Stormwater Best Management Practices
Operations and Maintenance Manual (O&M Manual)
Sand Filter Basins (SFBs)

for:

2217 Janitell Rd.
Colorado Springs, CO 80906

(EPC Project PPR2629)

Located at:

Tract 11 Valley Gardens
Section 28, Township 14S, Range 66W of the 6th P.M.

Date:

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Prepared for:

Sombers Investments LLC
5565 Piedra Vista
Colorado Springs, CO 80908
(719) 491-0466

Prepared by:

M.V.E., Inc.
1903 Lelaray Street, Suite 200
Colorado Springs, CO 80909
(719) 635-5736

Reference:
This plan is adapted from various maintenance manuals developed in the Colorado Front Range

Stormwater Best Management Practices
Operations and Maintenance Manual (O&M Manual)
Sand Filter Basins (SFBs) and Grass Buffers (GBs)

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Stormwater Best Management Practices
Operations and Maintenance Manual (O&M Manual)
Sand Filter Basins (SFBs)

I. Compliance with Stormwater Best Management Practices Maintenance Requirements

Property owner is responsible for ensuring that stormwater best management practices (BMPs) or facilities installed on the property are properly maintained and that they function as designed. The property owner at the time of development plan approval has executed a legally binding “Private Detention Basin/ Stormwater Quality Best Management Practice Maintenance Agreement and Easement” document which runs with the land/ BMP Maintenance Agreement. Property owner should be aware of the responsibilities regarding stormwater facility maintenance and need to be familiar with the contents of this Operations and Maintenance Manual (O&M Manual).

II. Inspection & Maintenance

The aforementioned BMP Maintenance Agreement requires the landowner or other responsible parties to conduct regular and routine inspections, cleanings, and maintenance.

Requirements for the inspection and maintenance of stormwater facilities are included in this Stormwater Best Management Practices O&M Manual.

Copies of the Inspection and Maintenance forms for each of the stormwater BMPs are located in Appendix C and D. These are provided for the convenience of the property owner or property manager and may be useful in demonstrating regular inspection and maintenance of the facility.

III. Preventative Measures to Reduce Maintenance Costs

The most effective way to maintain your water quality facility is to prevent the pollutants from entering the facility. Common pollutants include sediment, trash & debris, chemicals, pet wastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. A thoughtful maintenance program will include measures to address these potential contaminants and will save money and time in the long run. Key points to consider in your maintenance program include:

- Educate property owners/residents to be aware of how their actions affect water quality and how they can help reduce maintenance costs.
- Keep property, and parking lots free of trash, debris, and grass clippings.
- Ensure the proper use, storage, and disposal of hazardous wastes and chemicals. Promptly clean up and spilled materials and dispose of properly.
- Plan grass care to minimize and properly use chemicals and pesticides.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Encourage pet owners to clean up pet waste.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean any private storm drainage system components, including inlets, storm sewers, and outfalls.
- Do not store materials outdoors (including landscaping materials) unless properly protected from runoff.

IV. Access and Right to Enter

All stormwater management facilities located on the site should have both a designated access location and El Paso County has the right to enter for the purpose of inspecting and for maintaining BMPs where the owner has failed to do so, in accordance with the BMP Maintenance Agreement.

V. Safety

Keep safety considerations at the forefront of inspection procedures at all times. Likely hazards should be anticipated and avoided. Never enter a confined space (outlet structure, manhole, etc) without proper training, number of personal, and equipment.

Potentially dangerous (e.g., fuel, chemicals, hazardous materials) substances found in the areas must be referred to emergency services at 911 (non-emergency number is 444-7000). If a toxic or flammable substance is discovered, leave the immediate area and contact the local emergency services at 911.

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 greater than 48” in height, make the appropriate note/comment on the maintenance inspection form.

If any hazard is found within the facility area that poses an immediate threat to public safety, contact emergency services at 911 immediately.

VI. Field Inspection Equipment

It is imperative that the appropriate equipment is taken to the field with the inspector(s). This is to ensure the safety of the inspector and allow the inspections to be performed as efficiently as possible. Below is a list of the equipment that may be necessary to perform the inspections of all Stormwater BMPs:

- Protective clothing and boots.
- Safety equipment (vest, hard hat, confined space entry equipment [if certified to perform confined space entry]).
- Communication equipment.
- O&M Manual for the site.
- Clipboard.
- Stormwater BMP Inspection Forms (See Appendix C).
- Manhole Lid Remover
- Shovel.

Some of the items identified above need not be carried by the inspector (manhole lid remover, shovel, and confined space entry equipment), but should be available in the vehicle driven to the site. Specialized equipment may require specific training related to that equipment and should only be used by trained individuals.

VII. Inspecting Stormwater BMPs

The quality of stormwater entering the waters of the state relies heavily on the proper operation and maintenance of permanent BMPs. Stormwater BMPs must be periodically inspected to ensure that they function as designed. The inspection will determine the appropriate maintenance that is required for the facility.

A. Inspection Procedures

It is recommended that all Stormwater BMPs be inspected a minimum of once per year. Inspections should follow the inspection guidance found in the Standard Operation Procedures (SOP) for the specific type of facility. (Appendix B of this manual).

B. Inspection Report

It is recommended that the person(s) conducting the inspection activities complete the appropriate inspection report for the specific facility. Inspection reports are located in Appendix C. It is recommended that a copy of each inspection form be kept by the owner for a minimum of 5 years.

The following information explains how to fill out the Inspection Forms:

General Information

This section identifies the facility location, person conducting the inspection, the date and time the facility was inspected, and approximate days since the last rainfall. Property classification is identified as single-family residential, multi-family residential, commercial, or other.

The reason for the inspection is also identified on the form depending on the nature of the inspection. It is recommended that all facilities must be inspected on an annual basis at a minimum. In addition, all facilities should be inspected after a significant precipitation event to ensure the facility is draining appropriately and to identify any damage that occurred as a result of the increased runoff.

Inspection Scoring

For each inspection item, a score must be given to identify the urgency of required maintenance. The scoring is as follows:

0 = No deficiencies identified.

1 = Monitor – Although maintenance may not be required at this time, a potential problem exists that will most likely need to be addressed in the future. This can include items like minor erosion, concrete cracks/spalling, or minor sediment accumulation. This item should be revisited at the next inspection.

2 = Routine Maintenance Required – Some inspection items can be addressed through the routine maintenance program. This can include items like vegetation management or debris/trash removal.

