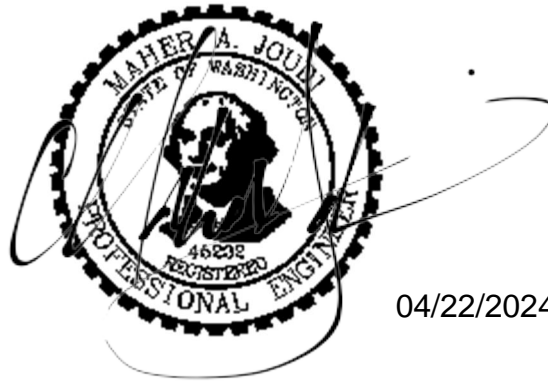


DRAINAGE REPORT

For

LORENZINI SFR LOT 1
4719 86TH AVE SE Mercer Island, WA



DRS Project No. 21071
Mercer Island Permit No. 2311-076

Applicant

Design Built Homes
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DRAINAGE REPORT

4719 89th AVE SE

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SECTION I: PROJECT OVERVIEW

GENERAL DESCRIPTION

The Site is located at 4719 86th Ave SE, Mercer Island Washington, also known as Tax Parcel Number 7598100420. Project is the development of an existing parcel into a single-family residential lot. Access to project will be along 89th Ave SE where it connects with the existing roadway facility; the second lot will be accessed from a proposed private drive located along the northern edge of the property line. The Project is required to meet the standards in the 2019 Department of Ecology Stormwater Management Manual for Western Washington. The existing residence will be removed.

PREDEVELOPED SITE CONDITIONS

The total area of the existing parcel is 28,644 s.f. (0.658 ac). The total project area is 25,649 s.f. (0.589 ac). The Site is currently developed with a single-family residence, driveways and landscaping. Vegetation consists of lawn and landscaping with evergreen and deciduous trees. There are no critical areas identified on the Site.

The Site is encompassed in one Threshold Discharge Area (TDA). This TDA consists of one Natural Discharge Area (NDA) and one Natural Discharge Locations (NDL). The topography of NDA 1 slopes from a high point in the north east corner of the site at approximately 12.2% at the eastern side of the Project to 4.4% at the western side of the Project; runoff travels southwest along the western property line exiting the Site through as sheet flow along the southwest property corner and continues southwest through the existing stormwater conveyance system in SE 47th PL. The system along SE 47th PL conveys runoff and outfalls to Lake Washington.

The USDA Web Soil Survey describes the soil on Site as Arents, Alderwood material, 6 to 15 percent slopes (AmC - 6-15% slopes), Kitsap silt loam, 2 to 8 percent slopes and Kitsap silt loam, 15 to 30 percent slopes.

DEVELOPED SITE CONDITIONS

The applicant has gained approval for development of 28,644 s.f. (0.658 ac) into a single-family residential lot through the City of Mercer Island permitting process (Project), with lot size of 14,974 s.f. (Project). The Project will contain a 20' wide private driveway. A total of 4,160 s.f. of pavement will be provided. The existing residence will be removed. A total of 5,097 CF of volume is required for flow control; accordingly, all developed runoff is being routed to a 110-foot long, 8-foot diameter tank.

The Project is located in R-9.6 zoning, which has a minimum lot area of 9,600 s.f. Maximum lot coverage is 40% with 60% required landscaping. Up to 9% of the lot area can be used for other hardscape improvements including walkways, decks, patios, but not driveways.

- Total area of land-disturbing activities = 25,649 s.f.
- Total Lot Coverage Allowed = 11,457 s.f. (40% of Site area)
- Total Hardscape Area Added = 11,146 s.f.

Applicable Minimum Requirements for the Project are determined by Flow chart (see Appendix A). The Project is defined as new development and therefore does not qualify for Redevelopment thresholds.

The Project will result in more than 2,000 s.f. of new, replaced, and new plus replaced impervious surfaces. The Project will provide 11,146 s.f. of hardscape surfaces; accordingly, all minimum requirements apply to the new and replaced hard surfaces and the land disturbed.

Minimum Requirement #1: Preparation of Stormwater Site Plans

This Stormwater Site Plan has been prepared in accordance with the 2019 Department of Ecology Stormwater Management Manual for Western Washington.

Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP)

The Project will comply with the Construction SWPP thirteen elements. An erosion control plan will be provided with each building permit.

Minimum Requirement #3: Source Control of Pollution

All known, available, and reasonable source control BMPs will be applied to this Project.

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

The natural drainage patterns will be maintained for this Project. Surface runoff will be collected for flow control and discharged to the existing system in SE 47th PL.

Minimum Requirement #5: On-site Stormwater Management

The project will apply On-site Stormwater Management BMPs in accordance with the project thresholds, standards, and lists found in Table 1-3-2 of the 2019 Department of Ecology Stormwater Management Manual for Western Washington. For the process of selecting on-site BMPs see Appendix A.

Since all nine minimum requirements are triggered by this project, On-site Stormwater Management BMPs from List #2 will be applied according to feasibility to each type of surface. The result of the BMP selection process for the Project is outlined below.

Lawn and Landscaped Areas:

- Post-Construction Soil Quality and Depth BMP T5.13 will be applied to all feasible areas in accordance with the 2019 Department of Ecology Stormwater Management Manual for Western Washington. See soil management plan, below.

Roofs:

- Full Dispersion: Not feasible as there is not enough available area that is in the native or forested condition.
- Full Infiltration: Not permitted per Mercer Island infiltration feasibility map.
- Bioretention: Not feasible due to the lack of a safe and available overflow pathway to the municipal storm system.
- Downspout Dispersion Systems: Not feasible due as there is not enough available area that is in the native or forested condition.
- Perforated Stub-out Connections: Not feasible as there is no logical location to connect to the municipal storm system with the use of gravity.

Other Hard Surfaces (Driveways/Sidewalks) .

- Full Dispersion: Not feasible as there is not enough available area that is in the native or forested condition.
- Permeable Pavement: Not permitted per Mercer Island infiltration feasibility map.
- Bioretention: Not feasible due to the lack of a safe and available overflow pathway to the municipal storm system.
- Sheet Flow Dispersion: Not feasible due as there is not enough available area that is in the native or forested condition.

Soil Management Plan

Within the limits of Site disturbance, duff and topsoil will be retained in an undisturbed state and stockpiled for later use to stabilize and amend soils throughout the Site. Post-construction soil amendment will meet the requirements of BMP T5.13 Post-Construction Soil Quality and Depth. Detailed calculation for imported soil amendment compost, if necessary, will be provided during engineering review for the Project.

Minimum Requirement #6: Runoff Treatment

Not applicable for this project. The total effective PGIS for the Project is less than 5,000 s.f. (4,414 s.f.) and therefore, according per the TDA thresholds as outlined in 1-3.4.6 of the 2019 Department of Ecology Stormwater Management Manual for Western Washington, a treatment facility is not applicable.

Minimum Requirement #7: Flow Control

A continuous simulation model, WWHM 2012, was used to analyze the pre- and post-developed runoff rates. The soil type is modeled as hydrologic soil group C for the Alderwood SCS classification as shown in Figure 4. In the pre-developed condition, the entire Site is modeled as %Forest+. In post-development conditions, the soil types are unchanged from the pre-developed conditions. Pursuant to the 2019 Department of Ecology Stormwater Management Manual for Western Washington, Volume III-Appendix C, all areas that meet the soil quality and depth requirement are to be entered

into the model as pasture rather than lawn/landscaping; accordingly, landscaped areas are modeled as Pasture for this Project. The remaining portions of the developed Site tributary to the proposed detention tank are modeled impervious as appropriate. Results of the WWHM2012 analysis are included in Appendix B.

Minimum Requirement #8: Wetlands Protection

Not applicable to this Project. There are no wetlands on the Project Site nor in the vicinity of the downstream discharge area.

Minimum Requirement #9: Operation and Maintenance

To maximize the effectiveness of the On-Site Stormwater Management BMPs the following practices should be implemented as part of an overall Site management program:

- Soil quality and depth should be established toward the end of construction and once established, should be protected from compaction, such as from large machinery, use, and from erosion.
- Soil should be planted and mulched after installation.
- Plant debris or its equivalent should be left on the soil surface to replenish organic matter.
- An Operation and Maintenance excerpt from the Manual is included at the end of this section.

PROPOSED SITE DOWNSTREAM DRAINAGE SYSTEM

Upstream Analysis

In evaluating the upstream area, we reviewed the USGS topographic survey mapping of the area, and field topographic survey, performed by D.R. STRONG Consulting Engineers Inc. The majority of upstream runoff appears to be drained away from the Site. Runoff from the parcel to the north drains toward the west and is either collected along SE 47th ST or sheet flows across neighboring parcels to the west until it is collected along 84th AVE SE. A negligible amount of stormwater may enter the Project Site over the northern property line before draining to the west, away from the Site. Runoff from parcels to the south drains southwest and away from the Site. In summary, the amount of upstream stormwater the Site is expected to receive is negligible.

Downstream Analysis

The downstream area is located within the Mercer Island Drainage Basin. The downstream area was evaluated by reviewing available resources, and by conducting a field reconnaissance. The field reconnaissance was performed on June 18, 2021 under sunny conditions and no precipitation.

The Site is encompassed in one Threshold Discharge Area (TDA). This TDA consists of one Natural Discharge Area (NDA) and one Natural Discharge Locations (NDL). The topography of NDA 1 slopes from a high point in the north east corner of the site at approximately 12.2% at the eastern side of the Project to 4.4% at the western side of the Project; runoff travels southwest along the western property line exiting the Site

through as sheet flow along the southwest property corner and continues southwest through the existing stormwater conveyance system in SE 47th PL. The system along SE 47th PL conveys runoff until it outfalls to Lake Washington.

Downstream Path of the NDA 1

Point A1+ is the natural discharge location where runoff sheet flows over the southwestern property corner of the Site. (0q)

From A1+ to Point A2+, runoff travels south as surface flow over vegetation. (0q±200q)
No flow was observed.

Point A2+, runoff enters an existing catch basin located in the loop of SE 47TH PL (±200q)

From Point A2+ to Point A3+, Runoff continues southwest as pipe flow through a 12-inch diameter concrete pipe. (±260) No flow was observed.

Point A3+, runoff from the 12-inch PVC converges with an open water course. (±260q)

From Point A3+ to Point A4+, Runoff continues west as channelized flow through. (±420) No flow was observed.

Point A4+, runoff from the channelized flow enters a 12+concrete pipe. (±420q)

From Point A4+ to Point A5+, Runoff continues southwest as pipe flow through a stormwater conveyance system. (±515) No flow was observed.

Point A5+, runoff enters a Type 2 manhole just north of Mercer Way. (±515q)

From Point A5+ to Point A6+, Runoff continues southwest as pipe flow through a 12-inch concrete pipe. (±620) No flow was observed.

From Point A6,+ stormwater outfalls from a 12-inch concrete pipe into an open watercourse (±620)

From Point A6+ to Point A7+, Runoff continues south as channel flow. (±705) No flow was observed.

From Point A7,+stormwater enters an 18-inch corrugated metal pipe (±705)

From Point A7+ to Point A8+, Runoff continues south as pipe flow through an 18-inch corrugated metal pipe. (±725) No flow was observed.

From Point A8,+stormwater enters a type 1 CB east of 84th Ave SE. (±725)

From Point A8+ to Point A9+, Runoff continues west as pipe flow through a 12-inch concrete pipe. (±740) No flow was observed.

From Point A9,+stormwater outfalls from a 12-inch concrete pipe to an open water course (±740)

From Point A9+ to Point A10+, Runoff continues west as channelized flow through an open water course. (±1320) No flow was observed.

From Point A10,+stormwater enters an 18-inch corrugated metal pipe where it travels through a series of catch basins, and open water courses until it ultimately outfalls to Lake Washington (±1320)

| NO. 3 – DETENTION TANKS AND VAULTS | | | |
|---|--|---|---|
| Maintenance Component | Defect or Problem | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Site | Trash and debris | Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping. | Trash and debris cleared from site. |
| | Noxious weeds | Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public. | Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Grass/groundcover | Grass or groundcover exceeds 18 inches in height. | Grass or groundcover mowed to a height no greater than 6 inches. |
| Tank or Vault Storage Area | Trash and debris | Any trash and debris accumulated in vault or tank (includes floatables and non-floatables). | No trash or debris in vault. |
| | Sediment accumulation | Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than ½ length of tank. | All sediment removed from storage area. |
| Tank Structure | Plugged air vent | Any blockage of the vent. | Tank or vault freely vents. |
| | Tank bent out of shape | Any part of tank/pipe is bent out of shape more than 10% of its design shape. | Tank repaired or replaced to design. |
| | Gaps between sections, damaged joints or cracks or tears in wall | A gap wider than ½-inch at the joint of any tank sections or any evidence of soil particles entering the tank at a joint or through a wall. | No water or soil entering tank through joints or walls. |
| Vault Structure | Damage to wall, frame, bottom, and/or top slab | Cracks wider than ½-inch, any evidence of soil entering the structure through cracks or qualified inspection personnel determines that the vault is not structurally sound. | Vault is sealed and structurally sound. |
| Inlet/Outlet Pipes | Sediment accumulation | Sediment filling 20% or more of the pipe. | Inlet/outlet pipes clear of sediment. |
| | Trash and debris | Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables). | No trash or debris in pipes. |
| | Damaged | Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes. | No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe. |

| NO. 3 – DETENTION TANKS AND VAULTS | | | |
|---|--------------------------------|---|---|
| Maintenance Component | Defect or Problem | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Access Manhole | Cover/lid not in place | Cover/lid is missing or only partially in place. Any open manhole requires immediate maintenance. | Manhole access covered. |
| | Locking mechanism not working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work. | Mechanism opens with proper tools. |
| | Cover/lid difficult to remove | One maintenance person cannot remove cover/lid after applying 80 lbs of lift. | Cover/lid can be removed and reinstalled by one maintenance person. |
| | Ladder rungs unsafe | Missing rungs, misalignment, rust, or cracks. | Ladder meets design standards. Allows maintenance person safe access. |
| Large access doors/plate | Damaged or difficult to open | Large access doors or plates cannot be opened/removed using normal equipment. | Replace or repair access door so it can be opened as designed. |
| | Gaps, doesn't cover completely | Large access doors not flat and/or access opening not completely covered. | Doors close flat; covers access opening completely. |
| | Lifting Rings missing, rusted | Lifting rings not capable of lifting weight of door or plate. | Lifting rings sufficient to lift or remove door or plate. |

| NO. 4 – CONTROL STRUCTURE/FLOW RESTRICTOR | | | |
|--|---------------------------------|---|---|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Structure | Trash and debris | Trash or debris of more than ½ cubic foot which is located immediately in front of the structure opening or is blocking capacity of the structure by more than 10%. | No Trash or debris blocking or potentially blocking entrance to structure. |
| | | Trash or debris in the structure that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin. | No trash or debris in the structure. |
| | | Deposits of garbage exceeding 1 cubic foot in volume. | No condition present which would attract or support the breeding of insects or rodents. |
| | Sediment | Sediment exceeds 60% of the depth from the bottom of the structure to the invert of the lowest pipe into or out of the structure or the bottom of the FROP-T section or is within 6 inches of the invert of the lowest pipe into or out of the structure or the bottom of the FROP-T section. | Sump of structure contains no sediment. |
| | Damage to frame and/or top slab | Corner of frame extends more than ¾ inch past curb face into the street (If applicable). | Frame is even with curb. |
| | | Top slab has holes larger than 2 square inches or cracks wider than ¼ inch. | Top slab is free of holes and cracks. |
| | | Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab. | Frame is sitting flush on top slab. |
| | Cracks in walls or bottom | Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering structure through cracks, or maintenance person judges that structure is unsound. | Structure is sealed and structurally sound. |
| | | Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering structure through cracks. | No cracks more than ¼ inch wide at the joint of inlet/outlet pipe. |
| | Settlement/ misalignment | Structure has settled more than 1 inch or has rotated more than 2 inches out of alignment. | Basin replaced or repaired to design standards. |
| | Damaged pipe joints | Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the structure at the joint of the inlet/outlet pipes. | No cracks more than ¼-inch wide at the joint of inlet/outlet pipes. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Ladder rungs missing or unsafe | Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges. | Ladder meets design standards and allows maintenance person safe access. |
| FROP-T Section | Damage | T section is not securely attached to structure wall and outlet pipe structure should support at least 1,000 lbs of up or down pressure. | T section securely attached to wall and outlet pipe. |
| | | Structure is not in upright position (allow up to 10% from plumb). | Structure in correct position. |
| | | Connections to outlet pipe are not watertight or show signs of deteriorated grout. | Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. |
| | | Any holes other than designed holes in the structure. | Structure has no holes other than designed holes. |

