

## STANDARD OPERATING PROCEDURES

FOR

## INSPECTION AND MAINTENANCE

FOR

### Outlook Powers & Grinnell Pond 1

*Northwest ¼ of Section 7, Township 15 South, and the Southwest ¼ of the Southwest ¼ of  
Section 6, Township 15 South, Range 65 West of the 6th Principal Meridian,  
County of El Paso, State of Colorado*

Prepared: May 8, 2023

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Add Appendices for:  
Inspection Forms  
Maintenance Forms  
Pond As-Built Drawings

## 1. Brief Introduction

This Standard Operating Procedure Manual is intended to guide property owners and their maintenance personnel to understanding structure locations as well as inspection and maintenance frequencies and procedures for a properly functioning Extended Detention Basin (EDB).

*Note: Please contact the City's Stormwater Quality Specialist if you have any questions regarding this document. See **CONTACT INFORMATION, INSPECTION AND MAINTENANCE PROVIDERS** document in Appendix D.*

## 2. Background

Extended Detention Basins (EDB) are one of the most common types of Stormwater Management Facilities utilized within the Front Range of Colorado. EDBs are an adaptation of a detention basin used for flood control, with the primary difference in the difference in that EDBs use forebays, micro-pools, and a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. Forebays are shallow concrete "pans" located at the inflow point to the basin. These forebays collect and briefly hold stormwater runoff resulting in a process called sedimentation, dropping sediment out of the stormwater. The stormwater is then released into the trickle channel and upper basin, the large grassy portion of the basin. An EDB is a sedimentation basin designed to totally drain dry sometime after stormwater runoff ends. The EDB's drain time for the water quality portion of the facility is typically 40 hours. Soluble pollutant removal is enhanced by provided a small wetland marsh or "micro-pool" at the outlet to promote biological update. The basins are considered to be "dry" because the majority of the basin is designed not to have a significant permanent pool of water remaining between runoff events. **(Note: Pond 6 does not contain a forebay, trickle-channel, or micro-pool).**

## 3. Inspecting Extended Detention Basins (EDBs)

### A. Location and Access

Inspection or maintenance personnel may utilize the Stormwater Facility Map, which shows the location(s) of the access point(s) and maintenance easement(s) of the **EDB within this development.**

### B. Stormwater Management Facilities Locations

Inspection or maintenance personnel may utilize the Stormwater Facility Map, which also contains the location of the EDB within this development.

