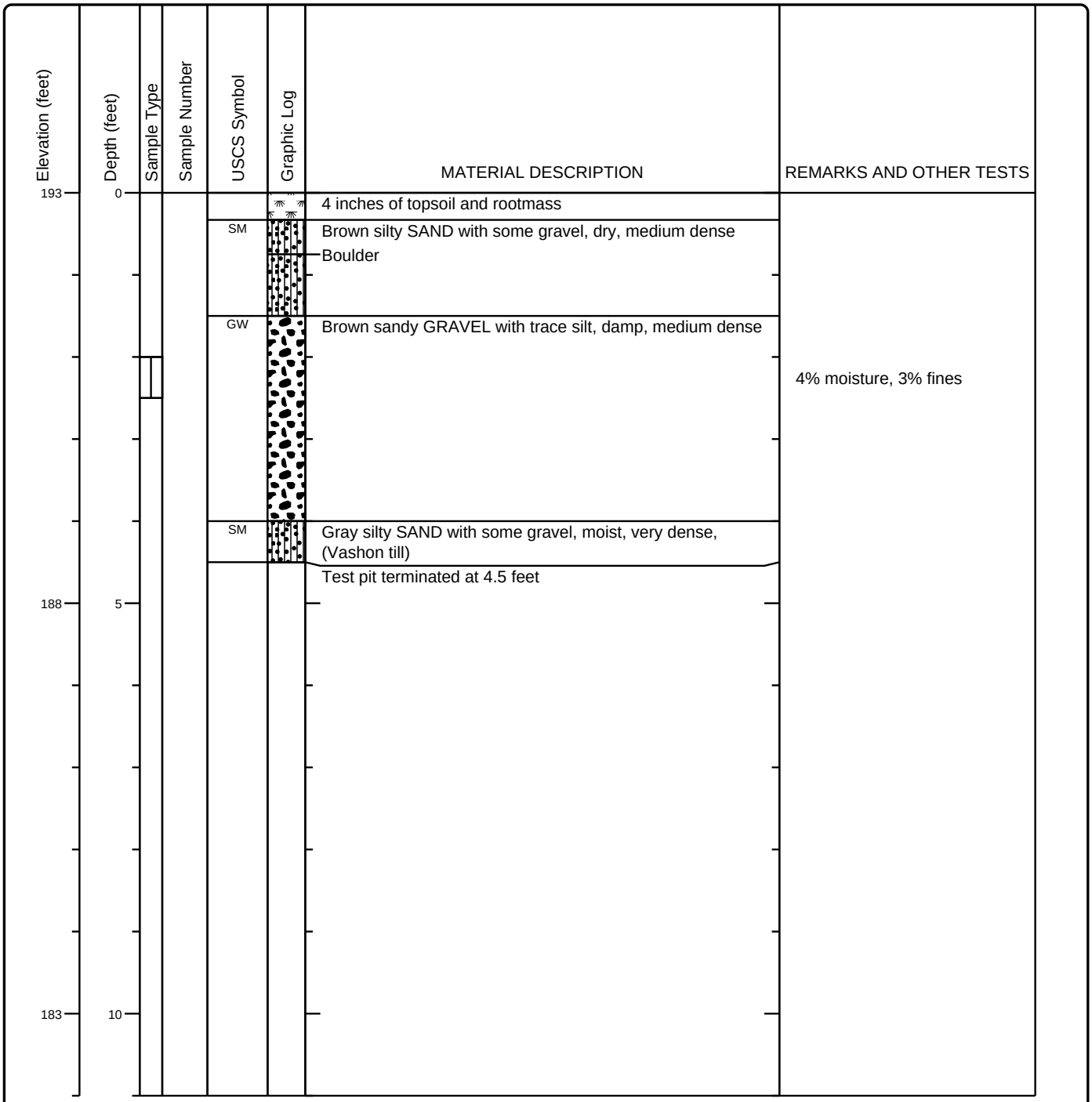


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-5

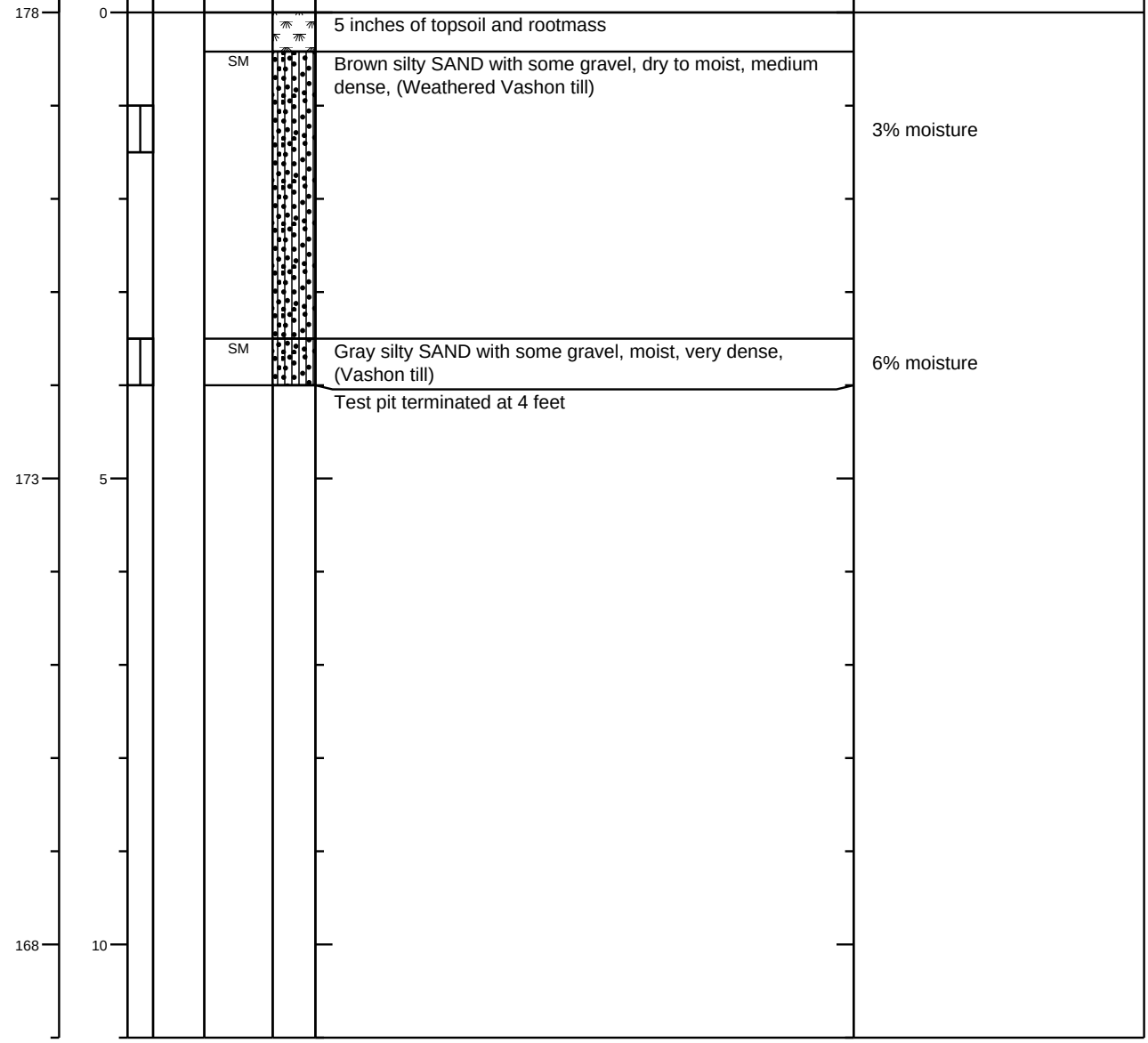
Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **4.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **193**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat** Project Number: **2024-165-1** Client: **D. R. Horton**	RILEYGROUP Test Pit No.: TP-6

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **4 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

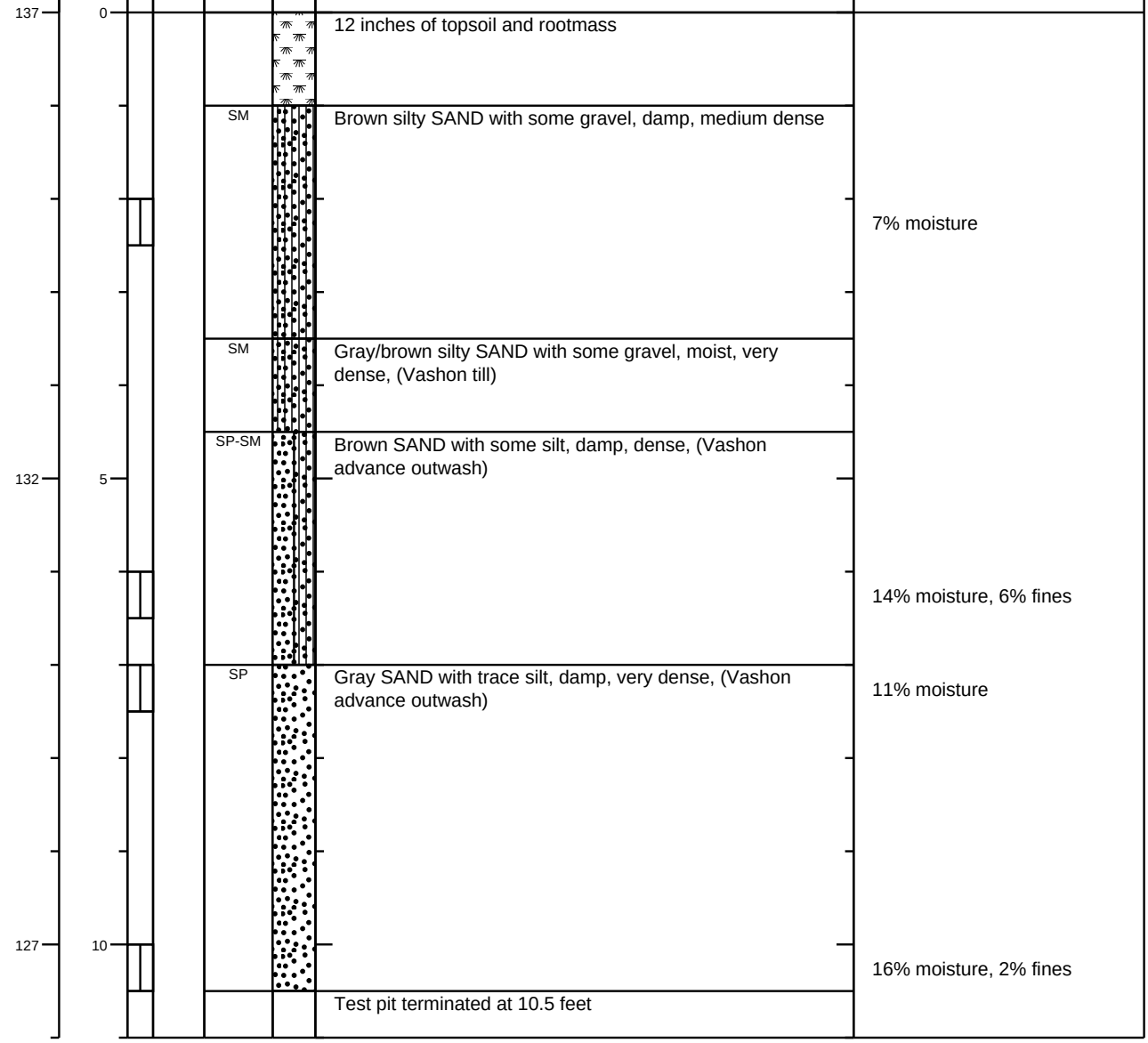


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-7

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **10.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **137**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

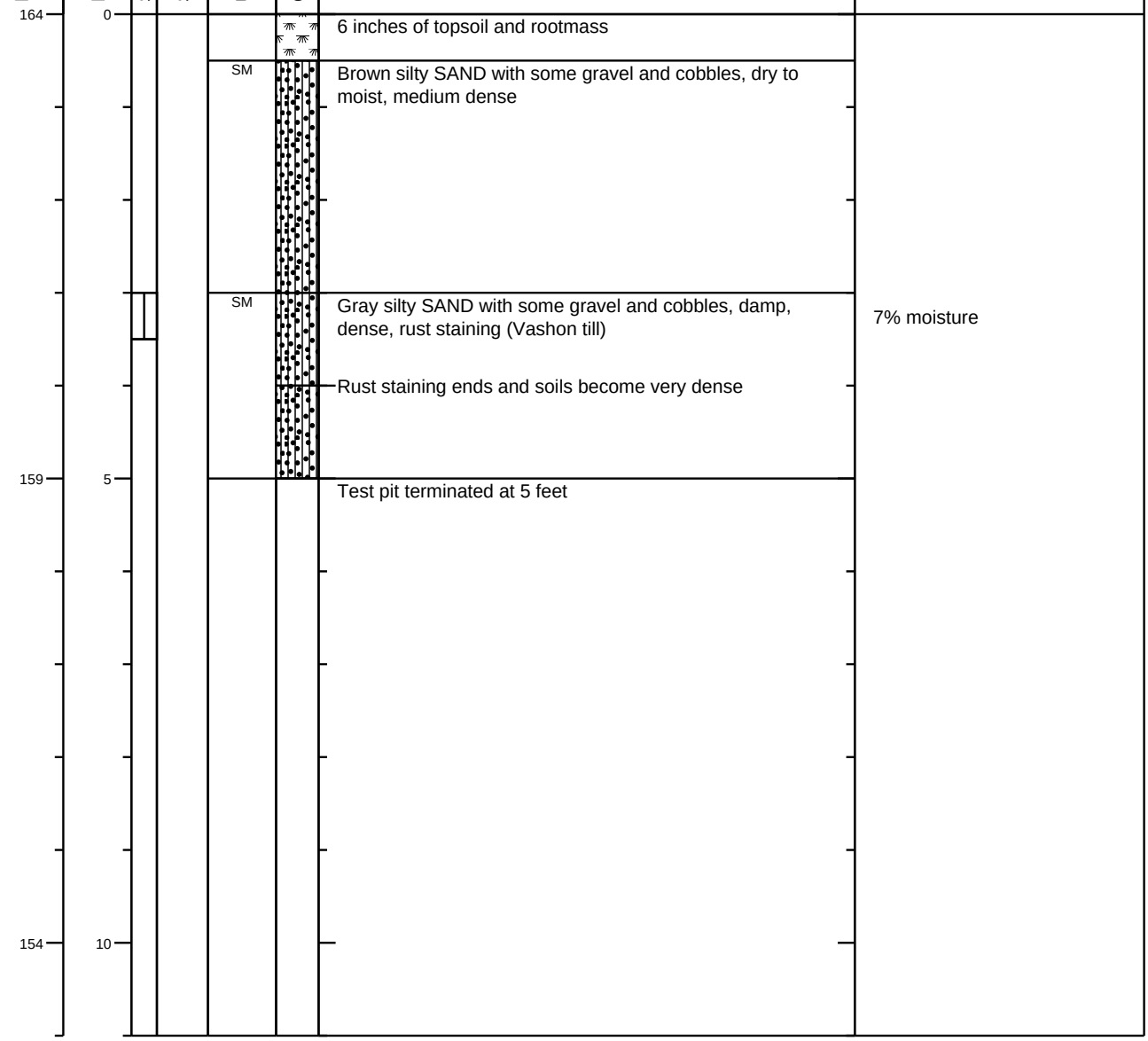


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-8

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **164**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

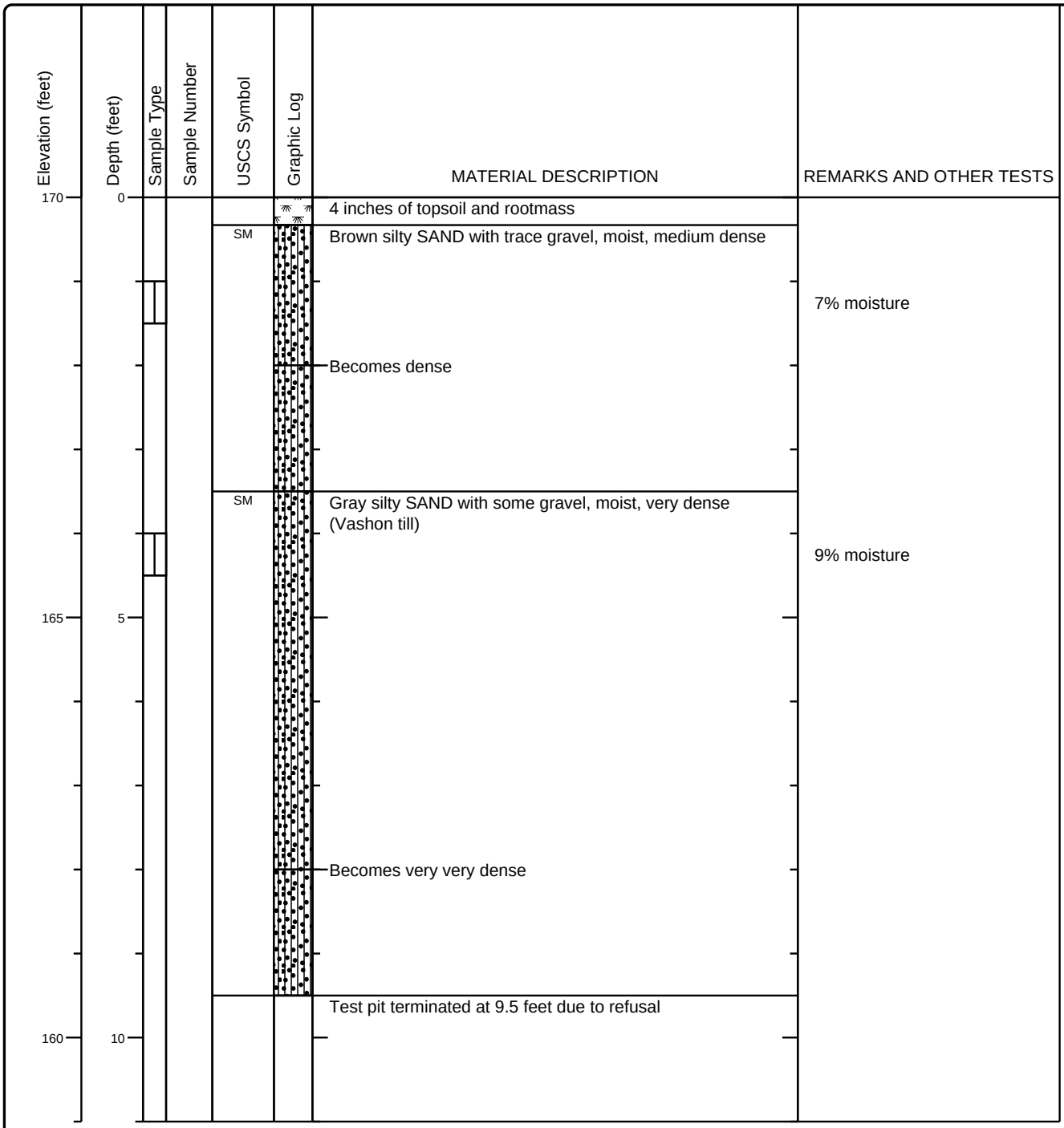


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-9

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **9.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **170**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

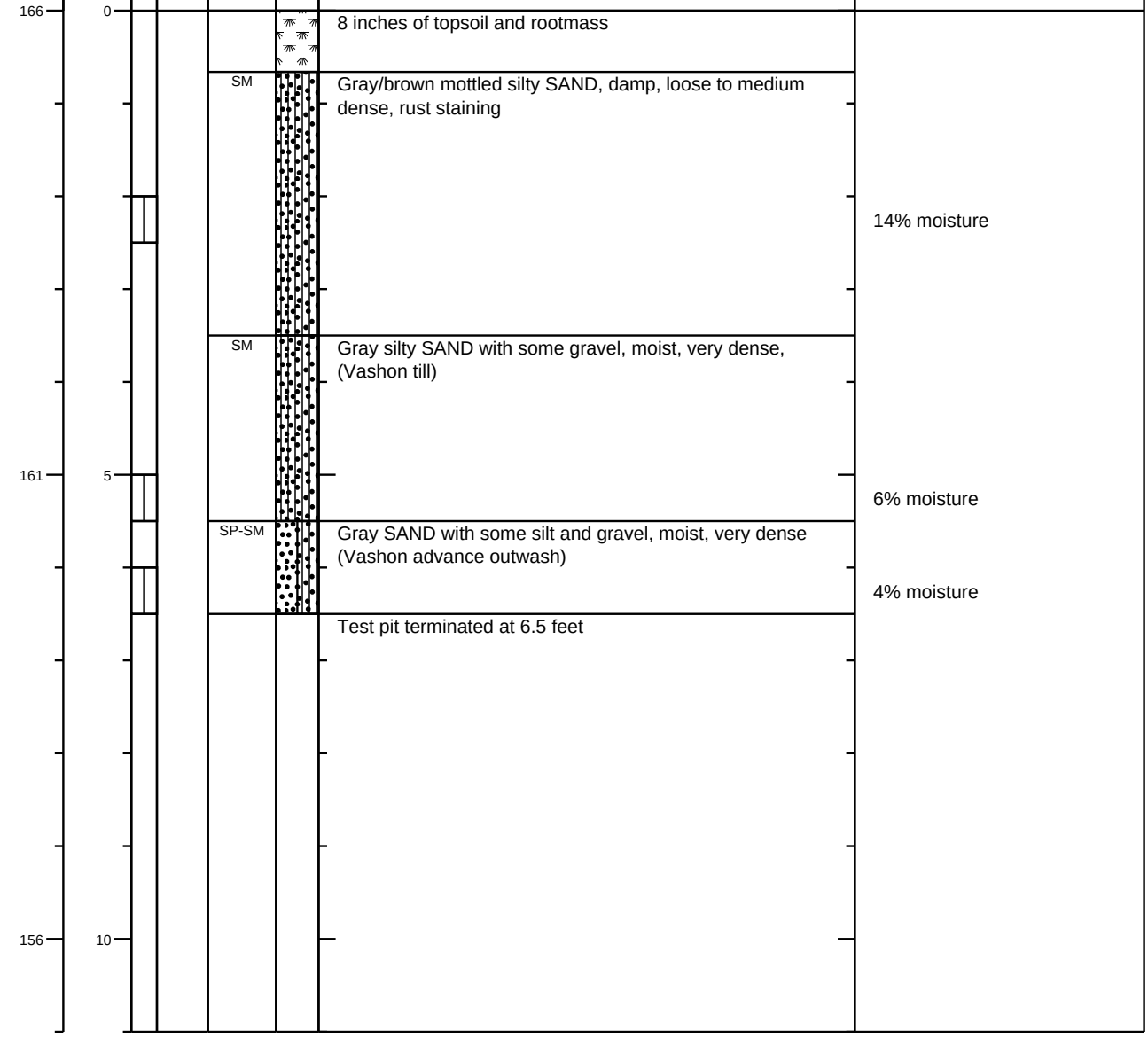


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-10

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **6.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **166**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**

Project Number: **2024-165-1**

Client: **D. R. Horton**

Key to Logs

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. USCS Symbol: USCS symbol of the subsurface material.
6. Graphic Log: Graphic depiction of the subsurface material encountered.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS


Poorly graded GRAVEL (GP)


Poorly graded GRAVEL with Silt (GP-GM)


Well graded GRAVEL (GW)


Silty SAND (SM)


Poorly graded SAND (SP)


Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS


Auger sampler


Bulk Sample


3-inch-OD California w/ brass rings


CME Sampler


Grab Sample


2.5-inch-OD Modified California w/ brass liners


Pitcher Sample


2-inch-OD unlined split spoon (SPT)


Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS


Water level (at time of drilling, ATD)


Water level (after waiting, AW)


Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Matertials Testing and Consulting
Burlington, WA
Geotechnical and Environmental Engineering

Log of Test Pit TP-1

Garry Oakes Plat Infiltration Assessment
1105 SW 24th Avenue
Oak Harbor, WA

MTC Job # 17B095

Date Started : 5/15/17
Date Completed : 5/15/17
Sampling Method : Grab Samples
Location : Phase 1 Residential Lot, See map
Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and forest duff surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SM-ML		SILTY SAND to SANDY SILT WITH GRAVEL, medium dense or stiff, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate orange mottling throughout **WEATHERED GLACIAL TILL**		X	30.3	10.4
2			Strong orange mottling horizons at 2.6' BPG, 0.5 to 1.0 inches thick				
3	ML		SANDY SILT, some gravel, hard, damp to dry with depth, gravel up to 1.5" subrounded. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**		X		
4			T.D. 3.5' BPG Excavation terminated at hard digging conditions. No groundwater observed.				
5							

05-23-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-1.bor

Matertials Testing and Consulting Burlington, WA Geotechnical and Environmental Engineering	Log of Test Pit TP-2
Garry Oakes Plat Infiltration Assessment 1105 SW 24th Avenue Oak Harbor, WA MTC Job # 17B095	Date Started : 5/15/17 Date Completed : 5/15/17 Sampling Method : Grab Samples Location : Phase 1 Detention Pond, See map Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	ML		SUBSOIL: SANDY SILT, some gravel, medium stiff, damp, some organics (roots), gravel up to 2" subrounded. ORANGE-BROWN				
2	SW		SAND WITH GRAVEL, some silt, trace cobbles, loose to medium dense, damp, trace organics (roots), gravel up to 3" subrounded, cobbles up to 6" subrounded. BROWN to GRAY **GLACIAL OUTWASH**		X	9.4	5.6
3	SM-ML		SILTY SAND to SANDY SILT, some gravel, medium dense or stiff, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate orange mottling throughout within silt dominant lenses **WEATHERED GLACIAL TILL**		X	18.1	10.1
4	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**				
5			T.D. 4.2' BPG Excavation terminated at hard digging conditions. No groundwater observed.				

05-23-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-2.bor

Matertials Testing and Consulting Burlington, WA Geotechnical and Environmental Engineering	Log of Test Pit TP-3
Garry Oakes Plat Infiltration Assessment 1105 SW 24th Avenue Oak Harbor, WA MTC Job # 17B095	Date Started : 5/15/17 Date Completed : 5/15/17 Sampling Method : Grab Samples Location : Phase 3 Detention Pond, See map Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SW		SAND WITH GRAVEL, minor silt, loose to medium dense, damp to saturated at base, trace organics (roots), gravel up to 3" subrounded. BROWN to GRAY **GLACIAL OUTWASH**				
2							
3			Light to moderate seepage at basal contact				
	ML		SANDY SILT WITH CLAY, medium stiff, wet to damp with depth, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate orange mottling throughout with strong mottling at upper contact **WEATHERED GLACIAL TILL**				
4							
5	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**				
6			T.D. 5.2' BPG Excavation terminated at hard digging conditions. Perched water observed at 2.9' BPG.				

05-16-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-3.bor

Matertials Testing and Consulting
Burlington, WA
Geotechnical and Environmental Engineering

Log of Test Pit TP-4

Garry Oakes Plat Infiltration Assessment
1105 SW 24th Avenue
Oak Harbor, WA

MTC Job # 17B095

Date Started : 5/15/17
Date Completed : 5/15/17
Sampling Method : Grab Samples
Location : Phase 4 Detention Pond, See map
Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SW-SM		SAND WITH SILT AND GRAVEL, loose to medium dense, damp to saturated at base, trace organics (roots), gravel up to 3" subrounded. BROWN to GRAY **GLACIAL OUTWASH**				
2			Light t seepage at 2.7' BPG		X	15.1	5.6
3	SM-ML		SILTY SAND to SANDY SILT, some gravel, medium stiff, wet to damp with depth, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate to strong orange mottling throughout **WEATHERED GLACIAL TILL**				
4	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**		X		
5			T.D. 4.5' BPG Excavation terminated at hard digging conditions. Minor Seepage observed at 2.7' BPG.				

05-23-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-4.bor

Matertials Testing and Consulting
Burlington, WA
Geotechnical and Environmental Engineering

Log of Test Pit TP-5

Garry Oakes Plat Infiltration Assessment
1105 SW 24th Avenue
Oak Harbor, WA

MTC Job # 17B095

Date Started : 5/15/17
Date Completed : 5/15/17
Sampling Method : Grab Samples
Location : Phase 4 Residential Lot, See map
Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SM-ML		SILTY SAND to SANDY SILT, minor gravel, medium dense or stiff, damp, trace organics (roots), gravel up to 1" subrounded. LIGHT BROWN to GRAY, some orange mottling throughout Strong mottling at basal contact		X		
2	SW		SAND WITH GRAVEL, minor silt, loose to medium dense, wet to saturated at base, trace organics (roots), gravel up to 3" subrounded. BROWN to GRAY **GLACIAL OUTWASH** Light to moderate seepage reported from excavation on 5/10/17		X		
3	SM-ML		SILTY SAND to SANDY SILT, some gravel, medium stiff, wet to damp with depth, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate to strong orange mottling throughout **WEATHERED GLACIAL TILL**	▼	X		
	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**				
4			T.D. 3.8' BPG Excavation terminated at hard digging conditions. Groundwater Stabilized at 3.0, observed on 5/15/17.				
5							

05-16-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-5.bor

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-1	
PROJECT NO.	2024-165-1		**Depth**	4 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	928.3
Wt Dry Soil & Tare (gm)	(w2)	857.9
Weight of Tare (gm)	(w3)	134.4
Weight of Water (gm)	(w4=w1-w2)	70.4
Weight of Dry Soil (gm)	(w5=w2-w3)	723.5
Moisture Content (%)	(w4/w5)*100	10

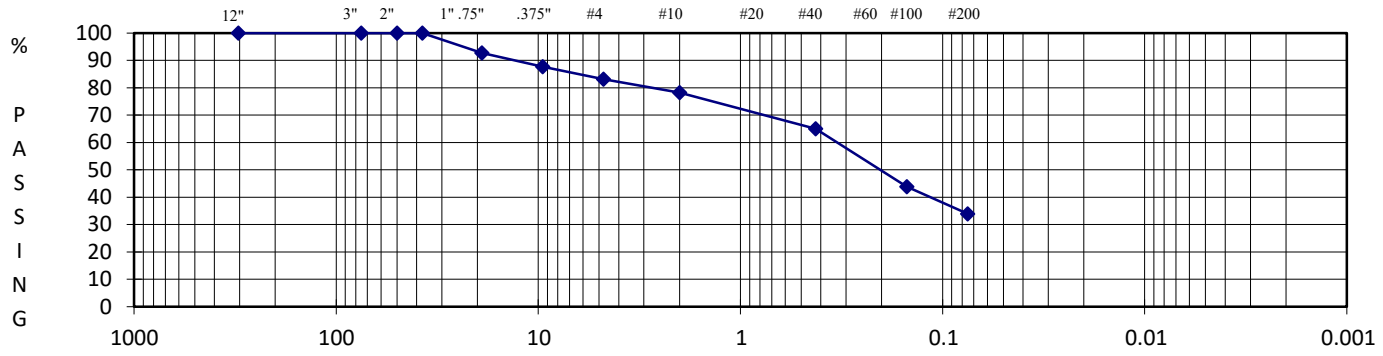
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		857.9
Tare Weight (gm)		134.4
Total Dry Weight (gm)	(W6)	723.5

% COBBLES	**0.0**
% C GRAVEL	**7.3**
% F GRAVEL	**9.5**
% C SAND	**5.0**
% M SAND	**13.2**
% F SAND	**31.1**
% FINES	**33.9**
% TOTAL	**100.0**
D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.4	0.00	0.00	100.00	cobbles
3.0"	134.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	134.4	0.00	0.00	100.00	coarse gravel
1.5"	134.4	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	187.1	52.70	7.28	92.72	fine gravel
0.50"					fine gravel
0.375"	223.0	88.60	12.25	87.75	fine gravel
#4	255.9	121.50	16.79	83.21	coarse sand
#10	292.0	157.60	21.78	78.22	medium sand
#20					medium sand
#40	387.6	253.20	35.00	65.00	fine sand
#60					fine sand
#100	541.0	406.60	56.20	43.80	fine sand
#200	612.4	478.00	66.07	33.93	fines
PAN	857.9	723.50	100.00	0.00	silt/clay



DESCRIPTION	Silty SAND with some gravel
USCS	SM

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-1	
PROJECT NO.	2024-165-1		**Depth**	9 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	967.5
Wt Dry Soil & Tare (gm)	(w2)	885.0
Weight of Tare (gm)	(w3)	124.7
Weight of Water (gm)	(w4=w1-w2)	82.5
Weight of Dry Soil (gm)	(w5=w2-w3)	760.3
Moisture Content (%)	(w4/w5)*100	11

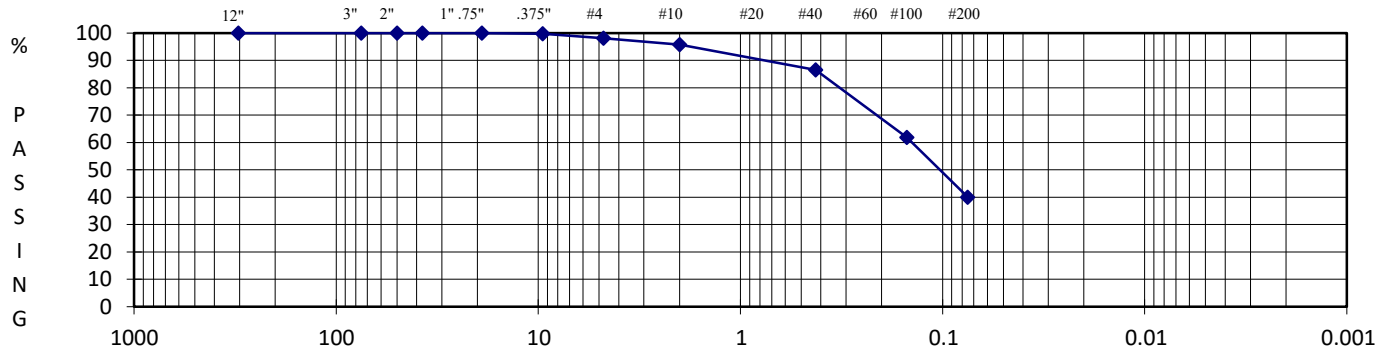
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		885.0
Tare Weight (gm)		124.7
Total Dry Weight (gm)	(W6)	760.3

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**1.8**
% C SAND	**2.4**
% M SAND	**9.2**
% F SAND	**46.5**
% FINES	**40.0**
% TOTAL	**100.0**
D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	124.7	0.00	0.00	100.00	cobbles
3.0"	124.7	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	124.7	0.00	0.00	100.00	coarse gravel
1.5"	124.7	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	124.7	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	126.9	2.20	0.29	99.71	fine gravel
#4	138.6	13.90	1.83	98.17	coarse sand
#10	156.9	32.20	4.24	95.76	medium sand
#20					medium sand
#40	227.1	102.40	13.47	86.53	fine sand
#60					fine sand
#100	414.5	289.80	38.12	61.88	fine sand
#200	580.5	455.80	59.95	40.05	fines
PAN	885.0	760.30	100.00	0.00	silt/clay



DESCRIPTION	Silty SAND
USCS	SM

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-2	
PROJECT NO.	2024-165-1		**Depth**	3 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1398.1
Wt Dry Soil & Tare (gm)	(w2)	1349.7
Weight of Tare (gm)	(w3)	126.4
Weight of Water (gm)	(w4=w1-w2)	48.4
Weight of Dry Soil (gm)	(w5=w2-w3)	1223.3
Moisture Content (%)	(w4/w5)*100	4

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

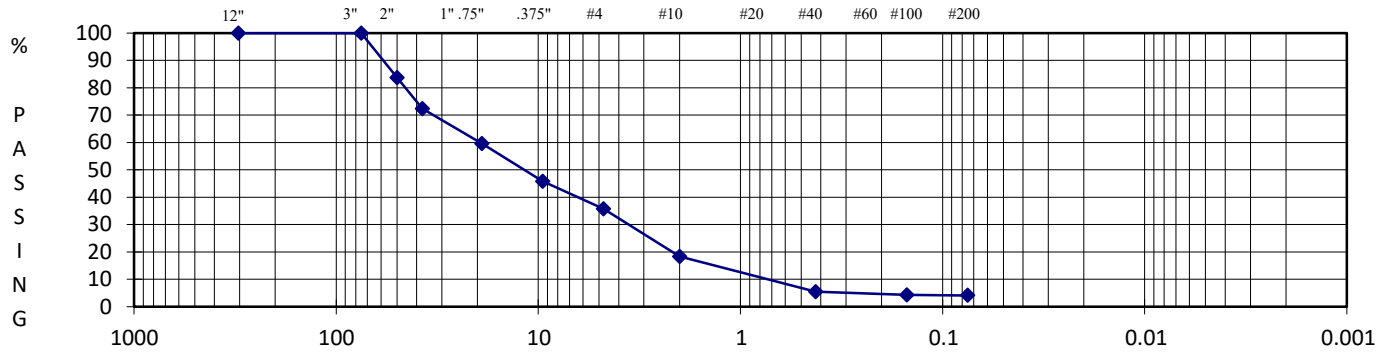
Weight Of Sample (gm)		1349.7
Tare Weight (gm)		126.4
Total Dry Weight (gm)	(W6)	1223.3

% COBBLES	**0.0**
% C GRAVEL	**40.4**
% F GRAVEL	**23.9**
% C SAND	**17.4**
% M SAND	**12.9**
% F SAND	**1.3**
% FINES	**4.2**
% TOTAL	**100.0**

D10 (mm)	0.72
D30 (mm)	3.6
D60 (mm)	19
Cu	26.4
Cc	0.9

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	126.4	0.00	0.00	100.00	cobbles
3.0"	126.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	325.0	198.60	16.23	83.77	coarse gravel
1.5"	464.0	337.60	27.60	72.40	coarse gravel
1.0"					coarse gravel
0.75"	620.2	493.80	40.37	59.63	fine gravel
0.50"					fine gravel
0.375"	789.3	662.90	54.19	45.81	fine gravel
#4	912.1	785.70	64.23	35.77	coarse sand
#10	1125.0	998.60	81.63	18.37	medium sand
#20					medium sand
#40	1282.5	1156.10	94.51	5.49	fine sand
#60					fine sand
#100	1297.4	1171.00	95.72	4.28	fine sand
#200	1298.9	1172.50	95.85	4.15	fines
PAN	1349.7	1223.30	100.00	0.00	silt/clay



DESCRIPTION	Sandy GRAVEL with trace silt
USCS	GP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-5	
PROJECT NO.	2024-165-1		**Depth**	2 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1277.1
Wt Dry Soil & Tare (gm)	(w2)	1237.6
Weight of Tare (gm)	(w3)	134.1
Weight of Water (gm)	(w4=w1-w2)	39.5
Weight of Dry Soil (gm)	(w5=w2-w3)	1103.5
Moisture Content (%)	(w4/w5)*100	4

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

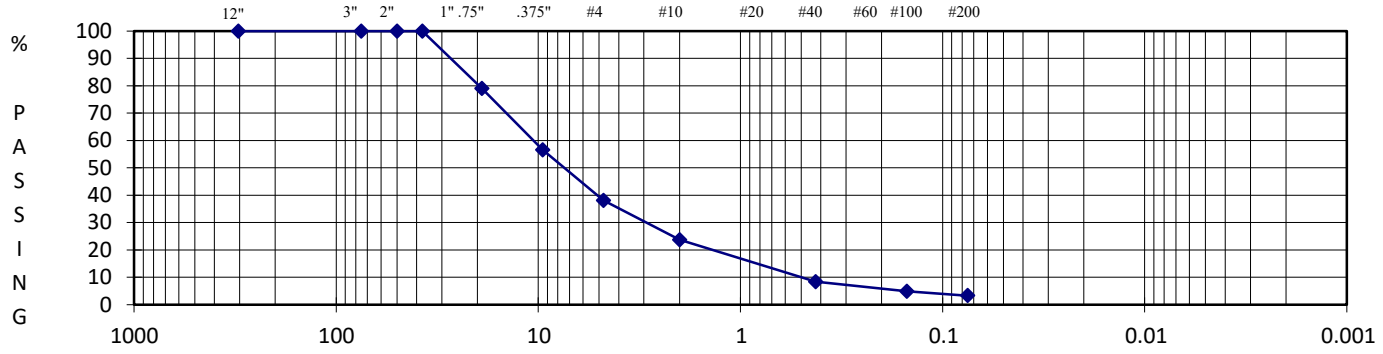
Weight Of Sample (gm)		1237.6
Tare Weight (gm)		134.1
Total Dry Weight (gm)	(W6)	1103.5

% COBBLES	**0.0**
% C GRAVEL	**20.9**
% F GRAVEL	**40.9**
% C SAND	**14.4**
% M SAND	**15.3**
% F SAND	**5.0**
% FINES	**3.3**
% TOTAL	**100.0**

D10 (mm)	0.5
D30 (mm)	2.9
D60 (mm)	11
Cu	22.0
Cc	1.5

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.1	0.00	0.00	100.00	cobbles
3.0"	134.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	134.1	0.00	0.00	100.00	coarse gravel
1.5"	134.1	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	365.2	231.10	20.94	79.06	fine gravel
0.50"					fine gravel
0.375"	613.2	479.10	43.42	56.58	fine gravel
#4	816.5	682.40	61.84	38.16	coarse sand
#10	975.7	841.60	76.27	23.73	medium sand
#20					medium sand
#40	1145.0	1010.90	91.61	8.39	fine sand
#60					fine sand
#100	1183.4	1049.30	95.09	4.91	fine sand
#200	1200.7	1066.60	96.66	3.34	fines
PAN	1237.6	1103.50	100.00	0.00	silt/clay



DESCRIPTION	Sandy GRAVEL with trace silt
USCS	GW

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-7	
PROJECT NO.	2024-165-1		**Depth**	6 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1003.8
Wt Dry Soil & Tare (gm)	(w2)	896.6
Weight of Tare (gm)	(w3)	134.6
Weight of Water (gm)	(w4=w1-w2)	107.2
Weight of Dry Soil (gm)	(w5=w2-w3)	762.0
Moisture Content (%)	(w4/w5)*100	14

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

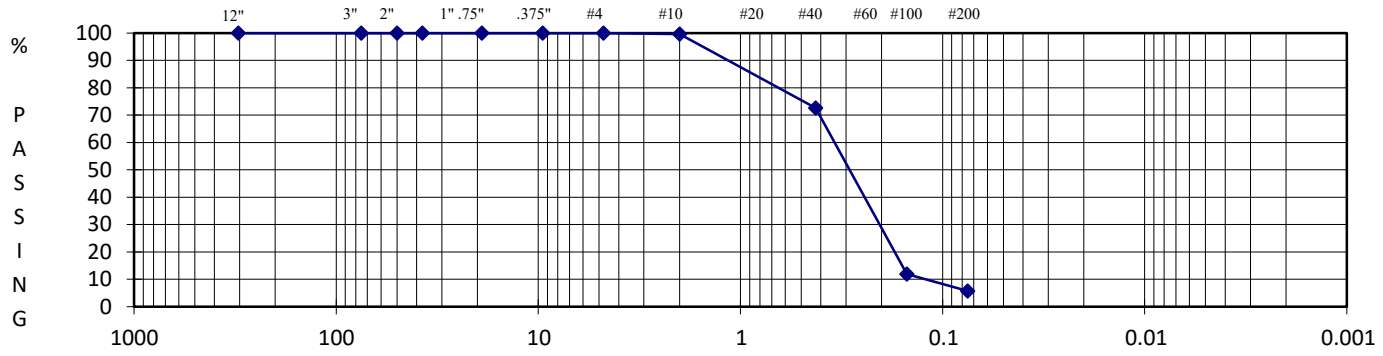
Weight Of Sample (gm)		896.6
Tare Weight (gm)		134.6
(W6) Total Dry Weight (gm)		762.0

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**0.0**
% C SAND	**0.3**
% M SAND	**26.9**
% F SAND	**66.9**
% FINES	**5.7**
% TOTAL	**100.0**

D10 (mm)	0.13
D30 (mm)	0.21
D60 (mm)	0.34
Cu	2.6
Cc	1.0

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.6	0.00	0.00	100.00	cobbles
3.0"	134.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	134.6	0.00	0.00	100.00	coarse gravel
1.5"	134.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	134.6	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	134.6	0.00	0.00	100.00	fine gravel
#4	134.9	0.30	0.04	99.96	coarse sand
#10	137.5	2.90	0.38	99.62	medium sand
#20					medium sand
#40	342.8	208.20	27.32	72.68	fine sand
#60					fine sand
#100	805.3	670.70	88.02	11.98	fine sand
#200	852.8	718.20	94.25	5.75	fines
PAN	896.6	762.00	100.00	0.00	silt/clay



DESCRIPTION	SAND with some silt
USCS	SP-SM

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-7	
PROJECT NO.	2024-165-1		**Depth**	10 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1015.3
Wt Dry Soil & Tare (gm)	(w2)	905.2
Weight of Tare (gm)	(w3)	212.2
Weight of Water (gm)	(w4=w1-w2)	110.1
Weight of Dry Soil (gm)	(w5=w2-w3)	693.0
Moisture Content (%)	(w4/w5)*100	16

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

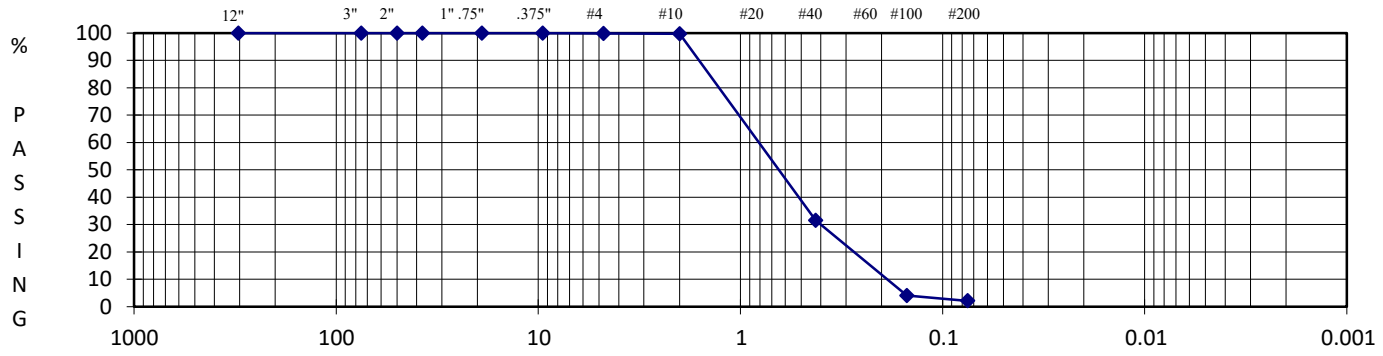
Weight Of Sample (gm)		905.2
Tare Weight (gm)		212.2
(W6) Total Dry Weight (gm)		693.0

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**0.1**
% C SAND	**0.2**
% M SAND	**68.2**
% F SAND	**29.4**
% FINES	**2.2**
% TOTAL	**100.0**

D10 (mm)	0.19
D30 (mm)	0.41
D60 (mm)	0.8
Cu	4.2
Cc	1.1

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	212.2	0.00	0.00	100.00	cobbles
3.0"	212.2	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	212.2	0.00	0.00	100.00	coarse gravel
1.5"	212.2	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	212.2	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	212.2	0.00	0.00	100.00	fine gravel
#4	212.7	0.50	0.07	99.93	coarse sand
#10	214.0	1.80	0.26	99.74	medium sand
#20					medium sand
#40	686.6	474.40	68.46	31.54	fine sand
#60					fine sand
#100	877.0	664.80	95.93	4.07	fine sand
#200	890.1	677.90	97.82	2.18	fines
PAN	905.2	693.00	100.00	0.00	silt/clay



DESCRIPTION	SAND with trace silt
USCS	SP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

CRITICAL AREAS REPORT
AND
HABITAT MANAGEMENT PLAN

FOR

OAK HEIGHTS- SR 20

Oak Harbor, WA

Wetland Resources, Inc. Project #24150

Prepared By:
Wetland Resources, Inc.
9505 19th Avenue SE, Suite 106
Everett, WA 98208
(425) 337-3174

Owner:
D.R. Horton, America's Builder
11241 Slater Avenue NE, #200
Kirkland, WA 98033

June 27, 2024

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 SITE DESCRIPTION 1
1.2 PROJECT DESCRIPTION 2
2.0 CRITICAL AREAS DELINEATION METHODOLOGY 3
2.1 WETLAND DELINEATION METHODOLOGY 3
2.2 CRITICAL AREA CLASSIFICATIONS 4
2.3 WETLAND BOUNDARY DETERMINATION FINDINGS 4
2.4 OTHER CRITICAL AREAS 6
2.5 WILDLIFE ASSESSMENT 7
3.0 HABITAT MANAGEMENT PLAN 8
4.0 FUNCTIONS AND VALUES ASSESSMENT 9
4.1 METHODOLOGY 9
4.2 EXISTING VALUES ASSESSMENT 10
5.0 FENCING AND SIGNAGE 10
6.0 BUILDING SETBACKS 11
7.0 USE OF THIS REPORT 11
8.0 REFERENCES 12

LIST OF FIGURES

FIGURE 1 – AERIAL VIEW OF THE SITE (NTS) 1
FIGURE 2 – WETLAND A, FACING SOUTH. 5

LIST OF APPENDICES

APPENDIX A: DOE WETLAND RATING FORMS AND FIGURES
APPENDIX B: WETLAND DETERMINATION DATA FORMS
APPENDIX C: CRITICAL AREA AND EXISTING CONDITIONS MAP

1.0 INTRODUCTION

Wetland Resources, Inc. (WRI) was contracted by D.R Horton, America's Builder to perform a site investigation on the assemblage of properties totaling 37.24 acres located southwest of the intersection of SR 20 and SW 24th Ave (R13210-295-1480; R13210-298-2300; R13210-364-2330; R13210-364-1900; R13210-364-1730) in the city of Oak Harbor, WA. The Public Land Survey System (PLSS) locator for the subject property is Section 10, Township 32N, Range 01E. The purpose of the investigation was to locate and evaluate jurisdictional wetlands and/or streams on and in the vicinity of the subject property.

A delineation was conducted by WRI on October 22, 2015, and January 21, 2016. Delineation methodologies are unchanged and development in the contributing basin is limited, therefore re-delineation of the wetland was deemed unnecessary. Two wetlands were identified and delineated on the site. These are referred to as Wetland A and Wetland B. No streams were identified during the investigation.



Figure 1 – Aerial view of the site (NTS)

1.1 SITE DESCRIPTION

This assemblage of properties is located within the city limits of Oak Harbor. It is bordered to the east by SR 20 and to the north by SW 24th Ave. Surrounding land use includes single-family residential development to the north and east, large rural residential lots to the south, and undeveloped land to the west. Topography is a gradual south-to-southeast aspect.

Several residential structures, outbuildings and associated access driveways occupy the eastern portion of the property. There is a large stormwater detention facility in its southeastern corner. The remaining portion of the site is maintained as pastureland with electric fencing and grazing horses in the southwestern parcel.

On-site vegetation consists of small areas of intact mature evergreen forest community comprised of: Douglas fir (*Pseudotuga menziesii*) in the canopy and ocean spray (*Holadiscus discolor*), snowberry (*Symphoricarpus albus*), salal (*Gaultheria shallon*), red flowering current (*Ribes sanguinium*), dwarf Oregon grape (*Mahonia nervosa*), Himalayan blackberry (*Rubus armeniacus*), trailing blackberry (*Rubus ursinus*), and bracken fern (*Pteridium aquilinum*) in the understory. Except for its developed portions, the remainder of the site has historically been used for farming and livestock and is currently pasture.

Native vegetation was cleared from the site more than 50 years ago and again in 2018. Evidence from a 1963 aerial photo shows a constructed farm pond on the site. Additional documentation reveals that the pond had not been well maintained over the years. The owner at the time expanded the pond in the late 60's to mitigate flooding problems. Despite the previous alterations done to this site, the natural topographic depression, mapped native hydric soils, and past flooding problems are all indicators that the area of the pond was sourced naturally by wetlands. These historic alterations to the site, however, pre-date any wetlands legislation in Washington State. WRI's findings resulted in a delineated wetland area surrounding the pond that is identified in this report as Wetland A.

Wetland A contains the constructed pond in the eastern portion of the site. This wetland area has been degraded over the years by the past land use practices. Wetland A is a depressional wetland with no observable outlet. Due to its degraded condition and position in the landscape this wetland receives a low score of 15 points for functions on the Wetland Rating Form (2014), which equates to a Category IV classification.

Wetland B is a small depressional wetland in the heavily grazed pasture area approximately 250 feet west of Wetland A. It supports a scrub-shrub vegetation class dominated by Nootka rose. Herbaceous ground cover in and around the wetland is actively grazed. Due to its degraded condition and position in the landscape, this wetland receives a low score of 14 points for functions on the Wetland Rating Form (2014), which also equates to a Category IV classification.

1.2 PROJECT DESCRIPTION

The applicant is proposing to construct a residential subdivision with associated infrastructure. The project proposal includes the placement of nature trails within the wetland buffers of Wetlands A and B. Recreational trails within wetland buffers are an allowed use under OHMC 20.24.030(10). The proposed trails will be no more than 5 feet wide and will be composed of a pervious material like wood chips. The trails will also be placed in the outer 25 percent of the wetland buffers. No critical area impacts are proposed.

2.0 CRITICAL AREAS DELINEATION METHODOLOGY

Before conducting the site investigation, public resource information was reviewed to gather background information on the subject property and the surrounding area in regards to wetlands, streams, and other critical areas. These sources include:

- Natural Heritage Program (DNR)- DNR does not list the subject Section/Township/Range as reported to contain Natural Heritage Features.
- USFWS National Wetland Inventory- NWI displays two freshwater ponds approximately where Wetland A was delineated by WRI. No other features are depicted on site.
- USDA/NRCS Soil Survey- The Web Soil Survey shows the site is composed of Everett-Alderwood complex, 0 to 5 percent slopes, Everett-Alderwood complex, 15 to 40 percent slopes, and Coveland loam, cool, 0 to 5 percent slopes. For further details, see Section 2.2.2.
- Priority Habitats and Species (WDFW PHS)- Online WDFW data displays a Big brown bat (*Eptesicus fuscus*) communal roost, and Townsend's Big-eared Bat (*Corynorhinus townsendii*) communal roost on and near the subject site. See section 2.4.1 for further information.
- Island County Critical Areas Map- Island County displays four on-site wetlands, two of which appear to form Wetland A as delineated by WRI. The other two wetlands were not determined to be wetlands by WRI.
- City of Oak Harbor Critical Areas Maps- The City displays Critical Aquifer Recharge Areas of low and moderate susceptibility located on site. The City also displays a bald eagle area as a Fish and Wildlife Habitat Conservation Area. The City displays two wetlands on-site, though these were not observed/determined to be wetlands by WRI.
- WDFW Salmonscape- WDFW displays two ponds approximately where Wetland A was delineated by WRI. No fish use is depicted in the site vicinity.

2.1 WETLAND DELINEATION METHODOLOGY

The presence of wetlands was determined using the routine determination approach described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (U.S. Army Corps of Engineers 2010). Under the routine methodology, the process for making a wetland determination is based on three steps:

1) Examination of the site for hydrophytic vegetation (species present and percent cover);
2) Examination of the site for hydric soils;
3) Determining the presence of wetland hydrology

The ordinary high water mark (OHWM) of Puget Sound was estimated using the methodology described in *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State* (Anderson et al. 2016). Waterbodies were classified according to the water typing system provided in the Washington Administrative Code (WAC), section 222-16-031 and ICC 17.02B.

2.1.1 Hydrophytic Vegetation Criteria

The manuals define hydrophytic vegetation as the "sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present." One of the most common indicators for hydrophytic vegetation is when more than 50 percent of a plant community consists of species rated "Facultative" and wetter on lists of plant species that occur in wetlands.

2.1.2 Soils Criteria and Mapped Description

The 2010 Regional Supplement (per the National Technical Committee for Hydric Soils) defines hydric soils as soils *"that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part."* Field indicators are used to determine whether a given soil meets the definition for hydric soils. Indicators are numerous and include, but are not limited to, presence of a histosol or histic epipedon, a sandy gleyed matrix, depleted matrix, and redoximorphic depressions.

2.1.3 Hydrology Criteria

The 2010 Regional Supplement defines wetland hydrology as "areas that are inundated (flooded or ponded) or the water table is less than or equal to 12 inches below the soil surface for 14 or more consecutive days during the growing season at a minimum frequency of 5 years in 10." During the early growing season, wetland hydrology determinations are made based on physical observation of surface water, a high water table, or saturation in the upper 12 inches. Outside of the early growing season, wetland hydrology determinations are made based on physical evidence of recent inundation or saturation (i.e. water marks, surface soil cracks, water-stained leaves).

2.2 CRITICAL AREA CLASSIFICATIONS

2.2.1 City of Oak Harbor Classification

According to Oak Harbor Municipal Code (OHMC) 20.24.010 wetlands shall be rated according to the Washington Department of Ecology wetland rating system, as outlined in the Washington State Wetland Rating System for Western Washington: 2014 Update (Ecology Publication No. 14-06-029, or as revised and approved by Ecology) (Version 2.0, July 2023, Ecology Publication 23.06.009), herein referred to as the 2014 DOE Rating Form.

2.3 WETLAND BOUNDARY DETERMINATION FINDINGS

Wetland A
Jurisdiction: Oak Harbor, Ecology
HGM Class: Depressional
Cowardin Classification: Palustrine, Forested, Broad-Leaved Deciduous, Permanently Flooded
Total Score for Functions: 15 Points
Habitat Score: 5 points
Oak Harbor Buffer Requirement: 50 feet (15 Points, High Intensity Land Use, No Outlet)

Dominant plant species within Wetland A include reed canarygrass (*Phalaris arundinacea*, FACW), soft rush (*Juncus effusus*, FACW), bedstraw (*Galium trifidum*, FACW). Underlying soils are dark grayish brown (10YR 2/3) silt loam more than 18 inches thick with approximately 10 percent strong dark yellowish brown redoximorphic features (10YR 3/6). Soils throughout the wetland varied between saturated and inundated. Other vegetation found within the wetland area surrounding the pond includes pacific willow (*Salix lucida*, FACW), Sitka willow (*Salix sitchensis*, FACW), Scouler's willow (*Salix scouleriana*, FAC), and Nootka rose (*Rosa nutkana*, FAC). Based on the positive field indicators described above, the areas mapped as wetlands on this site are inundated or saturated to the surface for more than 12.5 percent of the growing season, thereby fulfilling wetland hydrology criteria.

Dominant vegetation in the adjacent upland areas consists of tall fescue (*Festuca arundinacea*, FACU), redtop bentgrass (*Agrostis gigantia*, FAC), and hairy cat's-ear (*Hypochaeris radicata*, FACU). Soils in the adjacent upland areas were dark grayish brown (10YR 2/2) loam in the upper 2 inches and dark brown (10YR 3/3) loam from 2-16 inches. The soils were dry at the time of the investigation. Based on the lack of positive field indicators for hydrophytic vegetation, hydric soils, and saturation, the areas mapped as non-wetland are not saturated to the surface for more than 12.5 percent of the growing season, thereby not fulfilling wetland hydrology criteria.



Figure 2 – Wetland A, facing south.

Wetland B
Jurisdiction: Oak Harbor, Ecology
HGM Class: Depressional
Cowardin Classification: Palustrine, Scrub-Shrub Wetland, Broad-Leaved Deciduous, Seasonally Flooded
Total Score for Functions: 15 Points
Habitat Score: 5 points
Island County Buffer Requirement: 50 feet (15 Points, High Intensity Land Use, No Outlet)

Dominant plant species found in Wetland B includes Nootka rose (*Rosa nutkana*, FAC) and Kentucky bluegrass (*Poa pratensis*, FAC). The underlying soils are dark grayish brown gravelly sandy loam in the upper 6 inches with 5 percent dark yellowish brown (10YR 4/4) redox concentrations. Below 6 inches, the soil is dark gray (10YR 3/1) gravelly sandy loam with 2 percent dark yellowish gray (10YR 4/4) redox features and 2 percent gray (10YR 5/1) depletions. The soils were saturated throughout the profile during the site investigation. Based on the positive field indicators described above, the areas mapped as wetlands on this site are inundated or saturated to the surface for more than 12.5 percent of the growing season, thereby fulfilling wetland hydrology criteria.

Upland areas adjacent to Wetland B are dominated by clover (*Trifolium repens*, FAC) and Kentucky bluegrass (*Poa pratensis*, FAC). The underlying soils are dark grayish brown (10YR 3/2) gravelly sandy loam. No redox concentrations were present. Based on the lack of positive field indicators for hydrophytic vegetation, hydric soils, and saturation, the areas mapped as non-wetland are not saturated to the surface for more than 12.5 percent of the growing season, thereby not fulfilling wetland hydrology criteria.

Vegetation within Wetland B consists of bentgrass (*Agrostis* sp.; FAC), and common silverweed (*Potentilla anserina*; OBL). Soils within sample pit S3 are very dark brown (10YR 2/2) sandy loam to a depth of five inches below the mineral soil surface. From five to eight inches, soils are very dark brown (10YR 2/2) sandy loam with five percent dark yellowish brown (10YR 3/4) redoximorphic features. From eight to 18 inches soils are very dark grayish brown (2.5Y 3/2) sand. Redoximorphic features were observed as oxidized rhizospheres along living roots (C3). These soils meet the hydric soil indicator S5 (Sandy Redox). Saturation at four to six inches depth and a high water table at a depth of six inches were present during the site visit.

2.4 OTHER CRITICAL AREAS

2.4.1 Fish and Wildlife Habitat Conservation Area

Fish and wildlife habitat conservation areas are regulated according to OHMC 20.25, and designated as:

> *(1) Areas with which state or federally designated endangered, threatened, and sensitive species have a primary association. The Washington State Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service should be consulted for current listing status;*

(2) State priority habitats and areas associated with state priority species, as identified by the Washington State Department of Fish and Wildlife;

(3) Garry oak (Quercus garryana) stands and individual trees;

(4) Other habitats and species of local importance, as identified by the city in accordance with OHMC 20.25.020;

(5) Commercial and recreational shellfish areas, including all public and private tidelands or bedlands suitable for shellfish harvest as well as shellfish protection districts established pursuant to Chapter 90.72 RCW;

(6) Geoduck concentration areas, including all public and private bedlands suitable for geoduck colonization;

(7) Eelgrass beds;

(8) Forage fish spawning areas;

(9) Lakes or ponds that provide fish or wildlife habitat, except artificial ponds created for a non-wildlife purpose such as stormwater detention facilities, wastewater treatment facilities, farm ponds, and temporary construction ponds; and

(10) Areas of rare plant species or high-quality ecosystems identified by the Washington State Department of Natural Resources through the Natural Heritage Program under Chapter 79.70 RCW. (Ord. 1440 § 4, 2005).

As stated in section 2.1, online WDFW data displays a bald eagle (*Haliaeetus leucocephalus*) breeding area, big brown bat (*Eptesicus fuscus*) communal roost, and Townsend's big-eared bat (*Corynorhinus townsendii*) communal roost within the subject site.

Confirmation of these features was sought through an official WDFW PHS map request on September 8, 2016. This process confirmed the presence of a bald eagle nest just east of SR 20. The official priority habitat map did not show either bat species using this site. No other features were shown on the official PHS map within the vicinity. These maps are no longer available, so visual confirmation of the eagle nest was made during the site visit. According to OHMC 20.25.060(7), a Bald Eagle Habitat Management Plan shall be developed for activities within 660 feet of a bald eagle nest. The proposed development is on the opposite side of SR 20 and at its closest 225 feet from the nest location.

2.5 WILDLIFE ASSESSMENT

A variety of birds, mammals, and amphibians are expected to occur on the subject site. Avian species expected to use the subject site include: bald eagle (*Haliaeetus leucocephalus*), American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), spotted towhee (*Pipilo maculatushouse*), house finch (*Carpodacus mexicanus*), black-capped chickadee (*Poecile atricapillus*), dark-eyed junco (*Junco hyemalis*), bushtit (*Psaltriparus minimus*), northern flicker (*Colaptes auratus*), hairy woodpecker

(*Picoides villosus*), downy woodpecker (*Dendrocopus villosus*), red-breasted nuthatch (*Sitka canadensis*), brown creeper (*Certhia americana*), varied thrush (*Ixoreus naevius*), Barred owl (*Strix variaand*) and red-tailed hawk (*Buteo jamaicensis*). Mammals expected to use this site include: Virginia opossum (*Didelphis virginiana*), shrews (*Sorex* spp.), Douglas squirrel (*Tamiasciurus douglasii*), raccoon (*Procyon lotor*), and eastern cottontail rabbits (*Sylvilagus floridanus*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), and coyotes (*Canis latrans*). Aquatic species expected to use this site include: pacific tree frog (*Hyla regilla*), northwestern salamander (*Ambystoma gracile*), and rough-skinned newt (*Taricha granulosa*). These lists are not meant to be all-inclusive and may omit species that currently utilize or could utilize the site.

3.0 HABITAT MANAGEMENT PLAN

According to OHMC 20.25.060(7), a Habitat Management Plan for the off-site bald eagle nest is required as part of the critical areas report process. WA State Department of Fish and Wildlife (WDFW) previously identified this nest feature within a forested area directly across SR 20 from the project site. The nest location was surveyed by WDFW, and its location was provided to WRI as part of the 2016 report.

As part of the Habitat Management Plan, Oak Harbor requires a discussion of federal, state, and local management recommendations for bald eagles. At the local level, the City of Oak Harbor requires that nesting bald eagles and bald eagle habitat be protected consistent with USFWS Bald Eagle Management Guidelines, or the state and federal regulations in place at the time of application.

Washington State (WDFW) recently amended the bald eagle protection rules to no longer require state Bald Eagle Management Plans before issuing local permits. This is due to the de-listing of bald eagles from a State Threatened species status. The eagle has successfully recovered from a mere 104 breeding pairs in 1980 to an estimated 840 in occupied territories throughout WA State (WDFW 2016c). In Western WA, there are indications that populations are close to carrying capacity.

In 2007, the bald eagle was removed from the federal Endangered Species list. However, U.S. Fish and Wildlife Service (USFWS) still manages this species under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Federal permitting is required if significant landscape changes occur within 330 feet of a bald eagle nest, or if construction occurs within 660 feet of a nest during bald eagle nesting season (January 1 to August 31).

Wetland Resource, Inc. previously contacted USFWS (Mark Miller, USFWS eagle biologist) for specific management recommendations regarding the off-site bald eagle nest. The USFWS official explained that because SR-20 lies between the project site and eagle nest, individual eagles using the nest site are likely acclimatized to road noise produced from SR-20. Furthermore, there is no large tree removal proposed within 330 feet of the nest site. Due to these factors, federal permitting is not required for this project, though USFWS still recommends that quiet hours between dusk and dawn be respected during construction.

The applicant's project proposal is consistent with the eagle management recommendations of the City of Oak Harbor and USFWS. During the construction phase quiet hours between dusk and

dawn will be respected. Because the nest is already located adjacent to SR-20, it is unlikely that construction noise will impact eagle behavior. The project proposal has no impacts on large trees within a 660-foot radius of the nest. Dense residential development already surrounds the eagle nest site to the north, east, and south, so further residential development on the west side of SR-20 will likely have no impact on eagle behavior.

4.0 FUNCTIONS AND VALUES ASSESSMENT

4.1 METHODOLOGY

The methodology for this functions and values assessment is based on professional opinion developed through past field analyses and interpretation. This assessment pertains specifically to the on-site wetlands but is typical for assessments of similar systems common to Western Washington.

4.1.1 Functional Components

Wetlands in Western Washington perform a variety of ecosystem functions. Included among the most important functions provided by wetlands are stormwater control, water quality improvement, fish and wildlife habitat, aesthetic value, recreational opportunities, and education. The most commonly assessed functions and their descriptions are listed below. Assessments of these functions for the project site are provided in the "Analysis" section of this report.

Hydrologic Functions

Wetlands often function as natural water storage areas during periods of precipitation and flooding. By storing water that otherwise might be channeled into open-flow systems, wetlands can attenuate or modify potentially damaging effects of storm events, reducing erosion and peak flows to downstream systems. Additionally, the soils underlying wetlands are often less permeable, providing long-term storage of stormwater or flood flow and controlling baseflows of downstream systems. Stormwater storage capacity and flood flow attenuation are generally a function of the size of the wetland and its topographic characteristics.

Water Quality

Surface water quality improvement is another evaluated function. Surface runoff during periods of precipitation increases the potential for sediments and pollutants to enter surface water. Wetlands improve water quality by acting as filters as water passes through them, trapping sediments and pollutants from surface water. Ponded areas within depressional wetlands also allow sediments to drop out of suspension, thereby increasing water quality. As development increases, the potential for polluted water to reach wetlands and streams also increases. Unnaturally high inputs of pollutants, which are often found in urbanized areas, along with the size of the wetlands and the vegetation structure within them are the main limiting factors of this function.

Wildlife Habitat

Wetlands have potential to provide diverse habitat for aquatic, terrestrial, and avian species for nesting, rearing, resting, cover, and foraging. Wildlife species are commonly dependent upon a variety of intermingled habitat types, including wetlands, adjacent uplands, large bodies of

water, and movement corridors between them. Human intrusion, including development within and adjacent to wetlands, and impacts to movement corridors are the most limiting factors for wildlife habitat functions.

4.2 EXISTING VALUES ASSESSMENT

Wetlands A and B are depressional wetlands without outlets. The source of hydrology for both of these wetlands appears to be a combination of precipitation and high groundwater table. These wetlands are dominated by forested scrub-shrub vegetation. They can provide stormwater storage functions and water quality improvement functions. However, the lack of immediate downstream flooding problems and sources of pollutants in the area reduce their value for these functions. Moderately large areas of undisturbed forestland surround these wetlands, resulting in a moderate connection to other diverse habitats. Based on their physical characteristics, these wetlands support relatively low to moderate levels of flood control, water quality improvement, and wildlife habitat functions.

5.0 FENCING AND SIGNAGE

Temporary Markers
The outer perimeter of buffers and the clearing limits identified by an approved permit or authorization shall be marked in the field with temporary "clearing limits" fencing in such a way as to ensure that no unauthorized intrusion will occur. The marking is subject to inspection by the director before the commencement of permitted activities. This temporary marking shall be maintained throughout construction and shall not be removed until permanent signs, if required, are in place. (*OHMC 20.12.140*)

Permanent Signs
According to Oak Harbor Critical Areas Regulations (OHMC 20.12.140), the director may require signs identifying post-project buffers and critical areas as "critical areas." If the buffers or critical areas have predominantly native vegetation or are so restored by the project, signs may use the term "native growth protection areas." Signs shall be made of an enamel-coated metal face and attached to a metal post or other nontreated material of equal durability. Signs must be posted at an interval of one per lot or every 50 feet, whichever is less, and must be maintained by the property owner in perpetuity. Signs shall be worded as follows or with alternative language approved by the director:

Critical Area (or Native Growth Protection Area, as appropriate)
Do Not Disturb
Contact City of Oak Harbor Regarding Uses, Restrictions, and Opportunities for Stewardship
(*OHMC 20.12.140*)

Fencing
If the director determines fencing is necessary to protect the functions and values of the critical area, the director shall condition any permit or authorization to require the installation of a permanent fence at the edge of the wetland buffer (split-rail fence). (*OHMC 20.12.140*).

6.0 BUILDING SETBACKS

Unless otherwise provided, buildings and other structures shall be set back a distance of 10 feet from the edges of all critical area buffers or from the edges of all critical areas, if no buffers are required. The following may be allowed in the building setback area:

(1) Landscaping;
(2) Uncovered decks;
(3) Building overhangs, if such overhangs do not extend more than 18 inches into the setback area; and
(4) Impervious ground surfaces, such as driveways and patios; provided, that such improvements may be subject to water quality regulations.

7.0 USE OF THIS REPORT

This Critical Area Study and Habitat Management Plan is supplied to DR Horton as a means of determining the presence of on-site and nearby critical areas, as required by the City of Oak Harbor. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

The laws applicable to critical areas are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in effect.

This report conforms to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report and any implied representation or warranty is disclaimed.

Wetland Resources, Inc.



Scott Brainard, PWS
Principal Ecologist

8.0 REFERENCES

Anderson, P.S., Meyer, S., Olson, P., and E. Stockdale. 2016. *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State.* Washington State Department of Ecology. Publication #16-06-029.

Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands.* Technical Report WRPDE-4. US Army Engineers Waterways Experiment Station, Vicksburg, MS.

Cowardin, et al., 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Department of the Interior. FWS/OBS-79/31. December 1979.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual*. Technical Report Y-87-1. Environmental Laboratory, Department of the Army, Corps Waterways Experiment Station, Vicksburg, MS.

Oak Harbor, City of. 2024. Chapter 20. - *Environment.*

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C Melvin. 2016. *Western Mountains, Valleys, and Coast 2016 Regional Wetland Plant List.* Phytoneuron 2016-30: 1-17.

Munsell Color. 2012. *Munsell Soil Color Book.* Munsell Color, Grand Rapids, MI.

NRCS. 2024. *Web Soil Survey*. United States Department of Agriculture. http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

U.S. Department of Agriculture (USDA). 1958. Soil Survey of Island County Washington. Soil Conservation Service.

Sumioka, S.S. and Bauer, H.H. August 2004. *Estimating Ground-Water Recharge from Precipitation on Whidbey and Camano Islands, Island County, Washington, Water Years 1998 and 1999.* USGS Water-Resources Investigations Report 03-4101, prepared in cooperation with Island County Health Department. Version 1.20. Tacoma, Washington.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).* Vicksburg, MS

U.S. Fish & Wildlife Service (USFWS). 2024. *National Wetlands Inventory (NWI) Online Mapper*. http://www.fws.gov/wetlands/Data/Mapper.html.

Washington State. *Section 222-16-030 Water Typing System*. Chapter 222-16 Definitions. Title 222 Forest Practices Board. Washington Administrative Code (WAC).

WA Department of Fish & Wildlife (WDFW). 2024a. *Priority Habitat and Species (PHS) Interactive Map*. http://apps.wdfw.wa.gov/phsontheweb/

WA Department of Fish & Wildlife (WDFW). 2024b. *SalmonScape Online Mapping Application*. http://apps.wdfw.wa.gov/salmonscape/map.html

WA Department of Natural Resources (DNR). 2024. *Forest Practices Activity Mapping Tool (FPAMT)*. http://fortress.wa.gov/dnr/app1/fpars/viewer.htm.

APPENDIX A

DOE WETLAND RATING FORMS AND FIGURES

Wetland name or number Wetland A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): WetA Date of site visit: _____

Rated by SB Trained by Ecology? ✓ Yes ___No Date of training 10/16

HGM Class used for rating **Depressional** Wetland has multiple HGM classes? ___Y ✓ N

NOTE: Form is not complete without the required figures (figures can be combined).
Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY IV (based on functions ✓ or special characteristics__)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

_____**Category III** – Total score = 16 - 19

___✓___**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H [M] L	H [M] L	H M [L]	
Landscape Potential	H [M] L	H M [L]	H [M] L	
Value	[H] M L	H M [L]	H M [L]	TOTAL
Score Based on Ratings	**7**	**4**	**4**	**15**

Score for each function based on three ratings
(order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	✓

Wetland name or number Wetland A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	1
Hydroperiods	D 1.4, H 1.2	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 4.3, D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	3
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	4

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number Wetland A

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

   NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

   1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?
   The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,
   At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   - The wetland is on a slope (slope can be very gradual),
   - The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,
   - The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES –** The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

Wetland name or number Wetland A

5. Does the entire wetland unit **meet all** of the following criteria?
   - The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   - The overbank flooding occurs at least once every 2 years.

   NO – go to 6 **YES** – The wetland class is **Riverine**

   NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

   NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated		HGM class to use in rating
Slope + Riverine	☐	Riverine
Slope + Depressional	☐	Depressional
Slope + Lake Fringe	☐	Lake Fringe
Depressional + Riverine along stream within boundary of depression	☐	Depressional
Depressional + Lake Fringe	☐	Depressional
Riverine + Lake Fringe	☐	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	☐	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.

Wetland name or number Wetland A

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: ☑ Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 ☐ Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	**3**
D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	**0**
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): ☐ Wetland has persistent, ungrazed plants > 95% of area points = 5 ☑ Wetland has persistent, ungrazed plants > ½ of area points = 3 ☐ Wetland has persistent, ungrazed plants ≥ 1/10 of area points = 1 ☐ Wetland has persistent, ungrazed plants < 1/10 of area points = 0	**3**
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* ☑ Area seasonally ponded is > ½ total area of wetland points = 4 ☐ Area seasonally ponded is ≥ ¼ total area of wetland points = 2 ☐ Area seasonally ponded is < ¼ total area of wetland points = 0	**4**
Total for D 1 Add the points in the boxes above	**10**

Rating of Site Potential If score is: __**12-16 = H** _✓_**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	**0**
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	**1**
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	**1**
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	**0**
Total for D 2 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: __**3 or 4 = H** _✓_**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	**0**
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	**0**
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (Answer YES if there is a TMDL in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0	**2**
Total for D 3 Add the points in the boxes above	**2**

Rating of Value If score is: _✓_**2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Wetland A

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

- [x] Wetland is a depression or flat depression with no surface water leaving it (no outlet) — points = 4
- [ ] Wetland has an intermittently flowing stream/ditch, OR highly constricted permanently flowing outlet — points = 2
- [ ] Wetland is a flat depression (question 7 on key), whose outlet is a permanently flowing ditch — points = 1
- [ ] Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing — points = 0

4

D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.

- [ ] Marks of ponding are 3 ft or more above the surface or bottom of outlet — points = 7
- [ ] Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet — points = 5
- [x] Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet — points = 3
- [ ] The wetland is a "headwater" wetland — points = 3
- [ ] Wetland is flat but has small depressions on the surface that trap water — points = 1
- [ ] Marks of ponding less than 0.5 ft (6 in) — points = 0

3

D 4.3. Contribution of the wetland to storage in the watershed: Estimate the ratio of the area of upstream basin contributing surface water to the area of the wetland unit itself.

- [ ] The area of the basin is less than 10 times the area of the unit — points = 5
- [x] The area of the basin is 10 to 100 times the area of the unit — points = 3
- [ ] The area of the basin is more than 100 times the area of the unit — points = 0
- [ ] Entire wetland is in the Flats class — points = 5

3

Total for D 4	Add the points in the boxes above	**10**

Rating of Site Potential If score is: **__12-16 = H ✓ 6-11 = M ___0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 [No = 0]	**0**
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	Yes = 1 [No = 0]	**0**
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	Yes = 1 [No = 0]	**0**
Total for D 5	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: **__3 = H ___1 or 2 = M ✓ 0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. Is the unit in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.

The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds):

- [ ] • Flooding occurs in a sub-basin that is immediately downgradient of unit. — points = 2
- [ ] • Surface flooding problems are in a sub-basin farther downgradient. — points = 1
- [ ] • Flooding from groundwater is an issue in the sub-basin. — points = 1
- [x] • The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0
- [ ] • There are no problems with flooding downstream of the wetland. — points = 0

0

D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 [No = 0] — **0**

Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: **__2-4 = H ___1 = M ✓ 0 = L** *Record the rating on the first page*

Wetland name or number Wetland A

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: Indicators are Cowardin classes and strata within the Forested class. Check the Cowardin plant classes in the wetland. Up to 10 patches may be combined for each class to meet the threshold of ¼ ac if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac.

____	Aquatic bed	4 structures or more: points = 4
____	Emergent	3 structures: points = 2
✓	Scrub-shrub (areas where shrubs have > 30% cover)	**2 structures: points = 1**
✓	Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

____ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods).

✓	Permanently flooded or inundated	4 or more types present: points = 3
✓	Seasonally flooded or inundated	3 types present: points = 2
____	Occasionally flooded or inundated	**2 types present: points = 1**
____	Saturated only	1 type present: points = 0
____	Permanently flowing stream or river in, or adjacent to, the wetland	
____	Intermittently or seasonally flowing stream in, or adjacent to, the wetland	
____	**Lake Fringe wetland**	**2 points**
____	**Freshwater tidal wetland**	**2 points**

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. **Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canada thistle**

If you counted: > 19 species	points = 2
5 - 19 species	**points = 1**
< 5 species	points = 0

1

H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. If you have four or more plant classes or three classes and open water, the rating is always high.



None = 0 points

Low = 1 point

Moderate = 2 points

All three diagrams in this row are **High** = 3 points



1

Wetland name or number Wetland A

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. The number of checks is the number of points. ____Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft long). ____Standing snags (dbh > 4 in.) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that have not yet weathered where wood is exposed) __✓__At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (structures for egg-laying by amphibians) ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (see H 1.1 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	**1**
Total for H 1 Add the points in the boxes above	**5**

Rating of Site Potential If score is: __**15-18 = H** ___**7-14 = M** __✓__**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 14 + [(% moderate and low intensity land uses)/2] 6 = 20 % Total accessible habitat is: ☐ > 1/3 (33.3%) of 1 km Polygon points = 3 ☑ 20-33% of 1 km Polygon points = 2 ☐ 10-19% of 1 km Polygon points = 1 ☐ < 10% of 1 km Polygon points = 0	**2**
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 24 + [(% moderate and low intensity land uses)/2] 14 = 38 % ☐ Total habitat > 50% of Polygon points = 3 ☐ Total habitat 10-50% and in 1-3 patches points = 2 ☑ Total habitat 10-50% and > 3 patches points = 1 ☐ Total habitat < 10% of 1 km Polygon points = 0	**1**
H 2.3. Land use intensity in 1 km Polygon: ☐ > 50% of 1 km Polygon is high intensity land use points = (- 2) ☑ ≤ 50% of 1 km Polygon is high intensity points = 0	**0**
Total for H 2 Add the points in the boxes above	**3**

Rating of Landscape Potential If score is: __**4-6 = H** __✓__**1-3 = M** ___**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more Priority Habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW Priority Species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources data ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan ☐ Site has 1 or 2 Priority Habitats (listed on next page) within 100 m points = 1 ☑ Site does not meet any of the criteria above points = 0	**0**

Rating of Value If score is: __**2 = H** ___**1 = M** __✓__**0 = L** *Record the rating on the first page*

Wetland name or number Wetland A

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

☐ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. Do not select if Fresh Deepwater habitat is also present.