| NO. 4 – CONTROL STRUCTURE/FLOW RESTRICTOR | | | |
|--|-------------------------------|---|---|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Cleanout Gate | Damaged or missing | Cleanout gate is missing. | Replace cleanout gate. |
| | | Cleanout gate is not watertight. | Gate is watertight and works as designed. |
| | | Gate cannot be moved up and down by one maintenance person. | Gate moves up and down easily and is watertight. |
| | | Chain/rod leading to gate is missing or damaged. | Chain is in place and works as designed. |
| Orifice Plate | Damaged or missing | Control device is not working properly due to missing, out of place, or bent orifice plate. | Plate is in place and works as designed. |
| | Obstructions | Any trash, debris, sediment, or vegetation blocking the plate. | Plate is free of all obstructions and works as designed. |
| Overflow Pipe | Obstructions | Any trash or debris blocking (or having the potential of blocking) the overflow pipe. | Pipe is free of all obstructions and works as designed. |
| | Deformed or damaged lip | Lip of overflow pipe is bent or deformed. | Overflow pipe does not allow overflow at an elevation lower than design |
| Inlet/Outlet Pipe | Sediment accumulation | Sediment filling 20% or more of the pipe. | Inlet/outlet pipes clear of sediment. |
| | Trash and debris | Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables). | No trash or debris in pipes. |
| | Damaged | Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes. | No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe. |
| Metal Grates (If Applicable) | Unsafe grate opening | Grate with opening wider than 7/8 inch. | Grate opening meets design standards. |
| | Trash and debris | Trash and debris that is blocking more than 20% of grate surface. | Grate free of trash and debris. footnote to guidelines for disposal |
| | Damaged or missing | Grate missing or broken member(s) of the grate. | Grate is in place and meets design standards. |
| Manhole Cover/Lid | Cover/lid not in place | Cover/lid is missing or only partially in place. Any open structure requires urgent maintenance. | Cover/lid protects opening to structure. |
| | Locking mechanism Not Working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work. | Mechanism opens with proper tools. |
| | Cover/lid difficult to Remove | One maintenance person cannot remove cover/lid after applying 80 lbs. of lift. | Cover/lid can be removed and reinstalled by one maintenance person. |

| NO. 5 – CATCH BASINS AND MANHOLES | | | |
|--|---------------------------------|---|---|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Structure | Sediment | Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin. | Sump of catch basin contains no sediment. |
| | Trash and debris | Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%. | No Trash or debris blocking or potentially blocking entrance to catch basin. |
| | | Trash or debris in the catch basin that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin. | No trash or debris in the catch basin. |
| | | Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane). | No dead animals or vegetation present within catch basin. |
| | | Deposits of garbage exceeding 1 cubic foot in volume. | No condition present which would attract or support the breeding of insects or rodents. |
| | Damage to frame and/or top slab | Corner of frame extends more than ¾ inch past curb face into the street (If applicable). | Frame is even with curb. |
| | | Top slab has holes larger than 2 square inches or cracks wider than ¼ inch. | Top slab is free of holes and cracks. |
| | | Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab. | Frame is sitting flush on top slab. |
| | Cracks in walls or bottom | Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound. | Catch basin is sealed and is structurally sound. |
| | | Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks. | No cracks more than ¼ inch wide at the joint of inlet/outlet pipe. |
| | Settlement/ misalignment | Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment. | Basin replaced or repaired to design standards. |
| | Damaged pipe joints | Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes. | No cracks more than ¼-inch wide at the joint of inlet/outlet pipes. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Inlet/Outlet Pipe | Sediment accumulation | Sediment filling 20% or more of the pipe. |
| Trash and debris | | Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables). | No trash or debris in pipes. |
| Damaged | | Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes. | No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe. |

| NO. 5 – CATCH BASINS AND MANHOLES | | | |
|--|-------------------------------|---|---|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Metal Grates (Catch Basins) | Unsafe grate opening | Grate with opening wider than $\frac{7}{8}$ inch. | Grate opening meets design standards. |
| | Trash and debris | Trash and debris that is blocking more than 20% of grate surface. | Grate free of trash and debris. footnote to guidelines for disposal |
| | Damaged or missing | Grate missing or broken member(s) of the grate. Any open structure requires urgent maintenance. | Grate is in place and meets design standards. |
| Manhole Cover/Lid | Cover/lid not in place | Cover/lid is missing or only partially in place. Any open structure requires urgent maintenance. | Cover/lid protects opening to structure. |
| | Locking mechanism Not Working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work. | Mechanism opens with proper tools. |
| | Cover/lid difficult to Remove | One maintenance person cannot remove cover/lid after applying 80 lbs. of lift. | Cover/lid can be removed and reinstalled by one maintenance person. |

| NO. 6 – CONVEYANCE PIPES AND DITCHES | | | |
|---|---|---|---|
| Maintenance Component | Defect or Problem | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Pipes | Sediment & debris accumulation | Accumulated sediment or debris that exceeds 20% of the diameter of the pipe. | Water flows freely through pipes. |
| | Vegetation/roots | Vegetation/roots that reduce free movement of water through pipes. | Water flows freely through pipes. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Damage to protective coating or corrosion | Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe. | Pipe repaired or replaced. |
| | Damaged | Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe. | Pipe repaired or replaced. |
| Ditches | Trash and debris | Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes. | Trash and debris cleared from ditches. |
| | Sediment accumulation | Accumulated sediment that exceeds 20% of the design depth. | Ditch cleaned/flushed of all sediment and debris so that it matches design. |
| | Noxious weeds | Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public. | Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Vegetation | Vegetation that reduces free movement of water through ditches. | Water flows freely through ditches. |
| | Erosion damage to slopes | Any erosion observed on a ditch slope. | Slopes are not eroding. |
| | Rock lining out of place or missing (If Applicable) | One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil. | Replace rocks to design standards. |

| NO. 10 – GATES/BOLLARDS/ACCESS BARRIERS | | | |
|--|--------------------------------------|---|---|
| Maintenance Component | Defect or Problem | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Chain Link Fencing Gate | Damaged or missing members | Missing gate. | Gates in place. |
| | | Broken or missing hinges such that gate cannot be easily opened and closed by a maintenance person. | Hinges intact and lubed. Gate is working freely. |
| | | Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment. | Gate is aligned and vertical. |
| | | Missing stretcher bar, stretcher bands, and ties. | Stretcher bar, bands, and ties in place. |
| | Locking mechanism does not lock gate | Locking device missing, no-functioning or does not link to all parts. | Locking mechanism prevents opening of gate. |
| | Openings in fabric | Openings in fabric are such that an 8-inch diameter ball could fit through. | Fabric mesh openings within 50% of grid size. |
| Bar Gate | Damaged or missing cross bar | Cross bar does not swing open or closed, is missing or is bent to where it does not prevent vehicle access. | Cross bar swings fully open and closed and prevents vehicle access. |
| | Locking mechanism does not lock gate | Locking device missing, no-functioning or does not link to all parts. | Locking mechanism prevents opening of gate. |
| | Support post damaged | Support post does not hold cross bar up. | Cross bar held up preventing vehicle access into facility. |
| Bollards | Damaged or missing | Bollard broken, missing, does not fit into support hole or hinge broken or missing. | No access for motorized vehicles to get into facility. |
| | Does not lock | Locking assembly or lock missing or cannot be attached to lock bollard in place. | No access for motorized vehicles to get into facility. |
| Boulders | Dislodged | Boulders not located to prevent motorized vehicle access. | No access for motorized vehicles to get into facility. |
| | Circumvented | Motorized vehicles going around or between boulders. | No access for motorized vehicles to get into facility. |

| NO. 11 – GROUNDS (LANDSCAPING) | | | |
|---------------------------------------|----------------------------|---|---|
| Maintenance Component | Defect or Problem | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Site | Trash or litter | Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping. | Trash and debris cleared from site. |
| | Noxious weeds | Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public. | Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Grass/groundcover | Grass or groundcover exceeds 18 inches in height. | Grass or groundcover mowed to a height no greater than 6 inches. |
| Trees and Shrubs | Hazard | Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. A hazard tree identified by a qualified arborist must be removed as soon as possible. | No hazard trees in facility. |
| | Damaged | Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub. | Trees and shrubs with less than 5% of total foliage with split or broken limbs. |
| | | Trees or shrubs that have been blown down or knocked over. | No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury. |
| | | Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots. | Tree or shrub in place and adequately supported; dead or diseased trees removed. |

| NO. 12 – ACCESS ROADS | | | |
|--|---|--|---|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Site | Trash and debris | Trash and debris exceeds 1 cubic foot per 1,000 square feet (i.e., trash and debris would fill up one standards size garbage can). | Roadway drivable by maintenance vehicles. |
| | | Debris which could damage vehicle tires or prohibit use of road. | Roadway drivable by maintenance vehicles. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Blocked roadway | Any obstruction which reduces clearance above road surface to less than 14 feet. | Roadway overhead clear to 14 feet high. |
| Any obstruction restricting the access to a 10- to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width. | | At least 12-foot of width on access road. | |
| Road Surface | Erosion, settlement, potholes, soft spots, ruts | Any surface defect which hinders or prevents maintenance access. | Road drivable by maintenance vehicles. |
| | Vegetation on road surface | Trees or other vegetation prevent access to facility by maintenance vehicles. | Maintenance vehicles can access facility. |
| Shoulders and Ditches | Erosion | Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep. | Shoulder free of erosion and matching the surrounding road. |
| | Weeds and brush | Weeds and brush exceed 18 inches in height or hinder maintenance access. | Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access. |
| Modular Grid Pavement | Contaminants and pollution | Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Damaged or missing | Access surface compacted because of broken or missing modular block. | Access road surface restored so road infiltrates. |

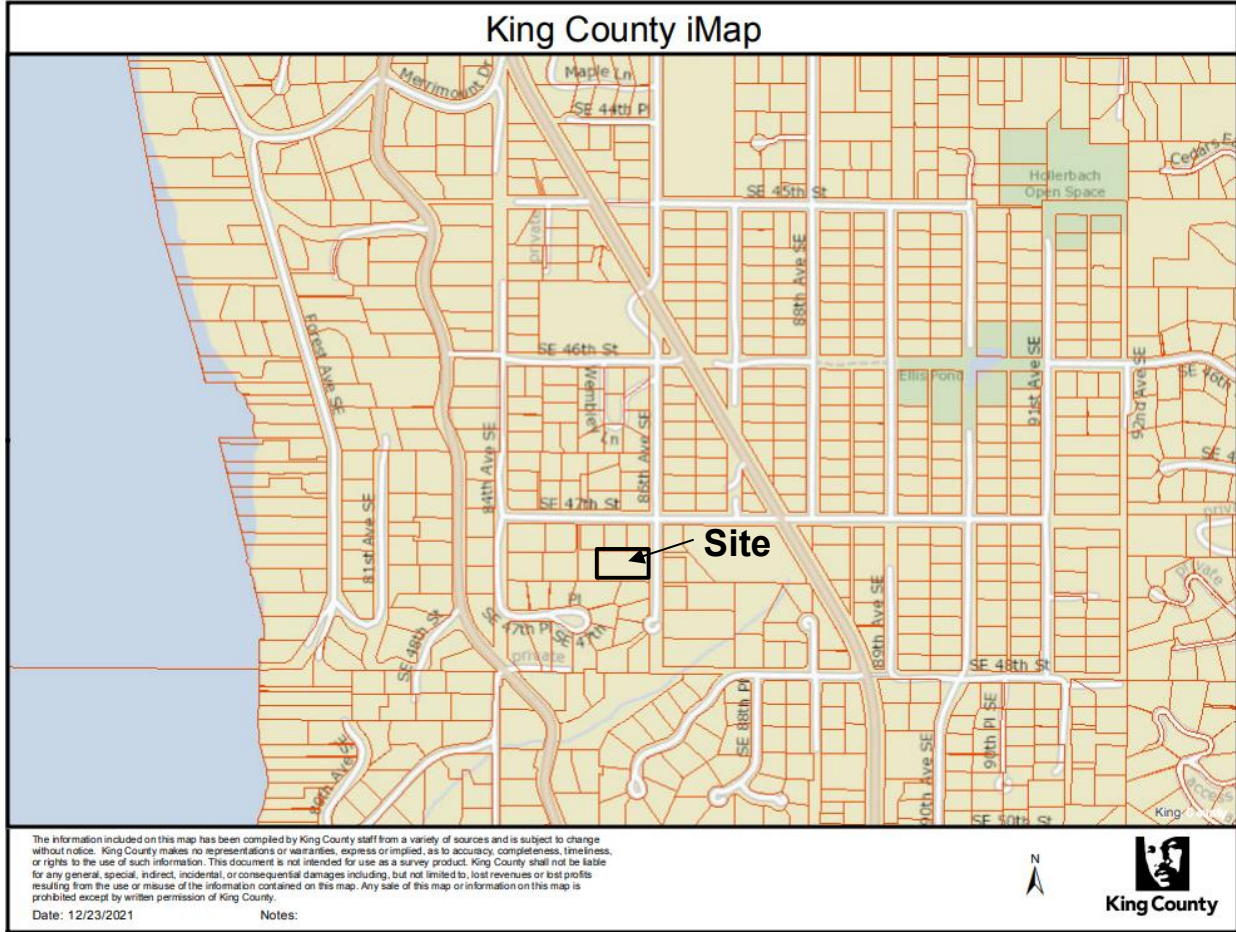
| NO. 21 – STORMFILTER (CARTRIDGE TYPE) | | | |
|--|--|--|---|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| Facility | Documentation | Update facility inspection record after each inspection. | Maintenance records are up to date. |
| | | Provide certification of replaced filter media. | Filter media is certified to meet Stormfilter® specifications. |
| Site | Trash and debris | Any trash or debris which impairs the function of the facility. | Trash and debris removed from facility. |
| | Contaminants and pollution | Any evidence of contaminants or pollution such as oils, gasoline, concrete slurries or paint. | Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film. |
| | Life cycle | System has not been inspected for three years. | Facility is re-inspected and any needed maintenance performed. |
| Vault Treatment Area | Sediment on vault floor | Greater than 2 inches of sediment. | Vault is free of sediment. |
| | Sediment on top of cartridges | Greater than ½ inch of sediment. | Vault is free of sediment. |
| | Multiple scum lines above top of cartridges | Thick or multiple scum lines above top of cartridges. Probably due to plugged canisters or underdrain manifold. | Cause of plugging corrected, canisters replaced if necessary. |
| Vault Structure | Damage to wall, Frame, Bottom, and/or Top Slab | Cracks wider than ½-inch and any evidence of soil particles entering the structure through the cracks, or qualified inspection personnel determines the vault is not structurally sound. | Vault replaced or repaired to design specifications. |
| | Baffles damaged | Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person. | Repair or replace baffles to specification. |
| Filter Media | Standing water in vault | 9 inches or greater of static water in the vault for more than 24 hours following a rain event and/or overflow occurs frequently. Probably due to plugged filter media, underdrain or outlet pipe. | No standing water in vault 24 hours after a rain event. |
| | Short circuiting | Flows do not properly enter filter cartridges. | Flows go through filter media. |
| Underdrains and Clean-Outs | Sediment/debris | Underdrains or clean-outs partially plugged or filled with sediment and/or debris. | Underdrains and clean-outs free of sediment and debris. |
| Inlet/Outlet Pipe | Sediment accumulation | Sediment filling 20% or more of the pipe. | Inlet/outlet pipes clear of sediment. |
| | Trash and debris | Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables). | No trash or debris in pipes. |
| | Damaged | Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes. | No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe. |
| Access Manhole | Cover/lid not in place | Cover/lid is missing or only partially in place. Any open manhole requires immediate maintenance. | Manhole access covered. |
| | Locking mechanism not working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work. | Mechanism opens with proper tools. |
| | Cover/lid difficult to remove | One maintenance person cannot remove cover/lid after applying 80 lbs of lift. | Cover/lid can be removed and reinstalled by one maintenance person. |

| NO. 21 – STORMFILTER (CARTRIDGE TYPE) | | | |
|--|--------------------------------|--|--|
| Maintenance Component | Defect or Problem | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
| | Ladder rungs unsafe | Missing rungs, misalignment, rust, or cracks. | Ladder meets design standards. Allows maintenance person safe access. |
| Large access doors/plate | Damaged or difficult to open | Large access doors or plates cannot be opened/removed using normal equipment. | Replace or repair access door so it can be opened as designed. |
| | Gaps, doesn't cover completely | Large access doors not flat and/or access opening not completely covered. | Doors close flat and cover access opening completely. |
| | Lifting Rings missing, rusted | Lifting rings not capable of lifting weight of door or plate. | Lifting rings sufficient to lift or remove door or plate. |
| Inspection | Frequency | <p>Maintenance conditions are site-specific, depending on pollutant loading.</p> <p>FIRST YEAR POST CONSTRUCTION: Monthly during wet season, every other month during dry season</p> <p>FOLLOWING FIRST YEAR: Continue monthly until site-specific frequency is established, then follow that schedule</p> <p>AT A MINIMUM, FOLLOWING FIRST YEAR: Annually (or quarterly if used as primary treatment) and following significant storms.</p> | Inspect Stormfilter facility for any maintenance deficiencies; maintain or replace as required per established site-specific schedule and manufacturer's requirements. |

