



Standard Operation Procedures
for
Inspection and Maintenance
of
Stormwater Quality Infiltration Basin(s)

Space Village Filing No. 4

Owner:
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Introduction

This plan addresses operation and maintenance of private detention / stormwater quality facilities (East and West Ponds) constructed as part of the Space Village Filing No. 4 development project, one-quarter mile east of the intersection of Peterson Boulevard and Space Village Avenue (EPC PCD projects number(s): XX-XX-XXX. The plat number of **Space Village Filing No. 4** is XX-XX-XXX.

Background

MS227

The State of Colorado Department of Public Health and Environment, Water Quality Control Division (CDPHE), has implemented federal regulations within the State of Colorado through permitting, and has included El Paso County as one of numerous Municipal Separate Storm Sewer Systems (MS4s) required to be permitted in compliance with National Pollutant Discharge Elimination System (NPDES) Phase 2 Regulations, as defined within Colorado's Phase 2 Municipal Guidance.

NPDES Phase 2 MS4s stormwater discharges are covered under a general permit under the Colorado Discharge Permit System (CDPS) under Regulation 61, and as a minimum require the MS4's operator (e.g., El Paso County) to develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants to the maximum extent practicable to protect water quality requirements of the Colorado Water Quality Control Act, Colorado Code of Regulations [CCR] 61.8(11)(a)(i).

This Stormwater Facilities Operation and Maintenance Plan (O&M Plan) is for the private on site detention facilities (East and West Ponds) constructed as part of the development project referenced above. [Click or tap here to enter text.](#)

Associated Agreements

The Private Detention / Stormwater Quality Best Management Practice Maintenance Agreement and Easement (Maintenance Agreement) for the development requires the property owner to construct the detention and stormwater quality facilities in accordance with county approved plans and to regularly and routinely inspect, clean, and maintain the facilities in good repair at their own expense. The Maintenance Agreement includes provision of an easement granted to the county to allow the county to access, inspect, clean, repair and maintain the facilities; although those duties are not implied to be that of the county.

The Subdivision Improvements Agreement (SIA) for the development requires the developer to complete the pond improvements as itemized in the associated Financial Assurance Estimate (FAE) and to provide collateral to remain in effect at all times until the improvements are completed and accepted in accordance with county regulations.

Funding for and Organization of Facility Operation and Maintenance

Hampton Partners will be responsible for operations and maintenance of the East and West Pond detention facilities upon acceptance of the facilities.

Site and Facilities Description

- 1) The East Pond is located along the south boundary of Lot 2, Block 1, Space Village Filing No. 4. The West Pond is located along the south boundary of Lot 1, Block 1, Space Village Filing No. 4.
- 2) Access to the site is by means of two drive entrances directly off Space Village Avenue. Access through the site is by means of any private drives constructed in conjunction with the development of the site with permission of the property owner. Access easement(s) around the perimeter of the site and immediately adjacent to a constructed channel, a constructed swale

and the constructed ponds allow access to drainage facilities for inspection and maintenance of the facilities as described below.

- 3) Emergency spillways for the East and the West Pond are comprised of each ponds' southernmost embankment. Runoff that is discharged over the spillways will be conveyed as sheet flow towards Peterson Air Force Base comparable to the historic condition.
- 4) Runoff enters the East Pond as sheet flow directly from the site. A drainage channel conveying off site runoff contributes flow at the pond's east end. The offsite runoff will utilize any excess pond capacity before bypassing the pond by means of the emergency spillway. The pond does not include any formal facilities (forebay, trickle channel, outlet structure, etc.) Runoff captured within the pond is infiltrated directly into the ground. Runoff enters the West Pond as sheet flow directly from the site. A drainage swale conveying off site runoff contributes flow at the pond's west end. The offsite runoff will utilize any excess pond capacity before bypassing the pond by means of the emergency spillway. The pond does not include any formal facilities (forebay, trickle channel, outlet structure, etc.) Runoff captured within the pond is infiltrated directly into the ground.

Stormwater Quality Infiltration Basin (SQIB) Description

The subsections below describe general SQIB operations and maintenance.

SQIB-1 GENERAL SQIB CONCEPT

Stormwater Quality Infiltration Basins (SQIBs) are permanent stormwater control measures. A SQIB is a sedimentation basin designed to capture stormwater runoff, and to drain completely sometime after stormwater runoff ends. The basins are considered to be "dry" because the basin is designed not to have a significant permanent pool of water remaining between runoff events.