3 = Immediate Repair Necessary – This item needs immediate attention because failure is imminent or has already occurred. This could include items such as structural failure of a feature (outlet works, forebay, etc), significant erosion, or significant sediment accumulation. This score should be given to an item that can significantly affect the function of the facility.

N/A This is checked by an item that may not exist in a facility. Not all facilities have all the features identified on the form (forebay, micro-pool, etc.).

Inspection Summary/Additional Comments

Additional explanations to inspection items, and observations about the facility not covered by the form, are recorded in this section.

Overall Facility Rating

An overall rating must be given for each facility inspected. The overall facility rating should correspond with the highest score (0, 1, 2, 3) given to any feature on the inspection form.

VIII. Maintaining Stormwater BMPs

Stormwater BMPs must be properly maintained to ensure that they operate correctly and provide the water quality treatment for which they were designed. Routine maintenance performed on a frequently scheduled basis can help avoid more costly rehabilitative maintenance that results when facilities are not adequately maintained.

A. Maintenance Categories

Stormwater BMP maintenance programs are separated into three broad categories of work. The categories are separated based upon the magnitude and type of maintenance activities performed. A description of each category follows:

Routine Work

The majority of this work consists of scheduled trash and debris pickups for stormwater management facilities during the year. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash racks. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence El Paso County; however, it is recommended that inspection and maintenance forms be completed with the information.

Restoration Work

This work consists of a variety of isolated or small-scale maintenance and work needed to address operational problems. Most of this work can be completed by a small crew, with minor tools, and small equipment. These items do not require prior correspondence with El Paso County. However, it is recommended that maintenance forms be completed and entered into the owner's maintenance records.

Rehabilitation Work

This work consists of large-scale maintenance and major improvements needed to address failures within the stormwater BMP. Consultation with El Paso County is recommended, which may result in a need for engineering design with construction plans to be prepared for review and approval by the County. This work may also require more specialized maintenance equipment, surveying, construction permits or assistance from private contractors and consultants.

B. Maintenance Personnel

Maintenance personnel should be qualified to properly maintain stormwater BMPs, especially for restoration or rehabilitation work. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

C. Maintenance Forms

The Stormwater BMP Maintenance Form provides a record of maintenance activities. Maintenance Forms for each facility type are provided in Appendix D. It is recommended that maintenance Forms shall be completed by the property owner, management company, or contractor completing the required maintenance items.

Appendix A

General Location and Description of Stormwater Best Management Practices Sand Filter Basins (SFBs)

A. General Site Description

The Tract 11, Valley Gardens site (2217 Janitell Rd.) consists of 4.86± acres located adjacent to the east side of Janitell Road, southwest of Las Vegas Street. The site is accessed from Janitell Road via a common access driveway with the adjacent Tract 5, Valley Gardens property located to the north. The property contains a contractor's equipment yard.

B. General Stormwater Management Description

Stormwater from the site sheets east and then flows south along the northeasterly property line to one (1) Full Spectrum, Full Infiltration Sand Filter Basin (FS-FI-SFB) which utilizes the native soil for the sand filter material. All flows entering the FS-FI-SFB are infiltrated into the sand filter and underlying soils.

C. Stormwater Facilities Map

Inspection or maintenance personnel may utilize the map in Appendix E for locating the stormwater facility within this development.

D. On-Site Stormwater Management Facilities

Storage Facilities (Detention)

Storm Detention is provided for Tract 11, Valley Gardens. Due to the area of disturbance being more than an acre, storm runoff for the developed conditions of Tract 11 are required to be detained and treated. The Full Spectrum, Full Infiltration Sand Filter Basin (FS-FI-SFB) provides storm detention and Water Quality for all storm events.

Water Quality Facilities

Tract 11, Valley Gardens site utilizes an FS-FI-SFB located in the southeastern portion of said Tract. This facility provides the required water quality treatment for the site.

Source Control Best Management Practices

The Tract 11, Valley Gardens site does not include any nonstructural BMPs.

Appendix B1

Standard Operation Procedures
for
Inspection and Maintenance

Sand Filter Basins
(SFBs)

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SFB-1 BACKGROUND

Sand Filter Basins (SFBs) are a common type of stormwater best management practice (BMP) utilized within the Front Range of Colorado. A SFB consists of a sedimentation chamber, a flat surfaced area of sand (sometimes covered with grass or sod), a filtration chamber, and a flat sand filter bed with an underdrain system. A surcharge zone exists within the sedimentation and filtration chambers for temporary storage of the Water Quality Capture Volume (WQCV). During a storm, runoff enters the sedimentation chamber, where the majority of sediments are deposited. The runoff then enters the filtration chamber where it ponds above the sand bed and gradually infiltrates into the underlying sand filter, filling the void spaces of the sand. The underdrain gradually infiltrates into the underlying sand filter, filling the void spaces of the sand. The underdrain gradually dewaters the sand bed and discharges the runoff to a nearby channel, swale, or storm sewer. SFBs provide for filtering and absorption of pollutants in the stormwater [1]. The popularity of SFBs has grown because they allow WQCV to be provided on a site that has little open area available for stormwater management. However, there are limitations on their use due to potential clogging from large amounts of sediment.

SFB-2 INSPECTING SAND FILTER BASINS (SFBs)

SFB-2.1 Access and Easements

Inspection and maintenance personnel may utilize the figures located in Appendix E containing the location(s) of the access points and potential maintenance easements of the SFB(s) within this development.

SFB-2.2 Stormwater Best Management Practice (BMP) Locations

Inspection or maintenance personnel may utilize the figures located in Appendix E containing the location of the FS-SFB within this development.

SFB-2.3 Extended Detention Basin (FS-SFB) Features

SFBs have several features that are designed to serve a particular function. Many times, the proper function of one feature depends on another. It is important for maintenance personnel to understand the function of each of these features to prevent damage to any feature during maintenance operations. Below is a list and description of the most common features within a SFB and the corresponding maintenance inspection items that can be anticipated:

[1] Design of Stormwater Filtering Systems, Centers for Watershed Protection, December 1996

Table SFB-1
Typical Inspection & Maintenance Requirements Matrix

SFB Features	Sediment Removal	Mowing/ Weed control	Trash & Debris Removal	Erosion	Overgrown Vegetation Removal	Removal/ Replacement	Structure Repair
Inflow Points/ Splitter Box	X		X				X
Sedimentation Chamber	X	X	X	X	X		
Filter Media	X	X	X	X	X	X	
Underdrain System	X					X	
Overflow Outlet Works	X		X				X
Embankment		X	X	X	X		

SFB-2.3.1 Inflow Points/Splitter Box

Inflow Points or Outfalls into SFBs are the point source of the stormwater discharge into the facility. An inflow point is commonly a curb cut with a concrete or riprap rundown or a storm sewer pipe outfall with a flared end section.

