

STORM DRAINAGE REPORT

Proposed Single Family Residence

Located at

xxxxx 33rd AVE NE Lake Forest Park, WA 98155

Parcel # 4023501234

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1- Project Overview

Per LFPMC 16.24, the City of Lake Forest Park has adopted the King County Washington Surface Water Design Manual (KCSWDM). This storm drainage technical information report has been prepared per the King County site development and storm drainage requirements for the proposed single family residence located at vacant site:

Address: xxxxx 33rd AVE NE, Lake Forest Park, WA 98155

Parcel: 4023501234

Quarter-Section-Township-Range: SE-9 -26-4

Zoning: RS 20000

Legal Description: LAKE FOREST PARK 2ND ADD POR WLY OF LN DRN FR PT ON S LN OF SD LOT 370 FT WLY OF SE COR THOF TO PT ON N LN OF LOT 146.76 FT NELY OF NW COR THOF

PLat Block: 27

Plat Lot: 9

The vacant 8627sf or 0.2 acres lot is located on the east of 33rd AVE NE at xxxxx 33rd AVE NE, Lake Forest Park, WA 98155. The site is irregular shape and undeveloped with grass, bushes and variable trees. The site has slope down from west to east at magnitudes of 30% to 60% and relief of about 55 feet. The site is bordered by single family residences on the north, south, east, and by 33rd AVE NE on the west. Please see the soil report from Cobalt Geosciences LLC and survey plan by Camp land Surveyors PLLC for more information about existing condition. There is no gutter, curbs and sidewalk on the 33rd AVE NE. There is a roadside ditch on the west side of 33rd Ave NE.

A new building with 740sf house, 435sf garage, 48sf cover porch, 10sf stairs, 140sf deck and 404sf onsite driveway will be constructed. Total new impervious area will be 1777sf or 20.6% of the site, and a new 303.5sf off-site entrance will be constructed.

Lot size	8,627 sf
Proposed House	740 sf
Proposed garage	435 sf
Cover Porch	48 sf
Stairs	10 sf
Deck	140 sf
Onsite Proposed Driveway	404 sf
Total new on-site impervious areas	1,777 sf or 20.6%
Proposed Off-site driveway	303.5 sf
Total proposed On and Off-site impervious areas	2,080.5 sf

Roof = 1437sf

Onsite clearing limit area = 4012sf

Offsite clearing limit area = 457sf

Per Lake Forest Park GIS and King County Imap, the site is in urban and not in coal mine hazards, wetland, 100-year flood plain, seismic or critical aquifer recharge area. The site is in Erosion hazards, landslide hazards, and steep slope. There is no drainage complaint downstream and upstream. Please see the KC and Lake Forest Park Critical Map below.

Drainage Basin: McAleer Creek

Watershed: Cedar River / Lake Washington

WRIA: Cedar-Sammamish (8)

Water district: North City Water District

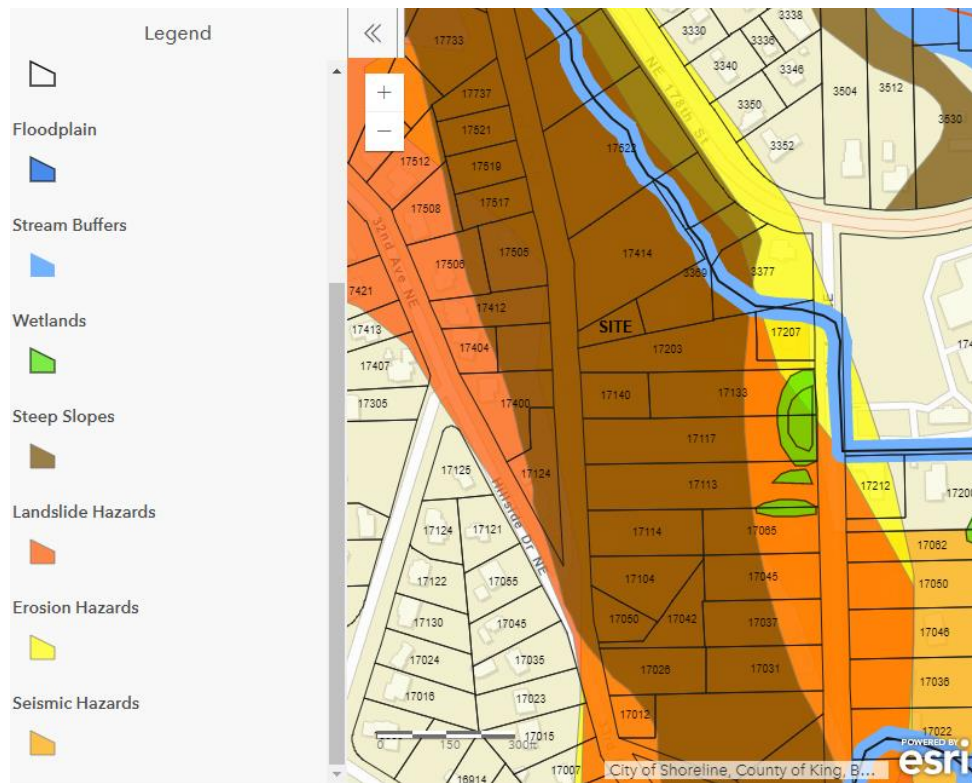
Sewer district: Lake Forest Park Sewer District