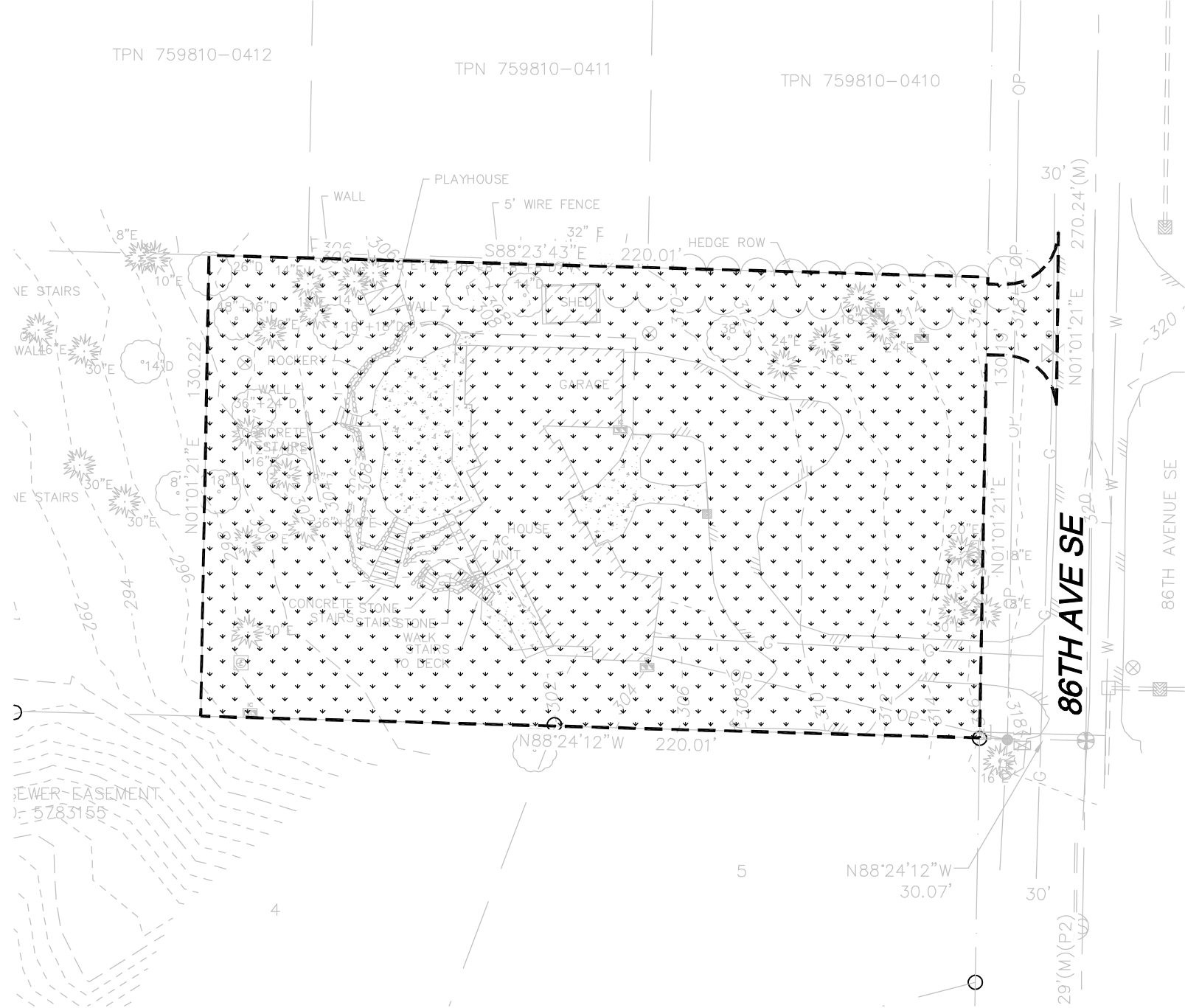
SECTION II: SITE MAPS

FIGURE 1 VICINITY MAP

4719 86TH AVE SE, MERCER ISLAND, WA




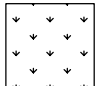
**FIGURE 2
PREDEVELOPED FIGURE**

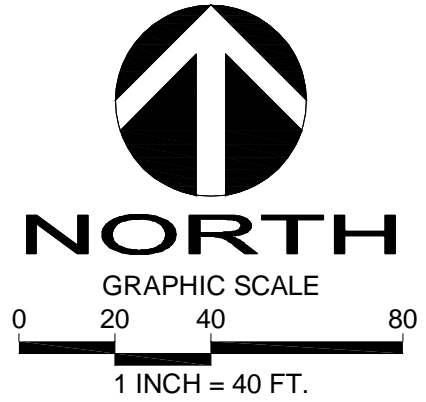


AREA BREAKDOWN

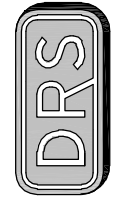
TOTAL SITE/PROJECT AREA: 29,138 S.F. (0.669 ACRES)

LEGEND

-  SITE/PROJECT BOUNDARY
-  C, FOREST, MODERATE 29,138 S.F. (0.669 ACRES)



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PREDEVELOPED FIGURE

SHORT PLAT
LORENZINI SP
MERCER ISLAND, WA

DRAFTED BY: JSE
DESIGNED BY: JSE
PROJECT ENGINEER: MAJ
DATE: 04.01.24
PROJECT NO.: 21071

FIGURE: 02




**FIGURE 3
DEVELOPED FIGURE**

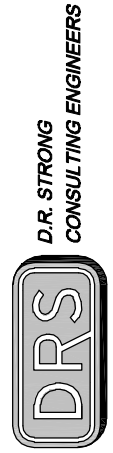
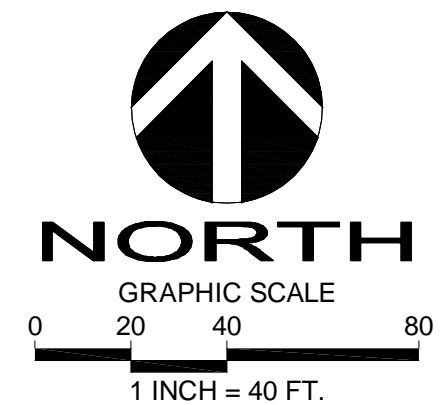


AREA BREAKDOWN

TOTAL SITE/PROJECT AREA: 29,138 S.F. (0.669 ACRES)

LEGEND

| | | |
|---|-----------------------|---------------------------|
|  | SITE/PROJECT BOUNDARY | |
|  | LOT AREA (PROPOSED): | 28,644 S.F. (0.658 ACRES) |
| | PERVIOUS: | 17,187 S.F. (0.395 ACRES) |
| | IMPERVIOUS: | 11,457 S.F. (0.263 ACRES) |
|  | ROW: | 494 S.F. (0.011 ACRES) |
| | PERVIOUS: | 0 S.F. (0.000 ACRES) |
| | IMPERVIOUS: | 494 S.F. (0.011 ACRES) |



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DEVELOPED FIGURE

SHORT PLAT
LORENZINI SP
MERCER ISLAND, WA

DRAFTED BY: JSE
DESIGNED BY: JSE
PROJECT ENGINEER: MAJ
DATE: 04.01.24
PROJECT NO.: 21071

FIGURE: 03

FIGURE 4 SOILS MAP



King County Area, Washington

AmC—Arents, Alderwood material, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1hmsq
Elevation: 50 to 660 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Arents, alderwood material, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arents, Alderwood Material

Setting

Landform: Till plains
Parent material: Basal till

Typical profile

H1 - 0 to 26 inches: gravelly sandy loam
H2 - 26 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: 20 to 40 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B/D
Hydric soil rating: No

Data Source Information

Soil Survey Area: King County Area, Washington
Survey Area Data: Version 17, Aug 23, 2021

King County Area, Washington

KpB—Kitsap silt loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1hmt9
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 24 inches: silt loam
H3 - 24 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Soils with Few Limitations (G002XN502WA)
Other vegetative classification: Soils with Few Limitations (G002XN502WA)
Hydric soil rating: No

Minor Components

Alderwood

Percent of map unit: 10 percent

Hydric soil rating: No

Bellingham

Percent of map unit: 3 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Seattle

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Tukwila

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: King County Area, Washington

Survey Area Data: Version 17, Aug 23, 2021

King County Area, Washington

KpD—Kitsap silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1hmtc
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 40 inches: silt loam
H3 - 40 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Sloping to Steep Soils (G002XN702WA)
Other vegetative classification: Sloping to Steep Soils (G002XN702WA)
Hydric soil rating: No

Minor Components

Bellingham

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Seattle

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Tukwila

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

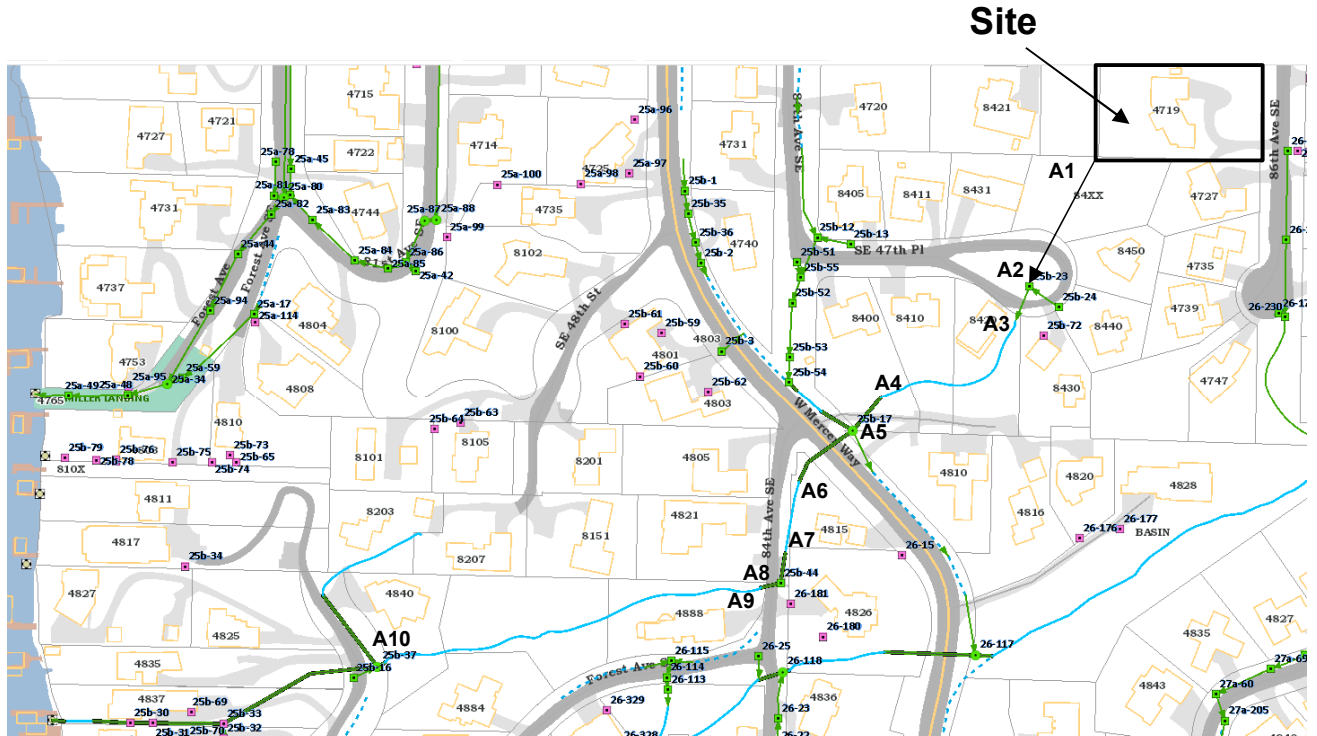
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: King County Area, Washington

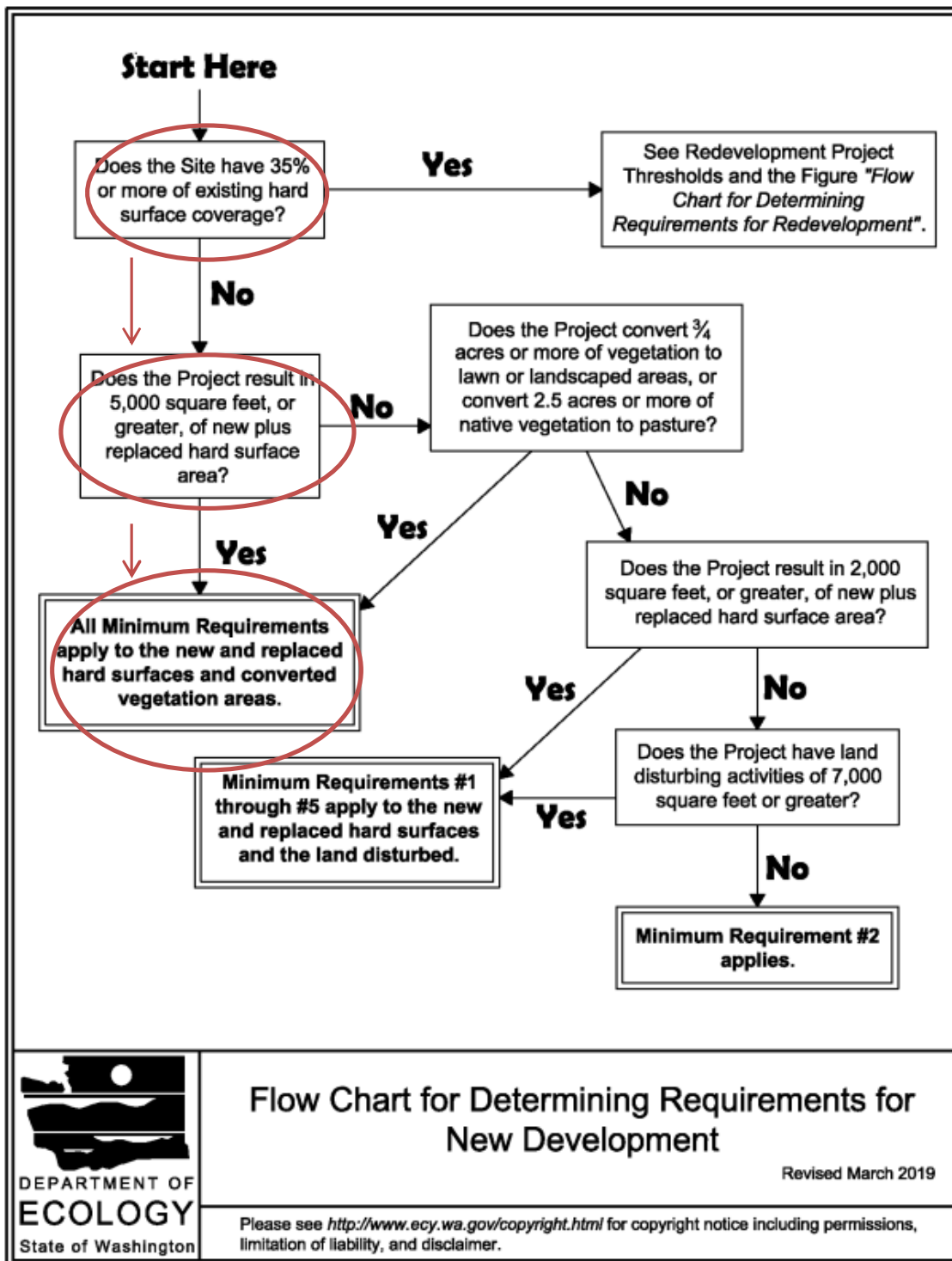
Survey Area Data: Version 17, Aug 23, 2021