SFBs are designed to treat only the WQCV. The WQCV is a volume of water of water that runs off a site during an 80th percentile event. Any amount over the WQCV is allowed to go to the storm sewer system without water quality treatment. The splitter box is generally constructed of reinforced concrete. The splitter box typically has a lower wall that has a height that will trap the required WQCV. Volumes over the WQCV are allowed to spill over the wall and enter a storm sewer system that often conveys the runoff to a regional detention facility. Proper inspection and maintenance of the splitter box is essential in ensuring the long-term operation of the SFB.

An energy dissipater is typically immediately downstream of the splitter box, at the discharge point into the SFB, to protect the sedimentation and filtration chambers from erosion. In some cases, the splitter box 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, the riprap can shift and settle. If any portion of the 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. Sediment Accumulation – Because of the turbulence in the water created by the 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.

c. Structural Damage – Structural damage can occur at any time during the life of the facility. Typically, for an inflow, structural damage occurs to the pipe flared end section (concrete or steel). Structural damage can lead to additional operating problems with the facility, including loss of hydraulic performance.

SFB-2.3.2 Sedimentation Chamber

The sedimentation chamber is located adjacent to the splitter box and generally consists of a flat irrigated turf grass area followed by a water trapping device that allows water to be briefly held in the sedimentation chamber before being released into the filtration chamber. This slowing of the runoff allows sediments to be deposited in the sedimentation chamber and not the filtration where they can cause clogging of the filter media.

The typical maintenance items that are required within the sedimentation chamber are as follows:

a. Woody growth/weeds present – If undesirable vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate, resulting in the blockage of the filter media. Also, shrubs, and weed roots can cause damage to the filter media and underdrain system. Routine maintenance is essential to prevent more extensive and costly future maintenance.

SFB-2.3.3 Filter Media

The filter media is the main pollutant removal component of the SFB. The filter media consists of 18-inches of washed sand. The filter media

removes pollutants through several different processes, including sedimentation, filtration, infiltration and microbial uptake.

Sedimentation is accomplished by the slow release of stormwater runoff through the filter media. This slow release allows for sediment particles that were not deposited in the sedimentation chamber to be deposited on the top layer of the filter media where they are easily removed through routine maintenance. Other pollutants are also removed through this process because they are attached to sediment.

Filtration is the main pollutant removal mechanism of SFBs. When the stormwater runoff migrates down through the filter media, many of the particulate pollutants are physically strained out as they pass through the filter bed of sand and are trapped on the surface or among the pores of the filter media.

SFBs that are not lined with an impervious liner allow for infiltration into the native soils. This process also allows for additional pollutant removal.

Microbes that naturally occur in the filter media can assist with pollutant removal by breaking down organic pollutants.

The typical maintenance items are as follows:

a. Mowing/woody growth control/weeds present – Noxious weeds and other unwanted vegetation must be treated as needed throughout the SFB. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with a local Weed Inspector is highly recommended prior to the use of herbicide. Herbicides should be utilized sparingly and as a last resort. All herbicide applications should be in accordance with the manufacturer's recommendations.

b. Sediment/Pollutant Removal – Although SFBs should not be utilized in areas where large concentrations of sediment and other pollutants will enter the SFB, it is inevitable that some sediment and other pollutants will enter the SFB. Most sediment will be deposited in the sedimentation chamber; however finer suspended particles will migrate to the filter media. These sediments need to be removed to ensure proper infiltration rates of the stormwater runoff.

c. Filter Replacement – The top layers of the filter media are the most susceptible to pollutant loading and therefore may need to be removed and disposed of properly on a semi regular basis when infiltration rates slow.

d. Infiltration Rate Test – An infiltration test may be necessary to ensure proper functioning of the filter media. The infiltration test can be conducted by filling the sand filter with water to the elevation of the overflow wall in the splitter box. The sand filter needs to drain completely within 40-hours of the filling. If the drain time for the basin is longer than 40-hours, the filter is in need of maintenance.

SFB-2.3.4 Underdrain System

The underdrain system consists of a layer of geotextile fabric, gravel storage are and perforated PVC pipes. The geotextile fabric is utilized to prevent the filter media from entering the underdrain system. The gravel storage area allows for storage of treated stormwater runoff prior to the discharge of the runoff through the perforated PVC pipe.

The typical maintenance items that are required for the underdrain system are as follows:

With proper maintenance of the filter media and sediment chamber, there should be a minimum amount of maintenance required on the underdrain system. Generally, the only maintenance performed on the underdrain system is jet-vac cleaning.

SFB-2.3.5 Overflow Outlet Works

Some SFBs include an overflow outlet that works in place of the splitter box. The overflow outlet works allows runoff amounts that exceed the WQCV to exit the SFB to the detention facility. The outlet works is typically constructed or reinforced concrete into the embankment of the SFB. The concrete structure typically has steel orifice plates anchored/embedded into it to control stormwater release rates. The larger openings (flood control) on the outlet structure typically have trash racks over them to prevent clogging. Proper inspection and maintenance of the outlet works is essential in ensuring the long-term operation of the SFB.

The typical maintenance activities that are required for the overflow outlet works are as follows:

a. Structural Damage – The overflow outlet structure is primarily constructed of concrete, which can crack, spall, and settle. The steel grate on the overflow outlet structure is also susceptible to damage.

b. Mowing/woody growth control/weeds present – The presence of plant material not part of the original landscaping, such as wetland plants or other woody growth, can clog the overflow outlet works during a larger storm event, causing flooding damage to adjacent areas. This plant

material may indicate a clogging of the filter media and may require additional investigation.

SFB-2.3.6 Embankments

Some SFBs utilize irrigated turf grass embankments to store WQCV.

The typical maintenance activities that are required for the embankment areas are as follows:

a. Vegetation Sparse – The embankments are one of the most visible parts of the SFB and, therefore, aesthetics is important. Adequate and properly maintained vegetation can greatly increase the overall appearance of the SFB. Also, vegetation can reduce the potential for erosion and subsequent sediment transport to the filter media, thereby reducing the need for more costly maintenance.

b. Erosion – Inadequate vegetative cover may result in erosion of the embankments. Erosion that occurs on the embankments can cause clogging of the filter media.

c. Trash/Debris – Trash and debris can accumulate In the upper area after large events, or from illegal dumping. Over time, this material can clog the SFB filter media and outlet works.

d. Mowing/Woody Growth Control/Weeds Present – The presence of plant material not part of the original landscaping, such as wetland plants or other woody growth, can result in difficulty in performing maintenance activities. These trees and shrubs may also damage the underdrain system of the SFB. This plant material may indicate a clogging of the filter media and may require additional investigation.