The owner has fire flow analysis task order No.1847 and certificate of sewer permit # 2022-SSA-004.

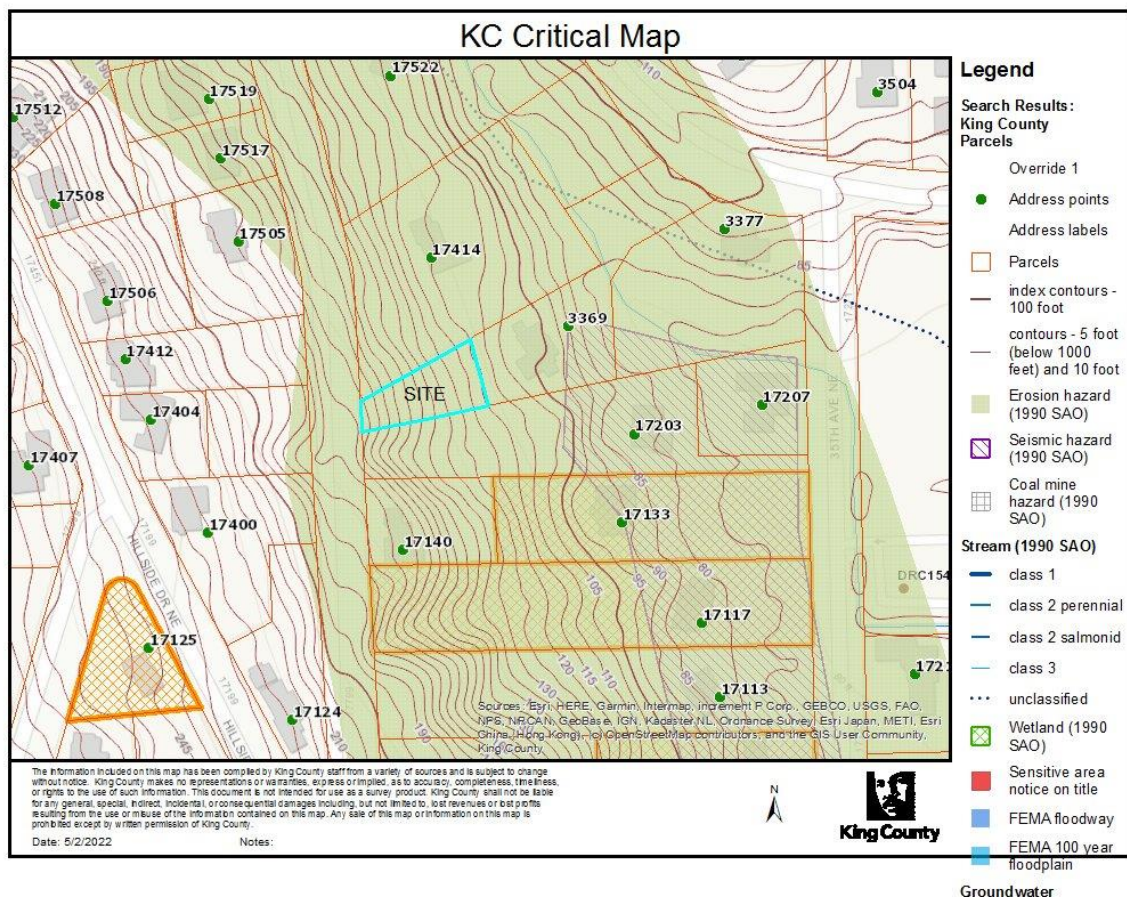
Per Cobalt Geosciences report, the site slopes are stable at this time with no evidence of historic or recent landslide activity, emergent groundwater, or erosion. The risk of erosion and shallow sloughing can be maintained at a low level during and after construction with proper use of temporary and permanent erosion control measures, proper grading and benching, adequate foundation placement, and if the work occurs during the dry season (see the soil report for each section detail).