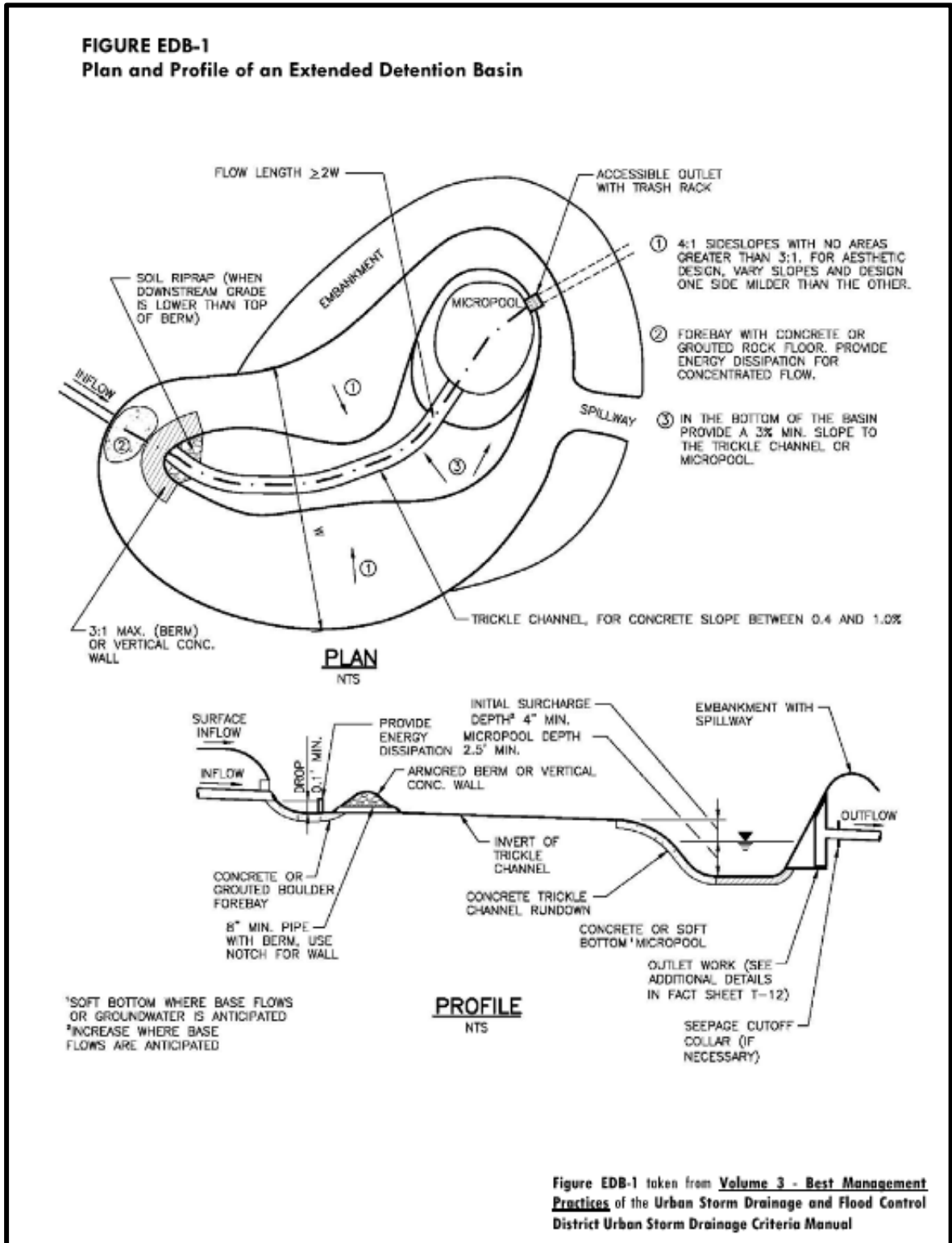
### C. Extended Detention Basin (EDB) Features

EDBs have a number of features that are designed to serve a particular function, (see Fig. EDB-1 Plan and Profile of an Extended Detention Basin on page 2). **(Note: Pond 6 does not contain a forebay, trickle-channel, or micro-pool).**

Remove all references to Pond 6.

Assign a name/number to all PBMPs and then update all submitted text and drawings accordingly with consistent labeling throughout (example: "Pond A" or "Pond 1").

Many times the proper function of one feature depends on another. For example, if a forebay is not properly maintained, it could negatively impact the performance of a feature downstream (trickle channel, micro-pool, etc.). Therefore, it is critical that each feature of the EDB is properly inspected and maintained to ensure that the overall facility functions as it was intended.



A list of the typical inspection and maintenance requirements for each component of an EDB are summarized in Table 1, and further described in the following sections:

**Table 1**  
**Typical Inspection & Maintenance Requirements Matrix**

EDB Features	Sediment Removal	Mowing /Weed Control	Trash & Debris Removal	Erosion	Overgrown Vegetation Removal	Standing Water (mosquito/algae control)	Structure Repair
Inflow Points (Outfalls)	X		X				X
Forebay*	X		X	X			X
Low-flow channel*	X		X	X	X		X
Bottom Stage	X	X	X		X	X	
Micro-pool*	X		X		X	X	X
Outlet Works	X		X				X
Emergency Spillway			X	X	X		X
Upper Stage			X	X			
Embankment		X		X	X		

(\*Note: Pond 6 does not contain a forebay, low-flow channel, or micro-pool)

Remove all references to Pond 6.

**a. Inflow Points (Outfalls)**

Inflow points or outfalls into EDBs 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 EDB. In some instances an inflow point could be a drainage channel or ditch that flows into the facility.