SFB-2.3.7 Emergency Overflow

An emergency overflow is typical of all SFBs and designed to serve as the overflow in the event the volume of the pond is exceeded. The emergency spillway is typically armored with riprap (or other hard armor) and is sometimes buried with soil or may be a concrete wall or other structure. The emergency spillway is typically a weir (notch) in the basin embankment. The 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 – As mentioned before, the emergency spillway is typically armored with riprap to provide erosion protection. Over the life of an SFB, the riprap may shift or become dislodged due to flow.

b. Erosion Present – Although the spillway is typically armored, 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. Mowing/Weed/Woody Growth Control – 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 SFB and reduce the capacity of the spillway. These trees and shrubs may also damage the underdrain system of the SFB.

d. Obstruction Debris – The spillway must be cleared of any obstruction (man made or natural) to ensure the proper design capacity.

SFB-2.3.8 Miscellaneous

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

a. Access – Access needs to be maintained.

b. Graffiti/Vandalism – Vandals can cause damage to the SFB infrastructure. If criminal mischief is evident, the inspector should forward this information to the local enforcement agency.

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 local emergency services at 911 immediately!**

d. Other – Any miscellaneous inspection/maintenance items not contained on the form should be entered here.

SFB-2.4 Inspection Forms

SFB Inspection forms are located in Appendix C. Inspection forms shall be completed by the person(s) conducting the inspection activities. Each form shall be reviewed and submitted by the property owner or property manager to El Paso

County per the requirements of the Inspection and Maintenance Plan. It is recommended that these inspection forms be kept a minimum of 5 years. A continuing record of inspection and maintenance forms will demonstrate proper maintenance over time in compliance with the BMP Maintenance Agreement.

SFB-3 MAINTAINING EXTENDED DETENTION BASINS (SFBS)

SFB-3.1 Maintenance Personnel

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

SFB-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 an SFB:

1.) Mowing Tractors
2.) Trimmers (extra string)
3.) Shovels
4.) Rakes
5.) All Surface Vehicle (ASVs)
6.) Skid Steer
7.) Back Hoe
8.) Track Hoe/Long Reach Excavator
9.) Dump Truck
10.) Jet-Vac Machine
11.) Engineers Level (laser)
12.) Riprap (Minimum - Type M)
13.) Geotextile Fabric
14.) Erosion Control Blanket(s)
15.) Sod
16.) Illicit Discharge Cleanup Kits
17.) Trash Bags
18.) Tools (wrenches, screw drivers, hammers, etc)

19.) Confined Space Entry Equipment

20.) Approved Inspection and Maintenance Plan

21.) ASTM C-33 Sand

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.

SFB-3.3 Safety

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

SFB-3.4 Maintenance Forms

The SFB Maintenance Form provides a record of each maintenance operation performed by maintenance contractors. It is recommended that the SFB Maintenance Form be filled out in the field after the completion of the maintenance operation. It is recommended that each form be retained by the property owner or property manager for a minimum of five years. The SFB Maintenance form is located in Appendix D.

SFB-3.5 Maintenance Categories and Activities

A typical SFB Maintenance Program will consist of three broad categories of work: Routine, Restoration (minor), and Rehabilitation (major). Within each category of work, a variety of maintenance activities can be performed on a SFB. A maintenance activity can be specific to each feature within the SFB, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for a SFB.

A variety of maintenance activities are typical of SFBs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of the SFB filter media or underdrain system. Below is a description of each maintenance activity, the objectives, and frequency of actions:

SFB-3.6 Routine Maintenance Activities

The majority of this work consists of regularly scheduled mowing, trash and debris pickups for the SFB during the growing season. It also includes activities such as weed control. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with El Paso

County; however, it is recommended that completed inspection and maintenance forms shall be retained by the owner for a minimum of five years.

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

TABLE – SFB-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 2" to 4"
Trash/Debris Removal	Twice annually	Trash & debris in SFB	Remove and dispose of trash and debris
Splitter Box/Overflow Outlet Works Cleaning	As needed - after significant rain events – twice annually min.	Clogged outlet structure; ponding water	Remove and dispose of debris/trash/sediment to allow outlet to function properly
Woody growth control/Weed removal	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist

SFB-3.6.1 Mowing

Routine mowing of the turf grass embankments and turf grass located in the sedimentation chamber is necessary to improve the overall appearance of the SFB and ensure proper performance of the sediment chamber. Turf grass should be mowed to a height of 2 to 4-inches and shall be bagged to prevent potential contamination of the filter media.

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

SFB-3.6.2 Trash/Debris Removal

Trash and debris must be removed from the entire SFB area to minimize outlet 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.

SFB-3.6.3 Splitter Box/ Overflow Outlet Works Cleaning

Debris and other materials can clog the outlet work's grate. This activity must be performed anytime other maintenance activities are conducted to ensure proper operation.

Frequency - Routine – After significant rainfall event or concurrently with other maintenance activities.

SFB-3.6.4 Woody Growth Control/Weed Removal

Noxious weeds and other unwanted vegetation must be treated as needed throughout the SFB. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with a local County Weed Inspector is highly recommended prior to the use of herbicide.

Frequency – Routine – As needed based on inspections.

SFB- 3.7 Restoration Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance/operational problems. Most of this work can be completed by a small crew, hand tools, and small equipment. These items do not require prior correspondence with El Paso County. However, it is recommended that completed inspection and maintenance forms be retained for each inspection and maintenance activity for a minimum of five years by the owner.

Table – SFB-3
Summary of Restoration Maintenance Activities

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Sediment/Pollutant	As needed;	Sediment build-up	Remove and dispose

Removal	typically, every 1 –2 years	in sedimentation chamber and filter media; decrease in infiltration rate	of sediment
Erosion Repair	As needed, based upon inspection	Rills/gullies on embankments or sedimentation in the forebay	Repair eroded areas & revegetate; address cause
Jet Vac/Cleaning Underdrains	As needed, based upon inspection	Sediment build-up /non draining system	Clean drains; Jet Vac if needed

SFB-3.7.1 Sediment/Pollutant Removal

Sediment removal is necessary to ensure proper function of the filter media. The infiltration rate of the SFB needs to be checked in order to ensure proper functioning of the SFB. A SFB should drain completely within 12-hours of a storm event. If drain times exceed the 12-hour drain time then maintenance of the filter media shall be required.