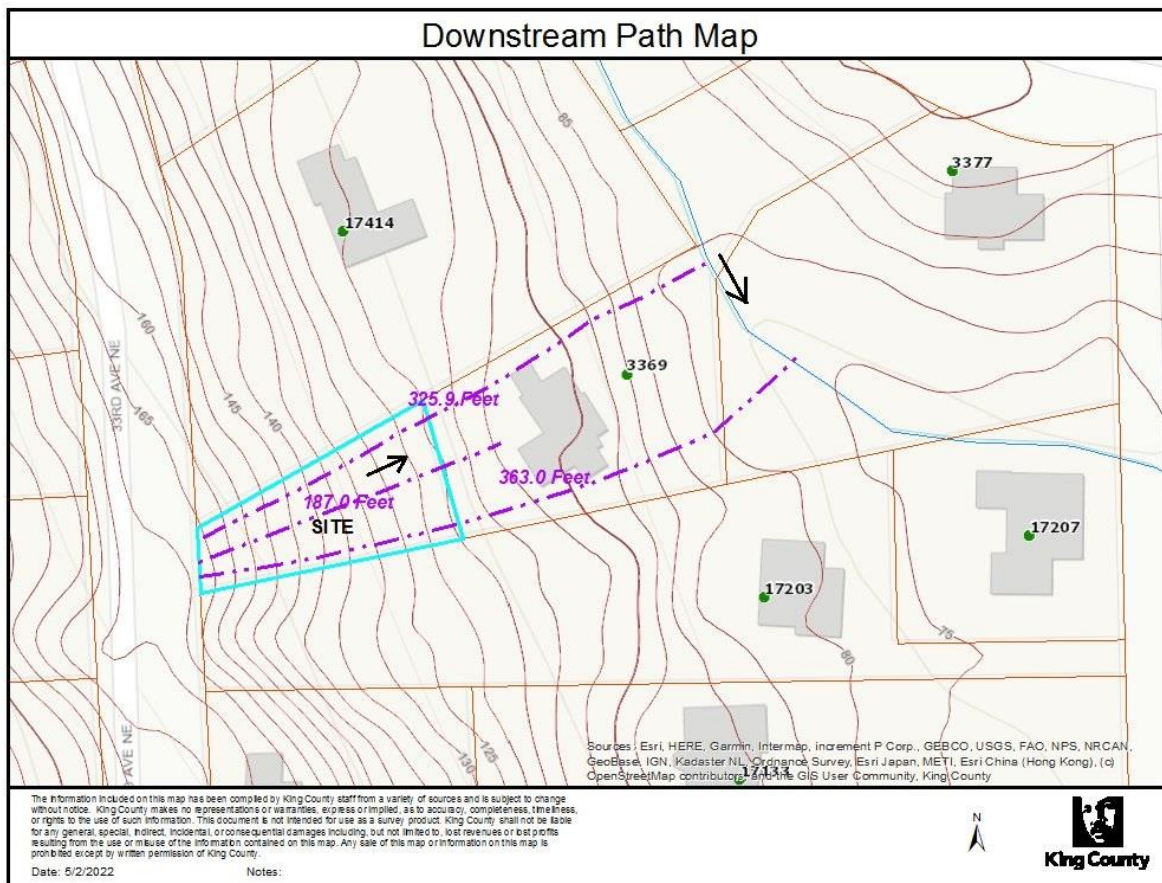


Vicinity Map



Lake Forest Park Critical Map





Current runoffs of the site infiltrates into ground, or sheet flows over ground to the east to McAleer Creek (see the downstream path map above). There are no reported problems to be investigated. There will not be any destruction of aquatic habitat on-site or downstream. The site was visited on 3/30/2022 and a downstream investigation was made. There are no signs of surface flow, no problems were identified. There are no existing or potential drainage problems and water quality problems. There is a drainage channel to the south of the site from a 12" CP road culvert crossing 33rd Ave. The flow path goes down the hill on the lot adjacent to this site in 12"Ø ADS pipes. The flow path crosses the Southeast corner of our site as a ditch and then continues east in 12" Ø ADS and CP pipes to McAleer Creek.