☐ **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

☐ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in. (81 cm) diameter at breast height (dbh) or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in. (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

Wetland name or number Wetland A

☐ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats

☐ **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in. (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in. (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☐ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

Wetland name or number Wetland A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

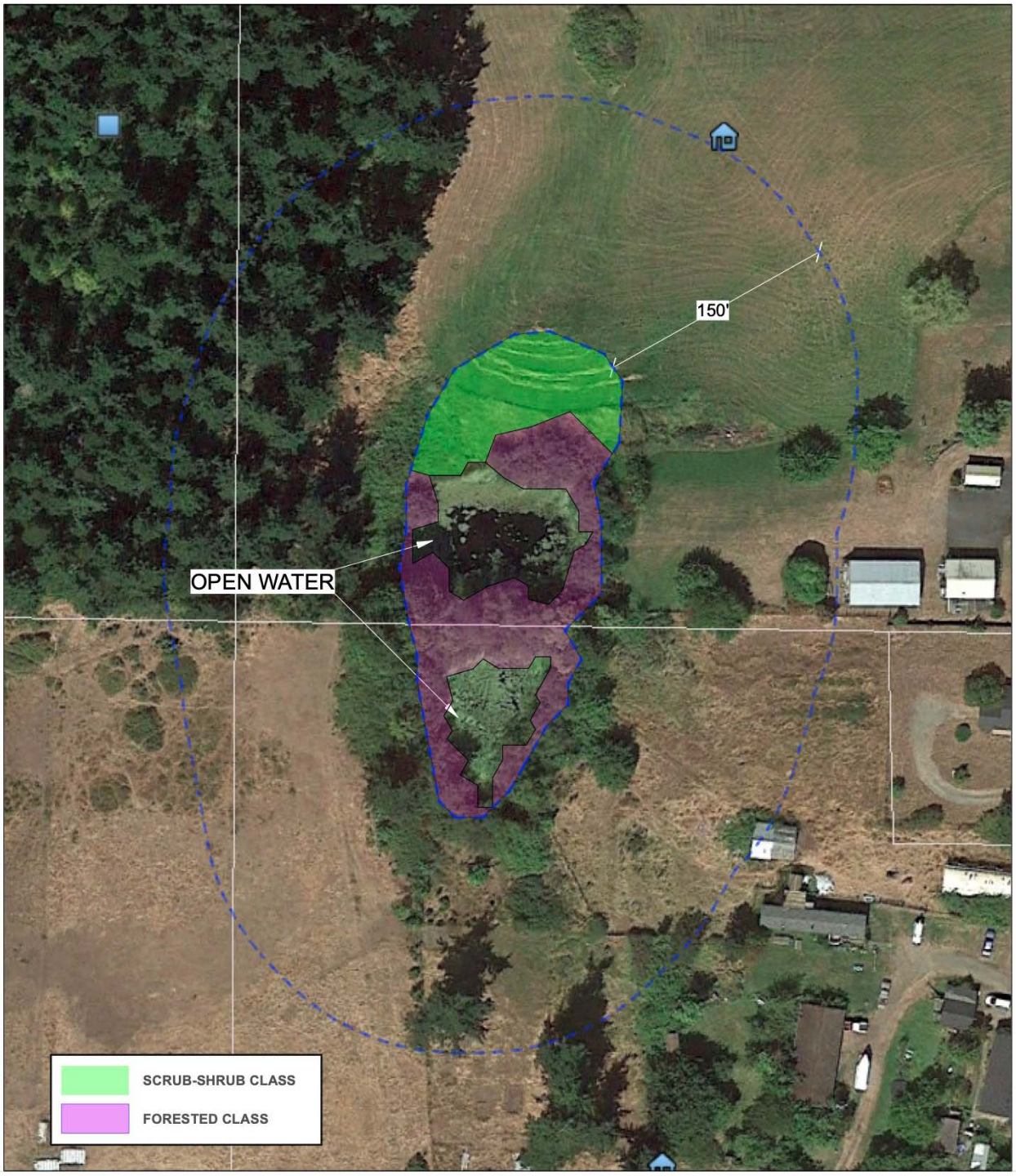
Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt Yes – Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No – Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 10% cover of non-native plant species. If non-native species are *Spartina*, see chapter 4.8 in the manual. ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Does the wetland overlap with any known or historical rare plant or rare & high-quality ecosystem polygons on the WNHP Data Explorer?[135] Yes **= Category I** No – Go to **SC 2.2** SC 2.2. Does the wetland have a rare plant species, rare ecosystem (e.g., plant community), or high-quality common ecosystem that may qualify the site as a WHCV? Contact WNHP for resources to help determine the presence of these elements. Yes – Submit data to WA Natural Heritage Program for determination,[136] Go to **SC 2.3** No **= Not a WHCV** SC 2.3. Did WNHP review the site within 30 days and determine that it has a rare plant or ecosystem that meets their criteria? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES, you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in. or more of the first 32 in. of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in. deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in. deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Category I bog** No **= Not a bog**	**Cat. I**

[135] https://www.dnr.wa.gov/NHPdata
[136] https://www.dnr.wa.gov/Publications/amp_nh_sighting_form.pdf

Wetland name or number Wetland A

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as Priority Habitats? ***If you answer YES, you will still need to rate the wetland based on its functions.*** ☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in. (81 cm) or more. ☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in. (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐ The lagoon retains some of its surface water at low tide during spring tides Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species in H 1.5 in the manual). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer YES, you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: ☐ Long Beach Peninsula: Lands west of SR 103 ☐ Grayland-Westport: Lands west of SR 105 ☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109 and Ocean Shores Blvd SW, including lands west of E. Oceans Shores Blvd SW. Yes – Go to **SC 6.1** No = **Not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

FIGURE 1a: COWARDIN VEGETATION CLASSES WITH 150' BOUNDARIES AROUND WETLANDS

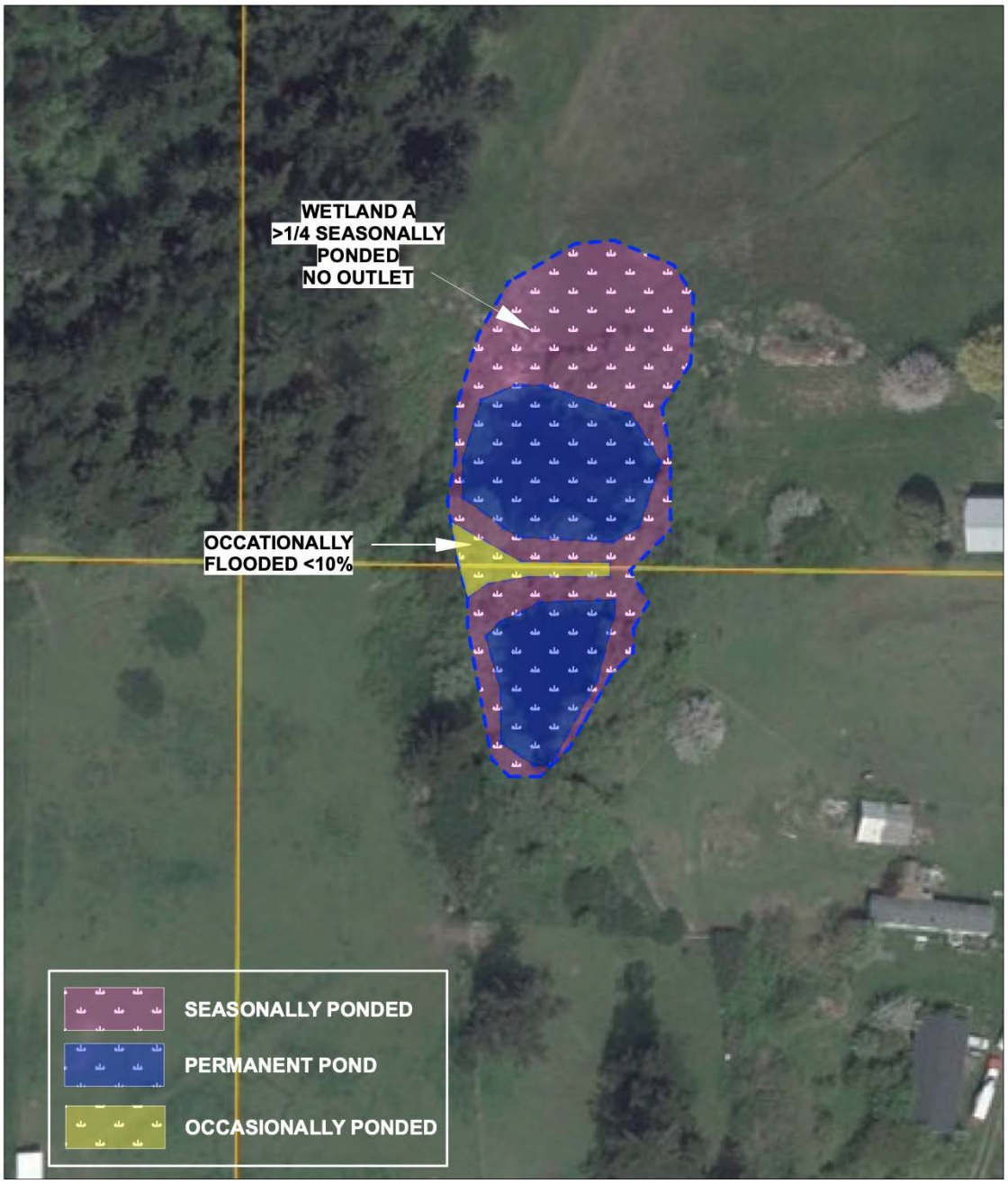


OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

Scale 1" = 100'

0 50 100 150 200

FIGURE 2a: HYDROPERIODS

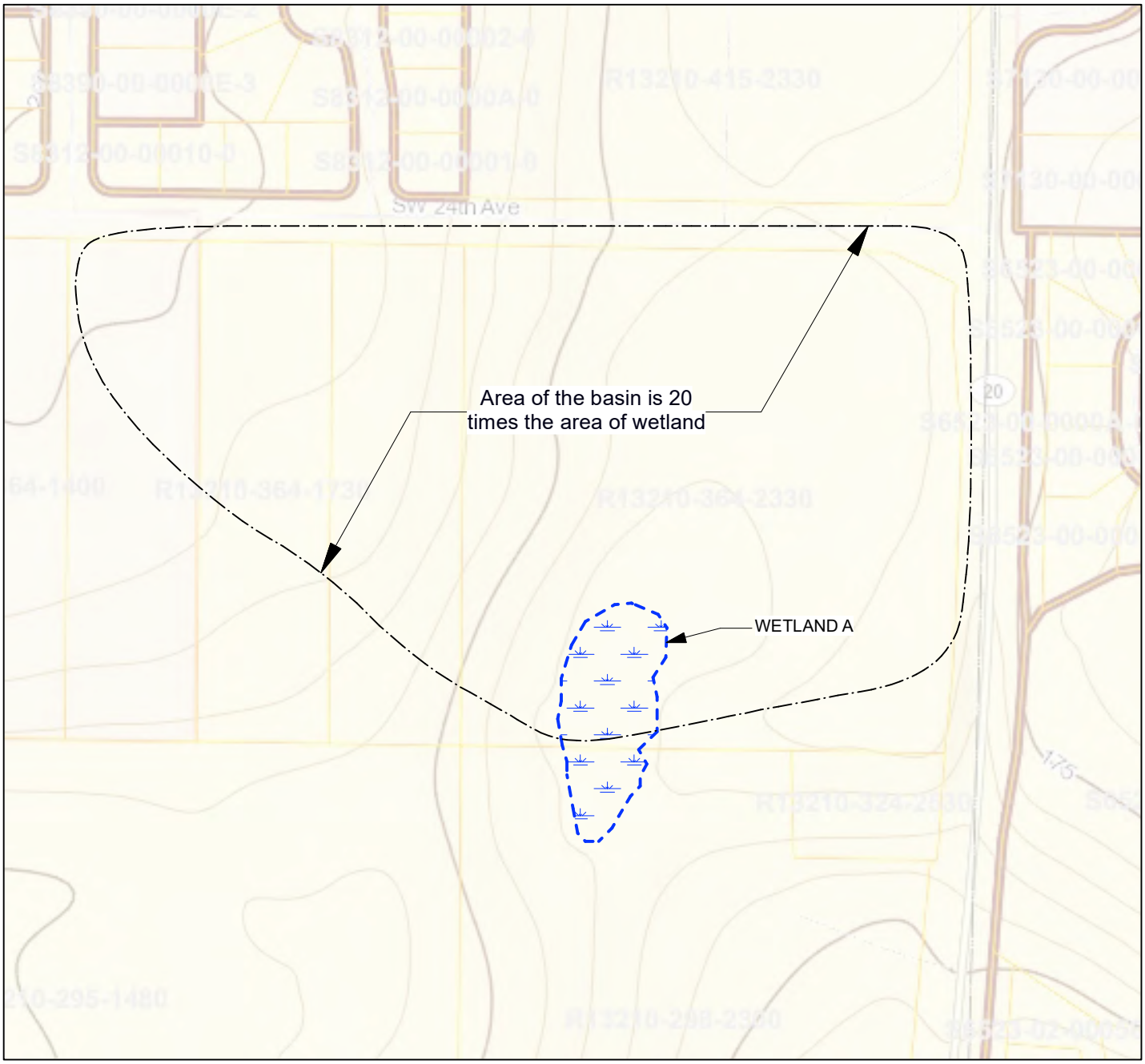


Scale 1" = 100'

0 50 100 150 200

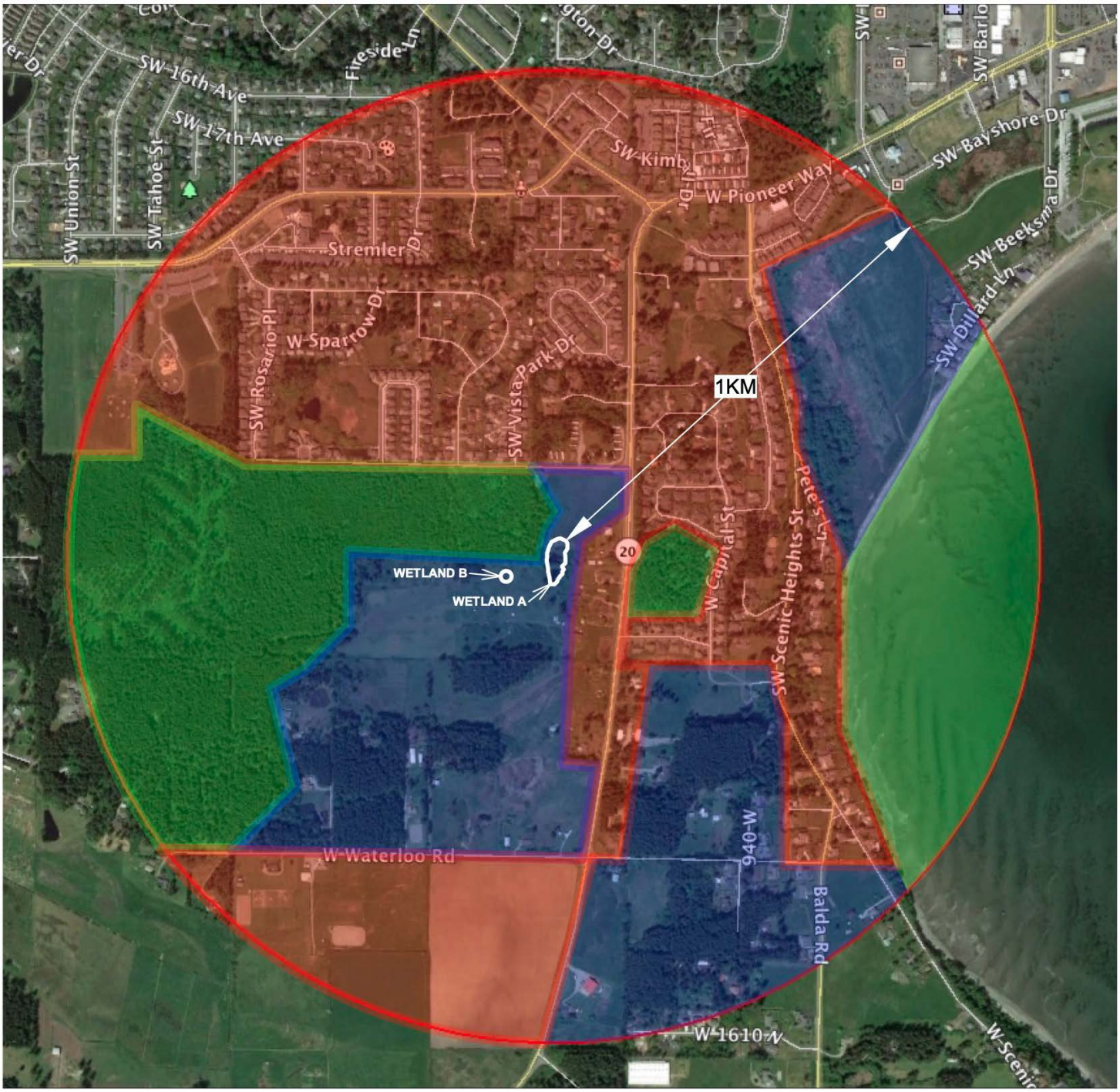
OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

FIGURE 3a: MAP OF CONTRIBUTING BASIN



OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

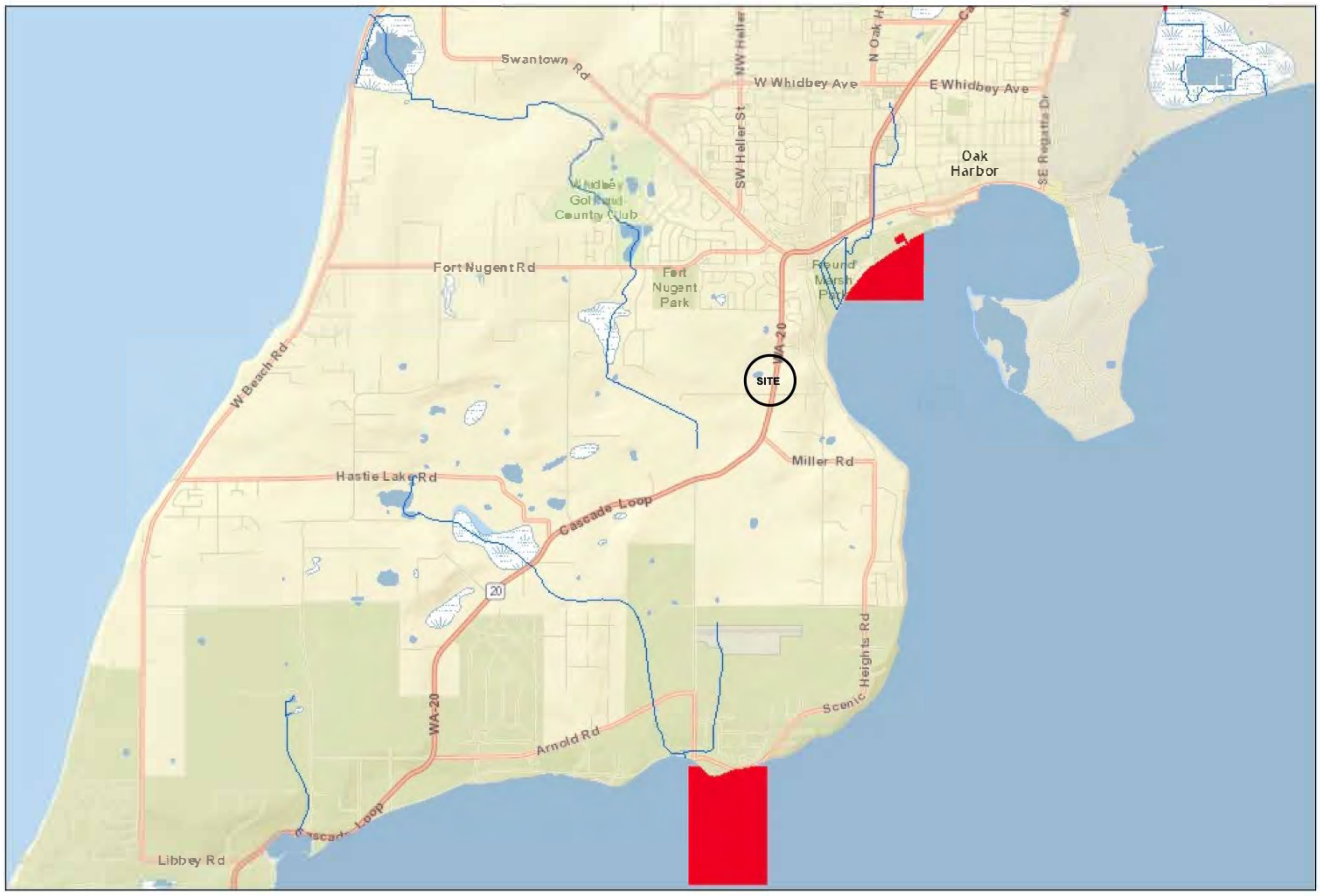
FIGURE 4: 1KM POLYGON AROUND WETLAND



	RELATIVELY UNDISTURBED
	HIGH INTENSITY LAND USE
	LOW/MODERATE LAND USE

OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

FIGURE 5: SCREEN CAPTURE OF MAP OF 303(d) LISTED WATERS



OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

Wetland name or number Wetland B

RATING SUMMARY – Western Washington

Name of wetland (or ID #): WetB Date of site visit: _____

Rated by SB Trained by Ecology? ✓ Yes ___No Date of training 10/16

HGM Class used for rating **Depressional** Wetland has multiple HGM classes? ___Y ✓ N

NOTE: Form is not complete without the required figures (figures can be combined).
Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY IV (based on functions ✓ or special characteristics__)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

_____**Category III** – Total score = 16 - 19

___✓___**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H [M] L	H [M] L	H M [L]	
Landscape Potential	H [M] L	H M [L]	H [M] L	
Value	[H] M L	H M [L]	H M [L]	TOTAL
Score Based on Ratings	**7**	**4**	**4**	**15**

Score for each function based on three ratings
(order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	✓

Wetland name or number Wetland B

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	1
Hydroperiods	D 1.4, H 1.2	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 4.3, D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	3
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	4

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number Wetland B

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

   NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

   1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?
   The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,
   At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   - The wetland is on a slope (slope can be very gradual),
   - The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,
   - The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES –** The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

Wetland name or number Wetland B

5. Does the entire wetland unit **meet all** of the following criteria?
   - The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   - The overbank flooding occurs at least once every 2 years.

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated		HGM class to use in rating
Slope + Riverine	☐	Riverine
Slope + Depressional	☐	Depressional
Slope + Lake Fringe	☐	Lake Fringe
Depressional + Riverine along stream within boundary of depression	☐	Depressional
Depressional + Lake Fringe	☐	Depressional
Riverine + Lake Fringe	☐	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	☐	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.

Wetland name or number Wetland B

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?

D 1.1. Characteristics of surface water outflows from the wetland:

- [x] Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3
- [ ] Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2
- [ ] Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1
- [ ] Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1

3

D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 [No = 0]

0

D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes):

- [ ] Wetland has persistent, ungrazed plants > 95% of area points = 5
- [x] Wetland has persistent, ungrazed plants > ½ of area points = 3
- [ ] Wetland has persistent, ungrazed plants ≥ 1/10 of area points = 1
- [ ] Wetland has persistent, ungrazed plants < 1/10 of area points = 0

3

D 1.4. Characteristics of seasonal ponding or inundation:

This is the area that is ponded for at least 2 months. See description in manual.

- [ ] Area seasonally ponded is > ½ total area of wetland points = 4
- [x] Area seasonally ponded is ≥ ¼ total area of wetland points = 2
- [ ] Area seasonally ponded is < ¼ total area of wetland points = 0

2

Total for D 1 — Add the points in the boxes above: **8**

Rating of Site Potential If score is: __ **12-16 = H** _✓_ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?

D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 [No = 0] — **0**

D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? [Yes = 1] No = 0 — **1**

D 2.3. Are there septic systems within 250 ft of the wetland? [Yes = 1] No = 0 — **1**

D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? — **0**

Source_____ Yes = 1 [No = 0]

Total for D 2 — Add the points in the boxes above: **2**

Rating of Landscape Potential If score is: __ **3 or 4 = H** _✓_ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?

D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0 — **0**

D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0 — **0**

D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (Answer YES if there is a TMDL in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0 — **2**

Total for D 3 — Add the points in the boxes above: **2**

Rating of Value If score is: _✓_ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Wetland B

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

- [x] Wetland is a depression or flat depression with no surface water leaving it (no outlet) — points = 4
- [ ] Wetland has an intermittently flowing stream/ditch, OR highly constricted permanently flowing outlet — points = 2
- [ ] Wetland is a flat depression (question 7 on key), whose outlet is a permanently flowing ditch — points = 1
- [ ] Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing — points = 0

4

D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.

- [ ] Marks of ponding are 3 ft or more above the surface or bottom of outlet — points = 7
- [ ] Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet — points = 5
- [ ] Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet — points = 3
- [ ] The wetland is a "headwater" wetland — points = 3
- [ ] Wetland is flat but has small depressions on the surface that trap water — points = 1
- [x] Marks of ponding less than 0.5 ft (6 in) — points = 0

0

D 4.3. Contribution of the wetland to storage in the watershed: Estimate the ratio of the area of upstream basin contributing surface water to the area of the wetland unit itself.

- [ ] The area of the basin is less than 10 times the area of the unit — points = 5
- [x] The area of the basin is 10 to 100 times the area of the unit — points = 3
- [ ] The area of the basin is more than 100 times the area of the unit — points = 0
- [ ] Entire wetland is in the Flats class — points = 5

3

Total for D 4	Add the points in the boxes above	**7**

Rating of Site Potential If score is: ___**12-16 = H** ✓ **6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 [No = 0]	**0**
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	Yes = 1 [No = 0]	**0**
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	Yes = 1 [No = 0]	**0**
Total for D 5	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ___**3 = H** ___**1 or 2 = M** ✓ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. Is the unit in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.

The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds):

- [ ] • Flooding occurs in a sub-basin that is immediately downgradient of unit. — points = 2
- [ ] • Surface flooding problems are in a sub-basin farther downgradient. — points = 1
- [ ] • Flooding from groundwater is an issue in the sub-basin. — points = 1
- [x] • The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0
- [ ] • There are no problems with flooding downstream of the wetland. — points = 0

0

D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 [No = 0] — **0**

Total for D 6	Add the points in the boxes above	**0**

Rating of Value If score is: ___**2-4 = H** ___**1 = M** ✓ **0 = L** *Record the rating on the first page*

Wetland name or number Wetland B

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: Indicators are Cowardin classes and strata within the Forested class. Check the Cowardin plant classes in the wetland. Up to 10 patches may be combined for each class to meet the threshold of ¼ ac if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac.

____	Aquatic bed	4 structures or more: points = 4
____	Emergent	3 structures: points = 2
✓	Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
____	Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

____ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) that each cover 20% within the Forested polygon

0

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods).

____	Permanently flooded or inundated	4 or more types present: points = 3
✓	Seasonally flooded or inundated	3 types present: points = 2
____	Occasionally flooded or inundated	2 types present: points = 1
____	Saturated only	1 type present: points = 0
____	Permanently flowing stream or river in, or adjacent to, the wetland	
____	Intermittently or seasonally flowing stream in, or adjacent to, the wetland	
____	**Lake Fringe wetland**	**2 points**
____	**Freshwater tidal wetland**	**2 points**

0

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. **Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canada thistle**

If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

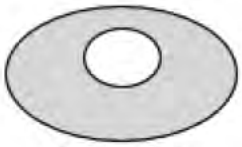
1

H 1.4. Interspersion of habitats

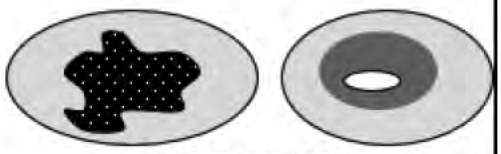
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. If you have four or more plant classes or three classes and open water, the rating is always high.



None = 0 points



Low = 1 point



Moderate = 2 points

All three diagrams in this row are **High** = 3 points



0

Wetland name or number Wetland B

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. The number of checks is the number of points. ____Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft long). ____Standing snags (dbh > 4 in.) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that have not yet weathered where wood is exposed) __✓__At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (structures for egg-laying by amphibians) ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (see H 1.1 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	**1**
Total for H 1 Add the points in the boxes above	**2**

Rating of Site Potential If score is: __**15-18 = H** ___**7-14 = M** __✓__**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 14 + [(% moderate and low intensity land uses)/2] 6 = 20 % Total accessible habitat is: ☐ > 1/3 (33.3%) of 1 km Polygon points = 3 ☑ 20-33% of 1 km Polygon points = 2 ☐ 10-19% of 1 km Polygon points = 1 ☐ < 10% of 1 km Polygon points = 0	**2**
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 24 + [(% moderate and low intensity land uses)/2] 14 = 38 % ☐ Total habitat > 50% of Polygon points = 3 ☐ Total habitat 10-50% and in 1-3 patches points = 2 ☑ Total habitat 10-50% and > 3 patches points = 1 ☐ Total habitat < 10% of 1 km Polygon points = 0	**1**
H 2.3. Land use intensity in 1 km Polygon: ☐ > 50% of 1 km Polygon is high intensity land use points = (- 2) ☑ ≤ 50% of 1 km Polygon is high intensity points = 0	**0**
Total for H 2 Add the points in the boxes above	**3**

Rating of Landscape Potential If score is: __**4-6 = H** __✓__**1-3 = M** ___**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more Priority Habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW Priority Species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources data ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan ☐ Site has 1 or 2 Priority Habitats (listed on next page) within 100 m points = 1 ☑ Site does not meet any of the criteria above points = 0	**0**

Rating of Value If score is: __**2 = H** ___**1 = M** __✓__**0 = L** *Record the rating on the first page*

Wetland name or number Wetland B

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

☐ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. Do not select if Fresh Deepwater habitat is also present.

☐ **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

☐ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in. (81 cm) diameter at breast height (dbh) or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in. (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

Wetland name or number Wetland B

☐ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats

☐ **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in. (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in. (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☐ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

Wetland name or number Wetland B

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt Yes – Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No – Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 10% cover of non-native plant species. If non-native species are *Spartina*, see chapter 4.8 in the manual. ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Does the wetland overlap with any known or historical rare plant or rare & high-quality ecosystem polygons on the WNHP Data Explorer?[135] Yes **= Category I** No – Go to **SC 2.2** SC 2.2. Does the wetland have a rare plant species, rare ecosystem (e.g., plant community), or high-quality common ecosystem that may qualify the site as a WHCV? Contact WNHP for resources to help determine the presence of these elements. Yes – Submit data to WA Natural Heritage Program for determination,[136] Go to **SC 2.3** No **= Not a WHCV** SC 2.3. Did WNHP review the site within 30 days and determine that it has a rare plant or ecosystem that meets their criteria? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES, you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in. or more of the first 32 in. of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in. deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in. deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Category I bog** No **= Not a bog**	**Cat. I**

[135] https://www.dnr.wa.gov/NHPdata
[136] https://www.dnr.wa.gov/Publications/amp_nh_sighting_form.pdf

Wetland name or number Wetland B

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as Priority Habitats? ***If you answer YES, you will still need to rate the wetland based on its functions.*** ☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in. (81 cm) or more. ☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in. (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐ The lagoon retains some of its surface water at low tide during spring tides Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species in H 1.5 in the manual). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer YES, you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: ☐ Long Beach Peninsula: Lands west of SR 103 ☐ Grayland-Westport: Lands west of SR 105 ☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109 and Ocean Shores Blvd SW, including lands west of E. Oceans Shores Blvd SW. Yes – Go to **SC 6.1** No = **Not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

FIGURE 1b: COWARDIN CLASS AND 150' BUFFER



Scale 1" = 100'

0 50 100 150 200

OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

FIGURE 2b: HYDROPERIODS

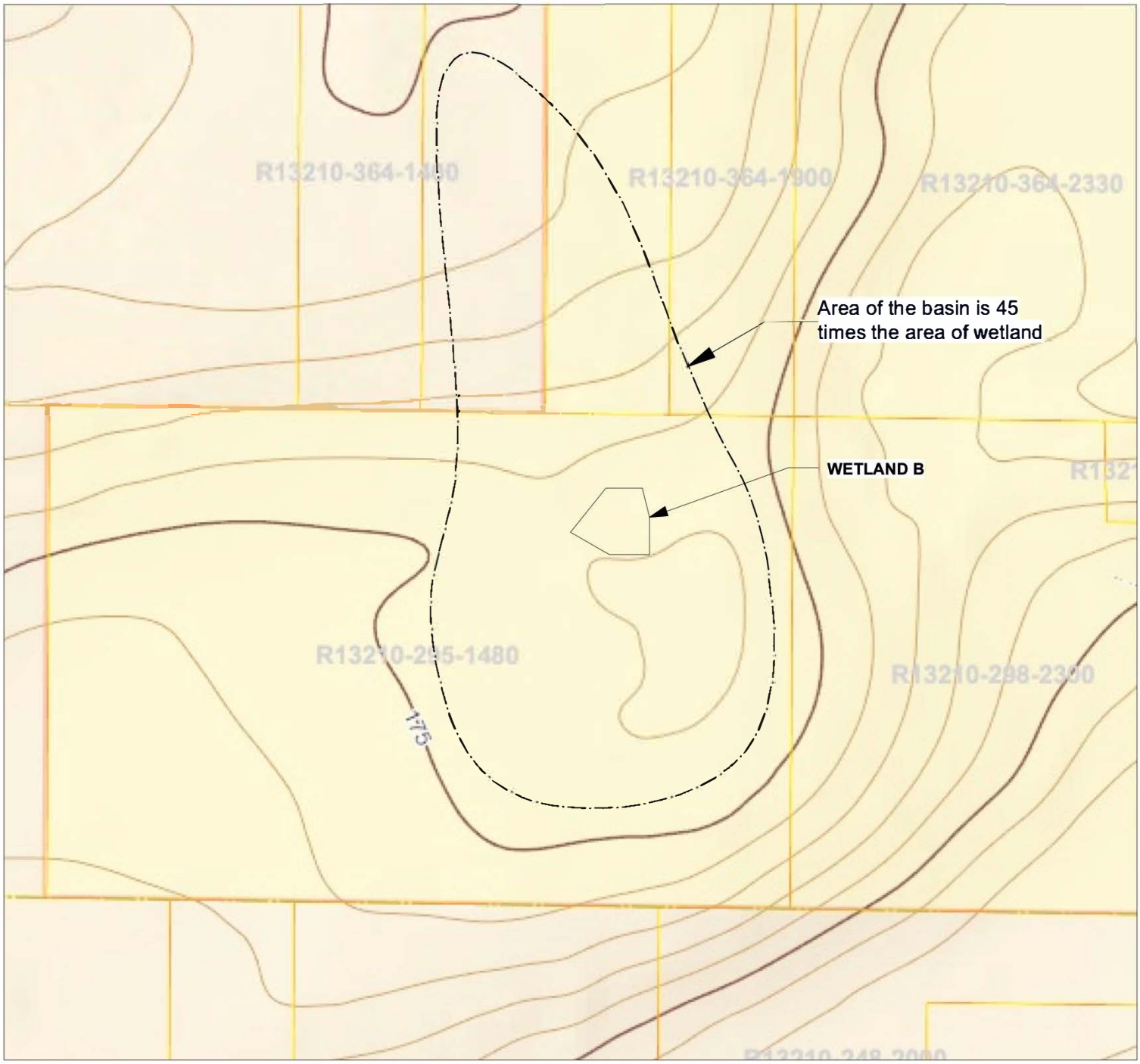


Scale 1" = 100'

0 50 100 150 200

OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

FIGURE 3b: MAP OF CONTRIBUTING BASIN

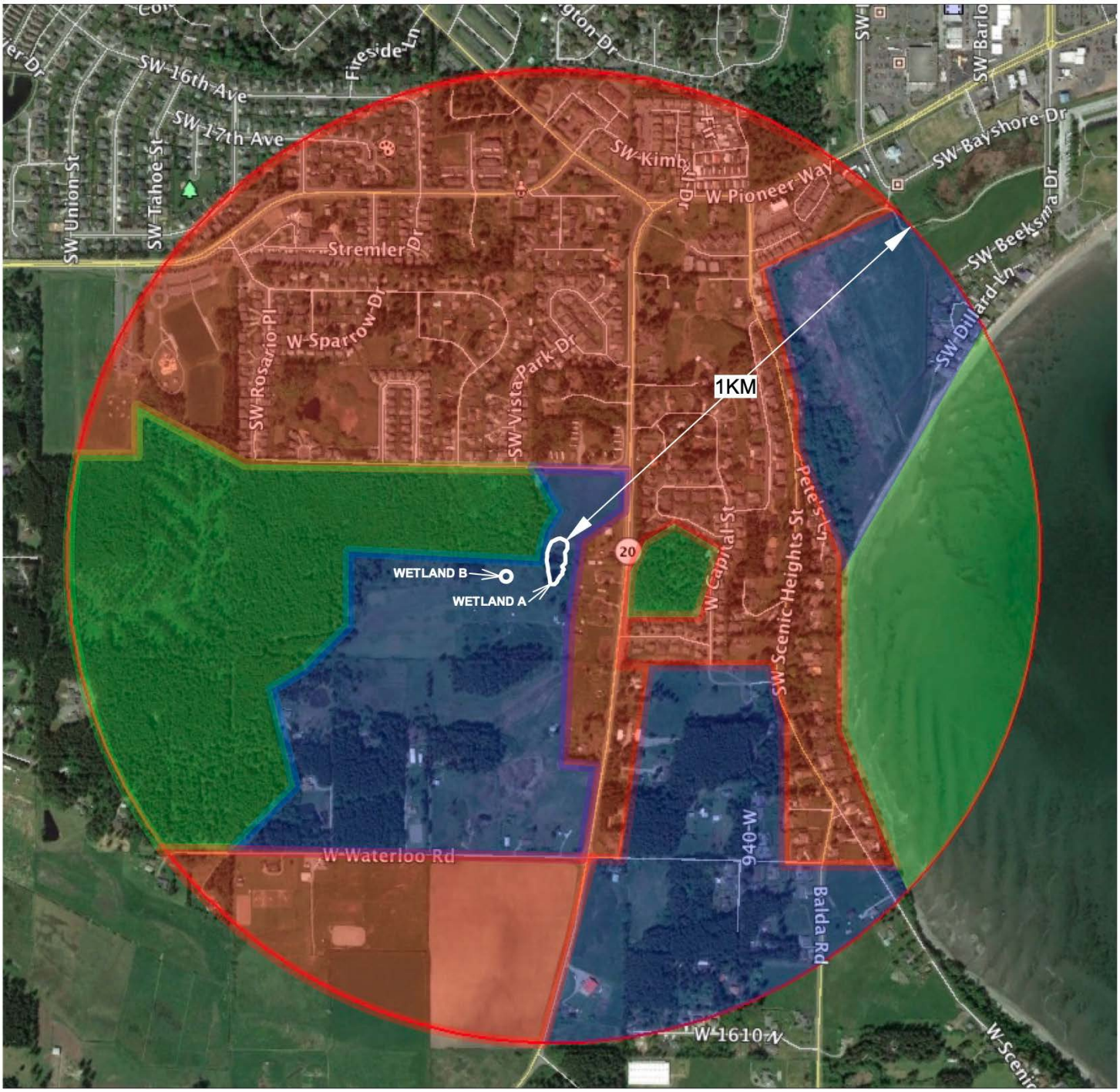


OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #15257

Scale 1" = 200'

0 100 200 300 400

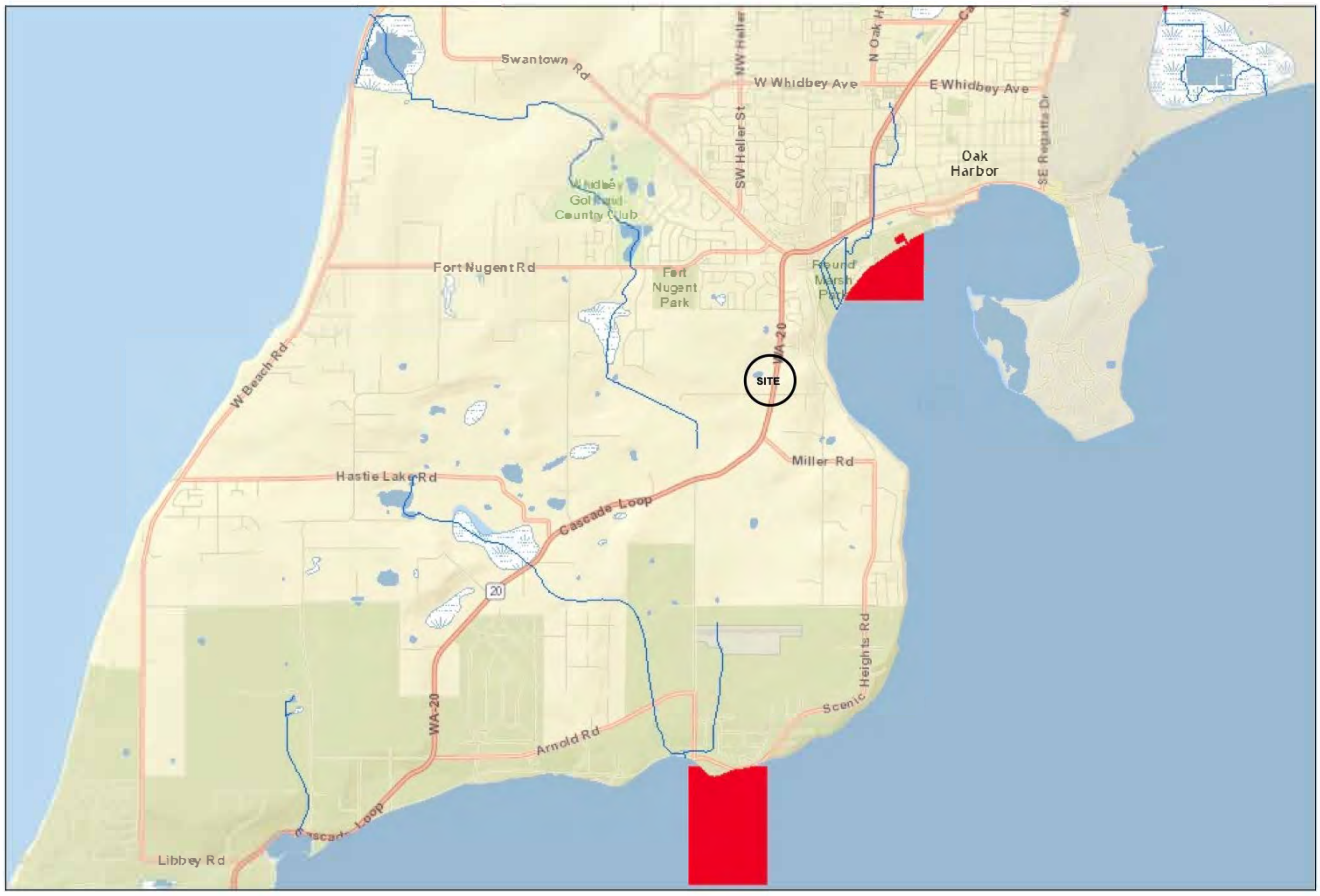
FIGURE 4: 1KM POLYGON AROUND WETLAND



	RELATIVELY UNDISTURBED
	HIGH INTENSITY LAND USE
	LOW/MODERATE LAND USE

OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

FIGURE 5: SCREEN CAPTURE OF MAP OF 303(d) LISTED WATERS



OAK HEIGHTS - SR 20
CITY OF OAK HARBOR, WA
WRI JOB #24150

APPENDIX B

WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Garry Oaks - SR 20 City/County: Oak Harbor / Island Co. Sampling Date: 10/22/15

Applicant/Owner: Garry Oaks LLC State: WA Sampling Point: 1

Investigator(s): A. Bachman Section, Township, Range: S10, T32N, R1E

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): LRR A Lat: 48°16'39.14"N Long: 122°40'18.21"W Datum:

Soil Map Unit Name: Coveland loam, cool, 0 to 5 percent slopes NWI classification: PUBHx - Freshwater pond

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☑ No ☐ Hydric Soil Present? Yes ☑ No ☐ Wetland Hydrology Present? Yes ☑ No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 10x10)			
1. Phalaris arundinacea	90	Y	FacW
2. Juncus effusus	5	N	FacW
3. Galium tr	3	N	FacW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	98 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: 0 (A)	0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☑ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	90	10YR 3/6	10	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches):

Water Table Present? Yes ☐ No ☑ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches):

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Garry Oaks - SR 20 City/County: Oak Harbor / Island Co. Sampling Date: 10/22/15

Applicant/Owner: Garry Oaks LLC State: WA Sampling Point: 2

Investigator(s): A. Bachman Section, Township, Range: S10, T32N, R1E

Landform (hillslope, terrace, etc.): valley Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): LRR A Lat: 48°16'39.14"N Long: 122°40'18.21"W Datum:

Soil Map Unit Name: Coveland loam, cool, 0 to 5 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☑ Hydric Soil Present? Yes ☐ No ☑ Wetland Hydrology Present? Yes ☐ No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 10x10)			
1. Festuca arundinacea	80	Y	FacU
2. Agrostis gigantia	15	N	Fac
3. Hypochaeris radicata	5	N	FacU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: 0 (A)	0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/2	100					loam	
2-16	10YR 3/3	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:_____

Depth (inches):_____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Garry Oaks - SR 20 City/County: Oak Harbor / Island Co. Sampling Date: 1/21/16

Applicant/Owner: Garry Oaks LLC State: WA Sampling Point: 3

Investigator(s): A. Bachman Section, Township, Range: S10, T32N, R1E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): LRR A Lat: 48°16'39.14"N Long: 122°40'18.21"W Datum:

Soil Map Unit Name: Everett-Alderwood complex, 0 to 5 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☐ No ☑ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☑ No ☐ Hydric Soil Present? Yes ☑ No ☐ Wetland Hydrology Present? Yes ☑ No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐

Remarks:

Above average rainfall.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10x10)			
1. Rosa nutkana	85	Y	Fac
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 10x10)			
1. Poa pratensis	80	Y	Fac
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	98 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: 0 (A)	0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☑ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	95	10YR 4/4	5	C	M	gr salo	saturated
6-10	10YR 3/1		10YR 4/4	2	C	M	gr salo	saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): 10

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☑ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☑ No ☐ Depth (inches): _____

Water Table Present? Yes ☑ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☑ No ☐ Depth (inches): _____

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Garry Oaks - SR 20 City/County: Oak Harbor / Island Co. Sampling Date: 1/21/16

Applicant/Owner: Garry Oaks LLC State: WA Sampling Point: 4

Investigator(s): A. Bachman Section, Township, Range: S10, T32N, R1E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): <1

Subregion (LRR): LRR A Lat: 48°16'39.14"N Long: 122°40'18.21"W Datum:

Soil Map Unit Name: Everett-Alderwood complex, 0 to 5 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☑ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☑ Hydric Soil Present? Yes ☐ No ☑ Wetland Hydrology Present? Yes ☐ No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑

Remarks:

Rainfall is above average.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10x10)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 10x10)			
1. Trifolium pretense	80	Y	FacU
2. Poa pratensis	20	Y	Fac
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	98 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 = 0
FACW species	x 2 = 0
FAC species	x 3 = 0
FACU species	x 4 = 0
UPL species	x 5 = 0
Column Totals: 0 (A)	0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					gr salo	no redox / saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): 8

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Refusal @ 8". No redox features. Standing water and saturation present due to recent significant rainfall. No positive hydric soil indicators found.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☑ No ☐ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Standing water and saturation present due to recent significant rainfall.

APPENDIX C

CRITICAL AREA AND EXISTING CONDITIONS MAP

CRITICAL AREAS AND EXISTING CONDITIONS MAP
OAK HEIGHTS
PORTION OF SECTION 10, TOWNSHIP 32N, RANGE 01E





LEGEND
- WETLAND
- WETLAND BUFFER
- DISTANCE BUFFER (BALD EAGLE NEST)
- LANDSCAPE BUFFER (BALD EAGLE NEST)

Scale 1" = 200'

0 100 200 300 400

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett,Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

CRITICAL AREAS & EXISTING CONDITIONS MAP
OAK HEIGHTS- SR 20
Oak Harbor, Washington

Oak Heights
Christian Anderson
31650 SR 20, Suite 2
Oak Harbor, WA 98277

Sheet 1/2
WRI Job # 24150
Drawn by: sb
Date: 6/27/2024

Preliminary
Storm Drainage Report

Oak Heights

Oak Harbor, WA

DHI Engineering, LLC.

Prepared For: SSHI LLC, dba DR Horton

Date Prepared: 7/30/2024

Latest Revision:

Prepared By: Preston Longoni, P.E.

Approved By: Preston Longoni, P.E.



Table of Contents

Section 1: Project Overview 4
Figure 1-1: Vicinity Map 5
Section 2: Minimum Requirements Summary 6
Figure 2-1: Flow Chart for Determining Requirements for New Development 6
Figure 2-2: Flow Chart for Determining LID MR#5 Requirements 7
Minimum Requirement #1 – Preparation of Stormwater Site Plans: 8
Minimum Requirement #2 – Construction Stormwater Pollution Prevention: 8
Minimum Requirement #3 – Source Control of Pollution: 8
Minimum Requirement #4 – Preservation of Natural Drainage System and Outfalls: 9
Minimum Requirement #5 – On-Site Stormwater Management: 9
Minimum Requirement #6 – Runoff Treatment: 9
Minimum Requirement #7 – Flow Control: 10
Minimum Requirement #8 – Wetlands Protection: 10
Minimum Requirement #9 – Operations and Maintenance: 10
Section 3: Site Analysis 11
On-Site Soils: 11
Figure 3-1: NRCS Soils Map 11
Upstream Analysis: 12
Downstream Analysis: 12
Figure 3-2: Upstream & Downstream Exhibit 14
Figure 3-3: Ridgeway Heights Pond Outfall 15
Section 4: Flow Control & Water Quality Analysis & Design 16
Project LID Feasibility / List #2: 16
Existing Conditions: 17
Figure 4-1: Existing Conditions Exhibit 20
Developed Conditions: 21
Figure 4-2: Developed Conditions Exhibit 22
Pond 1 / Wetland A Hydraulic Analysis: 23
Wetland B Hydraulic Analysis: 27
Pond 2 Hydraulic Analysis: 28
Pond 3 Hydraulic Analysis: 30
WSDOT Pond Hydraulic Analysis: 32

Section 5: Conveyance System Analysis & Design 34
Section 6: TESC/SWPPP Analysis & Design 35
Section 7: Operations & Maintenance Manual.....36
Section 8: Associated Reports & Studies.....37

Appendix A – WWHM Output Files

Appendix B – Geotech Report

Appendix C – Original WSDOT Pond "E" Construction Plans and Storm Report

Section 1: Project Overview

The Oak Heights (fka The Village of Garry Oaks) project site is 36.69 acres located south of SW 24th Avenue and west of State Route 20 within the Oak Harbor City limits. Please refer to Figure 1 - Vicinity Map on the following page for a depiction of the site location. The parcels included in the development are R13210-298-2300, R13210-295-1480, R13210-362-2330, R13210-364-1730, and R13210-364-1900. The project consists of 153 single-family detached lots, and 66 duplex units (a combination of front load and alley loaded product), for a total of 219 lots. The project is being processed as a Planned Residential Development (PRD) which will allow for duplex product within the northeast portion of the property. The property owner, and applicant is SSHI LLC, dba D.R. Horton.

The development will take access from SW 24th Avenue, in direct alignment with SW Vista Park Drive, SW Ridgeway Drive within the adjacent Ridgeway Heights development that is currently under construction, as well as State Route 20 in direct alignment with SW Eagle Vista Drive.

The site has been partially cleared and the existing structures have been demolished as part of the prior permit that was issued. The majority of the site is pasturelands with a few remaining trees. There are two Category IV wetlands on the property, referred to as Wetlands A & B. There are no other known critical areas on or adjacent to the property. The topography of the site is generally flat with rolling hills. The northeastern portion of the site slopes generally towards Wetland A at 0% to 10%. The southwest half of the site slopes southwesterly at slopes ranging from 0% to 10%. The southeastern half of the site slopes southeasterly at slopes ranging from 0% to 15%. The site is considered to be located within one threshold discharge area, and is within the Eagle Vista Drainage basin. Stormwater will be handled on-site by three separate detention/water quality ponds. Hydrology of Wetlands A and B will be maintained through basic dispersion of clean roof water and stormwater pond outflows.

The existing WSDOT pond located in the southeast corner of the site has been re-designed to account for the increase in impervious area associated with the required State Route 20 frontage improvements, as well as the major decrease in tributary existing on-site pasture area that is being redeveloped and treated for flow control and water quality in Pond #2 as part of the development. This WSDOT pond is being brought up to current Department of Ecology standards and will provide water quality.

The stormwater management systems for the project are designed in accordance with the Washington State Department of Ecology 2019 Stormwater Management Manual for Western Washington (DOE SWMMWW). The 2012 Western Washington Hydrology Modeling software (WWMH) has been utilized for stormwater pond and wetland recharge modeling.



Figure 1-1: Vicinity Map

Section 2: Minimum Requirements Summary

Since the project site has less than 35% of existing impervious coverage, and the project will result in greater than 5,000 square feet of new plus replaced hard surface area, all Minimum Requirements apply to the new and replaced hard surfaces and converted vegetation areas. The developer has elected not to meet the LID Performance Standard, therefore the first BMP feasible on List #2 will be selected. The flow charts from the 2019 DOE SWMMWW are included below as Figures 2-1 and 2-2. Following these figures is a discussion on how the project will satisfy Minimum Requirements 1 through 9.

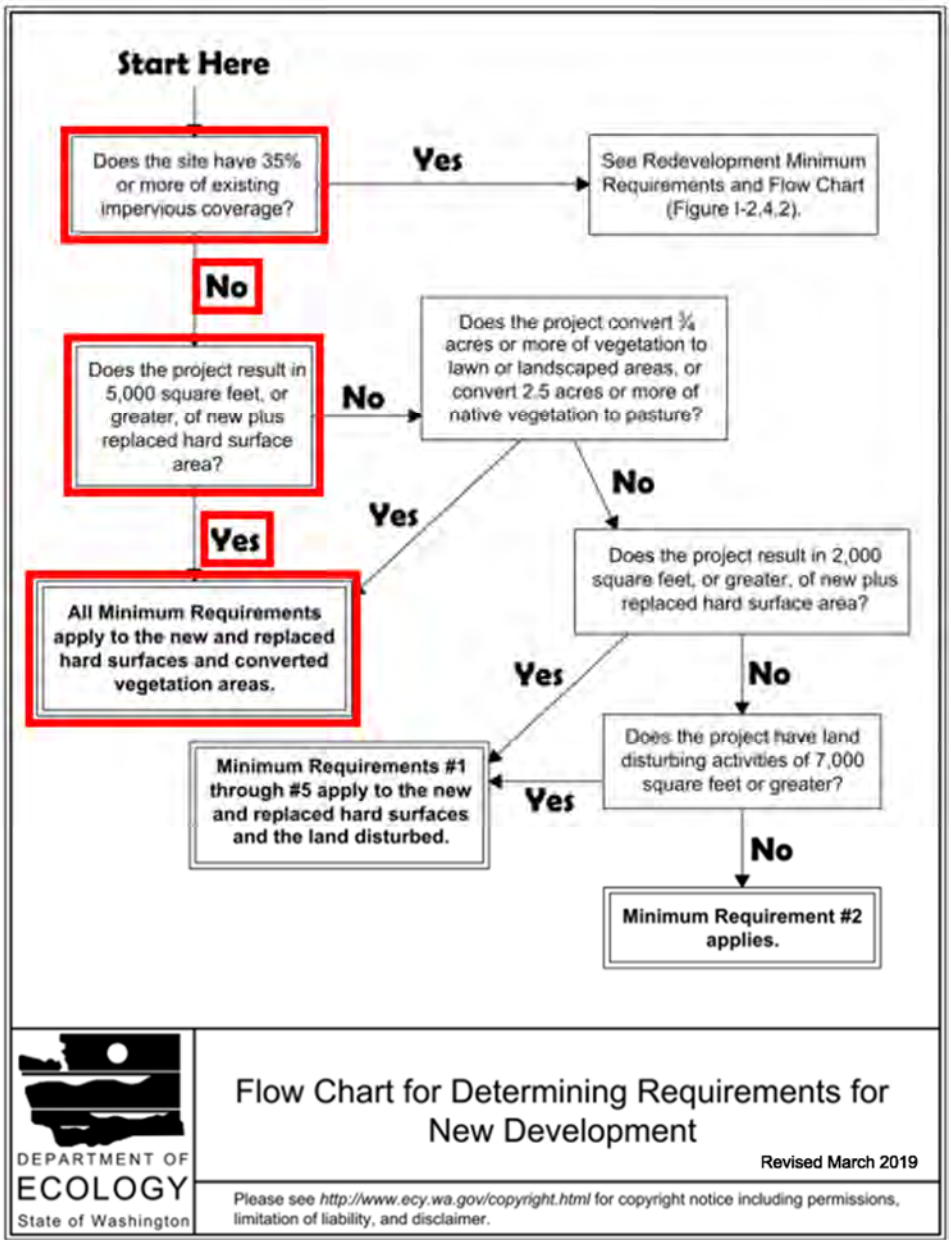


Figure 2-1: Flow Chart for Determining Requirements for New Development

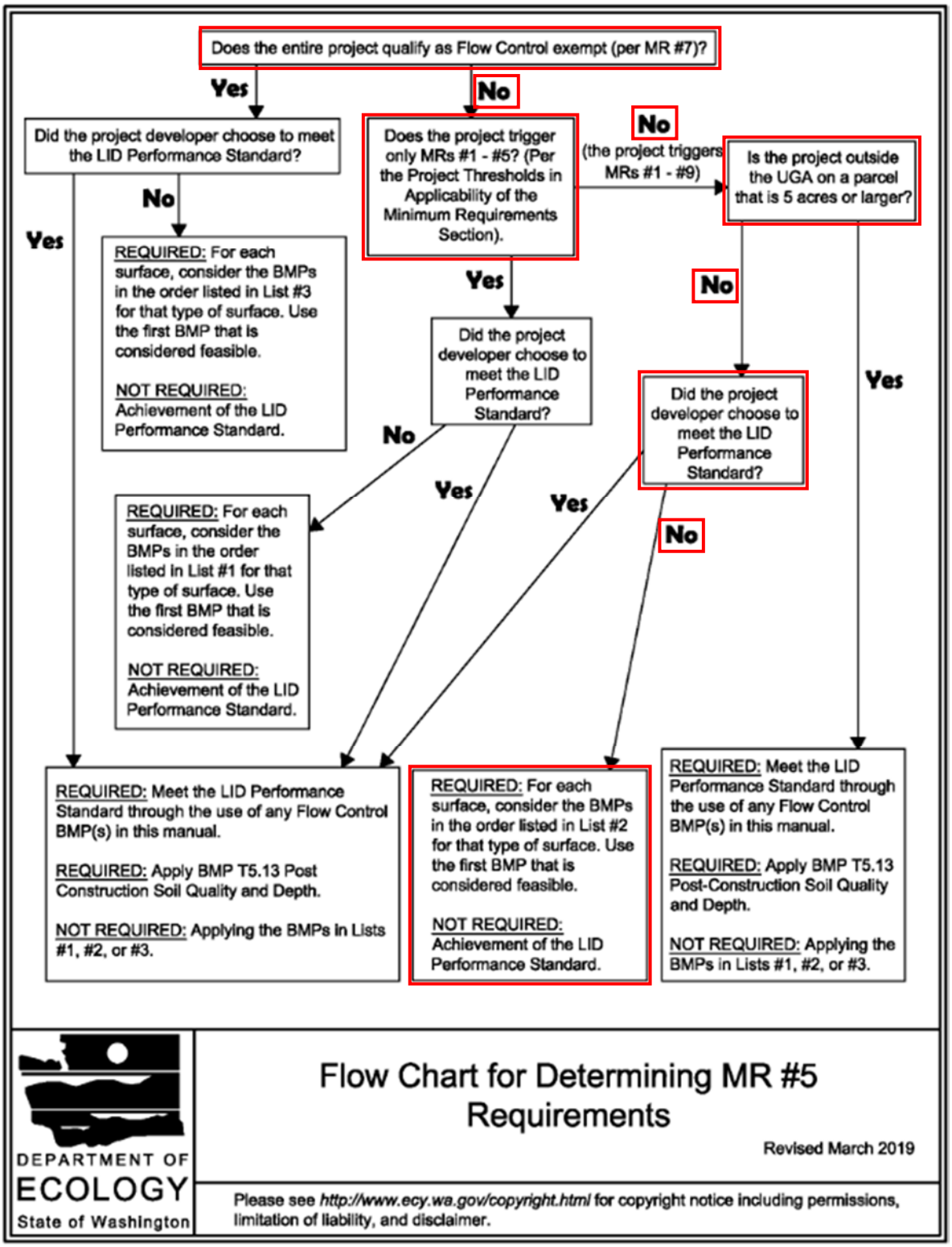


Figure 2-2: Flow Chart for Determining LID MR#5 Requirements

Minimum Requirement #1 – Preparation of Stormwater Site Plans:

Preliminary Stormwater Site Plans have been prepared and submitted to the City of Oak Harbor, which consist of this Preliminary Storm Drainage Report, and Preliminary Engineering Plans included as part of the Preliminary Plat drawings.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention:

A preliminary Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared and will be submitted under separate cover. It will be finalized during Final Engineering. The final version will include Temporary Erosion and Sediment Control Plans (TESC Plans), which will be prepared and included with the Civil Plans during Final Engineering.

Minimum Requirement #3 – Source Control of Pollution:

Note that there are no Basin Plans or TMDL requirements for this basin.

Construction BMPs for Source Control:

A SWPPP will be provided under separate cover during Final Engineering which will identify the application and location of most of the BMPs listed in Volume II, Section 4.1 of the 2019 DOE SWMMWW.

Operational & Structural BMPs for Source Control:

Operational Source Controls are generally applicable to commercial and industrial sites and cover items such as spill control, storage practices, record-keeping, etc.

Structural Source Controls are designed to provide a physical means of preventing pollutants from entering the stormwater system.

Due to the single-family nature of the site (including the duplex units which live like single-family, only attached) most Operational and Structural Source Controls are not applicable or necessary. Runoff from roadways and driveways will be collected within the public storm system and treated by the wet ponds so pollutants from fuel spills, oil leaks, vehicle washing, etc. are not likely to enter the wetland buffers or downstream system.

Transport of lawn fertilizer, herbicides, and pesticides has potential to enter surface waters and/or the wetland buffers. BMP T5.13 (Post-Construction Soil Quality and Depth) will be applied throughout the site; this helps minimize stormwater runoff by increasing infiltration and absorption, and reducing the need for fertilizers. Again, there is a wet pond for water quality treatment in each of the three on-site subbasins which will treat all runoff that enters the storm system.

"Landscaping and Lawn/Vegetation Management" is primarily an individual lot owners' responsibility, including the planter strips within the right-of-way. Open Space Tracts and buffers will be planted with trees, shrubs, and native grasses and are not expected to involve extensive use of fertilizer, herbicides, or pesticides. Some minor isolated uses may be necessary to prevent damage to the flora or loss of aesthetic characteristics. Excerpts from the 2019 DOE SWMMWW will be included within the Operations and Maintenance manual, which will be provided during Final Engineering. Restrictive Covenants should be included in the CCRs for the plat as follows:

- No disposal of grass clippings, leaves, sticks, or other vegetation within wetland buffers, waterways, storm drainage systems or detention facilities.

- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.
- Apply BMP T5.13 (Post-Construction Soil Quality and Depth) on the site.

Minimum Requirement #4 – Preservation of Natural Drainage System and Outfalls:

The City of Oak Harbor has determined that the site contains a single Threshold Discharge Area (TDA).

Wetland "A" appears to be a man-made excavation that has become a wetland over time. The wetland receives groundwater and runoff from the surrounding pastures. The maximum water surface elevation is controlled by an overflow at the south end of the wetland. When it overflows it disperses into the pasture to the south.

Wetland "B" appears to be a small isolated depression. An overflow system will route this wetland to the Wetland "A" overflow system in the event it were to overflow.

Pond 1 in the northeast portion of the site will discharge to Wetland "A" and help maintain its hydrology, along with clean roof/patio runoff and yards of adjacent lots. Clean roof water and yards from adjacent lots will be dispersed to Wetland "B" to maintain its hydrology. Refer to Section 4 of this report for the full wetland recharge analysis.

Ponds 1, 2, 3, and the WSDOT pond are sized to satisfy Wetland recharge and flow control and durations standards for the TDA. The natural discharge location for the TDA at the southeast corner of the site near the existing WSDOT pond and State Route 20 will be maintained.

The site receives some runoff from upstream development, such as the dispersion trench outfall from the Ridgeway Heights plat, as well as undeveloped forest last to the northwest. These flows will intercepted, routed through our site, and discharged at the south boundary line with a dispersion trench outfall device.

Please refer to the full upstream and downstream analysis in Section 3 of this report.

Minimum Requirement #5 – On-Site Stormwater Management:

The site is required to implement LID BMPs to the maximum extent feasible according to List #2.

On-site stormwater management consists of traditional street collection systems consisting of catch basins and pipe which are tight-lined to detention/water quality ponds, as well as BMPs on the individual lots.

The on-site soils in general are not conducive for infiltration and other LID techniques such as permeable pavement, biofiltration, etc.

Basic dispersion will be applied to the maximum extent feasible via trenches, reversed sloped sidewalks, sheet-flow dispersion, etc. All the disturbed areas that are to remain pervious in the developed condition will implement BMP T5.13 (Post-Construction Soil Quality and Depth).

Please refer to Section 4 for the detailed analysis and design for the flow control and water quality facilities proposed. Section 5 includes analysis and design for system capacity and backwater.

Minimum Requirement #6 – Runoff Treatment:

All stormwater on-site is treated for water quality by wet ponds (dead storage within the detention ponds). Please refer to Section 4 for detailed analysis and design information for the wet pond sizing.

Minimum Requirement #7 – Flow Control:

Flow control will be managed by three separate detention/water quality ponds. Please refer to Section 4 for a detailed analysis of the flow control and water quality facilities.

Minimum Requirement #8 – Wetlands Protection:

There are two Category IV wetlands on-site with 50-foot buffers, referred to as "Wetland A" and Wetland B". Please refer to the *Critical Areas Report and Habitat Management Plan* prepared by Wetland Resources, Inc. for more detailed information on Wetlands A and B, which has been submitted under separate cover.

Wetland A is the larger of the two, located in the middle portion of the east half of the site. This wetland was a man-made pond that was excavated as part of farming operations. Records indicate that at one time a pipe conveyed water from the ditch within SW 24th Avenue to Wetland A. This pipe has not been located. The pond goes dry during most of the summer, but holds water the rest of the year.

The existing tributary area to Wetland A is approximately 13.51 acres of pasture, buildings, lawn, and roadway. The outflows from Pond 1, in addition to dispersion of clean roof/patio water from adjacent lots, will maintain the existing hydrology of Wetland A. There is a birdcage overflow structure proposed at the ordinary high-water mark of this wetland which will convey any overflows through the development and into the downstream stormwater system. The full analysis and design of Pond 1, Wetland A, and the wetland recharge mechanisms are discussed in Section 4 of this report.

Wetland B is located approximately 250 feet west of Wetland A, and is a small depression that has no distinguished outfall. Based on topography and our field investigation, it appears that the tributary basin to this wetland is bound by the depression in the immediate vicinity of the wetland. It is our best judgement that the wetland seeps down gradient to the east towards Wetland A. The total tributary area to Wetland B is approximately 1.17 acres of pasture. In the developed condition, the wetland will be recharged by dispersion/infiltration devices on the adjacent lots. There is a birdcage overflow structure proposed at the ordinary high water mark which conveys any overflow from the wetland to the overflow system for Wetland A which conveys flows to the natural discharge location in the southeast corner of the site. Please refer to the full analysis and design in Section 4 of this report.

Minimum Requirement #9 – Operations and Maintenance:

A preliminary Operations and Maintenance Manual is provided within Section 7 of this report. It will be finalized during the Final Engineering stage of the project.

Section 3: Site Analysis

On-Site Soils:

The NRCS Web Soils Survey maps the site as predominately Coveland loam, C/D type soils, and Everett-Alderwood complex, A-type soils. On-site geotechnical explorations found medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel with trace to some silt, over dense to very dense silty sand with gravel (glacial till) and sand with varying amounts of silt and gravel (advance outwash). Soils suitable for infiltration were encountered at the site, however, they are generally underlain at a shallow depth by impermeable glacial till. Please refer to the geotechnical report prepared by Riley Group, dated June 28, 2024 for information about the on-site soils and infiltration feasibility in Section 8 and Appendix B of this report.

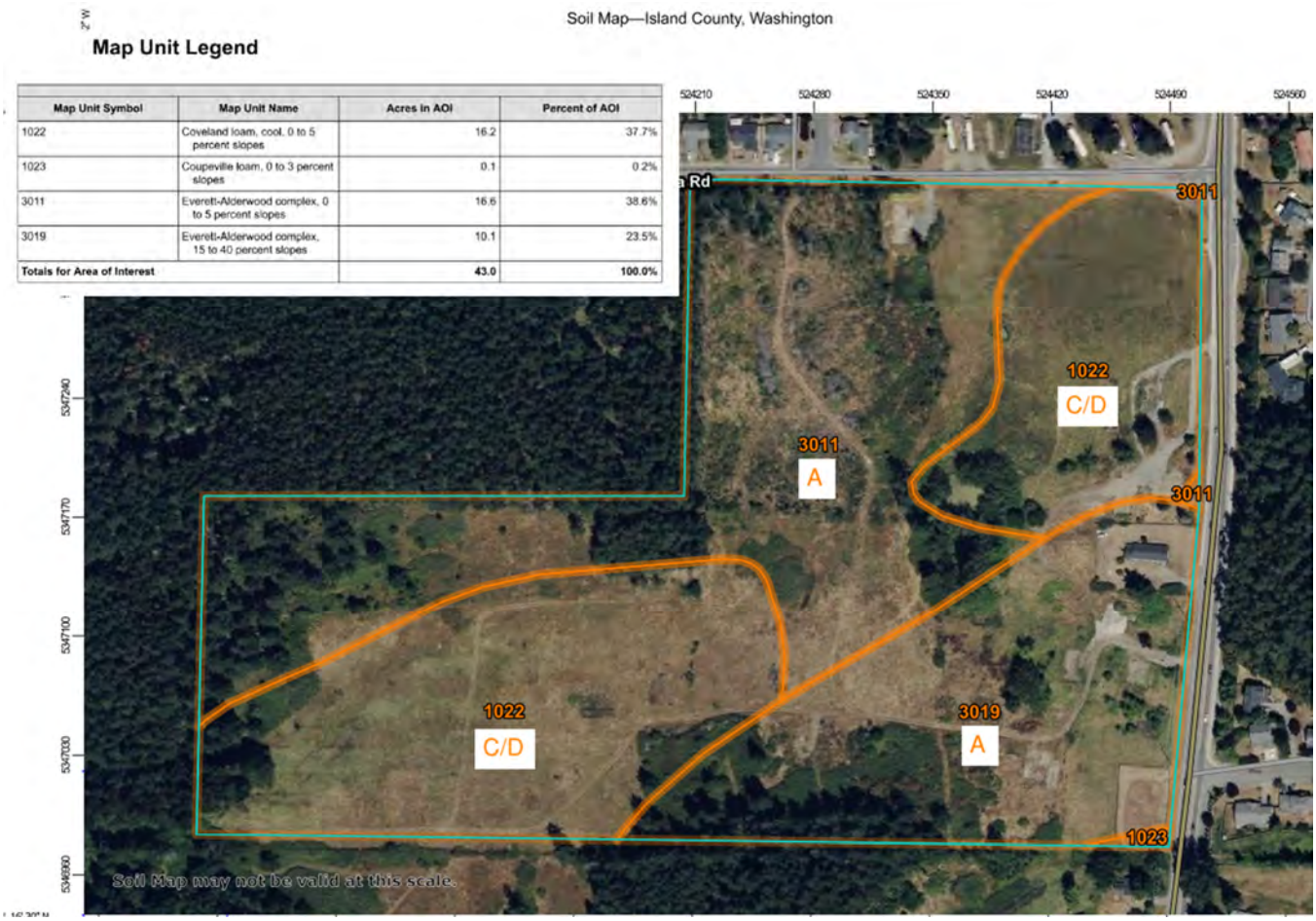


Figure 3-1: NRCS Soils Map

Upstream Analysis:

A site visit was conducted on April 24th, 2024. We observed the recently constructed Ridgeway Heights detention pond, emergency spillway, and outfall dispersion energy dissipator located approximately 25 feet north of our project boundary and future proposed lots (see Figure 3-3 for a photo of the outfall dispersion trench). Our plan is to construct a berm that prevents pond outflows/emergency overflows from flowing onto our proposed lots, and install a birdcage structure that will collect flow and route it through the site within SW Ridgeway Drive and discharge with a dispersion trench outfall device near Pond 3. There is minimal surface flow run-off anticipated from the forested parcel to the east, but the rear yards of these lots will have a gravel French drain installed to intercept any potential run-off from future development. The north boundary of the project that fronts SW 24th Ave receives minimum runoff from the southern half of SW 24th Ave, and this flow will be picked up with curb and gutter as part of our frontage improvements.

Downstream Analysis:

As outlined in the 2019 DOE SWMMWW, the downstream analysis shall identify and evaluate offsite water quality, erosion, slope stability, and drainage impacts that may be caused or aggravated by a proposed project, and to determine measures for preventing impacts and for not increasing the frequency of occurrence and/or severity of a problem.

This report addresses the following issues:

- Conveyance system capacity problems;
- Localized flooding;
- Upland erosion impacts, including landslide hazards;
- Stream channel erosion at the outfall location;
- Violations of surface water quality standards as identified in a Basin Plan or TMDL (Watter Clean-Up Plan); or violations of ground water standards in a wellhead protection area.

During the site visit in April, we walked the entire downstream system, from the project site to the edge of the embankment within the Scenic Heights plat above the HDPE outfall. The following paragraph contains a detailed description of the downstream system, followed by Figure 3-2: Upstream & Downstream Exhibit which illustrates a basic overview of the system described below.

The entire site is within one threshold discharge area (TDA), so it has one downstream system for observation. In general, all of the stormwater runoff sheet flows off the site to the south onto undeveloped portions of parcels R13210-229-0930, R13210-199-1250, R13210-198-1570, and R13210-248-2000, listed from west to east. These parcels contain a broad natural lowland swale that intercepts runoff and conveys undefined natural overland flows east, and northeasterly for approximately 1,550 lineal feet at slopes ranging from 0.5% to 5%. These flows ultimately cross State Route 20 at the southeast corner of the project site near the existing WSDOT detention pond. The water flows beneath SR-20 through two 24" diameter CMP culverts at approximately 1.4% slope. The culverts discharge into a large rip-rap lined ditch/swale that parallels the Eagle Crest detention pond for approximately 260 feet before angling southeast onto undefined overland flow through pasture within the northeast portion of the Barner property (parcel R13210-252-2860. The prior Storm Drainage Report prepared by Levik Engineering (on file with the City of Oak Harbor) states that the Barner's are okay with the sheet flow and ponding that occurs in this portion of their property, and that no easements or structural improvements are desired. This pastured area is approximately 60 feet wide and slopes less than 2%. The overflow from the Barner property was historically controlled by an 8" concrete storm pipe that conveyed flow to SW Scenic Heights Street, but a

new system has been constructed in recent years. A 12" pipe at the same elevation of the previous 8" concrete pipe picks up flow from the Barner property and routes flow north approximately 40 feet to a Type 1 catch basin, which also picks up the Eagle Crest detention pond outfall. These converged flows head easterly approximately 290 feet via 15" pipe to another Type 1 catch basin. From there, the 15" pipe continues easterly approximately 240 feet to a Type 2 catch basin located within the SW Scenic Heights Street west ditch line, north of SW 29th Place. This storm system between Barner's property and SW Scenic Heights Street is located within existing 15' and 20' wide storm easements (AFNs 93006896, 4475756, 4548759, 4475756, and 4548760) on property owned by Valley High Investments Inc and Preston Heights LLC (which is currently planned to be developed with 36 new single-family lots by MLR Development Group, LLC). The remainder of the storm system from the Type 2 catch basin in the west ditch line of SW Scenic Heights Street to the bay was recently completed (approximately 6 years ago) by the City of Oak Harbor. From the Type 2 catch basin in the west ditch line of SW Scenic Heights Street, the 15" pipe crosses SW Scenic Heights Street and connects to a Type 1 catch basin approximately 67 feet away. The 15" pipe continues for 183 feet to another Type 1 catch basin. At this point the pipe changes from a 15" CPEP to an 18" HDPE pipe. The pipe runs underground for approximately 144 feet, then daylights near the top of the bank. The 18" HDPE flows overland and down to an HDPE diffuser energy dissipation system at the toe of the slope (this overland portion of pipe, and the outfall, were not physically observed).

In general, there were no erosion, flooding, or capacity issues observed along the downstream system. The existing 100-year, 15-minutePage flow rate tributary to the downstream system is approximately 2.95 cubic feet per second, and the developed 100-year, 15-minute flow rate is 2.78 cubic feet per second, so the proposed development actually decreases total flow tributary to the downstream system. Therefore, the proposed development will not negatively impact the existing downstream system.

Conveyance System Capacity Problems:

The recently constructed downstream improvements described above appear to provide sufficient capacity for the upstream basin assuming flow control standards are met with future development.

Localized Flooding:

As mentioned in the downstream analysis above, there is a portion of landscaped pasture on the Barner parcel that floods at times, but they wish to leave it that way. The flooding is a natural occurrence and there is a 12" overflow system as described. There are no other known/observed areas of localized flooding.

Upland Erosion Impacts, Including Landslide Hazards:

There were no erosion or potential erosion issues observed for the downstream system, and the new City installed 18" HPDE overland outfall system that discharges at the toe of the slope on the beach should alleviate any potential concern for erosion and landslide hazards.

Stream Channel Erosion at the Outfall Location:

All inlets and outlets appear stable, and although not observed, it is assumed that the new HDPE diffuser on the beach is armored and stable.

Violations of Surface Water Quality Standards:

There are no known water quality problems identified. All runoff leaving the development will be treated in accordance with the 2019 DOE SWMMWW standards.

Figure 3-2: Upstream & Downstream Exhibit

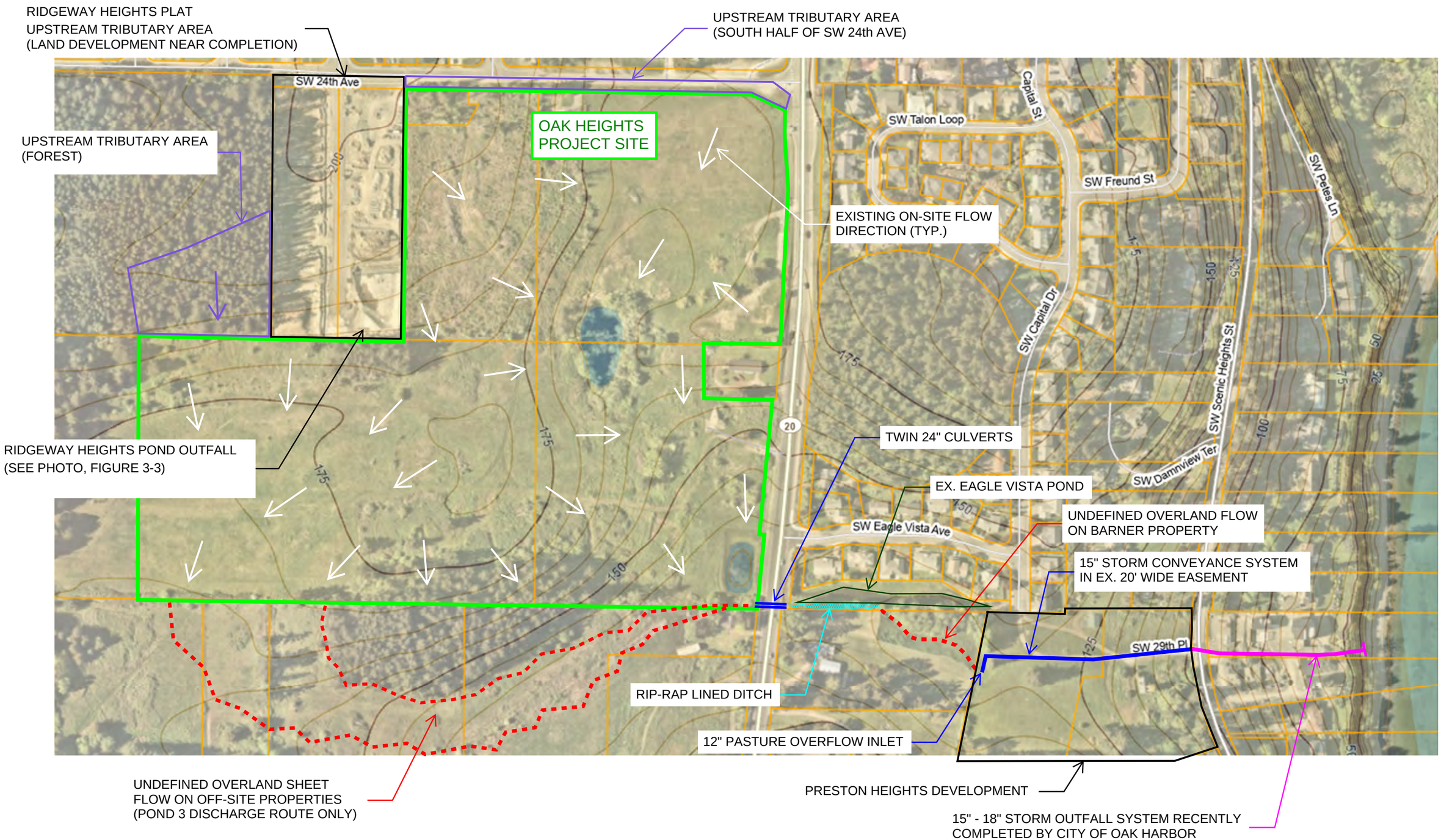


Figure 3-3: Ridgeway Heights Pond Outfall



Section 4: Flow Control & Water Quality Analysis & Design

Project LID Feasibility / List #2:

As discussed in Section 2 of this report, Minimum Requirement #5 requires that the project implement on-site stormwater management BMPs in List #2 to the maximum extent feasible in accordance with the 2019 DOE SWMMWW.

