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FARRIS SHORT PLAT

Lot 2 Improvements

Operation and Maintenance Manual

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The storm drainage improvements for this project will be privately owned and operated. The lot owner will be responsible for operation and maintenance of the drainage systems. The storm drainage facilities consist of:

- Dispersion trench
- Vegetated flowpath/Basic filter strip
- Conveyance system

Roof - Conveyance

Roof runoff will be tightlined to the dispersion trench west of the building. The system will consist of a 4-inch pipe running directly from the building roof drains to the junction box in the dispersion trench. The conveyance system should be inspected annually and after large (2 inches in 24 hours) storm events. The conveyance system should be inspected for sediment accumulation, blockage, and overflow. Additional considerations are listed in the maintenance checklists.

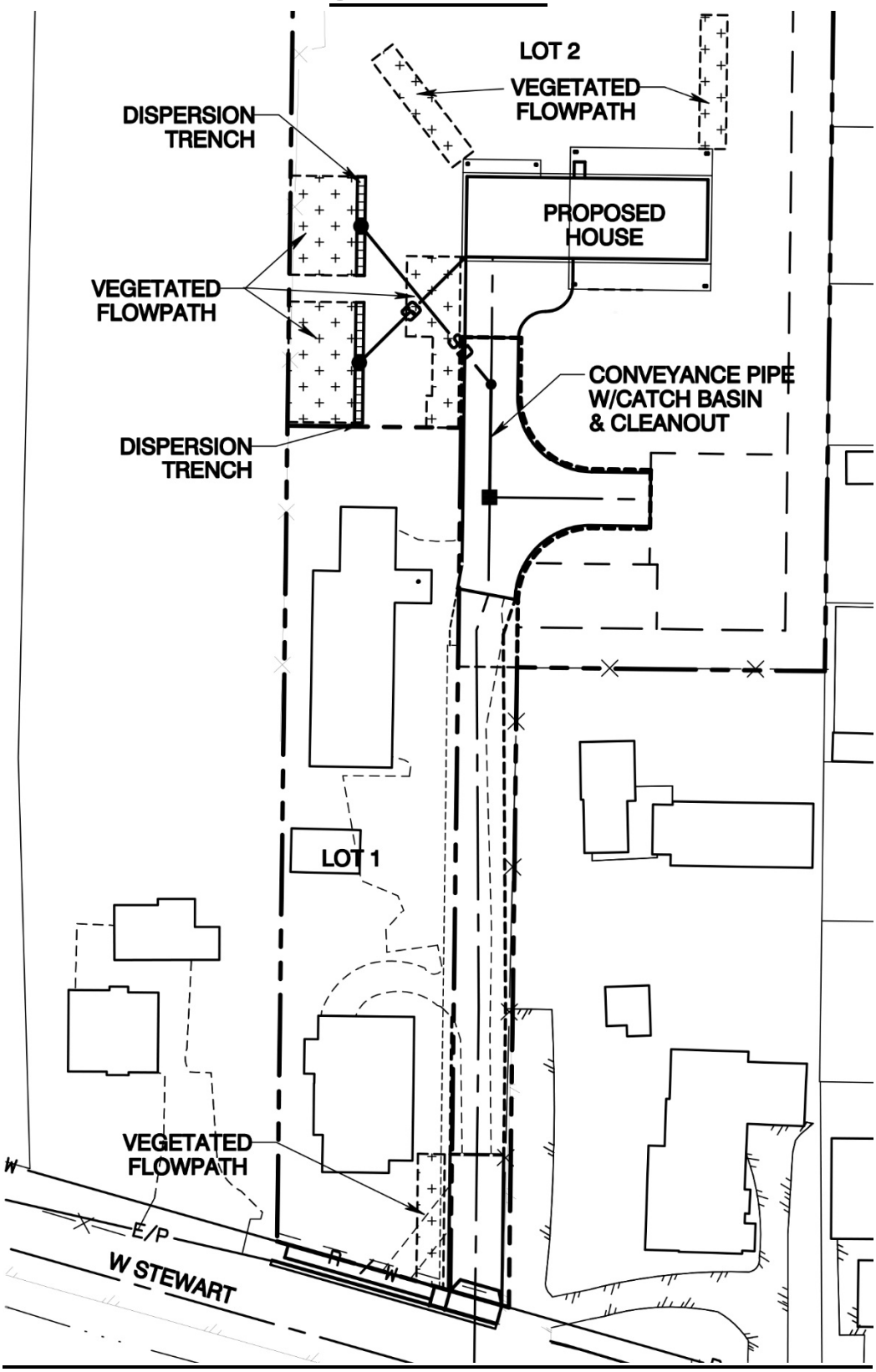
Roof – Dispersion Trench

Roof runoff will be tightlined to a dispersion trench to the west of the residence. The trench will consist of a 4-inch perforated pipe in a drainrock beck, with a level spreader board at surface grade. The intent of the trench is to event release runoff across the width of the trench. The dispersion trench system should be inspected annually and after large (2 inches in 24 hours) storm events. The trench should be inspected for to ensure level distribution of outflow and that a healthy vegetated path exists downstream. Additional considerations are listed in the maintenance checklists.

Driveway – Filter Strip

Driveway runoff will sheetflow to the west side of the driveway, then through a vegetated flowpath with width per the plans. This area serves both for dispersion and treatment of runoff. The filter strip should be inspected annually and after large (2 inches in 24 hours) storm events. The filter strip should be inspected to ensure healthy vegetation growth and no erosion or channeling through the filter strip. Additional considerations are listed in the maintenance checklists.

SITE PLAN


LOT 2
VEGETATED FLOWPATH
DISPERSION TRENCH
PROPOSED HOUSE
VEGETATED FLOWPATH
CONVEYANCE PIPE W/CATCH BASIN & CLEANOUT
DISPERSION TRENCH
LOT 1
VEGETATED FLOWPATH
E/P
W STEWART

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		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 the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	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 inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 10 – Filter Strips