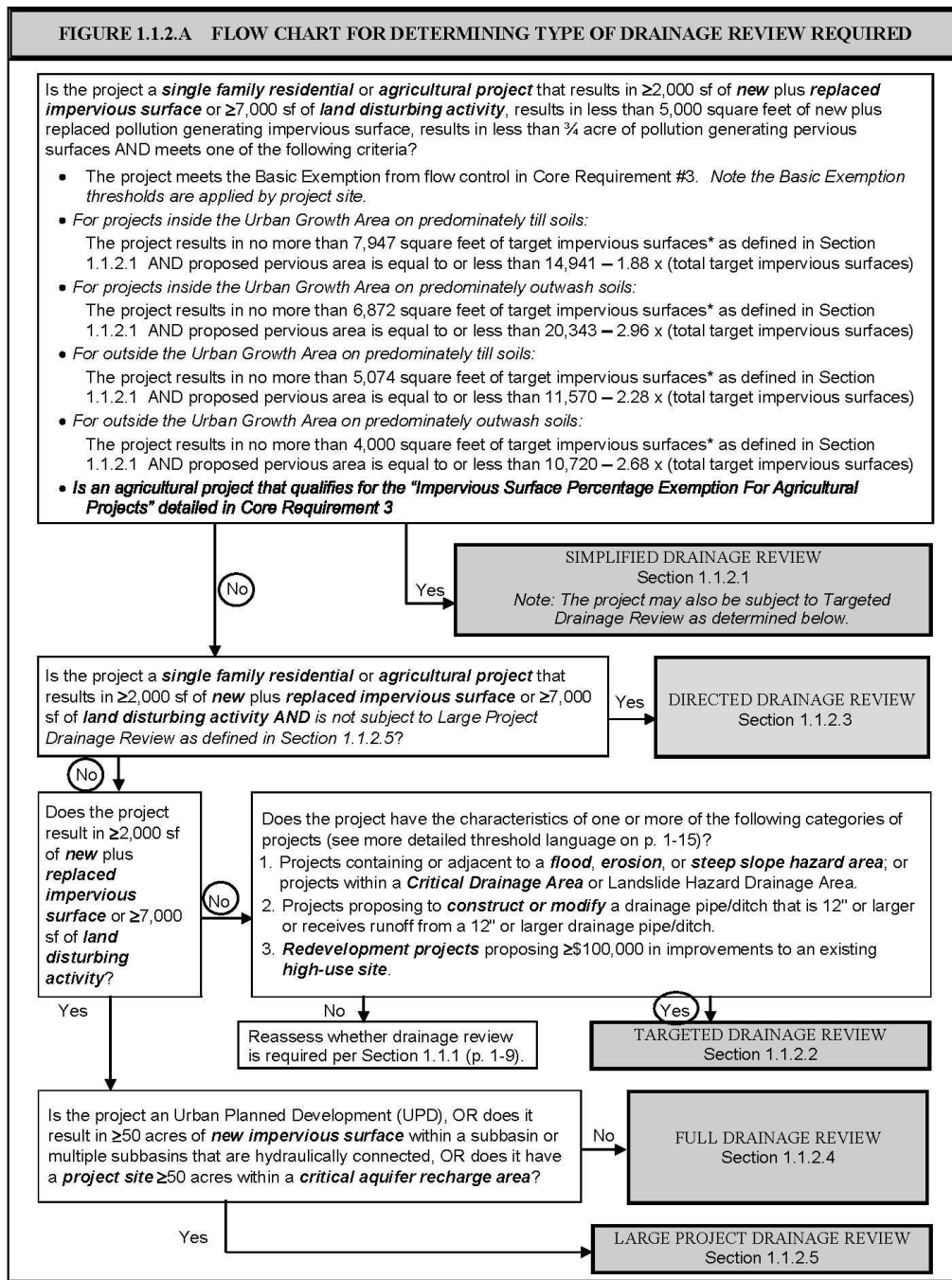
Per Cobalt Geosciences report, infiltration is not feasible due to the presence of very fine grained, mottled silts and steep topography. Dispersion is not feasible due to the 35% slopes.