For each surface, consider the BMPs in the order listed for that type of surface. Use the BMP that is considered feasible. No other On-site Stormwater Management BMP is necessary for that surface. Feasibility shall be determined by the evaluation against:

1. Design criteria, limitations, and infeasibility criteria identified for each BMP in the SWMMWW; and
2. Competing Needs Criteria listed in Chapter V-5 – On-Site Stormwater Management

Lawn and Landscaped Areas

1. Post Construction Soil Quality and Depth (BMP T5.13).

Feasible: BMP T5.13 will be implemented for all landscaped areas proposed by the project. This in turn allows us to model all landscaped areas as "Pasture" within WWHM for stormwater modeling purposes. The site will be fully cleared of existing trees and brush and the existing soils do not appear to contain significant levels of organic material adequate to meet the requirement of BMP T5.13. Therefore, all landscaped areas may require the use of imported topsoil/compost to meet the requirement.

Roofs

1. Full dispersion (BMP T5.30) or Downspout Full Infiltration Systems (BMP T5.10A).

Not Feasible: The project site cannot support the required 100-foot flow path required for full dispersion. Per the Geotech report, the on-site soils are not suitable for full infiltration either, given the shallow depth to glacial till.

2. Rain Gardens (BMP T5.14A) or Bioretention (Chapter 7, Volume V of the 2019 DOE SWMMWW).

Not Feasible: The depth to the restrictive layer/groundwater is insufficient. The roofs are not considered a pollution generating impervious surface and do not require water quality treatment. Flow control for roofs will be provided in the detention ponds and dispersion trenches.

3. Downspout Dispersion Systems (BMP T5.10B)

Feasible: Splashblocks are not feasible due to the lack of a 50-foot vegetated flowpath. Dispersion trenches are feasible on lots which are intended to disperse to Wetlands A and B for wetland recharge since they have adequate flowpath within the wetland buffers, but not feasible on other lots due to lack of a 50-foot vegetated flowpath.

4. Perforated Stub-out Connections (BMP T5.10C)

Feasible: Per the 2019 DOE SWMMWW, perforated stub-out connections are not appropriate when seasonal high water table is less than one foot below trench bottom. Where feasible, perforated stub-out connections will be provided on lots with deep enough groundwater.

Other Hard Surfaces

1. Full Dispersion (BMP T5.30)

Not Feasible: The site is infeasible for full site dispersion due to the lack of preserved open space and vegetated flow path.

2. Permeable Pavement (BMP T5.15)

Not Feasible: This is infeasible due to the non-infiltrative properties of the underlying soil.

3. Bioretention BMPs (Chapter 7, Volume V of the 2019 DOE SWMMWW)

Not Feasible: Depth to restrictive layer is inadequate and parcels are too small for this to be feasible.

4. Sheet Flow Dispersion (BMP T5.12) or Concentrated Flow Dispersion (BMP T5.11)

Feasible: Sheet flow dispersion is feasible adjacent to Wetlands A and B and will be utilized to the maximum extent possible for wetland recharge. Reverse slope sidewalk is proposed adjacent to Wetland B, and rear patios, walkways adjacent to Wetlands A and B are proposed to sheet flow into the wetland buffers. Most individual lots are not large enough to adequately accommodate sheet flow dispersion on-lot.

Existing Conditions:

The project site consists of 5 existing parcels totaling 36.69 acres. The topography is generally rolling, with slopes between 0% and 15%. The existing structures were removed as part of the prior land use action, and a majority of the 10 acres of forested area had been cleared. Aside from the 10 acres of forested area, the remainder of the site is pasture. The Geotechnical Engineer has determined the soils on-site to be medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel with trace to some silt, over dense to very dense silty sand with gravel (glacial till) and sand with varying amounts of silt and gravel (advance outwash). Soils suitable for infiltration were encountered at the site, however, they are generally underlain at a shallow depth by impermeable glacial till. The site is located within a single threshold discharge area, but the on-site drainage is split into 4 subbasins in the developed condition: Wetland A (Pond 1), Wetland B, Pond 2, and Pond 3. For the purposes of modeling the flow control facilities, the existing site is modeled as C-Forest in the pre-developed conditions for Ponds 2 and 3. The existing conditions (combination of forest, pasture, and impervious) are used in modeling the recharge for Wetland A, which includes the Pond 1 basin. The existing conditions are used in the wetland recharge for modeling Wetland B recharge as well.

The upstream detention pond discharge from the new Ridgeway Heights development to the north will be intercepted, routed through our project, and discharged at the south boundary line near Pond 3, effectively matching the natural discharge location. The southwestern portion of the Ridgeway Heights development, however, is a future development tract that relies on water and sewer services from our roadway connection in order to be developed into 3 lots. This area will be treated for flow control and water quality in Pond 3, and is considered C-Forest in the pre-developed condition.

In addition, the existing WSDOT pond in the southeast corner of the site will be resized according to the new developed conditions and brought up to 2019 DOE SWMMWW standards for flow control and water quality. The existing basin tributary to the pond has been modeled as C-Forest in the pre-developed condition.

Included on the next page are tables summarizing the existing/pre-developed conditions for each of the basins on-site that were used for the ponds and wetland recharge calculations in WWHM, followed by Figure 4-1: Existing Conditions Exhibit.

Pond 1 / Wetland A – Existing Conditions Summary	
Land Cover	Area (Acres)
C-Forest	0.00
C-Pasture	13.51
Impervious	1.33
Total	**13.51**

Wetland B – Existing Conditions Summary	
Land Cover	Area (Acres)
C-Forest	0.00
C-Pasture	1.17
Impervious	0.00
Total	**1.17**

Pond 2 – Pre-Developed Conditions Summary	
Land Cover	Area (Acres)
C-Forest	8.70
C-Pasture	0.00
Impervious	0.00
Total	**8.70**

Pond 3 – Pre-Developed Conditions Summary	
Land Cover	Area (Acres)
C-Forest	12.20
C-Pasture	0.00
Impervious	0.00
Total	**12.20**

WSDOT Pond – Pre-Developed Conditions Summary	
Land Cover	Area (Acres)
C-Forest	2.69
C-Pasture	0.00
Impervious	0.00
Total	**2.69**

SECTION 10, TOWNSHIP 32N, RANGE 1E, W.M.

RIDGEWAY HEIGHTS DEVELOPMENT

RIDGEWAY HEIGHTS STORM OUTFALL (TO BE ROUTED THROUGH SITE AND DISCHARGED NEAR POND 3)

WETLAND A / POND 1 BASIN
1.33 ACRES (IMPERVIOUS)
12.19 ACRES (C-PASTURE)

WETLAND B BASIN
1.17 ACRES (C-PASTURE)

POND 3 BASIN
12.07 ACRES (C-FOREST)

POND 2 BASIN
8.70 ACRES (C-FOREST)

WSDOT POND BASIN
2.69 ACRES (C-FOREST)

WETLAND A

WETLAND B

EX. WSDOT POND

SW 24TH AVE

STATE ROUTE 20

SW RIDGEWAY DR

GRAVEL ROAD

FOUND MON 2" BRASS DISC W/ PUNCH "LS 21591" VISITED 05/23/2024

APPROXIMATE DRAIN FIELD LOCATION

60' INGRESS, EGRESS & UTILITY EASEMENT AFN 4128383

ELECTRIC HORSE FENCE

N87°45'17"W 871.57'

N87°45'57"W 666.81'

N87°46'37"W 1452.52'

N87°44'37"W 2665.05'

N87°45'57"W 195.08'

N87°45'57"W 178.23'

S87°45'57"E 128.11'

N01°46'57"E 660.32'

N01°46'57"E 2644.07'

N02°47'09"W 91.05'

N83°12'21"W 95.00'

N06°47'39"E 198.60'

S58°47'39"W 1162.64'

N12°26'43"E 1361.34'

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE
-	-	-

FIGURE 4-1: PRE-DEVELOPED CONDITIONS EXHIBIT
OAK HEIGHTS

SSHI LLC, dba D.R. HORTON
11241 SLATER AVE NE, STE 200
KIRKLAND, WA 98033

PRELIMINARY
7-12-2024

DESIGNED: PRESTON LONGONI, P.E.
DRAWN: VALERIE GOODING
CHECKED:
APPROVED: COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE 7.12.2024

PERMIT NUMBER —

SHEET NUMBER —

SHEET	OF
1	1

Developed Conditions:

The project proposes the construction of 153 single-family residences and 66 duplex units, for a total of 219 units, along with associated roads and utilities. The development will gain access off of SW 24th Avenue, in direct alignment with SW Vista Park Drive, SW Ridgeway Drive within the adjacent Ridgeway Heights development that is currently under construction, as well as State Route-20 in direct alignment with SW Eagle Vista Drive. Frontage improvements are required along SW 24th Avenue as well as State Route-20. The public road sections are crowned with curb and gutter on both sides with a typical catch basin storm collection system within the flow line of the curb and gutter. The private tract roads will be inverted crown with a catch basin collection system within the center/flow line of the pavement.

Wetland A will be recharged by a combination of roof dispersion trenches and outflows from Pond 1. Wetland B will be recharged by adjacent roof dispersion trenches. The remainder of the stormwater on site will be collected and routed to Ponds 2 and 3. Pond 1 will work in conjunction with the roof dispersion systems to provide recharge and water quality for Wetland A in accordance with the 2019 DOE SWMMWW. Ponds 2, 3, and the WSDOT pond will provide flow control and water quality per the 2019 DOE SWMMWW. The flow control and water quality components have been modeled using WWHM, an approved continuous runoff model per the 2019 DOE SWMMWW.

The City of Oak Harbor allows a maximum building coverage of 45%, plus driveways, walkways, patios, and other hard surfaces. The single-family lots have a proposed maximum impervious coverage of 60%. The duplex lots have a proposed maximum impervious coverage of 70%.

On the following page is Figure 4-2: Developed Conditions Exhibit, which illustrates the developed subbasins for the project. Following the Developed Conditions Exhibit are sections which include the full hydraulic analysis for each developed subbasin including summaries of the developed basin areas, flow control and water quality calculations, required and proposed volumes, as well as wetland recharge calculations. The WWHM output files are included in Appendix A for reference.

SECTION 10, TOWNSHIP 32N, RANGE 1E, W.M.

RIDGEWAY HEIGHTS DEVELOPMENT

AREA TRIBUTARY TO WETLAND A RECHARGE
1.09 ACRES IMPERVIOUS (DISPERSED)
1.43 ACRES PERVIOUS (C-PASTURE)

AREA TRIBUTARY TO WETLAND B RECHARGE
0.219 ACRES IMPERVIOUS
0.232 ACRES IMPERVIOUS (DISPERSED)
0.467 ARES PERVIOUS (C-PASTURE)

* *LOTS 187, 188, 191, 192, 196 NOT DISPERSED*

RIDGEWAY HEIGHTS STORM OUTFALL (TO BE ROUTED THROUGH SITE AND DISCHARGED NEAR POND 3)

POND 1 / WETLAND A BASIN
7.33 ACRES IMPERVIOUS
3.23 ACRES PERVIOUS (C-PASTURE)

POND 3 BASIN
8.25 ACRES IMPERVIOUS
4.00 ACRES PERVIOUS (C-PASTURE)

POND 2 BASIN
5.49 ACRES IMPERVIOUS
3.82 ACRES PERVIOUS (C-PASTURE)

WSDOT POND BASIN
1.38 ACRES IMPERVIOUS
1.31 ACRES PERVIOUS (C-PASTURE)

SW 24TH AVE

STATE ROUTE 20

POND 1

WETLAND A

WETLAND B

POND 3

POND 2

WSDOT POND

APPROXIMATE DRAIN FIELD LOCATION

ELECTRIC HORSE FENCE

DHI

DHI Engineering, LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND, WASHINGTON 98033

DHI PROJECT NO.
24001

REV	DESCRIPTION	DATE
-	-	-

FIGURE 4-2: DEVELOPED CONDITIONS EXHIBIT
OAK HEIGHTS

SSHI LLC, dba D.R. HORTON
11241 SLATER AVE NE, STE 200
KIRKLAND, WA 98033

PRELIMINARY
7-12-2024

DESIGNED: PRESTON LONGON, P.E.
DRAWN: VALERIE GOODING
CHECKED:
APPROVED: COLIN LUND, PRESIDENT
PROJECT MANAGER

DATE
7.12.2024

PERMIT NUMBER
—

SHEET NUMBER
—

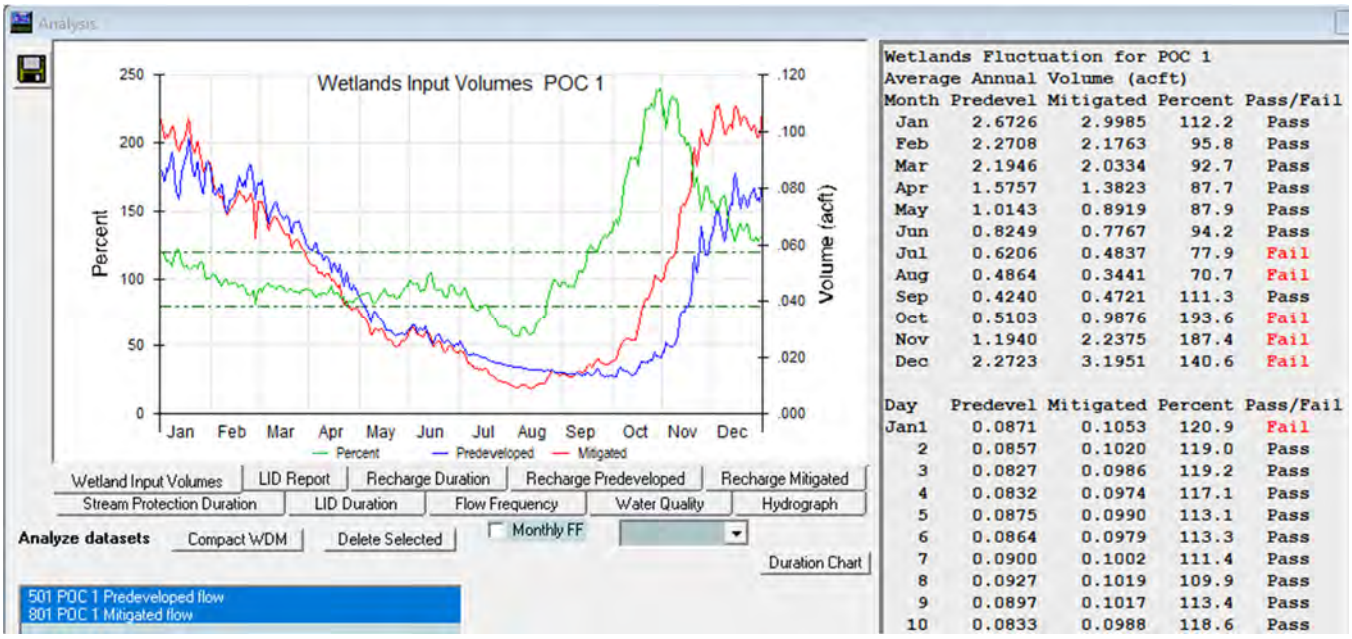
SHEET	OF
1	1

Pond 1 / Wetland A Hydraulic Analysis:

The Pond 1/ Wetland A subbasin involves maintaining the existing hydrology of Wetland A through a combination of Pond 1 discharge and dispersion of adjacent roofs, patios, yards, and walkways. Existing conditions were assumed for the pre-developed basin. The roofs, patios, and yards from lots 59 through 81 disperse into the wetland buffer via dispersion trenches, while the driveways are assumed to flow into the right-of-way storm system and are therefore tributary to Pond 1. The landscaped areas and pathways within Tracts G, H and a portion of Tract I are also tributary to the wetland buffer. The remaining basin areas are tributary to Pond 1. The following table summarizes the developed basins areas that were input into WWHM for the wetland recharge calculations. Post Construction Soil Quality and Depth (BMP T5.13) will be utilized in all landscaped areas, therefore, the pervious areas are modeled as C-Pasture as allowed per the 2019 DOE SWMMWW.

Pond 1 / Wetland A Developed Basin Summary			
	Total	Impervious	Pervious
Lots	231,053	151,392	79,660
ROW	92,228	82,778	9,450
Frontage	29,668	23,383	6,285
Tract C	47,567	35,000	12,567
Tract F	14,628	4,000	10,628
Tract I	30,113	9,000	21,113
Tract K	1,849	1,849	0
Tract L	1,428	1,428	0
Tract M	2,628	2,628	0
Tract T	1,876	760	1,116
Driveways (59-76)	7,200	7,200	0
Total (sf)	460,238	319,418	140,819
Total (acres)	**10.57**	**7.33**	**3.23**
Dispersion To Wetland A			
	Total	Impervious	Pervious
Lots	70,582	40,207	30,375
Tract C	3,388	0	3,388
Tract G	2,881	500	2,381
Tract H	5,297	1,344	3,953
Tract I	25,671	3,500	22,171
Tract N	2,133	2,133	0
Total (sf)	109,952	47,684	62,268
Total (acres)	**2.52**	**1.09**	**1.43**

The existing and developed basins tributary to Wetland A were modeled using the Wetland Input Volumes tab in WWHM. After many iterations, and with knowledge from prior experiences, the following wetland recharge analysis is as close to "passing" as possible without going extremely under existing volumes in the summer months and over in the winter months. During final design, Wetland Resources will provide language which justifies the proposed volumes tributary to the wetland. Note that the 2019 DOE SWMMWW states that *"In most cases, if Wetland Hydroperiod Protection is required per I-3.4.8 MR8: Wetlands Protection, then the Flow Control Performance Standard is also required per I-3.4.7 MR7: Flow Control. In these cases, the designer must attempt to meet the requirements for both MRs. This may prove to be feasible in many situations because I-3.4.7 MR7: Flow Control will seek to adjust the flow in small time intervals and I-3.4.8 MR8: Wetlands Protection looks to maintain daily flow volumes. If the designer is unable to meet both requirements* (we meet flow rates but not durations) *then the requirement to maintain the hydroperiod of the wetland becomes the overriding concern and the designer must show compliance with I-3.4.8 MR8: Wetlands Protection. If this is the case, the designer must also provide documentation detailing why they are unable to meet both requirements."* In general, the durations pass most of the time (see graph included within this section). If the durations were to fully pass in all storm events, then the developed wetland volumes end up well under the existing volumes over the entire year.



Wetlands Fluctuation for POC 1
Average Annual Volume (acft)

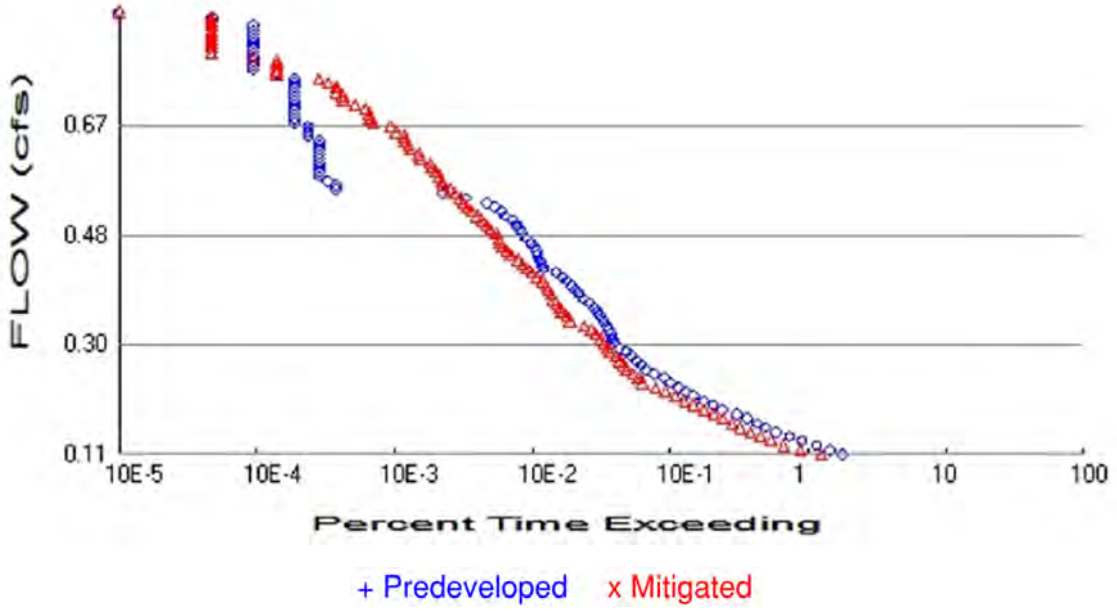
Month	Predevel	Mitigated	Percent	Pass/Fail
Jan	2.6726	2.9985	112.2	Pass
Feb	2.2708	2.1763	95.8	Pass
Mar	2.1946	2.0334	92.7	Pass
Apr	1.5757	1.3823	87.7	Pass
May	1.0143	0.8919	87.9	Pass
Jun	0.8249	0.7767	94.2	Pass
Jul	0.6206	0.4837	77.9	Fail
Aug	0.4864	0.3441	70.7	Fail
Sep	0.4240	0.4721	111.3	Pass
Oct	0.5103	0.9876	193.6	Fail
Nov	1.1940	2.2375	187.4	Fail
Dec	2.2723	3.1951	140.6	Fail

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	0.0871	0.1053	120.9	Fail
2	0.0857	0.1020	119.0	Pass
3	0.0827	0.0986	119.2	Pass
4	0.0832	0.0974	117.1	Pass
5	0.0875	0.0990	113.1	Pass
6	0.0864	0.0979	113.3	Pass
7	0.0900	0.1002	111.4	Pass
8	0.0927	0.1019	109.9	Pass
9	0.0897	0.1017	113.4	Pass
10	0.0833	0.0988	118.6	Pass

Pond 1 is designed with a live storage depth of 6 feet, and an overall required volume of 3.0429 acre-feet, or 132,548 cubic feet. The proposed live storage volume is 146,436 cubic feet. The required water quality storage volume is 0.6223 acre-feet, or 27,107 cubic feet. The proposed water quality storage is greater than 30,000 cubic feet at a depth of 4 feet. Snippets of the pond and control structure data from the WWHM output file are included below. Flow rates and durations are included for reference, although wetland recharge is the controlling threshold for this basin. Secondary and emergency overflow design for the pond will be completed during Final Engineering.

Trapezoidal Pond 1

Bottom Length:	145.00 ft.
Bottom Width:	115.00 ft.
Depth:	7 ft.
Volume at riser head:	3.0429 acre-feet.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	6 ft.
Riser Diameter:	18 in.
Notch Type :	V-notch
Notch Angle:	20.000
Notch Height:	1.500 ft.
Orifice 1 Diameter:	1.438 in. Elevation:0 ft.
Orifice 2 Diameter:	2.500 in. Elevation:2.75 ft.
Orifice 3 Diameter:	3.000 in. Elevation:3.5 ft.

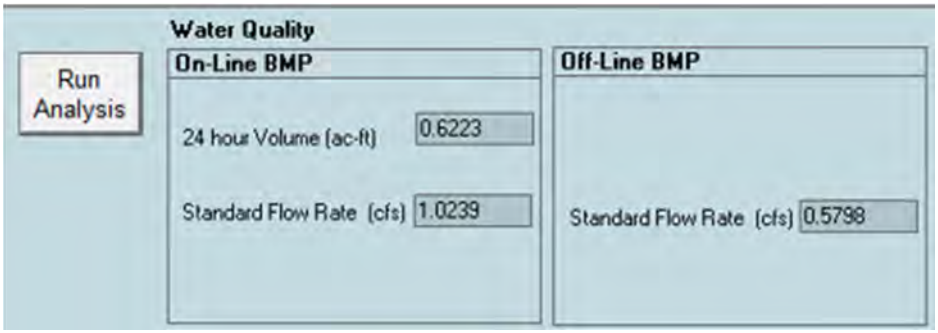


Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.212551
5 year	0.368831
10 year	0.498026
25 year	0.692464
50 year	0.861233
100 year	1.051575

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.153907
5 year	0.25665
10 year	0.346761
25 year	0.490731
50 year	0.62329
100 year	0.780691

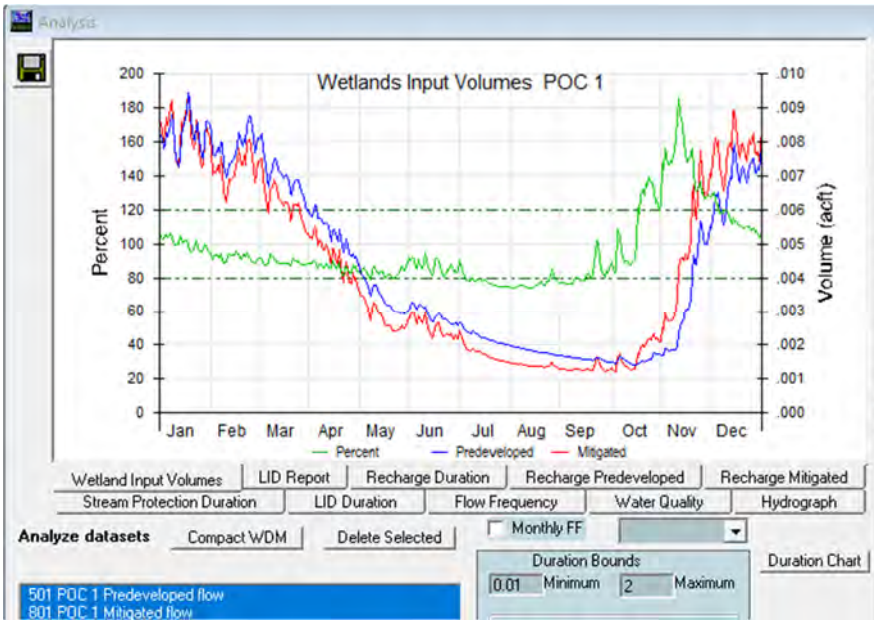


Wetland B Hydraulic Analysis:

The hydrology of Wetland B will be maintained through wetland recharge from adjacent single-family properties and landscaped areas within the Wetland B tract, Tract B. Existing conditions were assumed for the pre-developed basin. The roofs, patios, and yards from lots 187 through 192, 196, 197 and 203 will flow to the wetland buffer. The roofs of lots 189, 190, 197, and 203 will be dispersed via dispersion trenches, while the other lots will discharge without dispersion. The driveways are assumed to flow into the right-of-way storm system and are therefore tributary to either Pond 2 or Pond 3. Wetland B will have an overflow birdcage that conveys overflows to the overflow system for Wetland A, and ultimately discharge at the southeast corner of the site, the natural discharge location for the site. The following table summarizes the developed basins areas that were input into WWHM for the wetland recharge calculations. Post Construction Soil Quality and Depth (BMP T5.13) will be utilized in all landscaped areas, therefore, the pervious areas are modeled as C-Pasture as allowed per the 2019 DOE SWMMWW.

Wetland B Developed Basin Summary			
	Total	Impervious	Pervious
Lots (Dispersed)	19,543	10,126	9,417
Lots	19,237	9,542	9,695
Tract B	1,231	0	1,231
Total (sf)	40,011	19,668	20,343
Total (acres)	**0.919**	**0.452**	**0.467**

The existing and developed basins tributary to Wetland B were modeled using the Wetland Input Volumes tab in WWHM. After many iterations, and with knowledge from prior experiences, the following wetland recharge analysis is as close to "passing" as possible without going extremely under existing volumes in the summer months and over in the winter months.



Wetlands Fluctuation for POC 1
Average Annual Volume (acft)

Month	Predevel	Mitigated	Percent	Pass/Fail
Jan	0.2553	0.2576	100.9	Pass
Feb	0.2224	0.2059	92.6	Pass
Mar	0.2189	0.1963	89.7	Pass
Apr	0.1607	0.1396	86.9	Pass
May	0.1069	0.0888	83.1	Fail
Jun	0.0874	0.0761	87.1	Pass
Jul	0.0699	0.0549	78.6	Fail
Aug	0.0567	0.0433	76.3	Fail
Sep	0.0480	0.0392	81.6	Fail
Oct	0.0480	0.0523	109.1	Pass
Nov	0.0976	0.1401	143.5	Fail
Dec	0.2090	0.2393	114.5	Pass

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	0.0082	0.0087	105.3	Pass
2	0.0081	0.0084	103.3	Pass
3	0.0078	0.0080	102.9	Pass
4	0.0079	0.0083	105.2	Pass
5	0.0083	0.0087	105.2	Pass
6	0.0082	0.0085	103.9	Pass
7	0.0085	0.0090	106.6	Pass
8	0.0088	0.0092	104.7	Pass
9	0.0085	0.0086	101.1	Pass

Pond 2 Hydraulic Analysis:

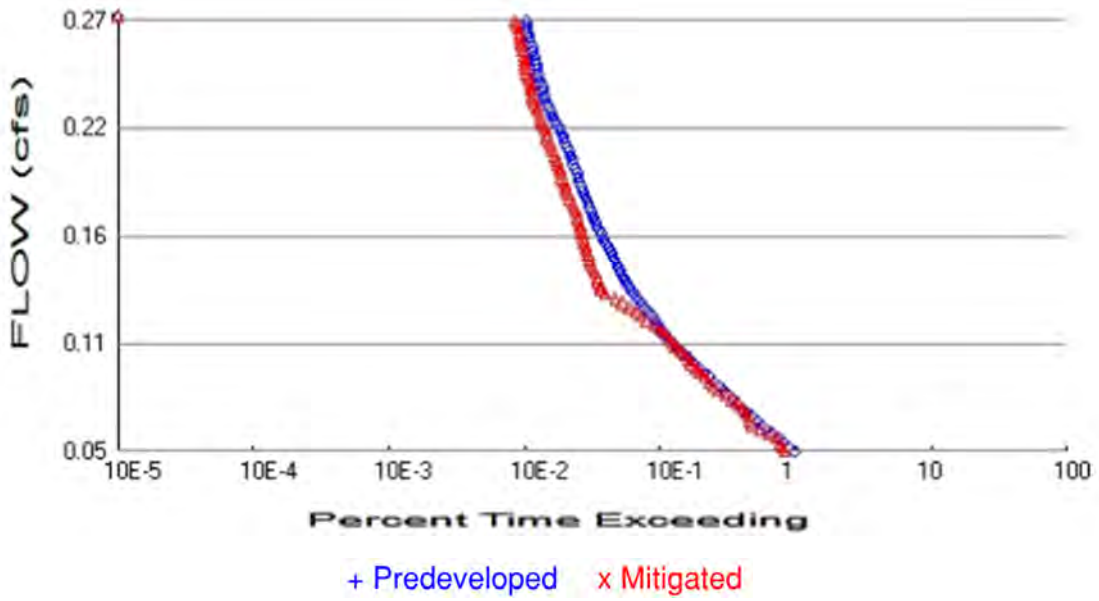
The Pond 2 subbasin does not involve wetland recharge and therefore durations and flow control govern and the pre-developed condition is modeled is C-Forest. The following table summarizes the developed basins areas that were input into WWHM model for the pond durations, flow control, and water quality storage sizing. Post Construction Soil Quality and Depth (BMP T5.13) will be utilized in all landscaped areas, therefore, the pervious areas are modeled as C-Pasture as allowed per the 2019 DOE SWMMWW.

Pond 2 Developed Basin Summary			
	Total	Impervious	Pervious
Lots	209,680	125,808	83,872
ROW	95,115	82,037	13,078
Tract B	3,410	0	3,410
Tract D	34,692	21,000	13,692
Tract I	54,222	5,500	48,722
Tract O	3,600	1,440	2,160
Tract P	4,440	3,186	1,254
Driveways (77-81, 203)	2,400	2,400	0
Total (sf)	405,159	238,971	166,188
Total (acres)	**9.30**	**5.49**	**3.82**

Pond 2 is designed with a live storage depth of 5.7 feet, and an overall required volume of 2.2112 acre-feet, or 96,319 cubic feet. The proposed live storage volume is 99,677 cubic feet. The required water quality storage volume is 0.4863 acre-feet, or 21,183 cubic feet. The proposed water quality storage is greater than 25,000 cubic feet at a depth of 4 feet. Snippets of the pond and control structure data from the WWHM output file are included below, as well as pre-developed and developed flow rates and durations are included as well. Secondary and emergency overflow design for the pond will be completed during Final Engineering.

Pond 2

Bottom Length:	129.00 ft.
Bottom Width:	106.00 ft.
Depth:	6.7 ft.
Volume at riser head:	2.2112 acre-feet.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	0 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	5.7 ft.
Riser Diameter:	18 in.
Notch Type:	Rectangular
Notch Width:	0.021 ft.
Notch Height:	0.650 ft.
Orifice 1 Diameter:	0.940 in. Elevation:0 ft.
Orifice 2 Diameter:	0.940 in. Elevation:4.55 ft.
Orifice 3 Diameter:	0.940 in. Elevation:4.85 ft.



Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.105219
5 year	0.165654
10 year	0.202304
25 year	0.24385
50 year	0.271384
100 year	0.29621

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.060641
5 year	0.127738
10 year	0.201279
25 year	0.344206
50 year	0.501182
100 year	0.71684

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.4863 acre-feet
On-line facility target flow:	0.759 cfs.
Adjusted for 15 min:	0.759 cfs.
Off-line facility target flow:	0.4298 cfs.
Adjusted for 15 min:	0.4298 cfs.

Pond 3 Hydraulic Analysis:

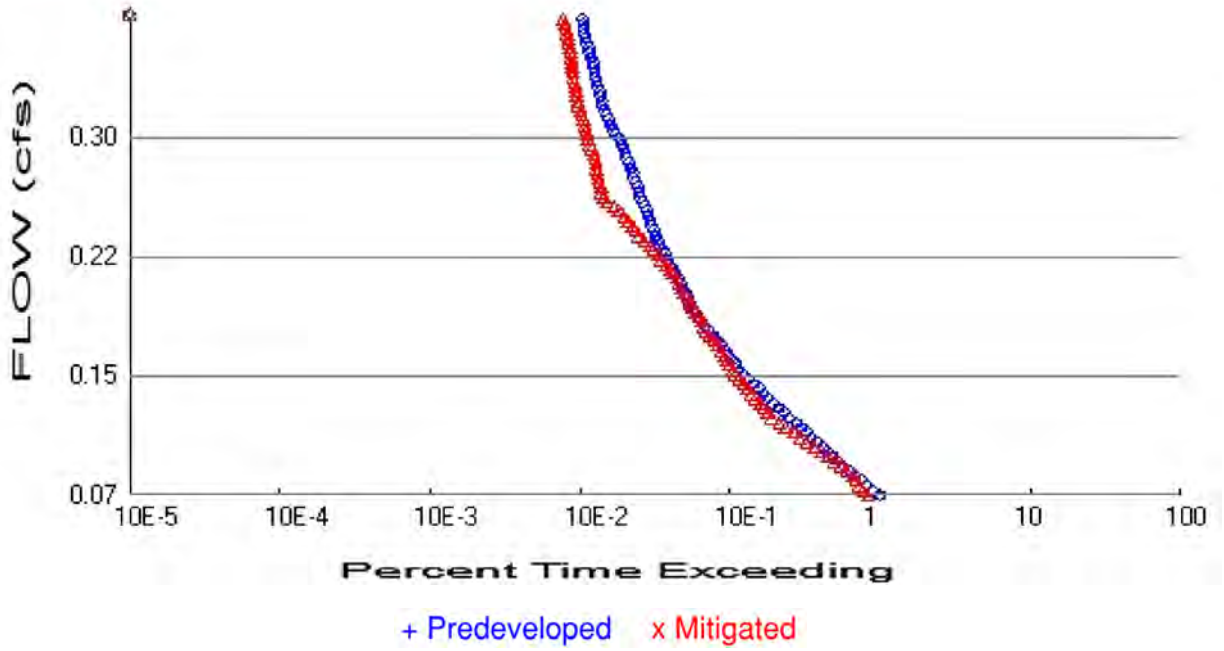
The Pond 3 subbasin does not involve wetland recharge and therefore durations and flow control govern and the pre-developed condition is modeled is C-Forest. The following table summarizes the developed basins areas that were input into WWHM model for the pond durations, flow control, and water quality storage sizing. Post Construction Soil Quality and Depth (BMP T5.13) will be utilized in all landscaped areas, therefore, the pervious areas are modeled as C-Pasture as allowed per the 2019 DOE SWMMWW.

Pond 3 Developed Basin Summary			
	Total	Impervious	Pervious
Lots	296,577	177,946	118,631
ROW	135,911	117,677	18,234
Ridgeway Heights Lots	17,713	10,628	7,085
Tract E	62,192	38,000	24,192
Tract J	7,783	2,500	5,283
Tract Q	2,000	1,200	800
Tract R	1,128	1,128	0
Tract S	7,370	7,370	0
Driveways (187-192, 196-197)	3,200	3,200	0
Toal (sf)	533,874	359,649	174,225
Total (acres)	**12.25**	**8.25**	**4.00**

Pond 3 is designed with a live storage depth of 5 feet, and an overall required volume of 3.4268 acre-feet, or 149,271 cubic feet. The proposed live storage volume is 152,535 cubic feet. The required water quality storage volume is 0.7033 acre-feet, or 30,636 cubic feet. The proposed water quality storage is greater than 35,000 cubic feet at a depth of 4 feet. Snippets of the pond and control structure data from the WWHM output file are included below, as well as pre-developed and developed flow rates and durations are included as well. Secondary and emergency overflow design for the pond will be completed during Final Engineering.

Pond 3

Bottom Length:	292.00 ft.
Bottom Width:	82.00 ft.
Depth:	6 ft.
Volume at riser head:	3.4268 acre-feet.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	5 ft.
Riser Diameter:	18 in.
Notch Type :	V-notch
Notch Angle:	12.000
Notch Height:	0.750 ft.
Orifice 1 Diameter:	1.130 in. Elevation:0 ft.
Orifice 2 Diameter:	1.000 in. Elevation:4 ft.
Orifice 3 Diameter:	1.000 in. Elevation:4.1 ft.



Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.145976
5 year	0.229821
10 year	0.280668
25 year	0.338306
50 year	0.376507
100 year	0.410949

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.079989
5 year	0.157011
10 year	0.236974
25 year	0.385164
50 year	0.541206
100 year	0.74828

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.7033 acre-feet
On-line facility target flow:	1.15 cfs.
Adjusted for 15 min:	1.15 cfs.
Off-line facility target flow:	0.6513 cfs.
Adjusted for 15 min:	0.6513 cfs.

WSDOT Pond Hydraulic Analysis:

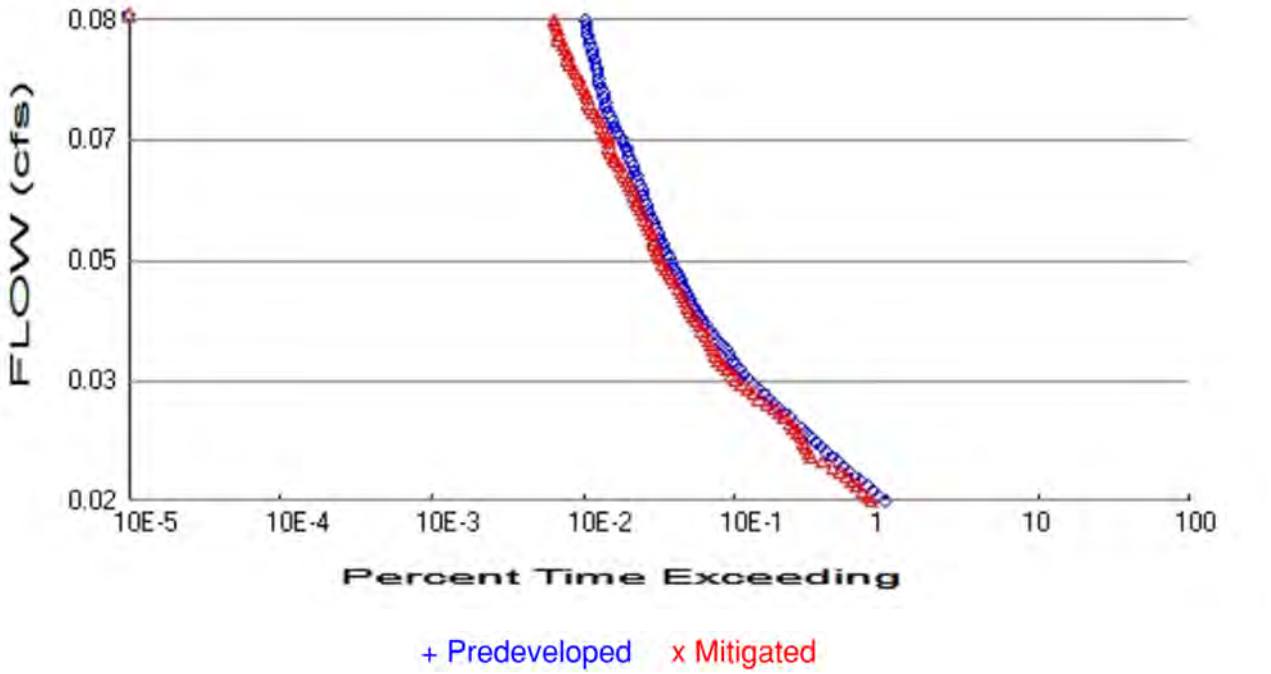
The existing WSDOT Pond "E" located in the southeast corner of the site is being redesigned as part of the proposed development since much of the existing on-site area that is currently tributary to the pond is going to be routed to Pond 2 on-site. The WSDOT pond is being sized to account for the new State Route 20 frontage improvements that are required, and is being brought up to 2019 DOE SWMMWW standards. The proposed frontage improvements eliminate the existing bioswale that provides water quality, so the revised pond will have water quality storage as well. The subbasin does not involve wetland recharge and therefore durations and flow control govern and the pre-developed condition is modeled is C-Forest. The following table summarizes the developed basins areas that were input into WWHM model for the pond durations, flow control, and water quality storage sizing. Post Construction Soil Quality and Depth (BMP T5.13) will be utilized in all landscaped areas, therefore, the pervious areas are modeled as C-Pasture as allowed per the 2019 DOE SWMMWW. The applicable pages from the original construction plans and storm report for WSDOT Pond "E" are included in Appendix C for reference.

WSDOT Pond – Developed Basin Summary	
Land Cover	Area (Acres)
C-Pasture	1.31
Impervious	1.38
Total	**2.69**

The WSDOT Pond is designed with a live storage depth of 3.7 feet, and an overall required volume of 0.4961 acre-feet, or 21,610 cubic feet. The proposed live storage volume is 22,052 cubic feet. The required water quality storage volume is 0.1266 acre-feet, or 5,515 cubic feet. The proposed water quality storage is greater than 8,000 cubic feet at a depth of 4 feet. Snippets of the pond and control structure data from the WWHM output file are included below, as well as pre-developed and developed flow rates and durations are included as well. Secondary and emergency overflow design for the pond will be completed during Final Engineering.

Trapezoidal Pond 1

Bottom Length:	92.00 ft.
Bottom Width:	45.00 ft.
Depth:	4.7 ft.
Volume at riser head:	0.4961 acre-feet.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	3.7 ft.
Riser Diameter:	18 in.
Notch Type :	V-notch
Notch Angle:	35.000
Notch Height:	0.300 ft.
Orifice 1 Diameter:	0.565 in. Elevation:0 ft.
Orifice 2 Diameter:	0.688 in. Elevation:2.9 ft.
Orifice 3 Diameter:	0.688 in. Elevation:3.2 ft.



Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.032533
5 year	0.051219
10 year	0.062552
25 year	0.075397
50 year	0.083911
100 year	0.091587

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.018728
5 year	0.039177
10 year	0.061471
25 year	0.104599
50 year	0.151771
100 year	0.216358

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.1266 acre-feet
On-line facility target flow:	0.1895 cfs.
Adjusted for 15 min:	0.1895 cfs.
Off-line facility target flow:	0.107 cfs.
Adjusted for 15 min:	0.107 cfs.

Section 5: Conveyance System Analysis & Design

The conveyance system will be designed to ensure adequate capacity during Final Engineering.

Section 6: TESC/SWPPP Analysis & Design

The temporary erosion and sediment control plans will be completed during Final Engineering. A draft SWPPP has been provided/submitted under separate cover.

Section 7: Operations & Maintenance Manual

An Operations and Maintenance Manual will be prepared and provided during Final Engineering.

Section 8: Associated Reports & Studies

The following reports have been prepared and submitted under separate cover, with the exception of the Geotechnical Engineering Report which is included in Appendix B of this report.

- Geotechnical Engineering Report prepared by The Riley Group, Inc.
- Traffic Impact Analysis prepared by Transpo Group
- Critical Areas Report and Habitat Management Plan prepared by Wetland Resources, Inc.

Appendix A – WWHM Output Files

POND 1 / WETLAND A RECHARGE

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Pond 1

Site Name:	Oak Heights
Site Address:	
City:	Oak Harbor
Report Date:	7/19/2024
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Wetland A Buffer

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	1.25

Ex. Pasture

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	12.19

Ex. Roofs/Driveways/Roads

Bypass:	No
Impervious Land Use	acre
ROADS MOD	1.33

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	3.12
Pervious Total	3.12
Impervious Land Use	acre
ROADS MOD	7.33
Impervious Total	7.33
Basin Total	10.45

Wetland A Buffer

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	1.25

Dispersed Roofs/Walks

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C IMP DISP MOD	1.09

Dispersed Yards

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Flat	1.43

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length: 145.00 ft.
Bottom Width: 115.00 ft.
Depth: 7 ft.
Volume at riser head: 3.0429 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 18 in.
Notch Type : V-notch
Notch Angle: 20.000
Notch Height: 1.500 ft.
Orifice 1 Diameter: 1.438 in. Elevation:0 ft.
Orifice 2 Diameter: 2.500 in. Elevation:2.75 ft.
Orifice 3 Diameter: 3.000 in. Elevation:3.5 ft.
Element Flows To:
Outlet 1 Outlet 2
Wetland A Buffer

Pond Hydraulic Table

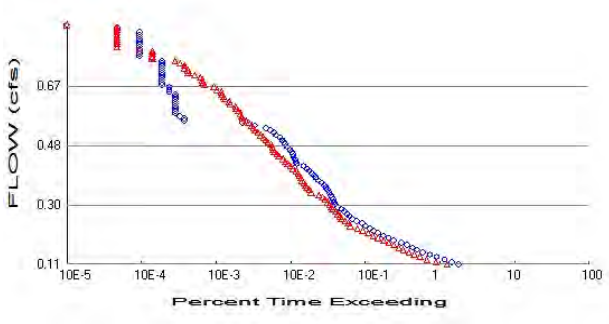
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
163.00	0.382	0.000	0.000	0.000
163.08	0.385	0.029	0.015	0.000
163.16	0.388	0.060	0.022	0.000
163.23	0.391	0.090	0.027	0.000
163.31	0.394	0.120	0.031	0.000
163.39	0.396	0.151	0.035	0.000
163.47	0.399	0.182	0.038	0.000
163.54	0.402	0.213	0.041	0.000
163.62	0.405	0.245	0.044	0.000
163.70	0.408	0.276	0.046	0.000
163.78	0.411	0.308	0.049	0.000
163.86	0.414	0.340	0.051	0.000
163.93	0.417	0.373	0.054	0.000
164.01	0.419	0.405	0.056	0.000
164.09	0.422	0.438	0.058	0.000
164.17	0.425	0.471	0.060	0.000
164.24	0.428	0.504	0.062	0.000
164.32	0.431	0.538	0.064	0.000
164.40	0.434	0.571	0.066	0.000
164.48	0.437	0.605	0.068	0.000
164.56	0.440	0.639	0.069	0.000
164.63	0.443	0.674	0.071	0.000
164.71	0.446	0.708	0.073	0.000
164.79	0.449	0.743	0.075	0.000
164.87	0.452	0.778	0.076	0.000
164.94	0.455	0.814	0.078	0.000
165.02	0.458	0.849	0.079	0.000
165.10	0.461	0.885	0.081	0.000
165.18	0.464	0.921	0.082	0.000
165.26	0.467	0.957	0.084	0.000

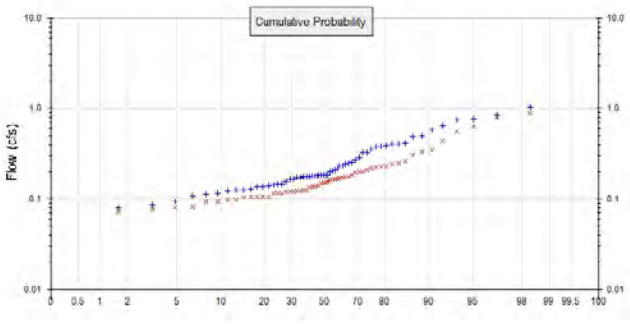
165.33	0.470	0.994	0.085	0.000
165.41	0.474	1.030	0.087	0.000
165.49	0.477	1.067	0.088	0.000
165.57	0.480	1.105	0.089	0.000
165.64	0.483	1.142	0.091	0.000
165.72	0.486	1.180	0.092	0.000
165.80	0.489	1.218	0.131	0.000
165.88	0.492	1.256	0.155	0.000
165.96	0.495	1.294	0.173	0.000
166.03	0.499	1.333	0.187	0.000
166.11	0.502	1.372	0.200	0.000
166.19	0.505	1.411	0.212	0.000
166.27	0.508	1.451	0.223	0.000
166.34	0.511	1.490	0.233	0.000
166.42	0.515	1.530	0.242	0.000
166.50	0.518	1.571	0.251	0.000
166.58	0.521	1.611	0.328	0.000
166.66	0.524	1.652	0.364	0.000
166.73	0.528	1.693	0.394	0.000
166.81	0.531	1.734	0.420	0.000
166.89	0.534	1.775	0.443	0.000
166.97	0.537	1.817	0.465	0.000
167.04	0.541	1.859	0.485	0.000
167.12	0.544	1.901	0.505	0.000
167.20	0.547	1.944	0.523	0.000
167.28	0.551	1.986	0.541	0.000
167.36	0.554	2.029	0.557	0.000
167.43	0.557	2.073	0.574	0.000
167.51	0.561	2.116	0.589	0.000
167.59	0.564	2.160	0.606	0.000
167.67	0.567	2.204	0.625	0.000
167.74	0.571	2.248	0.647	0.000
167.82	0.574	2.293	0.675	0.000
167.90	0.578	2.338	0.708	0.000
167.98	0.581	2.383	0.748	0.000
168.06	0.585	2.428	0.794	0.000
168.13	0.588	2.474	0.847	0.000
168.21	0.591	2.520	0.909	0.000
168.29	0.595	2.566	0.979	0.000
168.37	0.598	2.612	1.057	0.000
168.44	0.602	2.659	1.145	0.000
168.52	0.605	2.706	1.243	0.000
168.60	0.609	2.753	1.350	0.000
168.68	0.612	2.801	1.468	0.000
168.76	0.616	2.849	1.596	0.000
168.83	0.619	2.897	1.736	0.000
168.91	0.623	2.945	1.887	0.000
168.99	0.626	2.994	2.050	0.000
169.07	0.630	3.042	2.357	0.000
169.14	0.634	3.092	2.963	0.000
169.22	0.637	3.141	3.741	0.000
169.30	0.641	3.191	4.615	0.000
169.38	0.644	3.241	5.510	0.000
169.46	0.648	3.291	6.350	0.000
169.53	0.652	3.342	7.068	0.000
169.61	0.655	3.393	7.621	0.000
169.69	0.659	3.444	8.011	0.000
169.77	0.663	3.495	8.377	0.000

169.84	0.666	3.547	8.694	0.000
169.92	0.670	3.599	8.996	0.000
170.00	0.674	3.651	9.286	0.000
170.08	0.677	3.704	9.566	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 13.44
Total Impervious Area: 1.33

Mitigated Landuse Totals for POC #1
Total Pervious Area: 6.89
Total Impervious Area: 7.33

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.212551
5 year	0.368831
10 year	0.498026
25 year	0.692464
50 year	0.861233
100 year	1.051575

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.153907
5 year	0.25665
10 year	0.346761
25 year	0.490731
50 year	0.62329
100 year	0.780691

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.174	0.137
1950	0.386	0.164
1951	0.176	0.107
1952	0.184	0.122
1953	0.216	0.097
1954	0.757	0.346
1955	0.402	0.222
1956	0.247	0.228
1957	0.403	0.183
1958	0.375	0.120

1959	0.179	0.120
1960	0.156	0.115
1961	1.022	0.788
1962	0.164	0.077
1963	0.498	0.168
1964	0.141	0.134
1965	0.182	0.140
1966	0.086	0.093
1967	0.175	0.106
1968	0.209	0.147
1969	0.768	0.553
1970	0.136	0.107
1971	0.268	0.248
1972	0.287	0.245
1973	0.146	0.153
1974	0.329	0.217
1975	0.234	0.126
1976	0.125	0.097
1977	0.093	0.081
1978	0.122	0.104
1979	0.580	0.260
1980	0.183	0.148
1981	0.113	0.081
1982	0.140	0.141
1983	0.232	0.178
1984	0.172	0.229
1985	0.353	0.207
1986	0.488	0.627
1987	0.244	0.308
1988	0.116	0.154
1989	0.254	0.120
1990	0.183	0.164
1991	0.181	0.135
1992	0.165	0.160
1993	0.080	0.072
1994	0.107	0.124
1995	0.205	0.202
1996	0.329	0.202
1997	0.845	0.889
1998	0.202	0.107
1999	0.183	0.125
2000	0.137	0.167
2001	0.032	0.045
2002	0.182	0.178
2003	0.128	0.092
2004	0.173	0.173
2005	0.126	0.114
2006	0.650	0.334
2007	0.413	0.194
2008	0.377	0.442
2009	0.145	0.115

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.0224	0.8890
2	0.8455	0.7885
3	0.7682	0.6274

4	0.7572	0.5532
5	0.6502	0.4422
6	0.5795	0.3464
7	0.4981	0.3341
8	0.4880	0.3079
9	0.4126	0.2596
10	0.4028	0.2480
11	0.4016	0.2445
12	0.3865	0.2292
13	0.3771	0.2279
14	0.3755	0.2224
15	0.3526	0.2167
16	0.3291	0.2068
17	0.3287	0.2020
18	0.2870	0.2019
19	0.2683	0.1939
20	0.2536	0.1827
21	0.2466	0.1780
22	0.2436	0.1779
23	0.2340	0.1735
24	0.2320	0.1680
25	0.2157	0.1666
26	0.2094	0.1638
27	0.2052	0.1638
28	0.2016	0.1601
29	0.1840	0.1541
30	0.1835	0.1529
31	0.1826	0.1479
32	0.1826	0.1473
33	0.1819	0.1405
34	0.1816	0.1396
35	0.1805	0.1373
36	0.1792	0.1351
37	0.1762	0.1345
38	0.1749	0.1261
39	0.1745	0.1253
40	0.1728	0.1239
41	0.1716	0.1224
42	0.1651	0.1202
43	0.1639	0.1198
44	0.1563	0.1196
45	0.1464	0.1153
46	0.1445	0.1146
47	0.1414	0.1144
48	0.1404	0.1067
49	0.1367	0.1066
50	0.1357	0.1066
51	0.1276	0.1060
52	0.1262	0.1039
53	0.1249	0.0973
54	0.1217	0.0971
55	0.1163	0.0933
56	0.1133	0.0923
57	0.1069	0.0812
58	0.0927	0.0808
59	0.0864	0.0771
60	0.0804	0.0723
61	0.0322	0.0449

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1063	37580	26586	70	Pass
0.1139	30928	18942	61	Pass
0.1215	24554	14217	57	Pass
0.1292	19372	11473	59	Pass
0.1368	15607	9706	62	Pass
0.1444	12660	8222	64	Pass
0.1520	10620	6960	65	Pass
0.1597	9133	6049	66	Pass
0.1673	7796	5159	66	Pass
0.1749	6541	4434	67	Pass
0.1825	5069	3764	74	Pass
0.1902	4355	3163	72	Pass
0.1978	3749	2723	72	Pass
0.2054	3181	2321	72	Pass
0.2130	2744	1981	72	Pass
0.2207	2445	1684	68	Pass
0.2283	2150	1348	62	Pass
0.2359	1925	1262	65	Pass
0.2435	1618	1152	71	Pass
0.2512	1434	1022	71	Pass
0.2588	1319	982	74	Pass
0.2664	1220	925	75	Pass
0.2740	1113	853	76	Pass
0.2817	1024	779	76	Pass
0.2893	898	740	82	Pass
0.2969	848	708	83	Pass
0.3045	817	665	81	Pass
0.3122	789	614	77	Pass
0.3198	766	569	74	Pass
0.3274	733	506	69	Pass
0.3351	700	404	57	Pass
0.3427	671	379	56	Pass
0.3503	633	352	55	Pass
0.3579	598	338	56	Pass
0.3656	563	321	57	Pass
0.3732	508	305	60	Pass
0.3808	461	291	63	Pass
0.3884	436	280	64	Pass
0.3961	410	269	65	Pass
0.4037	382	254	66	Pass
0.4113	352	228	64	Pass
0.4189	318	211	66	Pass
0.4266	257	195	75	Pass
0.4342	247	179	72	Pass
0.4418	242	169	69	Pass
0.4494	233	148	63	Pass
0.4571	227	140	61	Pass
0.4647	219	129	58	Pass
0.4723	209	124	59	Pass
0.4799	191	122	63	Pass
0.4876	181	116	64	Pass
0.4952	172	106	61	Pass
0.5028	164	99	60	Pass
0.5104	153	92	60	Pass

0.5181	137	84	61	Pass
0.5257	126	78	61	Pass
0.5333	114	71	62	Pass
0.5409	99	68	68	Pass
0.5486	71	64	90	Pass
0.5562	48	58	120	Fail
0.5638	8	54	675	Fail
0.5715	8	48	600	Fail
0.5791	7	47	671	Fail
0.5867	6	45	750	Fail
0.5943	6	42	700	Fail
0.6020	6	40	666	Fail
0.6096	6	39	650	Fail
0.6172	6	33	550	Fail
0.6248	6	32	533	Fail
0.6325	6	28	466	Fail
0.6401	6	27	450	Fail
0.6477	6	25	416	Fail
0.6553	5	25	500	Fail
0.6630	5	22	440	Fail
0.6706	5	20	400	Fail
0.6782	4	15	375	Fail
0.6858	4	14	350	Fail
0.6935	4	14	350	Fail
0.7011	4	13	325	Fail
0.7087	4	11	275	Fail
0.7163	4	9	225	Fail
0.7240	4	9	225	Fail
0.7316	4	8	200	Fail
0.7392	4	8	200	Fail
0.7468	4	7	175	Fail
0.7545	4	6	150	Fail
0.7621	3	3	100	Pass
0.7697	2	3	150	Fail
0.7773	2	3	150	Fail
0.7850	2	3	150	Fail
0.7926	2	2	100	Pass
0.8002	2	1	50	Pass
0.8079	2	1	50	Pass
0.8155	2	1	50	Pass
0.8231	2	1	50	Pass
0.8307	2	1	50	Pass
0.8384	2	1	50	Pass
0.8460	2	1	50	Pass
0.8536	1	1	100	Pass
0.8612	1	1	100	Pass

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.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.2239 acre-feet
On-line facility target flow:	0.1126 cfs.
Adjusted for 15 min:	0.1126 cfs.
Off-line facility target flow:	0.075 cfs.
Adjusted for 15 min:	0.075 cfs.

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	☐	865.82			☐	0.00			
Total Volume Infiltrated		865.82	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

Model Default Modifications

Total of 0 changes have been made.

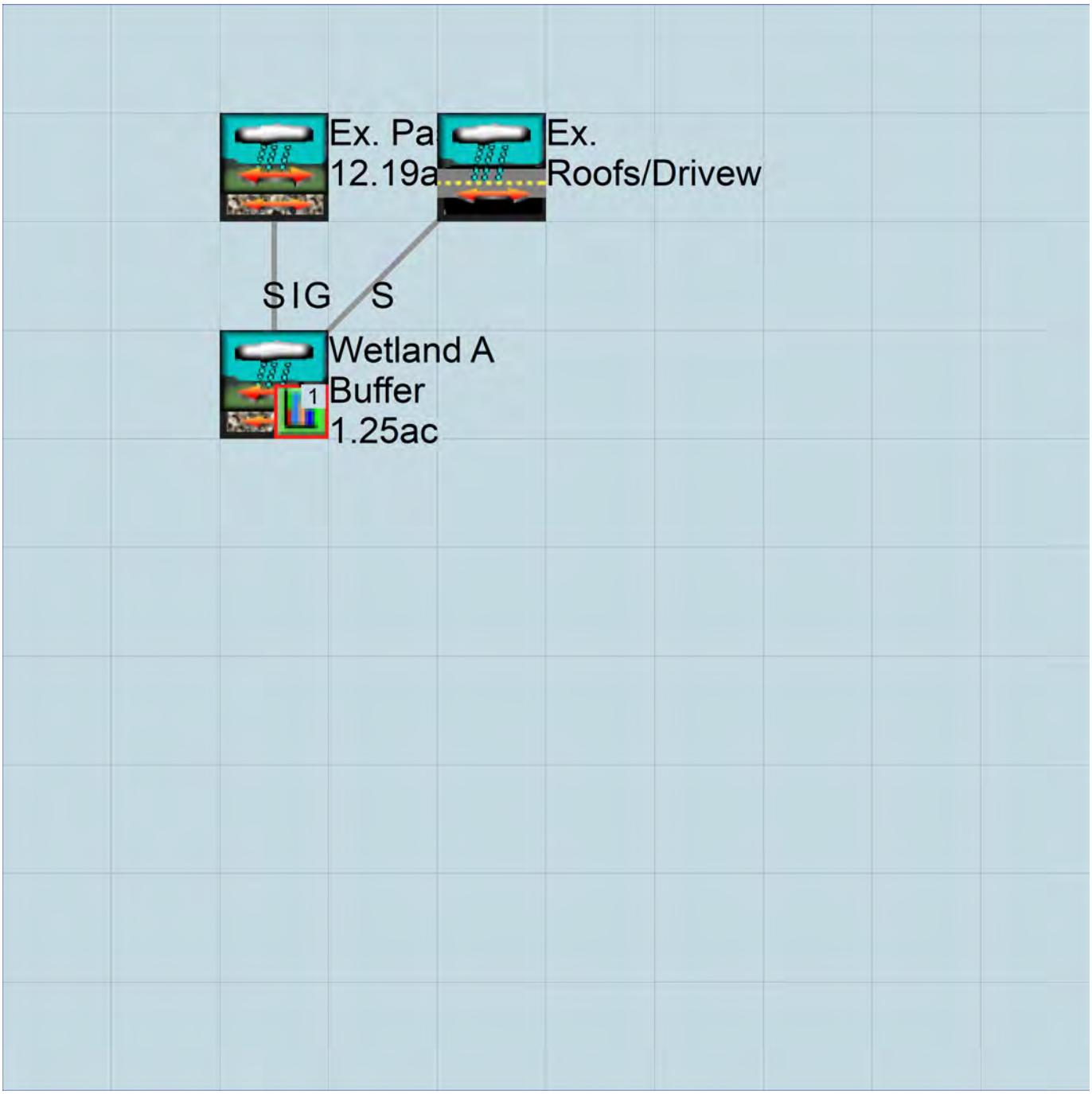
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Pond 1.wdm
MESSU       25   PrePond 1.MES
            27   PrePond 1.L61
            28   PrePond 1.L62
            30   POCPond 11.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      39
      IMPLND      16
      PERLND      38
      COPY       501
      COPY         1
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Wetland A Buffer            MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   39     C, Pasture, Mod         1    1    1    1   27    0
   38     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   39         0    0    1    0    0    0    0    0    0    0    0    0
   38         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
```

```
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   39         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   38         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   39         0    0    0    0    0    0    0    0    0    0    0
   38         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   39              0       4.5      0.06       400       0.1       0.5     0.996
   38              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   39              0         0         2         2         0         0         0
   38              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   39          0.15       0.4       0.3         6       0.5       0.4
   38          0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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      GWVS
   39              0         0         0         0       2.5         1         0
   38              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                  in  out           ***
   16      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   16         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   16         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   16         0    0    0    0    0
  END IWAT-PARM1
```

```
  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   16            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   16              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   16             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Ex. Roofs/Driveways/Roads***
IMPLND  16                       1.064     PERLND  38     50
Ex. Pasture***
PERLND  39                       9.752     PERLND  38     30
PERLND  39                       9.752     PERLND  38     34
PERLND  39                       9.752     PERLND  38     38
Wetland A Buffer***
PERLND  38                        1.25     COPY   501     12
PERLND  38                        1.25     COPY   501     13
PERLND  38                        1.25     COPY   501     14

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
```

```
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  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 OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   14

  MASS-LINK       30
PERLND     PWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   30

  MASS-LINK       34
PERLND     PWATER IFWO                     PERLND         EXTNL  IFWLI
  END MASS-LINK   34

  MASS-LINK       38
PERLND     PWATER AGWO                     PERLND         EXTNL  AGWLI
  END MASS-LINK   38

  MASS-LINK       50
IMPLND     IWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   50


END MASS-LINK
```

```
END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Pond 1.wdm
MESSU       25   MitPond 1.MES
            27   MitPond 1.L61
            28   MitPond 1.L62
            30   POCPond 11.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      IMPLND       2
      PERLND      44
      PERLND      45
      RCHRES       1
      PERLND      41
      COPY       501
      COPY         1
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Wetland A Buffer            MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
   44      C/IMP DISP /MOD        1    1    1    1   27    0
   45     C, Pasture, Flat        1    1    1    1   27    0
   41     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
   13         0    0    1    0    0    0    0    0    0    0    0    0
   44         0    0    1    0    0    0    0    0    0    0    0    0
   45         0    0    1    0    0    0    0    0    0    0    0    0
   41         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   44         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   41         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   13         0    0    0    0    0    0    0    0    0    0    0
   44         0    0    0    0    0    0    0    0    0    0    0
   45         0    0    0    0    0    0    0    0    0    0    0
   41         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   13              0       4.5      0.06       400      0.05        0.5      0.996
   44              0       4.5      0.03       400       0.1        0.5      0.996
   45              0       4.5      0.06       400      0.05        0.5      0.996
   41              0       4.5      0.06       400       0.1        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13              0         0         2         2         0         0         0
   44              0         0         2         2         0         0         0
   45              0         0         2         2         0         0         0
   41              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13          0.15       0.4       0.3         6       0.5       0.4
   44           0.1      0.25      0.25         6       0.5      0.25
   45          0.15       0.4       0.3         6       0.5       0.4
   41          0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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      GWVS
   13              0         0         0         0       2.5          1         0
   44              0         0         0         0       2.5          1         0
   45              0         0         0         0       2.5          1         0
   41              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***
```

```
  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2               0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  13                      3.12     RCHRES   1      2
PERLND  13                      3.12     RCHRES   1      3
IMPLND   2                      7.33     RCHRES   1      5
Dispersed Roofs/Walks***
PERLND  44                     0.872     PERLND  41     30
Dispersed Yards***
PERLND  45                     1.144     PERLND  41     30
PERLND  45                     1.144     PERLND  41     34
PERLND  45                     1.144     PERLND  41     38
Wetland A Buffer***
PERLND  41                      1.25     COPY   501     12
PERLND  41                      1.25     COPY   501     13
PERLND  41                      1.25     COPY   501     14

******Routing******
RCHRES   1                        .8     PERLND  41     60
RCHRES   1                               COPY     1     16
PERLND  44                      1.09     COPY     1     12
PERLND  45                      1.43     COPY     1     12
PERLND  45                      1.43     COPY     1     13
PERLND  45                      1.43     COPY     1     14
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
```

```
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                        in  out                              ***
    1     Trapezoidal Pond-005    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1               1      0.03       0.0     163.0       0.5       0.0
  END HYDR-PARM2
  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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><--->
```

1.011111	0.419861	0.405651	0.056386
1.088889	0.422781	0.438420	0.058515
1.166667	0.425712	0.471417	0.060569
1.244444	0.428652	0.504642	0.062555
1.322222	0.431602	0.538097	0.064480
1.400000	0.434563	0.571781	0.066350
1.477778	0.437533	0.605696	0.068168
1.555556	0.440514	0.639842	0.069939
1.633333	0.443504	0.674221	0.071666
1.711111	0.446505	0.708832	0.073352
1.788889	0.449515	0.743677	0.075001
1.866667	0.452535	0.778757	0.076614
1.944444	0.455566	0.814072	0.078194
2.022222	0.458606	0.849623	0.079742
2.100000	0.461657	0.885411	0.081261
2.177778	0.464717	0.921437	0.082753
2.255556	0.467787	0.957701	0.084217
2.333333	0.470868	0.994204	0.085657
2.411111	0.473958	1.030947	0.087073
2.488889	0.477059	1.067931	0.088466
2.566667	0.480169	1.105157	0.089838
2.644444	0.483289	1.142625	0.091189
2.722222	0.486420	1.180336	0.092520
2.800000	0.489560	1.218290	0.131757
2.877778	0.492711	1.256490	0.155754
2.955556	0.495871	1.294935	0.173300
3.033333	0.499041	1.333626	0.187943
3.111111	0.502222	1.372564	0.200828
3.188889	0.505412	1.411749	0.212498
3.266667	0.508612	1.451184	0.223262
3.344444	0.511823	1.490867	0.233316
3.422222	0.515043	1.530801	0.242794
3.500000	0.518274	1.570985	0.251790
3.577778	0.521514	1.611422	0.328491
3.655556	0.524764	1.652110	0.364937
3.733333	0.528025	1.693052	0.394509
3.811111	0.531295	1.734248	0.420408
3.888889	0.534576	1.775698	0.443888
3.966667	0.537866	1.817404	0.465604
4.044444	0.541166	1.859367	0.485948
4.122222	0.544477	1.901586	0.505183
4.200000	0.547797	1.944064	0.523491
4.277778	0.551127	1.986800	0.541009
4.355556	0.554468	2.029795	0.557842
4.433333	0.557818	2.073050	0.574071
4.511111	0.561179	2.116567	0.589769
4.588889	0.564549	2.160345	0.606075
4.666667	0.567929	2.204386	0.625037
4.744444	0.571320	2.248690	0.647867
4.822222	0.574720	2.293258	0.675484
4.900000	0.578130	2.338092	0.708654
4.977778	0.581551	2.383190	0.748047
5.055556	0.584981	2.428555	0.794262
5.133333	0.588421	2.474188	0.847848
5.211111	0.591872	2.520088	0.909312
5.288889	0.595332	2.566257	0.979128
5.366667	0.598803	2.612696	1.057740
5.444444	0.602283	2.659404	1.145571
5.522222	0.605773	2.706384	1.243024
5.600000	0.609274	2.753636	1.350483
5.677778	0.612784	2.801161	1.468318
5.755556	0.616304	2.848959	1.596885
5.833333	0.619835	2.897031	1.736528
5.911111	0.623375	2.945378	1.887581
5.988889	0.626925	2.994001	2.050367
6.066667	0.630486	3.042900	2.357289
6.144444	0.634056	3.092076	2.962952
6.222222	0.637636	3.141531	3.741142
6.300000	0.641227	3.191265	4.615566
6.377778	0.644827	3.241278	5.510573

```
  6.455556  0.648438  3.291572  6.350247
  6.533333  0.652058  3.342146  7.068106
  6.611111  0.655688  3.393003  7.621894
  6.688889  0.659329  3.444143  8.011884
  6.766667  0.662979  3.495566  8.377575
  6.844444  0.666639  3.547273  8.694058
  6.922222  0.670310  3.599266  8.996596
  7.000000  0.673990  3.651544  9.286912
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   14

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       30
PERLND     PWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   30

  MASS-LINK       34
PERLND     PWATER IFWO                     PERLND         EXTNL  IFWLI
  END MASS-LINK   34

  MASS-LINK       38
PERLND     PWATER AGWO                     PERLND         EXTNL  AGWLI
  END MASS-LINK   38
```

```
  MASS-LINK       60
RCHRES     ROFLOW            12.00000      PERLND         EXTNL  SURLI
  END MASS-LINK   60


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2024; All Rights Reserved.

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

WETLAND B RECHARGE

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Oak Heights - Wetland B Recharge

Site Name:	Oak Heights
Site Address:	
City:	Oak Harbor
Report Date:	7/19/2024
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Ex Pasture

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Mod	1.17

Wetland B Buffer

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	.39

Mitigated Land Use

Yards and Tract B

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	.467

Wetland B Buffer

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	.39

Lateral I Basin 1

Bypass:	No
Impervious Land Use	acre
SIDEWALKS FLAT	0.219

Dispersed Roofs

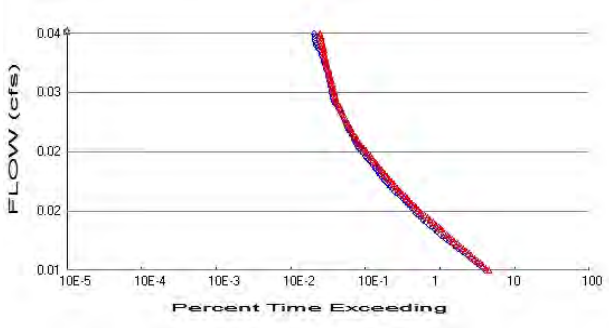
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C IMP DISP MOD	.232

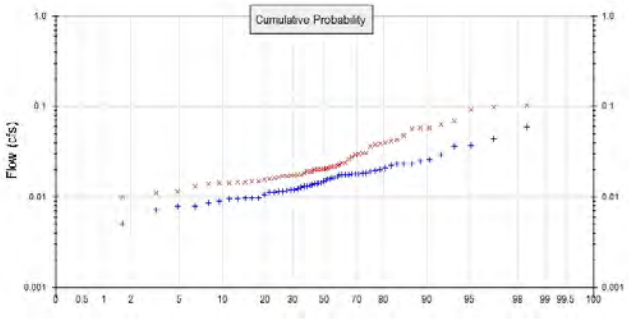
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.56
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.089
Total Impervious Area: 0.219

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.015191
5 year	0.022766
10 year	0.027743
25 year	0.033906
50 year	0.038387
100 year	0.042765

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.022785
5 year	0.038451
10 year	0.051724
25 year	0.07224
50 year	0.090537
100 year	0.111676

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.005	0.015
1950	0.018	0.037
1951	0.014	0.019
1952	0.011	0.018
1953	0.007	0.017
1954	0.030	0.092
1955	0.023	0.043
1956	0.025	0.026
1957	0.022	0.038
1958	0.018	0.030

1959	0.018	0.021
1960	0.014	0.017
1961	0.014	0.063
1962	0.010	0.016
1963	0.010	0.057
1964	0.011	0.018
1965	0.018	0.020
1966	0.009	0.011
1967	0.018	0.020
1968	0.019	0.024
1969	0.013	0.102
1970	0.013	0.016
1971	0.020	0.027
1972	0.014	0.022
1973	0.012	0.017
1974	0.017	0.040
1975	0.013	0.020
1976	0.013	0.014
1977	0.009	0.011
1978	0.012	0.015
1979	0.016	0.068
1980	0.012	0.019
1981	0.010	0.013
1982	0.014	0.019
1983	0.016	0.030
1984	0.016	0.022
1985	0.021	0.031
1986	0.044	0.058
1987	0.023	0.030
1988	0.011	0.014
1989	0.010	0.021
1990	0.018	0.021
1991	0.018	0.020
1992	0.016	0.018
1993	0.008	0.010
1994	0.008	0.015
1995	0.019	0.023
1996	0.026	0.038
1997	0.059	0.099
1998	0.012	0.014
1999	0.018	0.020
2000	0.010	0.014
2001	0.002	0.005
2002	0.017	0.021
2003	0.012	0.015
2004	0.015	0.024
2005	0.011	0.017
2006	0.037	0.058
2007	0.023	0.042
2008	0.037	0.048
2009	0.015	0.016

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0588	0.1021
2	0.0443	0.0991
3	0.0368	0.0920

4	0.0365	0.0685
5	0.0296	0.0635
6	0.0260	0.0581
7	0.0245	0.0577
8	0.0234	0.0566
9	0.0231	0.0476
10	0.0230	0.0427
11	0.0221	0.0417
12	0.0208	0.0398
13	0.0199	0.0384
14	0.0194	0.0377
15	0.0190	0.0366
16	0.0184	0.0308
17	0.0183	0.0304
18	0.0180	0.0299
19	0.0179	0.0296
20	0.0178	0.0273
21	0.0178	0.0263
22	0.0177	0.0239
23	0.0177	0.0237
24	0.0175	0.0230
25	0.0170	0.0223
26	0.0162	0.0218
27	0.0161	0.0215
28	0.0159	0.0214
29	0.0159	0.0210
30	0.0151	0.0207
31	0.0148	0.0204
32	0.0143	0.0200
33	0.0141	0.0200
34	0.0139	0.0200
35	0.0138	0.0200
36	0.0137	0.0194
37	0.0132	0.0192
38	0.0132	0.0192
39	0.0131	0.0185
40	0.0127	0.0175
41	0.0124	0.0175
42	0.0120	0.0174
43	0.0119	0.0173
44	0.0117	0.0170
45	0.0116	0.0168
46	0.0114	0.0165
47	0.0113	0.0160
48	0.0113	0.0158
49	0.0106	0.0154
50	0.0098	0.0149
51	0.0097	0.0148
52	0.0097	0.0147
53	0.0095	0.0145
54	0.0095	0.0141
55	0.0090	0.0141
56	0.0086	0.0140
57	0.0078	0.0131
58	0.0078	0.0114
59	0.0073	0.0109
60	0.0050	0.0100
61	0.0024	0.0046

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0076	87566	96207	109	Fail
0.0079	79887	87609	109	Fail
0.0082	73107	80101	109	Fail
0.0085	66733	73278	109	Fail
0.0088	60915	67032	110	Fail
0.0092	55846	61536	110	Fail
0.0095	50841	56488	111	Fail
0.0098	46114	51975	112	Fail
0.0101	41730	47718	114	Fail
0.0104	38008	43633	114	Fail
0.0107	34671	39976	115	Fail
0.0110	31548	36575	115	Fail
0.0113	28747	33538	116	Fail
0.0116	26073	30971	118	Fail
0.0119	23613	28575	121	Fail
0.0123	21624	26201	121	Fail
0.0126	19830	24062	121	Fail
0.0129	18272	22223	121	Fail
0.0132	16730	20548	122	Fail
0.0135	15269	18893	123	Fail
0.0138	13952	17346	124	Fail
0.0141	12805	15832	123	Fail
0.0144	11933	14403	120	Fail
0.0147	11034	13216	119	Fail
0.0151	10275	12048	117	Fail
0.0154	9655	11126	115	Fail
0.0157	9020	10371	114	Fail
0.0160	8434	9610	113	Fail
0.0163	7882	8923	113	Fail
0.0166	7368	8297	112	Fail
0.0169	6832	7751	113	Fail
0.0172	6275	7225	115	Fail
0.0175	5766	6718	116	Fail
0.0179	5307	6271	118	Fail
0.0182	4885	5848	119	Fail
0.0185	4605	5452	118	Fail
0.0188	4303	5135	119	Fail
0.0191	4049	4798	118	Fail
0.0194	3784	4481	118	Fail
0.0197	3561	4190	117	Fail
0.0200	3384	3927	116	Fail
0.0203	3215	3707	115	Fail
0.0207	3033	3491	115	Fail
0.0210	2877	3270	113	Fail
0.0213	2695	3063	113	Fail
0.0216	2537	2887	113	Fail
0.0219	2372	2731	115	Fail
0.0222	2242	2597	115	Fail
0.0225	2129	2470	116	Fail
0.0228	1989	2295	115	Fail
0.0231	1850	2156	116	Fail
0.0235	1756	2026	115	Fail
0.0238	1699	1893	111	Fail
0.0241	1644	1775	107	Pass

0.0244	1569	1696	108	Pass
0.0247	1503	1633	108	Pass
0.0250	1455	1560	107	Pass
0.0253	1397	1473	105	Pass
0.0256	1318	1415	107	Pass
0.0259	1253	1368	109	Pass
0.0263	1222	1317	107	Pass
0.0266	1196	1265	105	Pass
0.0269	1171	1215	103	Pass
0.0272	1140	1172	102	Pass
0.0275	1090	1123	103	Pass
0.0278	1051	1081	102	Pass
0.0281	1018	1050	103	Pass
0.0284	984	1014	103	Pass
0.0287	935	977	104	Pass
0.0291	878	931	106	Pass
0.0294	828	893	107	Pass
0.0297	806	871	108	Pass
0.0300	793	851	107	Pass
0.0303	783	837	106	Pass
0.0306	771	820	106	Pass
0.0309	762	804	105	Pass
0.0312	749	790	105	Pass
0.0315	739	775	104	Pass
0.0319	725	762	105	Pass
0.0322	712	749	105	Pass
0.0325	700	735	104	Pass
0.0328	687	720	104	Pass
0.0331	675	706	104	Pass
0.0334	661	691	104	Pass
0.0337	647	673	104	Pass
0.0340	633	659	104	Pass
0.0343	619	644	104	Pass
0.0347	605	636	105	Pass
0.0350	591	625	105	Pass
0.0353	578	617	106	Pass
0.0356	565	606	107	Pass
0.0359	547	599	109	Pass
0.0362	527	588	111	Fail
0.0365	495	581	117	Fail
0.0368	469	572	121	Fail
0.0371	463	560	120	Fail
0.0375	455	550	120	Fail
0.0378	451	543	120	Fail
0.0381	445	532	119	Fail
0.0384	440	525	119	Fail

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

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-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.