SQIBs are an adaptation of a detention basin used for flood control, with the primary difference being the addition of volume to accommodate the Water Quality Capture Volume (WQCV). The basins collect and infiltrate stormwater runoff capturing sediment within the basin as runoff infiltrates into the ground.

SQIB-2 INSPECTING STORMWATER QUALITY INFILTRATION BASINS (SQIBs)

SQIB-2.1 Access and Easements

Inspection and maintenance personnel may utilize the attached stormwater facility map containing the location(s) of the access points and maintenance easements of the SQIB(s) within this development.

SQIB-2.2 Stormwater Management Facilities Locations

Inspection and maintenance personnel may utilize the attached stormwater facility map containing the location(s) of the SQIB(s) within this development.

SQIB-2.3 Stormwater Quality Infiltration Basin (SQIB) Features

SQIBs have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another.

Therefore, it is critical that each feature of the SQIB is properly inspected and maintained to ensure that the overall facility functions as it was intended. Below is a list and description of the most common features within a SQIB and the corresponding maintenance inspection items that can be anticipated:

Table SQIB-1: Typical Inspection & Maintenance Requirements Matrix

SQIB Features	Sediment Removal	Mowing/ Weed Control	Trash & Debris Removal	Erosion	Over-grown Vegetation Removal	Standing Water (mosquito/ algae control)
Inflow Points (outfalls)	X	X	X	X	X	
Basin	X	X	X	X	X	X
Emergency Spillway			X	X	X	

SQIB-2.3.1 Inflow Points

Inflow Points or Outfalls into SQIBs are the point source of the stormwater discharge into the facility. An inflow point is commonly a storm sewer pipe with a flared end section that discharges into the SQIB. In some instances, an inflow point could be a drainage channel or ditch that flows into the facility.

An energy dissipater (riprap or hard armor protection) is typically immediately downstream of the discharge point into the SQIB to protect from erosion. In some cases, a storm sewer outfall can have a toe- wall or cut-off wall immediately below the structure to prevent undercutting of the outfall from erosion.

The typical maintenance items that are found with inflow points are as follows:

- a. Riprap Displaced* – Many times, because the repeated impact/force of water, riprap, if installed, can shift and settle. If any portion of a riprap apron appears to have settled, soil is present between the riprap, or the riprap has shifted, maintenance may be required to ensure future erosion is prevented.
- b. Erosion Present/Outfall Undercut* – In some situations, an energy dissipater may not have been sized, constructed, or maintained appropriately and erosion has occurred. Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility.
- c. Sediment Accumulation* – Because of the turbulence in the water created by an energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in hydraulic performance of the upstream infrastructure, sediment that accumulates in this area must be removed in a timely manner.
- d. Woody Growth/Weeds Present* – Undesirable vegetation can grow in and around the inflow area to a SQIB that can significantly affect the performance of the drainage facilities discharging into the facility. This type of vegetation includes trees (typically cottonwoods) and dense areas of shrubs (willows). If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate, resulting in blockage of the discharge. Routine maintenance is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree). In addition, noxious weeds growing in the facility can result in the loss of desirable native vegetation and impact adjacent open spaces/land.
- e. Trash/Debris* – Trash and debris can accumulate in the basin after large events, or from illegal dumping. Over time, this material can accumulate and clog the SQIB.

SQIB-2.3.2 Basin

The basin is designed to store runoff events. This area of the SQIB may develop wetland vegetation.

The typical maintenance items that are found with the basin are as follows:

- a. *Sediment/Debris Accumulation* – The basin accumulates sediment and debris. This material must be removed to maintain pond volume and proper function of the basin.
- b. *Woody Growth/Weeds Present* – Woody growth (cottonwoods/willows) can create operational problems for the SQIB. The basin will have to be dredged to ensure volume, and large trees and shrubs will be difficult to protect during that operation. Routine management is essential for trees (removing a small tree/sapling is much cheaper and less disruptive than removing a mature tree).
- c. *Bank Erosion* – The bottom grades of the basin are typically flat enough that erosion should not occur. However, inadequate vegetative cover may result in erosion of the basin banks. Erosion that occurs in this area can result in increased dredging/maintenance.
- d. *Petroleum/Chemical Sheen* – Indicators of illicit discharges into the drainage system may be present in the basin. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact County Stormwater immediately. Proper removal/mitigation of contaminated soils and water in the SQIB is necessary to minimize any environmental impacts downstream.
- e. *Vegetation Sparse* – Basin aesthetics are important. Adequate and properly maintained vegetation can greatly increase the overall appearance and acceptance of the SQIB by the public. In addition, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond.
- f. *Standing Water/Boggy Areas* – Standing water or boggy areas in the basin can encourage mosquito and algae problems. Mosquito larvae can be laid by adult mosquitoes within shallow water. Aquatic vegetation that grows in shallow can decompose causing foul odors. Chemical/mechanical treatment of these areas may be necessary to reduce impacts to adjacent homeowners. Routine maintenance (mowing, trash removal, etc.) can also be extremely difficult for the basin if the ground is saturated. If this inspection item is checked, make sure you have identified the root cause of the problem.
- g. *Trash/Debris* – Trash and debris can accumulate in the basin after large events, or from illegal dumping. Over time, this material can accumulate and clog the SQIB.
- h. *Maintenance Access* – Most SQIBs typically have a maintenance access path to the basin bottom and/or around the basin. This access path should be inspected to ensure the surface is still drivable. Some of the smaller SQIBs may not have maintenance access paths; however, the inspector should verify that access is available from adjacent properties.

SQIB-2.3.3 Emergency Spillway

An emergency spillway is typical of all SQIBs and designed to serve as the overflow in the

event the volume of the pond is exceeded. The emergency spillway may be armored with riprap (or other hard armor) and is sometimes buried with soil. The emergency spillway is typically a weir (notch) in the pond embankment. Proper function of the emergency spillway is essential to ensure flooding does not affect adjacent properties.

The typical maintenance items that are found with emergency spillways are as follows:

- a. Riprap Displaced* – If the emergency spillway is armored with riprap to provide erosion protection; over the life of an SQIB, the riprap may shift or dislodge due to flow.
- b. Erosion Present* – Stormwater flowing through the spillway can cause erosion damage. Erosion must be repaired to ensure the integrity of the basin embankment, and proper function of the spillway.
- c. Woody Growth/Weeds Present* – Management of woody vegetation is essential in the proper long-term function of the spillway. Larger trees or dense shrubs can capture larger debris entering the SQIB and reduce the capacity of the spillway.
- d. Obstruction Debris* – The spillway must be cleared of any obstruction (man-made or natural) to ensure the proper design capacity.

SQIB-2.3.4 Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the SQIB. This category on the inspection form is for maintenance items that are commonly found in the SQIB but may not be attributed to an individual feature.

- a. Encroachment in Easement Area* – Private lots/property can sometimes be located very close to the SQIBs, even though they are required to be located in tracts with drainage easements. Property owners may place landscaping, trash, fencing, or other items within the easement area that may affect maintenance or the operation of the facility.
- b. Graffiti/Vandalism* – Damage to the SQIB infrastructure can be caused by vandals. If criminal mischief is evident, the inspector should forward this information to the local Sheriff's Office.
- c. Public Hazards* – Public hazards include items such as vertical drops of greater than 4-feet, containers of unknown/suspicious substances, exposed metal/jagged concrete on structures. If any hazard is found within the facility area that poses an immediate threat to public safety, contact the Sheriff at 911 immediately!
- d. Burrowing Animals/Pests* – Prairie dogs and other burrowing rodents may cause damage to the SQIB features and negatively affect the vegetation within the SQIB. Consult EPC Environmental Division if this becomes an issue.
- e. Other* – Any miscellaneous inspection/maintenance items not contained on the form should be entered here.

SQIB-3 MAINTAINING STORMWATER QUALITY INFILTRATION BASINS (SQIBs)

SQIB-3.1 Maintenance Personnel

Maintenance personnel must be qualified to properly maintain SQIBs. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

SQIB-3.2 Equipment

It is imperative that the appropriate equipment and tools are taken to the field with the operations crew. The types of equipment/tools will vary depending on the task at hand. Below is a list of tools, equipment, and material(s) that may be necessary to perform maintenance on a SQIB:

- 1.) Loppers/Tree Trimming Tools
- 2.) Mowing Tractors
- 3.) Trimmers (extra string)
- 4.) Shovels
- 5.) Rakes
- 6.) All Surface Vehicle (ASVs)
- 7.) Skid Steer
- 8.) Backhoe
- 9.) Track Hoe/Long Reach Excavator
- 10.) Dump Truck
- 11.) Engineers Level (laser)
- 12.) Riprap
- 13.) Filter Fabric
- 14.) Erosion Control Blanket(s)
- 15.) Seed Mix (Native)
- 16.) Illicit Discharge Cleanup Kits
- 17.) Trash Bags
- 18.) Tools (wrenches, screw drivers, hammers, etc.)
- 19.) Chain Saw
- 20.) Approved Stormwater Facility Operation and Maintenance Manual

Some of the items identified above may not be needed for every maintenance operation. However, this equipment should be available to the maintenance operations crews should the need arise.