At a minimum, the top 3-inches of filter media should be removed at each removal period. Additional amounts of filter media may need to be removed if deeper sections of the filter media are contaminated. New filter media will need to be placed back in the SFB when the total amount of sand removed reaches 9-inches. This may take multiple maintenance events to accomplish. It is critical that only sand that meets the American Society for Testing and Material (ASTM) C-33 standard be utilized in the replacement of the filter media.

ASTM C-33 Sand Standard

US Standard Sieve Size (Number)	Total Percent Passing (%)
9.5mm (3/8 inch)	100
4.75mm (No. 4)	95-100
2.36mm (no. 8)	80-100
1.18mm (No. 16)	50-85
600nm (no. 30)	25-60
300nm (no. 50)	10-30
150nm (no. 100)	2-10

Other types of sand and soil material may lead to clogging of the SFB. The minor sediment removal activities can typically be addressed with shovels, rakes and smaller equipment. Major sediment removal activities will require larger and more specialized equipment. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system does not occur. The major sediment removal activities may also require surveying with an engineer's level, and consultation with the County's Engineering staff to ensure design volumes/grades are achieved.

Stormwater sediments removed from SFBs 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 to ensure proper removal and disposal. Sediments should be transported by motor vehicle only after they are dewatered. All sediments

must be taken to a licensed landfill for proper disposal. Should a spill occur during transportation, prompt and thorough cleanup and disposal is imperative.

Frequency – Nonroutine – As necessary based upon inspections. Sediment removal in the sedimentation chamber may be necessary as frequently as every 1-2 years.

SFB-3.7.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper function of the SFB, to minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to filter media and embankments, rills, and gullies in the embankments and inflow points. The repair of eroded areas may require the use of excavators, earthmoving equipment, riprap, concrete, and sod. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system does not occur. Major erosion repairs to the pond embankments, spillways, and adjacent to structures involve consultation with the County's Engineering staff.

Frequency – Nonroutine – As necessary based upon inspections.

SFB-3.7.3 Jet-Vac/Clearing Drains

A SFB contains an underdrain system that allows treated stormwater runoff to exit the facility. These underdrain systems can develop blockages that can result in a decrease of hydraulic capacity and also create standing water. Many times, the blockage to this infrastructure can be difficult to access and/or clean. Specialized equipment (jet-vac machines) may be necessary to clear debris from these difficult areas.

Frequency – Nonroutine – As necessary based upon inspections.

SFB-3.8 Rehabilitation Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. Consultation with County's Engineering staff is recommended to ensure the proper maintenance is performed, which may result in the need for engineering staff review of the original design and construction drawings to access the situation and assign the necessary maintenance. This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants. In the event that the basin needs to be dewatered, care should be given to ensure sediment, filter

material and other pollutants are not discharged. Proper permitting is required prior to any dewatering activity.

Table – SFB-4
Summary of Rehabilitation Maintenance Activities

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Major Sediment/Pollutant Removal	As needed – based upon scheduled inspections	Large quantities of sediment in the sedimentation chamber and/or filter media; reduced infiltration rate/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
Structural Repair	As needed – based upon scheduled inspections	Deterioration and/or damage to structural components – broken concrete, damaged pipes & outlet works	Structural repair to restore the structure to its original design
SFB Rebuild	As needed- due to complete failure of SFB	Removal of filter media and underdrain system	Contact City Engineering

SFB-3.8.1 Major Sediment/Pollutant Removal

In very rare cases the filter media of the SFB may be contaminated so badly that the entire 18-inches of the filter media may need to be removed.

Major sediment/pollutant removal consists of removal of large quantities of sediment/filter media. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system does not occur. The sediment/filter media needs to be carefully removed, transported and properly disposed of. Vegetated areas need special care to ensure design volumes and grades are preserved or may need to be replaced due to the removal activities. Stormwater sediments removed from SFBs do not meet the regulatory definition of “hazardous waste”. However, these sediments can be contaminated with a wide array of organic and inorganic pollutants and handling must be done with care to insure proper removal and disposal. Sediments should be transported by

motor vehicle only after they are dewatered. All sediments must be taken to a licensed landfill for proper disposal. Should a spill occur during transportation, prompt and thorough cleanup and disposal is imperative.

Frequency – Nonroutine – Repair as needed based upon inspections.

SFB-3.8.2 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. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system does not occur.

Frequency – Nonroutine – Repair as needed based upon inspections.

SFB-3.8.3 Structural Repair

A SFB generally includes a splitter box or concrete overflow outlet structure that can deteriorate or be damaged during the service life of the facility. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with the County's Engineering staff shall take place prior to all structural repairs.

Frequency – Nonroutine – Repair as needed based upon inspections.

SFB-3.8.4 SFB Rebuild

In very rare cases a SFB may need to be rebuilt. Generally, the need for a complete rebuild is a result of improper construction, improper maintenance resulting in structural damage to the underdrain system, or extensive contamination of the SFB. Consultation with the County's Engineering staff shall take place prior to any rebuild project.

Frequency – Nonroutine – As needed, based upon inspections.

APPENDIX C1

INSPECTION FORMS

SFB

EXTENDED DETENTION BASIN (SFB)
INSPECTION FORM

Date:_____

Subdivision/Business Name:_____ Inspector:_____

Subdivision/Business Address:_____

Weather: _____

Date of Last Rainfall:_____ Amount:_____Inches

Property Classification: Residential Multi Family Commercial Other:_____
(Circle One)

Reason for Inspection: Routine Complaint After Significant Rainfall Event
(Circle One)

INSPECTION SCORING - For each facility inspection item, insert one of the following scores:
0 = No deficiencies identified 2 = Routine maintenance required
1 = Monitor (potential for future problem) 3 =Immediate repair necessary
N/A = Not applicable

FEATURES

1.) Inflow Points
- ____Riprap Displaced
- ____Erosion Present/Outfall Undercut
- ____Sediment Accumulation
- ____Structural Damage (pipe, end-section, etc.)