An energy dissipater (rip-rap or hard armor protection) is typically immediately downstream of the discharge point into the EDB to protect from erosion. In some cases, the 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 most typical maintenance items that are found with inflow points are as follows:

- i. *Rip-rap Displaced* – Many times, because the repeated impact/force of water, the rip-rap can shift and settle. If any portion of the rip-rap apron appears to have settled, soil is present between the rip-rap, or the rip-rap has shifted, maintenance may be required to ensure future erosion is prevented.
- ii. *Erosion Present/ Outfall Undercut* – In some situations, the 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 of the structure(s) and sediment transport within the facility.

- iii. *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 structure, sediment that accumulates in this area must be removed in a timely manner.
- iv. *Structural Damage* – Structural damage can occur anytime during the life of the facility. Typically for an inflow, the 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.
- v. *Woody Growth/ Weeds Present* – Undesirable vegetation can grow in and around the inflow area to an EDB that can significantly impact 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. Also, tree roots can cause damage to the structural components of the inflow. Routine maintenance is essential for trees (removing a small tree/ sapling is much cheaper and “quieter” than a mature tree). Also, noxious weeds growing in the facility can result in the loss of desirable native vegetation and impact adjacent open spaces/ land.

#### **b. Forebay**

A forebay is a solid surface (pad), typically constructed of concrete, immediately downstream of the inflow point.

#### **c. Trickle Channel (Low-Flow)**

The trickle channel conveys stormwater from the forebay to the micro-pool of the EDB.

#### **d. Bottom Stage**

The bottom stage is at least 1.0 to 2.0 feet deeper than the upper stage and is located in front of the outlet works structure. The bottom stage is designed to store the smaller runoff events and assists in keeping the majority of the basin bottom dry resulting in easier maintenance operations and enhances the facilities pollutant removal capabilities. The area of the EDB may develop wetland vegetation.

- i. *Sediment/ Debris Accumulation* – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.
- ii. *Woody Growth/ Weeds Present* – Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/ removed, the growth can cause debris/sediment to accumulate outside of the micro-pool, which can cause problems with other EDB

There is no Pond 6 on this site.

- features (Please note that Pond 6 does not include a micro-pool). Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).
- iii. *Bank Erosion* – The micro-pool is usually a couple feet deeper than the other areas of the pond. Erosion can be caused by water dropping into the micro-pool if adequate protection/ armor is not present (Please note that Pond 6 does not include a micro-pool). Erosion in this area must be mitigated to prevent sediment transport and other EDB feature damage.
  - iv. *Mosquitoes/ Algae Treatment* – Nuisance created by stagnant water can result from improper maintenance/treatment of the micro-pool. Mosquito larvae can be laid by adult mosquitoes within the permanent pool. Also, aquatic vegetation that grows in shallow pools of water can decompose causing foul odors. Chemical/mechanical treatment of the micro-pool may be necessary to reduce these impacts to adjacent homeowners.
  - v. *Petroleum/ Chemical Sheen* – Many indicators of illicit discharges into the storm sewer systems will be present in the micro-pool area of the EDB (Please note that Pond 6 does not contain a micro-pool). These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact your supervisor immediately.

Proper removal/ mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

#### e. **Micro-pool**

The micro-pool is a concrete or grouted boulder walled structure directly in front of the outlet works.

#### f. **Outlet Structure**

The outlet structure is the feature that drains the EDB in specified quantities and periods of time. The outlet structure is typically constructed of reinforced concrete into the embankment of the EDB. 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. The water quality orifice plate (smaller diameter holes) will typically have a well screen covering it to prevent smaller materials from clogging it. The outlet structure is the single most important feature in the EDB operation. Proper inspection and maintenance of the outlet structure is essential in ensuring the long-term operation of the EDB.

- i. *Trash Rack/ Well Screen Clogged* – Floatable material that enters the EDB will most likely make its way to the outlet structure. This material gets trapped against the trash racks and well screens on the outlet structure (which is why they are there). This material must be removed on a routine basis to ensure the outlet structure drains in the specified design period.