2- Conditions and Requirements Summary

Per the Figure 1.1.2.A of 2021 King County Surface Water Design Manual below, this lot meets Targeted Drainage Review section 1.1.2.2 as the site is in erosion, landslide and steep slope. Per

Table 1.1.2.A-Requirements applied under each drainage review type, the project meets Targeted category 1: the core requirement #5 and special requirement #1 to #4 will be addressed in this TIR. Core requirement # 1, 2, 3, 4, 6, 7, and 8 may be applied by DLS-Permitting based on project. Project overview part above provides necessary information for the core requirement #1 & #2.

SECTION 1.1 DRAINAGE REVIEW



7/23/2021

CORE REQUIREMENT #5: CONSTRUCTION STORMWATER POLLUTION PREVENTION

Temporary ESC measures will be required as there will be disturbance of the soil to construct the new building. All of the flows from the new house and driveway will flow onto the lot, so no adjacent properties will be affected. In order to prevent erosion and trap sediment within the project site, the following BMPs will be used:

- Clearing limits will be marked by fencing or other means on the ground.
- Runoff will not be allowed to concentrate and no water will be allowed to point discharge.
- Mulch will be spread over all cleared areas of the site when they are not being worked.

Mulch will consist of air-dried straw and chipped vegetation.

A construction entrance, a silt fence, clearing limits and tree protection will be provided at a minimum. No special requirements are needed. A separate CSWPPP will be provided with this TIR.

Special Requirements:

Special Requirement #1: Other Adopted Area-Specific Requirements, section 1.3.1

None known

Special Requirement #2: Flood Hazard Area Delineation, section 1.3.2

The site is not in a flood hazard area, so flood hazard area delineation is not required.

Special Requirement #3: Flood Protection Facilities, section 1.3.3

The site is not in a flood plain, so no flood protection facilities are required.

Special Requirement #4: Source Control, section 1.3.4

The site is a single family residence with 404 PGS; it is not high use and less than 5000sf of PGS is created, so no source control is required.

As the site is smaller than 22,000sf, it is subjected to Small Lot BMP Requirement. As the site is less than 5000sf of new plus replaced impervious will be created and less than $\frac{3}{4}$ acres of new pervious surface will be added. Flow control is not required. On-site stormwater management BMPs have been examined for their feasibility.

Full Dispersion: It is infeasible as there is not an adequate 100 foot flow path on the site.

Full Infiltration: It is infeasible due to fine grained silt soils.

Limited Infiltration: It is infeasible per Soil report due to silt soils and steep slope.

Bioretention: It is infeasible as geotechnical recommended infiltration not be used due to steep slope and soil type.

Permeable Pavement: It is infeasible as driveway slope is greater than 10%.

Basic Dispersion : It is infeasible due to 35% slopes.

As no BMPs are feasible the runoff from the roof downspouts and driveway will be collected into a catch basin and routed down the hill in a 6" Ø surface laid HDPE pipe with pipe anchors. The HDPE pipe will outlet into the ditch at the SE corner of the site onto a rock pad.

See Maintenance and Operation, and ESC in the Appendix below.

APPENDIX:

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 ⅓ 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 ¼ 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 ¼ 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.	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. 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 $7/8$ 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.
	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.

The above measures must be implemented as needed to prevent the discharge of sediment-laden water and other pollutants from the construction site. Proposed measures must be shown on the Simplified site CSWPP plan required to be submitted with the Simplified drainage plans. Site-specific conditions during construction may require additional measures as deemed necessary by DLS-Permitting. As noted in Section C.3 above, other ESC and/or SWPPS measures found in Appendix D of the *SWDM* may be needed or may be more appropriate for the *project site* as determined by DLS-Permitting.

C.3.1 STABILIZED CONSTRUCTION ENTRANCE

Purpose

Construction entrances are stabilized to reduce the amount of sediment transported onto paved roads by motor vehicles or runoff by constructing a stabilized pad of quarry spalls at the entrances to construction sites.