2.) Forebay
- ____Sediment/Debris Accumulation
- ____Concrete Cracking/Failing
- ____Drain Pipe/Wier Clogged (not draining)
- ____Wier/Drain Pipe Damage
- ____Woody Growth/Weeds Present

3.) Trickle Channel (Low-flow)
- ____Sediment/Debris Accumulation
- ____Concrete/Riprap Damage
- ____Woody Growth/Weeds Present
- ____Erosion Outside Channel

4.) Bottom Stage (Micro-Pool)
- ____Sediment/Debris Accumulation
- ____Woody Growth/Weeds Present
- ____Bank Erosion
- ____Mosquitoes/Algae Treatment
- ____Petroleum/Chemical Sheen

5.) Outlet Works
- ____Trash Rack/Well Screen Clogged
- ____Structural Damage (concrete,steel,subgrade)
- ____Orifice Plate(s) Missing/Not Secure
- ____Manhole Access (cover, steps, etc.)
- ____Woody Growth/Weeds Present

6.) Emergency Spillway
- ____Riprap Displaced
- ____Erosion Present
- ____Woody Growth/Weeds Present
- ____Obstruction/Debris

7.) Upper Stage (Dry Storage)
- ____Vegetation Sparse
- ____Woody Growth/Undesirable Vegetation
- ____Standing Water/Boggy Areas
- ____Sediment Accumulation
- ____Erosion (banks and bottom)
- ____Trash/Debris
- ____Maintenance Access

8.) Miscellaneous
- ____Encroachment in Easement Area
- ____Graffiti/Vandalism
- ____Public Hazards
- ____Burrowing Animals/Pests
- ____Other

Inspection Summary / Additional Comments:_____

OVERALL FACILITY RATING (Circle One)
0 = No Deficiencies Identified 2 = Routine Maintenance Required
1 = Monitor (potential for future problem exists) 3 = Immediate Repair Necessary

It is recommended that this inspection form be retained for a minimum of 5 years by owner.

APPENDIX D1

MAINTENANCE FORM

SFB

EXTENDED DETENTION BASIN (SFB)
MAINTENANCE FORM

Subdivision/Business Name:_____ Completion Date:_____

Subdivision/Business Address:_____ Contact Name:_____

Maintenance Category: (Circle All That Apply) Routine Restoration Rehabilitation

MAINTENANCE ACTIVITIES PERFORMED

ROUTINE WORK

____ MOWING
____ TRASH/DEBRIS REMOVAL
____ OUTLET WORKS CLEANING (TRASH RACK/WELL SCREEN)
____ WEED CONTROL (HERBICIDE APPLICATION)
____ MOSQUITO TREATMENT
____ ALGAE TREATMENT

RESTORATION WORK

____ SEDIMENT REMOVAL
- ____ FOREBAY
- ____ TRICKLE CHANNEL
- ____ INFLOW

____ EROSION REPAIR
- ____ INFLOW POINT
- ____ TRICKLE CHANNEL

____ VEGETATION REMOVAL/TREE THINNING
- ____ INFLOW(S)
- ____ TRICKLE CHANNEL
- ____ UPPER STAGE
- ____ BOTTOM STAGE

____ REVEGETATION
____ JET-VAC/CLEARING DRAINS
- ____ FOREBAY
- ____ OUTLET WORKS
- ____ INFLOWS

REHABILITATION WORK

____ SEDIMENT REMOVAL (DREDGING)
- ____ BOTTOM STAGE
- ____ UPPER STAGE

____ EROSION REPAIR
- ____ OUTLET WORKS
- ____ UPPER STAGE
- ____ BOTTOM STAGE
- ____ SPILLWAY

____ STRUCTURAL REPAIR
- ____ INFLOW
- ____ OUTLET WORKS
- ____ FOREBAY
- ____ TRICKLE CHANNEL

OTHER_____
_____
_____

ESTIMATED TOTAL MANHOURS:

_____

COSTS INCURRED (include description of costs):

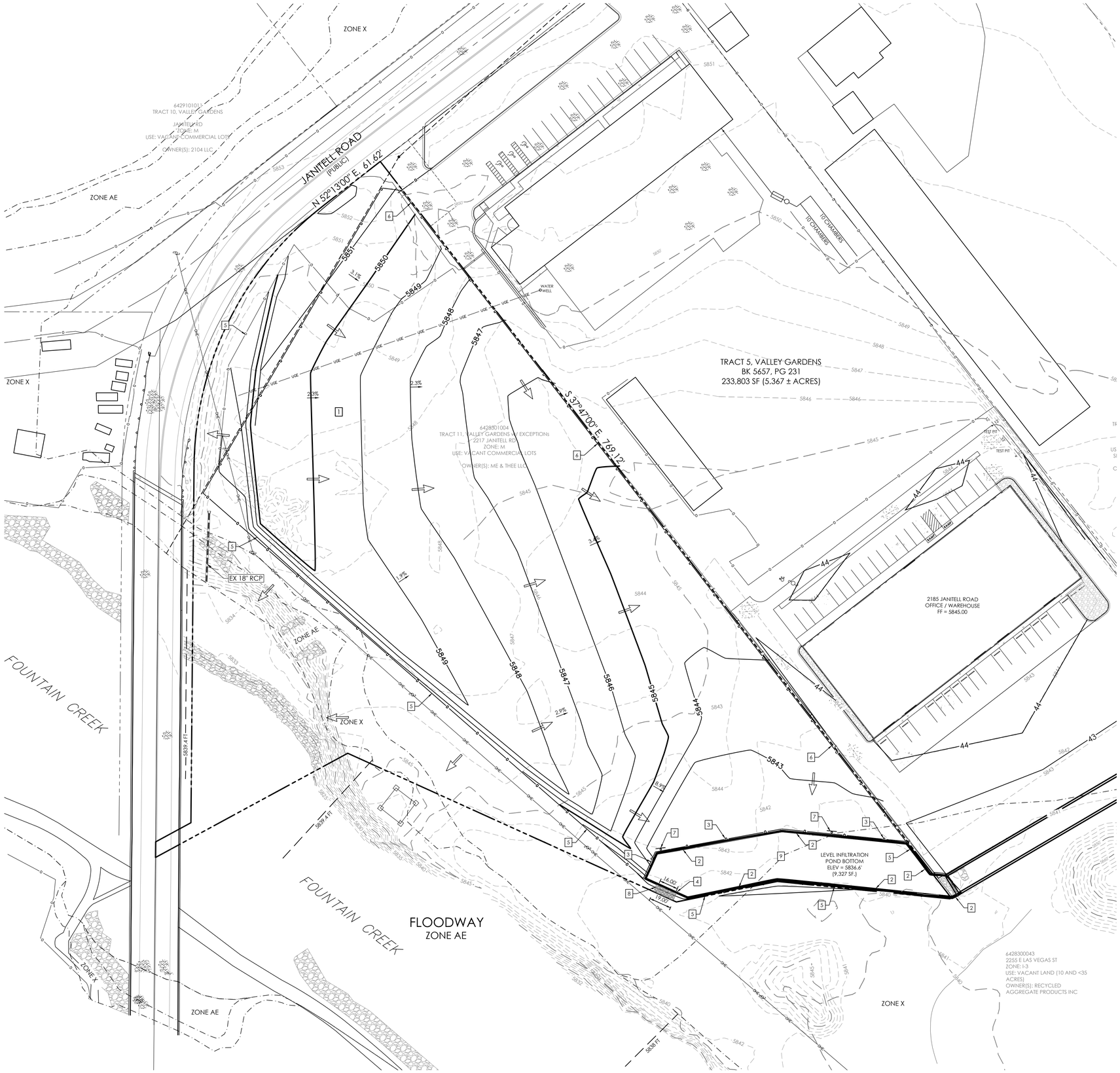
EQUIPMENT/MATERIAL USED (include hours of equipment usage and quantity of material used):