- ii. *Structural Damage* – The outlet structure is primarily constructed of concrete, which can crack, spall, and settle. The steel trash racks and well screens are also susceptible to damage.
- iii. *Orifice Plate Missing/ Not Secure* – Many times residents, property owners, or maintenance personnel will remove or loosen orifice plates if they believe the pond is not draining properly. Any modification to the orifice plate(s) will significantly impact the designed discharge rates for water quality and/or flood control.  
*Warning:* Modification of the orifice plates is not allowed without written approval from the City. See Appendix D for Contact Information.
- iv. *Manhole Access* – Access to the outlet structure is necessary to properly and inspect and maintain the facility. If access is difficult or not available to inspect the structure, chances are it will be difficult to maintain as well.  
*Warning:* To minimize risks involved when performing inspections and/or maintenance on EDBs all personnel should be well trained and have a Confined Space Certification before entering a Confined Space.
- v. *Woody Growth/ Weeds Present* – Because of the constant moisture in the soil surrounding the outlet works, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/ sediment to accumulate around the outlet works, which can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

#### **g. Emergency Spillway**

An emergency spillway is typical of all EDBs and designed to serve as the overflow in the event the volume of the pond is exceeded. The emergency spillway is typically armored with rip-rap (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 impact adjacent properties.

- i. *Rip-rap Displaced* – As mentioned before, the emergency spillway is typically armored with rip-rap to provide erosion protection. Over the life of an EDB, the rip-rap may shift or become dislodged due to flow.
- ii. *Erosion Present* – Although the emergency spillway is typically armored, stormwater flowing through the emergency spillway can cause erosion damage. Erosion must be repaired to ensure the integrity of the basin, embankment, and proper function of the emergency spillway.
- iii. *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 EDB and reduce the capacity of the spillway.
- iv. *Obstruction Debris* – The spillway must be cleared of any obstruction (man-made or natural) to ensure the proper design capacity.



## h. Upper Stage (Dry Storage)

The upper stage of the EDB provides the majority of the water quality flood detention volume. This area of the EDB is higher than the micro-pool and typically stays dry, except during storm events. The upper stage is the largest feature/ area of the basin. Sometimes, the upper stage can be utilized for park space and other uses in larger EDBs. With proper maintenance of the micro-pool and forebay(s), the upper stage should not experience much sedimentation; however, bottom elevations should be monitored to ensure adequate volume.

- i. *Vegetation Sparse* – The upper stage is the most visible part of the EDB and therefore aesthetics is important. Adequate and properly maintained vegetation can greatly increase the overall appearance and acceptance of the EDB by the public. Also, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond.
- ii. *Woody Growth/Undesirable Vegetation* – Although some trees and woody vegetation may be acceptable in the upper stage, some thinning of cottonwoods and willows may be necessary. Remember, the EDB will have to be dredged as to ensure volume, and large trees and shrubs will be difficult to protect during that operation (public perception).
- iii. *Standing Water/Boggy Areas* – Standing water or boggy areas in the upper stage is typically a sign that some other feature in the pond is not functioning properly. Routine maintenance (mowing, trash removal, etc) can be extremely difficult for the upper stage.

Following is a list of indicators:

1. Ground adjacent to the trickle channel appears to be several inches higher than concrete/riprap (Please note Pond 6 does not contain a trickle channel). **Remove all references to Pond 6.**
  2. Standing water or boggy areas in upper stage.
  3. Uneven grades or mounds
  4. Micro-pool and/or forebay have excessive amounts of sediment (Please note Pond 6 does not contain a trickle channel nor forebay)
- iv. *Erosion (banks and bottom)* – The bottom grades of the dry storage are typically flat enough that erosion should not occur. However, inadequate vegetative cover may result in erosion of the upper stage. Erosion that occurs in the upper stage can result in increased dredging/ maintenance of the micro-pool (Please note Pond 6 does not contain a micro-pool)
  - v. *Trash Debris* – Trash and debris can accumulate in the upper area after large events, or from illegal dumping. Over time, this material can accumulate and clog the EDB outlet structure.
  - vi. *Maintenance Access* – Most EDBs typically have a gravel/ concrete maintenance access path to either the upper stage or forebay. This access path should be inspected to ensure the surface is still drivable. Some of the smaller EDBs may not have maintenance access paths; however, the inspector should verify that access is available from adjacent properties.