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.
	Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3-4 inches.
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.	Remove trash and Debris from filter.
	Erosion/Scouring	Eroded or scoured areas due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width.

#22 – Maintenance Checklist for Conveyance Systems (Pipes and Ditches):

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Pipes	Sediment & Debris	Accumulated sediment that exceeds 20 percent of the diameter of the pipe.	Pipe cleaned of all sediment and debris.
Pipes	Vegetation	Vegetation that reduces free movement of water though pipes.	Vegetation does not impeded free movement of water through pipes. *Prohibit use of sand and sealant application and protect from construction runoff.*
Pipes	Damaged (Rusted, Bent or Crushed)	Protective coating is damaged: rust is causing more than 50 percent deterioration to any part of pipe.	Pipe repaired or replaced.
Pipes	Damaged (Rusted, Bent or Crushed)	Any dent that significantly impedes flow (i.e. decreases the cross section area of pipe by more than 20 percent).	Pipe repaired or replaced.
Pipes	Damaged (Rusted, Bent or Crushed)	Pipe has major cracks or tears allowing groundwater leakage.	Pipe repaired or replaced.
Open Ditches	Trash & Debris	Dumping of yard wastes such as grass clippings and branches. Unsightly accumulation of non-degradable materials such as glass, plastic, metal, foam, and coated paper.	No trash or debris present. Trash and debris removed and disposed of as prescribed by the County.
Open Ditches	Sediment Buildup	Accumulated sediment that exceeds 20 percent of the design depth.	Ditch cleaned of all sediment and debris so that it matches design.
Open Ditches	Vegetation	Vegetation (e.g. weedy shrubs or saplings) that reduces free movements of water through ditches.	Water flows freely though ditches. Grassy vegetation should be left alone.
Open Ditches	Erosion Damage to Slopes	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	No erosion damage present. Slopes stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
Open Ditches	Erosion Damage to Slopes	Any erosion observed on a compacted berm embankment.	*If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.*
Open Ditches	Rock Lining Out of Place or Missing (If Applicable)	Native soil is exposed beneath the rock lining.	Rocks replaced to design standards.

If you are unsure whether a problem exists, contact a professional engineer.