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

Model Default Modifications

Total of 0 changes have been made.

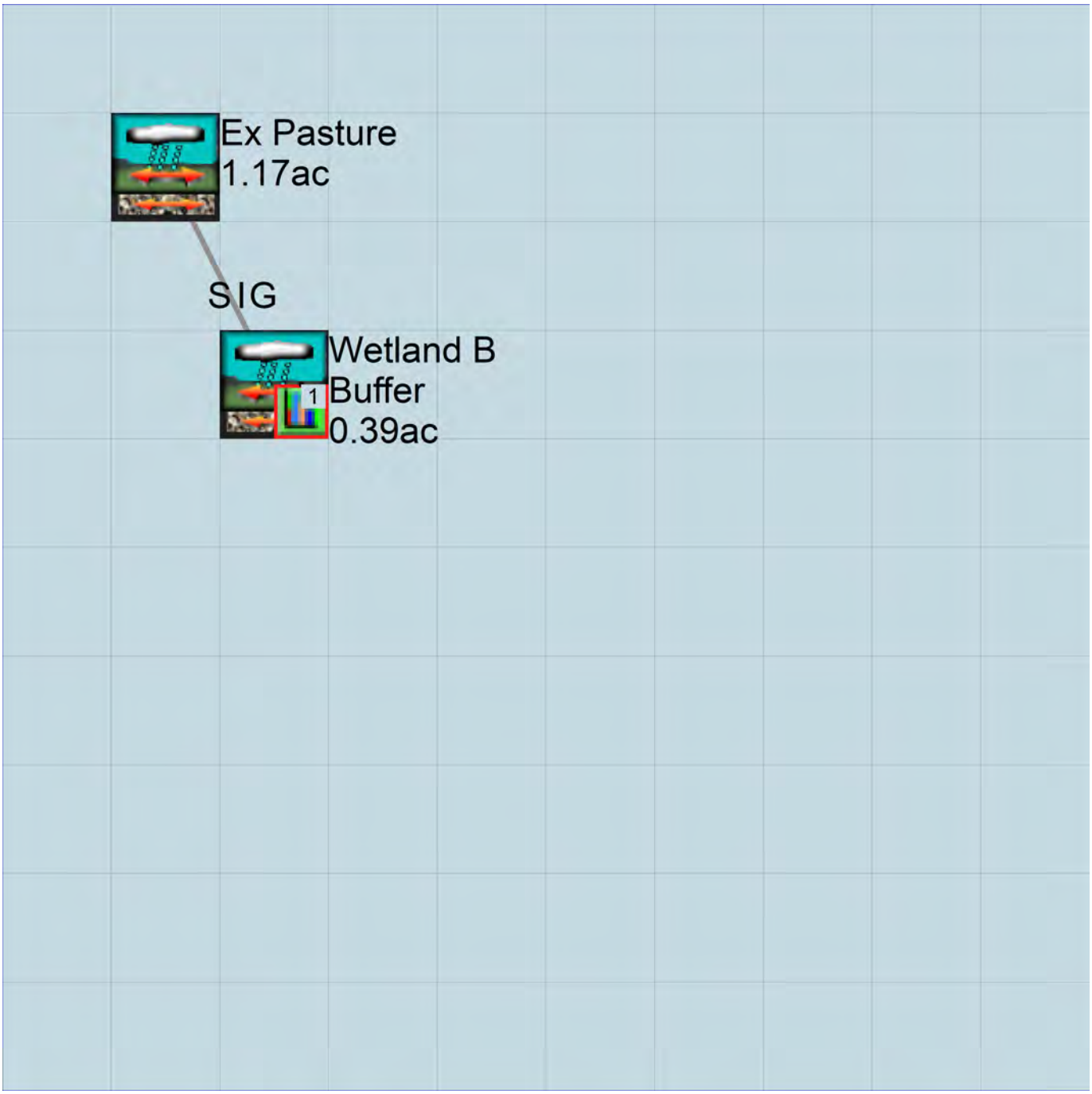
PERLND Changes

No PERLND changes have been made.

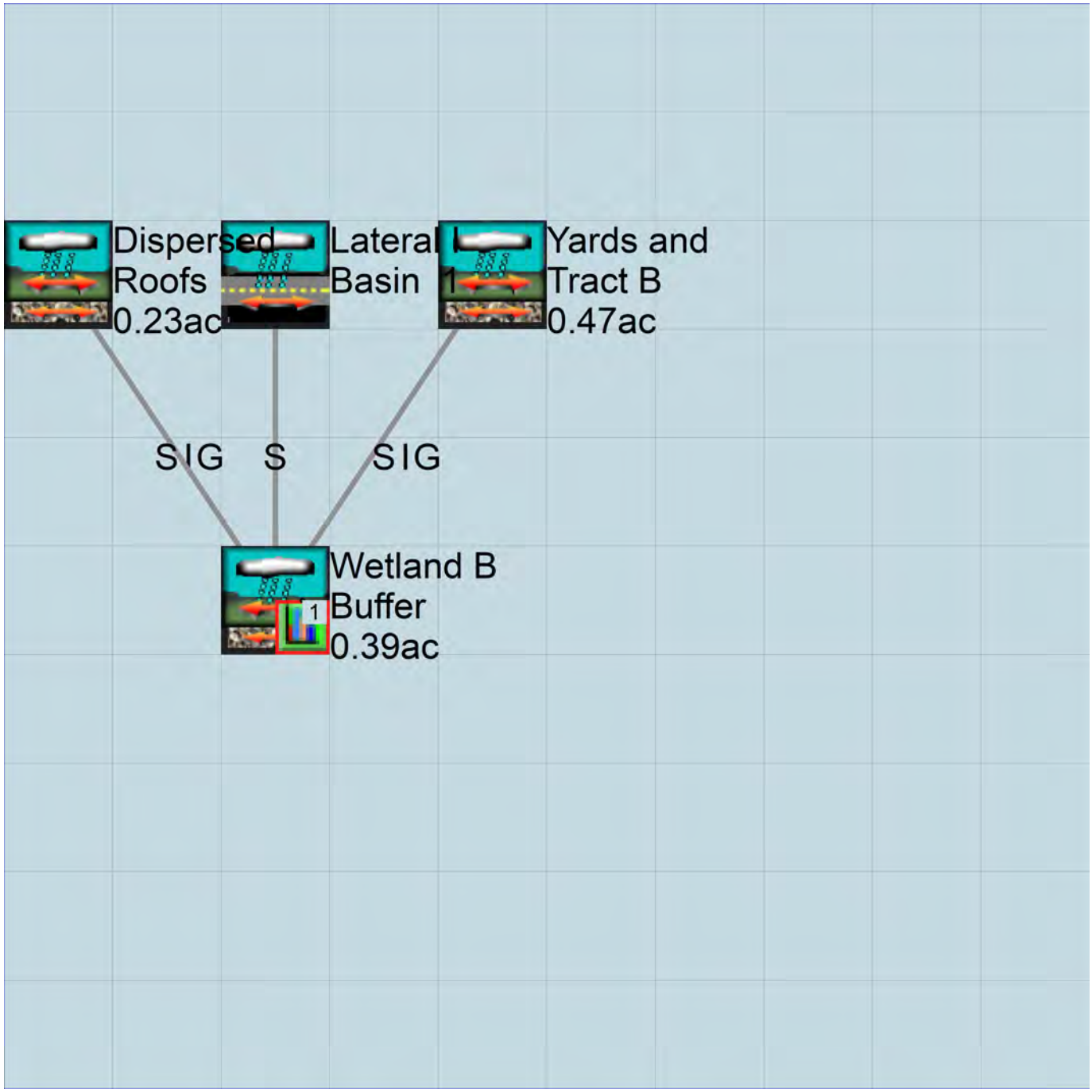
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Oak Heights - Wetland B Recharge.wdm
MESSU       25   PreOak Heights - Wetland B Recharge.MES
            27   PreOak Heights - Wetland B Recharge.L61
            28   PreOak Heights - Wetland B Recharge.L62
            30   POCOak Heights - Wetland B Recharge1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      38
      PERLND      40
      COPY       501
      COPY         1
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Wetland B Buffer            MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   38     C, Pasture, Mod         1    1    1    1   27    0
   40     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   38         0    0    1    0    0    0    0    0    0    0    0    0
   40         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   38         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   40         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   38         0    0    0    0    0    0    0    0    0    0    0
   40         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   38              0       4.5      0.06       400       0.1       0.5     0.996
   40              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   38              0         0         2         2         0         0         0
   40              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   38           0.15       0.4       0.3         6       0.5       0.4
   40           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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      GWVS
   38              0         0         0         0       2.5         1         0
   40              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                 in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Ex Pasture***
PERLND  38                          3     PERLND  40     30
PERLND  38                          3     PERLND  40     34
PERLND  38                          3     PERLND  40     38
Wetland B Buffer***
PERLND  40                       0.39     COPY   501     12
PERLND  40                       0.39     COPY   501     13
PERLND  40                       0.39     COPY   501     14

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  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 OUTDGT
```

```
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   14

  MASS-LINK       30
PERLND     PWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   30

  MASS-LINK       34
PERLND     PWATER IFWO                     PERLND         EXTNL  IFWLI
  END MASS-LINK   34

  MASS-LINK       38
PERLND     PWATER AGWO                     PERLND         EXTNL  AGWLI
  END MASS-LINK   38


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Oak Heights - Wetland B Recharge.wdm
MESSU       25   MitOak Heights - Wetland B Recharge.MES
            27   MitOak Heights - Wetland B Recharge.L61
            28   MitOak Heights - Wetland B Recharge.L62
            30   POCOak Heights - Wetland B Recharge1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      42
      IMPLND      16
      PERLND      44
      PERLND      43
      COPY       501
      COPY         1
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Wetland B Buffer            MAX                   1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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            ***
   42     C, Pasture, Mod         1    1    1    1   27    0
   44      C/IMP DISP /MOD        1    1    1    1   27    0
   43     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   42         0    0    1    0    0    0    0    0    0    0    0    0
   44         0    0    1    0    0    0    0    0    0    0    0    0
   43         0    0    1    0    0    0    0    0    0    0    0    0
```

```
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   42         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   44         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   43         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   42         0    0    0    0    0    0    0    0    0    0    0
   44         0    0    0    0    0    0    0    0    0    0    0
   43         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   42              0       4.5      0.06       400       0.1       0.5     0.996
   44              0       4.5      0.03       400       0.1       0.5     0.996
   43              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   42              0         0         2         2         0         0         0
   44              0         0         2         2         0         0         0
   43              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   42           0.15       0.4       0.3         6       0.5       0.4
   44            0.1      0.25      0.25         6       0.5      0.25
   43           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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      GWVS
   42              0         0         0         0       2.5          1         0
   44              0         0         0         0       2.5          1         0
   43              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
   16      SIDEWALKS/FLAT          1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   16         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
```

```
   16         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   16         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   16           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   16             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   16             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Yards and Tract B***
PERLND  42                      1.1974     PERLND  43     30
PERLND  42                      1.1974     PERLND  43     34
PERLND  42                      1.1974     PERLND  43     38
Lateral I Basin  1***
IMPLND  16                      0.5615     PERLND  43     50
Dispersed Roofs***
PERLND  44                      0.5949     PERLND  43     30
PERLND  44                      0.5949     PERLND  43     34
PERLND  44                      0.5949     PERLND  43     38
Wetland B Buffer***
PERLND  43                        0.39     COPY   501     12
PERLND  43                        0.39     COPY   501     13
PERLND  43                        0.39     COPY   501     14

******Routing******
PERLND  42                       0.467     COPY     1     12
PERLND  42                       0.467     COPY     1     13
PERLND  42                       0.467     COPY     1     14
IMPLND  16                       0.219     COPY     1     15
PERLND  44                       0.232     COPY     1     12
PERLND  44                       0.232     COPY     1     13
PERLND  44                       0.232     COPY     1     14
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
```

```
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                       in  out                             ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  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 OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
```

```
  END MASS-LINK   14

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       30
PERLND     PWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   30

  MASS-LINK       34
PERLND     PWATER IFWO                     PERLND         EXTNL  IFWLI
  END MASS-LINK   34

  MASS-LINK       38
PERLND     PWATER AGWO                     PERLND         EXTNL  AGWLI
  END MASS-LINK   38

  MASS-LINK       50
IMPLND     IWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   50


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2024; All Rights Reserved.

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

POND 2

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Oak Heights - Pond 2

Site Name:	Oak Heights
Site Address:	
City:	Oak Harbor
Report Date:	7/19/2024
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Pond 2 Predeveloped

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	8.7
Pervious Total	8.7
Impervious Land Use	acre
Impervious Total	0
Basin Total	8.7

Mitigated Land Use

Pond 2 Developed

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	3.82
Pervious Total	3.82
Impervious Land Use	acre
ROADS MOD	5.49
Impervious Total	5.49
Basin Total	9.31

Routing Elements
Predeveloped Routing

Mitigated Routing

Pond 2

Bottom Length: 129.00 ft.
Bottom Width: 106.00 ft.
Depth: 6.7 ft.
Volume at riser head: 2.2112 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 0 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 5.7 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.021 ft.
Notch Height: 0.650 ft.
Orifice 1 Diameter: 0.940 in. Elevation:0 ft.
Orifice 2 Diameter: 0.940 in. Elevation:4.55 ft.
Orifice 3 Diameter: 0.940 in. Elevation:4.85 ft.
Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

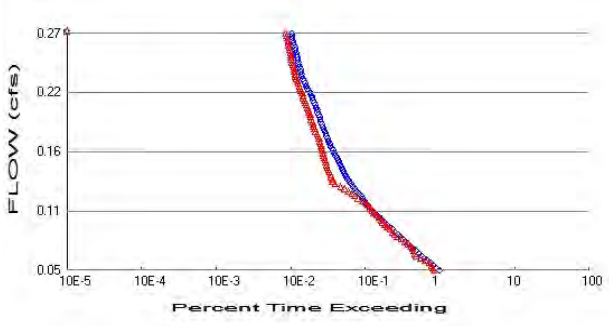
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
132.60	0.313	0.000	0.000	0.000
132.67	0.315	0.023	0.006	0.000
132.75	0.317	0.047	0.009	0.000
132.82	0.319	0.070	0.011	0.000
132.90	0.320	0.094	0.013	0.000
132.97	0.322	0.118	0.014	0.000
133.05	0.324	0.142	0.016	0.000
133.12	0.326	0.166	0.017	0.000
133.20	0.328	0.191	0.018	0.000
133.27	0.329	0.215	0.019	0.000
133.34	0.331	0.240	0.020	0.000
133.42	0.333	0.265	0.021	0.000
133.49	0.335	0.289	0.022	0.000
133.57	0.337	0.314	0.023	0.000
133.64	0.338	0.340	0.024	0.000
133.72	0.340	0.365	0.025	0.000
133.79	0.342	0.390	0.026	0.000
133.87	0.344	0.416	0.027	0.000
133.94	0.346	0.442	0.027	0.000
134.01	0.348	0.467	0.028	0.000
134.09	0.349	0.493	0.029	0.000
134.16	0.351	0.520	0.030	0.000
134.24	0.353	0.546	0.030	0.000
134.31	0.355	0.572	0.031	0.000
134.39	0.357	0.599	0.032	0.000
134.46	0.359	0.625	0.032	0.000
134.54	0.360	0.652	0.033	0.000
134.61	0.362	0.679	0.034	0.000
134.68	0.364	0.706	0.034	0.000
134.76	0.366	0.733	0.035	0.000

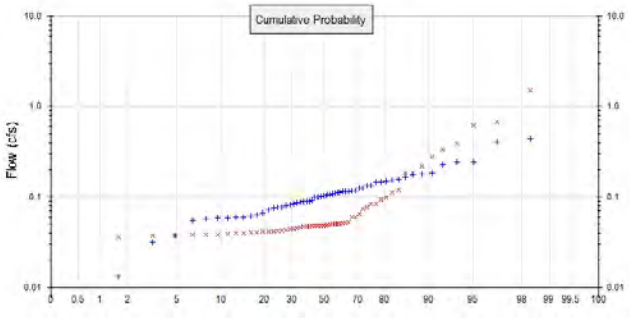
134.83	0.368	0.761	0.035	0.000
134.91	0.370	0.788	0.036	0.000
134.98	0.372	0.816	0.037	0.000
135.06	0.374	0.844	0.037	0.000
135.13	0.376	0.872	0.038	0.000
135.21	0.377	0.900	0.038	0.000
135.28	0.379	0.928	0.039	0.000
135.35	0.381	0.956	0.039	0.000
135.43	0.383	0.985	0.040	0.000
135.50	0.385	1.013	0.040	0.000
135.58	0.387	1.042	0.041	0.000
135.65	0.389	1.071	0.041	0.000
135.73	0.391	1.100	0.042	0.000
135.80	0.393	1.129	0.042	0.000
135.88	0.395	1.159	0.043	0.000
135.95	0.397	1.188	0.043	0.000
136.02	0.399	1.218	0.044	0.000
136.10	0.401	1.248	0.044	0.000
136.17	0.403	1.277	0.045	0.000
136.25	0.405	1.308	0.045	0.000
136.32	0.407	1.338	0.046	0.000
136.40	0.409	1.368	0.046	0.000
136.47	0.411	1.399	0.047	0.000
136.55	0.413	1.429	0.047	0.000
136.62	0.415	1.460	0.048	0.000
136.69	0.417	1.491	0.048	0.000
136.77	0.419	1.522	0.049	0.000
136.84	0.421	1.554	0.049	0.000
136.92	0.423	1.585	0.049	0.000
136.99	0.425	1.617	0.050	0.000
137.07	0.427	1.648	0.050	0.000
137.14	0.429	1.680	0.051	0.000
137.22	0.431	1.712	0.057	0.000
137.29	0.433	1.744	0.060	0.000
137.36	0.435	1.777	0.063	0.000
137.44	0.437	1.809	0.065	0.000
137.51	0.439	1.842	0.073	0.000
137.59	0.441	1.874	0.078	0.000
137.66	0.443	1.907	0.082	0.000
137.74	0.445	1.941	0.087	0.000
137.81	0.447	1.974	0.093	0.000
137.89	0.449	2.007	0.099	0.000
137.96	0.451	2.041	0.105	0.000
138.03	0.453	2.074	0.112	0.000
138.11	0.455	2.108	0.119	0.000
138.18	0.457	2.142	0.125	0.000
138.26	0.460	2.176	0.132	0.000
138.33	0.462	2.211	0.229	0.000
138.41	0.464	2.245	0.693	0.000
138.48	0.466	2.280	1.356	0.000
138.56	0.468	2.315	2.143	0.000
138.63	0.470	2.350	2.990	0.000
138.70	0.472	2.385	3.828	0.000
138.78	0.474	2.420	4.593	0.000
138.85	0.476	2.455	5.232	0.000
138.93	0.479	2.491	5.715	0.000
139.00	0.481	2.527	6.056	0.000
139.08	0.483	2.563	6.402	0.000

139.15	0.485	2.599	6.696	0.000
139.23	0.487	2.635	6.977	0.000
139.30	0.489	2.671	7.248	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 8.7
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.82
Total Impervious Area: 5.49

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.105219
5 year	0.165654
10 year	0.202304
25 year	0.24385
50 year	0.271384
100 year	0.29621

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.060641
5 year	0.127738
10 year	0.201279
25 year	0.344206
50 year	0.501182
100 year	0.71684

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.013	0.041
1950	0.134	0.064
1951	0.100	0.046
1952	0.073	0.042
1953	0.060	0.038
1954	0.181	0.050
1955	0.176	0.618
1956	0.147	0.668
1957	0.166	0.048
1958	0.115	0.050

1959	0.111	0.048
1960	0.100	0.044
1961	0.116	0.076
1962	0.058	0.037
1963	0.086	0.044
1964	0.100	0.040
1965	0.103	0.050
1966	0.055	0.042
1967	0.151	0.047
1968	0.146	0.052
1969	0.076	0.047
1970	0.082	0.046
1971	0.124	0.333
1972	0.114	0.040
1973	0.059	0.059
1974	0.125	0.074
1975	0.087	0.040
1976	0.081	0.048
1977	0.032	0.038
1978	0.077	0.042
1979	0.148	0.038
1980	0.090	0.042
1981	0.076	0.036
1982	0.117	0.051
1983	0.107	0.059
1984	0.103	0.098
1985	0.156	0.390
1986	0.404	0.275
1987	0.133	0.112
1988	0.089	0.049
1989	0.064	0.039
1990	0.112	0.048
1991	0.118	0.051
1992	0.089	0.049
1993	0.057	0.038
1994	0.038	0.049
1995	0.108	0.084
1996	0.241	0.093
1997	0.437	1.519
1998	0.058	0.048
1999	0.113	0.084
2000	0.060	0.050
2001	0.013	0.028
2002	0.106	0.182
2003	0.066	0.042
2004	0.101	0.048
2005	0.083	0.044
2006	0.242	0.219
2007	0.182	0.183
2008	0.229	0.121
2009	0.089	0.047

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.4368	1.5190
2	0.4042	0.6679
3	0.2424	0.6181

4	0.2410	0.3897
5	0.2289	0.3334
6	0.1821	0.2748
7	0.1809	0.2194
8	0.1759	0.1828
9	0.1664	0.1821
10	0.1559	0.1206
11	0.1506	0.1122
12	0.1483	0.0983
13	0.1469	0.0932
14	0.1463	0.0843
15	0.1338	0.0840
16	0.1330	0.0765
17	0.1250	0.0739
18	0.1242	0.0642
19	0.1184	0.0594
20	0.1166	0.0590
21	0.1155	0.0521
22	0.1153	0.0509
23	0.1142	0.0509
24	0.1126	0.0503
25	0.1123	0.0500
26	0.1115	0.0499
27	0.1080	0.0498
28	0.1068	0.0493
29	0.1059	0.0487
30	0.1035	0.0486
31	0.1029	0.0483
32	0.1014	0.0482
33	0.1002	0.0481
34	0.1000	0.0480
35	0.0999	0.0478
36	0.0902	0.0477
37	0.0890	0.0471
38	0.0890	0.0470
39	0.0889	0.0466
40	0.0874	0.0460
41	0.0857	0.0456
42	0.0833	0.0442
43	0.0820	0.0439
44	0.0810	0.0435
45	0.0772	0.0423
46	0.0762	0.0419
47	0.0755	0.0419
48	0.0725	0.0416
49	0.0664	0.0415
50	0.0638	0.0409
51	0.0602	0.0404
52	0.0601	0.0401
53	0.0594	0.0400
54	0.0579	0.0388
55	0.0578	0.0383
56	0.0569	0.0379
57	0.0548	0.0379
58	0.0377	0.0375
59	0.0316	0.0370
60	0.0131	0.0360
61	0.0128	0.0279

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0526	20811	17877	85	Pass
0.0548	18980	17124	90	Pass
0.0570	17336	16459	94	Pass
0.0592	15823	15231	96	Pass
0.0614	14440	13682	94	Pass
0.0637	13214	11922	90	Pass
0.0659	12098	10241	84	Pass
0.0681	11073	9888	89	Pass
0.0703	10190	9509	93	Pass
0.0725	9362	9118	97	Pass
0.0747	8633	8656	100	Pass
0.0769	7989	8042	100	Pass
0.0791	7373	7349	99	Pass
0.0813	6782	6477	95	Pass
0.0835	6275	5732	91	Pass
0.0858	5794	5274	91	Pass
0.0880	5330	4900	91	Pass
0.0902	4894	4558	93	Pass
0.0924	4504	4209	93	Pass
0.0946	4158	3918	94	Pass
0.0968	3846	3677	95	Pass
0.0990	3572	3463	96	Pass
0.1012	3324	3249	97	Pass
0.1034	3065	3033	98	Pass
0.1056	2828	2798	98	Pass
0.1079	2637	2620	99	Pass
0.1101	2468	2464	99	Pass
0.1123	2308	2282	98	Pass
0.1145	2175	2136	98	Pass
0.1167	2064	1964	95	Pass
0.1189	1965	1691	86	Pass
0.1211	1860	1540	82	Pass
0.1233	1741	1412	81	Pass
0.1255	1649	1264	76	Pass
0.1277	1549	1129	72	Pass
0.1300	1453	1002	68	Pass
0.1322	1365	843	61	Pass
0.1344	1302	777	59	Pass
0.1366	1244	765	61	Pass
0.1388	1193	749	62	Pass
0.1410	1145	733	64	Pass
0.1432	1101	708	64	Pass
0.1454	1062	685	64	Pass
0.1476	1023	664	64	Pass
0.1498	991	649	65	Pass
0.1521	957	629	65	Pass
0.1543	927	617	66	Pass
0.1565	892	601	67	Pass
0.1587	856	591	69	Pass
0.1609	820	580	70	Pass
0.1631	783	571	72	Pass
0.1653	760	557	73	Pass
0.1675	727	547	75	Pass

0.1697	706	536	75	Pass
0.1719	682	524	76	Pass
0.1742	659	513	77	Pass
0.1764	643	501	77	Pass
0.1786	630	485	76	Pass
0.1808	610	464	76	Pass
0.1830	586	449	76	Pass
0.1852	572	433	75	Pass
0.1874	554	425	76	Pass
0.1896	540	415	76	Pass
0.1918	530	405	76	Pass
0.1940	517	394	76	Pass
0.1962	506	389	76	Pass
0.1985	491	377	76	Pass
0.2007	484	371	76	Pass
0.2029	466	361	77	Pass
0.2051	455	348	76	Pass
0.2073	441	334	75	Pass
0.2095	428	327	76	Pass
0.2117	416	317	76	Pass
0.2139	408	313	76	Pass
0.2161	388	305	78	Pass
0.2183	369	295	79	Pass
0.2206	353	284	80	Pass
0.2228	343	278	81	Pass
0.2250	333	268	80	Pass
0.2272	320	262	81	Pass
0.2294	309	251	81	Pass
0.2316	301	248	82	Pass
0.2338	297	242	81	Pass
0.2360	291	241	82	Pass
0.2382	287	238	82	Pass
0.2404	280	234	83	Pass
0.2427	273	228	83	Pass
0.2449	269	221	82	Pass
0.2471	266	217	81	Pass
0.2493	262	216	82	Pass
0.2515	256	215	83	Pass
0.2537	252	213	84	Pass
0.2559	246	207	84	Pass
0.2581	242	205	84	Pass
0.2603	237	201	84	Pass
0.2625	231	197	85	Pass
0.2648	228	197	86	Pass
0.2670	225	193	85	Pass
0.2692	223	186	83	Pass
0.2714	220	183	83	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.4863 acre-feet
On-line facility target flow:	0.759 cfs.
Adjusted for 15 min:	0.759 cfs.
Off-line facility target flow:	0.4298 cfs.
Adjusted for 15 min:	0.4298 cfs.

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
Pond 2 POC	☐	680.25			☐	0.00			
Total Volume Infiltrated		680.25	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

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

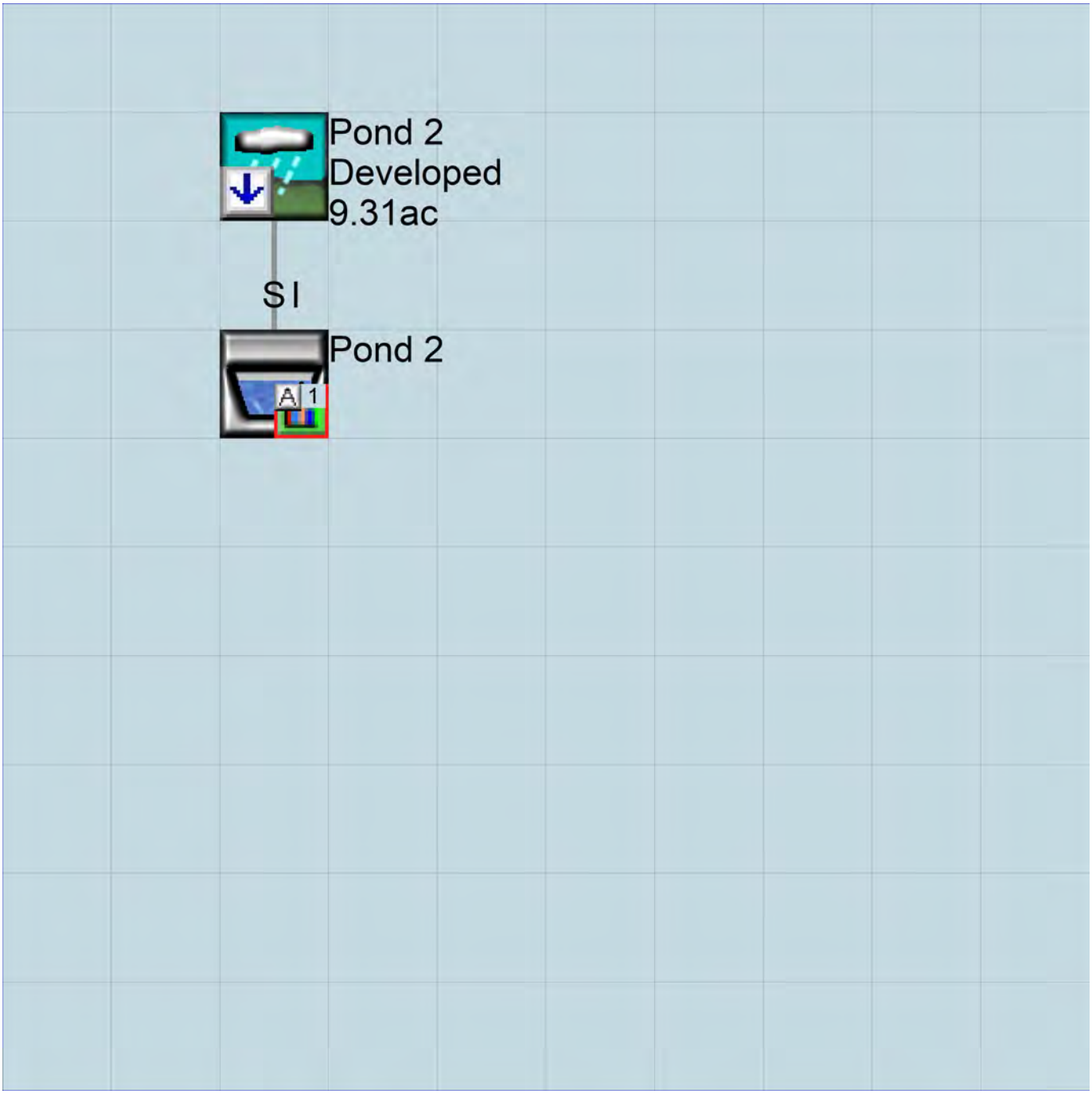
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Oak Heights - Pond 2.wdm
MESSU       25   PreOak Heights - Pond 2.MES
            27   PreOak Heights - Pond 2.L61
            28   PreOak Heights - Pond 2.L62
            30   POCOak Heights - Pond 21.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pond 2 Predeveloped         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   11     C, Forest, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-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      GWVS
   11             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Pond 2 Predeveloped***
PERLND  11                        8.7     COPY   501     12
PERLND  11                        8.7     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  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 OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.8             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8             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>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Oak Heights - Pond 2.wdm
MESSU      25   MitOak Heights - Pond 2.MES
           27   MitOak Heights - Pond 2.L61
           28   MitOak Heights - Pond 2.L62
           30   POCOak Heights - Pond 21.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      IMPLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pond 2                     MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   13         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   13             0       4.5      0.06       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13          0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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       GWVS
   13             0         0         0         0       2.5         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                  in  out           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
    2             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Pond 2 Developed***
PERLND  13                        3.82     RCHRES   1      2
PERLND  13                        3.82     RCHRES   1      3
IMPLND   2                        5.49     RCHRES   1      5

******Routing******
PERLND  13                        3.82     COPY     1     12
IMPLND   2                        5.49     COPY     1     15
PERLND  13                        3.82     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
    1     Pond 2                 1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                   ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->      ***
```

```
    1             1      0.02       0.0     132.6       0.5       0.0
  END HYDR-PARM2
  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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   90    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.313912  0.000000  0.000000
  0.074444  0.315662  0.023434  0.006542
  0.148889  0.317418  0.046999  0.009252
  0.223333  0.319177  0.070694  0.011332
  0.297778  0.320942  0.094521  0.013085
  0.372222  0.322711  0.118479  0.014629
  0.446667  0.324484  0.142569  0.016025
  0.521111  0.326262  0.166791  0.017309
  0.595556  0.328045  0.191146  0.018504
  0.670000  0.329832  0.215634  0.019627
  0.744444  0.331624  0.240255  0.020689
  0.818889  0.333420  0.265009  0.021698
  0.893333  0.335221  0.289897  0.022663
  0.967778  0.337027  0.314920  0.023589
  1.042222  0.338837  0.340077  0.024479
  1.116667  0.340652  0.365369  0.025338
  1.191111  0.342471  0.390797  0.026169
  1.265556  0.344295  0.416360  0.026975
  1.340000  0.346124  0.442059  0.027757
  1.414444  0.347957  0.467894  0.028517
  1.488889  0.349794  0.493866  0.029258
  1.563333  0.351636  0.519974  0.029981
  1.637778  0.353483  0.546220  0.030686
  1.712222  0.355335  0.572604  0.031376
  1.786667  0.357191  0.599126  0.032051
  1.861111  0.359051  0.625786  0.032712
  1.935556  0.360916  0.652585  0.033359
  2.010000  0.362786  0.679523  0.033995
  2.084444  0.364660  0.706600  0.034619
  2.158889  0.366539  0.733817  0.035231
  2.233333  0.368422  0.761174  0.035834
  2.307778  0.370310  0.788671  0.036426
  2.382222  0.372203  0.816309  0.037009
  2.456667  0.374100  0.844088  0.037583
  2.531111  0.376002  0.872008  0.038148
  2.605556  0.377908  0.900071  0.038705
  2.680000  0.379819  0.928275  0.039254
  2.754444  0.381735  0.956622  0.039795
  2.828889  0.383655  0.985111  0.040329
  2.903333  0.385579  1.013744  0.040857
  2.977778  0.387509  1.042520  0.041377
  3.052222  0.389442  1.071440  0.041891
  3.126667  0.391381  1.100504  0.042399
  3.201111  0.393324  1.129712  0.042901
  3.275556  0.395271  1.159065  0.043397
  3.350000  0.397223  1.188564  0.043887
  3.424444  0.399180  1.218208  0.044372
  3.498889  0.401141  1.247997  0.044852
  3.573333  0.403107  1.277933  0.045326
  3.647778  0.405078  1.308016  0.045796
  3.722222  0.407053  1.338245  0.046261
  3.796667  0.409032  1.368622  0.046721
```

```
  3.871111  0.411017  1.399146  0.047177
  3.945556  0.413005  1.429818  0.047629
  4.020000  0.414999  1.460638  0.048076
  4.094444  0.416997  1.491606  0.048519
  4.168889  0.418999  1.522724  0.048958
  4.243333  0.421006  1.553991  0.049393
  4.317778  0.423018  1.585407  0.049825
  4.392222  0.425034  1.616974  0.050252
  4.466667  0.427055  1.648690  0.050676
  4.541111  0.429081  1.680558  0.051097
  4.615556  0.431111  1.712576  0.057653
  4.690000  0.433145  1.744745  0.060900
  4.764444  0.435184  1.777067  0.063442
  4.838889  0.437228  1.809540  0.065634
  4.913333  0.439276  1.842165  0.073638
  4.987778  0.441329  1.874943  0.078316
  5.062222  0.443387  1.907874  0.082251
  5.136667  0.445449  1.940959  0.087302
  5.211111  0.447515  1.974197  0.093019
  5.285556  0.449587  2.007589  0.099134
  5.360000  0.451662  2.041136  0.105539
  5.434444  0.453743  2.074837  0.112166
  5.508889  0.455828  2.108693  0.118966
  5.583333  0.457917  2.142705  0.125898
  5.657778  0.460011  2.176872  0.132929
  5.732222  0.462110  2.211195  0.229938
  5.806667  0.464213  2.245675  0.693027
  5.881111  0.466321  2.280312  1.356378
  5.955556  0.468434  2.315105  2.143946
  6.030000  0.470551  2.350056  2.990376
  6.104444  0.472672  2.385165  3.828563
  6.178889  0.474798  2.420432  4.593573
  6.253333  0.476929  2.455858  5.232210
  6.327778  0.479065  2.491442  5.715909
  6.402222  0.481204  2.527185  6.056107
  6.476667  0.483349  2.563088  6.402157
  6.551111  0.485498  2.599151  6.696302
  6.625556  0.487652  2.635373  6.977883
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3
```

```
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1948/12/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-2.771E-01     0.00000  0.0000E+00     0.00000  -3.347E-10

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1958/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-2.560E-02     0.00000  0.0000E+00     0.00000  -4.885E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
```

DATE/TIME: 1967/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-7.759E-03	0.00000	0.0000E+00	0.00000	-1.641E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1994/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-1.514E-02	0.00000	0.0000E+00	0.00000	-8.354E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 2003/ 7/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-2.346E-01	0.00000	0.0000E+00	0.00000	-4.158E-10

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.

REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2024; All Rights Reserved.

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

POND 3

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Oak Heights - Pond 3

Site Name:	Oak Heights
Site Address:	
City:	Oak Harbor
Report Date:	8/5/2024
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Pond 3 Predeveloped

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	12.07
Pervious Total	12.07
Impervious Land Use	acre
Impervious Total	0
Basin Total	12.07

Mitigated Land Use

Pond 3 Developed

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	4.03
Pervious Total	4.03
Impervious Land Use	acre
ROADS MOD	8.25
Impervious Total	8.25
Basin Total	12.28

Routing Elements
Predeveloped Routing

Mitigated Routing

Pond 3

Bottom Length:	292.00 ft.
Bottom Width:	82.00 ft.
Depth:	6 ft.
Volume at riser head:	3.4268 acre-feet.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	5 ft.
Riser Diameter:	18 in.
Notch Type :	V-notch
Notch Angle:	12.000
Notch Height:	0.750 ft.
Orifice 1 Diameter:	1.130 in. Elevation:0 ft.
Orifice 2 Diameter:	1.000 in. Elevation:4 ft.
Orifice 3 Diameter:	1.000 in. Elevation:4.1 ft.
Element Flows To:	
Outlet 1	Outlet 2

Pond Hydraulic Table

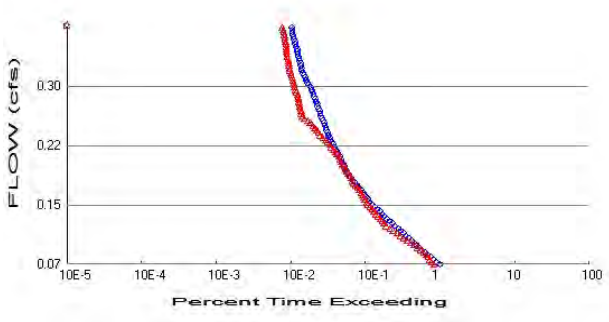
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
165.00	0.549	0.000	0.000	0.000
165.07	0.553	0.036	0.008	0.000
165.13	0.556	0.073	0.012	0.000
165.20	0.560	0.111	0.015	0.000
165.27	0.563	0.148	0.017	0.000
165.33	0.566	0.186	0.020	0.000
165.40	0.570	0.224	0.021	0.000
165.47	0.573	0.262	0.023	0.000
165.53	0.577	0.300	0.025	0.000
165.60	0.580	0.339	0.026	0.000
165.67	0.584	0.378	0.028	0.000
165.73	0.587	0.417	0.029	0.000
165.80	0.591	0.456	0.031	0.000
165.87	0.594	0.495	0.032	0.000
165.93	0.598	0.535	0.033	0.000
166.00	0.602	0.575	0.034	0.000
166.07	0.605	0.616	0.035	0.000
166.13	0.609	0.656	0.036	0.000
166.20	0.612	0.697	0.038	0.000
166.27	0.616	0.738	0.039	0.000
166.33	0.619	0.779	0.040	0.000
166.40	0.623	0.820	0.041	0.000
166.47	0.627	0.862	0.042	0.000
166.53	0.630	0.904	0.042	0.000
166.60	0.634	0.946	0.043	0.000
166.67	0.637	0.989	0.044	0.000
166.73	0.641	1.031	0.045	0.000
166.80	0.645	1.074	0.046	0.000
166.87	0.648	1.117	0.047	0.000
166.93	0.652	1.161	0.048	0.000

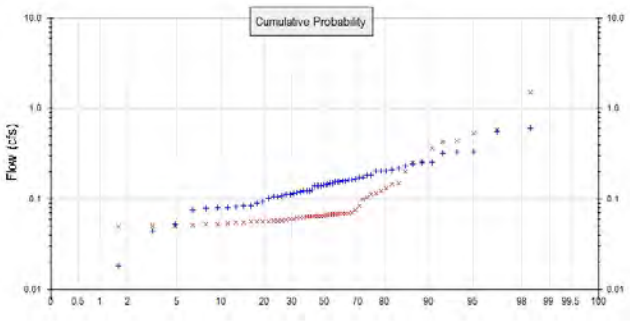
167.00	0.656	1.204	0.049	0.000
167.07	0.659	1.248	0.049	0.000
167.13	0.663	1.292	0.050	0.000
167.20	0.667	1.336	0.051	0.000
167.27	0.670	1.381	0.052	0.000
167.33	0.674	1.426	0.052	0.000
167.40	0.678	1.471	0.053	0.000
167.47	0.681	1.516	0.054	0.000
167.53	0.685	1.562	0.055	0.000
167.60	0.689	1.608	0.055	0.000
167.67	0.692	1.654	0.056	0.000
167.73	0.696	1.700	0.057	0.000
167.80	0.700	1.747	0.058	0.000
167.87	0.704	1.793	0.058	0.000
167.93	0.707	1.841	0.059	0.000
168.00	0.711	1.888	0.060	0.000
168.07	0.715	1.935	0.060	0.000
168.13	0.719	1.983	0.061	0.000
168.20	0.723	2.031	0.062	0.000
168.27	0.726	2.080	0.062	0.000
168.33	0.730	2.128	0.063	0.000
168.40	0.734	2.177	0.063	0.000
168.47	0.738	2.226	0.064	0.000
168.53	0.742	2.275	0.065	0.000
168.60	0.745	2.325	0.065	0.000
168.67	0.749	2.375	0.066	0.000
168.73	0.753	2.425	0.067	0.000
168.80	0.757	2.475	0.067	0.000
168.87	0.761	2.526	0.068	0.000
168.93	0.765	2.577	0.068	0.000
169.00	0.769	2.628	0.069	0.000
169.07	0.772	2.679	0.076	0.000
169.13	0.776	2.731	0.085	0.000
169.20	0.780	2.783	0.091	0.000
169.27	0.784	2.835	0.096	0.000
169.33	0.788	2.888	0.101	0.000
169.40	0.792	2.940	0.107	0.000
169.47	0.796	2.993	0.114	0.000
169.53	0.800	3.046	0.123	0.000
169.60	0.804	3.100	0.134	0.000
169.67	0.808	3.154	0.148	0.000
169.73	0.812	3.208	0.164	0.000
169.80	0.816	3.262	0.184	0.000
169.87	0.820	3.316	0.207	0.000
169.93	0.823	3.371	0.233	0.000
170.00	0.827	3.426	0.263	0.000
170.07	0.831	3.482	0.539	0.000
170.13	0.835	3.537	1.039	0.000
170.20	0.839	3.593	1.674	0.000
170.27	0.843	3.649	2.396	0.000
170.33	0.847	3.706	3.157	0.000
170.40	0.852	3.762	3.908	0.000
170.47	0.856	3.819	4.604	0.000
170.53	0.860	3.876	5.204	0.000
170.60	0.864	3.934	5.683	0.000
170.67	0.868	3.992	6.039	0.000
170.73	0.872	4.050	6.300	0.000
170.80	0.876	4.108	6.626	0.000

170.87	0.880	4.166	6.887	0.000
170.93	0.884	4.225	7.138	0.000
171.00	0.888	4.284	7.380	0.000
171.07	0.892	4.344	7.614	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 12.07
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.03
Total Impervious Area: 8.25

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.145976
5 year	0.229821
10 year	0.280668
25 year	0.338306
50 year	0.376507
100 year	0.410949

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.079989
5 year	0.157011
10 year	0.236974
25 year	0.385164
50 year	0.541206
100 year	0.74828

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.018	0.056
1950	0.186	0.084
1951	0.139	0.062
1952	0.101	0.057
1953	0.084	0.053
1954	0.251	0.069
1955	0.244	0.528
1956	0.204	0.583
1957	0.231	0.063
1958	0.160	0.067

1959	0.155	0.065
1960	0.139	0.059
1961	0.160	0.098
1962	0.080	0.051
1963	0.119	0.059
1964	0.139	0.056
1965	0.144	0.068
1966	0.076	0.056
1967	0.209	0.065
1968	0.203	0.069
1969	0.106	0.064
1970	0.114	0.062
1971	0.172	0.428
1972	0.158	0.054
1973	0.082	0.069
1974	0.173	0.103
1975	0.121	0.055
1976	0.112	0.067
1977	0.044	0.051
1978	0.107	0.056
1979	0.206	0.050
1980	0.125	0.057
1981	0.105	0.049
1982	0.162	0.069
1983	0.148	0.074
1984	0.143	0.131
1985	0.216	0.440
1986	0.561	0.200
1987	0.185	0.146
1988	0.123	0.066
1989	0.089	0.053
1990	0.156	0.064
1991	0.164	0.069
1992	0.123	0.064
1993	0.079	0.052
1994	0.052	0.067
1995	0.150	0.113
1996	0.334	0.123
1997	0.606	1.516
1998	0.080	0.064
1999	0.156	0.115
2000	0.083	0.070
2001	0.018	0.038
2002	0.147	0.254
2003	0.092	0.057
2004	0.141	0.065
2005	0.116	0.060
2006	0.336	0.366
2007	0.253	0.246
2008	0.318	0.148
2009	0.123	0.063

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6060	1.5164
2	0.5607	0.5831
3	0.3363	0.5280

4	0.3344	0.4401
5	0.3176	0.4275
6	0.2527	0.3656
7	0.2509	0.2538
8	0.2440	0.2465
9	0.2308	0.2001
10	0.2163	0.1482
11	0.2089	0.1465
12	0.2057	0.1309
13	0.2038	0.1228
14	0.2029	0.1153
15	0.1856	0.1130
16	0.1846	0.1030
17	0.1734	0.0983
18	0.1723	0.0843
19	0.1642	0.0744
20	0.1618	0.0699
21	0.1603	0.0689
22	0.1599	0.0687
23	0.1584	0.0686
24	0.1563	0.0686
25	0.1557	0.0686
26	0.1547	0.0679
27	0.1498	0.0671
28	0.1482	0.0669
29	0.1470	0.0669
30	0.1435	0.0664
31	0.1428	0.0655
32	0.1407	0.0650
33	0.1390	0.0646
34	0.1387	0.0644
35	0.1386	0.0642
36	0.1251	0.0638
37	0.1235	0.0635
38	0.1234	0.0634
39	0.1234	0.0627
40	0.1212	0.0625
41	0.1189	0.0621
42	0.1155	0.0596
43	0.1137	0.0592
44	0.1123	0.0588
45	0.1072	0.0571
46	0.1058	0.0569
47	0.1048	0.0566
48	0.1006	0.0561
49	0.0922	0.0559
50	0.0886	0.0557
51	0.0836	0.0557
52	0.0834	0.0551
53	0.0824	0.0545
54	0.0804	0.0533
55	0.0802	0.0530
56	0.0790	0.0523
57	0.0760	0.0511
58	0.0522	0.0506
59	0.0438	0.0500
60	0.0181	0.0488
61	0.0177	0.0379

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0730	21410	17825	83	Pass
0.0761	19006	16371	86	Pass
0.0791	17396	15595	89	Pass
0.0822	15900	14733	92	Pass
0.0853	14540	13920	95	Pass
0.0883	13330	12878	96	Pass
0.0914	12234	11813	96	Pass
0.0944	11229	10587	94	Pass
0.0975	10320	9610	93	Pass
0.1006	9503	8675	91	Pass
0.1036	8778	7745	88	Pass
0.1067	8130	6926	85	Pass
0.1098	7520	6228	82	Pass
0.1128	6943	5659	81	Pass
0.1159	6419	5037	78	Pass
0.1190	5953	4577	76	Pass
0.1220	5337	4079	76	Pass
0.1251	4904	3786	77	Pass
0.1282	4524	3600	79	Pass
0.1312	4184	3388	80	Pass
0.1343	3876	3153	81	Pass
0.1374	3604	2952	81	Pass
0.1404	3349	2781	83	Pass
0.1435	3104	2627	84	Pass
0.1466	2855	2451	85	Pass
0.1496	2663	2321	87	Pass
0.1527	2498	2229	89	Pass
0.1558	2340	2119	90	Pass
0.1588	2207	2033	92	Pass
0.1619	2098	1940	92	Pass
0.1650	1994	1873	93	Pass
0.1680	1860	1783	95	Pass
0.1711	1743	1676	96	Pass
0.1742	1654	1565	94	Pass
0.1772	1556	1503	96	Pass
0.1803	1461	1451	99	Pass
0.1834	1371	1390	101	Pass
0.1864	1308	1315	100	Pass
0.1895	1249	1265	101	Pass
0.1926	1200	1217	101	Pass
0.1956	1153	1165	101	Pass
0.1987	1112	1106	99	Pass
0.2018	1071	1047	97	Pass
0.2048	1029	1009	98	Pass
0.2079	1003	975	97	Pass
0.2110	967	945	97	Pass
0.2140	926	896	96	Pass
0.2171	892	848	95	Pass
0.2201	856	795	92	Pass
0.2232	821	747	90	Pass
0.2263	787	713	90	Pass
0.2293	765	661	86	Pass
0.2324	727	621	85	Pass

0.2355	708	576	81	Pass
0.2385	685	533	77	Pass
0.2416	665	501	75	Pass
0.2447	648	477	73	Pass
0.2477	631	449	71	Pass
0.2508	612	422	68	Pass
0.2539	595	389	65	Pass
0.2569	576	361	62	Pass
0.2600	554	325	58	Pass
0.2631	541	302	55	Pass
0.2661	530	296	55	Pass
0.2692	518	294	56	Pass
0.2723	506	290	57	Pass
0.2753	492	283	57	Pass
0.2784	484	280	57	Pass
0.2815	468	275	58	Pass
0.2845	457	272	59	Pass
0.2876	443	269	60	Pass
0.2907	433	264	60	Pass
0.2937	418	258	61	Pass
0.2968	409	247	60	Pass
0.2999	393	240	61	Pass
0.3029	373	238	63	Pass
0.3060	358	234	65	Pass
0.3091	343	230	67	Pass
0.3121	333	223	66	Pass
0.3152	320	219	68	Pass
0.3183	309	214	69	Pass
0.3213	303	208	68	Pass
0.3244	297	206	69	Pass
0.3275	292	203	69	Pass
0.3305	288	203	70	Pass
0.3336	282	200	70	Pass
0.3367	274	197	71	Pass
0.3397	269	191	71	Pass
0.3428	266	190	71	Pass
0.3458	263	189	71	Pass
0.3489	259	187	72	Pass
0.3520	253	186	73	Pass
0.3550	246	184	74	Pass
0.3581	242	182	75	Pass
0.3612	237	178	75	Pass
0.3642	232	177	76	Pass
0.3673	228	175	76	Pass
0.3704	225	172	76	Pass
0.3734	223	168	75	Pass
0.3765	220	164	74	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.7033 acre-feet
On-line facility target flow:	1.15 cfs.
Adjusted for 15 min:	1.15 cfs.
Off-line facility target flow:	0.6513 cfs.
Adjusted for 15 min:	0.6513 cfs.

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
Pond 3 POC	☐	985.52			☐	0.00			
Total Volume Infiltrated		985.52	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 = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

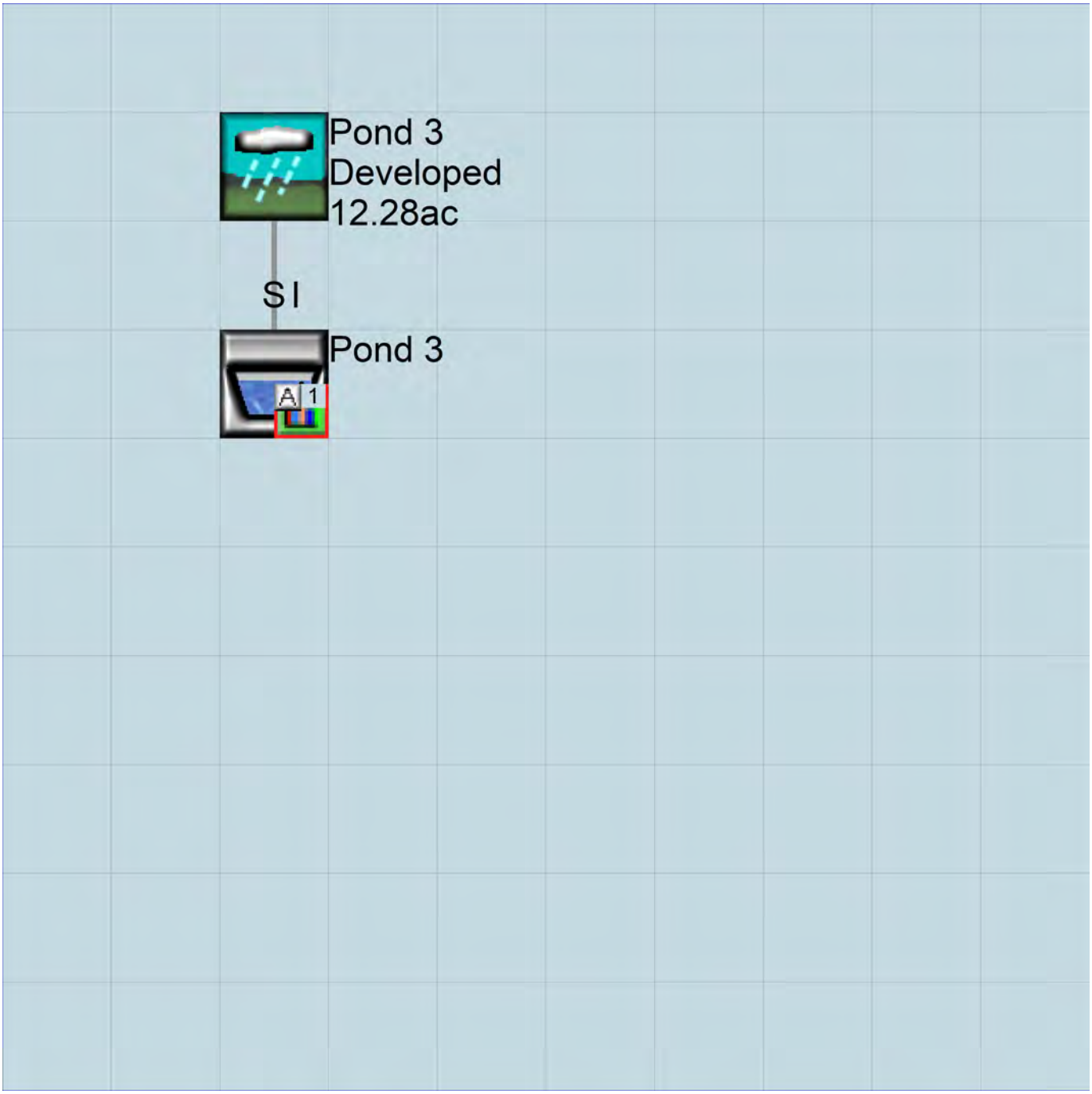
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Oak Heights - Pond 3.wdm
MESSU       25   PreOak Heights - Pond 3.MES
            27   PreOak Heights - Pond 3.L61
            28   PreOak Heights - Pond 3.L62
            30   POCOak Heights - Pond 31.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pond 3 Predeveloped         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   11     C, Forest, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11          0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-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      GWVS
   11             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Pond 3 Predeveloped***
PERLND  11                      12.07     COPY   501     12
PERLND  11                      12.07     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  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 OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.8             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8             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>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Oak Heights - Pond 3.wdm
MESSU      25   MitOak Heights - Pond 3.MES
           27   MitOak Heights - Pond 3.L61
           28   MitOak Heights - Pond 3.L62
           30   POCOak Heights - Pond 31.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      13
      IMPLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pond 3                     MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
 13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 13         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 13             0       4.5      0.06       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 13             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 13           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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       GWVS
 13             0         0         0         0       2.5         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                  in  out           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
    2             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Pond 3 Developed***
PERLND  13                        4.03     RCHRES   1      2
PERLND  13                        4.03     RCHRES   1      3
IMPLND   2                        8.25     RCHRES   1      5

******Routing******
PERLND  13                        4.03     COPY     1     12
IMPLND   2                        8.25     COPY     1     15
PERLND  13                        4.03     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
    1     Pond 3                 1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                   ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->      ***
```

```
    1             1      0.06       0.0     165.0       0.5       0.0
  END HYDR-PARM2
  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
  <------><-------->     <--><--><--><--><--> *** <--><--><--><--><--><--><--><-->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.549679  0.000000  0.000000
  0.066667  0.553117  0.036760  0.008947
  0.133333  0.556562  0.073749  0.012653
  0.200000  0.560015  0.110968  0.015496
  0.266667  0.563475  0.148418  0.017894
  0.333333  0.566942  0.186099  0.020006
  0.400000  0.570417  0.224011  0.021915
  0.466667  0.573899  0.262154  0.023671
  0.533333  0.577388  0.300531  0.025306
  0.600000  0.580885  0.339140  0.026841
  0.666667  0.584389  0.377982  0.028292
  0.733333  0.587901  0.417059  0.029673
  0.800000  0.591420  0.456369  0.030993
  0.866667  0.594946  0.495915  0.032258
  0.933333  0.598479  0.535696  0.033476
  1.000000  0.602020  0.575712  0.034651
  1.066667  0.605568  0.615965  0.035787
  1.133333  0.609124  0.656455  0.036889
  1.200000  0.612687  0.697182  0.037958
  1.266667  0.616257  0.738147  0.038998
  1.333333  0.619835  0.779350  0.040012
  1.400000  0.623420  0.820792  0.041000
  1.466667  0.627012  0.862473  0.041964
  1.533333  0.630612  0.904394  0.042908
  1.600000  0.634219  0.946555  0.043830
  1.666667  0.637833  0.988956  0.044734
  1.733333  0.641455  1.031599  0.045620
  1.800000  0.645084  1.074484  0.046489
  1.866667  0.648720  1.117611  0.047342
  1.933333  0.652364  1.160980  0.048180
  2.000000  0.656015  1.204593  0.049004
  2.066667  0.659673  1.248449  0.049814
  2.133333  0.663339  1.292549  0.050611
  2.200000  0.667012  1.336894  0.051396
  2.266667  0.670692  1.381484  0.052169
  2.333333  0.674380  1.426320  0.052930
  2.400000  0.678075  1.471402  0.053681
  2.466667  0.681778  1.516730  0.054422
  2.533333  0.685488  1.562306  0.055152
  2.600000  0.689205  1.608129  0.055873
  2.666667  0.692929  1.654200  0.056585
  2.733333  0.696661  1.700520  0.057288
  2.800000  0.700400  1.747089  0.057982
  2.866667  0.704147  1.793907  0.058668
  2.933333  0.707901  1.840975  0.059347
  3.000000  0.711662  1.888294  0.060017
  3.066667  0.715431  1.935864  0.060680
  3.133333  0.719207  1.983685  0.061336
  3.200000  0.722990  2.031758  0.061986
  3.266667  0.726781  2.080084  0.062628
  3.333333  0.730579  2.128662  0.063264
  3.400000  0.734384  2.177494  0.063893
```

```
  3.466667  0.738197  2.226580  0.064517
  3.533333  0.742017  2.275921  0.065134
  3.600000  0.745844  2.325516  0.065746
  3.666667  0.749679  2.375367  0.066352
  3.733333  0.753521  2.425474  0.066952
  3.800000  0.757370  2.475837  0.067547
  3.866667  0.761227  2.526457  0.068137
  3.933333  0.765091  2.577334  0.068722
  4.000000  0.768962  2.628469  0.069302
  4.066667  0.772841  2.679862  0.076884
  4.133333  0.776727  2.731515  0.085311
  4.200000  0.780621  2.783426  0.091731
  4.266667  0.784522  2.835598  0.096677
  4.333333  0.788430  2.888029  0.101467
  4.400000  0.792345  2.940722  0.107136
  4.466667  0.796268  2.993676  0.114269
  4.533333  0.800198  3.046891  0.123292
  4.600000  0.804136  3.100369  0.134550
  4.666667  0.808081  3.154110  0.148335
  4.733333  0.812033  3.208113  0.164905
  4.800000  0.815993  3.262381  0.184491
  4.866667  0.819960  3.316913  0.207306
  4.933333  0.823934  3.371709  0.233547
  5.000000  0.827916  3.426771  0.263397
  5.066667  0.831904  3.482098  0.539434
  5.133333  0.835901  3.537692  1.039482
  5.200000  0.839904  3.593552  1.674703
  5.266667  0.843916  3.649679  2.396231
  5.333333  0.847934  3.706074  3.157048
  5.400000  0.851960  3.762737  3.908806
  5.466667  0.855993  3.819669  4.604666
  5.533333  0.860033  3.876870  5.204832
  5.600000  0.864081  3.934340  5.683815
  5.666667  0.868136  3.992081  6.039014
  5.733333  0.872198  4.050092  6.300402
  5.800000  0.876268  4.108374  6.626783
  5.866667  0.880345  4.166928  6.887437
  5.933333  0.884430  4.225754  7.138285
  6.000000  0.888522  4.284852  7.380362
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
```

```
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1948/12/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-1.627E-02     0.00000  0.0000E+00     0.00000  -1.099E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1958/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-2.236E-03     0.00000  0.0000E+00     0.00000  -8.129E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
```

DATE/TIME: 1967/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-1.303E-03	0.00000	0.0000E+00	0.00000	-1.389E-07

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1994/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-2.006E-03	0.00000	0.0000E+00	0.00000	-9.012E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 2003/ 7/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-2.033E-02	0.00000	0.0000E+00	0.00000	-8.702E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.

REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2024; All Rights Reserved.

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

WSDOT POND

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Oak Heights - WSDOT Pond

Site Name:	Oak Heights
Site Address:	
City:	Oak Harbor
Report Date:	7/18/2024
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	2.69
Pervious Total	2.69
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.69

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	1.31
Pervious Total	1.31
Impervious Land Use	acre
ROADS MOD	1.38
Impervious Total	1.38
Basin Total	2.69

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	92.00 ft.
Bottom Width:	45.00 ft.
Depth:	4.7 ft.
Volume at riser head:	0.4961 acre-feet.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	3.7 ft.
Riser Diameter:	18 in.
Notch Type :	V-notch
Notch Angle:	35.000
Notch Height:	0.300 ft.
Orifice 1 Diameter:	0.565 in. Elevation:0 ft.
Orifice 2 Diameter:	0.688 in. Elevation:2.9 ft.
Orifice 3 Diameter:	0.688 in. Elevation:3.2 ft.
Element Flows To:	
Outlet 1	Outlet 2

Pond Hydraulic Table

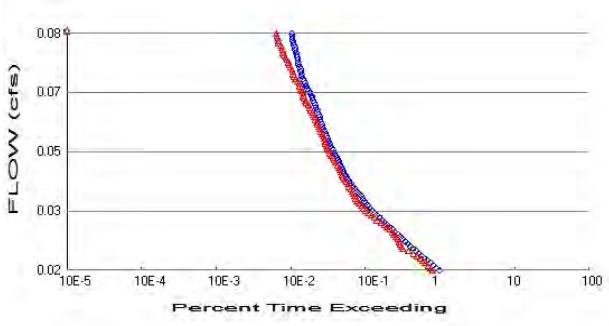
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
132.20	0.095	0.000	0.000	0.000
132.25	0.096	0.005	0.002	0.000
132.30	0.097	0.010	0.002	0.000
132.36	0.098	0.015	0.003	0.000
132.41	0.099	0.020	0.004	0.000
132.46	0.100	0.025	0.004	0.000
132.51	0.101	0.030	0.004	0.000
132.57	0.102	0.036	0.005	0.000
132.62	0.103	0.041	0.005	0.000
132.67	0.104	0.046	0.005	0.000
132.72	0.105	0.052	0.006	0.000
132.77	0.106	0.057	0.006	0.000
132.83	0.107	0.063	0.006	0.000
132.88	0.108	0.069	0.007	0.000
132.93	0.109	0.074	0.007	0.000
132.98	0.110	0.080	0.007	0.000
133.04	0.111	0.086	0.007	0.000
133.09	0.112	0.092	0.008	0.000
133.14	0.113	0.097	0.008	0.000
133.19	0.114	0.103	0.008	0.000
133.24	0.115	0.109	0.008	0.000
133.30	0.116	0.115	0.009	0.000
133.35	0.117	0.122	0.009	0.000
133.40	0.118	0.128	0.009	0.000
133.45	0.120	0.134	0.009	0.000
133.51	0.121	0.140	0.009	0.000
133.56	0.122	0.147	0.010	0.000
133.61	0.123	0.153	0.010	0.000
133.66	0.124	0.160	0.010	0.000
133.71	0.125	0.166	0.010	0.000

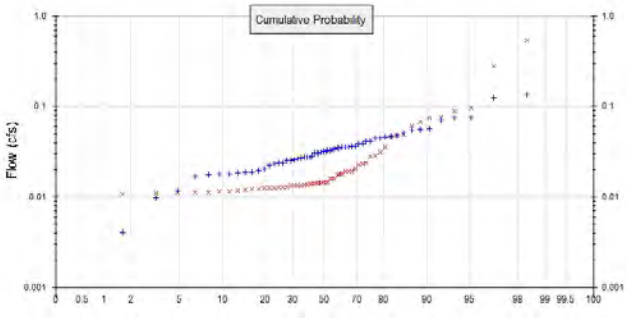
133.77	0.126	0.173	0.010	0.000
133.82	0.127	0.179	0.011	0.000
133.87	0.128	0.186	0.011	0.000
133.92	0.130	0.193	0.011	0.000
133.98	0.131	0.200	0.011	0.000
134.03	0.132	0.206	0.011	0.000
134.08	0.133	0.213	0.011	0.000
134.13	0.134	0.220	0.012	0.000
134.18	0.135	0.227	0.012	0.000
134.24	0.136	0.235	0.012	0.000
134.29	0.138	0.242	0.012	0.000
134.34	0.139	0.249	0.012	0.000
134.39	0.140	0.256	0.012	0.000
134.45	0.141	0.264	0.013	0.000
134.50	0.142	0.271	0.013	0.000
134.55	0.144	0.279	0.013	0.000
134.60	0.145	0.286	0.013	0.000
134.65	0.146	0.294	0.013	0.000
134.71	0.147	0.301	0.013	0.000
134.76	0.148	0.309	0.013	0.000
134.81	0.149	0.317	0.014	0.000
134.86	0.151	0.325	0.014	0.000
134.92	0.152	0.333	0.014	0.000
134.97	0.153	0.341	0.014	0.000
135.02	0.154	0.349	0.014	0.000
135.07	0.156	0.357	0.014	0.000
135.12	0.157	0.365	0.016	0.000
135.18	0.158	0.373	0.018	0.000
135.23	0.159	0.382	0.019	0.000
135.28	0.161	0.390	0.020	0.000
135.33	0.162	0.398	0.021	0.000
135.39	0.163	0.407	0.022	0.000
135.44	0.164	0.416	0.025	0.000
135.49	0.166	0.424	0.027	0.000
135.54	0.167	0.433	0.029	0.000
135.59	0.168	0.442	0.030	0.000
135.65	0.169	0.450	0.032	0.000
135.70	0.171	0.459	0.035	0.000
135.75	0.172	0.468	0.041	0.000
135.80	0.173	0.477	0.050	0.000
135.86	0.175	0.487	0.063	0.000
135.91	0.176	0.496	0.089	0.000
135.96	0.177	0.505	0.312	0.000
136.01	0.179	0.514	0.676	0.000
136.06	0.180	0.524	1.134	0.000
136.12	0.181	0.533	1.659	0.000
136.17	0.183	0.543	2.231	0.000
136.22	0.184	0.552	2.826	0.000
136.27	0.185	0.562	3.420	0.000
136.33	0.187	0.572	3.992	0.000
136.38	0.188	0.581	4.519	0.000
136.43	0.189	0.591	4.983	0.000
136.48	0.191	0.601	5.373	0.000
136.53	0.192	0.611	5.686	0.000
136.59	0.193	0.621	5.928	0.000
136.64	0.195	0.631	6.122	0.000
136.69	0.196	0.642	6.393	0.000
136.74	0.197	0.652	6.598	0.000

136.80	0.199	0.662	6.797	0.000
136.85	0.200	0.673	6.991	0.000
136.90	0.202	0.683	7.179	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.69
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.31
Total Impervious Area: 1.38

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.032533
5 year	0.051219
10 year	0.062552
25 year	0.075397
50 year	0.083911
100 year	0.091587

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.018728
5 year	0.039177
10 year	0.061471
25 year	0.104599
50 year	0.151771
100 year	0.216358

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.004	0.012
1950	0.041	0.023
1951	0.031	0.013
1952	0.022	0.013
1953	0.019	0.011
1954	0.056	0.014
1955	0.054	0.097
1956	0.045	0.088
1957	0.051	0.017
1958	0.036	0.016

1959	0.034	0.014
1960	0.031	0.013
1961	0.036	0.029
1962	0.018	0.011
1963	0.026	0.013
1964	0.031	0.011
1965	0.032	0.016
1966	0.017	0.012
1967	0.047	0.014
1968	0.045	0.019
1969	0.024	0.014
1970	0.025	0.014
1971	0.038	0.077
1972	0.035	0.012
1973	0.018	0.023
1974	0.039	0.021
1975	0.027	0.012
1976	0.025	0.013
1977	0.010	0.012
1978	0.024	0.013
1979	0.046	0.011
1980	0.028	0.012
1981	0.023	0.011
1982	0.036	0.018
1983	0.033	0.019
1984	0.032	0.036
1985	0.048	0.067
1986	0.125	0.281
1987	0.041	0.060
1988	0.028	0.014
1989	0.020	0.011
1990	0.035	0.016
1991	0.037	0.019
1992	0.028	0.018
1993	0.018	0.011
1994	0.012	0.015
1995	0.033	0.028
1996	0.075	0.031
1997	0.135	0.540
1998	0.018	0.014
1999	0.035	0.023
2000	0.019	0.015
2001	0.004	0.009
2002	0.033	0.047
2003	0.021	0.013
2004	0.031	0.015
2005	0.026	0.013
2006	0.075	0.049
2007	0.056	0.047
2008	0.071	0.075
2009	0.028	0.014

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1351	0.5397
2	0.1250	0.2813
3	0.0749	0.0974

4	0.0745	0.0879
5	0.0708	0.0772
6	0.0563	0.0746
7	0.0559	0.0672
8	0.0544	0.0603
9	0.0514	0.0486
10	0.0482	0.0474
11	0.0466	0.0471
12	0.0458	0.0356
13	0.0454	0.0312
14	0.0452	0.0288
15	0.0414	0.0280
16	0.0411	0.0235
17	0.0386	0.0231
18	0.0384	0.0226
19	0.0366	0.0206
20	0.0361	0.0193
21	0.0357	0.0193
22	0.0356	0.0190
23	0.0353	0.0178
24	0.0348	0.0178
25	0.0347	0.0174
26	0.0345	0.0159
27	0.0334	0.0158
28	0.0330	0.0157
29	0.0328	0.0147
30	0.0320	0.0145
31	0.0318	0.0145
32	0.0314	0.0143
33	0.0310	0.0143
34	0.0309	0.0143
35	0.0309	0.0141
36	0.0279	0.0140
37	0.0275	0.0138
38	0.0275	0.0137
39	0.0275	0.0136
40	0.0270	0.0135
41	0.0265	0.0135
42	0.0257	0.0133
43	0.0253	0.0133
44	0.0250	0.0129
45	0.0239	0.0128
46	0.0236	0.0127
47	0.0234	0.0125
48	0.0224	0.0125
49	0.0205	0.0124
50	0.0197	0.0122
51	0.0186	0.0122
52	0.0186	0.0120
53	0.0184	0.0117
54	0.0179	0.0114
55	0.0179	0.0114
56	0.0176	0.0114
57	0.0169	0.0113
58	0.0116	0.0113
59	0.0098	0.0110
60	0.0040	0.0108
61	0.0040	0.0087

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0163	20824	16944	81	Pass
0.0169	19004	15965	84	Pass
0.0176	17336	14763	85	Pass
0.0183	15832	13676	86	Pass
0.0190	14459	12551	86	Pass
0.0197	13216	11573	87	Pass
0.0204	12102	10538	87	Pass
0.0210	11084	9426	85	Pass
0.0217	10190	8012	78	Pass
0.0224	9366	6785	72	Pass
0.0231	8637	6498	75	Pass
0.0238	7989	6218	77	Pass
0.0245	7373	5997	81	Pass
0.0251	6791	5796	85	Pass
0.0258	6275	5542	88	Pass
0.0265	5796	5195	89	Pass
0.0272	5337	4877	91	Pass
0.0279	4894	4528	92	Pass
0.0286	4504	4177	92	Pass
0.0292	4158	3839	92	Pass
0.0299	3846	3478	90	Pass
0.0306	3574	3089	86	Pass
0.0313	3324	2806	84	Pass
0.0320	3063	2571	83	Pass
0.0327	2821	2344	83	Pass
0.0333	2633	2160	82	Pass
0.0340	2455	2022	82	Pass
0.0347	2304	1889	81	Pass
0.0354	2173	1773	81	Pass
0.0361	2062	1669	80	Pass
0.0368	1965	1591	80	Pass
0.0374	1860	1545	83	Pass
0.0381	1741	1485	85	Pass
0.0388	1649	1431	86	Pass
0.0395	1549	1377	88	Pass
0.0402	1450	1308	90	Pass
0.0409	1363	1247	91	Pass
0.0415	1301	1188	91	Pass
0.0422	1242	1124	90	Pass
0.0429	1192	1090	91	Pass
0.0436	1146	1058	92	Pass
0.0443	1101	1014	92	Pass
0.0450	1061	977	92	Pass
0.0456	1022	940	91	Pass
0.0463	990	903	91	Pass
0.0470	957	854	89	Pass
0.0477	927	813	87	Pass
0.0484	891	783	87	Pass
0.0491	855	744	87	Pass
0.0497	817	712	87	Pass
0.0504	783	682	87	Pass
0.0511	760	661	86	Pass
0.0518	727	648	89	Pass

0.0525	706	633	89	Pass
0.0532	682	619	90	Pass
0.0538	659	605	91	Pass
0.0545	643	586	91	Pass
0.0552	630	567	90	Pass
0.0559	610	546	89	Pass
0.0566	585	525	89	Pass
0.0573	572	509	88	Pass
0.0579	554	486	87	Pass
0.0586	541	474	87	Pass
0.0593	529	462	87	Pass
0.0600	517	448	86	Pass
0.0607	506	433	85	Pass
0.0614	491	418	85	Pass
0.0620	484	405	83	Pass
0.0627	465	388	83	Pass
0.0634	454	369	81	Pass
0.0641	441	344	78	Pass
0.0648	429	338	78	Pass
0.0655	416	328	78	Pass
0.0661	407	318	78	Pass
0.0668	388	312	80	Pass
0.0675	369	305	82	Pass
0.0682	353	295	83	Pass
0.0689	343	286	83	Pass
0.0696	333	278	83	Pass
0.0702	319	264	82	Pass
0.0709	309	247	79	Pass
0.0716	301	239	79	Pass
0.0723	297	232	78	Pass
0.0730	291	226	77	Pass
0.0737	287	222	77	Pass
0.0743	280	215	76	Pass
0.0750	273	206	75	Pass
0.0757	269	198	73	Pass
0.0764	266	191	71	Pass
0.0771	262	185	70	Pass
0.0778	256	171	66	Pass
0.0784	252	170	67	Pass
0.0791	246	167	67	Pass
0.0798	242	162	66	Pass
0.0805	237	157	66	Pass
0.0812	231	148	64	Pass
0.0819	228	146	64	Pass
0.0825	225	144	64	Pass
0.0832	223	140	62	Pass
0.0839	219	137	62	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.1266 acre-feet
On-line facility target flow:	0.1895 cfs.
Adjusted for 15 min:	0.1895 cfs.
Off-line facility target flow:	0.107 cfs.
Adjusted for 15 min:	0.107 cfs.

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	☐	178.50			☐	0.00			
Total Volume Infiltrated		178.50	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

Model Default Modifications

Total of 0 changes have been made.