COMMENTS/ADDITIONAL INFO:

It is recommended that this Maintenance Activity Form be retained for a minimum of 5 years by owner.

APPENDIX E

STORMWATER FACILITY MAPS



GRADING PLAN SPECIFIC NOTES

1. INSTALL 3" TO 4" ASPHALT MILLINGS (SEE DETAIL)
2. INSTALL INFILTRATION BASIN CONCRETE BLOCK WALL (SEE DETAIL)
3. INSTALL 4' CHAIN-LINK FENCE (SEE DETAIL)
4. INSTALL EMERGENCY OVERFLOW SPILLWAY (SEE DETAIL)
5. INSTALL 6' OPAQUE FENCE
6. INSTALL 6' CHAIN-LINK FENCE
7. INSTALL POND SIGN
8. INSTALL EMERGENCY OVERFLOW RIP-RAP SPILLWAY APRON (SEE DETAIL)
9. INSTALL FS-SFB (SEE DETAIL)

MAP NOTES

1. BOUNDARY BEARINGS AND DISTANCES SHOWN ON THIS MAP ARE RELATIVE TO THE EAST PROPERTY LINE BEARING S 37°47'09"W.

2. THE EXISTING TOPOGRAPHY SHOWN ON THIS PLAN WAS PREPARED AND PROVIDED BY POLARIS SURVEYING INC. ELEVATIONS SHOWN ARE RELATIVE TO THE CITY OF COLORADO SPRINGS CONTROL NETWORK (FIMS DATAM)

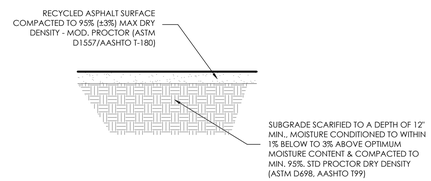
3. ALL EXISTING UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM UTILITY MAIN RECORD MAPS AND UTILITY SERVICE LOCATION MAPS. THE LOCATION OF UTILITIES AS SHOWN ARE APPROXIMATE. ALL UTILITIES MAY NOT BE SHOWN OR MAY NOT HAVE BEEN LOCATED. BELOW GROUND UTILITY LOCATIONS WERE NOT PERFORMED.

4. FEMA -ZONE X = AREA OF 0.2% TO1.0% CHANCE FLOOD HAZARD WITH AVERAGE DEPTH LESS THAN ONE FOOT, OR DRAINAGE AREAS LESS THAN ONE SQUARE MILE.

5. FEMA-ZONE AE = SPECIAL FLOOD HAZARD AREA WITH BASE FLOOD ELEVATION (BFE).

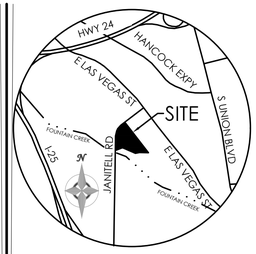
ABBREVIATION LEGEND

ASPH	ASPHALT
CONC	CONCRETE
C & G	CURB & GUTTER
DET.	DETAIL
ESMT	EASEMENT
ME	MATCH EXISTING
P.B., PG.	PLAT BOOK, PAGE
PVMT	PAVEMENT
RET. WALL	RETAINING WALL
REC. NO.	RECEPTION NUMBER
R.O.W.	RIGHT-OF-WAY
RD	ROOF DRAIN (SEE C1.6)
SF	SQUARE FOOT
STBK	SETBACK
SW	SIDEWALK
UTIL	UTILITY



STORAGE AREA SURFACING

SCALE 1" = 1.0'



VICINITY MAP

NOT TO SCALE

BENCHMARK

10 0 20 40 80

1" = 40'