SQIB-3.3 Safety

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop. If a vertical drop is identified within the SQIB that is greater than 48" in height, make the appropriate note/comment on the maintenance inspection form.

SQIB-3.4 Maintenance Categories and Activities

A typical SQIB Maintenance Program will consist of three broad categories of work: routine, minor, and major maintenance activities. Within each category of work, a variety of maintenance activities can be performed on a SQIB. A maintenance activity can be specific to each feature within the SQIB, or general to the overall facility. A variety of maintenance activities are typical of SQIBs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of drainage infrastructure. The following three sub-sections (3.5, 3.6, and 3.7) explain each of the categories and briefly describes the typical maintenance activities for a SQIB, including the objectives and frequency of actions.

SQIB-3.5 Routine Maintenance Activities

The majority of this work consists of regularly scheduled mowing and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as

the removal of debris/material. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities will normally be performed numerous times during the year. These items can be completed without any prior correspondence with the EPC Stormwater; however, completed inspection and maintenance forms shall be retained for each inspection and maintenance activity.

The Maintenance Activities are summarized below, and further described in the following sub-sections.

TABLE SQIB-2: Summary of Routine Maintenance Activities

MAINTENANCE ACTIVITY	MINIMUM FREQUENCY	LOOK FOR	MAINTENANCE ACTION
Mowing	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 4" to 6"
Trash/Debris Removal	Twice annually	Trash & debris in SQIB	Remove and dispose of trash and debris
Weed control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist
Mosquito Treatment	As needed	Standing water/ mosquito habitat	Treat w/ EPA approved chemicals
Algae Treatment	As needed	Standing water/ Algal growth/green color	Treat w/ EPA approved chemicals

SQIB-3.5.1 Mowing

Occasional mowing is necessary to limit unwanted vegetation and to improve the overall appearance of the SQIB. Native vegetation should be mowed to a height of 4-to-6 inches tall. Grass clippings should be collected and disposed of properly.

Frequency – Routine - Minimum of twice annually or depending on aesthetics.

SQIB-3.5.2 Trash/Debris Removal

Trash and debris must be removed from the entire SQIB area to minimize clogging and to improve aesthetics. This activity must be performed prior to mowing operations.

Frequency – Routine – Prior to mowing operations and minimum of twice annually.

SQIB-3.5.3 Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the SQIB. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with the Environmental Division at 719-520-7878 is highly recommended prior to the use of herbicide.

Frequency – Routine – As needed based on inspections.

SQIB-3.5.4 Mosquito/Algae Treatment

Treatment of permanent pools that may have formed is necessary to control mosquitoes and undesirable aquatic vegetation that can create nuisances. Only EPA approved chemicals/materials can be used in areas that are warranted.

Frequency – As needed.

SQIB- 3.6 Minor Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance or operational problems. Most of this work can be completed by a small crew, tools, and small equipment. These items may require prior correspondence with EPC Stormwater and require completed inspection and maintenance forms to be submitted to EPC upon request for each inspection and maintenance activity.

Table SQIB-3: Summary of Minor Maintenance Activities

MAINTENANCE ACTIVITY	MINIMUM FREQUENCY	LOOK FOR	MAINTENANCE ACTION
Sediment Removal	As needed; typically every 1–2 years	Sediment build-up; decrease in pond volume	Remove and dispose of sediment
Erosion Repair	As needed, based upon inspection	Rills/gullies forming on side slopes, trickle channel, other areas	Repair eroded areas Revegetate; address source of erosion
Vegetation Removal/Tree Thinning	As needed, based upon inspection	Large trees/wood vegetation in lower stage of pond	Remove vegetation; restore grade and surface

SQIB-3.6.1 Sediment Removal

Sediment removal is necessary to maintain the original design volume of the SQIB and to ensure proper function of the infrastructure. Regular sediment removal (minor) from the inflow(s) can significantly reduce the frequency of major sediment removal activities (dredging) in the basin. The minor sediment removal activities can typically be addressed with shovels and smaller equipment. Major sediment removal activities will require larger and more specialized equipment. The major sediment activities will also require surveying with an engineer's level, and consultation with EPC Stormwater Staff to ensure design volumes/grades are achieved.