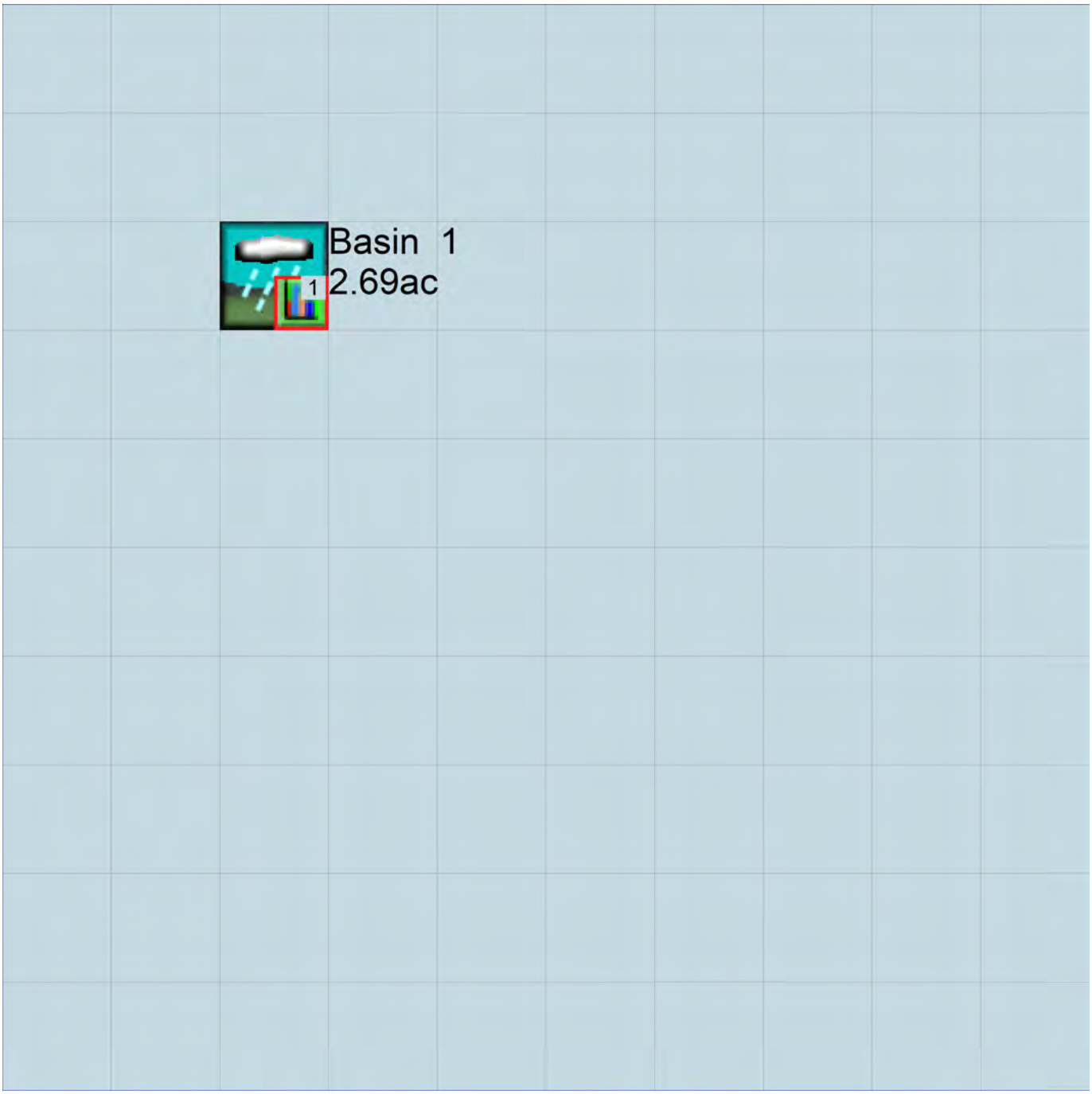
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Oak Heights - WSDOT Pond.wdm
MESSU       25   PreOak Heights - WSDOT Pond.MES
            27   PreOak Heights - WSDOT Pond.L61
            28   PreOak Heights - WSDOT Pond.L62
            30   POCOak Heights - WSDOT Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   11     C, Forest, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-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      GWVS
   11             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                       2.69     COPY   501     12
PERLND  11                       2.69     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  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 OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><---><---><---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.8             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8             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>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Oak Heights - WSDOT Pond.wdm
MESSU      25   MitOak Heights - WSDOT Pond.MES
           27   MitOak Heights - WSDOT Pond.L61
           28   MitOak Heights - WSDOT Pond.L62
           30   POCOak Heights - WSDOT Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      14
      IMPLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         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           ***
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   14         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
   14         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   14         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   14           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-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       GWVS
   14              0         0         0         0       2.5         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                  in  out           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
    2             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  14                        1.31     RCHRES   1      2
PERLND  14                        1.31     RCHRES   1      3
IMPLND   2                        1.38     RCHRES   1      5

******Routing******
PERLND  14                        1.31     COPY     1     12
IMPLND   2                        1.38     COPY     1     15
PERLND  14                        1.31     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
    1     Trapezoidal Pond-005    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->      ***
```

```
    1             1      0.02       0.0     132.2       0.5       0.0
  END HYDR-PARM2
  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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   90    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.095041  0.000000  0.000000
  0.052222  0.096029  0.004989  0.001980
  0.104444  0.097021  0.010030  0.002800
  0.156667  0.098018  0.015123  0.003429
  0.208889  0.099019  0.020267  0.003959
  0.261111  0.100025  0.025465  0.004427
  0.313333  0.101035  0.030715  0.004849
  0.365556  0.102050  0.036017  0.005238
  0.417778  0.103069  0.041373  0.005599
  0.470000  0.104093  0.046782  0.005939
  0.522222  0.105121  0.052245  0.006260
  0.574444  0.106154  0.057762  0.006566
  0.626667  0.107191  0.063333  0.006858
  0.678889  0.108233  0.068958  0.007138
  0.731111  0.109280  0.074637  0.007407
  0.783333  0.110330  0.080371  0.007667
  0.835556  0.111386  0.086161  0.007919
  0.887778  0.112446  0.092005  0.008162
  0.940000  0.113510  0.097905  0.008399
  0.992222  0.114579  0.103861  0.008629
  1.044444  0.115652  0.109872  0.008853
  1.096667  0.116730  0.115940  0.009072
  1.148889  0.117812  0.122064  0.009285
  1.201111  0.118899  0.128245  0.009494
  1.253333  0.119991  0.134483  0.009698
  1.305556  0.121086  0.140777  0.009898
  1.357778  0.122187  0.147130  0.010094
  1.410000  0.123292  0.153539  0.010286
  1.462222  0.124401  0.160007  0.010475
  1.514444  0.125515  0.166532  0.010661
  1.566667  0.126634  0.173116  0.010843
  1.618889  0.127757  0.179759  0.011022
  1.671111  0.128884  0.186460  0.011198
  1.723333  0.130016  0.193220  0.011372
  1.775556  0.131152  0.200039  0.011543
  1.827778  0.132293  0.206918  0.011712
  1.880000  0.133439  0.213857  0.011878
  1.932222  0.134589  0.220855  0.012042
  1.984444  0.135743  0.227914  0.012203
  2.036667  0.136902  0.235033  0.012363
  2.088889  0.138066  0.242213  0.012520
  2.141111  0.139234  0.249453  0.012676
  2.193333  0.140406  0.256755  0.012829
  2.245556  0.141584  0.264118  0.012981
  2.297778  0.142765  0.271543  0.013131
  2.350000  0.143951  0.279029  0.013280
  2.402222  0.145142  0.286578  0.013426
  2.454444  0.146337  0.294189  0.013572
  2.506667  0.147536  0.301862  0.013715
  2.558889  0.148740  0.309598  0.013857
  2.611111  0.149949  0.317397  0.013998
  2.663333  0.151162  0.325260  0.014137
```

```
  2.715556  0.152380  0.333185  0.014275
  2.767778  0.153602  0.341175  0.014412
  2.820000  0.154828  0.349228  0.014547
  2.872222  0.156060  0.357346  0.014681
  2.924444  0.157295  0.365528  0.016822
  2.976667  0.158535  0.373775  0.018502
  3.028889  0.159780  0.382086  0.019688
  3.081111  0.161029  0.390463  0.020672
  3.133333  0.162283  0.398905  0.021539
  3.185556  0.163541  0.407413  0.022325
  3.237778  0.164804  0.415986  0.025550
  3.290000  0.166071  0.424626  0.027588
  3.342222  0.167343  0.433331  0.029223
  3.394444  0.168619  0.442104  0.030657
  3.446667  0.169900  0.450943  0.032353
  3.498889  0.171185  0.459849  0.035736
  3.551111  0.172474  0.468822  0.041698
  3.603333  0.173769  0.477863  0.050874
  3.655556  0.175067  0.486972  0.063783
  3.707778  0.176371  0.496148  0.089118
  3.760000  0.177678  0.505393  0.312865
  3.812222  0.178991  0.514706  0.676651
  3.864444  0.180308  0.524087  1.134094
  3.916667  0.181629  0.533538  1.659802
  3.968889  0.182955  0.543058  2.231361
  4.021111  0.184285  0.552647  2.826092
  4.073333  0.185620  0.562305  3.420712
  4.125556  0.186959  0.572034  3.992150
  4.177778  0.188303  0.581832  4.519014
  4.230000  0.189651  0.591701  4.983512
  4.282222  0.191004  0.601640  5.373712
  4.334444  0.192361  0.611650  5.686103
  4.386667  0.193723  0.621732  5.928406
  4.438889  0.195090  0.631884  6.122612
  4.491111  0.196460  0.642108  6.393166
  4.543333  0.197836  0.652403  6.598545
  4.595556  0.199216  0.662771  6.797667
  4.647778  0.200600  0.673210  6.991073
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            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>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3
```

```
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 2002/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-0.00163     0.00000  0.0000E+00     0.00000  -1.268E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2024; All Rights Reserved.

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

Appendix B – Geotech Report

GEOTECHNICAL ENGINEERING REPORT

PREPARED BY:

THE RILEY GROUP, INC.
17522 BOTHELL WAY NORTHEAST
BOTHELL, WASHINGTON 98011

PREPARED FOR:

D.R. HORTON
11241 SLATER AVENUE NORTHEAST, #200
KIRKLAND, WASHINGTON 98033

RGI PROJECT NO. 2024-165-1

OAK HEIGHTS PLAT
1105 SOUTHWEST 24TH AVENUE
OAK HARBOR, WASHINGTON

JUNE 28, 2024

June 28, 2024

Nicole Mecum
D.R. Horton
11241 Slater Avenue Northeast, #200
Kirkland, Washington 98033

Subject: **Geotechnical Engineering Report**
Oak Heights Plat
1105 Southwest 24th Avenue
Oak Harbor, Washington
RGI Project No. 2024-165-1

Dear Nicole Mecum:

As requested, The Riley Group, Inc. (RGI) has performed a Geotechnical Engineering Report (GER) for the Oak Heights Plat located at 1105 Southwest 24th Avenue, Oak Harbor, Washington. Our services were completed in accordance with our proposal dated May 22, 2024 and authorized by you on May 28, 2024. The information in this GER is based on our understanding of the proposed construction, and the soil and groundwater conditions encountered in the test pits completed by RGI at the site on June 26, 2024, and review of five test pit logs excavated at the site by Materials Testing and Consulting (MTC) on May 15, 2017.

RGI recommends that you submit the project plans to RGI for a general review so that we may confirm that the recommendations in this GER are interpreted and implemented properly in the plans. RGI also recommends that a representative of our firm be present on site during portions of the project construction to confirm that the soil and groundwater conditions are consistent with those that form the basis for the engineering recommendations in this GER.

If you have any questions or require additional information, please contact us.

Respectfully submitted,

THE RILEY GROUP, INC.

State of Washington 2698 Licensed Geologist
06/28/2024
ERIC L. WOODS

Eric L. Woods, LG
Senior Project Geologist

KRISTINA MARIE WELLER STATE OF WASHINGTON 33182 REGISTERED PROFESSIONAL ENGINEER
06/28/2024

Kristina M. Weller, PE
Principal Geotechnical Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION 1

3.0 FIELD EXPLORATION AND LABORATORY TESTING 1
3.1 Field Exploration 1
3.2 Laboratory Testing 2

4.0 SITE CONDITIONS 2
4.1 Surface 2
4.2 Geology 2
4.3 Soils 3
4.4 Groundwater 3
4.5 Seismic Considerations 3
4.6 Geologic Hazard Areas 3

5.0 DISCUSSION AND RECOMMENDATIONS 4
5.1 Geotechnical Considerations 4
5.2 Earthwork 5
5.2.1 Erosion and Sediment Control 5
5.2.2 Stripping 6
5.2.3 Excavations 6
5.2.4 Site Preparation 6
5.2.5 Structural Fill 7
5.2.6 Cut and Fill Slopes 8
5.2.7 Wet Weather Construction Considerations 9
5.3 Foundations 9
5.4 Retaining Walls 10
5.5 Slab-on-Grade Construction 10
5.6 Drainage 11
5.6.1 Surface 11
5.6.2 Subsurface 11
5.6.3 Infiltration 11
5.7 Utilities 11
5.8 Pavements 12

6.0 ADDITIONAL SERVICES 12

7.0 LIMITATIONS 13

LIST OF FIGURES AND APPENDICES

Figure 1 ..... Site Vicinity Map
Figure 2 ..... Geotechnical Exploration Plan
Figure 3 ..... Retaining Wall Drainage Detail
Figure 4 ..... Typical Footing Drain Detail
Appendix A ..... Field Exploration and Laboratory Testing

Executive Summary

This Executive Summary should be used in conjunction with the entire Geotechnical Engineering Report (GER) for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the GER must be read in its entirety for a comprehensive understanding of the items contained herein. Section 7.0 should be read for an understanding of limitations.

RGI's geotechnical scope of work included the advancement of 10 test pits to approximate depths of 4 to 10 feet below existing site grades, and review of 5 test pit logs prepared by MTC.

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

Soil Conditions: The soils encountered during field exploration include loose to medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel with trace to some silt, over dense to very dense silty sand with gravel glacial till and sand with varying amounts of silt and gravel advance outwash.

Groundwater: Light groundwater seepage was encountered at two locations at depths of 3 to 4 feet during our subsurface exploration.

Foundations: Foundations for the proposed residences may be supported on conventional spread footings bearing on native soil or structural fill.

Slab-on-grade: Slab-on-grade floors and slabs for the proposed residences can be supported on native soil or structural fill.

1.0 Introduction

This Geotechnical Engineering Report (GER) presents the results of the geotechnical engineering services provided for the Oak Heights Plat in Oak Harbor, Washington. The purpose of this evaluation is to assess subsurface conditions and provide geotechnical recommendations for the construction of a 219 lot residential plat with associated stormwater facilities, utilities, roadways, and landscape areas. Our scope of services included field explorations, laboratory testing, engineering analyses, and preparation of this GER.

The recommendations in the following sections of this GER are based upon our current understanding of the proposed site development as outlined below. If actual features vary or changes are made, RGI should review them in order to modify our recommendations as required. In addition, RGI requests to review the site plans when available to verify that our project understanding is correct and that our recommendations have been properly interpreted and incorporated into the project design.

2.0 Project description

The project site is located at 1105 Southwest 24th Avenue in Oak Harbor, Washington. The approximate location of the site is shown on Figure 1.

The site is currently undeveloped pasture and forest. RGI understands the site will be developed with a 219 lot residential plat with associated stormwater facilities, utilities, roadways, and landscape areas. Site stormwater will be routed to three detention ponds.

Based on our experience with similar construction, RGI anticipates that the proposed buildings will be supported on perimeter walls with bearing loads of two to six kips per linear foot. Slab-on-grade floor loading of 150 pounds per square foot (psf) are expected.

3.0 Field Exploration and Laboratory Testing

3.1 Field Exploration

On June 26, 2024, RGI observed the excavation of 10 test pits. RGI also reviewed 5 test pit logs prepared by MTC for test pits excavated at the site on May 15, 2017. The approximate exploration locations are shown on Figure 2.

Field logs of each exploration were prepared by the geotechnical engineer or geologist that continuously observed the excavation. These logs included visual classifications of the materials encountered during excavation as well as our interpretation of the subsurface conditions between samples. The test pits logs included in Appendix A represent an interpretation of the field logs and include modifications based on laboratory observation and analysis of the samples.

3.2 LABORATORY TESTING

During the field exploration, a representative portion of each recovered sample was sealed in containers and transported to our laboratory for further visual and laboratory examination. Selected samples retrieved from the test pits were tested for moisture content and grain size analysis to aid in soil classification and provide input for the recommendations provided in this GER. The results and descriptions of the laboratory tests are enclosed in Appendix A.

4.0 Site Conditions

4.1 SURFACE

The subject site is comprised of five parcels totaling approximately 36.69 acres in size. The site is bound to the north by Southwest 24th Avenue, to the east by State Route 20, to the south by undeveloped pasture and forest, and to the west by undeveloped pasture and forest, and a residential development currently under construction.

The site is comprised of undeveloped pasture and forest. Several residences have been removed from the site. The site slopes generally southeast with a total elevation change of approximately 62 feet across the property. Several wetlands are located in the central portion of the property. The site is vegetated with grass, mixed brush and scattered trees.

4.2 GEOLOGY

Review of the *Geologic Map of the Oak Harbor, Crescent Harbor, and part of the Smith Island 7.5-minute Quadrangles, Island County, Washington,* by Joe D. Dragovich, etc. (2005) indicates that several soil deposits are mapped within the property. The northwestern and southeastern portions of the site are mapped as Vashon Stade Till (Map Unit Qgt_v), which is a compact mixture of clay, silt, sand, and gravel deposited by the Vashon ice sheet, and may underlie the entire site at depth.

The east-central portion of the site is mapped as Gravel deposits ($Qgog_e$), which is pebble cobble gravel to pebbly cobbly sand with sand lenses. Much of the northern portion of the site is mapped as Diamicton (Qgi_e), which is an ice-contact deposit comprised of sandy silty pebble gravel to bouldery gravelly sandy silt, and much of the western portion of the site is mapped as Moraine deposits ($Qgim_e$), which is an ice-contact deposit comprised of bouldery cobble gravel with sand interbeds. Soils surrounding the wetlands in the central portion of the site are mapped as Peat (Qp), which is peat and organic sediments in bogs and wetlands. The above descriptions are generally similar to the findings in our field explorations.

4.3 SOILS

The soils encountered during field exploration include loose to medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel with trace to some silt, over dense to very dense silty sand with gravel (glacial till) and sand with varying amounts of silt and gravel (advance outwash).

More detailed descriptions of the subsurface conditions encountered are presented in the test pits included in Appendix A. Sieve analysis was performed on six selected soil samples. Grain size distribution curves are included in Appendix A.

4.4 GROUNDWATER

Light groundwater seepage was encountered at two locations at depths of 3 to 4 feet during our subsurface exploration.

It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the explorations were performed. In addition, perched water can develop within seams and layers contained in fill soils or higher permeability soils overlying less permeable soils following periods of heavy or prolonged precipitation. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the logs. Groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.5 GEOLOGIC HAZARD AREAS

Regulated geologically hazardous areas include erosion, landslide, earthquake, or other geological hazards. Based on review of the Oak Harbor Geologic Hazards map, the site does not contain geologically hazardous areas.

4.6 SEISMIC CONSIDERATIONS

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in water pressure induced by vibrations from a seismic event. Liquefaction mainly affects geologically recent deposits of fine-grained sands that are below the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction, thus reducing or eliminating the soil's strength.

RGI reviewed the results of the field and laboratory testing and assessed the potential for liquefaction of the site's soil during an earthquake. Since the site is underlain by glacial till and glacially consolidated deposits and lacks an established shallow groundwater table, RGI considers that the possibility of liquefaction during an earthquake is minimal.

Based on the International Building Code (IBC), RGI recommends the follow seismic parameters for design.

Table 1 IBC

Parameter	2018 Value
Site Soil Class[1]	D[2]
Site Latitude	48.2788
Site Longitude	-122.6720
Short Period Spectral Response Acceleration, S_S (g)	1.35
1-Second Period Spectral Response Acceleration, S_1 (g)	0.485
Adjusted Short Period Spectral Response Acceleration, S_{MS} (g)	1.35
Adjusted 1-Sec Period Spectral Response Acceleration, S_{M1} (g)	0.88
Numeric seismic design value at 0.2 second; S_{DS}(g)	0.9
Numeric seismic design value at 1.0 second; S_{D1}(g)	0.587

1. Note: In general accordance with Chapter 20 of ASCE 7-16, the Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.

2. Note: ASCE 7-16 require a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope of our services does not include the required 100 foot soil profile determination. Test pits extended to a maximum depth of 10.5 feet, and this seismic site class definition considers that similar soil continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

3. Note: In accordance with ASCE 11.4.8, a ground motion hazard analysis is not required for the following cases:

- Structures on Site Class E sites with S_S greater than or equal to 1.0, provided the site coefficient Fa is taken as equal to that of Site Class C.
- Structures on Site Class D sites with S_1 greater than or equal to 0.2, provided that the value of the seismic response coefficient Cs is determined by Eq. 12.8-2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for $T_L \geq T > 1.5T_s$ or Eq. 12.8-4 for $T > T_L$.
- Structures on Site Class E sites with S_1 greater than or equal to 0.2, provided that T is less than or equal to T_s and the equivalent static force procedure is used for design.

The above exceptions do not apply to seismically isolated structures, structures with damping systems or structures designed using the response history procedures of Chapter 16.

5.0 Discussion and Recommendations

5.1 Geotechnical Considerations

Based on our study, the site is suitable for the proposed construction from a geotechnical standpoint. Foundations for the proposed residences can be supported on conventional spread footings bearing on native soil or structural fill. Slab-on-grade floors and pavements can be similarly supported.

Detailed recommendations regarding the above issues and other geotechnical design considerations are provided in the following sections. These recommendations should be incorporated into the final design drawings and construction specifications.

5.2 EARTHWORK

Earthwork is to include excavating stormwater facilities, grading the lots and roadways, installing utilities, excavating footings, and backfilling foundations.

5.2.1 EROSION AND SEDIMENT CONTROL

Potential sources or causes of erosion and sedimentation depend on construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. The impacts on erosion-prone areas can be reduced by implementing an erosion and sedimentation control plan. The plan should be designed in accordance with applicable city and/or county standards.

RGI recommends the following erosion control Best Management Practices (BMPs):

- Scheduling site preparation and grading for the drier summer and early fall months and undertaking activities that expose soil during periods of little or no rainfall
- Retaining existing vegetation whenever feasible
- Establishing a quarry spall construction entrance
- Installing siltation control fencing or anchored straw or coir wattles on the downhill side of work areas
- Covering soil stockpiles with anchored plastic sheeting
- Revegetating or mulching exposed soils with a minimum 3-inch thickness of straw if surfaces will be left undisturbed for more than one day during wet weather or one week in dry weather
- Directing runoff away from exposed soils and slopes
- Minimizing the length and steepness of slopes with exposed soils and cover excavation surfaces with anchored plastic sheeting (Graded and disturbed slopes should be tracked in place with the equipment running perpendicular to the slope contours so that the track marks provide a texture to help resist erosion and channeling. Some sloughing and raveling of slopes with exposed or disturbed soil should be expected.)
- Decreasing runoff velocities with check dams, straw bales or coir wattles
- Confining sediment to the project site
- Inspecting and maintaining erosion and sediment control measures frequently (The contractor should be aware that inspection and maintenance of erosion control BMPs is critical toward their satisfactory performance. Repair and/or replacement of dysfunctional erosion control elements should be anticipated.)

Permanent erosion protection should be provided by reestablishing vegetation using hydroseeding and/or landscape planting. Until the permanent erosion protection is established, site monitoring should be performed by qualified personnel to evaluate the effectiveness of the erosion control measures. Provisions for modifications to the erosion

control system based on monitoring observations should be included in the erosion and sedimentation control plan.

5.2.2 STRIPPING

Stripping efforts should include removal of pavements, vegetation, organic materials, and deleterious debris from areas slated for building, pavement, and utility construction. The test pits encountered 3 to 12 inches of topsoil and rootmass. Deeper areas of stripping may be required in forested or heavily vegetated areas of the site.

5.2.3 EXCAVATIONS

All temporary cut slopes associated with the site and utility excavations should be adequately inclined to prevent sloughing and collapse. The site soils consist of loose to very dense sand with varying amounts of silt and gravel and silty sand with trace to some gravel.

Accordingly, for excavations more than 4 feet but less than 20 feet in depth, the temporary side slopes should be laid back with a minimum slope inclination of 1.5H:1V (Horizontal:Vertical) in the loose to medium dense deposits and the dense to very dense sand deposits, and 0.75H:1V in the dense to very dense glacial till. If there is insufficient room to complete the excavations in this manner, or excavations greater than 20 feet in depth are planned, using temporary shoring to support the excavations should be considered. For open cuts at the site, RGI recommends:

- No traffic, construction equipment, stockpiles or building supplies are allowed at the top of cut slopes within a distance of at least five feet from the top of the cut
- Exposed soil along the slope is protected from surface erosion using waterproof tarps and/or plastic sheeting
- Construction activities are scheduled so that the length of time the temporary cut is left open is minimized
- Surface water is diverted away from the excavation
- The general condition of slopes should be observed periodically by a geotechnical engineer to confirm adequate stability and erosion control measures

In all cases, however, appropriate inclinations will depend on the actual soil and groundwater conditions encountered during earthwork. Ultimately, the site contractor must be responsible for maintaining safe excavation slopes that comply with applicable OSHA or WISHA guidelines.

5.2.4 SITE PREPARATION

RGI anticipates that some areas of loose or soft soil will be exposed upon completion of stripping and grubbing. Proofrolling and subgrade verification should be considered an essential step in site preparation. After stripping, grubbing, and prior to placement of structural fill, RGI recommends proofrolling building and pavement subgrades and areas to

receive structural fill. These areas should moisture conditioned and compacted to a firm and unyielding condition in order to achieve a minimum compaction level of 95 percent of the modified proctor maximum dry density as determined by the American Society of Testing and Materials D1557-09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557).

Proofrolling and adequate subgrade compaction can only be achieved when the soils are within approximately ± 2 percent moisture content of the optimum moisture content. Soils which appear firm after stripping and grubbing may be proofrolled with a heavy compactor, loaded double-axle dump truck, or other heavy equipment under the observation of an RGI representative. This observer will assess the subgrade conditions prior to filling. The need for or advisability of proofrolling due to soil moisture conditions should be determined at the time of construction. In wet areas it may be necessary to hand probe the exposed subgrades in lieu of proofrolling with mechanical equipment.

If fill is placed in areas of the site where existing slopes are steeper than 5:1 (Horizontal:Vertical), the area should be benched to reduce the potential for slippage between existing slopes and fills. Benches should be wide enough to accommodate compaction and earth moving equipment, and to allow placement of horizontal lifts of fill.

Subgrade soils that become disturbed due to elevated moisture conditions should be overexcavated to reveal firm, non-yielding, non-organic soils and backfilled with compacted structural fill. In order to maximize utilization of site soils as structural fill, RGI recommends that the earthwork portion of this project be completed during extended periods of warm and dry weather if possible. If earthwork is completed during the wet season (typically November through May) it will be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork will require additional mitigative measures beyond that which would be expected during the drier summer and fall months.

5.2.5 Structural Fill

Once stripping, clearing and other preparing operations are complete, cuts and fills can be made to establish desired lot and roadway grades. Prior to placing fill, RGI recommends proof-rolling as described above.

RGI recommends fill below the foundation and floor slab, behind retaining walls, and below pavement and hardscape surfaces be placed in accordance with the following recommendations for structural fill.

The suitability of excavated site soils and import soils for compacted structural fill use will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the U.S. No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more

difficult or impossible to achieve. Soils containing more than about 5 percent fines cannot be consistently compacted to a dense, non-yielding condition when the moisture content is more than 2 percent above or below optimum. Optimum moisture content is that moisture that results in the greatest compacted dry density with a specified compactive effort.

Non-organic site soils are only considered suitable for structural fill provided that their moisture content is within about two percent of the optimum moisture level as determined by ASTM D1557. Excavated site soils may not be suitable for re-use as structural fill depending on the moisture content and weather conditions at the time of construction. If soils are stockpiled for future reuse and wet weather is anticipated, the stockpile should be protected with plastic sheeting that is securely anchored.

Even during dry weather, moisture conditioning (such as, windrowing and drying) of site soils to be reused as structural fill may be required. Even during the summer, delays in grading can occur due to excessively high moisture conditions of the soils or due to precipitation. If wet weather occurs, the upper wetted portion of the site soils may need to be scarified and allowed to dry prior to further earthwork, or may need to be wasted from the site.

If on-site soils are or become unusable, it may become necessary to import clean, granular soils to complete site work. Prior to use, an RGI representative should observe and test all materials imported to the site for use as structural fill. Structural fill materials should be placed in uniform loose layers not exceeding 12 inches and compacted to 95 percent of the maxim dry density. The soil's maximum density and optimum moisture should be determined by ASTM D1557.

Placement and compaction of structural fill should be observed by RGI. A representative number of in-place density tests should be performed as the fill is being placed to confirm that the recommended level of compaction is achieved. The silty sand and sandy silt soils should be moisture conditioned such that they are 2 to 4 points over optimum moisture prior to placement.

5.2.6 CUT AND FILL SLOPES

All permanent cut and fill slopes should be graded with a finished inclination no greater than 2H:1V. The interior slopes of the detention ponds must be graded with a slope gradient no steeper than 3H:1V, unless fenced. Upon completion of construction, the slope face should be trackwalked, compacted and vegetated, or provided with other physical means to guard against erosion. All fill placed for slope construction should meet the structural fill requirements as described in Section 5.2.5.

Final grades at the top of the slopes must promote surface drainage away from the slope crest. Water must not be allowed to flow in an uncontrolled fashion over the slope face. If

it is necessary to direct surface runoff towards the slope, it should be controlled at the top of the slope, piped in a closed conduit installed on the slope face, and taken to an appropriate point of discharge beyond the toe of the slope.

5.2.7 WET WEATHER CONSTRUCTION CONSIDERATIONS

RGI recommends that preparation for site grading and construction include procedures intended to drain ponded water, control surface water runoff, and to collect shallow subsurface seepage zones in excavations where encountered. It will not be possible to successfully compact the subgrade or utilize on-site soils as structural fill if accumulated water is not drained prior to grading or if drainage is not controlled during construction.

Attempting to grade the site without adequate drainage control measures will reduce the amount of on-site soil effectively available for use, increase the amount of select import fill materials required, and ultimately increase the cost of the earthwork phases of the project. Free water should not be allowed to pond on the subgrade soils. RGI anticipates that the use of berms and shallow drainage ditches, with sumps and pumps in utility trenches, will be required for surface water control during wet weather and/or wet site conditions.

5.3 FOUNDATIONS

Following site preparation and grading, the proposed residences can be supported on conventional spread footings bearing on native soil or structural fill. Loose, organic, or other unsuitable soils may be encountered in the proposed building footprint. If unsuitable soils are encountered, they should be overexcavated and backfilled with structural fill.

Perimeter foundations exposed to weather should be at a minimum depth of 18 inches below final exterior grades. Interior foundations can be constructed at any convenient depth below the floor slab. Finished grade is defined as the lowest adjacent grade within 5 feet of the foundation for perimeter (or exterior) footings and finished floor level for interior footings.

Table 2 Foundation Design

Design Parameter	Value
Allowable Bearing Capacity	2,000 psf[1]
Friction Coefficient	0.30
Passive pressure (equivalent fluid pressure)	250 pcf[2]

1. psf = pounds per square foot
2. pcf = pounds per cubic foot

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. For short-term loads, such as wind and seismic, a 1/3 increase in this allowable

capacity may be used. At perimeter locations, RGI recommends not including the upper 12 inches of soil in the computation of passive pressures because they can be affected by weather or disturbed by future grading activity. The passive pressure value assumes the foundation will be constructed neat against competent soil or backfilled with structural fill as described in Section 5.2.5. The recommended base friction and passive resistance value includes a safety factor of about 1.5.

With spread footing foundations designed in accordance with the recommendations in this section, maximum total and differential post-construction settlements of 1 inch and 1/2 inch, respectively, should be expected.

5.4 RETAINING WALLS

If retaining walls are needed for the residences or ponds, RGI recommends cast-in-place concrete walls be used. Modular block walls may be used for grade changes in other areas.

The magnitude of earth pressure development on retaining walls will partly depend on the quality of the wall backfill. RGI recommends placing and compacting wall backfill as structural fill. Wall drainage will be needed behind the wall face. A typical retaining wall drainage detail is shown in Figure 3.

With wall backfill placed and compacted as recommended, level backfill and drainage properly installed, RGI recommends using the values in the following table for design.

Table 3 Retaining Wall Design

Design Parameter	Value
Active Earth Pressure (unrestrained walls)	35 pcf
At-rest Earth Pressure (restrained walls)	50 pcf

For seismic design, an additional uniform load of 7 times the wall height (H) for unrestrained walls and 14H in psf for restrained walls should be applied to the wall surface. Friction at the base of foundations and passive earth pressure will provide resistance to these lateral loads. Values for these parameters are provided in Section 5.3.

5.5 SLAB-ON-GRADE CONSTRUCTION

RGI recommends that the concrete slab be placed on top of medium dense native soil or structural fill. Immediately below the floor slab, RGI recommends placing a four-inch thick capillary break layer of clean, free-draining sand or gravel that has less than five percent passing the U.S. No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab.

Where moisture by vapor transmission is undesirable, an 8- to 10-millimeter thick plastic membrane should be placed on a 4-inch thick layer of clean gravel. For the anticipated floor slab loading, we estimate post-construction floor settlements of 1/4- to 1/2-inch.

5.6 DRAINAGE

5.6.1 SURFACE

Final exterior grades should promote free and positive drainage away from the residences area. Water must not be allowed to pond or collect adjacent to foundations. For non-pavement locations, RGI recommends providing a minimum drainage gradient of 3 percent for a minimum distance of 10 feet from the building perimeter. In paved locations, a minimum gradient of 1 percent should be provided unless provisions are included for collection and disposal of surface water adjacent to the structure.

5.6.2 SUBSURFACE

RGI recommends installing perimeter foundation drains. A typical footing drain detail is shown on Figure 4. The foundation drains and roof downspouts should be tightlined separately to an approved discharge facility. Subsurface drains must be laid with a gradient sufficient to promote positive flow to a controlled point of approved discharge.

5.6.3 INFILTRATION

Soils suitable for infiltration were encountered at the site, however, they are generally underlain at a shallow depth by impermeable glacial till. Permeable pavement and shallow infiltration may be feasible depending on the final site grades.

5.7 UTILITIES

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) specifications. For site utilities located within the right-of-ways, bedding and backfill should be completed in accordance with City of Oak Harbor specifications.

In accordance with the city standards, trench backfill shall be gravel backfill meeting the WSDOT Standard Specifications 9-03.19. Trench backfill should be placed and compacted as structural fill, as described in Section 5.2.5. Where utilities occur below unimproved areas, suitable native soils may be used and the degree of compaction can be reduced to a minimum of 90 percent of the soil's maximum density as determined by the referenced ASTM D1557.

5.8 PAVEMENTS

Pavement subgrades should be prepared as described in Section 5.2 and as discussed below. Regardless of the relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. The subgrade should be proof-rolled with heavy construction equipment to verify this condition.

5.8.1 FLEXIBLE PAVEMENTS

With the pavement subgrade prepared as described above, RGI recommends the following pavement sections for areas paved with flexible asphalt concrete surfacing.

- **For local residential**: 3 inches of Hot Mix Asphalt (HMA) over 2 inches of Crushed Surfacing Top Course (CSTC) over 6 inches of Crushed Surfacing Base Course (CSBC)

5.8.2 CONCRETE PAVEMENTS

With the pavement subgrade prepared as described above, RGI recommends the following pavement sections for parking and drive areas paved with concrete surfacing.

- **For concrete sidewalks**: 6 inches of concrete over 4 inches of CSBC

The paving materials used should conform to the WSDOT specifications for HMA, concrete paving, and 9-03.9(3) Crushed Surfacing.

Long-term pavement performance will depend on surface drainage. A poorly-drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability.

For optimum pavement performance, surface drainage gradients of no less than 2 percent are recommended. Also, some degree of longitudinal and transverse cracking of the pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

6.0 Additional Services

RGI is available to provide further geotechnical consultation throughout the design phase of the project. RGI should review the final design plans in order to verify that earthwork and foundation recommendations have been properly interpreted and incorporated into project design and construction.

RGI is also available to provide geotechnical engineering and construction observation services during construction. The integrity of the earthwork and construction depends on proper site preparation and procedures. In addition, engineering decisions may arise in the field in the event that variations in subsurface conditions become apparent.

7.0 Limitations

This GER is the property of RGI, D.R. Horton, and its designated agents. Within the limits of the scope and budget, this GER was prepared in accordance with generally accepted geotechnical engineering practices in the area at the time this GER was issued. This GER is intended for specific application to the Oak Heights Plat project in Oak Harbor, Washington, and for the exclusive use of D.R. Horton and its authorized representatives. No other warranty, expressed or implied, is made. Site safety, excavation support, and dewatering requirements are the responsibility of others.

The scope of services for this project does not include either specifically or by implication any environmental or biological (for example, mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, we can provide a proposal for these services.

The analyses and recommendations presented in this GER are based upon data obtained from the explorations performed on site. Variations in soil conditions can occur, the nature and extent of which may not become evident until construction. If variations appear evident, RGI should be requested to reevaluate the recommendations in this GER prior to proceeding with construction.

It is the client's responsibility to see that all parties to the project, including the designers, contractors, subcontractors, are made aware of this GER in its entirety. The use of information contained in this GER for bidding purposes should be done at the contractor's option and risk.

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

On June 26, 2024, RGI observed field explorations using a mini excavator. We documented subsurface soil conditions at the site by observing the excavation of 10 test pits to a maximum depth of 10.5 feet below existing grade. RGI also reviewed 5 test pit logs prepared by MTC for previous test pits excavated at the site on May 15, 2017. The test pit locations are shown on Figure 2. The test pit locations were approximately determined by measurements from existing property lines and paved roads.

A geologist/engineer from our office observed the field exploration and classified the soil conditions encountered, maintained a log of each test exploration, obtained representative soil samples, and observed pertinent site features. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS).

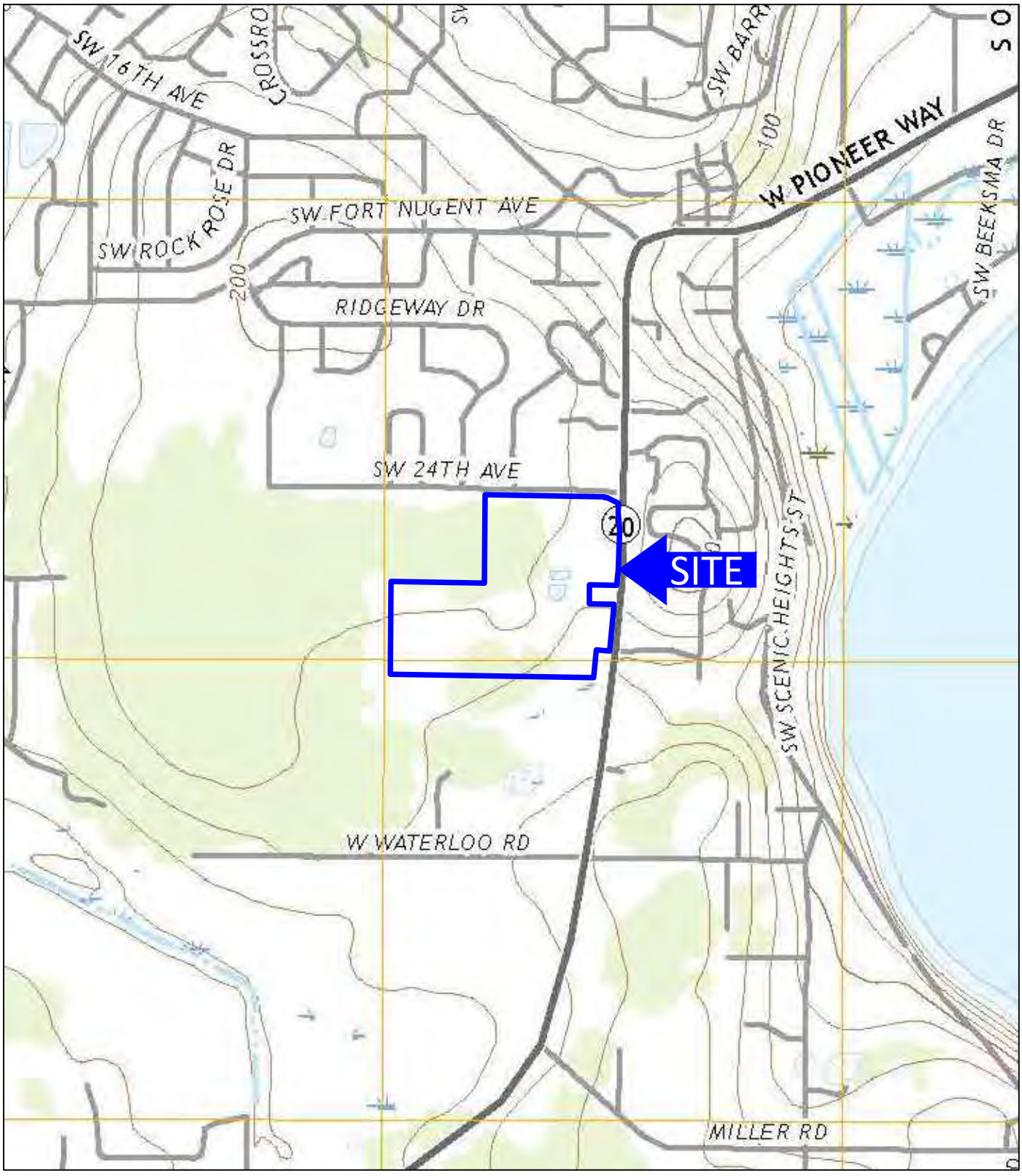
Representative soil samples obtained from the explorations were placed in closed containers and taken to our laboratory for further examination and testing. As a part of the laboratory testing program, the soil samples were classified in our in house laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described below.

Moisture Content Determinations

Moisture content determinations were performed in accordance with ASTM D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216) on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. The moisture content of typical sample was measured and is reported on the test pit logs.

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analyses was determined using D6913-04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis (ASTM D6913) on six of the samples.



USGS, 2020, Oak Harbor, Washington
7.5-Minute Quadrangle

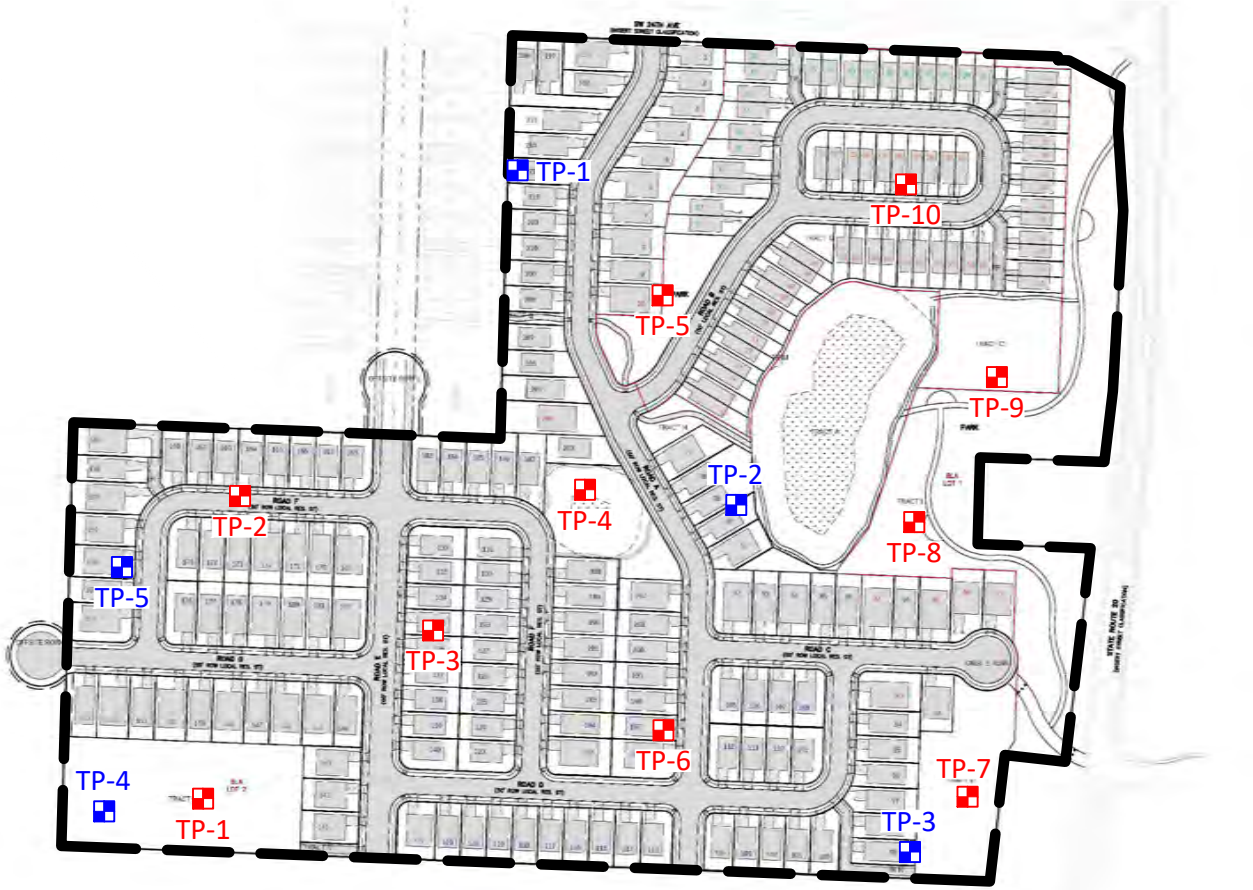
Approximate Scale: 1"=1000'

0 500 1000 2000

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Oak Heights Plat		Figure 1
RGI Project Number: 2024-165-1	Site Vicinity Map	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		



= Test pit locations by RGI, 06/26/2024

= Test pit locations by Materials Testing & Consulting, Inc., 05/15/2017

= Site boundary

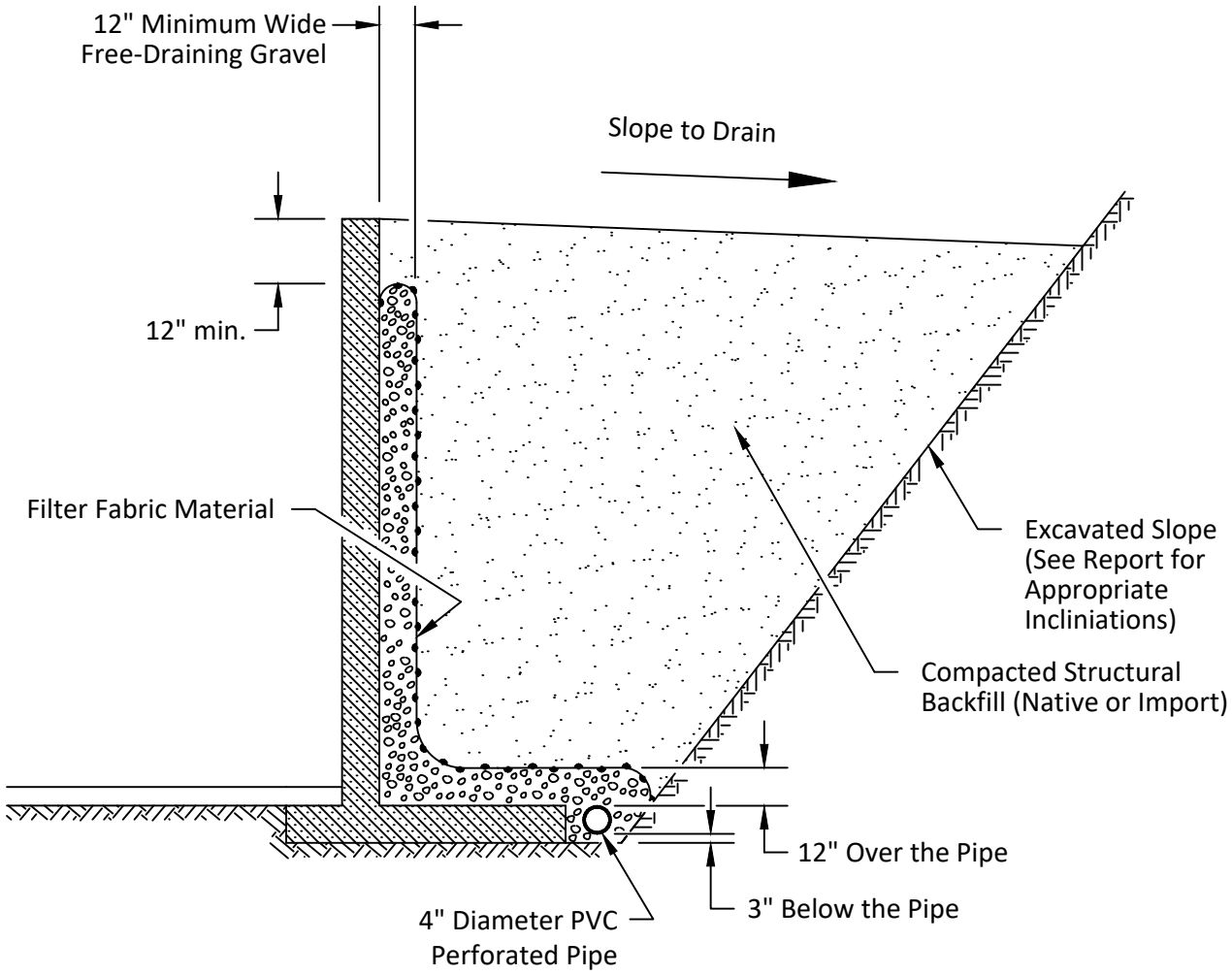
Approximate Scale: 1" = 300'

0 150 300 600

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

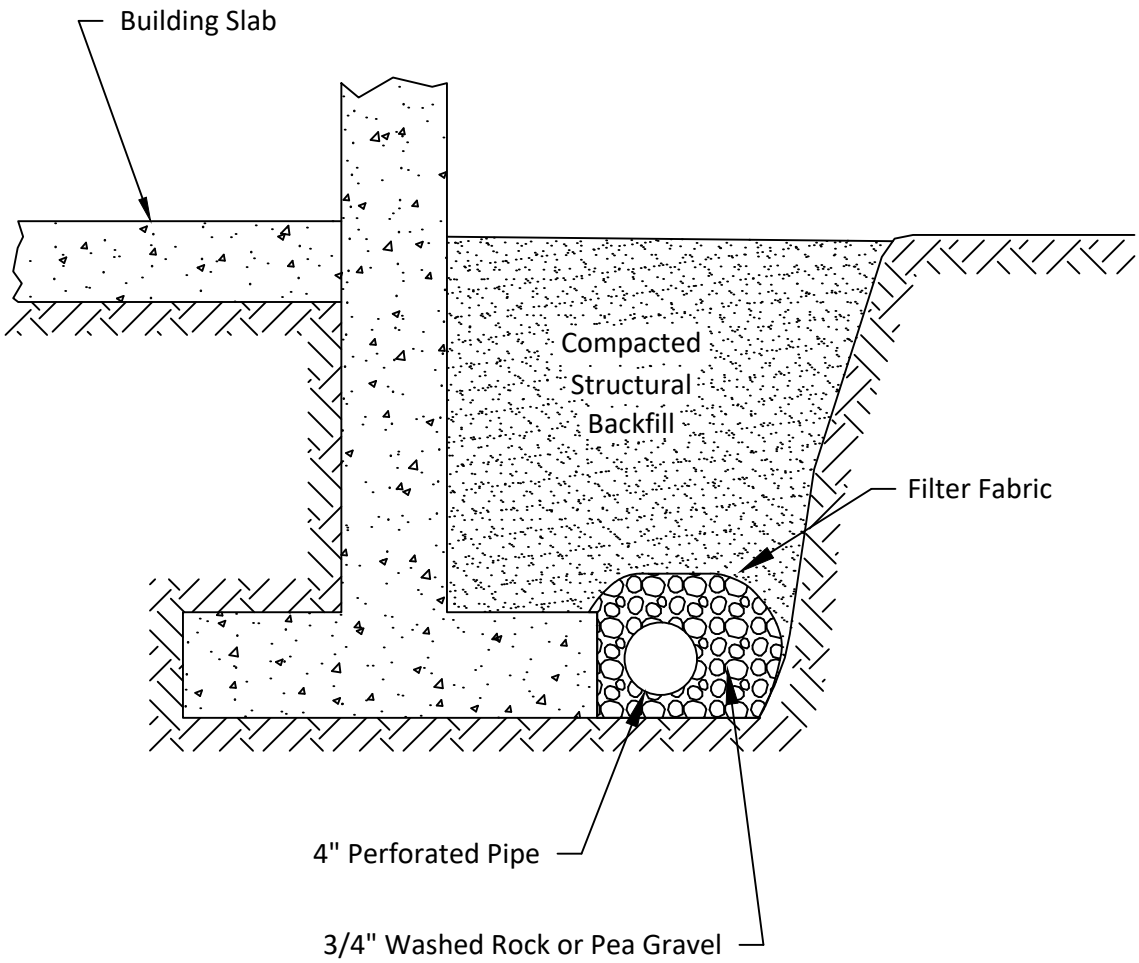
Oak Heights Plat		Figure 2
RGI Project Number: 2024-165-1	Geotechnical Exploration Plan	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		



Not to Scale

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Oak Heights Plat		Figure 3
RGI Project Number: 2024-165-1	Retaining Wall Drainage Detail	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		



Not to Scale

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Oak Heights Plat		Figure 4
RGI Project Number: 2024-165-1	Typical Footing Drain Detail	Date Drawn: 06/2024
Address: 1105 Southwest 24th Avenue, Oak Harbor, Washington 98277		

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

On June 26, 2024, RGI observed field explorations using a mini excavator. We documented subsurface soil conditions at the site by observing the excavation of 10 test pits to a maximum depth of 10.5 feet below existing grade. RGI also reviewed 5 test pit logs prepared by MTC for previous test pits excavated at the site on May 15, 2017. The test pit locations are shown on Figure 2. The test pit locations were approximately determined by measurements from existing property lines and paved roads.

A geologist/engineer from our office observed the field exploration and classified the soil conditions encountered, maintained a log of each test exploration, obtained representative soil samples, and observed pertinent site features. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS).

Representative soil samples obtained from the explorations were placed in closed containers and taken to our laboratory for further examination and testing. As a part of the laboratory testing program, the soil samples were classified in our in house laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described below.

Moisture Content Determinations

Moisture content determinations were performed in accordance with ASTM D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216) on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. The moisture content of typical sample was measured and is reported on the test pit logs.

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analyses was determined using D6913-04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis (ASTM D6913) on six of the samples.

Project Name: **Oak Heights Plat** Project Number: **2024-165-1** Client: **D. R. Horton**	Test Pit No.: TP-1

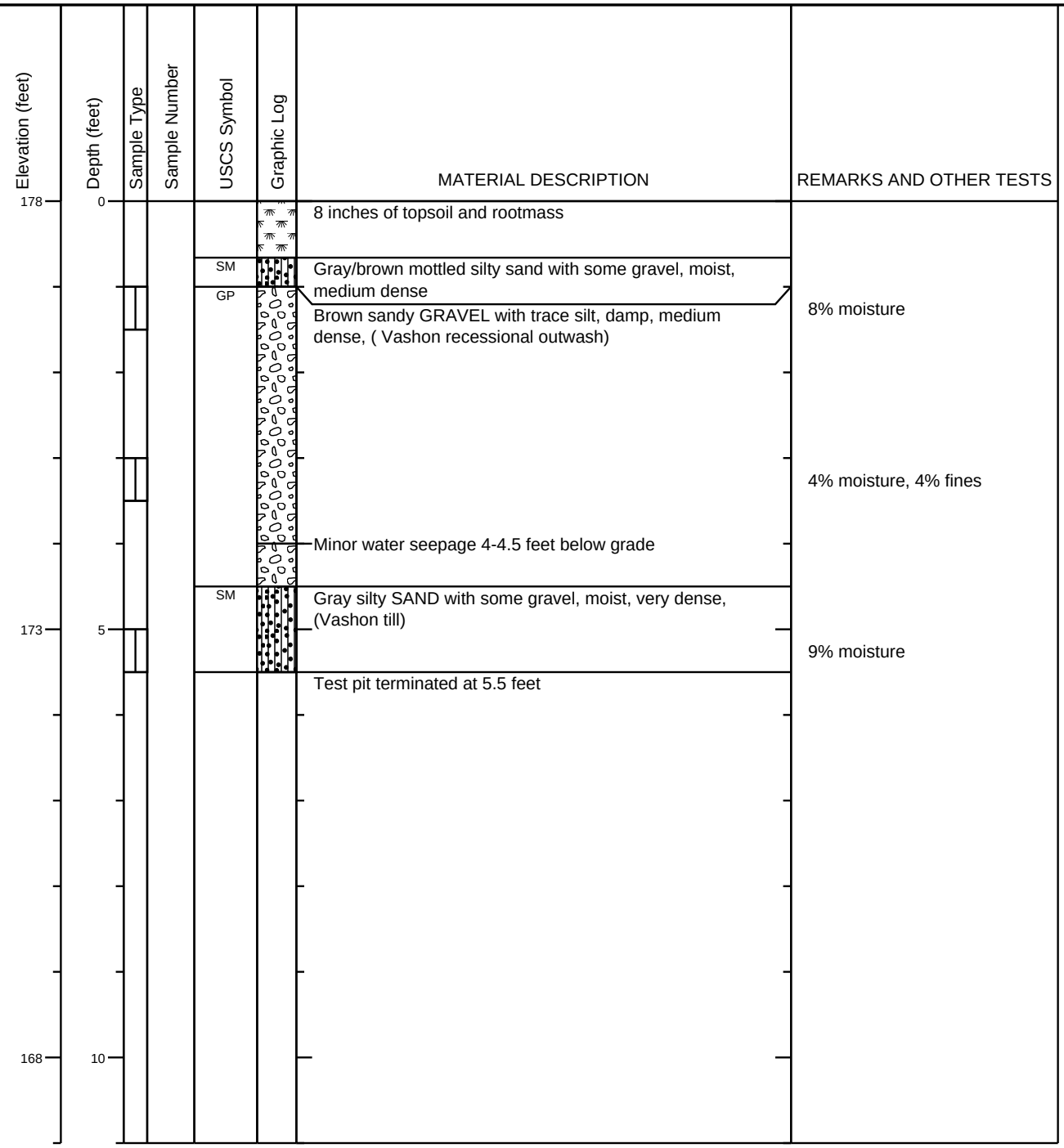
Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **10 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **168**
Groundwater Level: **Minor seepage at 3.25 feet below grade**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
168	0					4 inches of topsoil and rootmass	
				SM		Brown silty SAND with trace gravel, moist, loose	
				SM		Gray/brown mottled silty SAND with some gravel and cobles, moist, medium dense, rust staining,	19% moisture
						Minor water seepage	
				SM		Gray silty SAND with some gravel, moist, very dense, (Vashon till)	10% moisture, 34% fines
163	5						9% moisture
				SM		Gray silty SAND, moist, very dense, (Vashon till)	11% moisture, 40% fines
158	10					Terminated at 10 feet, refusal due to either the density of soils, or a large boulder	

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-2

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **5.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Minor seepage at 4 feet below grade**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat** Project Number: **2024-165-1** Client: **D. R. Horton**	Test Pit No.: TP-3

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **4 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

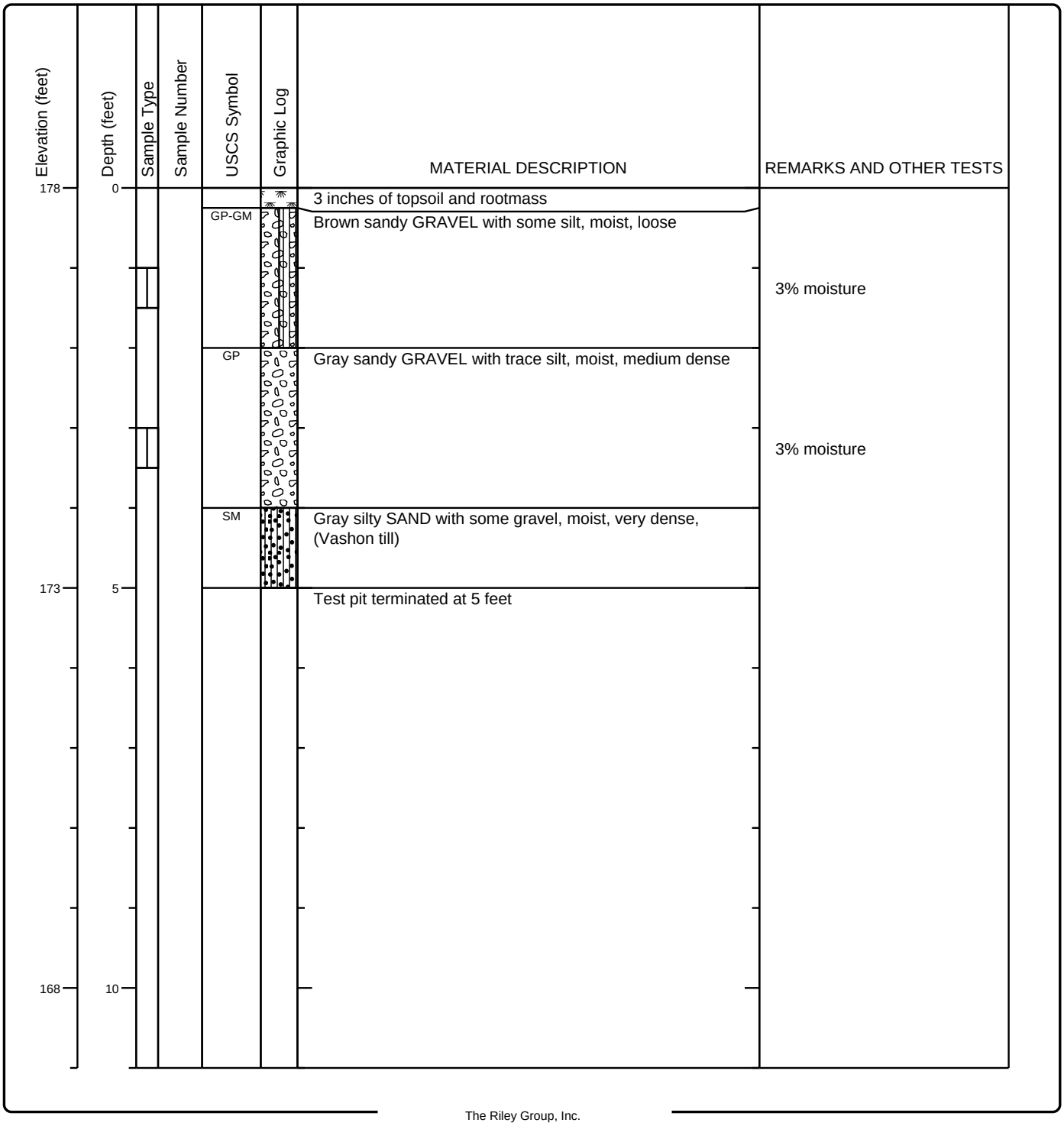
Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
178	0					8 inches of topsoil and rootmass	
				SM		Brown silty SAND with some gravel, moist, medium dense, (Weathered Vashon till)	8% moisture
				SM		Gray silty SAND with some gravel, moist, very dense, (Vashon till)	9% moisture
						Test pit terminated at 4 feet	
173	5						
168	10						

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-4

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

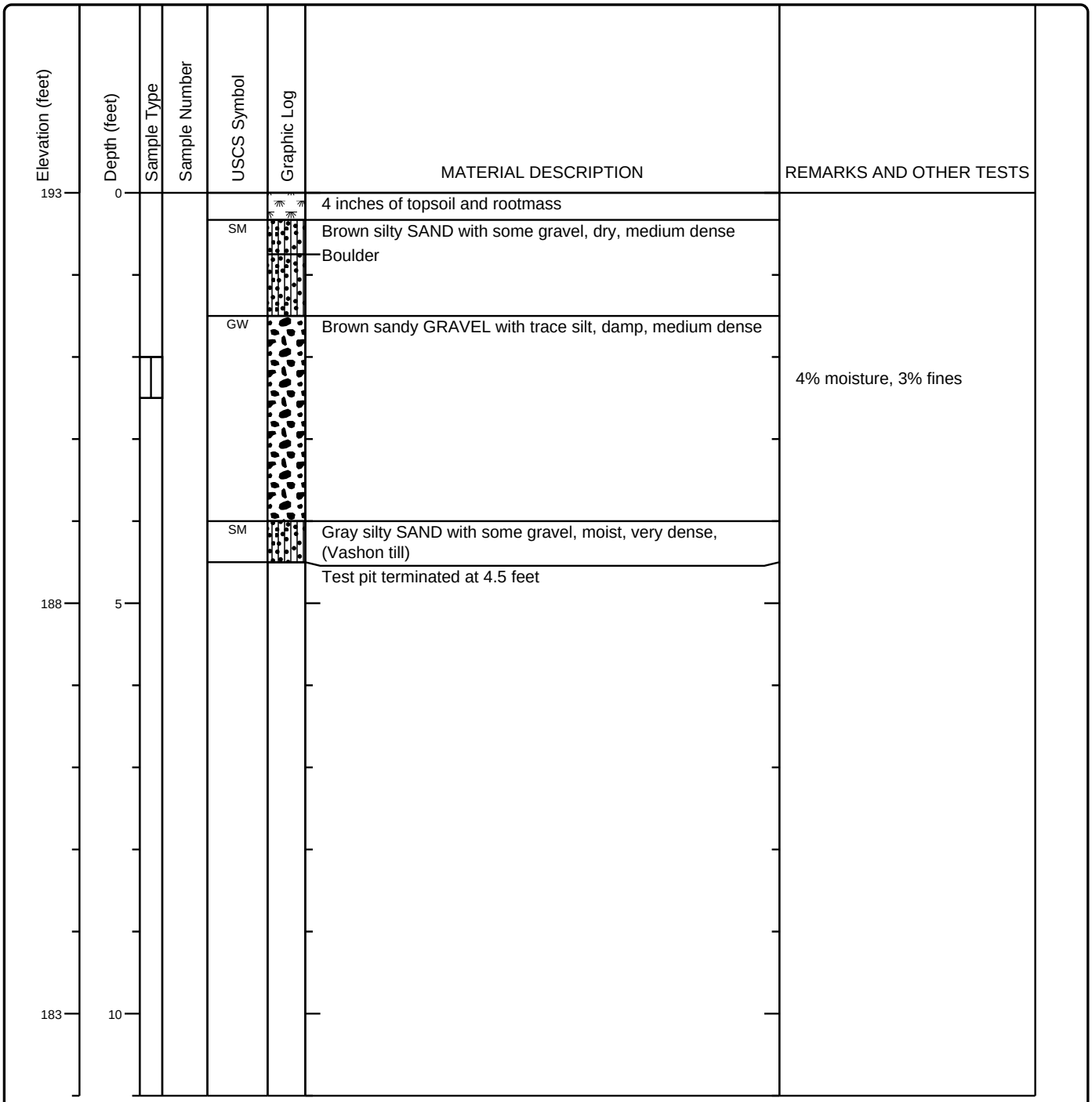


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-5

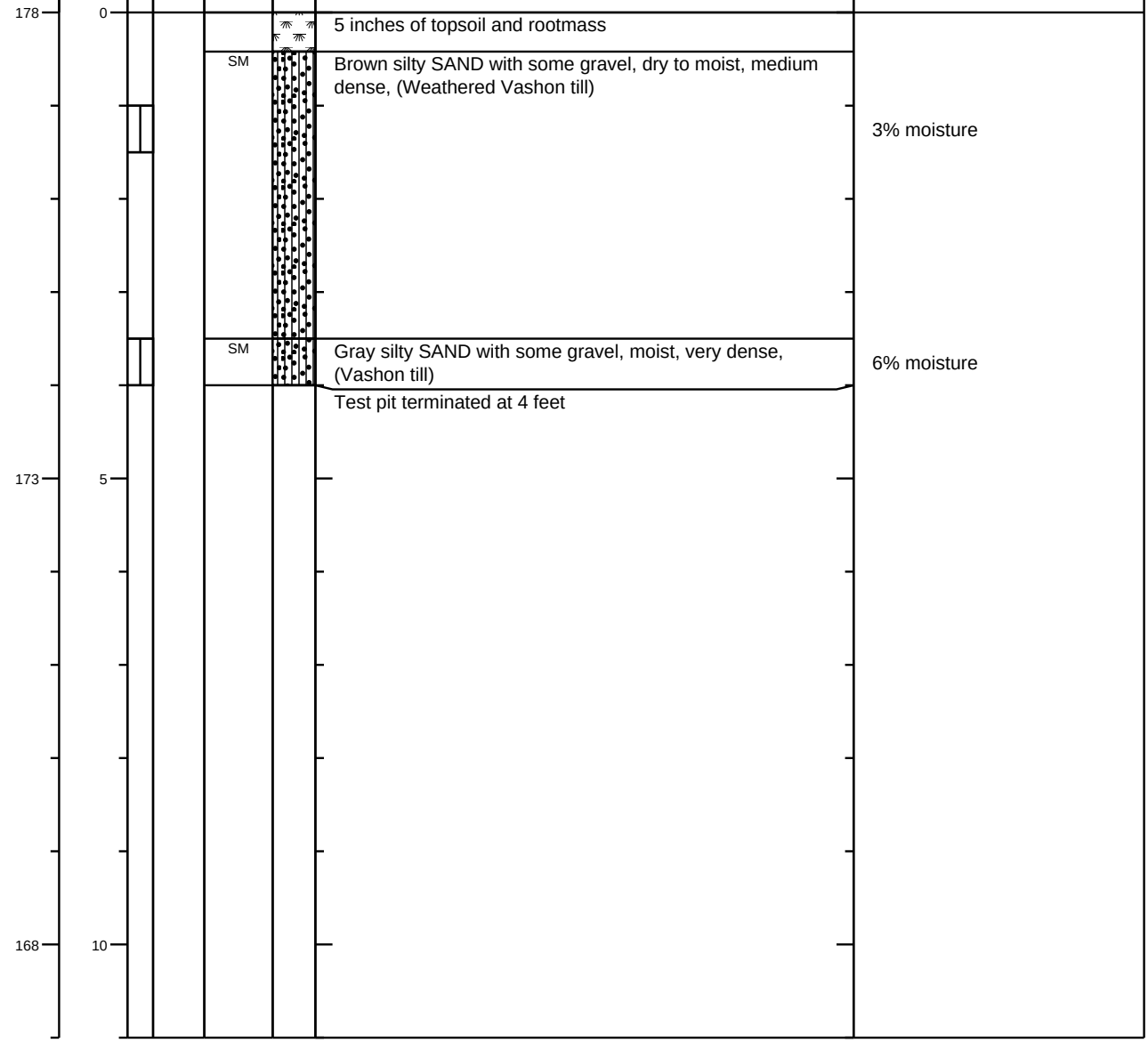
Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **4.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **193**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat** Project Number: **2024-165-1** Client: **D. R. Horton**	RILEYGROUP Test Pit No.: TP-6

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **4 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **178**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

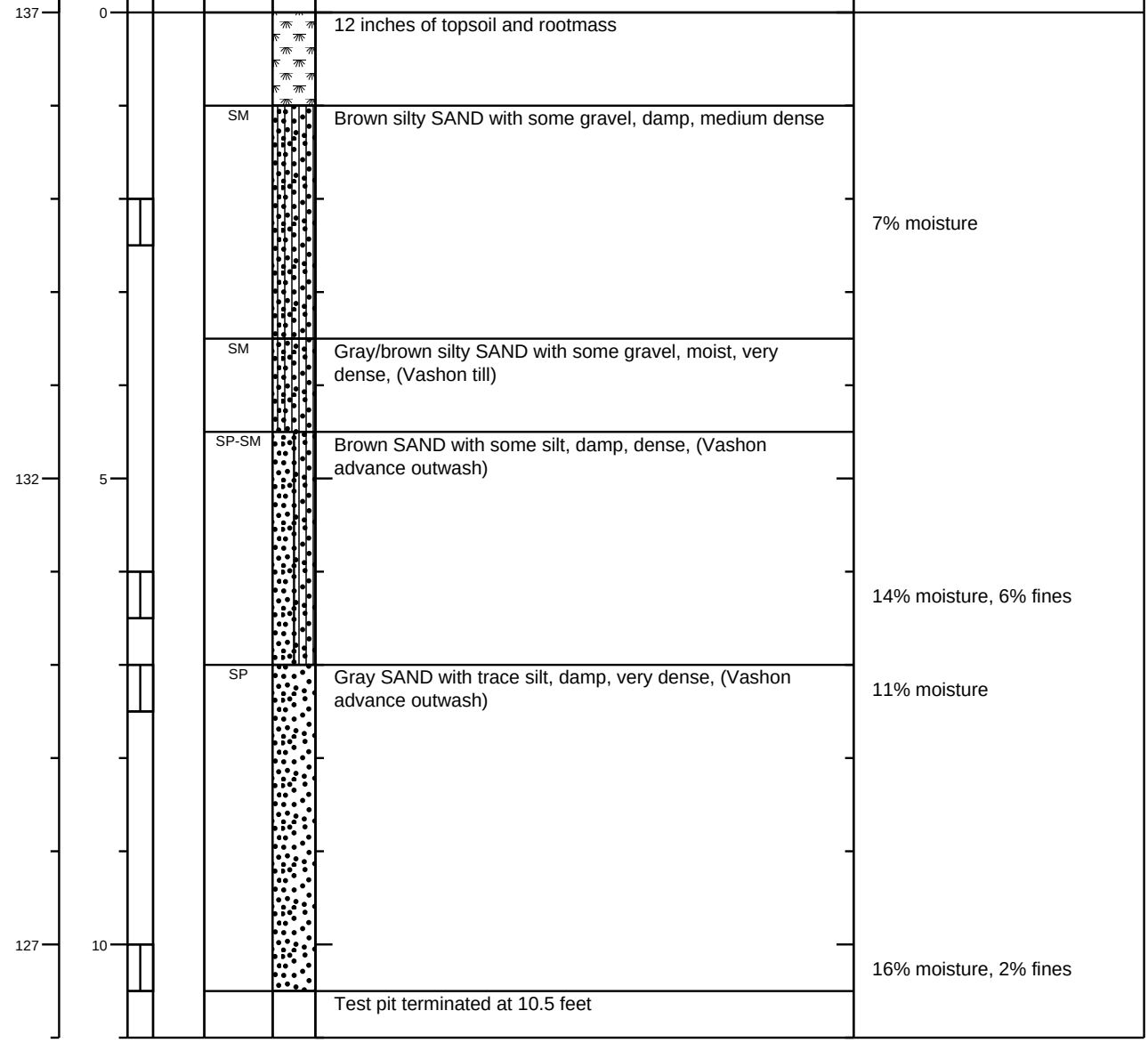


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-7

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **10.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **137**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

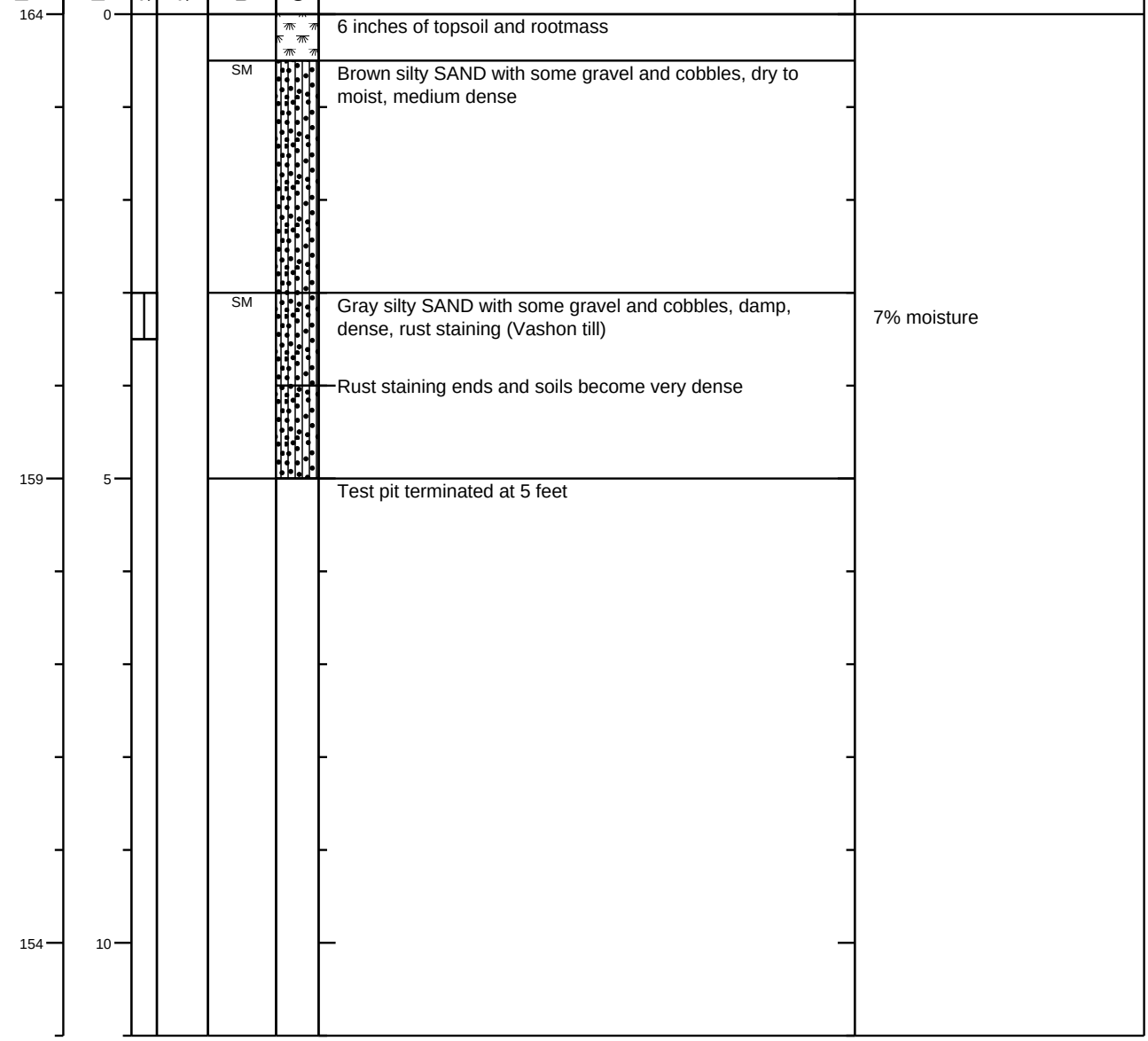


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-8

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **164**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

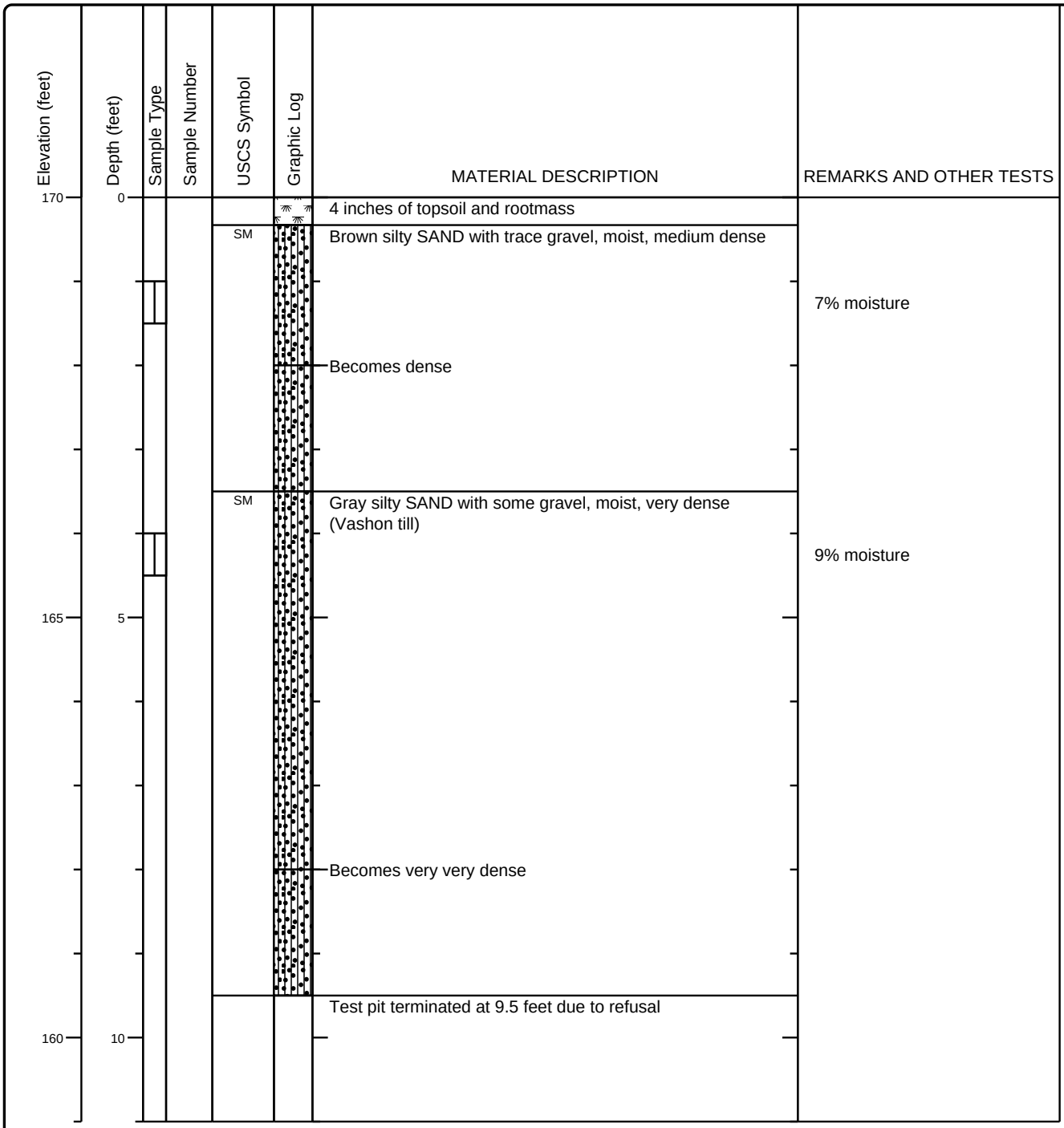


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-9

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **9.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **170**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	

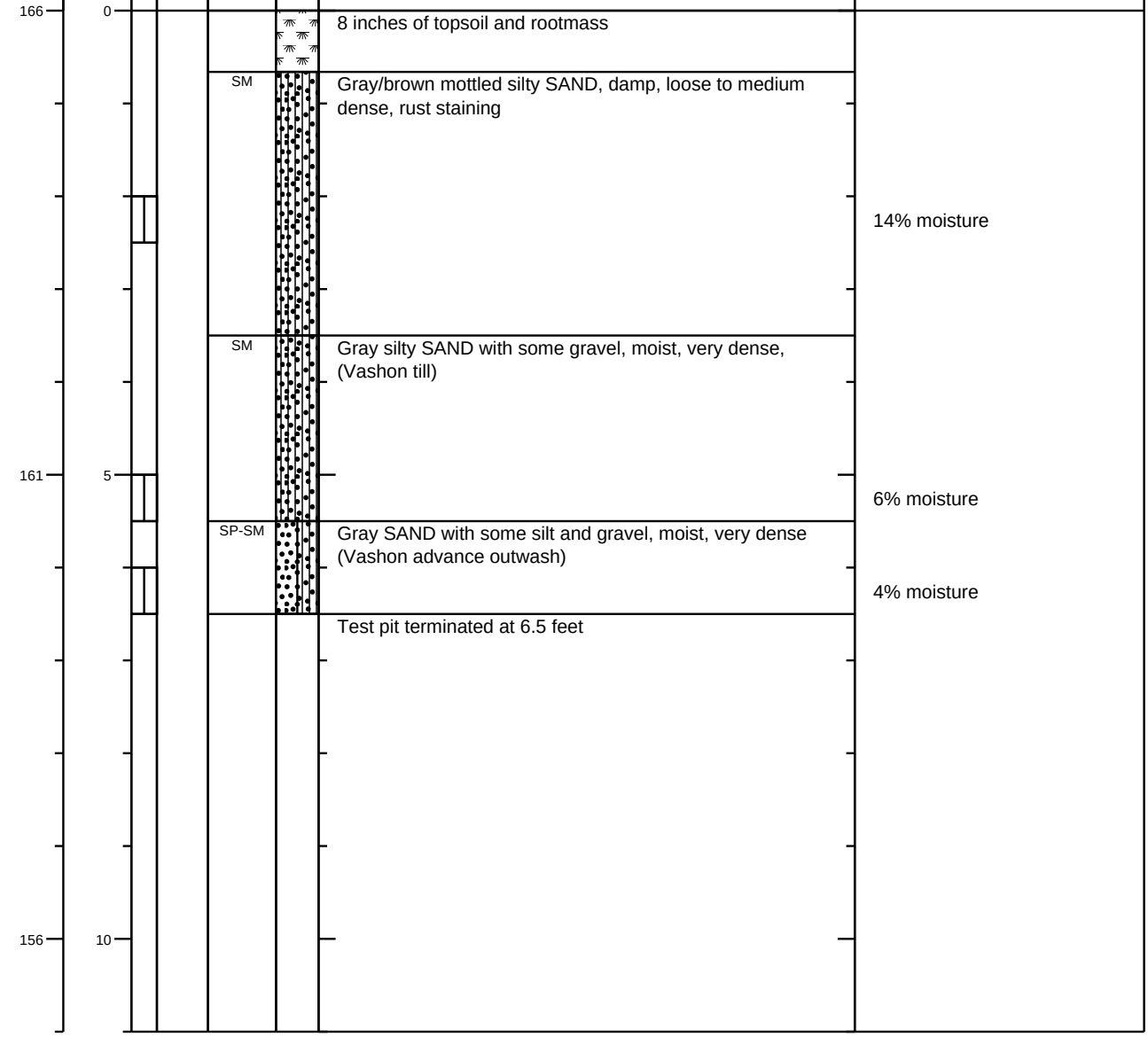


The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**
Project Number: **2024-165-1**
Client: **D. R. Horton**

Test Pit No.: TP-10

Date(s) Excavated: **June 26, 2024**	Logged By **LW**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **2 Feet**	Total Depth of Excavation: **6.5 feet bgs**
Excavator Type: **Rubber tracked mini excavator**	Excavating Contractor: **NW Excavating**	Approximate Surface Elevation **166**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket Tamp**
Test Pit Backfill: **Cuttings**	Location **1105 Southwest 24th Avenue, Oak Harbor, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Oak Heights Plat**

Project Number: **2024-165-1**

Client: **D. R. Horton**

Key to Logs

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. USCS Symbol: USCS symbol of the subsurface material.
6. Graphic Log: Graphic depiction of the subsurface material encountered.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS


Poorly graded GRAVEL (GP)


Poorly graded GRAVEL with Silt (GP-GM)


Well graded GRAVEL (GW)


Silty SAND (SM)


Poorly graded SAND (SP)


Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS


Auger sampler


Bulk Sample


3-inch-OD California w/ brass rings


CME Sampler


Grab Sample


2.5-inch-OD Modified California w/ brass liners


Pitcher Sample


2-inch-OD unlined split spoon (SPT)


Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS


Water level (at time of drilling, ATD)


Water level (after waiting, AW)


Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Matertials Testing and Consulting
Burlington, WA
Geotechnical and Environmental Engineering

Log of Test Pit TP-1

Garry Oakes Plat Infiltration Assessment
1105 SW 24th Avenue
Oak Harbor, WA

MTC Job # 17B095

Date Started : 5/15/17
Date Completed : 5/15/17
Sampling Method : Grab Samples
Location : Phase 1 Residential Lot, See map
Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and forest duff surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SM-ML		SILTY SAND to SANDY SILT WITH GRAVEL, medium dense or stiff, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate orange mottling throughout **WEATHERED GLACIAL TILL**		X	30.3	10.4
2			Strong orange mottling horizons at 2.6' BPG, 0.5 to 1.0 inches thick				
3	ML		SANDY SILT, some gravel, hard, damp to dry with depth, gravel up to 1.5" subrounded. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**		X		
4			T.D. 3.5' BPG Excavation terminated at hard digging conditions. No groundwater observed.				
5							

05-23-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-1.bor

Matertials Testing and Consulting Burlington, WA Geotechnical and Environmental Engineering	Log of Test Pit TP-2
Garry Oakes Plat Infiltration Assessment 1105 SW 24th Avenue Oak Harbor, WA MTC Job # 17B095	Date Started : 5/15/17 Date Completed : 5/15/17 Sampling Method : Grab Samples Location : Phase 1 Detention Pond, See map Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	ML		SUBSOIL: SANDY SILT, some gravel, medium stiff, damp, some organics (roots), gravel up to 2" subrounded. ORANGE-BROWN				
2	SW		SAND WITH GRAVEL, some silt, trace cobbles, loose to medium dense, damp, trace organics (roots), gravel up to 3" subrounded, cobbles up to 6" subrounded. BROWN to GRAY **GLACIAL OUTWASH**		X	9.4	5.6
3	SM-ML		SILTY SAND to SANDY SILT, some gravel, medium dense or stiff, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate orange mottling throughout within silt dominant lenses **WEATHERED GLACIAL TILL**		X	18.1	10.1
4	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**				
5			T.D. 4.2' BPG Excavation terminated at hard digging conditions. No groundwater observed.				