Application

Construction entrances shall be stabilized wherever traffic will be leaving a construction site and traveling on paved roads or other paved areas within 1,000 feet of the *site*.

Design and Installation Specifications

1. See Figure C.3.1.A for details.
2. A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:

Grab Tensile Strength (ASTM D4632)	200 lbs min.
Grab Tensile Elongation (ASTM D4632)	30% max. (woven)
Puncture Strength (ASTM D6241)	495 lbs min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

3. Hog fuel (wood based mulch) may be substituted for or combined with quarry spalls in areas that will not be used for permanent roads. The effectiveness of hog fuel is highly variable, but it has been used successfully on many construction sites. It generally requires more maintenance than quarry spalls. Hog fuel is not recommended for entrance stabilization in urban areas. The inspector may at any time require the use of quarry spalls if the hog fuel is not preventing sediment from being tracked onto pavement or if the hog fuel is being carried onto pavement. Hog fuel is prohibited in permanent roadbeds because organics in the subgrade soils cause difficulties with compaction.
4. Whenever possible, the entrance shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.

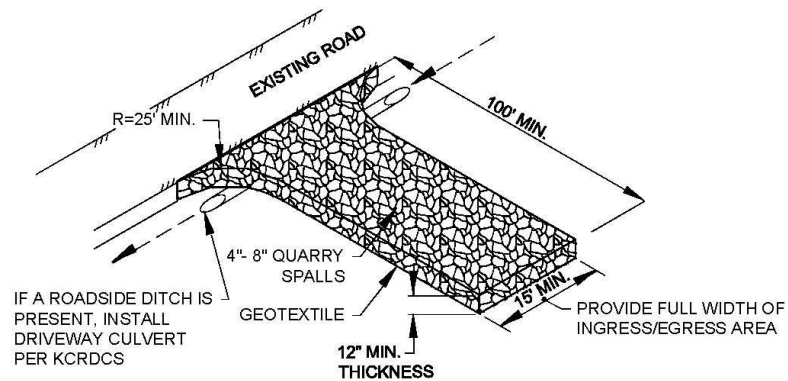
Maintenance

1. Quarry spalls (or hog fuel) shall be added if the pad is no longer in accordance with the specifications.
2. If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include street sweeping, an increase in the dimensions of the entrance, or the installation of a wheel wash. If washing is used, it shall be done on an area covered with crushed rock, and wash water shall drain to a sediment trap or pond.
3. Any sediment that is tracked onto pavement shall be removed immediately by sweeping. The sediment collected by sweeping shall be removed or stabilized onsite. The pavement shall not be

cleaned by washing down the street, except when sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, a small sump must be constructed. The sediment would then be washed into the sump where it can be controlled. Wash water must be pumped back onto the *site* and cannot discharge to systems tributary to surface waters.

4. Any quarry spalls that are loosened from the pad and end up on the roadway shall be removed immediately.

FIGURE C.3.1.A STABILIZED CONSTRUCTION ENTRANCE



NOTES:

- PER KING COUNTY ROAD DESIGN AND CONSTRUCTION STANDARDS (KCRDCS), DRIVEWAYS SHALL BE PAVED TO EDGE OF R-O-W PRIOR TO INSTALLATION OF THE CONSTRUCTION ENTRANCE TO AVOID DAMAGING OF THE ROADWAY.
- IT IS RECOMMENDED THAT THE ENTRANCE BE CROWNED SO THAT RUNOFF DRAINS OFF THE PAD.

C.3.6 SILT FENCE

Purpose

Use of a silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

Silt fence may be used downslope of all disturbed areas. Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow.

Design and Installation Specifications

1. See Figure C.3.6.A and Figure C.3.6.B for details.
2. The geotextile used must meet the standards listed below. A copy of the manufacturer's fabric specifications must be available onsite.

AOS (ASTM D4751)	30-100 sieve size (0.60-0.15 mm) for slit film 50-100 sieve size (0.30-0.15 mm) for other fabrics
Water Permittivity (ASTM D4491)	0.02 sec ⁻¹ minimum
Grab Tensile Strength (ASTM D4632) (see Specification Note 3)	180 lbs. min. for extra strength fabric 100 lbs. min. for standard strength fabric
Grab Tensile Elongation (ASTM D4632)	30% max. (woven)
Ultraviolet Resistance (ASTM D4355)	70% min.