**FIGURE 5
DOWNSTREAM MAP**



APPENDICES

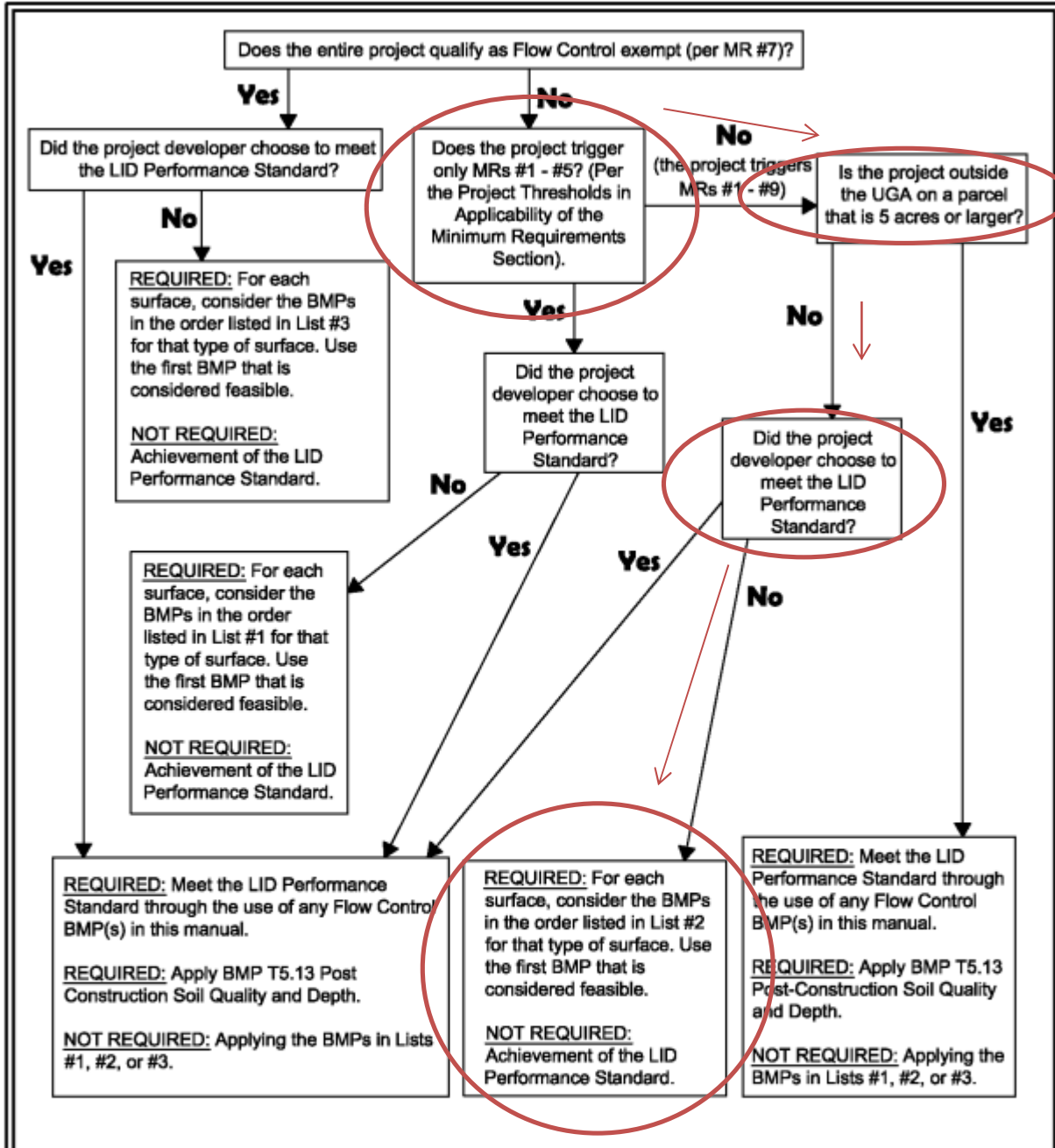
APPENDIX A FLOW CHART



Flow Chart for Determining Requirements for New Development

Revised March 2019

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Flow Chart for Determining MR #5 Requirements

Revised March 2019

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APPENDIX B
WWHM Report

WWHM2012
PROJECT REPORT

General Model Information

WWHM2012 Project Name: pipe
Site Name: Lorenzini
Site Address:
City:
Report Date: 4/8/2024
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.000
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 C, Forest, Mod | acre 0.638 |
| Pervious Total | 0.638 |
| Impervious Land Use | acre |
| Impervious Total | 0 |
| Basin Total | 0.638 |

Mitigated Land Use

Basin 1

| | |
|---------------------|-------|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | acre |
| C, Pasture, Flat | 0.364 |
| Pervious Total | 0.364 |
| Impervious Land Use | acre |
| ROOF TOPS FLAT | 0.178 |
| ROADS FLAT | 0.09 |
| SIDEWALKS FLAT | 0.006 |
| Impervious Total | 0.274 |
| Basin Total | 0.638 |

Routing Elements
Predeveloped Routing

Mitigated Routing

Tank 1

Dimensions
 Depth: 8 ft.
 Tank Type: Circular
 Diameter: 8 ft.
 Length: 109 ft.
 Discharge Structure
 Riser Height: 7 ft.
 Riser Diameter: 18 in.
 Orifice 1 Diameter: 0.410 in. Elevation:0 ft.
 Orifice 2 Diameter: 0.670 in. Elevation:4.7 ft.
 Orifice 3 Diameter: 0.430 in. Elevation:6 ft.
 Element Flows To:
 Outlet 1 Outlet 2

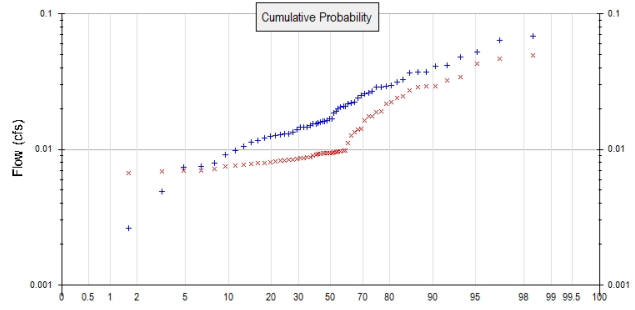
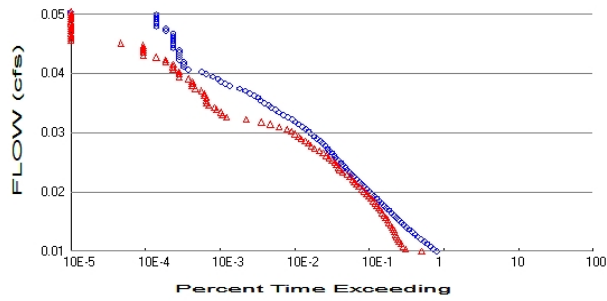
Tank Hydraulic Table

| Stage(feet) | Area(ac.) | Volume(ac-ft.) | Discharge(cfs) | Infilt(cfs) |
|-------------|-----------|----------------|----------------|-------------|
| 0.0000 | 0.000000 | 0.000000 | 0.000 | 0.000 |
| 0.0889 | 0.004197 | 0.000249 | 0.001 | 0.000 |
| 0.1778 | 0.005902 | 0.000703 | 0.001 | 0.000 |
| 0.2667 | 0.007187 | 0.001286 | 0.002 | 0.000 |
| 0.3556 | 0.008251 | 0.001974 | 0.002 | 0.000 |
| 0.4444 | 0.009171 | 0.002749 | 0.003 | 0.000 |
| 0.5333 | 0.009987 | 0.003601 | 0.003 | 0.000 |
| 0.6222 | 0.010723 | 0.004522 | 0.003 | 0.000 |
| 0.7111 | 0.011394 | 0.005505 | 0.003 | 0.000 |
| 0.8000 | 0.012011 | 0.006546 | 0.004 | 0.000 |
| 0.8889 | 0.012582 | 0.007639 | 0.004 | 0.000 |
| 0.9778 | 0.013114 | 0.008782 | 0.004 | 0.000 |
| 1.0667 | 0.013610 | 0.009970 | 0.004 | 0.000 |
| 1.1556 | 0.014075 | 0.011200 | 0.004 | 0.000 |
| 1.2444 | 0.014511 | 0.012471 | 0.005 | 0.000 |
| 1.3333 | 0.014921 | 0.013779 | 0.005 | 0.000 |
| 1.4222 | 0.015307 | 0.015123 | 0.005 | 0.000 |
| 1.5111 | 0.015671 | 0.016500 | 0.005 | 0.000 |
| 1.6000 | 0.016015 | 0.017908 | 0.005 | 0.000 |
| 1.6889 | 0.016339 | 0.019346 | 0.005 | 0.000 |
| 1.7778 | 0.016645 | 0.020812 | 0.006 | 0.000 |
| 1.8667 | 0.016934 | 0.022305 | 0.006 | 0.000 |
| 1.9556 | 0.017206 | 0.023822 | 0.006 | 0.000 |
| 2.0444 | 0.017463 | 0.025363 | 0.006 | 0.000 |
| 2.1333 | 0.017705 | 0.026926 | 0.006 | 0.000 |
| 2.2222 | 0.017933 | 0.028510 | 0.006 | 0.000 |
| 2.3111 | 0.018146 | 0.030114 | 0.006 | 0.000 |
| 2.4000 | 0.018347 | 0.031736 | 0.007 | 0.000 |
| 2.4889 | 0.018535 | 0.033375 | 0.007 | 0.000 |
| 2.5778 | 0.018710 | 0.035031 | 0.007 | 0.000 |
| 2.6667 | 0.018873 | 0.036701 | 0.007 | 0.000 |
| 2.7556 | 0.019025 | 0.038386 | 0.007 | 0.000 |
| 2.8444 | 0.019165 | 0.040083 | 0.007 | 0.000 |
| 2.9333 | 0.019293 | 0.041792 | 0.007 | 0.000 |
| 3.0222 | 0.019411 | 0.043513 | 0.007 | 0.000 |
| 3.1111 | 0.019518 | 0.045243 | 0.008 | 0.000 |

| | | | | |
|--------|----------|----------|-------|-------|
| 3.2000 | 0.019614 | 0.046982 | 0.008 | 0.000 |
| 3.2889 | 0.019699 | 0.048730 | 0.008 | 0.000 |
| 3.3778 | 0.019775 | 0.050484 | 0.008 | 0.000 |
| 3.4667 | 0.019840 | 0.052245 | 0.008 | 0.000 |
| 3.5556 | 0.019894 | 0.054011 | 0.008 | 0.000 |
| 3.6444 | 0.019939 | 0.055781 | 0.008 | 0.000 |
| 3.7333 | 0.019974 | 0.057555 | 0.008 | 0.000 |
| 3.8222 | 0.019999 | 0.059332 | 0.008 | 0.000 |
| 3.9111 | 0.020013 | 0.061110 | 0.009 | 0.000 |
| 4.0000 | 0.020018 | 0.062890 | 0.009 | 0.000 |
| 4.0889 | 0.020013 | 0.064669 | 0.009 | 0.000 |
| 4.1778 | 0.019999 | 0.066447 | 0.009 | 0.000 |
| 4.2667 | 0.019974 | 0.068224 | 0.009 | 0.000 |
| 4.3556 | 0.019939 | 0.069998 | 0.009 | 0.000 |
| 4.4444 | 0.019894 | 0.071768 | 0.009 | 0.000 |
| 4.5333 | 0.019840 | 0.073534 | 0.009 | 0.000 |
| 4.6222 | 0.019775 | 0.075295 | 0.009 | 0.000 |
| 4.7111 | 0.019699 | 0.077049 | 0.011 | 0.000 |
| 4.8000 | 0.019614 | 0.078797 | 0.013 | 0.000 |
| 4.8889 | 0.019518 | 0.080536 | 0.015 | 0.000 |
| 4.9778 | 0.019411 | 0.082266 | 0.016 | 0.000 |
| 5.0667 | 0.019293 | 0.083987 | 0.017 | 0.000 |
| 5.1556 | 0.019165 | 0.085696 | 0.018 | 0.000 |
| 5.2444 | 0.019025 | 0.087393 | 0.019 | 0.000 |
| 5.3333 | 0.018873 | 0.089078 | 0.020 | 0.000 |
| 5.4222 | 0.018710 | 0.090748 | 0.021 | 0.000 |
| 5.5111 | 0.018535 | 0.092404 | 0.021 | 0.000 |
| 5.6000 | 0.018347 | 0.094043 | 0.022 | 0.000 |
| 5.6889 | 0.018146 | 0.095665 | 0.023 | 0.000 |
| 5.7778 | 0.017933 | 0.097269 | 0.023 | 0.000 |
| 5.8667 | 0.017705 | 0.098853 | 0.024 | 0.000 |
| 5.9556 | 0.017463 | 0.100416 | 0.024 | 0.000 |
| 6.0444 | 0.017206 | 0.101957 | 0.026 | 0.000 |
| 6.1333 | 0.016934 | 0.103474 | 0.027 | 0.000 |
| 6.2222 | 0.016645 | 0.104967 | 0.028 | 0.000 |
| 6.3111 | 0.016339 | 0.106433 | 0.029 | 0.000 |
| 6.4000 | 0.016015 | 0.107871 | 0.030 | 0.000 |
| 6.4889 | 0.015671 | 0.109279 | 0.031 | 0.000 |
| 6.5778 | 0.015307 | 0.110656 | 0.032 | 0.000 |
| 6.6667 | 0.014921 | 0.112000 | 0.033 | 0.000 |
| 6.7556 | 0.014511 | 0.113308 | 0.033 | 0.000 |
| 6.8444 | 0.014075 | 0.114579 | 0.034 | 0.000 |
| 6.9333 | 0.013610 | 0.115809 | 0.035 | 0.000 |
| 7.0222 | 0.013114 | 0.116997 | 0.088 | 0.000 |
| 7.1111 | 0.012582 | 0.118140 | 0.624 | 0.000 |
| 7.2000 | 0.012011 | 0.119233 | 1.441 | 0.000 |
| 7.2889 | 0.011394 | 0.120274 | 2.412 | 0.000 |
| 7.3778 | 0.010723 | 0.121257 | 3.424 | 0.000 |
| 7.4667 | 0.009987 | 0.122178 | 4.364 | 0.000 |
| 7.5556 | 0.009171 | 0.123030 | 5.136 | 0.000 |
| 7.6444 | 0.008251 | 0.123805 | 5.689 | 0.000 |
| 7.7333 | 0.007187 | 0.124493 | 6.054 | 0.000 |
| 7.8222 | 0.005902 | 0.125076 | 6.467 | 0.000 |
| 7.9111 | 0.004197 | 0.125530 | 6.806 | 0.000 |
| 8.0000 | 0.000000 | 0.125779 | 7.128 | 0.000 |
| 8.0889 | 0.000000 | 0.000000 | 7.437 | 0.000 |

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0.638
 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.364
 Total Impervious Area: 0.274

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| Return Period | Flow(cfs) |
|---------------|-----------|
| 2 year | 0.018997 |
| 5 year | 0.031128 |
| 10 year | 0.038928 |
| 25 year | 0.048206 |
| 50 year | 0.054633 |
| 100 year | 0.060636 |

Flow Frequency Return Periods for Mitigated. POC #1

| Return Period | Flow(cfs) |
|---------------|-----------|
| 2 year | 0.011552 |
| 5 year | 0.019037 |
| 10 year | 0.025542 |
| 25 year | 0.035857 |
| 50 year | 0.045291 |
| 100 year | 0.056432 |

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| Year | Predeveloped | Mitigated |
|------|--------------|-----------|
| 1949 | 0.022 | 0.008 |
| 1950 | 0.026 | 0.014 |
| 1951 | 0.042 | 0.049 |
| 1952 | 0.013 | 0.007 |
| 1953 | 0.011 | 0.008 |
| 1954 | 0.016 | 0.009 |
| 1955 | 0.026 | 0.009 |
| 1956 | 0.021 | 0.019 |
| 1957 | 0.017 | 0.009 |
| 1958 | 0.019 | 0.009 |

| | | |
|------|-------|-------|
| 1959 | 0.016 | 0.008 |
| 1960 | 0.029 | 0.027 |
| 1961 | 0.016 | 0.009 |
| 1962 | 0.010 | 0.007 |
| 1963 | 0.013 | 0.009 |
| 1964 | 0.019 | 0.009 |
| 1965 | 0.013 | 0.013 |
| 1966 | 0.012 | 0.008 |
| 1967 | 0.029 | 0.009 |
| 1968 | 0.016 | 0.009 |
| 1969 | 0.016 | 0.008 |
| 1970 | 0.013 | 0.009 |
| 1971 | 0.014 | 0.010 |
| 1972 | 0.032 | 0.024 |
| 1973 | 0.014 | 0.014 |
| 1974 | 0.015 | 0.010 |
| 1975 | 0.022 | 0.009 |
| 1976 | 0.015 | 0.009 |
| 1977 | 0.002 | 0.007 |
| 1978 | 0.013 | 0.010 |
| 1979 | 0.008 | 0.007 |
| 1980 | 0.037 | 0.025 |
| 1981 | 0.012 | 0.009 |
| 1982 | 0.024 | 0.019 |
| 1983 | 0.021 | 0.010 |
| 1984 | 0.012 | 0.008 |
| 1985 | 0.007 | 0.008 |
| 1986 | 0.033 | 0.018 |
| 1987 | 0.029 | 0.022 |
| 1988 | 0.011 | 0.008 |
| 1989 | 0.008 | 0.007 |
| 1990 | 0.069 | 0.029 |
| 1991 | 0.036 | 0.029 |
| 1992 | 0.015 | 0.010 |
| 1993 | 0.015 | 0.008 |
| 1994 | 0.005 | 0.007 |
| 1995 | 0.021 | 0.011 |
| 1996 | 0.048 | 0.047 |
| 1997 | 0.037 | 0.032 |
| 1998 | 0.009 | 0.008 |
| 1999 | 0.041 | 0.022 |
| 2000 | 0.014 | 0.009 |
| 2001 | 0.003 | 0.007 |
| 2002 | 0.017 | 0.016 |
| 2003 | 0.025 | 0.008 |
| 2004 | 0.027 | 0.029 |
| 2005 | 0.020 | 0.010 |
| 2006 | 0.022 | 0.013 |
| 2007 | 0.052 | 0.043 |
| 2008 | 0.063 | 0.034 |
| 2009 | 0.030 | 0.018 |