05-23-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-2.bor

Matertials Testing and Consulting Burlington, WA Geotechnical and Environmental Engineering	Log of Test Pit TP-3
Garry Oakes Plat Infiltration Assessment 1105 SW 24th Avenue Oak Harbor, WA MTC Job # 17B095	Date Started : 5/15/17 Date Completed : 5/15/17 Sampling Method : Grab Samples Location : Phase 3 Detention Pond, See map Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SW		SAND WITH GRAVEL, minor silt, loose to medium dense, damp to saturated at base, trace organics (roots), gravel up to 3" subrounded. BROWN to GRAY **GLACIAL OUTWASH**				
2							
3			Light to moderate seepage at basal contact				
	ML		SANDY SILT WITH CLAY, medium stiff, wet to damp with depth, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate orange mottling throughout with strong mottling at upper contact **WEATHERED GLACIAL TILL**				
4							
5	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**				
6			T.D. 5.2' BPG Excavation terminated at hard digging conditions. Perched water observed at 2.9' BPG.				

05-16-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-3.bor

Matertials Testing and Consulting
Burlington, WA
Geotechnical and Environmental Engineering

Log of Test Pit TP-4

Garry Oakes Plat Infiltration Assessment
1105 SW 24th Avenue
Oak Harbor, WA

MTC Job # 17B095

Date Started : 5/15/17
Date Completed : 5/15/17
Sampling Method : Grab Samples
Location : Phase 4 Detention Pond, See map
Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SW-SM		SAND WITH SILT AND GRAVEL, loose to medium dense, damp to saturated at base, trace organics (roots), gravel up to 3" subrounded. BROWN to GRAY **GLACIAL OUTWASH**				
2			Light t seepage at 2.7' BPG		X	15.1	5.6
3	SM-ML		SILTY SAND to SANDY SILT, some gravel, medium stiff, wet to damp with depth, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate to strong orange mottling throughout **WEATHERED GLACIAL TILL**				
4	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**		X		
5			T.D. 4.5' BPG Excavation terminated at hard digging conditions. Minor Seepage observed at 2.7' BPG.				

05-23-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-4.bor

Matertials Testing and Consulting
Burlington, WA
Geotechnical and Environmental Engineering

Log of Test Pit TP-5

Garry Oakes Plat Infiltration Assessment
1105 SW 24th Avenue
Oak Harbor, WA

MTC Job # 17B095

Date Started : 5/15/17
Date Completed : 5/15/17
Sampling Method : Grab Samples
Location : Phase 4 Residential Lot, See map
Logged By : CD

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT WITH SAND, some gravel, loose, damp, strong organics (roots and grass surface), gravel up to 2" subrounded. DARK to MEDIUM BROWN				
1	SM-ML		SILTY SAND to SANDY SILT, minor gravel, medium dense or stiff, damp, trace organics (roots), gravel up to 1" subrounded. LIGHT BROWN to GRAY, some orange mottling throughout Strong mottling at basal contact		X		
2	SW		SAND WITH GRAVEL, minor silt, loose to medium dense, wet to saturated at base, trace organics (roots), gravel up to 3" subrounded. BROWN to GRAY **GLACIAL OUTWASH** Light to moderate seepage reported from excavation on 5/10/17		X		
3	SM-ML		SILTY SAND to SANDY SILT, some gravel, medium stiff, wet to damp with depth, trace organics (roots), gravel up to 1.5" subrounded. LIGHT BROWN to GRAY, moderate to strong orange mottling throughout **WEATHERED GLACIAL TILL**	▼	X		
	ML		SANDY SILT, some gravel and clay, hard, damp to dry with depth, gravel up to 1.5" subrounded, semi-consolidated. GRAY, faint orange mottling at upper contact **UNWEATHERED GLACIAL TILL**				
4			T.D. 3.8' BPG Excavation terminated at hard digging conditions. Groundwater Stabilized at 3.0, observed on 5/15/17.				
5							

05-16-2017 \\192.168.16.6\MTC Files\Burlington Office\Geotechnical Services\1 Burl\2017\Garry Oaks Plat Infiltration\TP Logs\TP-5.bor

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-1	
PROJECT NO.	2024-165-1		**Depth**	4 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	928.3
Wt Dry Soil & Tare (gm)	(w2)	857.9
Weight of Tare (gm)	(w3)	134.4
Weight of Water (gm)	(w4=w1-w2)	70.4
Weight of Dry Soil (gm)	(w5=w2-w3)	723.5
Moisture Content (%)	(w4/w5)*100	10

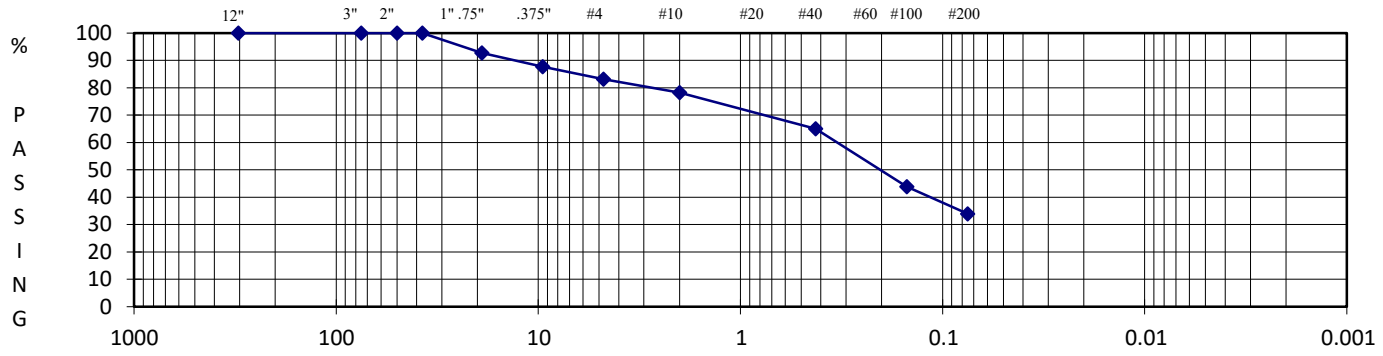
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		857.9
Tare Weight (gm)		134.4
Total Dry Weight (gm)	(W6)	723.5

% COBBLES	**0.0**
% C GRAVEL	**7.3**
% F GRAVEL	**9.5**
% C SAND	**5.0**
% M SAND	**13.2**
% F SAND	**31.1**
% FINES	**33.9**
% TOTAL	**100.0**
D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.4	0.00	0.00	100.00	cobbles
3.0"	134.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	134.4	0.00	0.00	100.00	coarse gravel
1.5"	134.4	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	187.1	52.70	7.28	92.72	fine gravel
0.50"					fine gravel
0.375"	223.0	88.60	12.25	87.75	fine gravel
#4	255.9	121.50	16.79	83.21	coarse sand
#10	292.0	157.60	21.78	78.22	medium sand
#20					medium sand
#40	387.6	253.20	35.00	65.00	fine sand
#60					fine sand
#100	541.0	406.60	56.20	43.80	fine sand
#200	612.4	478.00	66.07	33.93	fines
PAN	857.9	723.50	100.00	0.00	silt/clay



DESCRIPTION	Silty SAND with some gravel
USCS	SM

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-1	
PROJECT NO.	2024-165-1		**Depth**	9 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	967.5
Wt Dry Soil & Tare (gm)	(w2)	885.0
Weight of Tare (gm)	(w3)	124.7
Weight of Water (gm)	(w4=w1-w2)	82.5
Weight of Dry Soil (gm)	(w5=w2-w3)	760.3
Moisture Content (%)	(w4/w5)*100	11

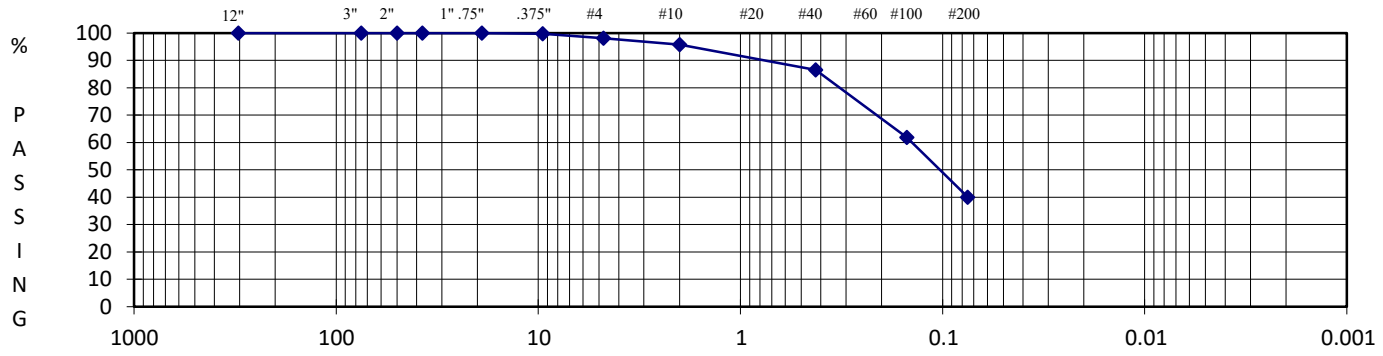
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		885.0
Tare Weight (gm)		124.7
Total Dry Weight (gm)	(W6)	760.3

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**1.8**
% C SAND	**2.4**
% M SAND	**9.2**
% F SAND	**46.5**
% FINES	**40.0**
% TOTAL	**100.0**
D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	124.7	0.00	0.00	100.00	cobbles
3.0"	124.7	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	124.7	0.00	0.00	100.00	coarse gravel
1.5"	124.7	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	124.7	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	126.9	2.20	0.29	99.71	fine gravel
#4	138.6	13.90	1.83	98.17	coarse sand
#10	156.9	32.20	4.24	95.76	medium sand
#20					medium sand
#40	227.1	102.40	13.47	86.53	fine sand
#60					fine sand
#100	414.5	289.80	38.12	61.88	fine sand
#200	580.5	455.80	59.95	40.05	fines
PAN	885.0	760.30	100.00	0.00	silt/clay



DESCRIPTION	Silty SAND
USCS	SM

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-2	
PROJECT NO.	2024-165-1		**Depth**	3 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1398.1
Wt Dry Soil & Tare (gm)	(w2)	1349.7
Weight of Tare (gm)	(w3)	126.4
Weight of Water (gm)	(w4=w1-w2)	48.4
Weight of Dry Soil (gm)	(w5=w2-w3)	1223.3
Moisture Content (%)	(w4/w5)*100	4

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

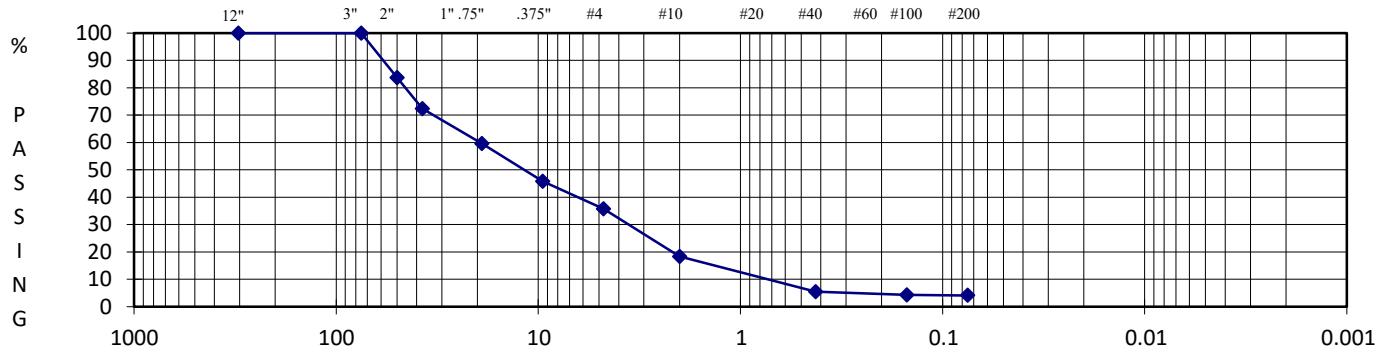
Weight Of Sample (gm)		1349.7
Tare Weight (gm)		126.4
Total Dry Weight (gm)	(W6)	1223.3

% COBBLES	**0.0**
% C GRAVEL	**40.4**
% F GRAVEL	**23.9**
% C SAND	**17.4**
% M SAND	**12.9**
% F SAND	**1.3**
% FINES	**4.2**
% TOTAL	**100.0**

D10 (mm)	0.72
D30 (mm)	3.6
D60 (mm)	19
Cu	26.4
Cc	0.9

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	126.4	0.00	0.00	100.00	cobbles
3.0"	126.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	325.0	198.60	16.23	83.77	coarse gravel
1.5"	464.0	337.60	27.60	72.40	coarse gravel
1.0"					coarse gravel
0.75"	620.2	493.80	40.37	59.63	fine gravel
0.50"					fine gravel
0.375"	789.3	662.90	54.19	45.81	fine gravel
#4	912.1	785.70	64.23	35.77	coarse sand
#10	1125.0	998.60	81.63	18.37	medium sand
#20					medium sand
#40	1282.5	1156.10	94.51	5.49	fine sand
#60					fine sand
#100	1297.4	1171.00	95.72	4.28	fine sand
#200	1298.9	1172.50	95.85	4.15	fines
PAN	1349.7	1223.30	100.00	0.00	silt/clay



DESCRIPTION	Sandy GRAVEL with trace silt
USCS	GP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-5	
PROJECT NO.	2024-165-1		**Depth**	2 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1277.1
Wt Dry Soil & Tare (gm)	(w2)	1237.6
Weight of Tare (gm)	(w3)	134.1
Weight of Water (gm)	(w4=w1-w2)	39.5
Weight of Dry Soil (gm)	(w5=w2-w3)	1103.5
Moisture Content (%)	(w4/w5)*100	4

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

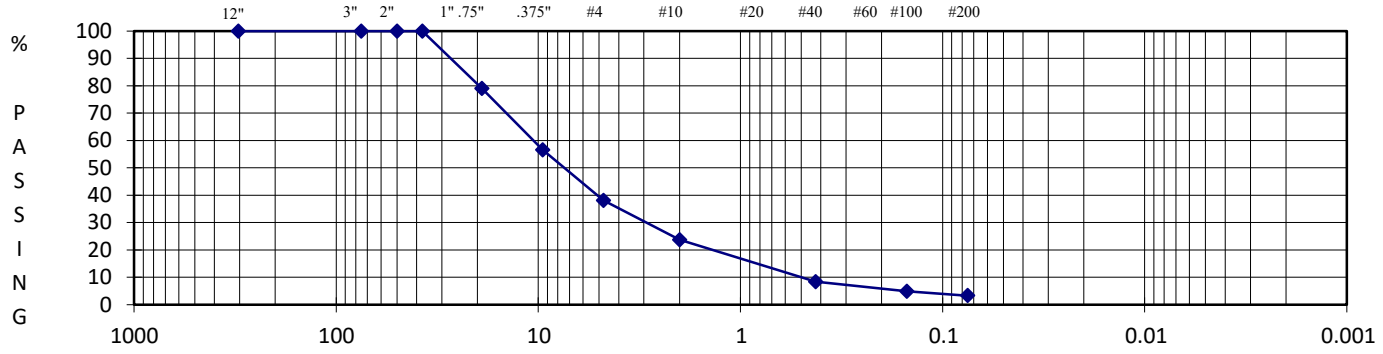
Weight Of Sample (gm)		1237.6
Tare Weight (gm)		134.1
Total Dry Weight (gm)	(W6)	1103.5

% COBBLES	**0.0**
% C GRAVEL	**20.9**
% F GRAVEL	**40.9**
% C SAND	**14.4**
% M SAND	**15.3**
% F SAND	**5.0**
% FINES	**3.3**
% TOTAL	**100.0**

D10 (mm)	0.5
D30 (mm)	2.9
D60 (mm)	11
Cu	22.0
Cc	1.5

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.1	0.00	0.00	100.00	cobbles
3.0"	134.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	134.1	0.00	0.00	100.00	coarse gravel
1.5"	134.1	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	365.2	231.10	20.94	79.06	fine gravel
0.50"					fine gravel
0.375"	613.2	479.10	43.42	56.58	fine gravel
#4	816.5	682.40	61.84	38.16	coarse sand
#10	975.7	841.60	76.27	23.73	medium sand
#20					medium sand
#40	1145.0	1010.90	91.61	8.39	fine sand
#60					fine sand
#100	1183.4	1049.30	95.09	4.91	fine sand
#200	1200.7	1066.60	96.66	3.34	fines
PAN	1237.6	1103.50	100.00	0.00	silt/clay



DESCRIPTION	Sandy GRAVEL with trace silt
USCS	GW

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-7	
PROJECT NO.	2024-165-1		**Depth**	6 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1003.8
Wt Dry Soil & Tare (gm)	(w2)	896.6
Weight of Tare (gm)	(w3)	134.6
Weight of Water (gm)	(w4=w1-w2)	107.2
Weight of Dry Soil (gm)	(w5=w2-w3)	762.0
Moisture Content (%)	(w4/w5)*100	14

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

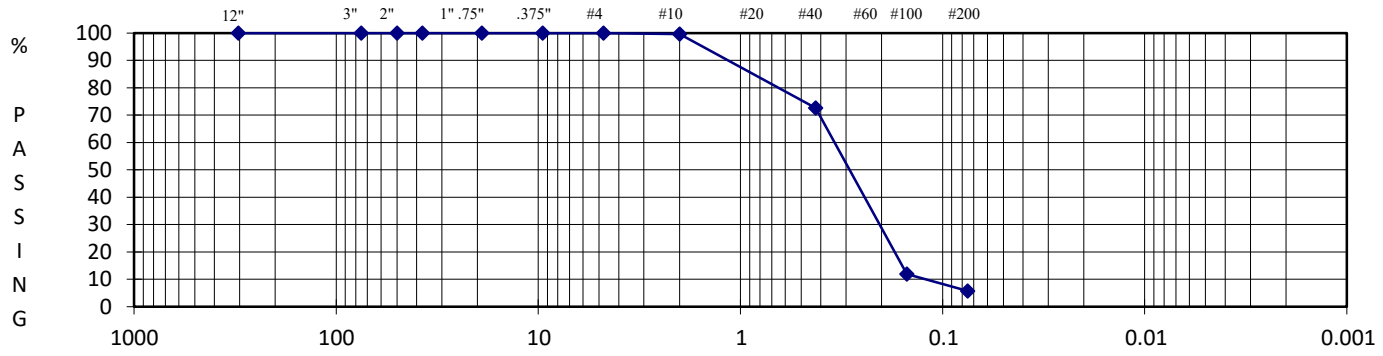
Weight Of Sample (gm)		896.6
Tare Weight (gm)		134.6
(W6) Total Dry Weight (gm)		762.0

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**0.0**
% C SAND	**0.3**
% M SAND	**26.9**
% F SAND	**66.9**
% FINES	**5.7**
% TOTAL	**100.0**

D10 (mm)	0.13
D30 (mm)	0.21
D60 (mm)	0.34
Cu	2.6
Cc	1.0

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.6	0.00	0.00	100.00	cobbles
3.0"	134.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	134.6	0.00	0.00	100.00	coarse gravel
1.5"	134.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	134.6	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	134.6	0.00	0.00	100.00	fine gravel
#4	134.9	0.30	0.04	99.96	coarse sand
#10	137.5	2.90	0.38	99.62	medium sand
#20					medium sand
#40	342.8	208.20	27.32	72.68	fine sand
#60					fine sand
#100	805.3	670.70	88.02	11.98	fine sand
#200	852.8	718.20	94.25	5.75	fines
PAN	896.6	762.00	100.00	0.00	silt/clay



DESCRIPTION	SAND with some silt
USCS	SP-SM

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Oak Heights Plat		**Exploration Type**	TP-7	
PROJECT NO.	2024-165-1		**Depth**	10 FEET	
TECH/TEST DATE	RT/PL	6/26/2024	**Date Received**	6/26/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1015.3
Wt Dry Soil & Tare (gm)	(w2)	905.2
Weight of Tare (gm)	(w3)	212.2
Weight of Water (gm)	(w4=w1-w2)	110.1
Weight of Dry Soil (gm)	(w5=w2-w3)	693.0
Moisture Content (%)	(w4/w5)*100	16

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

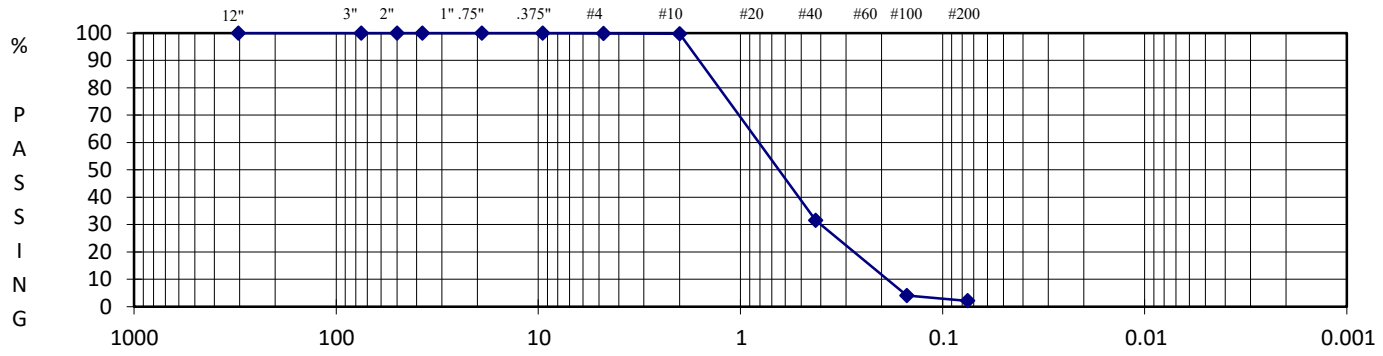
Weight Of Sample (gm)		905.2
Tare Weight (gm)		212.2
(W6) Total Dry Weight (gm)		693.0

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**0.1**
% C SAND	**0.2**
% M SAND	**68.2**
% F SAND	**29.4**
% FINES	**2.2**
% TOTAL	**100.0**

D10 (mm)	0.19
D30 (mm)	0.41
D60 (mm)	0.8
Cu	4.2
Cc	1.1

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	212.2	0.00	0.00	100.00	cobbles
3.0"	212.2	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"	212.2	0.00	0.00	100.00	coarse gravel
1.5"	212.2	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	212.2	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	212.2	0.00	0.00	100.00	fine gravel
#4	212.7	0.50	0.07	99.93	coarse sand
#10	214.0	1.80	0.26	99.74	medium sand
#20					medium sand
#40	686.6	474.40	68.46	31.54	fine sand
#60					fine sand
#100	877.0	664.80	95.93	4.07	fine sand
#200	890.1	677.90	97.82	2.18	fines
PAN	905.2	693.00	100.00	0.00	silt/clay



DESCRIPTION	SAND with trace silt
USCS	SP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

Appendix C – Original WSDOT Pond "E" Construction Plans and Storm Report

T.32N. R1E. W.M.

NE 1/4 SE 1/4 SEC. 10

SE 1/4 NE 1/4 SEC. 10

N 07°14'29" E

POND E
BOTTOM AREA
7,843 S.F.
EL. 133.77'

RIGHT OF WAY

ACCESS CONTROL GATES

C 253+70.29 (68.00'LT)

C 253+59.76 (67.77'LT)

SEE QUARRY SPALL LINED EMERGENCY OVERFLOW SPILLWAY DETAIL (SHT. DD1).

SEE QUARRY SPALL LINED SPILLWAY DETAIL (SHT. DD1).

BEGIN BIOFILTRATION SWALE
C 255+06.92 (41.75'LT)=
10+00.00

C 255+20.00 (25.63'LT)=
10+22.33

C 255+50.00 (25.30'LT)=
10+52.58

C 256+00.00 (29.27'LT)=
11+02.53

C 256+50.00 (33.95'LT)=
11+52.75

SEE BIOFILTRATION SWALE DETAIL (SHT. DD1).

END BIOFILTRATION SWALE
C 257+00.00 (38.85 LT)=
12+03.00

DT13 1 · DT13 2 · DT13 3 · DT13 4 · DT13 5

MAINTENANCE PULL-OUT

ACCESS CONTROL GATES

C LINE

SR 20

253 · 254 · 255 · 256 · 257

RIGHT OF WAY

EAGLE VISTA AVE.

GOV'T LOT 3

GOV'T LOT 2

10

SECTION E-E

EXISTING GROUND · POND BOTTOM ELEVATION 133.77' · 3:1 · 3:1

HORI. 1"=40'
VERI. 1"=40'

0 20 40 60 80
SCALE IN FEET

DATUM (NAVD) 88

ACCESS CONTROL GATE, FENCE, & MAINTENANCE PULL-OUT ALIGNMENT POINTS

POINT#	STATION	OFFSET (LT)
A	C 254+34.20	29.04'
B	C 254+54.19	29.20'
C	C 254+73.68	29.35'
D	C 255+13.68	17.56'
E	C 255+35.97	40.92'
F	C 255+35.23	135.92'
G	C 253+84.57	135.10'
H	C 253+74.48	113.61'
I	C 253+68.48	87.02'
J	C 253+72.00	55.00'
K	C 254+03.70	28.81'
L	C 253+63.72	16.65'

POND ALIGNMENT POINTS

POINT#	STATION	OFFSET (LT)
A	C 253+82.43	98.37
B	C 253+91.19	111.15
C	C 254+97.43	111.40
D	C 255+06.21	101.31
E	C 255+07.10	59.38
F	C 254+92.29	48.72
G	C 253+98.13	48.70
H	C 253+83.29	61.00

FILE NAME	C:\Dgn\L3678_Sidney_to_Scenic\PS&E\L3678DetentionPonds.dgn				REGION NO.	STATE	FED.AID PROJ.NO.
TIME	12:41:00 PM				10	WASH	
DATE	04/07/2006				JOB NUMBER		
PLOTTED BY	FeisleR				CONTRACT NO.	LOCATION NO.	
DESIGNED BY	Y. BEREDED-SAMUEL						
ENTERED BY	R. FEISLEY						
CHECKED BY	G. GURULE						
PROJ. ENGR.	D. YANKAUSKAS						
REGIONAL ADM.	L. ENG	REVISION	DATE	BY			

HANK KAWS YANKAUSKAS — STATE OF WASHINGTON — 22311 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 7-20-06 — DATE — P.E. STAMP BOX

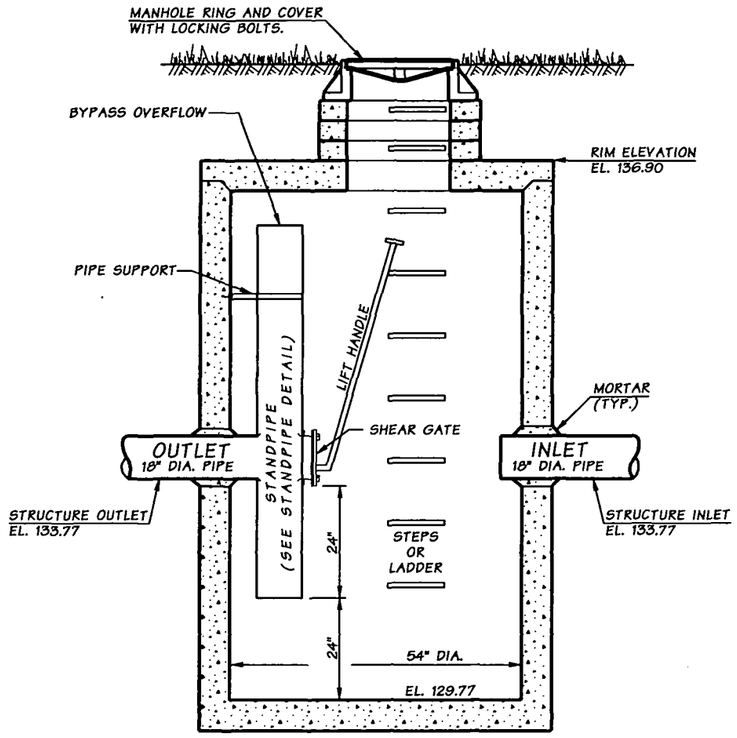
DATE — P.E. STAMP BOX

Washington State Department of Transportation

SR 20
SIDNEY ST. VIC. TO SCENIC HEIGHTS RD. VIC.

DETENTION POND E PLAN

PLOTS
PD5
SHEET OF SHEETS

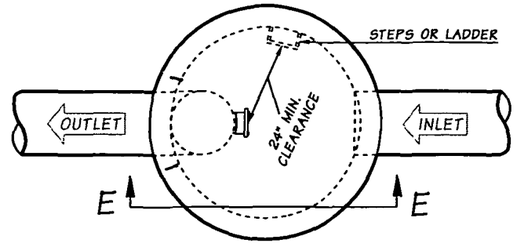


SECTION E - E

NOT TO SCALE

DETENTION POND E CONTROL STRUCTURE

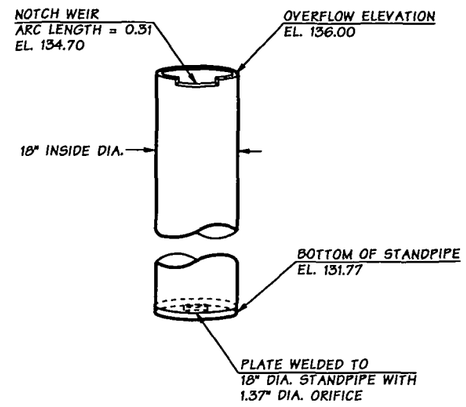
STR. CODE DT13-2



CATCH BASIN TYPE 2 54" DIA. W/ OIL SEP. FOR POND OUTLET

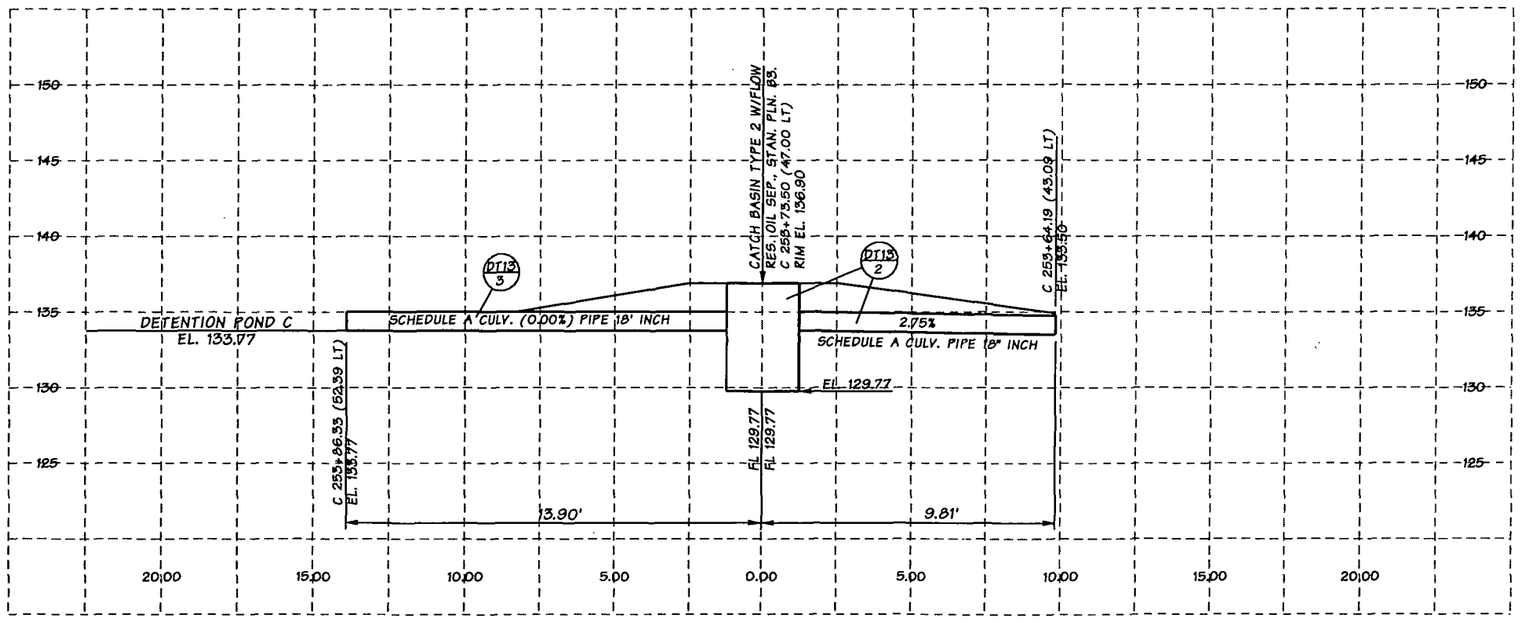
NOT TO SCALE

NOTE:
EXCEPT AS SHOWN OR NOTED, UNITS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS FOR CATCH BASIN TYPE 2 WITH FLOW RESTRICTOR - OIL SEPARATOR AND STANDARD PLAN B-3 AND B-25.



STANDPIPE DETAIL

NOT TO SCALE



DRAINAGE PROFILE - DETENTION POND E CONTROL STRUCTURE, INLET, AND OUTLET PIPES

FILE NAME	J:\Staff\Yared\L3678DetentionPonds.dgn						
TIME	11:28:18 AM						
DATE	01/29/2006						
PLOTTED BY	beredey						
DESIGNED BY	Y. SAMUEL						
ENTERED BY	R. FETSLEY						
CHECKED BY	G. GURULE						
PROJ. ENGR.	D. YANKAUSKAS						
REGIONAL ADM.	L. ENG	REVISION	DATE	BY			

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.	LOCATION NO.	

HABIB ANNE YAMEOGO — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 7-20-06

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

Washington State Department of Transportation

SR 20
SIDNEY ST. VIC. TO
SCENIC HEIGHTS RD. VIC.

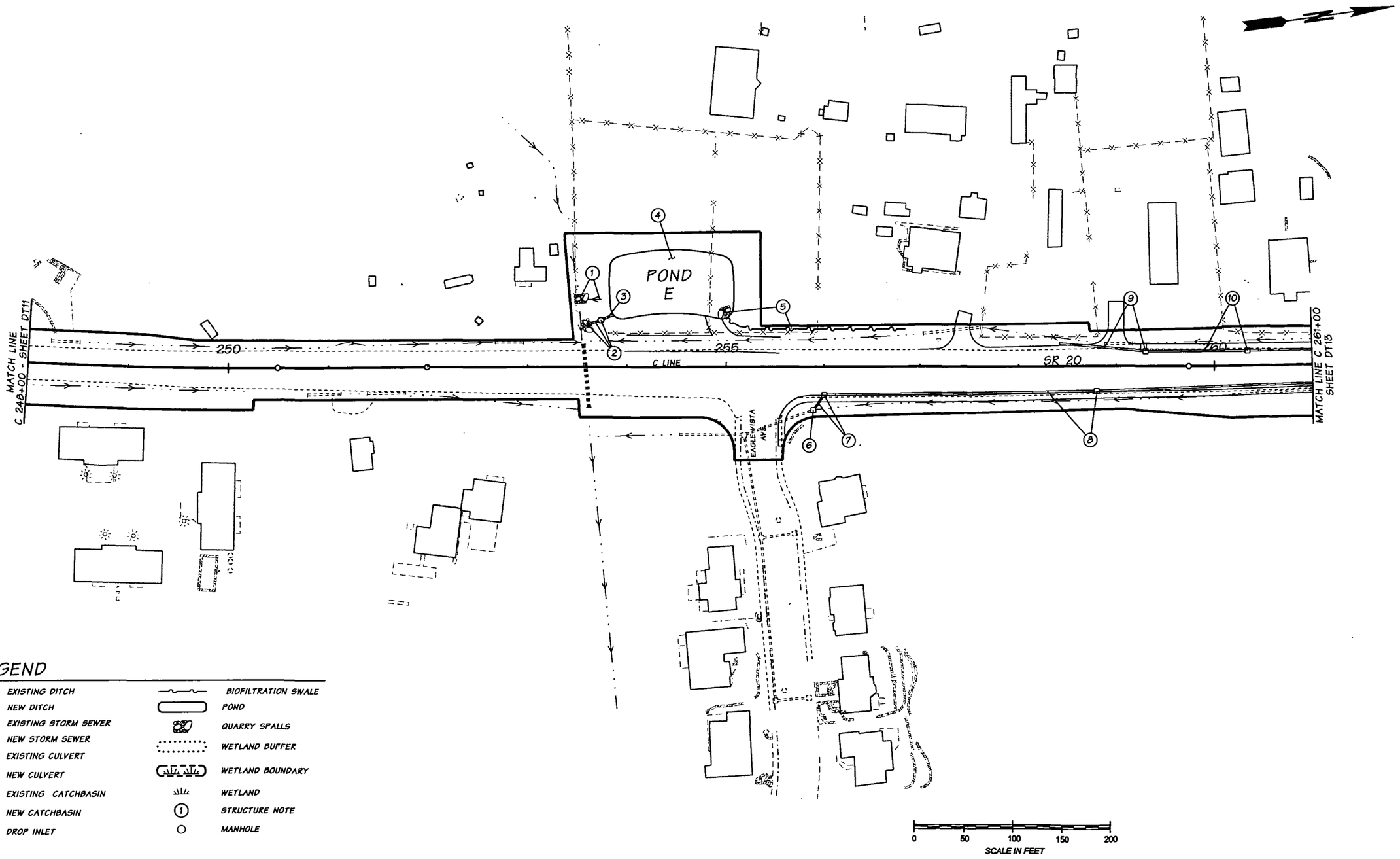
DETENTION POND E CONTROL STRUCTURE

PLOT15

DS5

SHEET OF SHEETS

T.32N. R1E. W.M.



LEGEND

- EXISTING DITCH
- NEW DITCH
- EXISTING STORM SEWER
- NEW STORM SEWER
- EXISTING CULVERT
- NEW CULVERT
- EXISTING CATCHBASIN
- NEW CATCHBASIN
- DROP INLET
- BIOFILTRATION SWALE
- POND
- QUARRY SPALLS
- WETLAND BUFFER
- WETLAND BOUNDARY
- WETLAND
- STRUCTURE NOTE
- MANHOLE

0 50 100 150 200
SCALE IN FEET

FILE NAME	C:\aaproduction\PS&E\L3678Drainage.dgn						
TIME	10:40:03 AM						
DATE	03/25/2006						
PLOTTED BY	beredey						
DESIGNED BY	Y. BEREDED- SAMUEL						
ENTERED BY	R. FEISLEY						
CHECKED BY	A. WILLIAMS						
PROJ. ENGR.	D. YANKAUSKAS						
REGIONAL ADM.	L. ENG	REVISION	DATE	BY			

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

Washington State Department of Transportation

SR 20
SIDNEY ST. VIC. TO
SCENIC HEIGHTS RD. VIC.

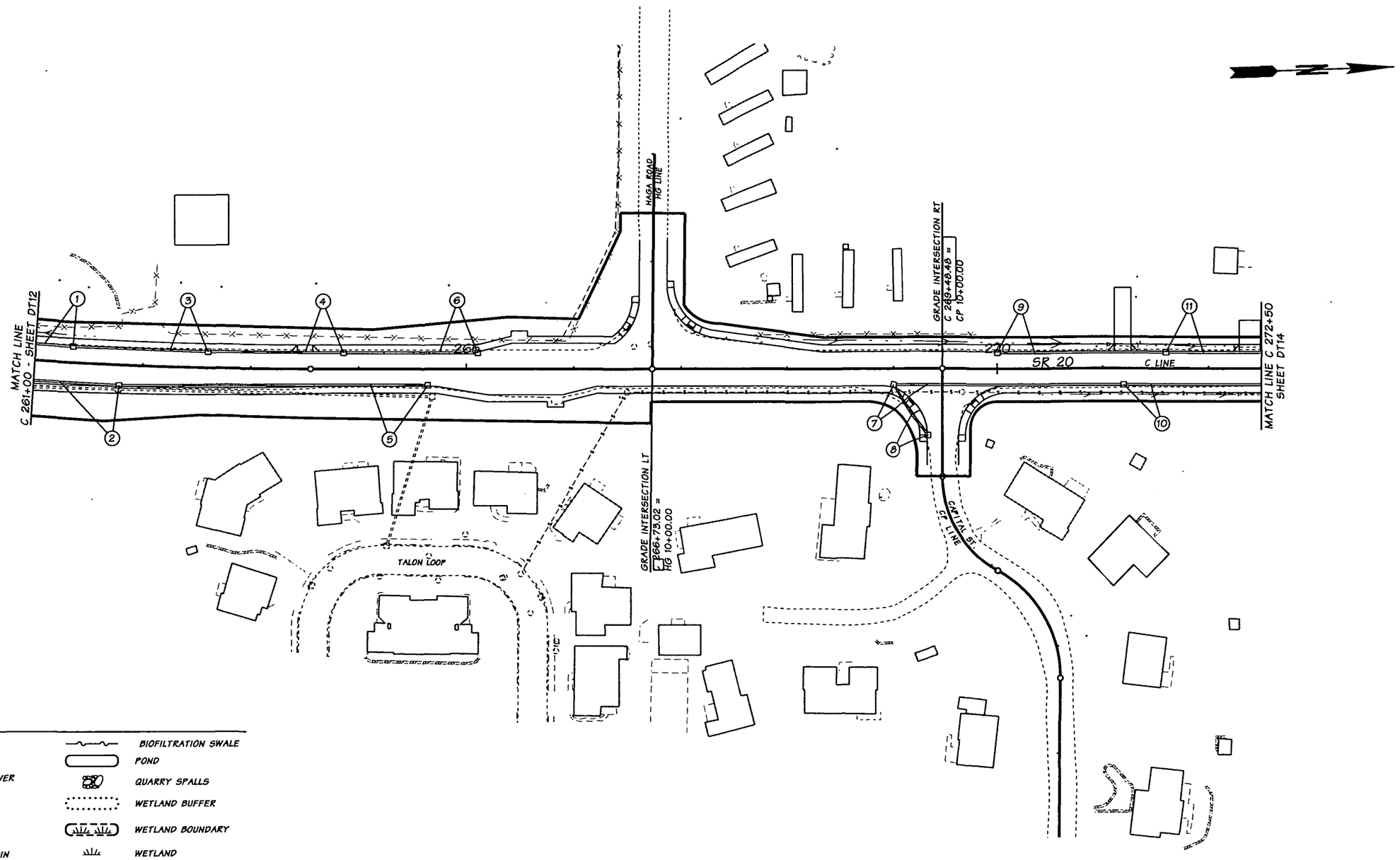
DRAINAGE PLAN

PLOT13

DT13

SHEET OF SHEETS

T.32N. R1E. W.M.



LEGEND

EXISTING DITCH	BIOFILTRATION SWALE
NEW DITCH	POND
EXISTING STORM SEWER	QUARRY SPALLS
NEW STORM SEWER	WETLAND BUFFER
EXISTING CULVERT	WETLAND BOUNDARY
NEW CULVERT	WETLAND
EXISTING CATCHBASIN	STRUCTURE NOTE
NEW CATCHBASIN	MANHOLE
DROP INLET	

0 50 100 150 200
SCALE IN FEET

FILE NAME	C:\aaproduction\PS&E\L3678Drainage.dgn
TIME	10:40:07 AM
DATE	03/25/2006
PLOTTED BY	beredey
DESIGNED BY	Y. BEREDED- SAMUEL
ENTERED BY	R. FEISLEY
CHECKED BY	A. WILLIAMS
PROJ. ENGR.	D. YANKAUSKAS
REGIONAL ADM.	L. ENG

REVISION	DATE	BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

P.E. STAMP BOX — DATE

P.E. STAMP BOX — DATE

Washington State Department of Transportation

SR 20
SIDNEY ST. VIC. TO
SCENIC HEIGHTS RD. VIC.

DRAINAGE PLAN

PLOT14

DT14

SHEET OF SHEETS

MGS FLOOD
PROJECT REPORT

Program Version: 3.04 **Run Date: 01/26/2006 11:02 AM**

Input File Name: **Pond at Eagle Vista.fld**
Project Name: OL3675
Analysis Title: Pond at Eagle Vista, Pond E
Comments: Due to the proximity to a private well this detention will have a clay liner

********** Precipitation Input**********

Precipitation Station Data Selected
Climatic Region Number: 5
Full Period of Record Available used for Routing
Precipitation Station : 452675 Everett 10/01/1948-10/01/1996
Evaporation Station : 456803 Puyallup
At Site 25-Year, 24-Hour Precipitation (inches): 2.69
Gage 25-Year, 24-Hour Precipitation (inches) : 2.69
Precipitation Scale Factor : 1.000
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

	Area(Acres)		
		Developed	
	Predeveloped	To Node	Bypass Node
Till Forest	2.180	1.500	0.000
Till Pasture	1.880	1.880	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.120	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.220	0.220	0.000
Wetland	0.000	0.000	0.000
Impervious	0.000	0.800	0.000
Subbasin Total	4.400	4.400	0.000

	Lateral Flow Connnections					
	Predeveloped			Developed		
	Surface	Interflow	Grnd Water	Surface	Interflow	Grnd Water
Till Forest	Node	Node		Node	Node	
Till Pasture	Node	Node		Node	Node	
Till Grass	Node	Node		Node	Node	
Outwash Forest	Node	Node		Node	Node	
Outwash Pasture	Node	Node		Node	Node	
Outwash Grass	Node	Node		Node	Node	
Wetland	Node	Node		Node	Node	
Impervious	Node			Node		
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***

No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	Link Type	Downstream Node
Node 1	Pond	Node 2

Predeveloped Compliance Node: 1

*** Predeveloped Structure Summary ***

*** Postdeveloped Structure Summary ***

Link No. 1, Pond: Structure Imported from MGSFlood Version 2.x

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used

Pond Floor Elevation	: 133.77ft	
Riser Crest Elevation	: 136.00ft	
Max Pond Elevation	: 136.50ft	
Max Storage Depth	: 2.23 ft	
Pond Bottom Length	: 120.0 ft	
Pond Bottom Width	: 60.0 ft	
Pond Side Slopes	: L1= 3.00 L2= 3.00 W1= 3.00 W2= 3.00 ft/ft	
Pond Bottom Area	: 7200. sq-ft	
Area at Riser Crest El	: 9,787.	sq-ft
	: 0.225	acres
Volume at Riser Crest	: 18,867.	cu-ft
	: 0.433	ac-ft
Area at Max Elevation	: 10417.	sq-ft
	: 0.239	acres
Vol at Max Elevation	: 23,912.	cu-ft
	: 0.549 ac-ft	
Hydraulic Conductivity	: 0.00	in/hr
Depth to Water Table	: 100.00	ft

Riser Geometry

Riser Structure Type	: Circular
Riser Diameter	: 18.00 in
Common Length	: 0.030 ft
Riser Crest Elevation	: 136.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

—Device Number 1 —

Device Type	: Circular Orifice
Invert Elevation	: 133.77 ft
Diameter	: 1.37 in
Orientation	: Horizontal
Elbow	: No

— Device Number 2 —

Device Type	: Vertical Rectangular Orifice
Invert Elevation	: 134.70 ft
Length	: 0.31 in
Height	: 15.60 in
Orientation	: Vertical
Elbow	: No

**********Predeveloped Hydraulic Rating Tables**********

**********Postdeveloped Hydraulic Rating Tables**********

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
133.770	0.000	0.000	0.000
133.783	0.002	0.006	0.000
133.795	0.004	0.008	0.000
133.820	0.008	0.011	0.000
133.870	0.017	0.016	0.000
133.920	0.025	0.020	0.000
133.970	0.034	0.023	0.000
134.020	0.042	0.025	0.000
134.070	0.051	0.028	0.000
134.120	0.059	0.030	0.000
134.170	0.068	0.032	0.000
134.220	0.077	0.034	0.000
134.270	0.086	0.036	0.000
134.320	0.095	0.037	0.000
134.370	0.104	0.039	0.000

134.420	0.113	0.041	0.000
134.470	0.122	0.042	0.000
134.520	0.131	0.044	0.000
134.570	0.140	0.045	0.000
134.620	0.150	0.047	0.000
134.640	0.153	0.047	0.000
134.660	0.157	0.048	0.000
134.680	0.161	0.048	0.000
134.700	0.165	0.049	0.000
134.713	0.167	0.049	0.000
134.725	0.169	0.050	0.000
134.738	0.172	0.050	0.000
134.750	0.174	0.051	0.000
134.800	0.184	0.053	0.000
134.850	0.193	0.056	0.000
134.900	0.203	0.060	0.000
134.950	0.213	0.063	0.000
135.000	0.223	0.067	0.000
135.050	0.232	0.071	0.000
135.100	0.242	0.076	0.000
135.150	0.252	0.080	0.000
135.200	0.263	0.085	0.000
135.250	0.273	0.089	0.000
135.300	0.283	0.094	0.000
135.350	0.293	0.099	0.000
135.400	0.304	0.105	0.000
135.450	0.314	0.110	0.000
135.500	0.324	0.116	0.000
135.550	0.335	0.121	0.000
135.600	0.346	0.127	0.000
135.650	0.356	0.133	0.000
135.700	0.367	0.139	0.000
135.750	0.378	0.145	0.000
135.800	0.389	0.151	0.000
135.850	0.400	0.158	0.000
135.900	0.411	0.164	0.000
135.925	0.417	0.167	0.000
135.950	0.422	0.171	0.000
135.975	0.428	0.174	0.000
136.000	0.433	0.177	0.000
136.013	0.436	0.201	0.000
136.025	0.439	0.243	0.000
136.038	0.442	0.297	0.000
136.050	0.445	0.361	0.000
136.063	0.447	0.433	0.000
136.075	0.450	0.512	0.000
136.088	0.453	0.598	0.000
136.100	0.456	0.690	0.000
136.150	0.467	1.112	0.000
136.200	0.479	1.602	0.000
136.250	0.490	2.140	0.000
136.300	0.502	2.707	0.000
136.350	0.514	3.283	0.000
136.400	0.525	3.847	0.000
136.450	0.537	4.379	0.000
136.500	0.549	4.863	0.000
136.550	0.561	5.283	0.000
136.600	0.573	5.631	0.000
136.650	0.585	5.909	0.000
136.700	0.598	6.128	0.000
136.750	0.610	6.375	0.000
136.800	0.622	6.580	0.000
136.850	0.635	6.778	0.000
136.900	0.647	6.970	0.000
136.950	0.660	7.157	0.000
137.000	0.672	7.339	0.000

Postdeveloped Node Statistics

Annual Maxima Discharge (cfs)
Node: 1

Max Date	Q (cfs)
05/02/1949	0.211
12/01/1949	0.500
09/07/1951	0.229
11/30/1951	0.242
02/07/1953	0.328
12/19/1953	0.438
12/23/1954	0.420
12/20/1955	0.205
02/24/1957	0.377
05/31/1958	0.602
01/08/1959	0.238
11/20/1959	0.220
10/23/1960	0.743
06/02/1962	0.355

02/04/1963	0.572
01/01/1964	0.236
02/05/1965	0.164
01/05/1966	0.164
09/10/1967	0.548
08/26/1968	0.366
06/27/1969	0.592
10/01/1969	0.206
11/24/1970	0.332
09/22/1972	0.595
11/04/1972	0.305
10/28/1973	0.314
12/21/1974	0.297
10/17/1975	0.252
03/08/1977	0.183
12/15/1977	0.211
04/12/1979	0.524
01/12/1980	0.199
11/21/1980	0.232
10/06/1981	0.237
06/18/1983	0.269
06/08/1984	0.231
12/14/1984	0.344
05/10/1986	0.458
10/26/1986	0.355
05/12/1988	0.232
01/09/1989	0.343
06/06/1990	0.177
12/04/1990	0.204
01/27/1992	0.243
07/01/1993	0.215
12/09/1993	0.147
11/01/1994	0.191
04/23/1996	0.330

Postdeveloped Ranked Annual Maxima Discharge (cfs)

Tr (yrs)	Node: 1
1.01	0.147
1.03	0.164
1.06	0.164
1.08	0.177
1.10	0.183
1.13	0.191
1.16	0.199
1.19	0.204
1.22	0.205
1.25	0.206
1.28	0.211
1.32	0.211
1.35	0.215
1.39	0.220
1.43	0.229
1.48	0.231
1.52	0.232
1.57	0.232
1.63	0.236
1.68	0.237
1.75	0.238
1.81	0.242
1.88	0.243
1.96	0.252
2.04	0.269
2.13	0.297
2.23	0.305
2.34	0.314
2.46	0.328
2.59	0.330
2.74	0.332
2.91	0.343
3.09	0.344
3.30	0.355
3.55	0.355
3.83	0.366
4.16	0.377
4.56	0.420
5.03	0.438
5.62	0.458
6.37	0.500
7.34	0.524
8.65	0.548
10.55	0.572
13.52	0.592
18.80	0.595

30.85	0.602
85.93	0.743

Postdeveloped Flow Frequency Data (cfs)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Node: 1
2-Year	0.260
5-Year	0.437
10-Year	0.566
25-Year	0.599
50-Year	0.668
100-Year	**
200-Year	**

** Record too Short to Compute Peak WSEL for These Recurrence Intervals

Postdeveloped Flow Duration Data (cfs)

Node: 1	
Discharge (cfs)	**Exceedance Probability**
3.714E-03	2.5878E-01
7.429E-03	1.8553E-01
0.011	1.4025E-01
0.015	1.1197E-01
0.019	9.1086E-02
0.022	7.5186E-02
0.026	6.2999E-02
0.030	5.3212E-02
0.033	4.5355E-02
0.037	3.9019E-02
0.041	3.3745E-02
0.045	2.9501E-02
0.048	2.5812E-02
0.052	2.2640E-02
0.056	2.0042E-02
0.059	1.7877E-02
0.063	1.5904E-02
0.067	1.4062E-02
0.071	1.2491E-02
0.074	1.1146E-02
0.078	1.0001E-02
0.082	8.9717E-03
0.085	8.0591E-03
0.089	7.2273E-03
0.093	6.5737E-03
0.097	5.8702E-03
0.100	5.2832E-03
0.104	4.8007E-03
0.108	4.3658E-03
0.111	3.9784E-03
0.115	3.6576E-03
0.119	3.3249E-03
0.123	3.0421E-03
0.126	2.7901E-03
0.130	2.5535E-03
0.134	2.2863E-03
0.137	2.0629E-03
0.141	1.8656E-03
0.145	1.7183E-03
0.149	1.5591E-03
0.152	1.4093E-03
0.156	1.2786E-03
0.160	1.1550E-03
0.163	1.0885E-03
0.167	9.8629E-04
0.171	9.0549E-04
0.175	8.4370E-04
0.178	7.7240E-04
0.182	7.2724E-04
0.186	7.0110E-04
0.189	6.4168E-04
0.193	5.7276E-04
0.197	5.3474E-04
0.201	4.9909E-04
0.204	4.5393E-04
0.208	4.2304E-04
0.212	3.9689E-04
0.215	3.7788E-04
0.219	3.5649E-04
0.223	3.1134E-04
0.227	2.8519E-04
0.230	2.7569E-04
0.234	2.5430E-04

0.238	2.2578E-04
0.241	2.0676E-04
0.245	1.9488E-04
0.249	1.8775E-04
0.253	1.7825E-04
0.256	1.7112E-04
0.260	1.6640E-04
0.264	1.6161E-04
0.267	1.5923E-04
0.271	1.5448E-04
0.275	1.5210E-04
0.279	1.4973E-04
0.282	1.4735E-04
0.286	1.4497E-04
0.290	1.4260E-04
0.293	1.3547E-04
0.297	1.2358E-04
0.301	1.2121E-04
0.305	1.1645E-04
0.308	1.0932E-04
0.312	1.0695E-04
0.316	9.9817E-05
0.319	9.9817E-05
0.323	9.7441E-05
0.327	9.5064E-05
0.331	8.7934E-05
0.334	8.5558E-05
0.338	7.8428E-05
0.342	7.8428E-05
0.345	6.8922E-05
0.349	6.8922E-05
0.353	6.4168E-05
0.357	5.9415E-05
0.360	5.7039E-05
0.364	5.4662E-05
0.368	5.2285E-05
0.371	5.2285E-05
0.375	4.9909E-05
0.379	4.5156E-05
0.383	4.5156E-05
0.386	4.5156E-05
0.390	4.5156E-05
0.394	4.5156E-05
0.397	4.5156E-05
0.401	3.8026E-05
0.405	3.8026E-05
0.409	3.8026E-05
0.412	3.8026E-05
0.416	3.8026E-05
0.420	3.0896E-05
0.423	3.0896E-05
0.427	3.0896E-05
0.431	3.0896E-05
0.435	3.0896E-05
0.437	2.9492E-05
0.442	2.8519E-05
0.446	2.8519E-05
0.449	2.8519E-05
0.453	2.8519E-05
0.457	2.8519E-05
0.461	2.3766E-05
0.464	2.3766E-05
0.468	2.3766E-05
0.472	2.3766E-05
0.475	2.3766E-05
0.479	2.3766E-05
0.483	2.3766E-05
0.487	2.3766E-05
0.490	2.1389E-05
0.494	2.1389E-05
0.498	2.1389E-05
0.501	1.9013E-05
0.505	1.9013E-05
0.509	1.9013E-05
0.513	1.9013E-05
0.516	1.6636E-05
0.520	1.6636E-05
0.524	1.6636E-05
0.527	1.4260E-05
0.531	1.4260E-05
0.535	1.4260E-05
0.539	1.4260E-05
0.542	1.4260E-05
0.546	1.4260E-05

0.550	1.1883E-05
0.553	1.1883E-05
0.557	1.1883E-05
0.561	1.1883E-05
0.565	1.1883E-05
0.568	1.1883E-05
0.572	1.1883E-05
0.576	9.5064E-06
0.579	9.5064E-06
0.583	9.5064E-06
0.587	9.5064E-06
0.591	9.5064E-06
0.594	7.1298E-06
0.598	4.7532E-06
0.602	2.3766E-06
0.605	2.3766E-06
0.609	2.3766E-06
0.613	2.3766E-06
0.617	2.3766E-06
0.620	2.3766E-06
0.624	2.3766E-06
0.628	2.3766E-06
0.631	2.3766E-06
0.635	2.3766E-06
0.639	2.3766E-06
0.643	2.3766E-06
0.646	2.3766E-06
0.650	2.3766E-06
0.654	2.3766E-06
0.657	2.3766E-06
0.661	2.3766E-06
0.665	2.3766E-06
0.668	2.3766E-06
0.672	2.3766E-06
0.676	2.3766E-06
0.680	2.3766E-06
0.683	2.3766E-06
0.687	2.3766E-06
0.691	2.3766E-06
0.695	2.3766E-06
0.698	2.3766E-06
0.702	2.3766E-06
0.706	2.3766E-06
0.709	2.3766E-06
0.713	2.3766E-06
0.717	2.3766E-06
0.721	2.3766E-06
0.724	2.3766E-06
0.728	2.3766E-06
0.732	2.3766E-06
0.735	2.3766E-06
0.739	2.3766E-06
0.743	2.3766E-06

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	Q (cfs)
02/22/1949	134.356
03/05/1950	134.867
01/02/1951	134.629
12/01/1951	134.416
01/08/1953	134.226
01/07/1954	134.860
12/30/1954	135.191
12/22/1955	135.222
02/25/1957	135.206
02/26/1958	134.874
01/10/1959	134.960
11/22/1959	134.791
11/25/1960	134.926
06/03/1962	134.698
02/05/1963	134.527
01/02/1964	134.515
01/30/1965	134.924
12/30/1965	134.222
01/20/1967	134.796
12/26/1967	135.124
12/12/1968	134.565
12/23/1969	134.563
01/25/1971	135.058
03/06/1972	134.549
12/19/1972	

01/16/1974	134.849
03/02/1975	134.539
10/18/1975	134.505
05/05/1977	134.408
12/16/1977	134.456
11/04/1978	134.748
01/12/1980	134.486
06/18/1981	134.385
10/07/1981	134.911
12/16/1982	134.639
11/20/1983	135.115
11/29/1984	135.074
01/18/1986	136.020
11/24/1986	135.468
12/06/1987	134.571
03/12/1989	134.202
01/10/1990	135.062
02/05/1991	134.954
01/31/1992	134.926
12/15/1992	134.271
12/11/1993	134.583
12/20/1994	135.174
02/09/1996	135.338

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.01	134.202
1.03	134.222
1.06	134.226
1.08	134.271
1.10	134.356
1.13	134.385
1.16	134.408
1.19	134.416
1.22	134.456
1.25	134.486
1.28	134.505
1.32	134.515
1.35	134.527
1.39	134.539
1.43	134.549
1.48	134.563
1.52	134.565
1.57	134.571
1.63	134.583
1.68	134.629
1.75	134.639
1.81	134.649
1.88	134.698
1.96	134.748
2.04	134.791
2.13	134.796
2.23	134.849
2.34	134.860
2.46	134.867
2.59	134.874
2.74	134.911
2.91	134.924
3.09	134.926
3.30	134.926
3.55	134.954
3.83	134.960
4.16	135.058
4.56	135.062
5.03	135.074
5.62	135.115
6.37	135.124
7.34	135.174
8.65	135.191
10.55	135.206
13.52	135.222
18.80	135.338
30.85	135.468
85.93	136.020

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	134.223
1.11-Year	134.368
1.25-Year	134.488
2.00-Year	134.774
3.33-Year	134.929
5-Year	135.071
10-Year	135.203
25-Year	135.359
50-Year	135.613

100-Year **
** Record too Short to Compute Peak WSEL for These Recurrence Intervals

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	205.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

**********Water Quality Facility Data **********

Node No: 1
2-Year Discharge Rate : 0.260 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.12 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.07 cfs

Node No: 2
2-Year Discharge Rate : 0.052 cfs

**********Compliance Point Results **********

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff Date	Annual Max Q (cfs)	Postdevelopment Runoff Date	Annual Max Q (cfs)
05/02/1949	0.049	02/22/1949	0.039
12/01/1949	0.197	03/05/1950	0.058
12/30/1950	0.070	01/02/1951	0.047
11/30/1951	0.086	12/01/1951	0.041
02/07/1953	0.115	01/08/1953	0.034
12/19/1953	0.170	01/07/1954	0.057
12/14/1954	0.185	12/30/1954	0.084
12/20/1955	0.117	12/22/1955	0.087
02/24/1957	0.185	02/25/1957	0.085
05/31/1958	0.206	02/26/1958	0.058
01/08/1959	0.098	01/10/1959	0.064
01/29/1960	0.087	11/22/1959	0.053
10/23/1960	0.246	11/25/1960	0.062
06/02/1962	0.153	06/03/1962	0.049
02/04/1963	0.247	02/05/1963	0.044
01/01/1964	0.089	01/02/1964	0.044
01/29/1965	0.086	01/30/1965	0.061
01/05/1966	0.053	12/30/1965	0.034
01/19/1967	0.118	01/20/1967	0.053
12/25/1967	0.128	12/26/1967	0.078
06/27/1969	0.246	12/12/1968	0.045
12/22/1969	0.068	12/23/1969	0.045
01/19/1971	0.113	01/25/1971	0.072
09/22/1972	0.192	03/06/1972	0.045
12/19/1972	0.071	12/19/1972	0.047
01/14/1974	0.093	01/16/1974	0.056
12/21/1974	0.080	03/02/1975	0.044
04/20/1976	0.066	10/18/1975	0.043
05/04/1977	0.057	05/05/1977	0.040
12/15/1977	0.075	12/16/1977	0.042
04/12/1979	0.267	11/04/1978	0.051
01/12/1980	0.076	01/12/1980	0.043
02/19/1981	0.097	06/18/1981	0.040
03/11/1982	0.082	10/07/1981	0.061
12/03/1982	0.099	12/16/1982	0.047
11/20/1983	0.092	11/20/1983	0.077
12/14/1984	0.138	11/29/1984	0.073
01/18/1986	0.289	01/18/1986	0.227
11/24/1986	0.132	11/24/1986	0.112
04/06/1988	0.066	12/06/1987	0.045

01/09/1989	0.136	03/12/1989	0.033
01/09/1990	0.088	01/10/1990	0.072
04/05/1991	0.091	02/05/1991	0.064
01/27/1992	0.090	01/31/1992	0.062
07/02/1993	0.048	12/15/1992	0.036
12/10/1993	0.054	12/11/1993	0.045
12/19/1994	0.089	12/20/1994	0.082
04/23/1996	0.175	02/09/1996	0.098

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	Q (cfs)	Tr (yrs)	Q (cfs)
1.01	0.048	1.01	0.033
1.03	0.049	1.03	0.034
1.06	0.053	1.06	0.034
1.08	0.054	1.08	0.036
1.10	0.057	1.10	0.039
1.13	0.066	1.13	0.040
1.16	0.066	1.16	0.040
1.19	0.068	1.19	0.041
1.22	0.070	1.22	0.042
1.25	0.071	1.25	0.043
1.28	0.075	1.28	0.043
1.32	0.076	1.32	0.044
1.35	0.080	1.35	0.044
1.39	0.082	1.39	0.044
1.43	0.086	1.43	0.045
1.48	0.086	1.48	0.045
1.52	0.087	1.52	0.045
1.57	0.088	1.57	0.045
1.63	0.089	1.63	0.045
1.68	0.089	1.68	0.047
1.75	0.090	1.75	0.047
1.81	0.091	1.81	0.047
1.88	0.092	1.88	0.049
1.96	0.093	1.96	0.051
2.04	0.097	2.04	0.053
2.13	0.098	2.13	0.053
2.23	0.099	2.23	0.056
2.34	0.113	2.34	0.057
2.46	0.115	2.46	0.058
2.59	0.117	2.59	0.058
2.74	0.118	2.74	0.061
2.91	0.128	2.91	0.061
3.09	0.132	3.09	0.062
3.30	0.136	3.30	0.062
3.55	0.138	3.55	0.064
3.83	0.153	3.83	0.064
4.16	0.170	4.16	0.072
4.56	0.175	4.56	0.072
5.03	0.185	5.03	0.073
5.62	0.185	5.62	0.077
6.37	0.192	6.37	0.078
7.34	0.197	7.34	0.082
8.65	0.206	8.65	0.084
10.55	0.246	10.55	0.085
13.52	0.246	13.52	0.087
18.80	0.247	18.80	0.098
30.85	0.267	30.85	0.112
85.93	0.289	85.93	0.227

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.095	2-Year	0.052
5-Year	0.184	5-Year	0.073
10-Year	0.235	10-Year	0.085
25-Year	0.258	25-Year	0.106
50-Year	0.277	50-Year	0.166
100-Year	**	100-Year	**
200-Year	**	200-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability

0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
1.444E-03	3.0133E-01	1.137E-03	4.0800E-01
2.888E-03	2.3270E-01	2.274E-03	3.5398E-01
4.333E-03	1.9111E-01	3.412E-03	3.2604E-01
5.777E-03	1.6008E-01	4.549E-03	3.0897E-01
7.221E-03	1.3675E-01	5.686E-03	2.9648E-01
8.665E-03	1.1887E-01	6.823E-03	2.7373E-01
0.010	1.0430E-01	0.008	2.5496E-01
0.012	9.2100E-02	0.009	2.3410E-01
0.013	8.1819E-02	0.010	2.1680E-01
0.014	7.2971E-02	0.011	2.0143E-01
0.016	6.5147E-02	0.013	1.8339E-01
0.017	5.8417E-02	0.014	1.6825E-01
0.019	5.2737E-02	0.015	1.5466E-01
0.020	4.7539E-02	0.016	1.4325E-01
0.022	4.3076E-02	0.017	1.3036E-01
0.023	3.9126E-02	0.018	1.1930E-01
0.025	3.5559E-02	0.019	1.0981E-01
0.026	3.2386E-02	0.020	1.0012E-01
0.027	2.9586E-02	0.022	9.1378E-02
0.029	2.6991E-02	0.023	8.3704E-02
0.030	2.4610E-02	0.024	7.6204E-02
0.032	2.2537E-02	0.025	6.9599E-02
0.033	2.0653E-02	0.026	6.3175E-02
0.035	1.8939E-02	0.027	5.7378E-02
0.036	1.7285E-02	0.028	5.2093E-02
0.038	1.5814E-02	0.030	4.6967E-02
0.039	1.4545E-02	0.031	4.2201E-02
0.040	1.3330E-02	0.032	3.7736E-02
0.042	1.2318E-02	0.033	3.3755E-02
0.043	1.1367E-02	0.034	3.0287E-02
0.045	1.0543E-02	0.035	2.7466E-02
0.046	9.7797E-03	0.036	2.4688E-02
0.047	9.1501E-03	0.038	2.2119E-02
0.049	8.3276E-03	0.039	1.9448E-02
0.051	7.7097E-03	0.040	1.7325E-02
0.052	7.1084E-03	0.041	1.5469E-02
0.053	6.5190E-03	0.042	1.3625E-02
0.055	6.0437E-03	0.043	1.1876E-02
0.056	5.6444E-03	0.044	1.0165E-02
0.058	5.2547E-03	0.045	8.8172E-03
0.059	4.8601E-03	0.047	7.7454E-03
0.061	4.4514E-03	0.047	6.9410E-03
0.062	4.1068E-03	0.049	5.6064E-03
0.064	3.8073E-03	0.050	5.0004E-03
0.065	3.5340E-03	0.051	4.4847E-03
0.066	3.2250E-03	0.052	4.1496E-03
0.068	2.9589E-03	0.053	3.8192E-03
0.069	2.7640E-03	0.055	3.5364E-03
0.071	2.5548E-03	0.056	3.2464E-03
0.072	2.3576E-03	0.057	2.9755E-03
0.074	2.2079E-03	0.058	2.7260E-03
0.075	2.0439E-03	0.059	2.5453E-03
0.077	1.8823E-03	0.060	2.3196E-03
0.078	1.7373E-03	0.061	2.1223E-03
0.079	1.5899E-03	0.063	1.9964E-03
0.081	1.4331E-03	0.064	1.8942E-03
0.082	1.3095E-03	0.065	1.7896E-03
0.084	1.1859E-03	0.066	1.7040E-03
0.085	1.0814E-03	0.067	1.5804E-03
0.087	9.8867E-04	0.068	1.4664E-03
0.088	8.9360E-04	0.069	1.3642E-03
0.090	8.2230E-04	0.071	1.2548E-03
0.091	7.6051E-04	0.072	1.1384E-03
0.092	7.0823E-04	0.073	1.0386E-03
0.094	6.5832E-04	0.074	9.7679E-04
0.095	6.3411E-04	0.075	9.2212E-04
0.097	5.7038E-04	0.076	8.4370E-04
0.098	5.4187E-04	0.077	7.7715E-04
0.100	4.9671E-04	0.078	7.1774E-04
0.101	4.6819E-04	0.080	6.6307E-04
0.103	4.4680E-04	0.081	5.9415E-04
0.104	4.1591E-04	0.082	5.1810E-04
0.105	3.8739E-04	0.083	4.5393E-04
0.107	3.7550E-04	0.084	4.0165E-04
0.108	3.4698E-04	0.085	3.3985E-04
0.110	3.3272E-04	0.086	3.1609E-04
0.111	3.1609E-04	0.088	2.8995E-04
0.113	3.0658E-04	0.089	2.8044E-04
0.114	2.7806E-04	0.090	2.7093E-04
0.116	2.7331E-04	0.091	2.6380E-04
0.117	2.6618E-04	0.092	2.5667E-04
0.118	2.5192E-04	0.093	2.4954E-04
0.120	2.4004E-04	0.095	2.3797E-04
0.121	2.3053E-04	0.096	2.3528E-04
0.123	2.2340E-04	0.097	2.2102E-04
0.124	2.1627E-04	0.098	2.0201E-04
0.126	2.0439E-04	0.099	1.9251E-04

0.127	1.9726E-04	0.100	1.8538E-04
0.129	1.8537E-04	0.101	1.8062E-04
0.130	1.8062E-04	0.102	1.7587E-04
0.131	1.7587E-04	0.103	1.7349E-04
0.133	1.6636E-04	0.105	1.6636E-04
0.134	1.6399E-04	0.106	1.6161E-04
0.136	1.5686E-04	0.107	1.5923E-04
0.137	1.5448E-04	0.108	1.5210E-04
0.139	1.5210E-04	0.109	1.4260E-04
0.140	1.4735E-04	0.110	1.3547E-04
0.142	1.4260E-04	0.111	1.2834E-04
0.143	1.4022E-04	0.113	1.1883E-04
0.144	1.3547E-04	0.114	1.1883E-04
0.146	1.3547E-04	0.115	1.1645E-04
0.147	1.3547E-04	0.116	1.1645E-04
0.149	1.3071E-04	0.117	1.1170E-04
0.150	1.2596E-04	0.118	1.1170E-04
0.152	1.2121E-04	0.119	1.0932E-04
0.153	1.1645E-04	0.121	1.0695E-04
0.155	1.1170E-04	0.122	1.0695E-04
0.156	1.1170E-04	0.123	1.0457E-04
0.157	1.0932E-04	0.124	1.0219E-04
0.159	1.0932E-04	0.125	9.9817E-05
0.160	1.0932E-04	0.126	9.9817E-05
0.162	1.0695E-04	0.127	9.7441E-05
0.163	1.0695E-04	0.129	9.7441E-05
0.165	1.0457E-04	0.130	9.5064E-05
0.166	9.9817E-05	0.131	9.2688E-05
0.168	9.7441E-05	0.132	9.0311E-05
0.169	9.7441E-05	0.133	9.0311E-05
0.170	9.5064E-05	0.134	8.7934E-05
0.172	9.2687E-05	0.135	8.7934E-05
0.173	9.0311E-05	0.136	8.5558E-05
0.175	9.0311E-05	0.138	8.5558E-05
0.176	8.3181E-05	0.139	8.0805E-05
0.178	8.3181E-05	0.140	8.0805E-05
0.179	8.3181E-05	0.141	7.8428E-05
0.181	8.3181E-05	0.142	7.8428E-05
0.182	8.0804E-05	0.143	7.6051E-05
0.184	8.0348E-05	0.144	7.6051E-05
0.185	7.8428E-05	0.146	7.3675E-05
0.186	7.3675E-05	0.147	7.1298E-05
0.188	7.3675E-05	0.148	6.8922E-05
0.189	7.3675E-05	0.149	6.8922E-05
0.191	7.3675E-05	0.150	6.6545E-05
0.192	7.1298E-05	0.151	6.6545E-05
0.194	6.8921E-05	0.152	6.4168E-05
0.195	6.8921E-05	0.154	6.4168E-05
0.196	6.6545E-05	0.155	6.1792E-05
0.198	6.1792E-05	0.156	6.1792E-05
0.199	5.9415E-05	0.157	5.9415E-05
0.201	5.9415E-05	0.158	5.7039E-05
0.202	5.9415E-05	0.159	5.4662E-05
0.204	5.7038E-05	0.160	5.4662E-05
0.205	5.7038E-05	0.161	5.2285E-05
0.207	5.2285E-05	0.163	4.9909E-05
0.208	5.2285E-05	0.164	4.9909E-05
0.209	4.7532E-05	0.165	4.7532E-05
0.211	4.5155E-05	0.166	4.7532E-05
0.212	4.5155E-05	0.167	4.5156E-05
0.214	4.0402E-05	0.168	4.2779E-05
0.215	3.8026E-05	0.169	4.0402E-05
0.217	3.8026E-05	0.171	3.8026E-05
0.218	3.5649E-05	0.172	3.5649E-05
0.220	3.5649E-05	0.173	3.3272E-05
0.221	3.5649E-05	0.174	3.0896E-05
0.222	3.3272E-05	0.175	2.8519E-05
0.224	3.3272E-05	0.176	2.6143E-05
0.225	3.0896E-05	0.177	2.1389E-05
0.227	3.0896E-05	0.179	2.1389E-05
0.228	2.8519E-05	0.180	1.9013E-05
0.230	2.8519E-05	0.181	1.6636E-05
0.231	2.8519E-05	0.182	1.6636E-05
0.233	2.8519E-05	0.183	1.6636E-05
0.234	2.8519E-05	0.184	1.6577E-05
0.235	2.6143E-05	0.185	1.6636E-05
0.237	2.6143E-05	0.186	1.4260E-05
0.238	2.6143E-05	0.188	1.4260E-05
0.240	2.6143E-05	0.189	1.4260E-05
0.241	2.3766E-05	0.190	1.4260E-05
0.243	2.3766E-05	0.191	1.4260E-05
0.244	2.3766E-05	0.192	1.1883E-05
0.246	2.1389E-05	0.193	1.1883E-05
0.247	1.4260E-05	0.194	1.1883E-05
0.248	1.1883E-05	0.196	1.1883E-05
0.250	1.1883E-05	0.197	1.1883E-05
0.251	1.1883E-05	0.198	9.5064E-06
0.253	1.1883E-05	0.199	9.5064E-06
0.254	1.1883E-05	0.200	9.5064E-06

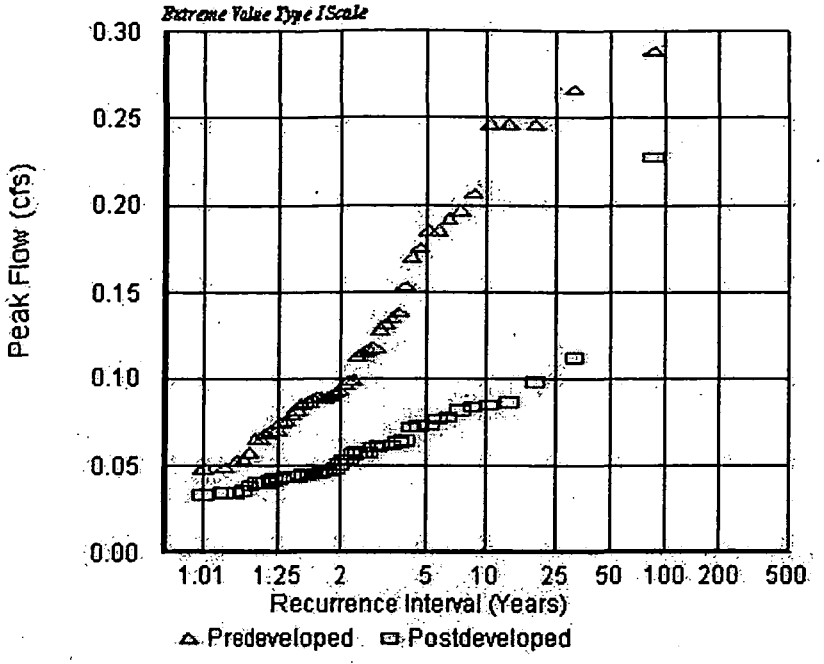
0.256	9.5064E-06	0.201	9.5064E-06
0.257	9.5064E-06	0.202	9.5064E-06
0.259	9.5064E-06	0.204	9.5064E-06
0.260	9.5064E-06	0.205	9.5064E-06
0.261	9.5064E-06	0.206	7.1298E-06
0.263	9.5064E-06	0.207	7.1298E-06
0.264	9.5064E-06	0.208	7.1298E-06
0.266	9.5064E-06	0.209	7.1298E-06
0.267	7.1298E-06	0.210	7.1298E-06
0.269	7.1298E-06	0.212	7.1298E-06
0.270	7.1298E-06	0.213	7.1298E-06
0.272	7.1298E-06	0.214	7.1298E-06
0.273	4.7532E-06	0.215	7.1298E-06
0.274	4.7532E-06	0.216	7.1298E-06
0.276	4.7532E-06	0.217	4.7532E-06
0.277	2.5015E-06	0.218	4.7532E-06
0.279	2.3766E-06	0.219	4.7532E-06
0.280	2.3766E-06	0.221	4.7532E-06
0.282	2.3766E-06	0.222	4.7532E-06
0.283	2.3766E-06	0.223	4.7532E-06
0.285	2.3766E-06	0.224	4.7532E-06
0.286	2.3766E-06	0.225	4.7532E-06
0.287	2.3766E-06	0.226	4.7532E-06
0.289	1.3309E-06	0.227	2.3766E-06

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

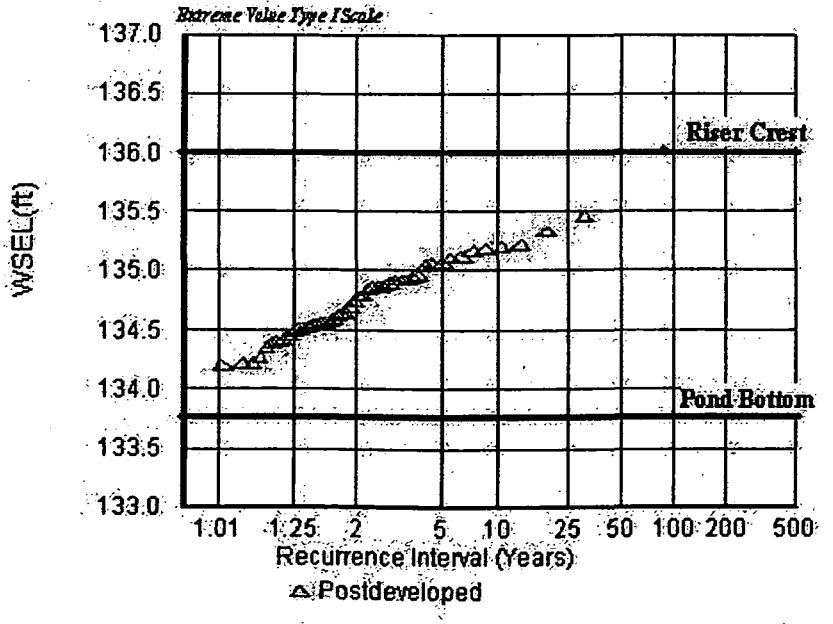
Excursion at Predeveloped ½Q2 (Must be Less Than 0%):	-24.4%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-24.4%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-43.9%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

Flood Frequency Plot



WSEL Structure: Structure Imported from M



POND E

Design Emergency Spillway:
Use weir flow calculation and 100_ year post developed peak flow (HRM 5-4.3.3)
to determine depth of flow.
Flow Depth Determination:

Q_100 = 0.74 cfs (*Note: Postdeveloped annual maxima discharge of Tr -85.93 yrs was taken as Q-100)*

$Q = 3.21 [LH^{3/2} + 2.4 H^{5/2}]$

Or

$L= (Q100/(3.21H^{3/2})] - 2.4 H^{5/2}$ or 6 feet minimum

For Q = 0.743 cfs:

Assume H= 0.2

$L= (0.743/(3.21(0.2^{3/2}))] - 2.4 (0.2^{5/2})$

2.59 feet

use 6 feet

Traffic Impact Analysis

GARRY OAKS RESIDENTIAL

Prepared for:
DR Horton

July 2024

Prepared by:

12131 113th Avenue NE, Suite 203
Kirkland, WA 98034-7120
Phone: 425-821-3665
www.transpogroup.com

1.24166.00

© 2024 Transpo Group

Table of Contents

Introduction **1**
Project Description 1
Study Scope and Study Area 1

Existing & Future Without-Project Conditions **4**
Roadway Network 4
Transit Service 5
Traffic Volumes 5
Traffic Operations 9
Traffic Safety 10

Project Impacts **11**
Trip Generation 11
Trip Distribution and Assignment 12
Future With-Project Traffic Volumes 12
Future With-Project Traffic Operations 15
Site Access Analysis 15
Transportation Impact Fee 16

Summary and Findings **17**

Appendix

Appendix A: Traffic Counts
Appendix B: SR 20 Annual Traffic Volume Trends
Appendix C: LOS Definitions
Appendix D: LOS Worksheets
Appendix E: Detailed Trip Generation

Figures

Figure 1. Site Vicinity and Study Intersections 2
Figure 2. Preliminary Site Plan 3
Figure 3. Existing PM Peak Hour Traffic Volumes 6
Figure 4. Future (2029) Without-Project PM Peak Hour Traffic Volumes 8
Figure 5. Weekday Peak Hour Project Trip Distribution and Assignment 13
Figure 6. Future (2029) With-Project Weekday Peak Hour Traffic Volumes 14

Tables

Table 1. Existing Transit Service 5
Table 2. Existing and Future (2029) Without-Project Weekday PM Peak Hour LOS Summary 9
Table 3. Study Intersection Collision Data Summary (2021 – 2023) 10
Table 4. Estimated Weekday Vehicle Trip Generation 11
Table 5. PM Peak Hour Traffic Volume Impacts at Study Intersections 12
Table 6. Future Weekday PM Peak Hour Intersection Operations 15

Introduction

This traffic impact analysis (TIA) identifies potential transportation-related impacts associated with the proposed Garry Oaks Residential development in Oak Harbor, WA.