3. Standard strength fabric requires wire backing to increase the strength of the fence. Wire backing or closer post spacing may be required for extra strength fabric if field performance warrants a stronger fence.
4. Where the fence is installed, the slope shall be no steeper than 2H:1V.
5. If a typical silt fence (per Figure C.3.6.A) is used, the standard 4 x 4 trench may not be reduced as long as the bottom 8 inches of the silt fence is well buried and secured in a trench that stabilizes the fence and does not allow water to bypass or undermine the silt fence.
6. Silt fences shall be located so as to avoid interfering with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.

Maintenance Standards

1. Any damage shall be repaired immediately.
2. If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a sediment trap or pond.
3. It is important to check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
4. Sediment must be removed when the sediment is 6 inches high.
5. If the filter fabric (geotextile) has deteriorated due to ultraviolet breakdown, it shall be replaced.

FIGURE C.3.6.A SILT FENCE

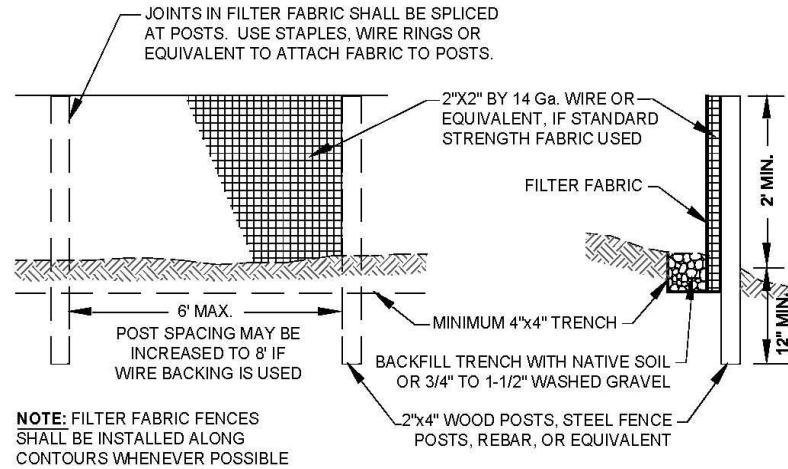


FIGURE C.3.6.B SILT FENCE INSTALLATION AND MAINTENANCE

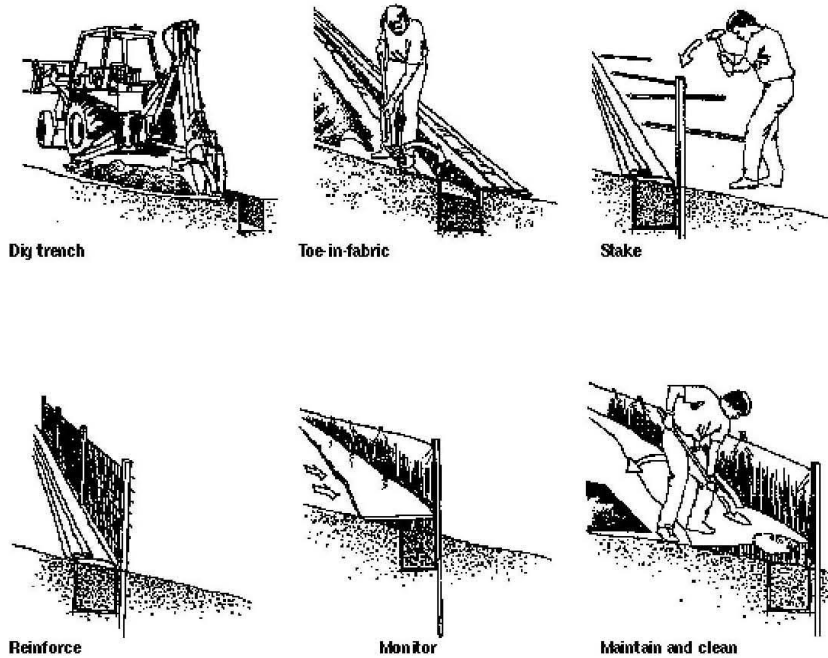


FIGURE 4.2.1.C CORRUGATED METAL PIPE COUPLING AND/OR GENERAL PIPE ANCHOR ASSEMBLY