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|------|--------------|-----------|
| 1 | 0.0688 | 0.0493 |
| 2 | 0.0634 | 0.0469 |
| 3 | 0.0520 | 0.0426 |

| | | |
|----|--------|--------|
| 4 | 0.0482 | 0.0342 |
| 5 | 0.0415 | 0.0323 |
| 6 | 0.0408 | 0.0293 |
| 7 | 0.0372 | 0.0290 |
| 8 | 0.0371 | 0.0290 |
| 9 | 0.0365 | 0.0274 |
| 10 | 0.0326 | 0.0248 |
| 11 | 0.0315 | 0.0239 |
| 12 | 0.0295 | 0.0224 |
| 13 | 0.0292 | 0.0218 |
| 14 | 0.0287 | 0.0192 |
| 15 | 0.0286 | 0.0189 |
| 16 | 0.0268 | 0.0176 |
| 17 | 0.0260 | 0.0175 |
| 18 | 0.0258 | 0.0164 |
| 19 | 0.0251 | 0.0142 |
| 20 | 0.0241 | 0.0140 |
| 21 | 0.0224 | 0.0134 |
| 22 | 0.0219 | 0.0126 |
| 23 | 0.0215 | 0.0111 |
| 24 | 0.0208 | 0.0098 |
| 25 | 0.0208 | 0.0097 |
| 26 | 0.0206 | 0.0097 |
| 27 | 0.0199 | 0.0096 |
| 28 | 0.0191 | 0.0095 |
| 29 | 0.0186 | 0.0095 |
| 30 | 0.0168 | 0.0094 |
| 31 | 0.0168 | 0.0094 |
| 32 | 0.0164 | 0.0094 |
| 33 | 0.0162 | 0.0094 |
| 34 | 0.0160 | 0.0094 |
| 35 | 0.0160 | 0.0093 |
| 36 | 0.0157 | 0.0092 |
| 37 | 0.0155 | 0.0091 |
| 38 | 0.0154 | 0.0090 |
| 39 | 0.0149 | 0.0087 |
| 40 | 0.0145 | 0.0087 |
| 41 | 0.0145 | 0.0086 |
| 42 | 0.0145 | 0.0086 |
| 43 | 0.0140 | 0.0085 |
| 44 | 0.0135 | 0.0084 |
| 45 | 0.0130 | 0.0084 |
| 46 | 0.0130 | 0.0083 |
| 47 | 0.0128 | 0.0082 |
| 48 | 0.0127 | 0.0081 |
| 49 | 0.0124 | 0.0080 |
| 50 | 0.0122 | 0.0079 |
| 51 | 0.0116 | 0.0079 |
| 52 | 0.0113 | 0.0078 |
| 53 | 0.0105 | 0.0077 |
| 54 | 0.0098 | 0.0075 |
| 55 | 0.0091 | 0.0075 |
| 56 | 0.0079 | 0.0071 |
| 57 | 0.0075 | 0.0069 |
| 58 | 0.0074 | 0.0069 |
| 59 | 0.0049 | 0.0069 |
| 60 | 0.0026 | 0.0067 |
| 61 | 0.0023 | 0.0065 |

Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|-----------|--------|-------|------------|-----------|
| 0.0095 | 17075 | 10667 | 62 | Pass |
| 0.0100 | 15481 | 6521 | 42 | Pass |
| 0.0104 | 14067 | 6053 | 43 | Pass |
| 0.0109 | 12810 | 5694 | 44 | Pass |
| 0.0113 | 11569 | 5369 | 46 | Pass |
| 0.0118 | 10532 | 5172 | 49 | Pass |
| 0.0122 | 9569 | 4990 | 52 | Pass |
| 0.0127 | 8765 | 4798 | 54 | Pass |
| 0.0131 | 8044 | 4635 | 57 | Pass |
| 0.0136 | 7347 | 4500 | 61 | Pass |
| 0.0141 | 6744 | 4329 | 64 | Pass |
| 0.0145 | 6192 | 4128 | 66 | Pass |
| 0.0150 | 5739 | 3933 | 68 | Pass |
| 0.0154 | 5311 | 3756 | 70 | Pass |
| 0.0159 | 4924 | 3568 | 72 | Pass |
| 0.0163 | 4571 | 3369 | 73 | Pass |
| 0.0168 | 4237 | 3202 | 75 | Pass |
| 0.0172 | 3957 | 3022 | 76 | Pass |
| 0.0177 | 3645 | 2845 | 78 | Pass |
| 0.0182 | 3388 | 2697 | 79 | Pass |
| 0.0186 | 3133 | 2571 | 82 | Pass |
| 0.0191 | 2915 | 2402 | 82 | Pass |
| 0.0195 | 2706 | 2250 | 83 | Pass |
| 0.0200 | 2490 | 2098 | 84 | Pass |
| 0.0204 | 2314 | 1941 | 83 | Pass |
| 0.0209 | 2136 | 1831 | 85 | Pass |
| 0.0214 | 1972 | 1695 | 85 | Pass |
| 0.0218 | 1826 | 1557 | 85 | Pass |
| 0.0223 | 1702 | 1434 | 84 | Pass |
| 0.0227 | 1579 | 1345 | 85 | Pass |
| 0.0232 | 1443 | 1269 | 87 | Pass |
| 0.0236 | 1325 | 1179 | 88 | Pass |
| 0.0241 | 1233 | 1069 | 86 | Pass |
| 0.0245 | 1147 | 936 | 81 | Pass |
| 0.0250 | 1086 | 857 | 78 | Pass |
| 0.0255 | 1020 | 818 | 80 | Pass |
| 0.0259 | 947 | 779 | 82 | Pass |
| 0.0264 | 887 | 732 | 82 | Pass |
| 0.0268 | 824 | 679 | 82 | Pass |
| 0.0273 | 761 | 614 | 80 | Pass |
| 0.0277 | 725 | 567 | 78 | Pass |
| 0.0282 | 674 | 516 | 76 | Pass |
| 0.0286 | 623 | 455 | 73 | Pass |
| 0.0291 | 589 | 392 | 66 | Pass |
| 0.0296 | 549 | 353 | 64 | Pass |
| 0.0300 | 506 | 325 | 64 | Pass |
| 0.0305 | 469 | 294 | 62 | Pass |
| 0.0309 | 427 | 260 | 60 | Pass |
| 0.0314 | 388 | 240 | 61 | Pass |
| 0.0318 | 356 | 217 | 60 | Pass |
| 0.0323 | 328 | 193 | 58 | Pass |
| 0.0327 | 298 | 168 | 56 | Pass |
| 0.0332 | 270 | 132 | 48 | Pass |

| | | | | |
|--------|-----|-----|----|------|
| 0.0337 | 241 | 101 | 41 | Pass |
| 0.0341 | 218 | 77 | 35 | Pass |
| 0.0346 | 198 | 48 | 24 | Pass |
| 0.0350 | 174 | 26 | 14 | Pass |
| 0.0355 | 152 | 23 | 15 | Pass |
| 0.0359 | 130 | 22 | 16 | Pass |
| 0.0364 | 119 | 19 | 15 | Pass |
| 0.0369 | 104 | 18 | 17 | Pass |
| 0.0373 | 95 | 15 | 15 | Pass |
| 0.0378 | 83 | 14 | 16 | Pass |
| 0.0382 | 74 | 14 | 18 | Pass |
| 0.0387 | 69 | 14 | 20 | Pass |
| 0.0391 | 61 | 13 | 21 | Pass |
| 0.0396 | 53 | 13 | 24 | Pass |
| 0.0400 | 46 | 12 | 26 | Pass |
| 0.0405 | 39 | 10 | 25 | Pass |
| 0.0410 | 29 | 9 | 31 | Pass |
| 0.0414 | 25 | 9 | 36 | Pass |
| 0.0419 | 22 | 9 | 40 | Pass |
| 0.0423 | 20 | 8 | 40 | Pass |
| 0.0428 | 17 | 6 | 35 | Pass |
| 0.0432 | 14 | 6 | 42 | Pass |
| 0.0437 | 12 | 6 | 50 | Pass |
| 0.0441 | 8 | 5 | 62 | Pass |
| 0.0446 | 7 | 5 | 71 | Pass |
| 0.0451 | 7 | 5 | 71 | Pass |
| 0.0455 | 7 | 4 | 57 | Pass |
| 0.0460 | 6 | 4 | 66 | Pass |
| 0.0464 | 6 | 3 | 50 | Pass |
| 0.0469 | 6 | 2 | 33 | Pass |
| 0.0473 | 6 | 2 | 33 | Pass |
| 0.0478 | 6 | 2 | 33 | Pass |
| 0.0483 | 5 | 2 | 40 | Pass |
| 0.0487 | 5 | 2 | 40 | Pass |
| 0.0492 | 5 | 1 | 20 | Pass |
| 0.0496 | 5 | 0 | 0 | Pass |
| 0.0501 | 5 | 0 | 0 | Pass |
| 0.0505 | 5 | 0 | 0 | Pass |
| 0.0510 | 5 | 0 | 0 | Pass |
| 0.0514 | 4 | 0 | 0 | Pass |
| 0.0519 | 4 | 0 | 0 | Pass |
| 0.0524 | 3 | 0 | 0 | Pass |
| 0.0528 | 3 | 0 | 0 | Pass |
| 0.0533 | 3 | 0 | 0 | Pass |
| 0.0537 | 3 | 0 | 0 | Pass |
| 0.0542 | 3 | 0 | 0 | Pass |
| 0.0546 | 3 | 0 | 0 | Pass |

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 |
|--|--------------------------|--------------------------------------|---------------------------------|-----------------------------|---------------------------------------|----------------------------|---------------|-------------------------------|-----------------------------------|
| Tank 1 POC | <input type="checkbox"/> | 56.45 | | | <input type="checkbox"/> | 0.00 | | | |
| Total Volume Infiltrated | | 56.45 | 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.

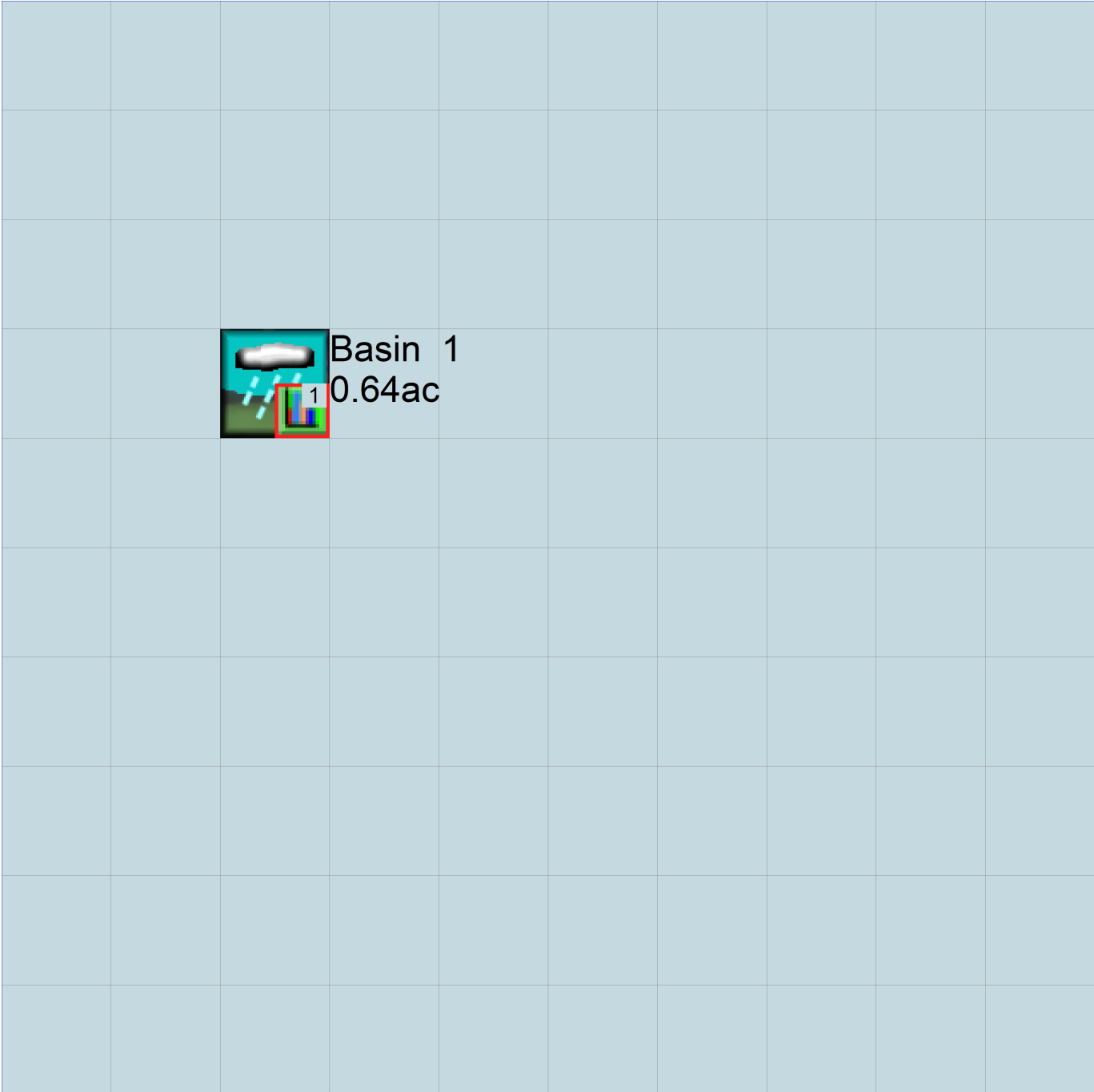
PERLND Changes

No PERLND changes have been made.

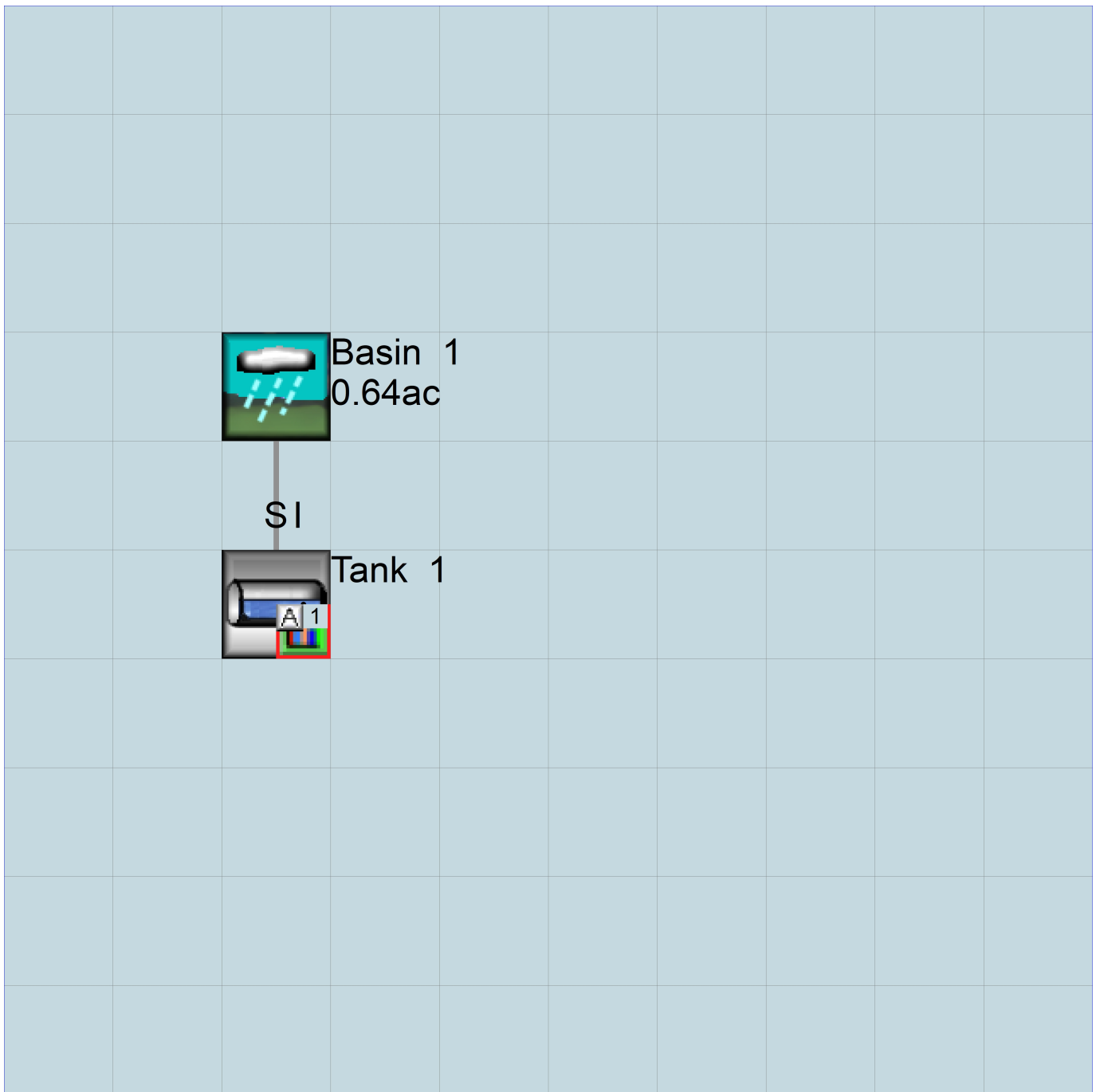
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

```
WVHM4 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      pipe.wdm
MESSU    25      Prepipe.MES
          27      Prepipe.L61
          28      Prepipe.L62
          30      POCpipe1.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 Engr 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-> | <Name> # | <--Area--> | <-factor--> | <-Target-> | <Name> # | MBLK | Tbl# | *** |
|------------|----------|------------|-------------|------------|----------|------|------|-----|
| Basin | 1 | | | | | | | |
| PERLND | 11 | 0.638 | | COPY | 501 | 12 | | |
| PERLND | 11 | 0.638 | | 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 | *** | ODGTFG for each | FUNCT for each | *** |
|--------|-----------------------------|-----------------|-----------------|----------------|-----|
| # - # | VC A1 A2 A3 | ODFVFG for each | *** | possible exit | *** |
| | FG FG FG FG | 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 |
| | *** ac-ft | for each possible exit |
| | | Initial value of OUTDGT |
| | | 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 | 1 | PERLND | 1 999 | EXTNL | PREC |
| WDM | 2 | PREC | ENGL | 1 | IMPLND | 1 999 | EXTNL | PREC |