Stormwater sediments removed from SQIBs do not meet the criteria of "hazardous waste". However, these sediments are contaminated with a wide array of organic and inorganic pollutants and handling must be done with care. Sediments from permanent pools that may have formed must be carefully removed to minimize turbidity, further sedimentation, or other adverse water quality impacts. Sediments should be transported by motor vehicle only after they are dewatered. All sediments must be taken to a landfill for proper disposal. Prompt and thorough cleanup is important should a spill occur during transportation.

Frequency – Nonroutine – As necessary based upon inspections.

SQIB-3.6.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper function of the SQIB, minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs and rilling to major gullies in the embankments and spillways. The repair of eroded areas may require the use of excavators, earthmoving equipment, riprap, concrete, erosion control blankets, and turf reinforcement mats. Major erosion repair to the pond embankments and spillways will require consultation with EPC Stormwater Staff.

Frequency – Nonroutine – As necessary based upon inspections.

SQIB-3.6.3 Vegetation Removal/Tree Thinning

Dense stands of woody vegetation (willows, shrubs, etc) or trees can create maintenance problems for the infrastructure within a SQIB. Tree roots can damage the basin thereby blocking flows. Also, trees growing in the basin of the SQIB will most likely have to be removed when sediment/dredging operations occur. A small tree is easier to remove than a large tree, therefore, regular removal/thinning is preferred. All trees and woody vegetation that is growing in the bottom of the SQIB or near structures (inflows, emergency spillways, etc) should be removed.

Frequency – Nonroutine – As necessary based upon inspections.

SQIB-3.7 Major Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All of this work requires consultation with EPC Stormwater Staff to ensure the proper maintenance is performed. This work requires that the staff review the original design and construction drawings to assess the situation and assign the necessary maintenance. **An ESQCP permit may be required for major maintenance activities.** This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants.

Table SQIB-4: Summary of Major Maintenance Activities

MAINTENANCE ACTIVITY	MINIMUM FREQUENCY	LOOK FOR	MAINTENANCE ACTION
Major Sediment Removal	As needed – based upon scheduled inspections	Large quantities of sediment; reduced pond capacity	Remove and dispose of sediment. Repair vegetation as needed
Major Erosion Repair	As needed – based upon scheduled inspections	Severe erosion including gullies, excessive soil displacement, areas of settlement, holes	Repair erosion – find cause of problem and address to avoid future erosion

SQIB-3.7.1 Major Sediment Removal

Major sediment removal consists of removal of large quantities of sediment or removal of sediment from vegetated areas. Care shall be given when removing large quantities of sediment and sediment deposited in vegetated areas. Large quantities of sediment need to be carefully removed, transported and disposed of. Vegetated areas need special care to ensure design volumes and grades are preserved.

Frequency – Nonroutine – Repair as needed based upon inspections.

SQIB-3.7.2 Major Erosion Repair

Major erosion repair consists of filling and revegetating areas of severe erosion. Determining the cause of the erosion as well as correcting the condition that caused the erosion should also be part of the erosion repair. Care should be given to ensure design grades and volumes are preserved.