#33 – Maintenance Checklist for Downspout, Sheet Flow, and Concentrated Dispersion Systems:

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Splash block	Water Directed Toward Building	Water is being directed towards building structure.	Water directed away from building structure.
Splash block	Water Causing Erosion	Water disrupts soil media.	Blocks are reconfigured/ repaired and media is restored.
Transition zone	Erosion	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than 2 foot of width.	No eroded or scoured areas. Cause of erosion or scour is addressed.
Dispersion trench	Concentrated Flow	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" from edge of trench; intent is to prevent erosion damage).	No debris on trench surface. Notched grade board or other distributor type is aligned to prevent erosion. Trench is rebuilt to standards, if necessary.
Surface of trench	Accumulated Debris	Accumulated trash, debris, or sediment on drain rock surface impedes sheet flow from facility.	Trash or debris is removed/disposed in accordance with local solid waste requirements.
Surface of trench	Vegetation Impeding Flow	Vegetation/moss present on drain rock surface impedes sheet flow from facility.	Freely draining drain rock surface.
Pipe(s) to trench	Accumulated Debris in Drains	Accumulation of trash, debris, or sediment in roof drains, gutters, driveway drains, area drains, etc.	No trash or debris in roof drains, gutters, driveway drains, or area drains.
Pipe(s) to trench	Accumulated Debris in Inlet Pipe	Pipe from sump to trench or drywell has accumulated sediment or is plugged.	No sediment or debris in inlet/outlet pipe screen or inlet/outlet pipe.
Pipe(s) to trench	Damaged Pipes	Cracked, collapsed, broken, or misaligned drain pipes.	No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.
Sump	Accumulated Sediment	Sediment in the sump.	Sump contains no sediment.
Access lid	Hard to Open	Cannot be easily opened.	Access lid is repaired or replaced.
Access lid	Buried	Buried.	Access lid functions as designed (refer to record drawings for design intent).
Access lid	Missing Cover	Cover missing.	Cover is replaced.
Rock pad	Inadequate Rock Cover	Only one layer of rock exists above native soil in area 6 square feet or larger, or any exposure of native soil.	Rock pad is repaired/replaced to meet design standards.
Rock pad	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad is repaired/replaced to meet design standards.
Dispersal Area	Erosion	Erosion (gullies/ rills) greater than 2 inches deep in dispersal area.	No eroded or scoured areas. Cause of erosion or scour is addressed.
Dispersal Area	Accumulated Sediment	Accumulated sediment or debris to extent that blocks or channelizes flow path.	No excess sediment or debris in dispersal area. Sediment source is addressed (if feasible).

#33 – Maintenance Checklist for Downspout, Sheet Flow, and Concentrated Dispersion Systems:

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Ponded water	Ponded Water	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.	System freely drains and there is no standing water in dispersion area between storms. The cause of the standing water (e.g., grade depressions, compacted soil) is addressed.
Vegetation	Plant Survival	Dispersal area vegetation in establishment period (1-2 years, or additional 3rd year) during extreme dry weather).	Vegetation is healthy and watered weekly during periods of no rain to ensure plant establishment.
Vegetation	Lack of Vegetation Allowing Erosion	Poor vegetation cover such that erosion is occurring.	Vegetation is healthy and watered. No eroded or scoured areas are present. Cause of erosion or scour is addressed. Plant species are appropriate for the soil and moisture conditions.
Vegetation	Vegetation Blocking Flow	Vegetation inhibits dispersed flow along flow path.	Vegetation is trimmed, weeded, or replanted to restore dispersed flow path.
Vegetation	Presence of 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.
Pest Control	Mosquito Infestation	Standing water remains for more than three days following storms.	All inlets, overflows and other openings are protected with mosquito screens. No mosquito infestation present.
Rodents	Presence of Rodents	Rodent holes or mounds disturb dispersion flow paths.	Rodents removed or destroyed, holes are filled, and flow path is revegetated.

If you are unsure whether a problem exists, contact a professional engineer.

MAINTENANCE ACTIVITY LOG

Date: _____

Site Address: _____

Facility Inspected: _____

Reason for Inspection: ____ A =Annual (March or April preferred)
____ M =Monthly (see schedule)
____ S =after major storms (use 1-inch in 24 hours as a guideline)

Problems Encountered (See Maintenance Checklist):

Actions Taken (note as routine or emergency):

Inspection performed by: _____

Signature: _____