```
WDM      1 EVAP      ENGL      0.76          PERLND    1 999 EXTNL  PETINP
WDM      1 EVAP      ENGL      0.76          IMPLND    1 999 EXTNL  PETINP
```

END EXT SOURCES

EXT TARGETS

```
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>      #      <Name> # #<-factor->strg <Name>      # <Name>      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

```
WVHM4 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      pipe.wdm
MESSU    25      Mitpipe.MES
          27      Mitpipe.L61
          28      Mitpipe.L62
          30      POCpipe1.dat
```

END FILES

OPN SEQUENCE

```
INGRP          INDELT 00:15
  PERLND        13
  IMPLND         4
  IMPLND         1
  IMPLND         8
  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      Tank 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          ***
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  0  1  9
END PRINT-INFO

```

```

PWAT-PARM1
<PLS > PWATER variable monthly parameter value flags ***
# - # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRG  VLE INFC  HWT ***
13  0  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  LRSUR  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
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  Engr Metr ***
      in  out  ***
4  ROOF TOPS/FLAT  1  1  1  27  0
1  ROADS/FLAT  1  1  1  27  0
8  SIDEWALKS/FLAT  1  1  1  27  0
END GEN-INFO
*** Section IWATER***

```

```

ACTIVITY
<PLS > ***** Active Sections *****
# - # ATMP SNOW IWAT  SLD  IWG IQAL  ***
4  0  0  1  0  0  0
1  0  0  1  0  0  0
8  0  0  1  0  0  0
END ACTIVITY

```

```

PRINT-INFO
<ILS > ***** Print-flags ***** PIVL  PYR
# - # ATMP SNOW IWAT  SLD  IWG IQAL  *****
4  0  0  4  0  0  4  1  9
1  0  0  4  0  0  0  1  9
8  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  ***
4  0  0  0  0  0
1  0  0  0  0  0
8  0  0  0  0  0

```

END IWAT-PARM1

IWAT-PARM2

```

<PLS > IWATER input info: Part 2 ***
# - # *** LSUR SLSUR NSUR RETSC
4 400 0.01 0.1 0.1
1 400 0.01 0.1 0.1
8 400 0.01 0.1 0.1

```

END IWAT-PARM2

IWAT-PARM3

```

<PLS > IWATER input info: Part 3 ***
# - # ***PETMAX PETMIN
4 0 0
1 0 0
8 0 0

```

END IWAT-PARM3

IWAT-STATE1

```

<PLS > *** Initial conditions at start of simulation
# - # *** RETS SURS
4 0 0
1 0 0
8 0 0

```

END IWAT-STATE1

END IMPLND

SCHEMATIC

```

<-Source-> <--Area--> <-Target-> MBLK ***
<Name> # <-factor-> <Name> # Tbl# ***
Basin 1***
PERLND 13 0.364 RCHRES 1 2
PERLND 13 0.364 RCHRES 1 3
IMPLND 4 0.178 RCHRES 1 5
IMPLND 1 0.09 RCHRES 1 5
IMPLND 8 0.006 RCHRES 1 5

```

*****Routing*****

```

PERLND 13 0.364 COPY 1 12
IMPLND 4 0.178 COPY 1 15
IMPLND 1 0.09 COPY 1 15
IMPLND 8 0.006 COPY 1 15
PERLND 13 0.364 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 Tank 1 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 ***

```


| | | | |
|----------|----------|----------|----------|
| 2.844444 | 0.019165 | 0.040083 | 0.007694 |
| 2.933333 | 0.019293 | 0.041792 | 0.007813 |
| 3.022222 | 0.019411 | 0.043513 | 0.007930 |
| 3.111111 | 0.019518 | 0.045243 | 0.008046 |
| 3.200000 | 0.019614 | 0.046982 | 0.008160 |
| 3.288889 | 0.019699 | 0.048730 | 0.008273 |
| 3.377778 | 0.019775 | 0.050484 | 0.008384 |
| 3.466667 | 0.019840 | 0.052245 | 0.008493 |
| 3.555556 | 0.019894 | 0.054011 | 0.008602 |
| 3.644444 | 0.019939 | 0.055781 | 0.008708 |
| 3.733333 | 0.019974 | 0.057555 | 0.008814 |
| 3.822222 | 0.019999 | 0.059332 | 0.008918 |
| 3.911111 | 0.020013 | 0.061110 | 0.009021 |
| 4.000000 | 0.020018 | 0.062890 | 0.009123 |
| 4.088889 | 0.020013 | 0.064669 | 0.009224 |
| 4.177778 | 0.019999 | 0.066447 | 0.009324 |
| 4.266667 | 0.019974 | 0.068224 | 0.009423 |
| 4.355556 | 0.019939 | 0.069998 | 0.009520 |
| 4.444444 | 0.019894 | 0.071768 | 0.009617 |
| 4.533333 | 0.019840 | 0.073534 | 0.009713 |
| 4.622222 | 0.019775 | 0.075295 | 0.009807 |
| 4.711111 | 0.019699 | 0.077049 | 0.011185 |
| 4.800000 | 0.019614 | 0.078797 | 0.013846 |
| 4.888889 | 0.019518 | 0.080536 | 0.015381 |
| 4.977778 | 0.019411 | 0.082266 | 0.016598 |
| 5.066667 | 0.019293 | 0.083987 | 0.017644 |
| 5.155556 | 0.019165 | 0.085696 | 0.018580 |
| 5.244444 | 0.019025 | 0.087393 | 0.019435 |
| 5.333333 | 0.018873 | 0.089078 | 0.020229 |
| 5.422222 | 0.018710 | 0.090748 | 0.020975 |
| 5.511111 | 0.018535 | 0.092404 | 0.021680 |
| 5.600000 | 0.018347 | 0.094043 | 0.022352 |
| 5.688889 | 0.018146 | 0.095665 | 0.022994 |
| 5.777778 | 0.017933 | 0.097269 | 0.023612 |
| 5.866667 | 0.017705 | 0.098853 | 0.024207 |
| 5.955556 | 0.017463 | 0.100416 | 0.024782 |
| 6.044444 | 0.017206 | 0.101957 | 0.026398 |
| 6.133333 | 0.016934 | 0.103474 | 0.027714 |
| 6.222222 | 0.016645 | 0.104967 | 0.028774 |
| 6.311111 | 0.016339 | 0.106433 | 0.029721 |
| 6.400000 | 0.016015 | 0.107871 | 0.030597 |
| 6.488889 | 0.015671 | 0.109279 | 0.031421 |
| 6.577778 | 0.015307 | 0.110656 | 0.032206 |
| 6.666667 | 0.014921 | 0.112000 | 0.032958 |
| 6.755556 | 0.014511 | 0.113308 | 0.033683 |
| 6.844444 | 0.014075 | 0.114579 | 0.034384 |
| 6.933333 | 0.013610 | 0.115809 | 0.035064 |
| 7.022222 | 0.013114 | 0.116997 | 0.088462 |
| 7.111111 | 0.012582 | 0.118140 | 0.624174 |
| 7.200000 | 0.012011 | 0.119233 | 1.441462 |
| 7.288889 | 0.011394 | 0.120274 | 2.412336 |
| 7.377778 | 0.010723 | 0.121257 | 3.424498 |
| 7.466667 | 0.009987 | 0.122178 | 4.364830 |
| 7.555556 | 0.009171 | 0.123030 | 5.136736 |
| 7.644444 | 0.008251 | 0.123805 | 5.689369 |
| 7.733333 | 0.007187 | 0.124493 | 6.054497 |
| 7.822222 | 0.005902 | 0.125076 | 6.466996 |
| 7.911111 | 0.004197 | 0.125530 | 6.805972 |
| 8.000000 | 0.001000 | 0.125779 | 7.128795 |

END FTABLE 1

END FTABLES

EXT SOURCES

| <-Volume-> | <Member> | SsysSgap<--Mult--> | Tran | <-Target vols> | <-Grp> | <-Member-> | *** | | | |
|------------|----------|--------------------|------|----------------|----------------|------------|--------|-----|-------|--------|
| <Name> | # | <Name> | # | tem | strg<-factor-> | strg | <Name> | # | # | *** |
| WDM | 2 | PREC | ENGL | 1 | | PERLND | 1 | 999 | EXTNL | PREC |
| WDM | 2 | PREC | ENGL | 1 | | IMPLND | 1 | 999 | EXTNL | PREC |
| WDM | 1 | EVAP | ENGL | 0.76 | | PERLND | 1 | 999 | EXTNL | PETINP |
| WDM | 1 | EVAP | ENGL | 0.76 | | IMPLND | 1 | 999 | EXTNL | PETINP |

END EXT SOURCES

EXT TARGETS

| <-Volume-> | <-Grp> | <-Member-> | <--Mult--> | Tran | <-Volume-> | <Member> | Tsys | Tgap | Amd | *** | |
|------------|--------|------------|------------|------------|------------|----------|------|--------|------|------|---------|
| <Name> | # | <Name> | # | <-factor-> | strg | <Name> | # | <Name> | tem | strg | strg*** |
| RCHRES | 1 | HYDR | RO | 1 | 1 | 1 | WDM | 1002 | FLOW | ENGL | REPL |
| RCHRES | 1 | HYDR | STAGE | 1 | 1 | 1 | WDM | 1003 | 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> | # | *** |
| 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

Mitigated HSPF Message File

Disclaimer

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APPENDIX C
Geotechnical Report



Geotechnical Engineering
Construction Observation/Testing
Environmental Services



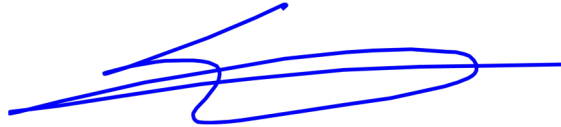
**GEOTECHNICAL ENGINEERING STUDY
LORENZINI SHORT PLAT
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84XX SOUTHEAST 47TH STREET
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ES-8009.01

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February 1, 2022



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Important Information about This

Geotechnical-Engineering Report

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

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

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

Understand the Geotechnical-Engineering Services Provided for this Report

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

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

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

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

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

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

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

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

Read this Report in Full

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

You Need to Inform Your Geotechnical Engineer About Change

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

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

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

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

This Report’s Recommendations Are Confirmation-Dependent

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

This Report Could Be Misinterpreted

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

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

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

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

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

Geoenvironmental Concerns Are Not Covered

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

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

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



Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org



February 1, 2022
ES-8009.01

Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

Design Built Homes, LLC
11400 Southeast 8th Street, Suite 415
Bellevue, Washington 98004

Attention: Mr. Todd Sherman

Dear Mr. Sherman:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled "Geotechnical Engineering Study, Lorenzini Short Plat, 4719 – 86th Avenue Southeast and 84XX Southeast 47th Street, Mercer Island, Washington".

The native soil underlying the site consists of glacial till based on our observation of the subsurface conditions. In our opinion, the proposed residence can be supported on conventional continuous and spread footing foundations bearing on competent native soils, competent existing fill, or new structural fill. We anticipate suitable bearing soils will be encountered at depths of approximately two feet below existing grades. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material will be necessary.

Groundwater seepage was not observed during our fieldwork (December 22, 2021). However, the client should anticipate groundwater seepage on the site at the contact with the unweathered glacial till. The maximum depth-of-exploration was seven and one-half feet below the existing surface elevations.

We performed infiltration testing at the request of the design team. We observed no infiltration during the testing procedure. We recommend full infiltration not be pursued on the subject site as a result. Limited infiltration measures can be considered, such as permeable pavement. Where permeable pavement is to be utilized, an overflow capacity should be designed into the system.

Recommendations for foundation design, site preparation, drainage, and other pertinent recommendations are provided in this study. We appreciate the opportunity to be of service to you on this project. If you have questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Stephen H. Avril
Project Manager

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**GEOTECHNICAL ENGINEERING STUDY
LORENZINI SHORT PLAT
4719 – 86TH AVENUE SOUTHEAST AND
84XX SOUTHEAST 47TH STREET
MERCER ISLAND, WASHINGTON**

ES-8009.01

INTRODUCTION

General

The subject site is located on the west side of 86th Avenue Southeast, south of the intersection with Southeast 47th Street in Mercer Island, Washington. The site is currently developed with a single-family residential structure, driveway, and general landscape areas. Site development plans include the construction of three single-family residences and associated improvements following demolition of the existing structure.

The purpose of this study was to explore subsurface conditions across the site and develop geotechnical recommendations for the proposed development. Our scope of services for completing this geotechnical engineering study included the following:

- Site exploration consisting of test pits advanced within four locations on the property;
- Laboratory testing of soil samples obtained during subsurface exploration;
- Engineering analyses of data gathered during site exploration, and;
- Preparation of this report.

The following documents/maps were reviewed as part of our report preparation:

- Geologic Map of Washington, Northwest Quadrant, Dragovich, Logan, et al, 2002, and;
- Washington USDA Soil Conservation Survey (SCS).

Project Description

Final site design was not complete at the time of report production; however, we understand the properties will be redeveloped with three new single-family residences and associated improvements.

Given the topographic change of about 25 feet across the site, grading activities will likely involve cuts and fills up to about ten feet to establish the final design grades.

Building construction is anticipated to consist of relatively lightly loaded wood framing and slab-on-grade floors. Perimeter foundation loading is expected to range from approximately one to two kips per foot. Slab-on-grade loading is expected to be on the order of 150 pounds per square foot (psf).

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

SITE CONDITIONS

Surface

The subject site is located on the west side of 86th Avenue Southeast, south of the intersection with Southeast 47th Street in Mercer Island, Washington. The site is comprised of a single tax parcel, and was occupied by a single-family residence at the time of report production.

The existing site topography is sloped in nature, descending from east to west, with topographic relief on the order of 25 feet across the entirety of the site. Taken overall, slope inclinations across the entirety of the site are on the order of 10 percent, with the steepest section in the western portion of the site inclined at approximately 14 percent.

Subsurface

ESNW representatives observed, logged and sampled four test pits, associated with this report. The test pits were advanced using an excavator and operator contracted by the client. The approximate location of the test pits is depicted on the Test Pit Location Plan (Plate 2). Please refer to the soil logs provided in Appendix A for a more detailed description of the subsurface conditions. Test pit TP-4 was terminated at a shallow depth due to the presence of an irrigation pipe within the test pit.

Topsoil

Topsoil was encountered at the test locations on the order of six to 14 inches in thickness. Where topsoil is encountered during site grading activities, it is not suitable for use as structural fill nor should it be mixed with material to be used as structural fill. Topsoil or otherwise unsuitable material can be used in landscaping areas if desired.

Fill

Fill soil was not encountered at the test locations during our fieldwork. Fill soil may likely be encountered surrounding the existing buildings, roads, and utility alignments, and will have to be evaluated during construction for use as structural fill.

Native Soil

Underlying the topsoil at the test locations, native soils consisting of silty sand (Unified Soil Classification, SM) were encountered. The native soils were generally observed in a medium dense grading to very dense condition. These soil types were observed extending to the maximum exploration depth of seven and one-half feet below existing grades.

Geologic Setting

The referenced geologic map resource identifies glacial till (Qvt) deposits. The referenced SCS soil survey describes Alderwood gravelly sandy loam (AgC) 8 to 15 percent slope series soils for the majority of the site; and Kitsap silt loam (KpB) 2 to 8 percent slope series soils for the western portion of the site. Alderwood series of soil is typified by loamy glacial drift over glaciomarine deposits. Whereas Kitsap series soils are typically comprised of lacustrine depositional environments. The majority of the native soil observed at the test locations are consistent with glacial till which is a component of glacial drift.

Groundwater

Groundwater seepage was not observed during the fieldwork (December 2021). Seepage can be present on sites underlain by glacial till and will typically be in a perched condition atop the unweathered till. Seepage should be expected within excavations at this site; particularly during the winter, spring, and early summer months. Groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the wetter, winter months. However, the groundwater table was not observed on the subject site.

ENVIRONMENTALLY CRITICAL AREA ASSESSMENT

As part of our report preparation, we assessed the site for potential critical areas utilizing the Mercer Island online GIS resources (critical areas maps). The subject site is not described as possessing geologic hazard areas with the exception of a historic scarp and a seismic hazard delineated for portions of the site.