Project Description

The proposed project will construct 153 single family homes and 66 duplex units on a currently vacant site located west of State Route (SR 20) and south of SW 24th Avenue in Oak Harbor, WA. The site vicinity is shown on Figure 1. Circulation on site will be provided by various internal roadways, with 2 access roads connecting north to SW 24th Avenue, and one access east to SR 20, as shown in the preliminary site plan in Figure 2. The proposed project is anticipated to be fully constructed by 2029.

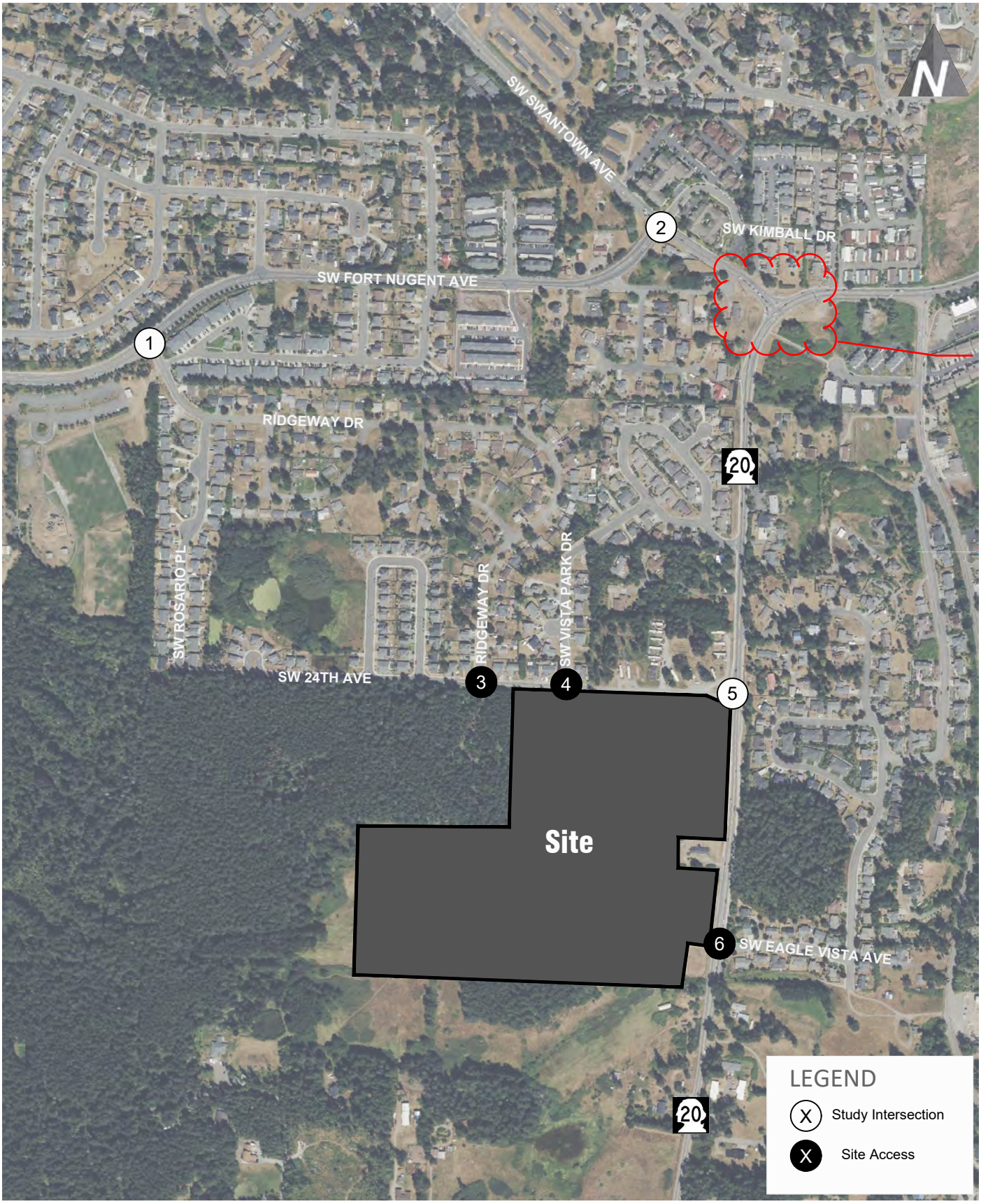
Study Scope and Study Area

The following intersections surrounding the project site were identified for analysis through coordination with City of Oak Harbor Staff:

1. Ridgeway Dr/SW Fort Nugent Ave
2. SW Fort Nugent Ave/SW Kimball Dr/SW Swantown Ave
3. Ridgeway Dr/SW 24th Ave/Future Northwest Site Access
4. SW Vista Park Dr/SW 24th Ave/Future Northeast Site Access
5. SR 20/SW 24th Ave
6. SR 20/SW Eagle Vista Ave/Future East Site Access

SR20/Swantown needs to be included in analysis. Future condition (2029) can assume WSDOT-funded roundabout.

The analysis includes a review of existing conditions in the vicinity of the project site, including the motorized and non-motorized transportation network, planned improvements, existing and future without-project peak hour traffic volumes, traffic operations, and traffic safety. Future with-project conditions are evaluated by adding site-generated traffic to future without-project volumes. Future without and with-project conditions are compared to identify the impacts the proposed project has on the surrounding transportation system.



Site Vicinity and Study Intersections

FIGURE 1

Garry Oaks Residential

transpogroup



Preliminary Site Plan

Garry Oaks Residential

FIGURE
2

transpogroup

Existing & Future Without-Project Conditions

This section describes both existing and future (2029) without-project conditions within the identified study area. Study area characteristics are provided for the transportation system, planned improvements, existing and future forecasted without-project traffic volumes, traffic operations, and traffic safety.

Roadway Network

The following sections describe the existing street network within the vicinity of the proposed project site and anticipated planned improvements.

Existing

The primary roadways within the study area and their characteristics near the study intersections are described below.

State Route (SR) 20 is functionally classified by WSDOT as an urban principal arterial and has a speed limit of 40 mph. SR 20 is a two-lane roadway which provides connectivity north to Anacortes and south to SR 525. Sidewalks are provided on both sides of SR 20 north of SW Eagle Vista Drive, although no dedicated bicycle facilities are present.

SW Swantown Avenue is a four-lane roadway within the study area and is classified as a principal arterial by the City of Oak Harbor. The speed limit of SW Swantown Avenue is 35 mph in the vicinity of the project site. Sidewalks are provided along both sides of SW Swantown Avenue although no bicycle facilities are present.

SW Fort Nugent Avenue is a two to three-lane roadway in the vicinity of the project site with a speed limit of 35 mph. SW Fort Nugent Avenue is classified as a minor arterial by the City of Oak Harbor. Sidewalks are provided along both sides of SW Fort Nugent Avenue in the vicinity of its intersection with Ridgeway Drive and intermittently east of Ridgeway Drive. In areas where sidewalks are not provided, wide painted shoulders are present.

Where is this information from? Our 2016 Transportation Comp Plan classifies Ridgeway as a local.

Ridgeway Drive is classified as a collector west of SW Rosario Place and a local road to the east. Ridgeway Drive has 2 lanes of travel and a speed limit of 25 mph. No sidewalks or bike lanes are provided along Ridgeway Drive with the exception of the south side of the roadway west of SW Rosario Place. East of SW Rosario Place no sidewalks, bike lanes or shoulders are provided.

SW 24th Avenue is classified as a local road with 2 travel lanes and a speed limit of 25 mph. East of SW Vista Park Drive no bicycle or pedestrian facilities are provided along SW 24th Avenue with no sidewalks, bicycle lanes or shoulders provided. West of SW Vista Park Drive, sidewalks are provided on the north side of the roadway.

SW Vista Park Drive is a local road with 2 lanes of travel and a speed limit of 25 mph. Sidewalks are provided on both sides of the roadway although no dedicated bicycle facilities are present.

SW Eagle Vista Avenue is classified as a local road with 2 lanes of travel. The speed limit along SW Eagle Vista Avenue is 25 mph. Sidewalks are provided on both sides of the roadway although no dedicated bicycle facilities are present.

Planned Improvements

Based on a review of the *City of Oak Harbor's 2023-2028 Capital Improvements Plan*, Island County*'s 2023-2028 Six-Year Transportation Improvement Program* (TIP)*, and Washington State Department of Transportation's (WSDOT) 2024-2027 Statewide Transportation Improvement Plan (STIP),* one project was identified in the vicinity of the project site, although will not affect the study intersections. The project involves constructing a roundabout at the intersection of SR 20 and SW Swantown Avenue, located approximately 0.3 miles north of the project site.

Transit Service

Transit service in the vicinity of the project site is provided by Island Transit. The closest transit stop to the project site is located at the intersection of SR 20 and SW 24th Avenue on the northeast corner of the site and served by Route 1. Additional stops are provided at the intersection of SW 24th Avenue and Ridgeway Drive and along SW Fort Nugent Avenue approximately 0.1 miles north of the project site and served by Routes 6 and 9. Route characteristics are summarized in Table 1.

Table 1. Existing Transit Service

Routes	Area Served	Approximate Weekday Operating Hours	AM Peak Period Trips (7-9 AM)	PM Peak Period Trips (4-6 PM)	Headways (minutes)
1	Oak Harbor, Coupeville, Central Whidbey, Greenbank, Freeland, Bayview, Clinton	3:45 a.m. – 8:10 p.m.	3	3	25-45
6	Oak Harbor, San de Fuca, Coveland, Coupeville	5:40 a.m. – 7:40 p.m.	1	1	120
9	Oak Harbor	7:15 a.m. – 7:45 a.m.	2	2	60

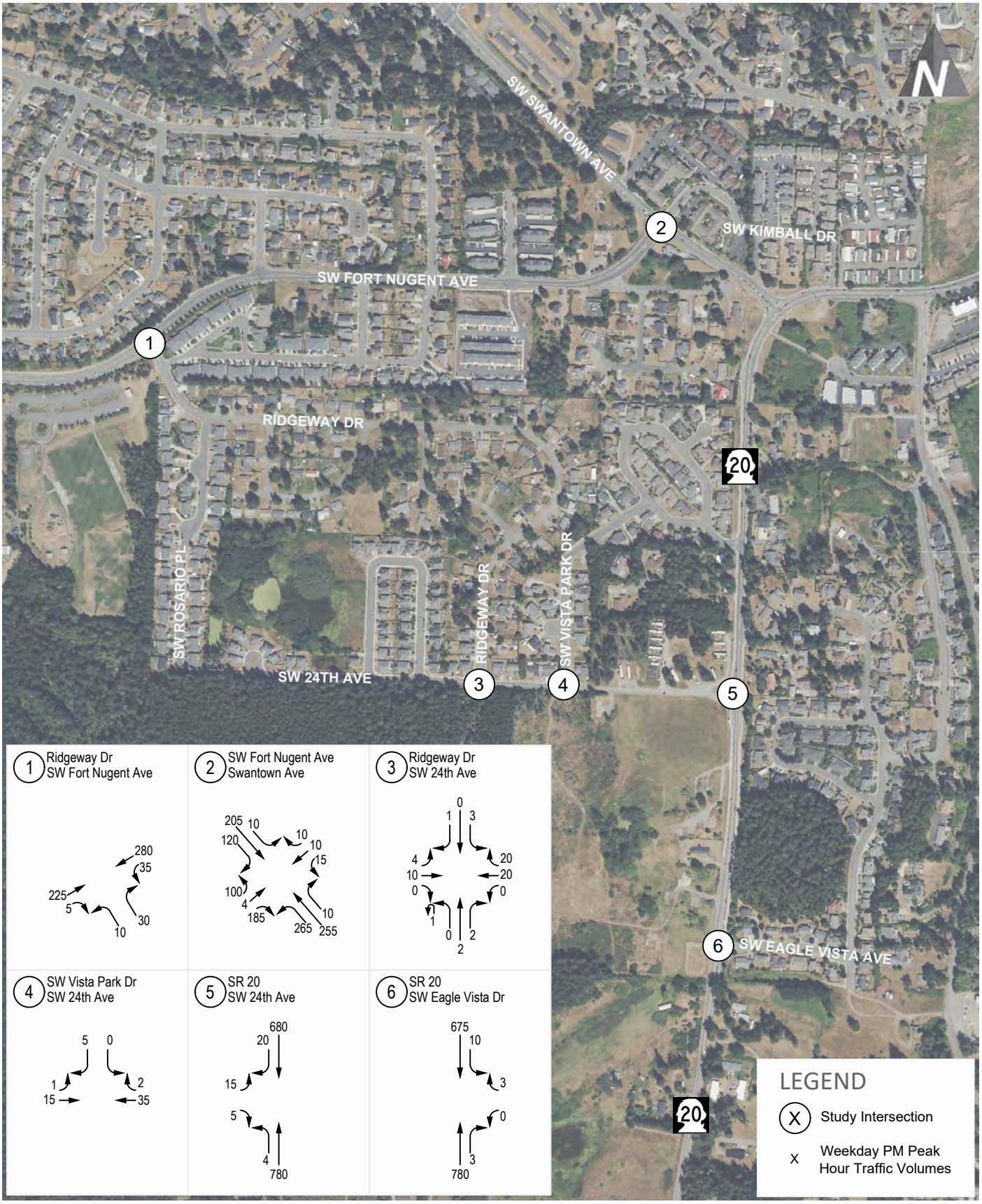
Source: Island Transit (June 2024)

Traffic Volumes

Existing

Existing weekday PM (4 to 6 p.m.) peak period traffic counts were collected at each study intersection in June 2024 (Appendix A). Volumes are rounded to the nearest 5 vehicles to account for the daily fluctuations in traffic volumes. Data from WSDOT's permanent traffic counter located along SR 20 approximately 10 miles south of the project site near Park Road in Coupeville, were reviewed to determine if there are any seasonal fluctuations to consider. It was found that traffic volumes are greatest during the summer months of June, July and August and lowest in the winter months of November to February. No seasonal adjustments were made and given data was collected in June, this analysis represents a condition that was well above average and above the 80th percentile condition. Annual average daily traffic trends are summarized in Appendix B.

Figure 3 illustrates the existing weekday PM peak hour traffic volumes at the off-site study intersections.



Existing Weekday PM Peak Hour Traffic Volumes

FIGURE
3

Garry Oaks Residential

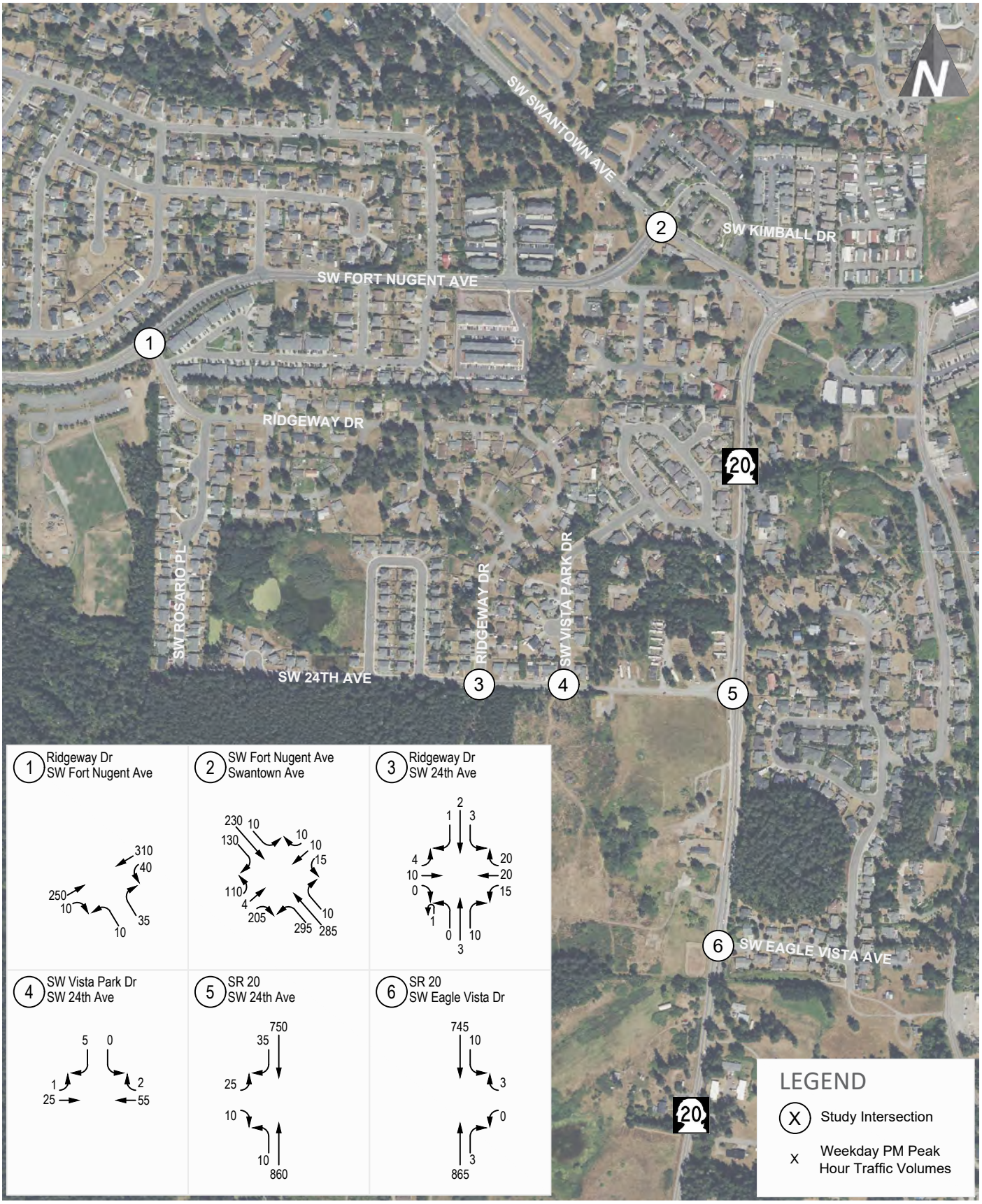
transpogroup

Future Without-Project Traffic Volumes

Future (2029) without-project traffic volumes are comprised of background traffic growth, and traffic generated from planned "pipeline" developments in the vicinity of the project site. An annual growth rate of 2.0 percent was applied, consistent with other projects in the vicinity of the project site and a review of AADT data provided by WSDOT's Traffic Count Database System in the vicinity of the project site. In addition to the annual growth rate, traffic from approved, but not yet occupied development projects in the vicinity of the project site were also included in the analysis. One pipeline project was identified by City Staff to be included and is described below:

1. **11 SW 24th Avenue** project is a residential development located directly west of the proposed Garry Oaks project site. The development includes the construction of 28 single family homes with access at the intersection of SW 24th Avenue/Ridgeway Drive and a connection to the Garry Oaks project site to the south.

The forecast future 2029 without-project weekday PM peak hour traffic volumes are shown on Figure 4.



Future (2029) Without-Project Weekday PM Peak Hour Traffic Volumes

FIGURE 4

Garry Oaks Residential

transpogroup

Traffic Operations

The following section summarizes the traffic operations for existing and future without-project conditions for the off-site study intersections.

The operational characteristics of an intersection are determined by calculating the intersection level of service (LOS). At signalized intersections, LOS is measured in average control delay per vehicle and is reported using the intersection delay. At unsignalized side-street, stop-controlled intersections, LOS is measured by the average delay on the worst-movement of the intersection. Traffic operations and average vehicle delay can be described qualitatively with a range of levels of service (LOS A through LOS F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. Appendix C contains a detailed explanation of LOS criteria and definitions.

According to the *Oak Harbor Comprehensive Plan,* active through 2036, the proposed project site is located inside the City's Urban Growth Area (UGA). The level of service standard for all intersections on City streets within the UGA is LOS D while a standard of LOS E is followed for all intersections along SR 20 within the UGA.

Weekday peak hour traffic operations for existing and future without-project conditions were evaluated at the study intersections based on the procedures identified in the *Highway Capacity Manual* (HCM 7th ed.) and using *Synchro 12*. *Synchro 12* is a software program that uses *HCM* methodology to evaluate intersection LOS and average vehicle delays. Analysis parameters such as lane channelization and traffic control type were maintained for future 2029 without-project conditions consistent with existing conditions.

Results for the existing and future without-project operations analyses are summarized in Table 2. Detailed LOS worksheets for the existing and future without-project analysis are included in Appendix D.

Table 2. Existing and Future (2029) Without-Project Weekday PM Peak Hour LOS Summary

	LOS Standard	Existing			Future (2029) Without-Project		
		LOS[1]	Delay[2]	WM[3]	LOS	Delay	WM
1. Ridgeway Dr/SW Fort Nugent Ave	D	B	12.4	NBL	B	12.9	NBL
2. SW Fort Nugent Ave/SW Kimball Dr/SW Swantown Ave[4]	D	D	35.1	-	D	41.4	-
3. Ridgeway Dr/SW 24th Ave	D	A	9.0	SB	A	9.5	SB
4. SW Vista Park Dr/SW 24th Ave	D	A	8.6	SB	A	8.7	SB
5. SR 20/SW 24th Ave	E	D	34.5	EB	**F**	**51.1**	**EB**
6. SR 20/SW Eagle Vista Ave	E	C	15.1	WB	C	16.5	WB

Note: **Bold** indicates LOS standard is not met.
1. Level of Service (A – F) as defined by the 7th Edition *Highway Capacity Manual* (HCM), Transportation Research Board.
2. Average delay per vehicle in seconds.
3. Worst movement reported for unsignalized intersections where NBL = northbound left-turn, SB = southbound, EB = eastbound and WB = westbound.
4. Evaluated using HCM 2000 due to non NEMA signal timing phasing.

Table 2 shows that under existing conditions, all the study intersections operate at LOS D or better during the weekday PM peak hour, meeting the required LOS standards. With the addition of background growth and traffic from the planned "pipeline" development in the vicinity of the project site, under future without-project conditions, all study intersections are expected to continue operating at the same LOS as under existing conditions, with the exception of the stop-controlled intersection of SR 20 and SW 24th Avenue. The intersection of SR 20/SW 24th Avenue is forecast to operate at LOS F under future (2029) prior to the development of the proposed project.

Traffic Safety

The three most recent years of collision records (January 1, 2021, to December 31, 2023) provided by the Washington State Department of Transportation (WSDOT) were reviewed within the study area to identify existing traffic safety issues at the study intersections and along the roadway segments surrounding the site. A summary of the total and average annual number of reported collisions at the study intersections are provided in Table 3.

Table 3. Study Intersection Collision Data Summary (2021 – 2023)

	Number of Reported Collisions			Total	Annual Average
	2021	2022	2023		
Intersection:					
1. Ridgeway Dr/SW Fort Nugent Ave	0	0	1	1	0.33
2. SW Fort Nugent Ave/SW Kimball Dr/SW Swantown Ave	0	1	1	2	0.67
3. Ridgeway Dr/SW 24th Ave	0	0	0	0	0.00
4. SW Vista Park Dr/SW 24th Ave	0	0	0	0	0.00
5. SR 20/SW 24th Ave	0	1	0	1	0.33
6. SR 20/SW Eagle Vista Ave	0	1	0	1	0.33
Roadway Segment:					
SR 20 along the Site Frontage	2	0	1	3	1.00
SW 24th Avenue along the Site Frontage	0	0	0	0	0.00

Source: WSDOT 2024.
Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

As shown in Table 3, the study intersections and roadway segments along the project frontage had an annual average of 1 collision or less per year over the last three-year period. No collisions were reported over the review period at the intersections of Ridgeway Drive/SW 24th Avenue or SW Vista Park Drive/SW 24th Avenue, or along the site frontage on SW 24th Avenue.

Out of the 5 total collisions reported at the study intersections, 4 were reported as rear end collisions, and one was a sideswipe collision. All collisions resulted in property damage only with 2 resulting in minor injury. The 3 collisions reported on SR 20 between SW 24th Avenue and SW Eagle Vista Avenue were reported as rear end collisions resulting in property damage only. Overall, no collisions involving pedestrians or bicyclists and no fatalities were reported over the last 3-year review period and no safety issues were identified in the study area.

Project Impacts

This section of the report documents project-generated impacts within the study area. First, peak hour traffic volumes are estimated, distributed, and assigned to adjacent roadways and intersections within the study area. Next, future (2029) traffic volumes including project traffic are developed and the potential impact to traffic volumes and traffic operations are identified.

Trip Generation

Trip generation for the proposed project was based on the established trip rates published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (11th Edition, 2021). For the proposed land uses, ITE's Single-Family Attached Housing (LU #215) and Single-Family Detached Housing (LU #210) land uses were used for the duplex units and single-family homes proposed. Table 4 summarizes the estimated weekday trips generated by the proposed project. The detailed trip generation calculations are included in Appendix E.

Table 4. Estimated Weekday Vehicle Trip Generation

Land Use[1]	Size	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
			In	Out	Total	In	Out	Total
Single Family Attached Housing (LU #215)	66 du	452	7	22	29	21	15	36
Single Family Detached Housing (LU #210)	153 du	1,442	27	80	107	91	53	144
New Trips		**1,894**	**34**	**102**	**136**	**112**	**68**	**180**

Note: du = dwelling units
1. Average trip rates from ITE *Trip Generation Manual*, 11th Edition (2021).

As shown in Table 5, the proposed project is estimated to generate 1,894 new weekday daily trips with 136 trips during the weekday AM peak hour and 180 during the PM peak hour.

Trip Distribution and Assignment

Trip distribution patterns for the proposed uses to and from the site were based on previously approved projects in the vicinity of the project site and existing travel patterns identified in the area. The trip distribution for the proposed project is shown on Figure 5. The new PM peak hour project vehicle trips were assigned within the study area based on the distribution for the proposed project and are shown on Figure 5.

Future With-Project Traffic Volumes

Site-generated weekday peak hour traffic volumes were added to the future without-project traffic volumes at the study intersections. The resulting future (2029) with-project peak hour traffic volumes are illustrated on Figure 6.

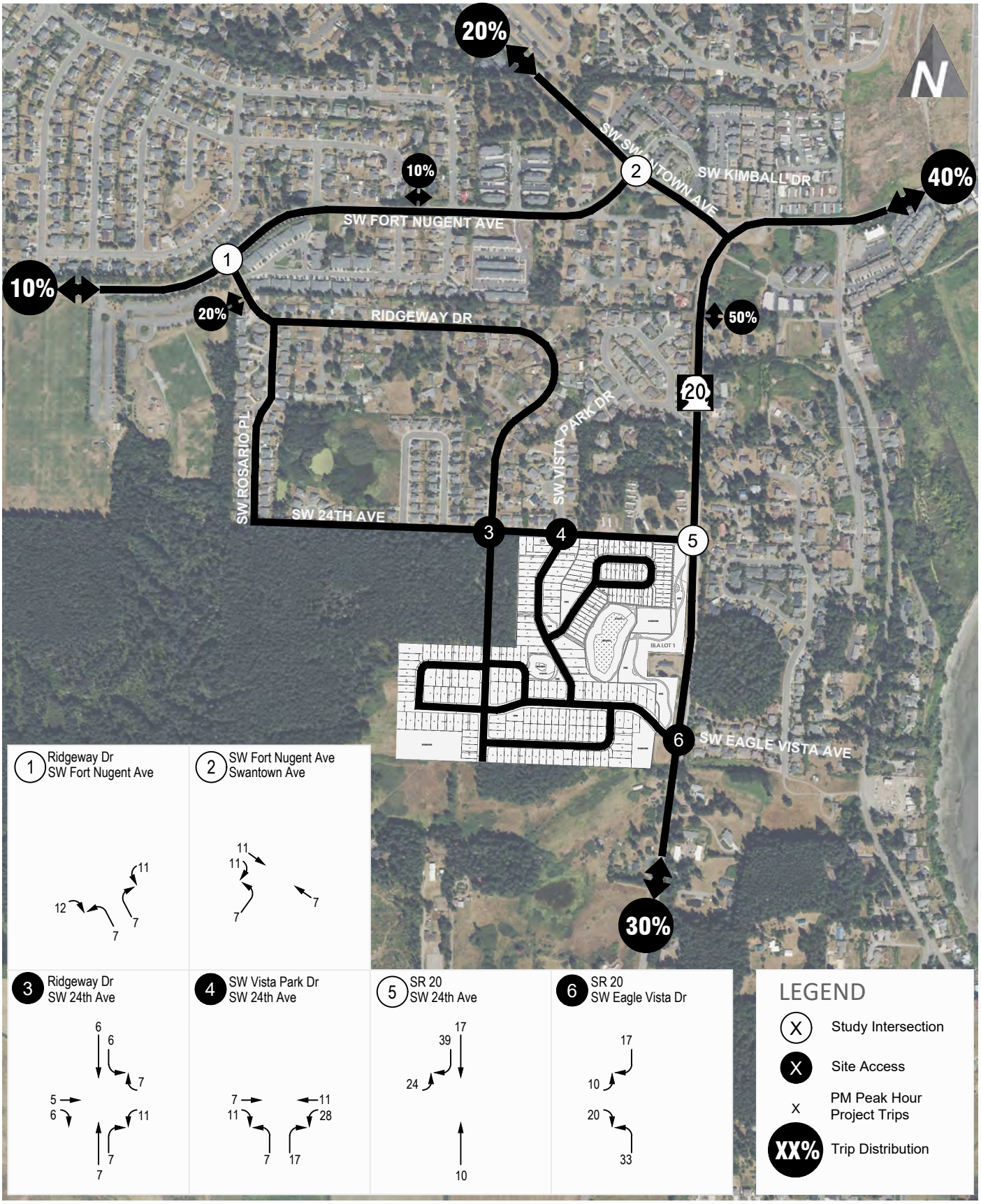
Table 5 summarizes the anticipated increase in total entering traffic at the off-site study intersections as well as the percent of future with-project traffic volumes attributable to the proposed project.

Table 5. PM Peak Hour Traffic Volume Impacts at Study Intersections

Intersection	2029 Future Without-Project TEV	Project Trips TEV	2029 Future With-Project TEV	Percent Share
1. Ridgeway Dr/SW Fort Nugent Ave	655	37	692	5.3%
2. SW Fort Nugent Ave/SW Kimball Dr/SW Swantown Ave	1,314	36	1,350	2.7%
3. Ridgeway Dr/SW 24th Ave	90	55	144	38.2%
4. SW Vista Park Dr/SW 24th Ave	88	81	169	47.9%
5. SR 20/SW 24th Ave	1,690	90	1,780	5.1%
6. SR 20/SW Eagle Vista Ave	1,627	80	1,706	4.7%

Note: TEV = Total Entering Vehicles

As shown in Table 5, the project share in future (2029) traffic volumes is estimated to be approximately 5.3 percent or less at the off-site study intersections during the weekday PM peak hour and 47.9 percent or less at the site access intersections. Traffic volumes may fluctuate day-to-day by 5 to 10 percent; therefore, the increase in traffic at the majority of offsite study intersections as a result of the proposed project is less than or equal to the daily fluctuation. The percent share increase is only higher at study intersections 3 and 4 given these are local stop-controlled intersections located adjacent to the site that have less than 100 PM peak hour trips.

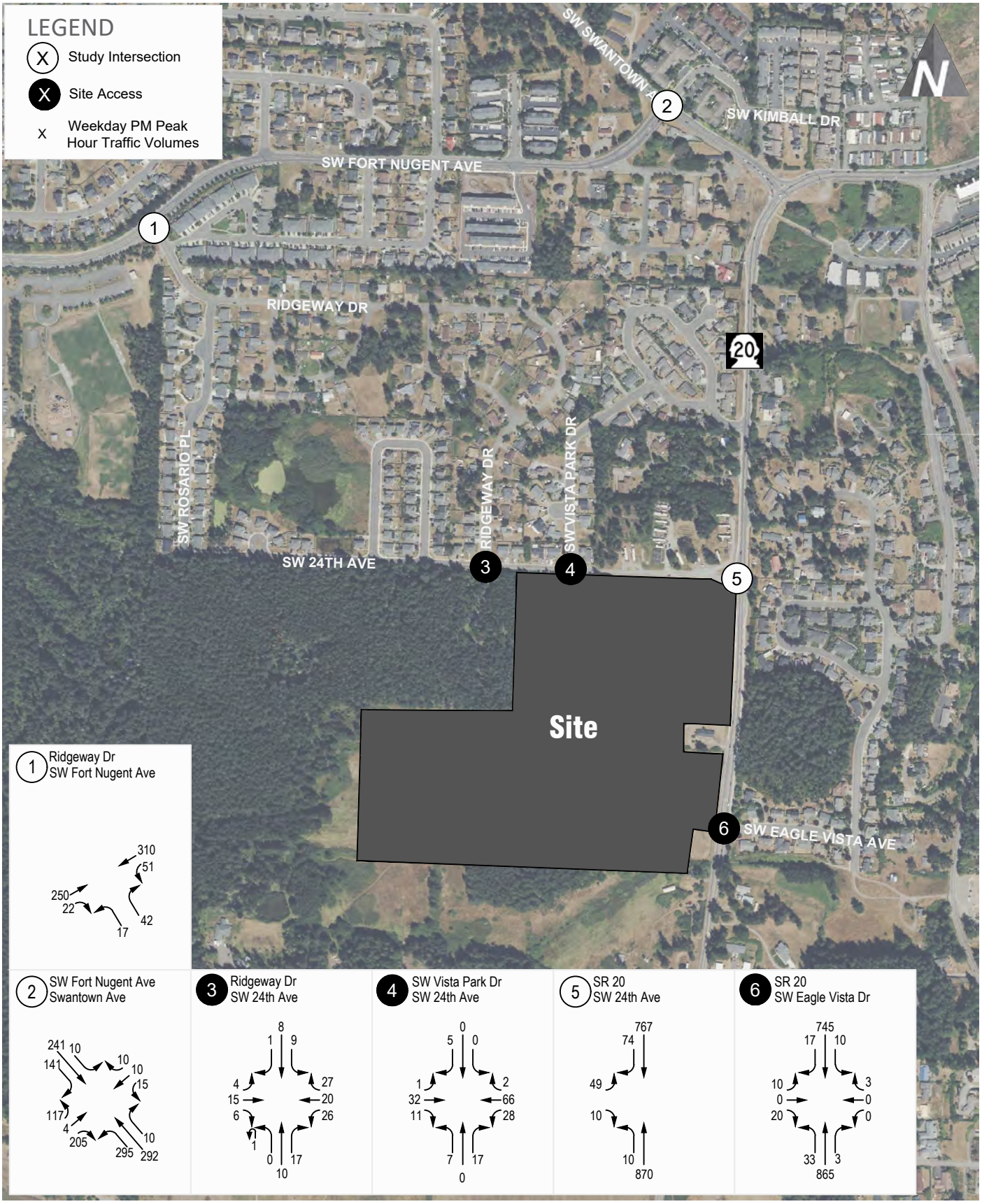


Weekday PM Peak Hour Project Trip Distribution and Assignment

FIGURE 5

Garry Oaks Residential

transpogroup



Future (2029) With-Project Weekday PM Peak Hour Traffic Volumes

FIGURE 6

Garry Oaks Residential

transpogroup

Future With-Project Traffic Operations

Future 2029 with-project study intersection operations were evaluated for the weekday PM peak hour. Intersection LOS was calculated using the methodology described previously. Analysis parameters such as lane channelization and signal timing were assumed to be consistent for the future without- and with-project conditions. The without-project conditions are compared to the with-project conditions to understand the potential traffic impacts of the proposed project. Table 6 summarizes the 2029 without- and with-project intersection operations for the weekday PM peak hour. LOS worksheets are included in Appendix D.

Table 6. Future Weekday PM Peak Hour Intersection Operations

Intersection	LOS Standard	2029 Without-Project			2029 With-Project		
		LOS[1]	Delay[2]	WM[3]	LOS	Delay	WM
1. Ridgeway Dr/SW Fort Nugent Ave	D	B	12.9	NBL	B	13.4	NBL
2. SW Fort Nugent Ave/SW Kimball Dr/SW Swantown Ave[4]	D	D	41.4	-	D	43.0	-
3. Ridgeway Dr/SW 24th Ave/Northwest Site Access	D	A	9.5	SB	B	10.1	SB
4. SW Vista Park Dr/SW 24th Ave/Northeast Site Access	D	A	8.7	SB	A	9.1	NB
5. SR 20/SW 24th Ave	E	**F**	**51.1**	**EB**	**F**	**92.3**	**EB**
6. SR 20/SW Eagle Vista Ave/South Site Access	E	C	16.5	WB	E	47.7	EB

Note: **Bold** indicates LOS standard is not met.
1. Level of Service (A – F) as defined by the 7th Edition *Highway Capacity Manual* (HCM), Transportation Research Board.
2. Average delay per vehicle in seconds.
3. Worst movement reported for unsignalized intersections where NBL = northbound left-turn, SB = southbound, EB = eastbound and WB = westbound.
4. Evaluated using HCM 2000 due to non NEMA signal timing phasing.

As shown in Table 6, with the addition of project traffic, all study intersections are anticipated to continue meeting standard with the exception of the SR 20/SW 24th Avenue intersection. As noted previously the intersection of SR 20/ SW 24th Avenue is forecast to operate at LOS F even prior to the development of the proposed project and remains at LOS F with the proposed project. Even though future conditions are forecast to operate at LOS F, the 95th percentile queue length is anticipated to be less than 4 vehicles for the eastbound approach.

Site Access Analysis

The proposed project includes three site access points, two along SW 24th Avenue and one along SR 20 (see Figure 2). The northeastern access along SW 24th Avenue and the access on SR 20 are proposed to add a 4th leg to existing 3-leg side-street stop-controlled intersections, aligning with SW Vista Park Drive and SW Eagle Vista Avenue, respectively. These access points are intentionally aligned to provide for safer travel through a standard f4-leg intersection. The western access along SW 24th Avenue will provide connection from the site, north through the adjacent residential development, and align with Ridgeway Drive at SW 24th Avenue.

The traffic operations at the site access points were evaluated under future with-project conditions for the weekday PM peak hour. The operational analysis was consistent with the methodology described above. LOS worksheets are included in Appendix D. Table 6 above summarizes the traffic operations at the site access intersections for the weekday PM peak hour.

As shown above in Table 6, all three of the site access intersections are anticipated to operate at LOS B or better along SW 24th Avenue and LOS E at SR 20/SW Eagle Vista Ave under future with-project conditions during the weekday PM peak hour, meeting the City and WSDOT's level of service standards.

Transportation Impact Fee

Payment of transportation impact fees will be required by the project applicant to help mitigate the project's impact to the transportation system. Fees collected are used to construct projects in the City's Transportation Improvement Plan identified to accommodate future development in the city. According to the City of Oak Harbor's active *Master Fee Schedule* (October 2023), a fee of $907 per residential unit developed is required to be paid. With a total of 219 residential units constructed as a part of the Garry Oaks development, an estimated transportation impact fee of $198,633 will be required to be paid to the City. The final impact fee total will be calculated by City staff at the time of building permit issuance.

Summary and Findings

This traffic impact analysis summarizes the project traffic impacts of the proposed Garry Oaks residential development located west of SR 20 and south of SW 24th Avenue in Oak Harbor, WA. General findings include:

- **Project Description** – The proposed project will construct 153 single family homes and 66 duplex units on a currently vacant site located in Oak Harbor, WA.

- **Trip Generation** – The proposed project is anticipated to generate 1,894 new weekday daily trips with 136 trips during the weekday AM peak hour and 180 during the PM peak hour.

- **Site Access Evaluation** – The proposed project includes three site access points, two along SW 24th Avenue and one along SR 20. All site access intersections are anticipated to operate at LOS B or better along SW 24th Avenue and LOS E along SR 20 under future with-project conditions during the weekday PM peak hour, meeting the City's level of service standards.

- **Traffic Operations** – The analysis shows that with the addition of traffic associated with the proposed project, all of the study intersections operate at acceptable levels with the exception of the intersection of SR 20/SW 24th Avenue. This intersection is forecast to operate at LOS F, below standards, regardless of the development of the project. This intersection is forecasted to operate at LOS F in the future prior to the development of the project. The proposed project is anticipated to add additional delay and would account for approximately 5 percent of the overall traffic at this intersection. Additional coordination will occur with the City and WSDOT to determine if any mitigation is necessary.

- **Transportation Impact Fee** – The proposed project constructing 219 residential units on site will require an estimated transportation impact fee of $198,633 be paid to the City. The actual impact fee total will be calculated by the City based on the fee adopted at the time of building permit issuance. This fee will be utilized to help fund future transportation improvements within the City.

Per City Code mitigation at this intersection is necessary as it is projected to be LOS F. Additionally, compared to the no-build future state the project will increase the delay time by 80% (51.1 sec to 92.4 sec). Coordination with the City and WSDOT is needed.

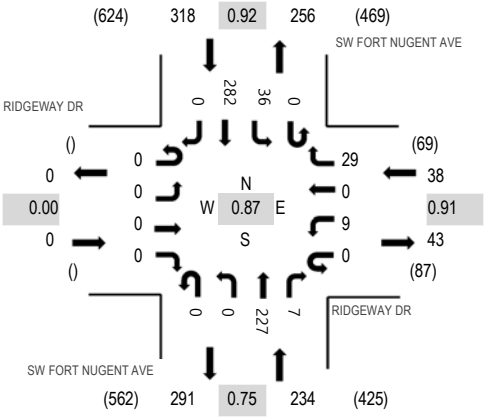
Appendix A: Traffic Counts

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 1 SW FORT NUGENT AVE & RIDGEWAY DR PM
Date: Thursday, June 6, 2024
Peak Hour: 04:15 PM - 05:15 PM
Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour

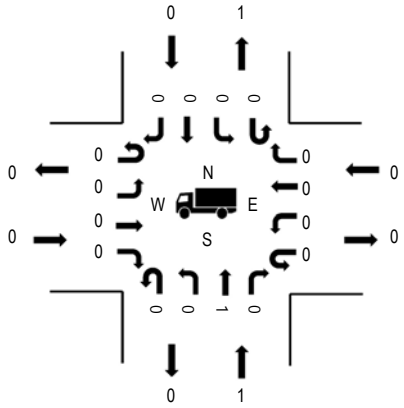
Motorized Vehicles



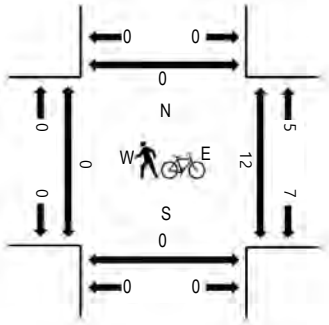
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.00
WB	0.0%	0.91
NB	0.4%	0.75
SB	0.0%	0.92
All	0.2%	0.87

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

Interval Start Time	RIDGEWAY DR Eastbound				RIDGEWAY DR Westbound				SW FORT NUGENT AVE Northbound				SW FORT NUGENT AVE Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	0	0	0	2	0	8	0	0	47	1	0	13	64	0	135	583
4:15 PM	0	0	0	0	0	1	0	9	0	0	44	1	0	11	76	0	142	590
4:30 PM	0	0	0	0	0	4	0	7	0	0	49	3	0	7	67	0	137	582
4:45 PM	0	0	0	0	0	3	0	6	0	0	76	3	0	8	73	0	169	575
5:00 PM	0	0	0	0	0	1	0	7	0	0	58	0	0	10	66	0	142	535
5:15 PM	0	0	0	0	0	1	0	9	0	0	48	0	0	8	68	0	134	
5:30 PM	0	0	0	0	0	1	0	4	0	0	44	2	0	12	67	0	130	
5:45 PM	0	0	0	0	0	2	0	4	0	0	49	0	0	8	66	0	129	
Count Total	0	0	0	0	0	15	0	54	0	0	415	10	0	77	547	0	1,118	
Peak Hour	0	0	0	0	0	9	0	29	0	0	227	7	0	36	282	0	590	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

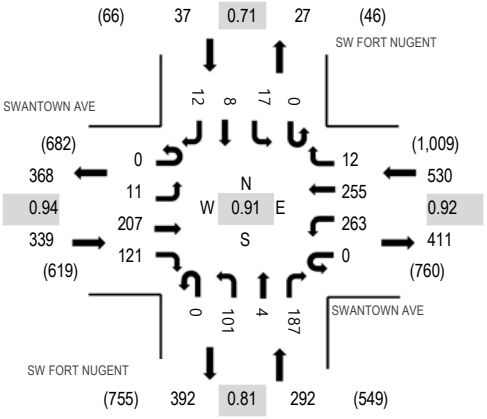
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM	0	1	0	0	1	4:15 PM	0	0	4	0	4
4:30 PM	0	1	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	1	0	1
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	1	0	1
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	6	0	6
5:15 PM	0	0	0	0	0	5:15 PM	0	1	0	0	1	5:15 PM	1	0	0	0	1
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	1	0	0	0	1
Count Total	0	1	0	0	1	Count Total	0	2	0	0	2	Count Total	2	0	12	0	14
Peak Hour	0	1	0	0	1	Peak Hour	0	1	0	0	1	Peak Hour	0	0	12	0	12

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 2 SW FORT NUGENT & SWANTOWN AVE PM
Date: Thursday, June 6, 2024
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour

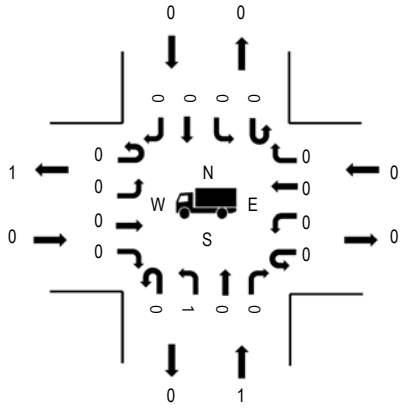
Motorized Vehicles



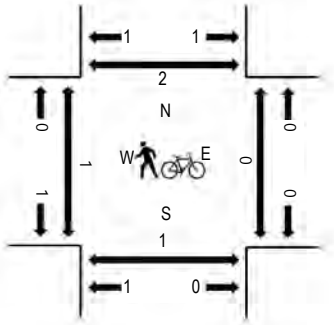
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.94
WB	0.0%	0.92
NB	0.3%	0.81
SB	0.0%	0.71
All	0.1%	0.91

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

Interval Start Time	SWANTOWN AVE Eastbound				SWANTOWN AVE Westbound				SW FORT NUGENT Northbound				SW FORT NUGENT Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	1	52	33	0	62	52	2	0	21	2	42	0	4	2	1	274	1,198
4:15 PM	0	6	58	26	0	77	48	8	0	25	0	44	0	4	5	4	305	1,190
4:30 PM	0	1	41	33	0	62	75	0	0	16	1	50	0	7	0	4	290	1,141
4:45 PM	0	3	56	29	0	62	80	2	0	39	1	51	0	2	1	3	329	1,122
5:00 PM	0	1	46	28	0	63	53	1	0	26	0	43	0	2	1	2	266	1,045
5:15 PM	0	1	38	34	0	51	56	2	0	24	1	42	0	2	2	3	256	
5:30 PM	0	1	38	28	0	70	56	2	0	19	2	43	0	8	0	4	271	
5:45 PM	0	3	46	16	0	70	52	3	0	17	2	38	0	3	0	2	252	
Count Total	0	17	375	227	0	517	472	20	0	187	9	353	0	32	11	23	2,243	
Peak Hour	0	11	207	121	0	263	255	12	0	101	4	187	0	17	8	12	1,198	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

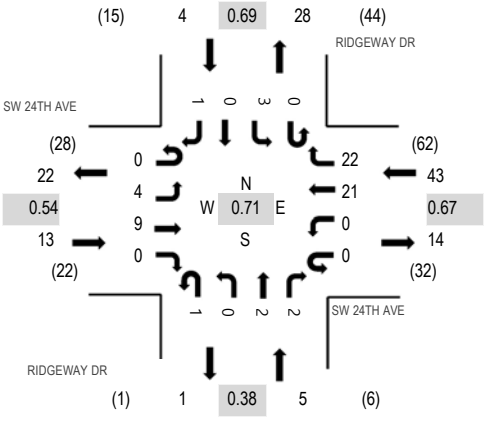
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0	4:15 PM	1	1	0	1	3
4:30 PM	0	1	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	1	1
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	1	1	0	0	2	5:15 PM	0	0	0	1	1
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	1	0	0	0	1	5:45 PM	0	1	0	0	1
Count Total	0	1	0	0	1	Count Total	2	1	0	0	3	Count Total	1	2	0	3	6
Peak Hour	0	1	0	0	1	Peak Hour	0	0	0	0	0	Peak Hour	1	1	0	2	4

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 3 RIDGEWAY DR & SW 24TH AVE PM
Date: Thursday, June 6, 2024
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour

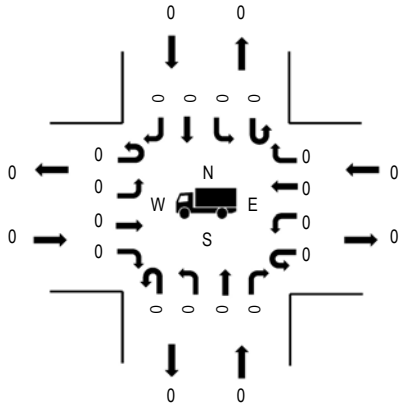
Motorized Vehicles



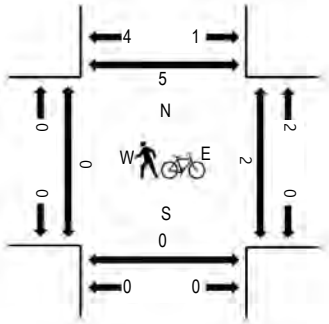
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.54
WB	0.0%	0.67
NB	0.0%	0.38
SB	0.0%	0.69
All	0.0%	0.71

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

Interval Start Time	SW 24TH AVE Eastbound				SW 24TH AVE Westbound				RIDGEWAY DR Northbound				RIDGEWAY DR Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	3	3	0	0	0	10	6	0	0	0	0	0	1	0	0	23	65
4:15 PM	0	1	2	0	0	0	5	5	0	0	0	1	0	1	0	1	16	53
4:30 PM	0	0	2	0	0	0	3	3	1	0	2	1	0	0	0	0	12	49
4:45 PM	0	0	2	0	0	0	3	8	0	0	0	0	0	1	0	0	14	43
5:00 PM	0	2	1	0	0	0	1	2	0	0	0	1	0	4	0	0	11	40
5:15 PM	0	0	2	0	0	0	3	5	0	0	0	0	0	2	0	0	12	
5:30 PM	0	0	1	0	0	0	0	1	0	0	0	0	0	3	0	1	6	
5:45 PM	0	0	3	0	0	0	1	6	0	0	0	0	0	1	0	0	11	
Count Total	0	6	16	0	0	0	26	36	1	0	2	3	0	13	0	2	105	
Peak Hour	0	4	9	0	0	0	21	22	1	0	2	2	0	3	0	1	65	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

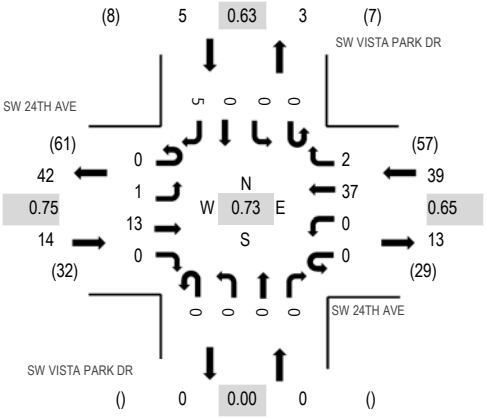
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	2	0	2	4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	1	1	4:15 PM	0	0	0	1	1
4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	2	2	4:30 PM	0	0	0	1	1
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	2	3	5
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	1	0	0	1
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	3	3
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
Count Total	0	0	0	0	0	Count Total	0	0	2	3	5	Count Total	0	1	2	8	11
Peak Hour	0	0	0	0	0	Peak Hour	0	0	2	3	5	Peak Hour	0	0	2	5	7

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 4 SW VISTA PARK DR & SW 24TH AVE PM
Date: Thursday, June 6, 2024
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour

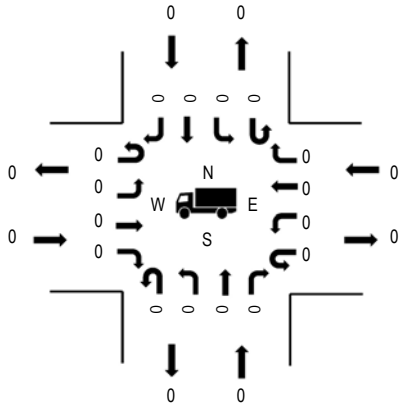
Motorized Vehicles



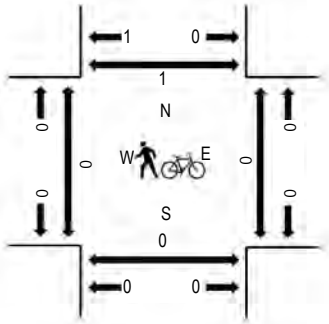
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.75
WB	0.0%	0.65
NB	0.0%	0.00
SB	0.0%	0.63
All	0.0%	0.73

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

Interval Start Time	SW 24TH AVE Eastbound				SW 24TH AVE Westbound				SW VISTA PARK DR Northbound				SW VISTA PARK DR Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	1	3	0	0	0	14	1	0	0	0	0	0	0	0	1	20	58
4:15 PM	0	0	4	0	0	0	9	0	0	0	0	0	0	0	0	1	14	48
4:30 PM	0	0	3	0	0	0	4	1	0	0	0	0	0	0	0	2	10	46
4:45 PM	0	0	3	0	0	0	10	0	0	0	0	0	0	0	0	1	14	41
5:00 PM	0	1	5	0	0	0	3	0	0	0	0	0	0	1	0	0	10	39
5:15 PM	1	0	3	0	0	0	6	1	0	0	0	0	0	0	0	1	12	
5:30 PM	0	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	5	
5:45 PM	0	0	4	0	0	0	7	0	0	0	0	0	0	1	0	0	12	
Count Total	1	4	27	0	0	0	54	3	0	0	0	0	0	2	0	6	97	
Peak Hour	0	1	13	0	0	0	37	2	0	0	0	0	0	0	0	5	58	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

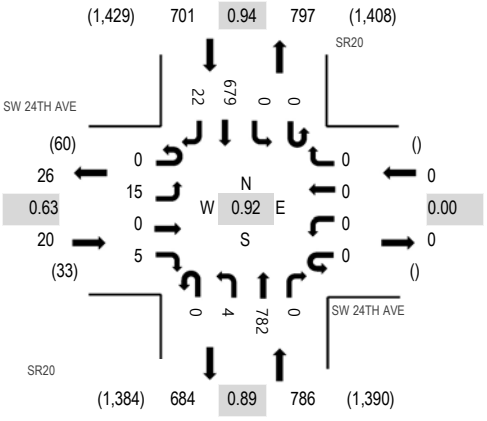
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	2	0	2	4:00 PM	0	0	0	1	1
4:15 PM	0	0	0	0	0	4:15 PM	1	0	0	0	1	4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
Count Total	0	0	0	0	0	Count Total	1	0	2	0	3	Count Total	0	0	0	1	1
Peak Hour	0	0	0	0	0	Peak Hour	1	0	2	0	3	Peak Hour	0	0	0	1	1

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 5 SR20 & SW 24TH AVE PM
Date: Thursday, June 6, 2024
Peak Hour: 04:30 PM - 05:30 PM
Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour

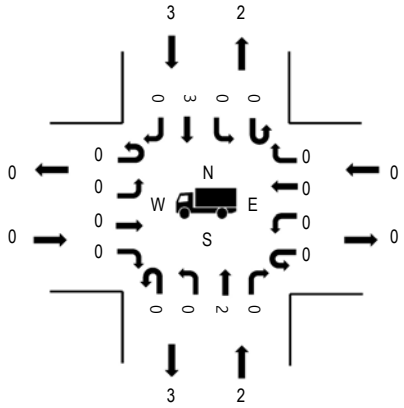
Motorized Vehicles



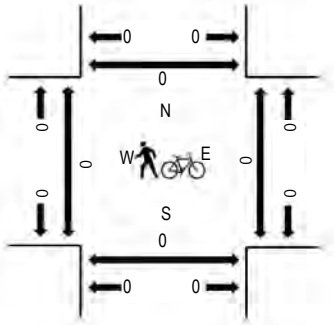
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.63
WB	0.0%	0.00
NB	0.3%	0.89
SB	0.4%	0.94
All	0.3%	0.92

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

Interval Start Time	SW 24TH AVE Eastbound				SW 24TH AVE Westbound				SR20 Northbound				SR20 Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	3	0	0	0	0	0	0	0	1	165	0	0	0	182	14	365	1,498
4:15 PM	0	2	0	1	0	0	0	0	0	0	149	0	0	0	186	11	349	1,484
4:30 PM	0	3	0	1	0	0	0	0	0	1	205	0	0	0	161	3	374	1,507
4:45 PM	0	2	0	1	0	0	0	0	0	3	217	0	0	0	180	7	410	1,455
5:00 PM	0	6	0	2	0	0	0	0	0	0	168	0	0	0	171	4	351	1,354
5:15 PM	0	4	0	1	0	0	0	0	0	0	192	0	0	0	167	8	372	
5:30 PM	0	0	0	1	0	0	0	0	0	0	144	0	0	0	175	2	322	
5:45 PM	0	5	0	1	0	0	0	0	0	2	143	0	0	0	154	4	309	
Count Total	0	25	0	8	0	0	0	0	0	7	1,383	0	0	0	1,376	53	2,852	
Peak Hour	0	15	0	5	0	0	0	0	0	4	782	0	0	0	679	22	1,507	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

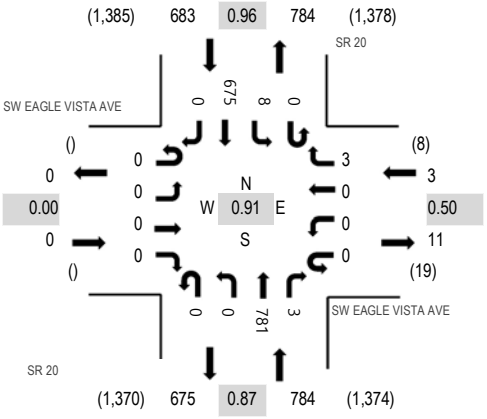
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	1	0	0	1	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:15 PM	0	1	0	0	1	4:15 PM	1	0	0	0	1	4:15 PM	0	0	1	0	1
4:30 PM	0	1	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	2	2	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:15 PM	0	1	0	1	2	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	1	1	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	1	1	5:45 PM	0	1	0	1	2	5:45 PM	1	0	0	0	1
Count Total	0	4	0	5	9	Count Total	1	1	0	1	3	Count Total	1	0	1	0	2
Peak Hour	0	2	0	3	5	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 6 SR 20 & SW EAGLE VISTA AVE PM
Date: Thursday, June 6, 2024
Peak Hour: 04:30 PM - 05:30 PM
Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour

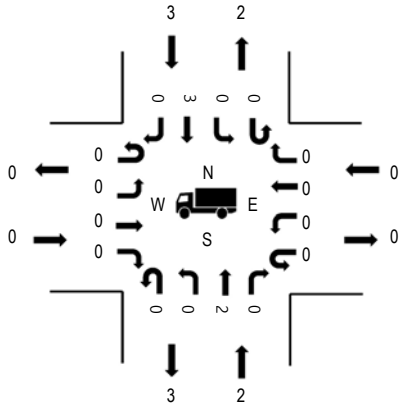
Motorized Vehicles



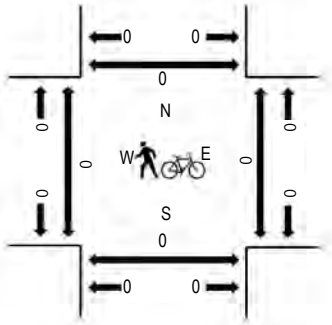
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.00
WB	0.0%	0.50
NB	0.3%	0.87
SB	0.4%	0.96
All	0.3%	0.91

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

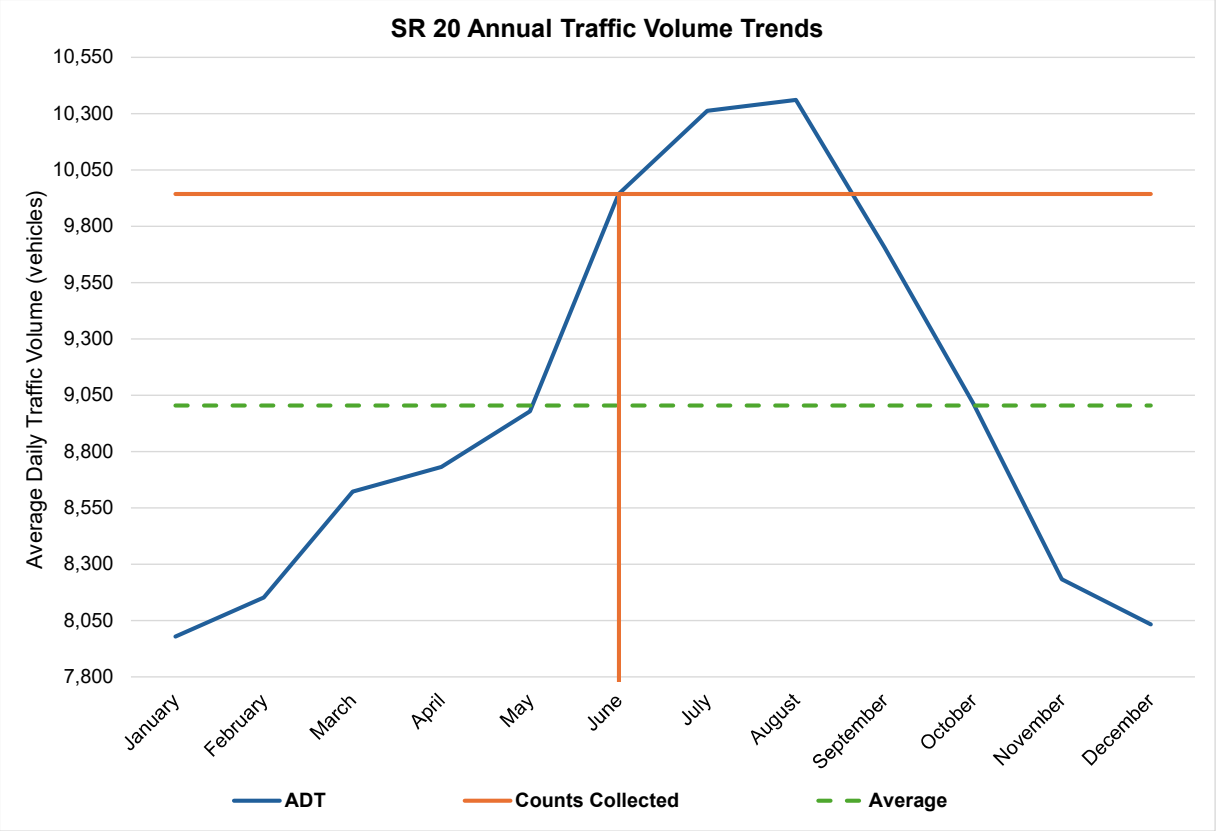
Interval Start Time	SW EAGLE VISTA AVE Eastbound				SW EAGLE VISTA AVE Westbound				SR 20 Northbound				SR 20 Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	0	0	0	0	0	1	0	0	154	0	0	1	186	0	342	1,453
4:15 PM	0	0	0	0	0	1	0	2	0	0	152	0	0	1	184	0	340	1,451
4:30 PM	0	0	0	0	0	0	0	0	0	0	201	0	0	2	163	0	366	1,470
4:45 PM	0	0	0	0	0	0	0	1	0	0	224	2	0	4	174	0	405	1,426
5:00 PM	0	0	0	0	0	0	0	2	0	0	165	1	0	1	171	0	340	1,314
5:15 PM	0	0	0	0	0	0	0	0	0	0	191	0	0	1	167	0	359	
5:30 PM	0	0	0	0	0	0	0	1	0	0	146	0	0	5	170	0	322	
5:45 PM	0	0	0	0	0	0	0	0	0	0	138	0	0	1	154	0	293	
Count Total	0	0	0	0	0	1	0	7	0	0	1,371	3	0	16	1,369	0	2,767	
Peak Hour	0	0	0	0	0	0	0	3	0	0	781	3	0	8	675	0	1,470	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	1	0	0	1	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:15 PM	0	1	0	0	1	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:30 PM	0	1	0	0	1	4:30 PM	0	1	0	0	1	4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	1	1	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	1	1	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:15 PM	0	1	0	1	2	5:15 PM	0	0	1	0	1	5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	1	1	5:30 PM	0	1	0	0	1	5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	1	1	5:45 PM	0	0	0	1	1	5:45 PM	0	0	0	0	0
Count Total	0	4	0	5	9	Count Total	0	2	1	1	4	Count Total	0	0	0	0	0
Peak Hour	0	2	0	3	5	Peak Hour	0	1	1	0	2	Peak Hour	0	0	0	0	0

Appendix B: SR 20 Annual Traffic Volume Trends

APPENDIX B


SR 20 Annual Traffic Volume Trends
Average Daily Traffic Volume (vehicles)
10,550
10,300
10,050
9,800
9,550
9,300
9,050
8,800
8,550
8,300
8,050
7,800
January
February
March
April
May
June
July
August
September
October
November
December
ADT
Counts Collected
Average

Appendix C: LOS Definitions

Highway Capacity Manual 7th Edition

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* 7th Edition (Transportation Research Board, 2022).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 7th Edition*, Transportation Research Board, 2022, respectively.
1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop controlled. All-way stop controlled intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F[1]	>50

Source: *Highway Capacity Manual 7th Edition*, Transportation Research Board, 2022, respectively.
1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Highway Capacity Manual, 2000

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Appendix D: LOS Worksheets

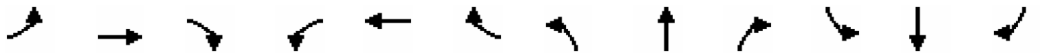
Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	225	5	35	280	10	30
Future Vol, veh/h	225	5	35	280	10	30
Conflicting Peds, #/hr	0	12	12	0	12	12
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	50	140	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	259	6	40	322	11	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	271	0	685	283
Stage 1	-	-	-	-	271	-
Stage 2	-	-	-	-	414	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1305	-	417	761
Stage 1	-	-	-	-	780	-
Stage 2	-	-	-	-	671	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1290	-	395	744
Mov Cap-2 Maneuver	-	-	-	-	497	-
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	643	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.88	10.66
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	497	744	-	-	1290	-
HCM Lane V/C Ratio	0.023	0.046	-	-	0.031	-
HCM Control Delay (s/veh)	12.4	10.1	-	-	7.9	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0.1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	205	120	265	255	10	100	4	185	15	10	10
Future Volume (vph)	10	205	120	265	255	10	100	4	185	15	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5			5.0	5.0		5.0	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			0.99			1.00	1.00		0.99	
Flpb, ped/bikes		0.99			1.00			0.99	1.00		1.00	
Frt		0.94			0.99			1.00	0.85		0.96	
Flt Protected		0.99			0.97			0.95	1.00		0.97	
Satd. Flow (prot)		3383			3510			1812	1615		1781	
Flt Permitted		0.92			0.61			0.43	1.00		0.81	
Satd. Flow (perm)		3134			2226			818	1615		1475	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	225	132	291	280	11	110	4	203	16	11	11
RTOR Reduction (vph)	0	49	0	0	1	0	0	0	155	0	11	0
Lane Group Flow (vph)	0	319	0	0	581	0	0	114	48	0	27	0
Confl. Peds. (#/hr)	2		1	1		2	1					1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			5			7			8	
Permitted Phases	6			5			7		7	8		
Actuated Green, G (s)		15.9			32.8			23.2	23.2		4.4	
Effective Green, g (s)		15.9			32.8			23.2	23.2		4.4	
Actuated g/C Ratio		0.16			0.34			0.24	0.24		0.05	
Clearance Time (s)		5.5			5.5			5.0	5.0		5.0	
Vehicle Extension (s)		2.0			2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		512			750			195	385		66	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			c0.26			c0.14	0.03		c0.02	
v/c Ratio		0.62			3.68dl			0.58	0.12		0.41	
Uniform Delay, d1		37.9			28.9			32.7	29.0		45.2	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.6			4.5			2.8	0.0		1.5	
Delay (s)		39.6			33.5			35.6	29.1		46.7	
Level of Service		D			C			D	C		D	
Approach Delay (s/veh)		39.6			33.5			31.4			46.7	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	35.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	21.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕				↕			↕	
Traffic Vol, veh/h	4	10	0	0	20	20	1	0	2	2	3	0	1
Future Vol, veh/h	4	10	0	0	20	20	1	0	2	2	3	0	1
Conflicting Peds, #/hr	5	0	0	2	0	7	0	0	0	2	7	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	14	0	0	28	28	1	0	3	3	4	0	1

Major/Minor	Major1			Major2			Minor1				Minor2		
Conflicting Flow All	63	0	0	16	0	0	0	61	91	23	83	77	54
Stage 1	-	-	-	-	-	-	0	27	27	-	49	49	-
Stage 2	-	-	-	-	-	-	0	33	63	-	34	27	-
Critical Hdwy	4.1	-	-	4.1	-	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1552	-	-	1615	-	-	0	940	803	1060	909	818	1019
Stage 1	-	-	-	-	-	-	0	995	876	-	969	858	-
Stage 2	-	-	-	-	-	-	0	988	846	-	987	876	-
Platoon blocked, %		-	-		-	-	-						
Mov Cap-1 Maneuver	1542	-	-	1611	-	-	0	929	793	1050	888	808	1007
Mov Cap-2 Maneuver	-	-	-	-	-	-	0	929	793	-	888	808	-
Stage 1	-	-	-	-	-	-	0	990	871	-	963	852	-
Stage 2	-	-	-	-	-	-	0	982	840	-	971	871	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.1	0	9.01	8.96
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	904	514	-	-	1611	-	-	915
HCM Lane V/C Ratio	0.008	0.004	-	-	-	-	-	0.006
HCM Control Delay (s/veh)	9	7.3	0	-	0	-	-	9
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	15	35	2	0	5
Future Vol, veh/h	1	15	35	2	0	5
Conflicting Peds, #/hr	1	0	0	1	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	21	48	3	0	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	52	0	-	0	75	51
Stage 1	-	-	-	-	50	-
Stage 2	-	-	-	-	24	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1567	-	-	-	934	1022
Stage 1	-	-	-	-	977	-
Stage 2	-	-	-	-	1004	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1566	-	-	-	931	1020
Mov Cap-2 Maneuver	-	-	-	-	931	-
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	1003	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.46	0	8.55
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	112	-	-	-	1020
HCM Lane V/C Ratio	0.001	-	-	-	0.007
HCM Control Delay (s/veh)	7.3	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	15	5	4	780	680	20
Future Vol, veh/h	15	5	4	780	680	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	30
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	16	5	4	848	739	22

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1596	739	761	0	-	0
Stage 1	739	-	-	-	-	-
Stage 2	857	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	119	421	860	-	-	-
Stage 1	476	-	-	-	-	-
Stage 2	419	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	118	421	860	-	-	-
Mov Cap-2 Maneuver	118	-	-	-	-	-
Stage 1	471	-	-	-	-	-
Stage 2	419	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	34.54	0.05	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	9	-	143	-	-
HCM Lane V/C Ratio	0.005	-	0.152	-	-
HCM Control Delay (s/veh)	9.2	0	34.5	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	3	780	3	10	675
Future Vol, veh/h	0	3	780	3	10	675
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3	857	3	11	742

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1623	859	0	0	860	0
Stage 1	859	-	-	-	-	-
Stage 2	764	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	114	359	-	-	790	-
Stage 1	418	-	-	-	-	-
Stage 2	463	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	113	359	-	-	790	-
Mov Cap-2 Maneuver	113	-	-	-	-	-
Stage 1	418	-	-	-	-	-
Stage 2	457	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	15.12	0	0.14
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	359	790	-
HCM Lane V/C Ratio	-	-	0.009	0.014	-
HCM Control Delay (s/veh)	-	-	15.1	9.6	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

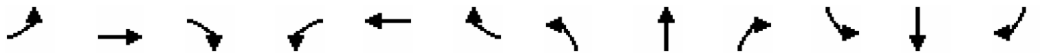
Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	250	10	40	310	10	35
Future Vol, veh/h	250	10	40	310	10	35
Conflicting Peds, #/hr	0	12	12	0	12	12
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	50	140	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	287	11	46	356	11	40

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	299	0	760	311
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	460	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1273	-	377	734
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	640	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1259	-	355	717
Mov Cap-2 Maneuver	-	-	-	-	465	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	609	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.91	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	465	717	-	-	1259	-
HCM Lane V/C Ratio	0.025	0.056	-	-	0.037	-
HCM Control Delay (s/veh)	12.9	10.3	-	-	8	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0.1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	230	130	295	285	10	110	4	205	15	10	10
Future Volume (vph)	10	230	130	295	285	10	110	4	205	15	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5			5.0	5.0		5.0	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			0.99			1.00	1.00		0.99	
Flpb, ped/bikes		0.99			1.00			1.00	1.00		1.00	
Frt		0.94			0.99			1.00	0.85		0.96	
Flt Protected		0.99			0.97			0.95	1.00		0.97	
Satd. Flow (prot)		3388			3511			1812	1615		1781	
Flt Permitted		0.92			0.61			0.42	1.00		0.80	
Satd. Flow (perm)		3137			2196			816	1615		1466	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	253	143	324	313	11	121	4	225	16	11	11
RTOR Reduction (vph)	0	47	0	0	1	0	0	0	173	0	10	0
Lane Group Flow (vph)	0	360	0	0	647	0	0	125	52	0	28	0
Confl. Peds. (#/hr)	2		1	1		2	1					1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			5			7			8	
Permitted Phases	6			5			7		7	8		
Actuated Green, G (s)		18.1			40.2			25.9	25.9		6.3	
Effective Green, g (s)		18.1			40.2			25.9	25.9		6.3	
Actuated g/C Ratio		0.16			0.36			0.23	0.23		0.06	
Clearance Time (s)		5.5			5.5			5.0	5.0		5.0	
Vehicle Extension (s)		2.0			2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		509			791			189	375		82	
v/s Ratio Prot												
v/s Ratio Perm		c0.11			c0.29			c0.15	0.03		c0.02	
v/c Ratio		0.70			4.70dl			0.66	0.13		0.33	
Uniform Delay, d1		44.1			32.3			38.8	33.9		50.5	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		3.6			6.2			6.5	0.0		0.8	
Delay (s)		47.8			38.6			45.3	34.0		51.4	
Level of Service		D			D			D	C		D	
Approach Delay (s/veh)		47.8			38.6			38.0			51.4	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	41.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	111.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕				↕			↕	
Traffic Vol, veh/h	4	10	0	15	20	20	1	0	3	10	3	2	1
Future Vol, veh/h	4	10	0	15	20	20	1	0	3	10	3	2	1
Conflicting Peds, #/hr	5	0	0	2	0	7	0	0	0	2	7	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	14	0	21	28	28	1	0	4	14	4	3	1