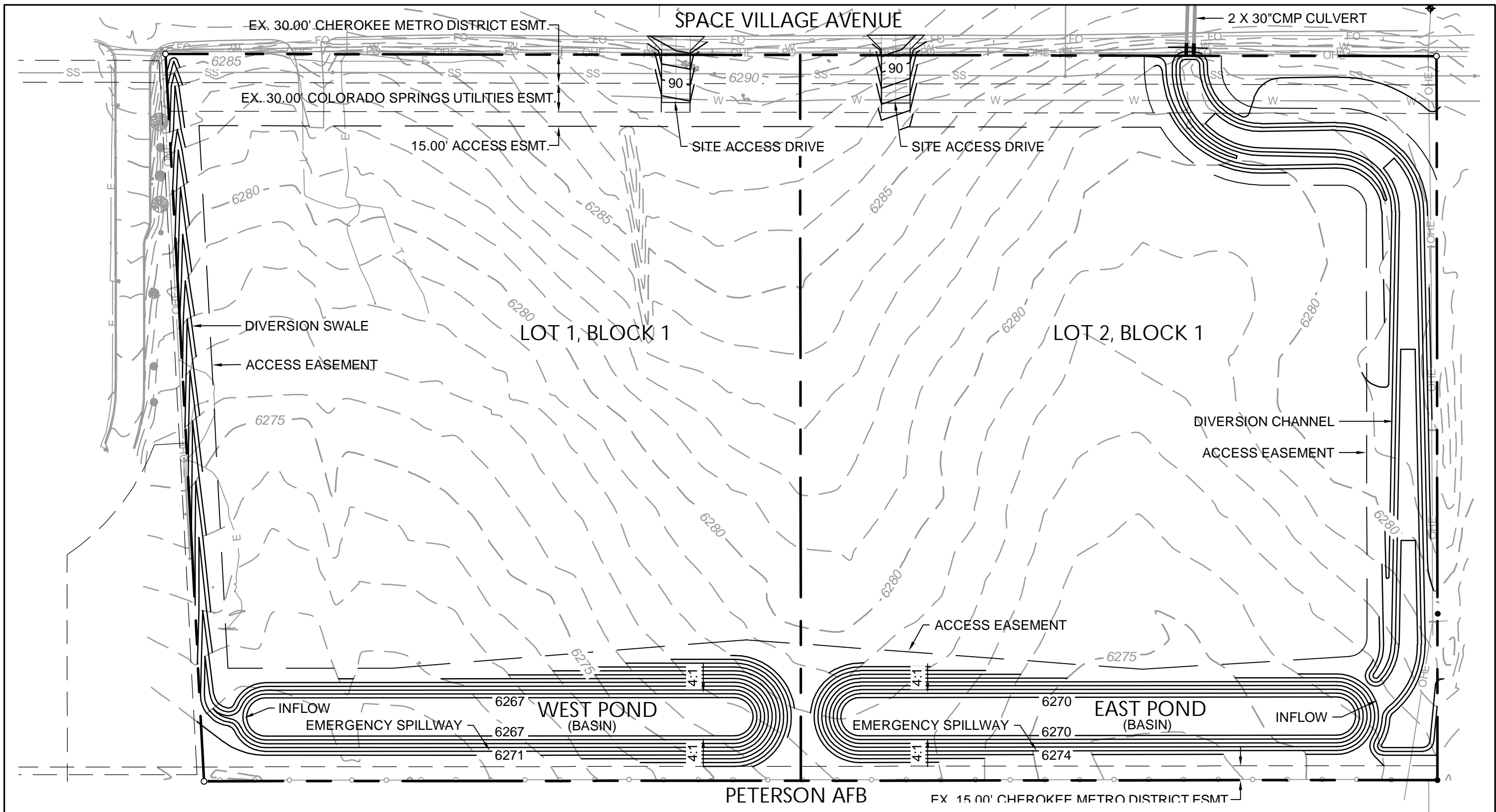
Frequency – Nonroutine – Repair as needed based upon inspections.

Reference:

This manual is adapted from SEMSWA and the Town of Parker, Colorado, *STORMWATER PERMANENT BEST MANAGEMENT PRACTICES (PBMP) LONG-TERM OPERATION AND MAINTENANCE MANUAL*, October 2004

For additional resources and contact info, visit the EPC Stormwater website:

<https://publicworks.elpasoco.com/stormwater/>



STORMWATER FACILITY MAP

SPACE VILLAGE FILING NO. 4
EL PASO COUNTY, COLORADO
SCALE: 1" = 100'
DATE: AUGUST 2022



NORTH

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- EXIST. MAJOR CONTOUR
- EXIST. MINOR CONTOUR

- EXIST. CURB AND GUTTER
- PROP. CONTOUR
- EXIST. FENCE
- EXIST. FIBER OPTIC
- EXIST. TELEPHONE

- EXIST. CURB AND GUTTER
- PROP. CONTOUR
- EXIST. FENCE
- EXIST. FIBER OPTIC
- EXIST. TELEPHONE

- OHE
- SS
- W
- G
- E

- EXIST. OVERHEAD ELECTRIC
- EXIST. SANITARY SEWER
- EXIST. WATERLINE
- EXIST. GAS LINE
- EXIST. ELECTRIC