The existing site topography is sloped in nature, descending from east to west, with topographic relief on the order of 25 feet across the entirety of the site. Taken overall, slope inclinations across the entirety of the site are on the order of 10 percent, with the steepest section in the western portion of the site inclined at approximately 14 percent.

The historic scarp is located on the subject site according to our review of the online GIS website provided by the City of Mercer Island. The scarp is shown bisecting the current residence, and is semi-circle in shape with the limits of the scarp described for the west side of the current residence and on the southern neighboring property. We observed no surficial signs that the scarp was active during our visual site reconnaissance.

With respect to the seismic hazard, liquefaction is a phenomenon where saturated or loose soil suddenly loses internal strength and behaves as a fluid. This behavior is in response to increased pore water pressures resulting from an earthquake or another intense ground shaking. In our opinion, site susceptibility to liquefaction may be considered negligible. The absence of a shallow groundwater table and the relative density of the native glacial till soil are the primary bases for this opinion.

DISCUSSION AND RECOMMENDATIONS

General

In our opinion, construction of the proposed structure is feasible from a geotechnical standpoint. The proposed buildings can be supported on conventional continuous and spread footing foundations bearing on competent native soils, competent existing fill, or new structural fill. Native soil capable of supporting residential foundations will be encountered at a depth of approximately two feet below existing grade in most areas. Slab-on-grade floors should be supported on competent native soil or structural fill. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material will be necessary. Recommendations for foundation design, site preparation, drainage, and other pertinent geotechnical recommendations are provided in the following sections of this study.

This study has been prepared for the exclusive use of Design Built Homes, LLC and their representatives. No warranty, expressed or implied, is made. This study has been prepared in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area.

Site Preparation and Earthwork

Site preparation activities will involve demolition of the existing structures, site clearing and stripping, and implementation of temporary erosion control measures. The primary geotechnical considerations associated with site preparation activities include erosion control installation, building pad subgrade preparation, retaining wall construction, underground utility installations, and preparation of pavement subgrade areas.

Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls (potentially placed over geotextile) can be considered in order to minimize off-site soil tracking and to provide a stable access entrance surface. Erosion control measures should consist of silt fencing placed along the down gradient side of the site. Soil stockpiles should be covered or otherwise protected to reduce soil erosion. Temporary sedimentation ponds or other approaches for controlling surface water runoff should be in place prior to beginning earthwork activities.

Where encountered, topsoil and organic-rich soil is not suitable for foundation support, nor is it suitable for use as structural fill. Topsoil or organic-rich soil can be used in non-structural areas if desired. Over-stripping of the site, however, should be avoided. A representative of ESNW should observe the initial stripping operations, to provide recommendations for stripping depths based on the soil conditions exposed during stripping.

Structural fill soils placed throughout foundation, slab, and pavement areas should be placed over a firm base. Loose or otherwise unsuitable areas of native soil exposed at subgrade elevations should be compacted to structural fill requirements or overexcavated and replaced with a suitable structural fill material. Where structural fill soils are used to construct foundation subgrade areas, the soil should be compacted to the requirements of structural fill described in the following section. Foundation subgrade areas should be protected from disturbance, construction traffic, and excessive moisture. Where instability develops below structural fill areas, use of a woven geotextile below the structural fill areas may be required. A representative of ESNW should observe structural fill placement in foundation, slab, and pavement areas.

The process of removing existing structures may produce voids where foundations and basements were present. Complete restoration of voids caused by the removal of existing structure must be executed as part of overall subgrade and building pad preparation activities, unless the excavation for the new building will be lower than existing basements (where present). The following guidelines for preparing building subgrade areas should be incorporated into the final design:

- Removal of the existing stem walls to an elevation where a four-foot vertical separation between the bottom of new foundations is maintained, and demolition of the slab present in the existing basement, or;
- Complete removal of all foundation elements, stem walls, footing drains, sewer and storm drainage pipes, etc. within the footprint of the existing structure.
- Where voids and related demolition disturbances extend below planned subgrade elevations, restoration of these areas should be completed. Structural fill should be used to restore voids or unstable areas resulting from the removal of existing structural improvements.
- Where pipes for stormwater and sanitary sewer are encountered, they should be plugged and abandoned.
- Recompact, or overexcavate and replace, areas of existing fill, if present, exposed at building subgrade elevations. ESNW should confirm subgrade conditions and the required level of recompaction, or overexcavation and replacement, during site preparation activities. Overexcavations should extend into competent native soils, and structural fill should be used to restore subgrades areas.
- ESNW should confirm the overall suitability of prepared subgrade areas following site preparation activities.

In-situ Soils

The soils encountered at the test sites have a moderate sensitivity to moisture and were generally in a moist condition at the time of the exploration (December 2021). In this respect, the in-situ soils may not be suitable for use as structural fill if the soil moisture content is more than about 3 percent above the optimum level at the time of construction. In general, soils encountered during the site excavations that are excessively over the optimum moisture content will require moisture conditioning prior to placement and compaction. Conversely, soils that are below the optimum moisture content will require moisture conditioning through the addition of water prior to use as structural fill. If the in-situ soils are determined to not be suitable for use as structural fill, then use of a suitable imported soil may be necessary. In our opinion, a contingency should be included in the project budget for exporting unsuitable soil and importing structural fill; or moisture conditioning recommendations can be provided upon request based on field observations during the construction phase of on-site work.

Imported Soils

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

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, and roadway areas. Fills placed to construct permanent slopes and throughout retaining wall and utility trench backfill areas are also considered structural fill. Soils placed in structural areas should be placed in loose lifts of 12 inches or less and compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by the Modified Proctor Method (ASTM D-1557). Additionally, more stringent compaction specifications may be required for utility trench backfill zones, depending on the responsible utility district or jurisdiction.

Foundations

Based on the results of our study, the proposed residential structures can be supported on conventional spread and continuous footings bearing on competent native soils, competent existing fill or new structural fill. Based on the soil conditions encountered at the test sites, competent native soils suitable for support of foundations should be encountered at depths of approximately two feet below existing grades. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with structural fill, may be necessary.

Provided foundations will be supported as described above, the following parameters can be used for design of new foundations:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf (equivalent fluid)
- Coefficient of friction 0.40

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

Seismic Design Considerations

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

| Parameter | Value |
|---|-------|
| Site Class | D* |
| Mapped short period spectral response acceleration, $S_s (g)$ | 1.438 |
| Mapped 1-second period spectral response acceleration, $S_1 (g)$ | 0.499 |
| Short period site coefficient, F_a | 1.000 |
| Long period site coefficient, F_v | 1.800 |
| Adjusted short period spectral response acceleration, $S_{MS} (g)$ | 1.438 |
| Adjusted 1-second period spectral response acceleration, $S_{M1} (g)$ | 0.898 |
| Design short period spectral response acceleration, $S_{Ds} (g)$ | 0.959 |
| Design 1-second period spectral response acceleration, $S_{D1} (g)$ | 0.599 |

* Assumes very dense soil conditions, encountered to a maximum depth of 7.5 feet bgs during the December 2021 field exploration, remain very dense to at least 100 feet bgs. Based on our experience with the project geologic setting (glacial till) across the Puget Sound region, soil conditions are likely consistent with this assumption.

Further discussion between the project structural engineer, the project owner (or their representative), and ESNW may be prudent to determine the possible impacts to the structural design due to increased earthquake load requirements under the 2018 IBC. ESNW can provide additional consulting services to aid with design efforts, including supplementary geotechnical and geophysical investigation, upon request.

Liquefaction is a phenomenon where saturated or loose soil suddenly loses internal strength and behaves as a fluid. This behavior is in response to increased pore water pressures resulting from an earthquake or another intense ground shaking. In our opinion, site susceptibility to liquefaction may be considered negligible. The absence of a shallow groundwater table and the dense characteristics of the native soil were the primary bases for this opinion.

Slab-On-Grade Floors

Slab-on-grade floors for the proposed buildings constructed at this site should be supported on a firm and unyielding subgrade. Where feasible, the soil exposed at the slab-on-grade subgrade level can be compacted in place to the specifications of structural fill. Unstable or yielding areas of the subgrade should be recompacted or overexcavated and replaced with suitable structural fill prior to construction of the slab. A capillary break consisting of a minimum of four inches of free draining crushed rock or gravel should be placed below the slab. The free draining material should have a fines content of 5 percent or less (percent passing the #200 sieve, based on the minus three-quarter inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is to be utilized it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the manufacturer's specifications.

Retaining Walls

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

- Active earth pressure (yielding condition) 35 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) 55 pcf
- Traffic surcharge for passenger vehicles (where applicable) 70 psf (rectangular distribution)
- Passive earth pressure 300 pcf (equivalent fluid)
- Coefficient of friction 0.40
- Seismic surcharge (active condition) 8H (where H equals retained height)

Additional surcharge loading from adjacent foundations, sloped backfill, or other loads should be included in the retaining wall design. Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Retaining walls should be backfilled with free draining material that extends along the height of the wall, and a distance of at least 18 inches behind the wall. The upper one foot of the wall backfill can consist of a less permeable soil, if desired. A perforated drain pipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3.

Drainage

Seepage will likely be encountered in excavations on the site, particularly during winter, spring, and early summer months. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading to identify areas of seepage and to provide recommendations to reduce the potential for instability related to seepage effects.

Finish grades must slope away from the building at an inclination of at least 2 percent for a distance of at ten feet or as adjacent building setbacks allow. In addition, surface water should be controlled utilizing best management practices (BMP) during, and after, construction on the subject site.

Footing drains should be installed given the nature of the soils on the site. A typical foundation drain detail for footings not placed directly against shoring is provided as Plate 4.

Infiltration Evaluation

The subject site is underlain by glacial till deposits within the proposed infiltration location, based on our observation of the subsurface conditions. The soil underlying the site consists of dense to very dense glacial till. These soils typically have very low or negligible infiltration capacity.

A Pilot Infiltration Test (PIT) was performed in test pit TP-2 at a depth of four feet below existing grades. No infiltration was observed during the test procedure.

Based on our experience targeted infiltration such as permeable pavement may be feasible on the subject site given a one-foot vertical separation is maintained from the cemented glacial till material present on the site. Additionally, where limited infiltration is employed, overflow should be considered such as underdrains in permeable pavement areas.

Excavations and Slopes

The Federal Occupation Safety and Health Administration (OSHA) and the Washington Industrial Safety and Health Act (WISHA) provide soil classification in terms of temporary slope inclinations. Based on the soil conditions encountered at the test locations, existing fill, loose native soil and any soil where groundwater seepage is exposed, are classified as Type C by OSHA/WISHA. Temporary slopes over four feet in height in Type C soils must be sloped no steeper than 1.5H:1V (Horizontal:Vertical). The presence of perched groundwater may cause caving of the temporary slopes due to hydrostatic pressure. The native silty sand glacial till soils observed are classified as Type A. Temporary slopes over four feet in height in Type A soils must be sloped no steeper than 0.75H:1V. Temporary excavations with inclinations steeper than those described may be acceptable from a geotechnical standpoint. ESNW should be consulted during the design phase to provide recommendations for steeper temporary excavations if necessary. ESNW should observe site excavations to confirm the soil type and allowable slope inclination. If the recommended temporary slope inclination cannot be achieved, temporary shoring may be necessary to support excavations. Additionally, due to the presence of slopes on the subject site, slope surcharging should be taken into consideration when planning open cuts.

Permanent slopes should maintain a gradient of 2H:1V, or flatter, and should be planted with vegetation to enhance stability and to minimize erosion. A representative of ESNW should observe temporary and permanent slopes to confirm the slope inclinations, and to provide additional excavation and slope recommendations, as necessary.

Utility Support and Trench Backfill

In our opinion, the soils anticipated to be exposed in utility excavations should generally be suitable for support of utilities. Organic or highly compressible soils encountered in the trench excavations should not be used for supporting utilities. The on-site soil may not be suitable for use as trench backfill if the soil moisture content is too high at the time of compaction. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report, or to the applicable City of Mercer Island specifications. Seepage should be anticipated within utility trench excavations.

LIMITATIONS

The recommendations and conclusions provided in this geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.



Reference:
King County, Washington
OpenStreetMap.org



NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

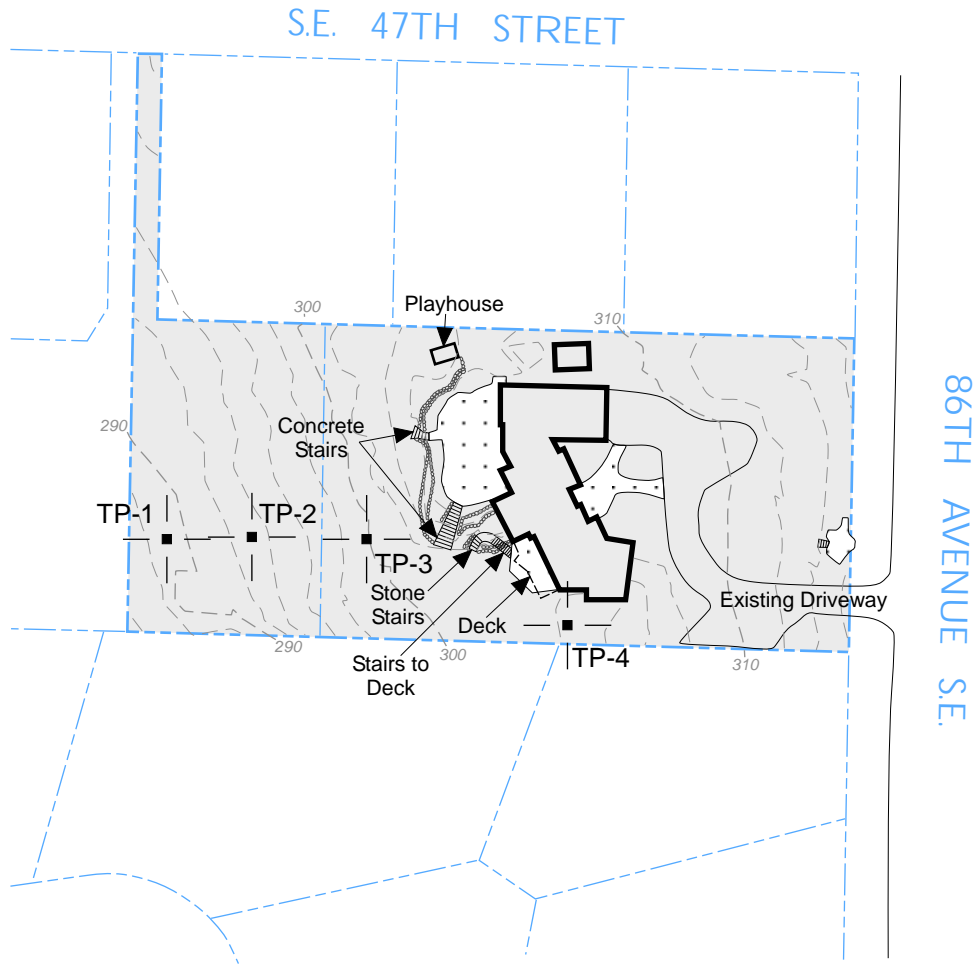


Earth Solutions NW, LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

**Vicinity Map
Lorenzini Short Plat
Mercer Island, Washington**

| | | |
|-------------|-----------------|-------------------|
| Drwn. CAM | Date 01/12/2022 | Proj. No. 8009.01 |
| Checked BCS | Date Jan. 2022 | Plate 1 |



LEGEND

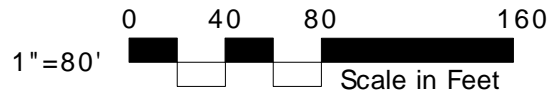
TP-1 | — ■ — | Approximate Location of ESNW Test Pit, Proj. No. ES-8009.01, Dec. 2021