Major/Minor	Major1			Major2			Minor1				Minor2		
Conflicting Flow All	63	0	0	16	0	0	0	104	133	23	126	119	54
Stage 1	-	-	-	-	-	-	0	27	27	-	92	92	-
Stage 2	-	-	-	-	-	-	0	77	106	-	34	27	-
Critical Hdwy	4.1	-	-	4.1	-	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1552	-	-	1615	-	-	0	881	762	1060	852	775	1019
Stage 1	-	-	-	-	-	-	0	995	876	-	921	823	-
Stage 2	-	-	-	-	-	-	0	937	812	-	987	876	-
Platoon blocked, %		-	-		-	-	-						
Mov Cap-1 Maneuver	1542	-	-	1611	-	-	0	855	742	1050	811	755	1007
Mov Cap-2 Maneuver	-	-	-	-	-	-	0	855	742	-	811	755	-
Stage 1	-	-	-	-	-	-	0	990	871	-	902	806	-
Stage 2	-	-	-	-	-	-	0	916	795	-	959	871	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.1	1.98	8.83	9.45
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	959	514	-	-	446	-	-	817
HCM Lane V/C Ratio	0.021	0.004	-	-	0.013	-	-	0.01
HCM Control Delay (s/veh)	8.8	7.3	0	-	7.3	0	-	9.5
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	25	55	2	0	5
Future Vol, veh/h	1	25	55	2	0	5
Conflicting Peds, #/hr	1	0	0	1	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	34	75	3	0	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	79	0	-	0	116	79
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	38	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1532	-	-	-	885	987
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	990	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1530	-	-	-	883	986
Mov Cap-2 Maneuver	-	-	-	-	883	-
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	989	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.28	0	8.68
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	69	-	-	-	986
HCM Lane V/C Ratio	0.001	-	-	-	0.007
HCM Control Delay (s/veh)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	10	10	860	750	35
Future Vol, veh/h	25	10	10	860	750	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	30
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	27	11	11	935	815	38

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1772	815	853	0	-	0
Stage 1	815	-	-	-	-	-
Stage 2	957	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	92	380	795	-	-	-
Stage 1	438	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	90	380	795	-	-	-
Mov Cap-2 Maneuver	90	-	-	-	-	-
Stage 1	426	-	-	-	-	-
Stage 2	376	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	51.1	0.11	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	21	-	115	-	-
HCM Lane V/C Ratio	0.014	-	0.331	-	-
HCM Control Delay (s/veh)	9.6	0	51.1	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0	-	1.3	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	3	865	3	10	745
Future Vol, veh/h	0	3	865	3	10	745
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3	951	3	11	819

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1793	952	0	0	954	0
Stage 1	952	-	-	-	-	-
Stage 2	841	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	90	317	-	-	729	-
Stage 1	378	-	-	-	-	-
Stage 2	427	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	88	317	-	-	729	-
Mov Cap-2 Maneuver	88	-	-	-	-	-
Stage 1	378	-	-	-	-	-
Stage 2	420	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	16.47	0	0.13
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	317	729	-
HCM Lane V/C Ratio	-	-	0.01	0.015	-
HCM Control Delay (s/veh)	-	-	16.5	10	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0	0	-

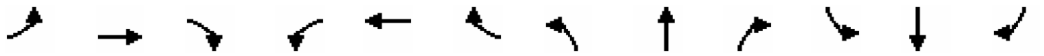
Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	250	22	51	310	17	42
Future Vol, veh/h	250	22	51	310	17	42
Conflicting Peds, #/hr	0	12	12	0	12	12
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	50	140	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	287	25	59	356	20	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	299	0	785	311
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	486	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1273	-	364	734
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	623	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1259	-	339	717
Mov Cap-2 Maneuver	-	-	-	-	451	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	587	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.13	11.24
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	451	717	-	-	1259	-
HCM Lane V/C Ratio	0.043	0.067	-	-	0.047	-
HCM Control Delay (s/veh)	13.4	10.4	-	-	8	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0.1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	241	141	295	292	10	117	4	205	15	10	10
Future Volume (vph)	10	241	141	295	292	10	117	4	205	15	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5			5.5			5.0	5.0		5.0	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			0.99			1.00	1.00		0.99	
Flpb, ped/bikes		0.99			1.00			1.00	1.00		1.00	
Frt		0.94			0.99			1.00	0.85		0.96	
Flt Protected		0.99			0.97			0.95	1.00		0.97	
Satd. Flow (prot)		3383			3513			1812	1615		1781	
Flt Permitted		0.92			0.60			0.42	1.00		0.80	
Satd. Flow (perm)		3138			2186			815	1615		1460	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	265	155	324	321	11	129	4	225	16	11	11
RTOR Reduction (vph)	0	49	0	0	1	0	0	0	168	0	10	0
Lane Group Flow (vph)	0	382	0	0	655	0	0	133	57	0	28	0
Confl. Peds. (#/hr)	2		1	1		2	1					1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			5			7			8	
Permitted Phases	6			5			7		7	8		
Actuated Green, G (s)		19.1			41.7			25.9	25.9		6.3	
Effective Green, g (s)		19.1			41.7			25.9	25.9		6.3	
Actuated g/C Ratio		0.17			0.37			0.23	0.23		0.06	
Clearance Time (s)		5.5			5.5			5.0	5.0		5.0	
Vehicle Extension (s)		2.0			2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		525			799			185	366		80	
v/s Ratio Prot												
v/s Ratio Perm		c0.12			c0.30			c0.16	0.04		c0.02	
v/c Ratio		0.72			4.84dl			0.71	0.15		0.34	
Uniform Delay, d1		44.9			32.7			40.6	35.2		51.8	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		4.2			6.4			10.5	0.0		0.9	
Delay (s)		49.2			39.1			51.2	35.3		52.8	
Level of Service		D			D			D	D		D	
Approach Delay (s/veh)		49.2			39.1			41.2			52.8	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	43.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	114.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕				↕			↕	
Traffic Vol, veh/h	4	15	6	26	20	27	1	0	10	17	9	8	1
Future Vol, veh/h	4	15	6	26	20	27	1	0	10	17	9	8	1
Conflicting Peds, #/hr	5	0	0	2	0	7	0	0	0	2	7	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	21	8	37	28	38	1	0	14	24	13	11	1

Major/Minor	Major1			Major2			Minor1				Minor2		
Conflicting Flow All	73	0	0	32	0	0	0	151	185	34	174	170	59
Stage 1	-	-	-	-	-	-	0	39	39	-	127	127	-
Stage 2	-	-	-	-	-	-	0	112	146	-	46	43	-
Critical Hdwy	4.1	-	-	4.1	-	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1539	-	-	1594	-	-	0	821	713	1045	793	726	1012
Stage 1	-	-	-	-	-	-	0	982	867	-	881	794	-
Stage 2	-	-	-	-	-	-	0	898	780	-	972	863	-
Platoon blocked, %		-	-		-	-	-						
Mov Cap-1 Maneuver	1529	-	-	1591	-	-	0	780	687	1036	729	700	1001
Mov Cap-2 Maneuver	-	-	-	-	-	-	0	780	687	-	729	700	-
Stage 1	-	-	-	-	-	-	0	976	862	-	854	770	-
Stage 2	-	-	-	-	-	-	0	858	756	-	925	858	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	1.18	2.61	9.32	10.13
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	872	272	-	-	575	-	-	727
HCM Lane V/C Ratio	0.045	0.004	-	-	0.023	-	-	0.035
HCM Control Delay (s/veh)	9.3	7.4	0	-	7.3	0	-	10.1
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0.1

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	32	11	28	66	2	7	0	17	0	0	5
Future Vol, veh/h	1	32	11	28	66	2	7	0	17	0	0	5
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	1	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	1	44	15	38	90	3	10	0	23	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	94	0	0	59	0	0	222	225	52	217	231	94
Stage 1	-	-	-	-	-	-	54	54	-	169	169	-
Stage 2	-	-	-	-	-	-	168	171	-	48	62	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1513	-	-	1558	-	-	738	678	1021	744	672	969
Stage 1	-	-	-	-	-	-	963	854	-	837	762	-
Stage 2	-	-	-	-	-	-	839	761	-	971	847	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1511	-	-	1558	-	-	712	659	1020	706	654	967
Mov Cap-2 Maneuver	-	-	-	-	-	-	712	659	-	706	654	-
Stage 1	-	-	-	-	-	-	962	853	-	815	742	-
Stage 2	-	-	-	-	-	-	810	741	-	947	847	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.17	2.15	9.12	8.75
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	906	39	-	-	522	-	-	967
HCM Lane V/C Ratio	0.036	0.001	-	-	0.025	-	-	0.007
HCM Control Delay (s/veh)	9.1	7.4	0	-	7.4	0	-	8.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	49	10	10	870	767	74
Future Vol, veh/h	49	10	10	870	767	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	30
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	53	11	11	946	834	80

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1801	834	914	0	-	0
Stage 1	834	-	-	-	-	-
Stage 2	967	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	89	371	754	-	-	-
Stage 1	430	-	-	-	-	-
Stage 2	372	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	86	371	754	-	-	-
Mov Cap-2 Maneuver	86	-	-	-	-	-
Stage 1	417	-	-	-	-	-
Stage 2	372	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	92.31	0.11	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	20	-	99	-	-
HCM Lane V/C Ratio	0.014	-	0.649	-	-
HCM Control Delay (s/veh)	9.8	0	92.3	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0	-	3.2	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↰	↕	
Traffic Vol, veh/h	10	0	20	0	0	3	33	865	3	10	745	17
Future Vol, veh/h	10	0	20	0	0	3	33	865	3	10	745	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	290	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	11	0	22	0	0	3	36	951	3	11	819	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1873	1876	828	1865	1884	952	837	0	0	954	0	0
Stage 1	850	850	-	1025	1025	-	-	-	-	-	-	-
Stage 2	1023	1026	-	841	859	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	56	72	374	56	72	317	806	-	-	729	-	-
Stage 1	358	380	-	286	315	-	-	-	-	-	-	-
Stage 2	287	314	-	362	376	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	49	64	374	47	64	317	806	-	-	729	-	-
Mov Cap-2 Maneuver	49	64	-	47	64	-	-	-	-	-	-	-
Stage 1	353	374	-	259	285	-	-	-	-	-	-	-
Stage 2	257	284	-	336	370	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	47.7	16.47	0.35	0.13
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	66	-	-	116	317	729	-	-
HCM Lane V/C Ratio	0.045	-	-	0.283	0.01	0.015	-	-
HCM Control Delay (s/veh)	9.7	0	-	47.7	16.5	10	-	-
HCM Lane LOS	A	A	-	E	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0	0	-	-

Appendix E: Detailed Trip Generation

Garry Oaks Residential

Proposed Use

								Primary Trips		
Land Use	**Setting**	**Size**	**Units**	**Model**	**Equation**	**Rate**	**Inbound %**	**Inbound**	**Outbound**	**Total**
Single-Family Attached Housing (LU 215)		**66**	du							
Daily	General Urban/Suburban			Equation (lin)	T = 7.62(X) - 50.48	-	50%	226	226	452
AM Peak Hour	General Urban/Suburban			Equation (lin)	T = 0.52(X) - 5.70	-	25%	7	22	29
PM Peak Hour	General Urban/Suburban			Equation (lin)	T = 0.60(X) - 3.93	-	59%	21	15	36
Single-Family Detached Housing (LU 210)		**153**	du							
Daily	General Urban/Suburban			Rate	-	9.43	50%	721	721	1,442
AM Peak Hour	General Urban/Suburban			Rate	-	0.70	25%	27	80	107
PM Peak Hour	General Urban/Suburban			Rate	-	0.94	63%	91	53	144
Subtotal										
Daily								947	947	1,894
AM Peak Hour								34	102	136
PM Peak Hour								112	68	180

Net New Trips

Daily	947	947	1894
AM Peak Hour	34	102	136
PM Peak Hour	112	68	180

Notes:

1. Trip rates based on Institute of Transportation Engineers' (ITE) *Trip Generation Manual (*11th Edition) equation and average trip rates as shown above.

From: noreply@civicplus.com
To: planning
Subject: Online Form Submission #50752 for Oak Heights Preliminary Planned Residential Development Comments
Date: Tuesday, September 24, 2024 9:19:48 AM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Oak Heights Preliminary Planned Residential Development Comments

Project Details

NOTICE OF APPLICATION

R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

APPLICATION:

Preliminary Planned Residential Development 2408-0047

DHI Engineering, LLC submitted a Preliminary Planned Residential Development application and associated documents for a Proposed Preliminary Plat/PRD consisting of 153 single-family lots, and 66 duplex lots, for a total of 219 lots.

PROJECT LOCATION: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

The plans have been circulated to City staff for review and comments. Plans for the proposal are available for review at the City of Oak Harbor's Development Services Department, located in City Hall. For more information, please call (360) 279-4510.

DETERMINATION OF COMPLETENESS:

The above application was submitted on Wednesday, August 7, 2024 by DHI Engineering, LLC for Oaks Village 135 LLC property owners. The application has been determined complete for processing on Monday, September 9, 2024.

APPLICABLE REGULATIONS AND REVIEW CRITERIA: The above applications will be reviewed for compliance with the Oak Harbor Comprehensive Plan (June 2016 and Nov. 2014), Municipal Code. This may not be a comprehensive list of the applicable regulations and review criteria against which this application will be reviewed.

ENVIRONMENTAL DOCUMENTS AND/OR STUDIES APPLICABLE TO THIS PROJECT: SEPA

PUBLIC COMMENT PERIOD: 9-14-2024 through 9-27-2024

If you have questions regarding this application, please contact the Development Services Department at (360) 279-4510, between 8:00 a.m. and 4:30 p.m., Monday thru Friday.

To make written comments on this proposal, please mail or hand deliver specific comments to: City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277, no later than 4:30 p.m. on 9/27/2024.

To receive notification of the decision on this proposal, please include your email and send your request to the City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277. Please include the following: Notification of Decision for application 2408-0047.

Name	Ward Toner
Email Address	Ward.toner@yahoo.com

Address	1200 sw 24th ave
City	Oak harbor
State	Wa
Zip Code	98277
Phone Number	3609695442
Comment	The Garry Oaks residential traffic analysis although very in depth is somewhat misleading as the west end of 24th avenue is a one way only street. This forces local residents to use ridgeway drive during peak traffic. Ridgeway drive is narrow with no sidewalks and limited sight distance in certain areas. I would like to know what the city plan is to mitigate the impending hazards faced by the residents along ridgeway drive.
The colors of the American flag are Red, White, and ...	Blue

Email not displaying correctly? View it in your browser.

From: noreply@civicplus.com
To: planning
Subject: Online Form Submission #50990 for Oak Heights Preliminary Planned Residential Development Comments
Date: Friday, September 27, 2024 12:46:11 PM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Oak Heights Preliminary Planned Residential Development Comments

Project Details

NOTICE OF APPLICATION

R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

APPLICATION:

Preliminary Planned Residential Development 2408-0047

DHI Engineering, LLC submitted a Preliminary Planned Residential Development application and associated documents for a Proposed Preliminary Plat/PRD consisting of 153 single-family lots, and 66 duplex lots, for a total of 219 lots.

PROJECT LOCATION: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

The plans have been circulated to City staff for review and comments. Plans for the proposal are available for review at the City of Oak Harbor's Development Services Department, located in City Hall. For more information, please call (360) 279-4510.

DETERMINATION OF COMPLETENESS:

The above application was submitted on Wednesday, August 7, 2024 by DHI Engineering, LLC for Oaks Village 135 LLC property owners. The application has been determined complete for processing on Monday, September 9, 2024.

APPLICABLE REGULATIONS AND REVIEW CRITERIA: The above applications will be reviewed for compliance with the Oak Harbor Comprehensive Plan (June 2016 and Nov. 2014), Municipal Code. This may not be a comprehensive list of the applicable regulations and review criteria against which this application will be reviewed.

ENVIRONMENTAL DOCUMENTS AND/OR STUDIES APPLICABLE TO THIS PROJECT: SEPA

PUBLIC COMMENT PERIOD: 9-14-2024 through 9-27-2024

If you have questions regarding this application, please contact the Development Services Department at (360) 279-4510, between 8:00 a.m. and 4:30 p.m., Monday thru Friday.

To make written comments on this proposal, please mail or hand deliver specific comments to: City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277, no later than 4:30 p.m. on 9/27/2024.

To receive notification of the decision on this proposal, please include your email and send your request to the City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277. Please include the following: Notification of Decision for application 2408-0047.

Name	Amber Wood
Email Address	NORTHWESTMANAGEMENTLLC@GMAIL.COM

Address	PO BOX 8377
City	SPOKANE
State	WA
Zip Code	99203
Phone Number	5099930854
Comment	Requested- Notification of Decision for application 2408-0047 Public comment- I am the property manager of Parcel # R13210-248-2000 located at 30259 SR20. This development poses many impacts to the rentability of the property. Primarily the increase in noise from both construction and traffic. The decrease in privacy with 16 new adjacent houses only a few feet away, and the possibility of well contamination from pond 3 discharge that may include fertilizers, oil, and other contaminants. Additionally, it will be very difficult for our tenants to take a left onto SR20 towards Oak Harbor to shop and get essentials with the increased and constant traffic flow. This fundamentally changes the privacy and tranquility this home currently offers. How will these concerns be addressed? Thank you, Amber Wood
The colors of the American flag are Red, White, and ...	blue

Email not displaying correctly? View it in your browser.

From: noreply@civicplus.com
To: planning
Subject: Online Form Submission #51002 for Oak Heights Preliminary Planned Residential Development Comments
Date: Friday, September 27, 2024 2:24:16 PM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Oak Heights Preliminary Planned Residential Development Comments

Project Details

NOTICE OF APPLICATION

R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

APPLICATION:

Preliminary Planned Residential Development 2408-0047

DHI Engineering, LLC submitted a Preliminary Planned Residential Development application and associated documents for a Proposed Preliminary Plat/PRD consisting of 153 single-family lots, and 66 duplex lots, for a total of 219 lots.

PROJECT LOCATION: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

The plans have been circulated to City staff for review and comments. Plans for the proposal are available for review at the City of Oak Harbor's Development Services Department, located in City Hall. For more information, please call (360) 279-4510.

DETERMINATION OF COMPLETENESS:

The above application was submitted on Wednesday, August 7, 2024 by DHI Engineering, LLC for Oaks Village 135 LLC property owners. The application has been determined complete for processing on Monday, September 9, 2024.

APPLICABLE REGULATIONS AND REVIEW CRITERIA: The above applications will be reviewed for compliance with the Oak Harbor Comprehensive Plan (June 2016 and Nov. 2014), Municipal Code. This may not be a comprehensive list of the applicable regulations and review criteria against which this application will be reviewed.

ENVIRONMENTAL DOCUMENTS AND/OR STUDIES APPLICABLE TO THIS PROJECT: SEPA

PUBLIC COMMENT PERIOD: 9-14-2024 through 9-27-2024

If you have questions regarding this application, please contact the Development Services Department at (360) 279-4510, between 8:00 a.m. and 4:30 p.m., Monday thru Friday.

To make written comments on this proposal, please mail or hand deliver specific comments to: City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277, no later than 4:30 p.m. on 9/27/2024.

To receive notification of the decision on this proposal, please include your email and send your request to the City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277. Please include the following: Notification of Decision for application 2408-0047.

Name	Wayne Tilson
Email Address	waynetilson@gmail.com

Address	5555 Beach Bluff Drive
City	Freeland
State	WA
Zip Code	98249
Phone Number	(785) 550-5958
Comment	I am Wayne Tilson, owner of the property at 30259 SR 20, OH, WA 98277, Parcel number R13210-248-2000, adjacent to the south side of the Oak Heights proposed project. I wish to receive notifications of decisions for application 2408-0047. My concerns are the following negative impacts on my rental property: • a loss of privacy for my rental property and renters as many new houses will be built right up to my property line and house without proposed mitigation of this impact such as an open space as trees as well as walled sound barriers. • an increase in noise, lights at night, and a decrease in the attractiveness of my present setting as well as a decrease in air quality from the many vehicles, machines and air particles that will be generated from the development. • security for my renters, possible property damage, theft and trespassers. • storm water runoff, as my property is specifically mentioned as the site for all runoff from the Threshold discharge area on page 12 of the Storm Drainage Report and the possible negative effects on our well function and water quality. • Increase in traffic on SR20 as detailed in the Traffic Impact analysis, which will have a negative impact my renters' ability to turn north (LOS E for NB traffic at the nearby SR20, South site access and SW Eagle Vista Ave). • lower my ability to rent my property, lowering my income as well as raising my taxes. Please notify me of public hearings as I would like an opportunity to further express my concerns. Thank you for the opportunity to submit comments on the Oak Heights Development. Wayne Tilson
The colors of the American flag are Red, White, and ...	Blue

Email not displaying correctly? View it in your browser.

From: noreply@civicplus.com
To: planning
Subject: Online Form Submission #51011 for Oak Heights Preliminary Planned Residential Development Comments
Date: Friday, September 27, 2024 4:17:11 PM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Oak Heights Preliminary Planned Residential Development Comments

Project Details

NOTICE OF APPLICATION

R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

APPLICATION:

Preliminary Planned Residential Development 2408-0047

DHI Engineering, LLC submitted a Preliminary Planned Residential Development application and associated documents for a Proposed Preliminary Plat/PRD consisting of 153 single-family lots, and 66 duplex lots, for a total of 219 lots.

PROJECT LOCATION: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

The plans have been circulated to City staff for review and comments. Plans for the proposal are available for review at the City of Oak Harbor's Development Services Department, located in City Hall. For more information, please call (360) 279-4510.

DETERMINATION OF COMPLETENESS:

The above application was submitted on Wednesday, August 7, 2024 by DHI Engineering, LLC for Oaks Village 135 LLC property owners. The application has been determined complete for processing on Monday, September 9, 2024.

APPLICABLE REGULATIONS AND REVIEW CRITERIA: The above applications will be reviewed for compliance with the Oak Harbor Comprehensive Plan (June 2016 and Nov. 2014), Municipal Code. This may not be a comprehensive list of the applicable regulations and review criteria against which this application will be reviewed.

ENVIRONMENTAL DOCUMENTS AND/OR STUDIES APPLICABLE TO THIS PROJECT: SEPA

PUBLIC COMMENT PERIOD: 9-14-2024 through 9-27-2024

If you have questions regarding this application, please contact the Development Services Department at (360) 279-4510, between 8:00 a.m. and 4:30 p.m., Monday thru Friday.

To make written comments on this proposal, please mail or hand deliver specific comments to: City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277, no later than 4:30 p.m. on 9/27/2024.

To receive notification of the decision on this proposal, please include your email and send your request to the City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277. Please include the following: Notification of Decision for application 2408-0047.

Name	Nadine Weatherby
Email Address	nadinerby@hotmail.com

Address	1200 SW 24th Avenue
City	Oak Harbor
State	WA
Zip Code	98277
Phone Number	360-840-2527
Comment	The traffic study shows traffic patterns from 4:00 pm to 5:00 pm. I would like to see what the traffic flow is from 5:00 pm to 7:00 pm as we typically see lot of traffic along 24th Avenue until about 6:30 pm which makes sense for commuters who run errands after getting off work at 5:00 pm or later.
The colors of the American flag are Red, White, and ...	blue

Email not displaying correctly? View it in your browser.

Oak Heights Concerns

For the Oak Heights project my concerns as an adjacent property owner are: Traffic, Wetlands/ wetland setback on parcel R13210-248-2000 , Water mitigation to include drainage system management, well contamination, noise, Privacy, and wildlife. Each of these concerns directly affect the livability and value of my property.

Traffic is a concern of safety and congestion this is because a majority of the traffic from Oak Heights will end up at HWY 20 directly or indirectly from all 3 proposed exits. This development's traffic plus others in the area will make entering or exiting my property in either direction (north or south) unsafe because congested traffic will be traveling in excess of 50 MPH, there is no turn lane, and the line of sight is hindered due to terrain. I was told of future plans by WSDOT to put several round-a-bouts in including one at SR20/ SW Eagle Vista Ave. This would keep traffic moving at the intersection but would put cars bumper to bumper on the south side as they go into or exit the intersection further reducing my ability to enter or exit my property. It was also mentioned that this is proposed to be a one lane round-a-bout close to the bottom of two hills that get icy and is a main artery to the local hospital for emergency vehicles.

The wetlands are water mitigation go hand in hand. As noted in my bullets it is mentioned that overflow from the on site wetlands and retaining ponds will flow out of the SE corner of the property and then flow naturally to the HWY 20 culvert. My immediate concerns with this is how will it affect the current wetlands and who will be responsible for managing the water pathway to the HWY 20 culvert to ensure proper drainage? Without proper drainage I feel the current wetland setback will retain more water. I am also curious if the water being released from the Oak Heights site pond 3 will affect how this area will handle if the wetland pond on parcel R13210-170-2050 overflows. Based on topography it would flow into the same wetland setback that the new developments will be utilizing.

Well contamination is always a concern when new developments are not using the same drinking water and therefore will not have the same consideration to what chemicals, pesticides, and insecticides they are utilizing. How do the retention ponds and wetlands filter this out and how will ground water quality be measured and maintained?

Living in the county there is a 5 acre parcel minimum that was put into place to preserve the island and because people like to feel that they are in a rural environment. Viewing the plat proposal for Oak heights it does not appear that this fact was taken into account when planning the development and considering how it would affect the adjacent county lots that are not within the city or current UGA. I propose that discussions occur on vegetation that could be planted as a barrier that would increase privacy and reduce noise pollution for all parties.

My concerns with wildlife come from the fact that Whidbey Island is a tourist destination, wildlife welfare, and my livestock. As a tourist destination people come for the sites

and parks like deception pass and Fort Casey which are gorgeous in their own right but have also historically been surrounded by wildlife to include birds, coyotes, deer, and fish. As we grow these animals are being displaced in this case over 30 acres of habitat to include hunting and grazing which is concerning because deer populations are not being managed and neither are the coyotes. These two species pose the largest potential concern since the deer cause accidents and the coyotes will resort to eating my livestock if they exceed their new carrying capacity. On the other side of the spectrum you have rodents which are being displaced and will be looking for a new home further concentrating them and either increasing the proximity that predators like coyotes operate to humans or removing them from the picture leaving the ecosystem out of balance.

In summary I am concerned that this project will directly and indirectly affect my property and the community. Oak Heights and others like it do not take into account all the factors that must be considered when expanding. A little background on myself and why my thoughts should be taken under consideration when expanding the city of Oak harbor not only for this development but future plans. I was raised on the Island, joined the navy serving 8 years, and have now returned scrapping what I could to purchase parcel number: R13210-224-2350. From a young age I remember Oak Harbor growing and often wonder what we are losing as a community in that growth. We have gone from a small military town and tourist attraction with friendly people to a city that seems more concerned with growth than the community. The houses continue to go up left and right but schools haven't been expanded upon, crime continues to rise, and infrastructure is not keeping up. The traffic is becoming unbearable, grocery store shelves are often low on stock, and our local industry (military) isn't growing at the same rate. After considering the factors of the community, the natural beauty that attracts tourists here must also be considered. The Lorax was a children's book but we are quickly making it a reality. All of these things should be considered in growth, not just how much Revenue will be gained, that the waste treatment facility can handle it, and Washington state's growth agenda.

OAK HEIGHTS CONCERNS

WATER Run off/ Displacement

- Will the WSDOT retention pond be rebuilt? What will happen to the overflow ditch that is poorly managed? Will that be reconstructed and properly dug out to discharge any overflow into the wetland setback zone? If/ When a round-a-bout is put in how much will that increase the flow into the retention pond and subsequently the wetlands?

Storm drainage report

"Ponds 1, 2, 3, and the WSDOT pond are sized to satisfy Wetland recharge and Flow control and durations standards for the TDA. The natural discharge location for the TDA at the southeast corner of the site near the existing WSDOT pond and State Route 20 will be maintained." pg 9 storm drainage report.

- How will this increase the water level in the existing SE corner of the site? Will this wetland setback area grow/ retain additional water throughout the year?
- How will these "waterways" be maintained? By the city? By the housing development? HOA?
- "Note that there are no Basin Plans or TMDL requirements for this basin." pg 8 storm drainage report. Will this water be cleaned? If yes, to what standard? There are two wells feeding approximately 5 houses well contamination is a concern with oil run off, chemical sprays, lawn fertilizer etc.
- "There is a birdcage overFlow structure proposed at the ordinary high water mark which conveys any overFlow from the wetland to the overFlow system for Wetland A which conveys Flows to the natural discharge location in the southeast corner of the site." PG 10 storm drainage report. With the increased usage of the existing ponds due to roof runoff, impermeable surfaces, foundation french drains, and other water being directly into these ponds at a higher rate than natural infiltration, how much of an increase will the SouthEast corner see?
- Graphic 3-2 page 14 storm drainage report. Shows pond 3 discharge site which encompasses 4-5 adjacent lots and flows to the HWY 20 drainage culvert
- It is noted on page 12 in the storm drainage report that "These Flows ultimately cross State Route 20 at the southeast corner of the project site near the existing WSDOT detention pond. The water Flows beneath SR-20 through two 24" diameter CMP culverts at approximately 1.4% slope." My question here is who will be in charge of drainage ditch maintenance to ensure proper flow to the HWY 20 drainage.

Critical Areas Report and Habitat Management Plan

- Does not mention the Wetland/ wetland setback on the adjacent property Parcel: R13210-248-2000. How will this area be affected with a potential change in the amount of water going into it? With the overflow for wetland A being the southeast corner of the subdivision site and the use of the HWY 20 culvert. The pole barn in the southeast corner of Parcel: R13210-248-2000 is not much higher than the wetlands.

Traffic Report

- Page 4 states: "State Route (SR) 20 is functionally classified by WSDOT as an urban principal arterial and has a speed limit of 40 mph." This is true at site intersection 5 SW

24th AVE & HWY 20 which is on the North end of the property but not at site intersection 6 SW Eagle Vista Ave & HWY 20 where the speed limit is 50 MPH.

- Figure 3 pg 6 shows 6 traffic volume locations with 1, 2, and 5. Locations 1 & 2 are potential flows of traffic at Ridgeway and SW Swantown and 5 is SW24th and HWY 20. Locations 3,4, and 6 are entry/ exit locations from the development. Both 3 & 4 are on SW 24th and 6 is HWY 20. The concern with these chosen intersection points is that it does not take into account the affected SW swantown & HWY 20 intersection which has the potential to absorb all of this traffic and the traffic from other housing developments in the area and already results in backups which would cause congestion at location 2 SW Swantown and SW Fort Nugent Ave .
- Locations 6 is a direct connection to HWY 20. How will this traffic flow be managed? The safety of entering traffic from my lot parcel: R13210-224-2350 will be directly affected by an influx of traffic and any back-ups that occur due to a round-a-bout, light, and/or turn lanes. With the current traffic flow and topography It is already difficult to safely enter traffic. Parcel R13210-248-2000 will be even closer to the exit location and will also be directly affected.
- PG 15 states "as shown above in table 6, all three of the site access intersections are anticipated to operate at LOS B or better along SW 24th Avenue and LOS E at SR20/ SW Eagle Vista Ave under future with-project conditions." Chart 6 also shows that with the Future project traffic operations SR20/ 24th Ave will be level of service F (congested and queues fail to clear) and SW Fort Nugent Ave/ SW Kimball DR/ SW Swantown Ave condition D (tolerable delay, occasionally wait through more than one signal cycle before proceeding). Meaning 50% of the 6 potential entry and exit points (intersections according to table 6 pg 15) fail city requirements of LOS B or better.

Please feel free to contact me with any questions or responses.

V/R

James L. Engen
(360) 929-5169

Oak Heights – Public Comment

APPLICATION : Preliminary Planned Residential Development 2408 -0047

Development Configuration: I believe it'd be prudent from a City planning perspective to require the development to have a public road and all utilities stubbed to APN- R13210-364-0650 in the vicinity of proposed lot 177. There is a proposed road stub to the westerly adjacent parcel which is also within the UGA but no interconnectivity to the larger 20-acre parcel to the north which fronts SW 24th Ave. This northerly adjacent parcel might be annexed and developed prior to the westerly 15-acre parcel. This would allow for gravity sewer, additional loop of the water main, and a route for stormwater discharge from the future detention facility.

Traffic: According to the traffic impact analysis the intersection of SW 24th Ave and SR-20 is already projected to operate at a L.O.S. F in year 2029 without Oak Heights. Does the City have an internal policy for requiring the developer to mitigate this overburdened intersection prior to issuing occupancy permits or does that fall on WSDOT to design improvements which the developer must install prior to final plat approval? I do note that additional coordination with the City and WSDOT will be needed to determine if mitigation is necessary but with an intersection already operating at a F level of service a blanket condition of future mitigation of that intersection which is mutually agreed upon between the three parties should be included in the preliminary plat recommendation.

I also have concern with the intersection of the development's proposed south entrance at SW Eagle Crest Vista and SR-20. Future trip distribution shows a projected weekday PM peak 10 left turns from the development to SR-20 and 17 right turns from SR-20 into the south entrance of the development. Currently the turn pocket on SR-20 is left only so some sort of mitigation to the channelization should be required as a condition to preliminary plat. The site distance and speed at this intersection is also a safety concern.

I believe an updated capital improvements plan is being drafted and would suggest adding both intersections to the list of projects. Maybe a traffic circle at one or both intersections since there is already a circle being proposed at the intersection of Swantown and SR-20.

Thank you for the opportunity to comment on this proposal.

Colin Smith

Managing Member, Ridgeway Ventures LLC

From: Colin Smith
To: Patti O"Mahony
Subject: Re: Oak Heights
Date: Wednesday, September 18, 2024 11:15:51 AM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.
Yes, that's the ticket!

Colin

From: Patti O'Mahony <pomahony@oakharbor.org>
Sent: Wednesday, September 18, 2024 11:14 AM
To: Colin Smith <colin_smith30@hotmail.com>
Subject: RE: Oak Heights

I'm not sure what you mean. Are you referring to when the hearing will be held and the notice of decision?

Patti O'Mahony
Permit Coordinator
865 SE Barrington Drive | Oak Harbor, WA 98277
Office: 360-279-4510 | pomahony@oakharbor.org

From: Colin Smith <colin_smith30@hotmail.com>
Sent: Wednesday, September 18, 2024 11:03 AM
To: Patti O'Mahony <pomahony@oakharbor.org>
Subject: Re: Oak Heights

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.
Thank you Patti!

Could I become an official party of record so that I can be notified of all the updates as this project progresses? Not sure if that is the correct terminology.

Colin

From: Patti O'Mahony <pomahony@oakharbor.org>

Sent: Wednesday, September 18, 2024 10:54 AM
To: Colin Smith <colin_smith30@hotmail.com>
Subject: Oak Heights

Let me know if you need anything else.

Thanks,

Patti O'Mahony
Permit Coordinator
865 SE Barrington Drive | Oak Harbor, WA 98277
Office: 360-279-4510 | pomahony@oakharbor.org

SEPA Environmental Checklist

A. Background

1. **Name of proposed project, if applicable:**

   Oak Heights Preliminary Plat/PRD

2. **Name of applicant:**

   SSHI LLC dba D.R. Horton
   Attention: Nicole Mecum

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

   11241 Slater Avenue NE
   Suite 200
   Kirkland, WA 98033
   (425) 821-3400 – Nicole Mecum

4. **Date checklist prepared:**

   July 30, 2024

5. **Agency requesting checklist:**

   The City of Oak Harbor, Washington.

6. **Proposed timing of schedule (including phasing, if applicable):**

   The project anticipates an early clearing and grading permit covering the entire project area to be issued early Spring 2025 which will be followed by two phases of site development. The initial phase will be concentrated on the easterly portion of the property containing 66 duplex units and 52 single-family detached units for a total of 118 units. Phase I of the preliminary plat/PRD includes the active recreation amenities in Tract F and Tract I, as well as the passive open space associated with Wetland A. Stormwater facilities will be provided within Tract C and Tract D. Roadway access will be via SW 24th Avenue/SW Vista Park Drive and SR-20/SE Eagle Vista Avenue. Recording of the Phase I final plat is expected in spring/summer of 2026. Phase II of the preliminary plat/PRD includes the remaining 101 single family detached units and the balance of the plat improvements. Phase II is expected to record approximately 10 months after the Phase I final plat. The phase line is depicted on the Preliminary Plat/PRD Map.

   Model home construction is anticipated to commence two months prior to the initial phase recording. The remaining homes will commence construction following Phase I and Phase II recordings, respectively. Home sales will likely occur between late spring 2026 through summer of 2029.

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

   There are no further plans beyond the scope of this development proposal.

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

   - A Critical Area Report and Habitat Management Plan was prepared by Wetland Resources, Inc. dated June 27, 2024.
   - A Geotechnical Report was prepared by The Riley Group dated June 28, 2024.
   - A Traffic Impact Analysis was prepared by Transpo Group dated July 2024
   - A Stormwater Drainage and Downstream Analysis prepared by DHI Engineering, LLC dated July 30, 2024.

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.**

   The approved plat of Ridgeway Heights adjacent to the northwesterly property line is expected to be completed and recorded within the next several months. The Oak Heights Preliminary Plat/PRD anticipates completing the extension of SW Ridgeway Drive from its designed cul-de-sac terminus on the Ridgeway Heights site to extend into and through the Oak Heights project. Oak Heights also anticipates the need to intercept the Ridgeway Heights stormwater prior to entering the existing dispersion trench and pipe the water to a new dispersion trench located on the southern side of the Oak Heights storm facility planned on the southwesterly proportion of the property. The Oak Heights project is also aligning a trail corridor to tie into a trail corridor provided at the common property line with the Ridgeway Heights project.

10. **List any government approvals or permits that will be needed for your proposal, if known.**

    - SEPA Determination
    - Preliminary Plat / PRD approval
    - Early Clear and Grade Permit
    - Construction Plan Approval
    - NPDES
    - Right-of-way Construction Permits (WSDOT and City of Oak Harbor)
    - WSDOT channelization approval of Eagle Vista Drive intersection with SR 20.
    - WSDOT approval of a stormwater pond modification.
    - Final Plat approvals (two anticipated)
    - Forest Practice Permit (FPA has been issued and remains valid).
    - Residential Home Construction Permits.

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 site is comprised of five parcels totaling 36.69 acres within the R-1 zoning district. The site received an MDNS on January 18, 2019, and Preliminary Plat approval on October 1, 2019. Based on extraordinary construction cost and other factors, the site was logged but construction did not commence. The Applicant is seeking a new entitlement to subdivide the property into 219 homesites with an average site density of 5.97 homes per acre. Homes will consist of both duplexes and single-family detached homes. In addition, the project will provide 6.22 acres of active park and passive open spaces, 5,038 linier feet of trails, and 3.17 acres of landscaped stormwater ponds.

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.**

    The project is located west of SR-20 and south of SW 24th Avenue in southern Oak Harbor. The southern portion of the site is near the intersection of SR-20 and SW Eagle Vista Drive.

    More generally, the site lies in the south ½ of the northeast ¼ of Section 10, Township 32 North, Range 01 East, WM.

B. Environmental Elements

1. Earth

a. General description of the site:

The subject property is a former farm with rolling terrain. Most of the site was pasture and a majority of the treed areas have been cleared under the existing Forest Practice Permit secured by the previous owner. Additionally, all structures have been removed from the property by the previous property owner.

Circle or highlight one: Flat, **rolling,** hilly, steep slopes, mountainous, other:

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

The site has limited areas of slope up to 15% primarily located in the southeasterly portion of the site.

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.

Based on the Geotechnical Report prepared by the Riley Group dated June 28, 2024, the site is primarily comprised of loose to medium dense silty sand with trace to some gravel, sand with trace to some silt and varying amounts of gravel, and sandy gravel

with trace to some silt, over dense to very dense silty sand with gravel glacial till and sand with varying amounts of silt and gravel advance outwash. Please refer to the Terra Associates Geotechnical Report for additional information.

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

There are no surface indications of unstable soils in the immediate vicinity.

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.

Overall, the site is expected to generate approximately 134,000 yards of cut volume and 129,300 yards of fill volume. No import of fill material associated with overall site grading is anticipated at this time. Backfill behind walls and pipe bedding will be imported from local suppliers as needed.

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

Localized erosion could occur during construction. A temporary erosion and sedimentary plan will be prepared as part of the early clear and grade permit to assist in stormwater management during construction. The plan will detail the location of swales, check dams, erosion control ponds, and other methods as outlined in the Terra Geotechnical Report and Department of Ecology requirements to control stormwater to help prevent erosion until the site is permanently stabilized.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The total impervious surface percentage of the site including roadways, sidewalks, trails, storm ponds, driveways and homes is expected to be approximately 55%.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any.

Best Management Practices erosion control measures will be followed during construction. The site will be fully stabilized as each home is constructed and residential landscape installed.

2. Air

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.

During construction, construction vehicles would emit exhaust into the air typical for a residential project site. Dust could also be produced during drier months of construction. The completed project would experience normal residential emissions from personal and delivery vehicles, dryer exhaust vents, lawn mowers, barbecues, etc.

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

No off- site sources of emissions or odors are known to exist that would influence the project site.

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

During construction, watering the site during drier weather will help control dust. Covering or stabilizing stockpiles will also help control dust created by wind.

3. Water

a. Surface:

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.

Wetland "A" is a manmade feature approximately .78 acres in size (not including the buffer area) near the central portion of the site. Wetland "B" is approximately .49 acres in size (not including the buffer area) and located westerly of Wetland "A". The Critical Area Report prepared by Wetland Resources dated June 27, 2024 evaluated both wetlands and determined both Wetland A (15 point habitat score) and Wetland B (14 point habitat score) are Category IV with a 50-foot buffer.

Washington State Department of Transportation constructed a stormwater pond at the site's southeasterly corner. The pond appears to collect water from SR-20 frontage improvements. The water discharges easterly under SR-20 via two recently installed 24" culverts. A majority of the project site also sheet flows to these culverts.

East of SR-20, a ditch carries the runoff easterly and eventually enters a recently installed pipe system that carries the stormwater to the Ordinary High Water Mark at Oak Harbor.

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.

Work will be conducted within 200 feet of Wetland A and Wetland B as shown on the preliminary plat/PRD and preliminary engineering drawings. Work will also be done to re-configure the WSDOT storm pond to accommodate a new intersection of Eagle Vista Drive with SR-20.

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.

No fill will be placed or removed from Wetland A or Wetland B.

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

   The process of site grading for roadways will result in some stormwater sheet flow being intercepted and re-routed to the on-site detention facilities. In addition, the stormwater outfall associated with Ridgeway Heights is planned to be intercepted and re-routed to a new dispersion trench located on the south side of the proposed storm pond located in the southwesterly portion of the site.

5. **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

   The site does not lie within a 100-year floodplain.

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.**

   The proposal does not include any discharges of waste materials to surface waters.

b. Ground:

1. **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 a general description, purpose, and approximate quantities if known.**

   No groundwater will be withdrawn. Roof and yard drains will be used to re-charge wetlands around wetland A and Wetland B. Please refer to the Stormwater Drainage Report dated July 30, 2024 for additional detail.

2. **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (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 waste material will be discharged to the ground.

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.**

   Stormwater runoff will primarily come from roofs, yards, sidewalks, driveways, and roads. It will be collected in a series of catch basins and routed to one of three planned on-site detention facilities. A portion of the collected roof stormwater will be routed to flow spreaders used to recharge Wetland A and Wetland B. Please refer to the Stormwater Drainage Report dated July 30, 2024 for additional details.

2. **Could waste materials enter ground or surface waters? If so, generally describe.**

Accidental spills could cause waste materials and pollutants to enter the stormwater system.

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

   The completed stormwater system is anticipated to reflect pre-development conditions. Please refer to the Stormwater Drainage Report dated July 30, 2024 for additional details.

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

The Applicant will be installing a stormwater detention system, a series of catch basins and piping to collect stormwater runoff and flow spreaders to re-charge the existing on-site wetlands.

4. Plants

a. **Check the types of vegetation found on the site:**

☒ **deciduous tree: alder, maple, aspen, other**

☒ **evergreen tree: fir, cedar, pine, other**

☒ **shrubs**

☒ **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?**

A majority of the site will be cleared and graded. Wetlands A and B with associated 50-foot buffers will generally be preserved (soft surface trails and flow spreaders within the outer buffer areas are anticipated).

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

None known

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

Traditional residential landscaping will be used on the home sites. Open space tracts, buffers, and other public spaces will incorporate native plant species as part of the

overall landscaping plan. Street trees will be provided based on the City's preferred street tree species. A mixture of street trees will be used to protect against specific tree diseases. Per the Oak Harbor Design Regulations and Guidelines, landscaping along sR-20 is subject to the Heritage Way Landscape Plan requiring a minimum 20-foot landscape area with trees planted every 30 feet. The Applicant has provided a landscape area which greatly exceeds this minimum width, and the preliminary landscape plan has included the planting of trees in compliance with the Heritage Way landscaping standards. In addition to the above, the Applicant intends to work with the Oak Harbor Garry Oak Society to locate native trees within Tract I and other locations within the site deemed appropriate for long-term conservation.

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

None Known.

5. Animals

a. List any birds and other animals that have been observed on or near the site or are known to be on or near the site.

Hawks, heron, eagle, robin, finch, crows, songbirds, etc.

Deer, raccoon, field mice, moles.

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

- A Bald Eagle nest was identified easterly of the project site in 2017 (east of SR-20.). While no longer listed as threatened or endangered, in December of 2017, Wetland Resources contacted USFWS staff seeking clarification regarding whether a timing buffer would be required for the proposed site construction. USFWS staff indicated that since SR-20 lies between the project site and eagle nest, individual eagles using the nest are likely acclimatized to significant road noise. USFWS staff determined that a timing restriction buffer on the project construction activities was unnecessary. Please refer to the Critical Area Report and Habitat Management Plan was prepared by Wetland Resources, Inc. dated June 27, 2024 for further details.

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

The site is part of the larger Pacific Flyway but does not contain any major water landing sites.

c. Proposed measures to preserve or enhance wildlife, if any.

Native plantings, street trees, preservation of Wetlands A and B and their respective buffers, the inclusion of stormwater ponds and a large landscape area fronting SR-20 will provide opportunities to preserve and attract wildlife to the project site.

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

None Known.

6. Energy and natural resources

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.**

Both natural gas and electricity are available at the site to meet the energy needs of the future homes.

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

The project will not affect the use of solar energy by adjacent properties.

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.**

Each of the homes constructed will meet or exceed the then applicable energy code for residential construction.

7. Environmental health

a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur because of this proposal? If so, describe.**

None known

1. **Describe any known or possible contamination at the site from present or past uses.**

   Based on a Phase 1 Environmental Site Assessment performed for the Applicant in February 2024, no contamination was identified as existing on the subject 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.**

   None Known.

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.**

   Heavy equipment during site construction will require on-site refueling. Refueling could pose a risk of spill during the refueling process. The contractor will be required to follow BMP refueling procedures and maintain a spill kit on site.

4. **Describe special emergency services that might be required.**

   None Known.

5. **Proposed measures to reduce or control environmental health hazards, if any.**

None.

b. Noise

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

   The primary source of noise in the vicinity is traffic noise associated with SR-20 adjacent to the project's easterly boundary.

   Aircraft noise from Whidbey Naval Air Station frequently fly over the area at low elevations resulting in significant short-term noise at ground level.

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)?**

   During site construction, heavy equipment will generate typical construction noise. Home construction will generate noise associated with power tools and pneumatic devices. The finished project would generate typical residential noise associated with dogs, children playing outside, lawnmowers, etc.

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

   The site construction will comply with the hours of operation as specified in the Oak Harbor Municipal Code.

8. Land and shoreline use

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 vacant. To the west is a residential subdivision (Ridgeway Heights) under site construction. To the north across SW 24th Ave are single family detached homes and a small grouping of modular homes. To the East across SR-20 is a large open space and single-family detached homes. To the South is a rural single-family home near SR-20 and primarily vacant land in the County jurisdiction.

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 because 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?**

   According to the Critical Area Report prepared by Wetland Resources dated June 27, 2024, the site has historically been used for farming and livestock. Native vegetation was cleared from the site more than 50 years ago. Based on recent aerial photographs, it does not appear the site has been used for farming or livestock in recent years.

   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?**

The site will not be affected by surrounding uses.

c. **Describe any structures on the site.**

All structures have been removed from the site by the prior applicant.

d. **Will any structures be demolished? If so, what?**

All structures have been removed from the site by the prior applicant.

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

The site is currently zoned R-1.

f. **What is the current comprehensive plan designation of the site?**

The Comprehensive Plan designation of the site is Low-Intensity Residential (3-16 units per acre).

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.**

Wetlands A and B have been identified on the site. Please refer to the Wetland Resources Critical Area Report dated June 27, 2024 for further details.

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

Assuming 2.53 persons per household per the City's Comprehensive Plan, the site would house approximately 554 residents.

j. **Approximately how many people would the completed project displace?**

None. All structures have been removed from the site by the prior applicant.

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

None.

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

The proposed PRD site plan density is consistent with both the underlying zoning and the Low-Intensity Residential designation in the Comprehensive Plan. In addition, the site is consistent with the terms of the Annexation Agreement and meets the park and open space requirements within the PUD standards.

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

None.

9. Housing

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

The project will provide 219 new housing units. Sixty-six of the units are proposed to be duplex units with the remainder being single-family detached. The units will provide middle income housing.

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

All structures have been removed from the site by the prior applicant.

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

None.

10. Aesthetics

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

The residential homes will not exceed the 35-foot height limit as established in the Oak Harbor Municipal Code for the R-1 zoning district.

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

Existing homes on the north side of SW 24th Avenue may have some southerly territorial views obstructed by the new homes.

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

The project will include the planting of street trees and trees in open space areas and enhanced landscaping at the project entrances. In addition, the entire site will be subject to the provisions of OHMC 19.31 (Planned Residential Development Code) which specifies enhanced criteria for Planned Residential Developments.

11. Light and glare

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

Typical residential lighting levels will exist in the nighttime hours. This includes porch lights, streetlights, and vehicle headlights.

b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

The anticipated light levels are consistent with those typical of residential neighborhoods.

c. **What existing off-site sources of light or glare may affect your proposal?**

None Known

d. Proposed measures to reduce or control light and glare impacts, if any:

None.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

The large multi-purpose Fort Nugent Park is located westerly of the subject property. This park includes parking, baseball field, soccer fields, basketball court, a large play structure, picnic areas, and passive open space. Theodore open space park is located northeasterly of the project site. Windjammer Park is also located northeasterly of the project site and offers basketball courts, picnic areas, large open lawn areas, and water access.

b. Would the proposed project displace any existing recreational uses? If so, describe.

The project will not displace any existing recreational uses.

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

The site design includes park and open space as follows:

- Tract F –active park area with landscaping, children's play area, walking path, benches, etc.
- Tract G – landscaping, trail.
- Tract H - landscaping, trail.
- Tract I - landscaping, trail, benches, etc.
- Tract J - park area with landscaping, seating areas, etc.
- Tract N – sidewalk connecting to the Wetland A perimeter trail
- Tract T – trail connection to the Ridgeway Heights trail system.
- Tract G, Tract O, Tract T - On-site trail corridors.
- In addition, a trail has been proposed around wetland A and wetland B.

13. Historic and cultural preservation

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.

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.**

Not applicable.

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.**

If archaeological materials are observed during site work, work in the area shall cease and the Washington State Office of Archeology and Historic Preservation shall be contacted immediately to determine the significance of any discovery and develop an action plan.

14. Transportation

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.**

The site will be accessed via SW 24th Avenue at the intersection of SW Vista Park Drive and access also available through SW Ridgeway Drive in the recently constructed plat of Ridgeway Heights. Access will also be provided via SR-20 at SW Eagle Vista Avenue.

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?**

The site is currently served by Island Transit which maintains transit stops on SR-20 along the project's frontage. Please refer to the Traffic Impact Analysis dated July 2024 for additional information.

c. **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).**

Several new residential streets will be constructed within the subdivision to serve the future home sites. The streets are anticipated to be public. A multipurpose trail (8-foot-wide sidewalk) is planned for the extension of SW Eagle Vista Avenue through the project site.

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

No.

e. **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?**

Based on the Trip generation calculations contained in the Transpo Group Traffic Impact Analysis dated July 2024, the project will generate 1,894 daily trips. Of these 180 will be peak PM trips. Please refer to the referenced Transpo Group report for further detail.

f. **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.

g. **Proposed measures to reduce or control transportation impacts, if any:**

A Traffic Impact fee will be paid in accordance with OHMC 3.63. The Master Fee Schedule dated October 2023 indicates a fee of $907 per residential unit. 219 residential units would total an estimated $198,633 impact fee to be paid to the City. The actual fee will be calculated by the City at the time of residential building permit issuance.

15. Public services

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.**

Yes, the site will require typical increases in fire, medical, police, schools, and other public services to support the new residents.

b. **Proposed measures to reduce or control direct impacts on public services, if any.**

Impact fees and increased property taxes associated with the increase valuation of the completed community will support the additional needed services.

16. Utilities

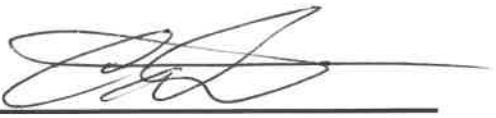
a. **~~Circle utilities currently~~ available at the site: electricity, natural gas, water, refuse, telephone, sanitary sewer, septic system, other:**

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.**

Electricity is anticipated to be the main energy source (gas service may also be utilized). The site has gas and electrical power along its northerly and/or easterly frontages. Water and sewer are also available adjacent to the northern and easterly frontages.

C.Signature

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.

X 

Colin Lund

Type name of signee: Colin Lund

Position and agency/organization: Area President, DHI Engineering

Date submitted: July 30, 2024

CITY OF
Oak Harbor
WHIDBEY ISLAND, WASHINGTON

City of Oak Harbor
State Environmental Policy Act
Mitigated Determination of Non-Significance

Date of issuance: *February 14, 2025*
Lead agency: *City of Oak Harbor*
Agency Contact: *Ray Lindenburg, Senior Planner, (360) 279-4578; rlindenburg@oakharbor.org*
Agency File Number: *2408-0047*
Description of proposal: *A preliminary plat and PRD application for a 219-lot subdivision including a mix of 153 single-family lots and 66 duplex lots located on approximately 36.7 acres. A previous application for subdivision was issued an MDNS in January 2019 and city approval granted for a preliminary plat in 2019. That project has been abandoned and replaced by this new application. The new project proposes an average density of 5.97 units per acre and approximately 6.2 acres of open spaces, approximately 1 mile of trail, landscaped stormwater facilities and associated infrastructure.*

Location of proposal: *Southwest corner of SW 24th Avenue and SR 20, Oak Harbor; parcel numbers R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900*

Proponent: *Nicole Mecum on behalf of SSHI LLC, 11241 Slater Avenue NE, Suite 200, Kirkland, WA 98033*

The City of Oak Harbor has determined that this proposal will not have a probable significant adverse impact on the environment. Pursuant to WAC 197-11-350(3), the proposal has been clarified, changed, and conditioned to include necessary mitigation measures to avoid, minimize or compensate for probable significant impacts. An environmental impact statement (EIS) is not required under RCW 43.21C.030. The necessary mitigation measures are listed below. The Environmental Checklist, preliminary plat, critical area report and habitat management plan, geotechnical report, traffic impact analysis and stormwater report are attached.

This determination is based on the following findings and conclusions:
Staff has reviewed all aspects of the proposed development and has determined that the construction of the proposed subdivision and subsequent residential units will not have an undue impact on the environment located within the existing designated urban growth area of the City of Oak Harbor. An Annexation Agreement (AFN #4260219) between the City and property owners exists for the subject property and will be adhered to in review for the preliminary plat and PRD application and public hearing.

The property was previously cleared in anticipation of an earlier approved preliminary plat which failed. Aesthetic and wetland buffering considerations have been addressed through the proposed landscape plan, which meets the standards of the Oak Harbor Municipal Code (OHMC) sections on wetland protection and landscaping standards. The city's Parks, Recreation, and Open Space Plan identifies park needs and trail extensions through the subject property, which have been addressed in the preliminary plat. Typical home elevations have been submitted by the applicant and will be included as conditions of approval with the preliminary plat approval to ensure aesthetic quality.

Traffic impacts were studied in the Traffic Impact Analysis and through coordination with Washington Department of Transportation and city engineering staff to ensure that levels of service will be maintained at an appropriate level and proper mitigation for traffic impacts are addressed.

Other potential impacts are transitory or minor in nature and will be addressed through development standards developed to ensure positive integration into the neighborhood. Erosion control, inadvertent discovery of cultural resources, grading and site preparation, are all sensitive issues in the development of this property and are mitigated by the process and procedures of the OHMC.

This mitigated determination is issued with the following conditions:

1. The development of this property is subject to an Annexation Agreement (AFN #4260219) between the City and the property owners and requirements under such agreement shall be met.

2. The intersection of SR 20/SW 24th Avenue is forecast to operate at LOS F in the future prior to the development of the project. The project will contribute to additional total traffic and potential delay. To mitigate increased delay and improve accessibility to SR 20 for the project and surrounding area, improvements at two intersections will occur. The intersection improvements may include eliminating left turn movements at the intersection of SR 20/SW 24th Avenue; and the construction of a compact roundabout at the intersection of SR 20/SW Eagle Vista Avenue. These improvements will alleviate operational issues that are anticipated to occur regardless of the project and will be completed jointly by the developer and the City of Oak Harbor. The specific design of these improvements will occur through coordination with Oak Harbor and WSDOT. Upon approval of the compact roundabout the developer shall commence construction of the compact roundabout prior to the first certificate of occupancy within Phase II unless approval of the plans/permit are unreasonably delayed, in which case Certificates of Occupancy within Phase II shall be issued if a surety for the cost of the compact roundabout is provided by the Developer.

3. All improvements and measures included in the SEPA checklist to mitigate impacts and shall be implemented in accordance with the proposed phasing plans, and in accordance with the approved preliminary plat including but not limited to the following conditions:

a. Design and build channelization improvements, approved by Washington State Department of Transportation, at the intersection of SR 20 and SW 24th Avenue, and SR 20 and SW Eagle Vista Drive, to be completed in Phase 1 and prior to commencing work on Phase 2;construction of improvements must be scheduled during low traffic seasons to minimize impacts to mobility and access.

b. Offsite drainage improvements proposed downstream shall be completed in Phase 1 development.

4. Wetland buffers to be maintained, averaged, and enhanced in accordance with the submitted Critical Areas Report and Habitat Management Plan

5. Landscape buffers along streets, detention basins, pathways, and the highway must be completed with each associated phase unless a delay is justified to target a specific planting season. Deferment shall be in accordance with OHMC 19.46.130.

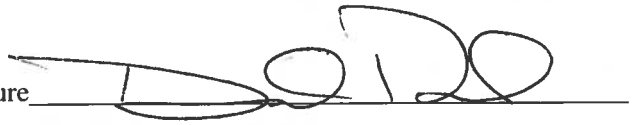
6. Grading, land clearing, and other site work shall be in accordance with OHMC 12.30 and 19.47 and commence only after the preliminary plat has been approved. Grading shall be done in phases concurrent with construction plan approval.

7. The development will be required to utilize construction stormwater and erosion control BMPs in compliance with City of Oak Harbor and Department of Ecology requirements.

8. The applicant shall sign a copy of the City's Inadvertent Discovery Plan (IDP) and make a copy of the IDP available onsite during construction.

This DNS is issued under WAC 197-11-340(2) and the comment/appeal period will end on March ~~14~~ 24, 2025.

Responsible Official: David Kuhl, AICP, Director, Development Services
(360) 279-4511
865 SE Barrington Drive, Oak Harbor, WA 98277

Signature  Date 2/14/25

You may appeal this determination:

- to Oak Harbor Hearing Examiner
- c/o City of Oak Harbor, 865 SE Barrington Drive, Oak Harbor, WA 98277 no later than 4:30 pm on March ~~14~~ 24, 2025 by mail or in person. You should be prepared to make specific factual objections.
- Please contact Patti O'Mahony, at (360) 279-4510 to ask about the procedures for SEPA appeals.

City of Oak Harbor
State Environmental Policy Act
Mitigated Determination of Non-Significance
(Revised)

Date of issuance: *March 12, 2025*
Lead agency: *City of Oak Harbor*
Agency Contact: *Ray Lindenburg, Senior Planner, (360) 279-4578; rlindenburg@oakharbor.org*
Agency File Number: *2408-0047*
Description of proposal: *A preliminary plat and PRD application for a 219-lot subdivision including a mix of 153 single-family lots and 66 duplex lots located on approximately 36.7 acres. A previous application for subdivision was issued an MDNS in January 2019 and city approval granted for a preliminary plat in 2019. That project has been abandoned and replaced by this new application. The new project proposes an average density of 5.97 units per acre and approximately 6.2 acres of open spaces, approximately 1 mile of trail, landscaped stormwater facilities and associated infrastructure.*

Location of proposal: *Southwest corner of SW 24th Avenue and SR 20, Oak Harbor; parcel numbers R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900*

Proponent: *Nicole Mecum on behalf of SSHI LLC, 11241 Slater Avenue NE, Suite 200, Kirkland, WA 98033*

The City of Oak Harbor has determined that this proposal will not have a probable significant adverse impact on the environment. Pursuant to WAC 197-11-350(3), the proposal has been clarified, changed, and conditioned to include necessary mitigation measures to avoid, minimize or compensate for probable significant impacts. An environmental impact statement (EIS) is not required under RCW 43.21C.030. The necessary mitigation measures are listed below. The Environmental Checklist, preliminary plat, critical area report and habitat management plan, geotechnical report, traffic impact analysis and stormwater report are attached.

This determination is based on the following findings and conclusions:
Staff has reviewed all aspects of the proposed development and has determined that the construction of the proposed subdivision and subsequent residential units will not have an undue impact on the environment located within the existing designated urban growth area of the City of Oak Harbor. An Annexation Agreement (AFN #4260219) between the City and property owners exists for the subject property and will be adhered to in review for the preliminary plat and PRD application and public hearing.

The property was previously cleared in anticipation of an earlier approved preliminary plat which expired. Aesthetic and wetland buffering considerations have been addressed through the proposed landscape plan, which meets the standards of the Oak Harbor Municipal Code (OHMC) sections on wetland protection and landscaping standards. The city's Parks, Recreation, and Open Space Plan identifies park needs and trail extensions through the subject property, which have been addressed in the preliminary plat. Typical home elevations have been submitted by the applicant and will be included as conditions of approval with the preliminary plat approval to ensure aesthetic quality.

Traffic impacts were studied in the Traffic Impact Analysis and through coordination with Washington Department of Transportation and city engineering staff to ensure that levels of service will be maintained at an appropriate level and proper mitigation for traffic impacts are addressed.

Other potential impacts are transitory or minor in nature and will be addressed through development standards developed to ensure positive integration into the neighborhood. Erosion control, inadvertent discovery of cultural resources, grading and site preparation, are all sensitive issues in the development of this property and are mitigated by the process and procedures of the OHMC.

This mitigated determination is issued with the following conditions:

1. The development of this property is subject to an Annexation Agreement (AFN #4260219) between the City and the property owners and requirements under such agreement shall be met.

2. The intersection of SR 20/SW 24th Avenue is forecast to operate at LOS F in the future prior to the development of the project. The project will contribute to additional total traffic and potential delay. To mitigate increased delay and improve accessibility to SR 20 for the project and surrounding area, improvements at two intersections will occur. The intersection improvements may include eliminating left turn movements at the intersection of SR 20/SW 24th Avenue; and the construction of a compact roundabout at the intersection of SR 20/SW Eagle Vista Avenue. These improvements will alleviate operational issues that are anticipated to occur regardless of the project and will be completed jointly by the developer and the City of Oak Harbor. The specific design of these improvements will occur through coordination with Oak Harbor and WSDOT. Upon approval of the compact roundabout the developer shall commence construction of the improvements. If approval of the plans/permit are unreasonably delayed, Certificates of Occupancy shall be issued with an appropriate surety bond for the cost of the compact roundabout provided by the Developer.

3. All improvements and measures included in the SEPA checklist to mitigate impacts and shall be implemented in accordance with the proposed phasing plans, and in accordance with the approved preliminary plat including but not limited to the following conditions:

a. Design and build channelization improvements, approved by Washington State Department of Transportation, at the intersection of SR 20 and SW 24th Avenue, and SR 20 and SW Eagle Vista Drive. Construction of improvements must be scheduled during low traffic seasons to minimize impacts to mobility and access.

b. Offsite drainage improvements proposed downstream shall be completed in Phase 1 development.

4. Wetland buffers to be maintained, averaged, and enhanced in accordance with the submitted Critical Areas Report and Habitat Management Plan

5. Landscape buffers along streets, detention basins, pathways, and the highway must be completed with each associated phase unless a delay is justified to target a specific planting season. Deferment shall be in accordance with OHMC 19.46.130.

6. Grading, land clearing, and other site work shall be in accordance with OHMC 12.30 and 19.47 and commence only after the preliminary plat has been approved.

7. The development will be required to utilize construction stormwater and erosion control BMPs in compliance with City of Oak Harbor and Department of Ecology requirements.

8. The applicant shall sign a copy of the City's Inadvertent Discovery Plan (IDP) and make a copy of the IDP available onsite during construction.

This revised MDNS is issued based on comments received during the 14-day comment period under WAC 197-11-340(2) and the revised, extended appeal period will end on March 26, 2025.

Responsible Official: David Kuhl, AICP, Director, Development Services
(360) 279-4511
865 SE Barrington Drive, Oak Harbor, WA 98277

Signature_____ Date _____

You may appeal this determination:

- to Oak Harbor Hearing Examiner
- c/o City of Oak Harbor, 865 SE Barrington Drive, Oak Harbor, WA 98277 no later than 4:30 pm on March 26, 2025 by mail or in person. You should be prepared to make specific factual objections.
- Please contact Patti O'Mahony, at (360) 279-4510 to ask about the procedures for SEPA appeals.

CITY OF OAK HARBOR
MDNS Issued for Project 2408-0047

Notice is hereby given that the City of Oak Harbor did on February 14, 2025, issue a mitigated determination of non-significance (MDNS) for an environmental checklist submitted by Nicole Mecum on behalf of SSHI LLC dba D.R. Horton, for a proposed 219 unit subdivision to be located at the southwest corner of SW 24th Avenue and SR 20.

The complete MDNS and pertinent documents may be examined during regular business hours at the office of Development Services located at City Hall, 865 SE Barrington Drive, Oak Harbor, WA 98277.

The MDNS shall be final unless otherwise modified after the comment period, and/or appeal is made by ~~March 14, 2025~~ March 24, 2025. Please note the extended appeal by date.

POSTED ON TUESDAY, FEBRUARY 25, 2025:
POSTED: City Hall Bulletin Boards
ONLINE: www.oakharbor.gov
EMAILED ON WEDNESDAY, FEBRUARY 12, 2025: legals@soundpublishing.com
PUBLISHED ON SATURDAY, FEBRUARY 15, 2025: Whidbey News Times

NOTICE OF APPLICATION

Oak Heights

APPLICATION: Preliminary Planned Residential Development 2408-0047

DHI Engineering, LLC submitted a Preliminary Planned Residential Development application and associated documents for a Proposed Preliminary Plat/PRD consisting of 153 single-family lots, and 66 duplex lots, for a total of 219 lots.

PROJECT LOCATION: The property location is Parcel Numbers: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

The plans have been circulated to City staff for review and comments. Plans for the proposal are available for review at the City of Oak Harbor's Development Services Department, located in City Hall. For more information, please call (360) 279-4510.

DETERMINATION OF COMPLETENESS: The above application was submitted on Wednesday, August 7, 2024 by DHI Engineering, LLC for Oaks Village 135 LLC property owners. The application has been determined complete for processing on Monday, September 9, 2024.

APPLICABLE REGULATIONS AND REVIEW CRITERIA: The above application will be reviewed for compliance with the Oak Harbor Comprehensive Plan (June 2016 and Nov. 2014), Municipal Code. This may not be a comprehensive list of the applicable regulations and review criteria against which this application will be reviewed.

ENVIRONMENTAL DOCUMENTS AND/OR STUDIES APPLICABLE TO THIS PROJECT: SEPA

PUBLIC COMMENT PERIOD: 9-14-2024 thru 9-27-2024

If you have questions regarding this application, please contact the Development Services Department at (360) 279-4510, between 8:00 a.m. and 4:30 p.m., Monday thru Friday.

To make written comments on this proposal, please mail or hand deliver specific comments to: City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277, **no later than 4:30 p.m. on 9-27-2024.**

To receive notification of the decision on this proposal, please include your email and send your request to the City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277. Please include Notification of Decision for application 2408-0047.

Patti O'Mahony
Permit Coordinator

Published: **Whidbey News Times**
Dated: **9-14-2024**

AFFIDAVIT OF POSTING

City of Oak Harbor
865 SE Barrington Drive
Oak Harbor, WA 98277

I, Anthony Brandolini, hereby certify that I did, on the 13 day of September 2024 post 2 notice(s), a copy of which is hereunto attached, marked "Exhibit", and by the reference made a part thereof, at the following location(s):

1. 30345 SR 20	R13210-298-2300

advertising a Notice of Application for Preliminary Planned Residential Development (2408-0047) for the proposed Oak Heights.

(Signature of person posting)

SIGNED AND ATTESTED to before me this 13 day of September 2024
by Patty Jane Mahoney.

Patti O'Mahoney
Notary Public
Print Name Patti Jane O'Mahoney
Notary Public in and for the State of Washington, Island City/County
Commission expires 5-24-2028

PATTI JANE O'MAHONY
APPOINTMENT EXPIRES
NOTARY
PUBLIC
ISLAND COUNTY
STATE OF WASHINGTON

September 9, 2024

NOTICE TO ADJACENT PROPERTY OWNERS
NOTICE OF APPLICATION

Oak Heights

APPLICATION: Preliminary Planned Residential Development 2408-0047

DHI Engineering, LLC submitted a Preliminary Planned Residential Development application and associated documents for a Proposed Preliminary Plat/PRD consisting of 153 single-family lots, and 66 duplex lots, for a total of 219 lots.

PROJECT LOCATION: Parcel Numbers: R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, R13210-364-1900.

The plans have been circulated to City staff for review and comments. Plans for the proposal are available for review at the City of Oak Harbor's Development Services Department, located in City Hall. For more information, please call (360) 279-4510.

PUBLIC COMMENT PERIOD: To make written comments on this proposal, please scan the below QR code. You can also mail or hand deliver specific comments to: City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277, **no later than 4:30 p.m. on 9-27-2024.** If you have questions regarding this proposal, please contact the Development Services Department at (360) 279-4510, between 8:00 a.m. and 4:30 p.m.

ENVIRONMENTAL DOCUMENTS AND/OR STUDIES APPLICABLE TO THIS PROJECT: SEPA

To receive notification of the decision on this proposal, please include your email and send your request to the City of Oak Harbor, Development Services Department, 865 SE Barrington Drive, Oak Harbor, WA 98277. Please include Notification of Decision for application 2408-0047.

Patti O'Mahony

Patti O'Mahony
Permit Coordinator
pomahony@oakharbor.org

MIGUEL, WESLEY & HOLLY MIQUEL
1092 WATERLOO RD
OAK HARBOR WA 98277

PARKER, FRANCES D
1104 WATERLOO RD
OAK HARBOR WA 98277

ENGEN, JAMES
30159 SR 20
OAK HARBOR WA 98277

WALLACE, LAWRENCE PETER & BONNIE RAE WALLACE
1130 WATERLOO RD
OAK HARBOR WA 98277

BARNER TRUSTEE, GENE KELLY & DIANE GRACE BARNER TRUSTEE
30236 STATE RT 20
OAK HARBOR WA 98277

NORTHWEST MANAGEMENT WA, LLC
PO BOX 8377
SPOKANE WA 99203

BARNER TRUSTEE, GENE KELLY & DIANE GRACE BARNER TRUSTEE
30236 STATE RT 20
OAK HARBOR WA 98277

BLACKTAIL INVESTMENTS LLC
PO BOX 597
DUVALL WA 98019

SSHI LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND WA 98033

SSHI LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND WA 98033

STONEHAM, THOMAS E & JACQUELYN S STONEHAM
950 SW UPLAND CT
OAK HARBOR WA 98277

FABER, DENNIS L
2052 SW DILLARD LN
OAK HARBOR WA 98277

SSHI LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND WA 98033

SSHI LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND WA 98033

SSHI LLC
11241 SLATER AVE NE, SUITE 200
KIRKLAND WA 98033

1020 FIR GROVE, LLC
PO BOX 8062
SPOKANE WA 99203

WRIGHT, DANIEL & BARBARA WRIGHT
2532 SW TALON LOOP
OAK HARBOR WA 98277

BUYS, MATTHEW K & MELANIE R BUYS
2550 SW TALON LOOP
OAK HARBOR WA 98277

STORER, SCOTT A & AMY L STORER
2566 SW TALON LOOP
OAK HARBOR WA 98277

HILT, PHIL & BONNIE SOUTHWICK
2580 SW TALON LOOP
OAK HARBOR WA 98277

PASSMORE, MARCUS M & STEPHANIE W HOLLINS PASSMORE
PO BOX 118
SULPHUR SPRINGS TX 75483

GELLER, SUZANNE & ROXANE GELLER
2620 SW TALON LOOP
OAK HARBOR WA 98277

EAGLE CREST COMMUNITY ASSN
PO BOX 1336
OAK HARBOR WA 98277

TALON COURT ASSOCIATES & NORMA ANDERS
2475 SW TALON LOOP
OAK HARBOR WA 98277

WATSON, HAYDEN H & SUSAN J WATSON
2636 SW TALON LOOP
OAK HARBOR WA 98277

ESGUERRA, ERNESTO S & VANESSA S ESGUERRA
2650 SW TALON LOOP
OAK HARBOR WA 98277

PERSONS, WESLEY AARON
2674 SW TALON LOOP
OAK HARBOR WA 98277

LENZ, MARGARET K & JEFFERY LENZ
2611 SW TALON LP
OAK HARBOR WA 98277

GUERRA, SOFIA
2601 SW TALON LOOP
OAK HARBOR WA 98277

EAGLE CREST COMMUNITY ASSN
PO BOX 1336
OAK HARBOR WA 98277

EAGLE CREST COMMUNITY ASSOC
PO BOX 1336
OAK HARBOR WA 98277

EAGLE CREST COMMUNITY ASSOC
PO BOX 1336
OAK HARBOR WA 98277

BONGANAY, LYNDON A & ELENITA H BONGANAY
915 SW EAGLE VISTA WAY
OAK HARBOR WA 98277

STEWART, ROBERT ADAM
945 SW EAGLE VISTA AVE
OAK HARBOR WA 98277

SANTOS, ROAN MANUEL & RIALEE JOY MANUEL
975 SW EAGLE VISTA AVE
OAK HARBOR WA 98277

MENDOZA, JOSEPH & JACQUELINE S MENDOZA
964 SW EAGLE VISTA AVE
OAK HARBOR WA 98277

REINHOLD, JOSEPH J & VICTORIA C REINHOLD
944 SW EAGLE VISTA AVE
OAK HARBOR WA 98277

FILARDO, STEVEN & CASSANDRA FILARDO
922 SW EAGLE VISTA AVE
OAK HARBOR WA 98277

RICKETTS, KERON & RANDIE RICKETTS
2683 ORCHARD DR #A
FALLON NV 89406

ELOPH, SUSAN LOUISE
1906 OLYMPIA WAY
OAK HARBOR WA 98277

RIVAS, DANIEL J
1907 OLYMPIA WAY
OAK HARBOR WA 98277

RIVAS, DANIEL & CHRISTINE RIVAS
1907 OLYMPIA WAY
OAK HARBOR WA 98277

TRUDEAU, DAN & SIRIKORN JITPRASERTPORN
2360 SW VISTA PARK DR
OAK HARBOR WA 98277

OLMSTEAD, MARK DEWAYNE
2330 SW VISTA PARK DR
OAK HARBOR WA 98277

SALCEDO, VICENTE D & MYRNA G SALCEDO
2316 SW VISTA PARK DR
OAK HARBOR WA 98277

TONER, WARD
1200 SW 24TH AVE
OAK HARBOR WA 98277

YUSCHALK, WILLIAM M & GLORIA M YUSCHALK
1228 SW 24TH AVE
OAK HARBOR WA 98277

GRANADE, JOHN
1256 SW 24TH AVE
OAK HARBOR WA 98277

THE HEIGHTS & LOT OWNERS
PO BOX 828
OAK HARBOR WA 98277

KOHLER, SETH ANDREW & DORI RENAE NYDAM
1282 SOUTHWEST 24TH AVE
OAK HARBOR WA 98277

STILL, RONALD S & CHRISTINE BOSWELL STIL
2331 SW VISTA PARK DR
OAK HARBOR WA 98277

MANIBUSAN, RAYMOND P & MELONIE L MANIBUSAN
2329 SW VISTA PARK DR
OAK HARBOR WA 98277

SMITH, ANDRE & MARIAH CRUZ
2321 SW VISTA PARK DR
OAK HARBOR WA 98277

THOMPSON, GEOFFREY R & JAIME L THOMPSON
994 RIDGEWAY DR
OAK HARBOR WA 98277

BUNCHER, MADISON K & ANDREW B COMLEY
225 HAWTHORNE DR
NICHOLASVILLE KY 40356

ANDERSON, TIMOTHY W & MELISSA S ANDERSON
2341 SW RIDGEWAY DR
OAK HARBOR WA 98277

HABITAT FOR HUMANITY OF ISLAND COUNTY
PO BOX 2279
OAK HARBOR WA 98277

CRAIG, JEREMY R & AMBER D CRAIG
1348 SW 24TH AVE
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

RIDGEWAY VENTURES, LLC
41 NE MIDWAY BLVD STE 101
OAK HARBOR WA 98277

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

MURPHY, SETH T
1415 COMMERCIAL AVE #101
ANACORTES WA 98221

NOTICE OF PUBLIC HEARING BEFORE
HEARING EXAMINER

Notice is hereby given that the following public hearing will be held before the City of Oak Harbor Hearing Examiner in the Council Chambers at City Hall on **Thursday, March 27, 2025 at 2:00 PM.** This will be both a physical meeting location and a virtual meeting. The hearing examiner, staff, and the public may attend virtually or in-person at City Hall, Council Chambers. The hearing may be viewed live via YouTube at www.youtube.com/cityofoakharbor. The hearing examiner will consider the following items:

Oak Heights Preliminary Plat and Planned Residential Development (PRD) Project 2408-0047:
The applicant is proposing a 219-lot subdivision including a mix of 153 single-family lots and 66 duplex lots to be located at the southwest corner of SW 24th Avenue and State Route 20 on parcels R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, and R13210-364-1900.

Anyone wishing to comment on the above item or provide other relevant information may appear in person before the Hearing Examiner at the time and place of said public hearing. Information on how to provide public comment virtually will be provided on the hearing agenda. After obtaining public input and considering the matter, the Hearing Examiner may approve or deny the proposed application. As part of any approval, conditions or limitations may be imposed.

The associated applications are available for review at the City of Oak Harbor Development Services Department at City Hall, 865 SE Barrington Drive. For more information, please contact the Permit Coordinator in the Development Services Department at 360-279-4510.

Sarah Heller, sheller@oakharbor.org
Senior Administrative Assistant - Development Services

POSTED ON FRIDAY, MARCH 7, 2025
POSTED: City Hall Bulletin Boards
POSTED: www.oakharbor.gov
EMAILED ON WEDNESDAY, MARCH 5, 2025: legals@soundpublishing.com
PUBLISHED ON SATURDAY, MARCH 8, 2025: Whidbey News Times

REMOVE 03/28/2025

NOTICE TO ADJACENT PROPERTY OWNERS OF PUBLIC HEARING
OAK HARBOR HEARING EXAMINER

You are receiving this notice because you own property within 300 feet of Parcels R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, and/or R13210-364-1900..

Notice is hereby given that the following public hearing will be held before the City of Oak Harbor Hearing Examiner in the Council Chambers at City Hall on Thursday, March 27, 2025 at 2:00 PM. This will be both a physical meeting location and a virtual meeting. The hearing examiner, staff, and the public may attend virtually or in-person at City Hall, Council Chambers. The hearing may be viewed live via YouTube at www.youtube.com/cityofoakharbor. The hearing examiner will consider the following items:

Oak Heights Preliminary Plat and Planned Residential Development (PRD) Project 2408-0047:
The applicant is proposing a 219-lot subdivision including a mix of 153 single-family lots and 66 duplex lots to be located at the southwest corner of SW 24th Avenue and State Route 20 on parcels R13210-295-1480, R13210-298-2300, R13210-364-2330, R13210-364-1730, and R13210-364-1900.

Anyone wishing to comment on the above item or provide other relevant information may appear in person before the Hearing Examiner at the time and place of said public hearing. Information on how to provide public comments virtually will be provided on the hearing agenda. After obtaining public input and considering the matter, the Hearing Examiner may approve or deny the proposed application. As part of any approval, conditions or limitations may be imposed.

The associated applications are available for review at the City of Oak Harbor Development Services Department at City Hall, 865 SE Barrington Drive. For more information, please contact the Permit Coordinator in the Development Services Department at 360-279-4510.

Sarah Heller

Sarah Heller
Sr. Administrative Assistant, Development Services
sheller@oakharbor.org