## **i. Miscellaneous**

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

- i. Encroachment in Easement Area* – Private lots/property can sometimes be located very close to the EDBs, even though the City requires that they be located in tracts with drainage easements. Property owners may place landscaping, trash, fencing, or other items within the easement area that may impact maintenance or the operation of the facility.
- ii. Graffiti/ Vandalism* – Damage to the EDB infrastructure can be caused by vandals. If criminal mischief is evident, the inspector should forward this information to the City of Loveland Police Department at 667-2151.
- iii. Public Hazards* – Public hazards include items such as: vertical drops of greater than 4-feet, containers of unknown/ suspicious substances, and exposed metal/jagged concrete on structures.  
*Warning: Contact the City of Loveland at 911 immediately if any containers of unknown/ suspicious substances are found within the facility area that poses an immediate threat to public safety! For other hazards contact the City of Loveland Dispatch at 667-2151.*
- iv. Burrowing Animals/Pests* – Prairie dogs and other burrowing rodents may cause damage to the EDB features and negatively impact the vegetation within the EDB.
- v. Other* – Any miscellaneous inspection/ maintenance items not contained on the form should be entered here.

## **4. Maintaining Extended Detention Basins (EDBs)**

### **a. Maintenance Personnel**

Maintenance personnel must be familiar with each of the components that comprise an EDB so they are qualified to properly maintain them. Inadequately trained personnel can cause additional problems that could result in additional maintenance costs.

### **b. 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 EDB:

- 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) Back Hoe
- 9) Track Hoe/ Long Reach Excavator
- 10) Dump Truck
- 11) Jet-Vac Machine
- 12) Engineers Level (laser)
- 13) Rip-rap (Minimum – Type M)
- 14) Filter Fabric
- 15) Erosion Control Blanket(s)
- 16) Seed Mix (Native – Foothills)
- 17) Illicit Discharge Cleanup Kits
- 18) Trash Bags
- 19) Tools (wrenches, screw drivers, hammers, etc)
- 20) Chain Saw
- 21) Confined Space Entry Equipment
- 22) 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.

#### **c. 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 EDB that is greater than 48” in height, make the appropriate note/comment on the maintenance inspection form.

#### **d. EDB Maintenance Categories and Activities**

A typical EDB Maintenance Program will consist of three broad categories of work. Within each category of work, a variety of maintenance activities can be performed on an EDB. A maintenance activity can be specific to each feature within the EDB, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for an EDB.

El Paso County has identified a variety of maintenance activities that are typical of EDBs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of drainage infrastructure. Below is a description of each maintenance activity, the objectives, and frequency of actions:

#### **e. Routine Inspection/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 that may

be clogging the outlet structure well screens and trash racks. It also includes normally will be performed numerous times during the year. These items can be completed without any prior correspondence with El Paso County; however, completed inspection and maintenance forms shall be submitted to the County for each inspection and maintenance period.

The Maintenance Activities are summarized in Table 2, and further described in the following sections.

**Table 2  
Summary of Routine Inspection/ Maintenance Activities**

<b>Maintenance Activity</b>	<b>Minimum Frequency</b>	<b>Look For</b>	<b>Maintenance Action</b>
<b>Mowing</b>	Twice annually.	Excessive vegetation height; Aesthetics.	Mow vegetation.
<b>Trash/Debris Removal</b>	Twice annually.	Trash & debris in EDB.	Remove and properly dispose of trash and debris.
<b>Outlet Works Cleaning</b>	As needed; After significant storm events; Minimum twice annually.	Clogged outlet structure; Ponding water.	Remove and dispose of debris, trash, and/or sediment to allow outlet to function properly.
<b>Weed Control/ Plant Management</b>	Minimum twice annually.	Noxious weeds; Unwanted vegetation.	Treat with herbicide or hand pull; Consult weed specialist.
<b>Mosquito Treatment</b>	As needed.	Stagnant/standing water; mosquito habitat.	Treat w/ EPA approved chemicals.
<b>Algae Treatment</b>	As needed.	Standing water; Algal growth; Green color.	Treat w/ EPA approved chemicals

**f. Mowing**

Occasional mowing is necessary to limit unwanted vegetation and to improve the overall appearance of the EDB. Native vegetation should be mowed to a height of 4-to-6 inches tall.