MVE INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

2217 JANITELL RD

GRADING & EROSION CONTROL

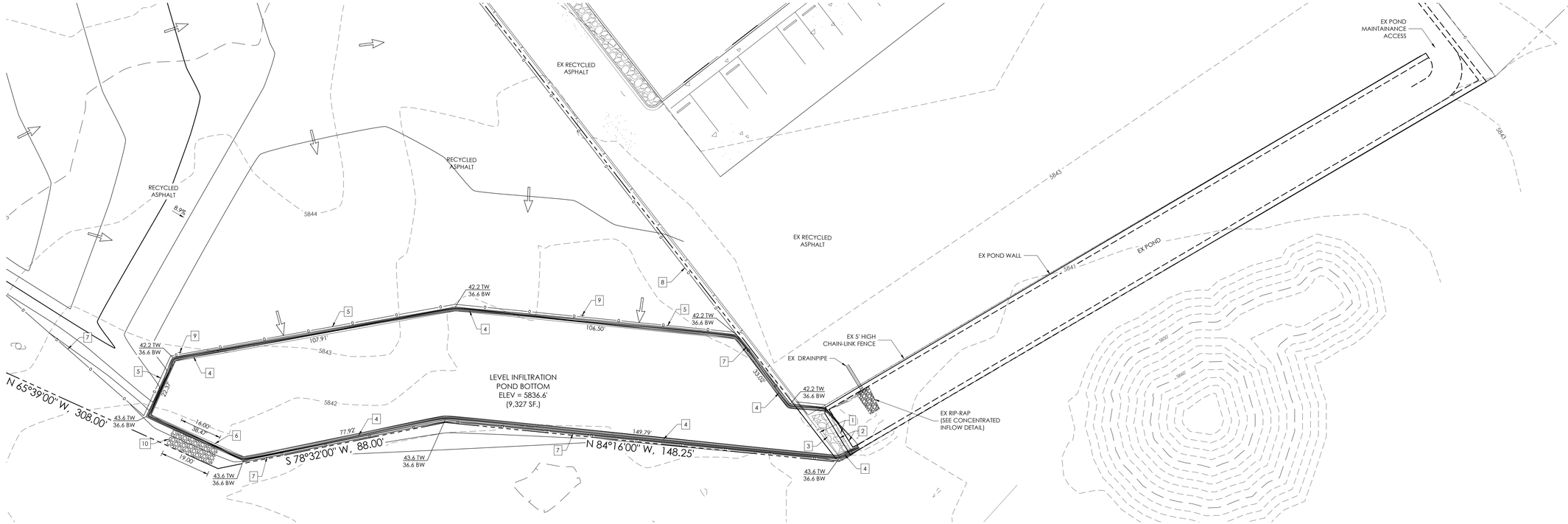
GRADING PLAN

C1.2

MVE PROJECT 61243

MVE DRAWING GEC - GP

OCTOBER 2, 2026

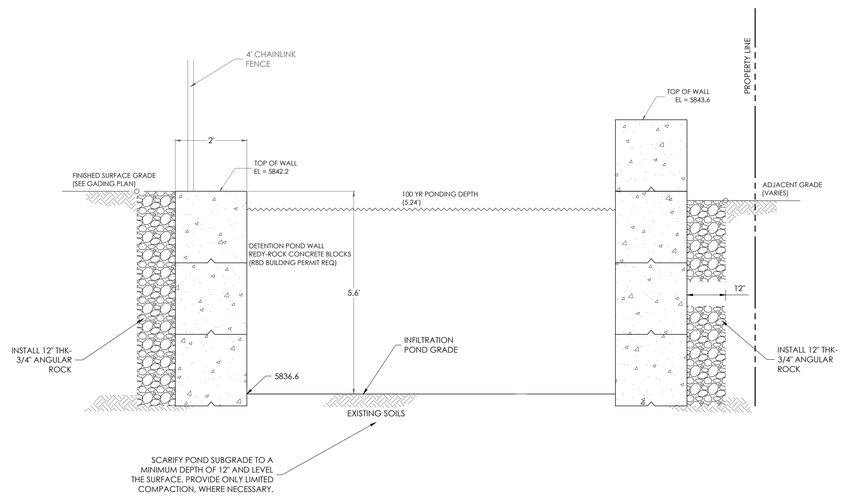


NOTE LEGEND

1. DEMO EX CHAIN-LINK FENCE
2. DEMO EX POND WALL
3. REMOVE EMERGENCY OVERFLOW RIP-RAP APRON
4. INSTALL INFILTRATION BASIN CONCRETE BLOCK WALL (SEE DETAIL)
5. INSTALL 4' CHAIN-LINK FENCE (SEE DETAIL)
6. INSTALL EMERGENCY OVERFLOW SPILLWAY (SEE DETAIL)
7. INSTALL 6' OPAQUE FENCE
8. INSTALL 6' CHAIN-LINK FENCE
9. INSTALL POND SIGN
10. INSTALL EMERGENCY OVERFLOW RIP-RAP SPILLWAY APRON (SEE DETAIL)

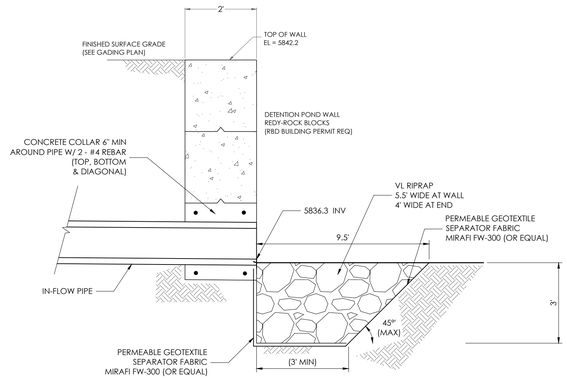
FULL SPECTRUM SAND FILTER DETAIL

SCALE 1" = 20'



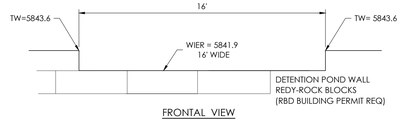
INFILTRATION BASIN BLOCK WALL DETAIL SECTION E-E

SCALE: 1" = 2'



CONCENTRATED IN-FLOW DETAIL

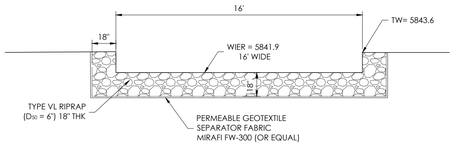
SCALE: NTS



FRONTAL VIEW

EMERGENCY OVERFLOW SPILLWAY BLOCK WALL

SCALE: NOT TO SCALE



FRONTAL SECTION VIEW

OVERFLOW RIP-RAP SPILLWAY APRON

SCALE: NOT TO SCALE

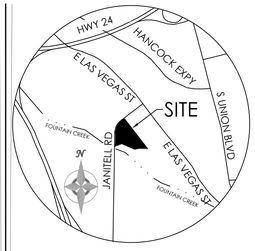
WARNING
THIS AREA IS A STORMWATER FACILITY AND IS SUBJECT TO PERIODIC FLOODING

24"x18"

1. TYPOGRAPHY TO BE HELVETICA MEDIUM
2. SIGNS TO BE MOUNTED ON METAL SIGN POST: 7'-0" ABOVE FINISH GRADE TO BOTTOM OF SIGN-TYP. ADDITIONAL PLACARD SIGNS SHALL BE MOUNTED AT LEAST 6'-0" ABOVE FINISH GRADE TO BOTTOM OF SIGN-TYP.
3. THE SIGNS SHALL BE FABRICATED OF DURABLE MATERIALS, SUCH AS METAL OR PLASTIC, USING RED LETTERING ON A WHITE BACKGROUND

POND SIGNAGE

SCALE: 1" = 1'-0"



VICINITY MAP

NOT TO SCALE

BENCHMARK



5 0 10 20 40

1" = 20'

MVE, INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

2217 JANITELL ROAD

GRADING & EROSION CONTROL

POND PLAN/DETAILS

C1.5

MVE PROJECT 61243

MVE DRAWING GEC - PP

OCTOBER 2, 2026

SHEET 5 OF 5