▭ Subject Site

▭ Existing Building

▭ Concrete

▭ Rockery



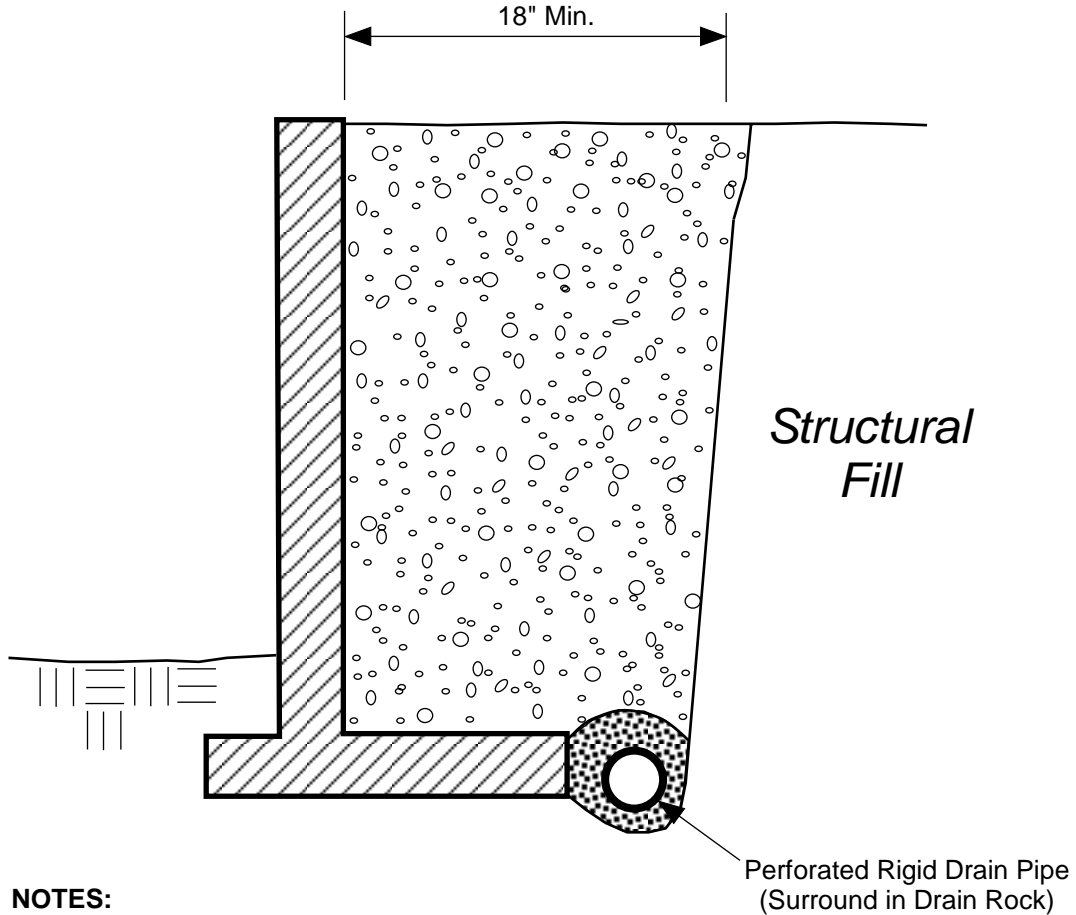
NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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 Geotechnical Engineering, Construction
 Observation/Testing and Environmental Services

**Test Pit Location Plan
 Lorenzini Short Plat
 Mercer Island, Washington**

| | | |
|-------------|-----------------|-------------------|
| Drwn. CAM | Date 01/12/2022 | Proj. No. 8009.01 |
| Checked BCS | Date Jan. 2022 | Plate 2 |

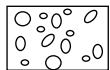


NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

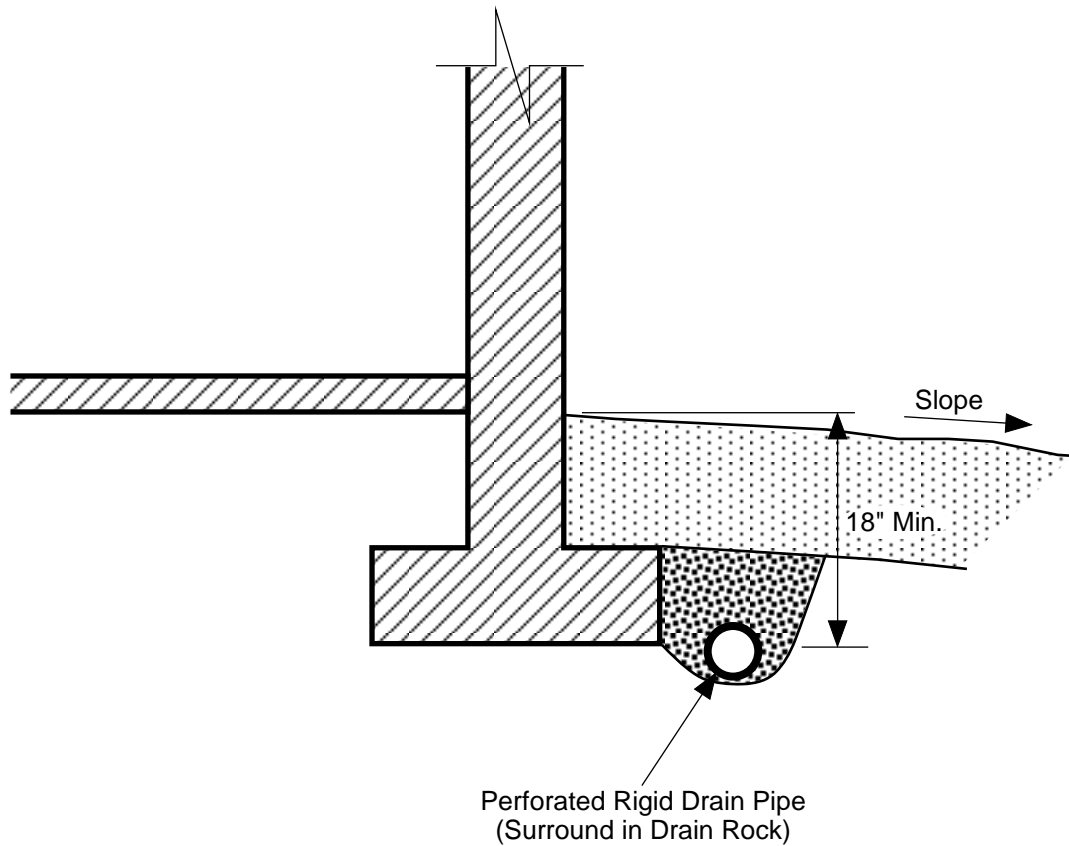


Free-draining Structural Backfill



1-inch Drain Rock

| | | |
|--|-----------------|---|
|  | | Earth Solutions NW_{LLC} Geotechnical Engineering, Construction Observation/Testing and Environmental Services |
| Retaining Wall Drainage Detail Lorenzini Short Plat Mercer Island, Washington | | |
| Drwn. CAM | Date 01/12/2022 | Proj. No. 8009.01 |
| Checked BCS | Date Jan. 2022 | Plate 3 |

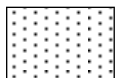


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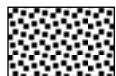
- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:



Surface Seal: native soil or other low-permeability material.



1-inch Drain Rock

| | | | |
|--|-----------------|---|--|
|  | | Earth Solutions NW_{LLC} Geotechnical Engineering, Construction Observation/Testing and Environmental Services | |
| Footing Drain Detail Lorenzini Short Plat Mercer Island, Washington | | | |
| Drwn. CAM | Date 01/12/2022 | Proj. No. 8009.01 | |
| Checked BCS | Date Jan. 2022 | Plate 4 | |

Appendix A



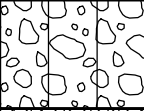
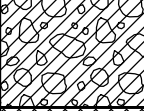

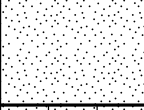
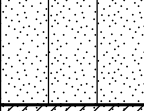
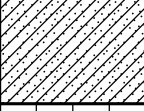
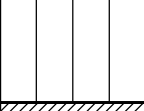
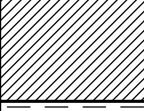
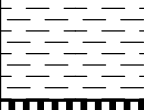


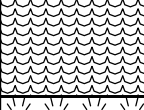


Subsurface Exploration Test Pit Logs

ES-8009.01

The subsurface conditions at the site were explored by excavating a total of four test pits across accessible portions of the property. The subsurface explorations were completed in December of 2021. The approximate test locations are illustrated on Plate 2 of this report. Logs of the test pits are provided in this Appendix. The test pits were excavated to a maximum depth of seven and one-half feet below existing grades.

Earth Solutions NW_{LLC}

SOIL CLASSIFICATION CHART

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

DUAL SYMBOLS are used to indicate borderline soil classifications.

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



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

PROJECT NUMBER ES-8009.01 PROJECT NAME Lorenzini Short Plat
 DATE STARTED 12/22/21 COMPLETED 12/22/21 GROUND ELEVATION 289 ft
 EXCAVATION CONTRACTOR Client Provided LATITUDE 47.56128 LONGITUDE -122.22549
 EXCAVATION METHOD _____ GROUND WATER LEVEL: _____
 LOGGED BY BCS CHECKED BY SHA AT TIME OF EXCAVATION _____
 NOTES Depth of Topsoil & Sod 10"-12": lawn grass

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|------------|--------------------|-----------------------------|----------|-------------|--|
| 0 | | | | | |
| | | | TPSL | | Dark brown TOPSOIL 288.0 |
| | | MC = 16.6% | SM | | Brown silty SAND, medium dense, moist to wet -becomes gray -sparse gravel -moderate iron oxide staining |
| 5 | | MC = 13.3% | | | -becomes very dense, weakly cemented |
| | | MC = 16.3% Fines = 35.6% | | | [USDA Classification: slightly gravelly sandy LOAM] 281.5 |

Test pit terminated at 7.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.





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TEST PIT NUMBER TP-2

PAGE 1 OF 1

PROJECT NUMBER ES-8009.01 PROJECT NAME Lorenzini Short Plat
 DATE STARTED 12/22/21 COMPLETED 12/22/21 GROUND ELEVATION 293 ft
 EXCAVATION CONTRACTOR Client Provided LATITUDE 47.56129 LONGITUDE -122.22542
 EXCAVATION METHOD _____ GROUND WATER LEVEL: _____
 LOGGED BY BCS CHECKED BY SHA AT TIME OF EXCAVATION _____
 NOTES Depth of Topsoil & Sod ~14": lawn grass

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|------------|--------------------|-----------------------------|----------|--|--|
| 0 | | | | | |
| | | | TPSL |  | Dark brown TOPSOIL |
| | | MC = 17.6% | | | |
| | | MC = 14.2% Fines = 35.5% | SM |  | Brown silty SAND, medium dense to dense, moist to wet -becomes gray -becomes very dense, light to moderate iron oxide staining, weak cementation -infiltration test at 4' [USDA Classification: gravelly sandy LOAM] |
| 5 | | MC = 10.0% | | | |
| | | MC = 10.9% | | | |
| | | | | 7.0 | 286.0 |



Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.



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TEST PIT NUMBER TP-3

PROJECT NUMBER ES-8009.01 PROJECT NAME Lorenzini Short Plat
 DATE STARTED 12/22/21 COMPLETED 12/22/21 GROUND ELEVATION 300 ft
 EXCAVATION CONTRACTOR Client Provided LATITUDE 47.56127 LONGITUDE -122.22519
 EXCAVATION METHOD _____ GROUND WATER LEVEL: _____
 LOGGED BY BCS CHECKED BY SHA AT TIME OF EXCAVATION _____
 NOTES Depth of Topsoil & Sod 6"-8": lawn grass

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|------------|--------------------|-----------------------------|----------|--|--|
| 0 | | | | | |
| | | MC = 16.8% Fines = 33.7% | TPSL |  | Dark brown TOPSOIL -large 4" diameter tree roots |
| | | MC = 11.7% | SM |  | Brown silty SAND with gravel, medium dense, moist to wet [USDA Classification: gravelly fine sandy LOAM] -becomes gray dense |
| 5 | | MC = 12.7% | | | -becomes very dense, weakly cemented |
| | | | | | |



Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.



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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-8009.01 PROJECT NAME Lorenzini Short Plat
 DATE STARTED 12/22/21 COMPLETED 12/22/21 GROUND ELEVATION 302 ft
 EXCAVATION CONTRACTOR Client Provided LATITUDE 47.56118 LONGITUDE -122.2249
 EXCAVATION METHOD _____ GROUND WATER LEVEL: _____
 LOGGED BY BCS CHECKED BY SHA AT TIME OF EXCAVATION _____
 NOTES Depth of Topsoil & Sod 12": lawn grass

| DEPTH (ft) | SAMPLE TYPE NUMBER | TESTS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | |
|------------|--------------------|------------|----------|---|--|-------|
| 0 | | | | | | |
| | | | TPSL |  | Dark brown TOPSOIL | 301.0 |
| | | MC = 14.1% | SM |  | Gray silty SAND, very dense, moist to wet -moderate to heavy iron oxide staining, weakly cemented | 300.5 |

Test pit terminated at 1.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

Appendix B
Laboratory Test Results
ES-8009.01

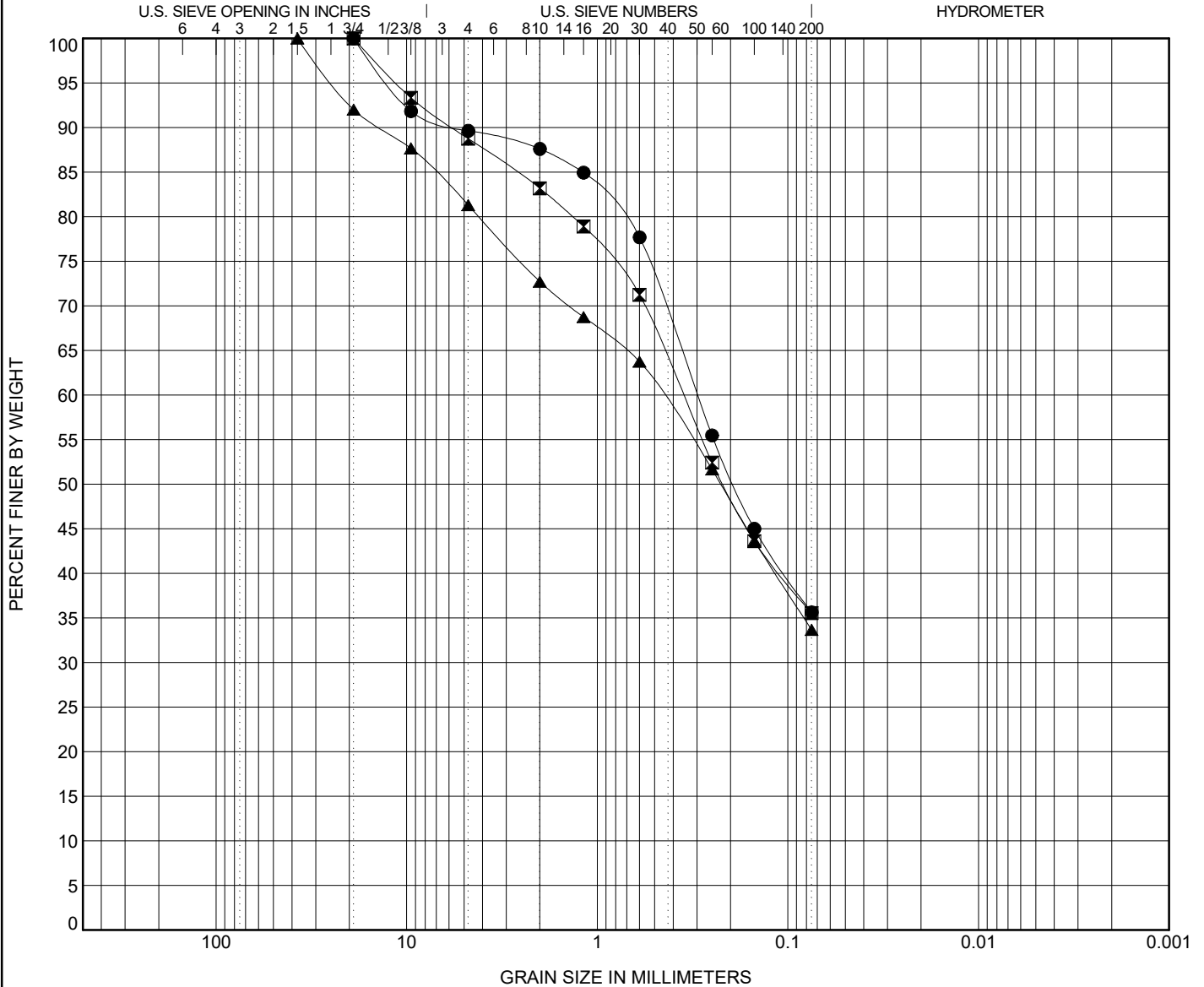


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 Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-8009.01

PROJECT NAME Lorenzini Short Plat



| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---------|--------|------|--------|--------|------|--------------|
| | coarse | fine | coarse | medium | fine | |

| Specimen Identification | Classification | | | | | | | Cc | Cu |
|-------------------------|--|--|--|--|--|--|--|----|----|
| ● TP-01 7.50ft. | USDA: Gray Slightly Gravelly Sandy Loam. USCS: SM. | | | | | | | | |
| ▣ TP-02 4.00ft. | USDA: Gray Gravelly Sandy Loam. USCS: SM. | | | | | | | | |
| ▲ TP-03 1.00ft. | USDA: Brown Gravelly Fine Sandy Loam. USCS: SM with Gravel. | | | | | | | | |

| Specimen Identification | D100 | D60 | D30 | D10 | LL | PL | PI | %Silt | %Clay |
|-------------------------|------|-------|-----|-----|----|----|----|-------|-------|
| ● TP-01 7.5ft. | 19 | 0.299 | | | | | | 35.6 | |
| ▣ TP-02 4.0ft. | 19 | 0.355 | | | | | | 35.5 | |
| ▲ TP-03 1.0ft. | 37.5 | 0.457 | | | | | | 33.7 | |

GRAIN SIZE USDA ES-8009.01 LORENZINI SHORT PLAT.GPJ GINT US LAB.GDT 1/6/22

Report Distribution

ES-8009.01

EMAIL ONLY

**Design Built Homes, LLC
11400 Southeast 8th Street, Suite 415
Bellevue, Washington 98004**

Attention: Mr. Todd Sherman