*Frequency* – Routine – At a minimum of twice annually or depending on aesthetics.

**g. Trash/Debris Removal**

Trash and debris must be removed from the entire EDB 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 at a minimum of twice annually.

**h. Our Structure Cleaning**

Debris and other materials can clog the outlet structure’s well screen, orifice plate(s) and trash rack. This activity must be performed anytime other maintenance activities are conducted to ensure proper operation.

*Frequency* – Routine – After a significant storm event or concurrently with other maintenance activities.

**i. Weed Control/ Plant Management**

Noxious weeds and other unwanted vegetation must be treated as needed throughout the EDB. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide.

*Frequency* – Routine – As needed based on inspections.

**j. Mosquito/Algae Treatment**

Treatment of permanent pools is necessary to control mosquitoes and undesirable aquatic vegetation that can create nuisances. Please Note that only US EPA approved chemicals/materials can be used in areas that are warranted. See **CONTACT INFORMATION, INSPECTION & MAINTENANCE PROVIDERS** document.

*Frequency* – As needed.

**k. Minor 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, tools, and small equipment.

The Minor Maintenance Activities are summarized in Table 3, and further described in the following sections.

**Table 3  
Summary of Minor Maintenance Activities**

<b>Maintenance Activity</b>	<b>Minimum Frequency</b>	<b>Look For</b>	<b>Maintenance Action</b>
<b>Minor Sediment Removal</b>	As needed; typically every 1-2 years.	Sediment build-up; decrease in pond volume.	Remove and properly dispose of sediment.

<b>Minor Erosion Repair</b>	As needed, based upon inspection.	Rillying/gullying of side slopes; trickle channel*; other areas	Repair eroded areas; vegetate; stabilize, and address cause.
<b>Woody Vegetation: Removal and/or Thinning</b>	As needed, based upon inspection.	Woody vegetation comprised of large trees/ shrubs in lower chamber of pond.	Remove and/or thin out woody vegetation; restore grade and surface.
<b>Aquatic Plant Harvesting</b>	As needed, based upon inspection.	Loss of volume; nuisances related to overgrowth of vegetation.	Perform during the dry season (November to February).
<b>Drain Cleaning/ Jet Vac</b>	As needed, based upon inspection.	Sediment build-up/ non-draining system.	Clean drains; Jet Vac if needed.

(\*Note: Pond 6 does not contain a trickle channel.)

Remove all references to Pond 6.

i. **Minor Sediment Removal**

Sediment removal is necessary to maintain the original design volume of the EDB and to ensure proper function of the infrastructure. Regular sediment removal (minor) from the forebay\* (*Please Note Pond 6 does not contain a forebay*), inflow(s), and trickle channel\* (*Please Note Pond 6 does not contain a trickle channel*) can significantly reduce the frequency of major sediment removal activities (dredging) in the upper and lower stages. 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 the El Paso County Engineering Staff to ensure design volumes/ grades are achieved.

Stormwater sediments removed from EDBs 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 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. Should a spill occur during transportation, prompt and thorough cleanup is important. See **CONTACT INFORMATION, INSPECTION & MAINTENANCE PROVIDERS** document.

*Frequency* – Nonroutine – As necessary based upon inspections. Sediment removal in the forebay and trickle channel may be necessary as frequently as every 1-2 years.

## ii. **Woody Vegetation: Removal and/or Thinning**

Dense stands of woody vegetation (willows, shrubs, etc.) or trees can create maintenance problems for the infrastructure within an EDB. Tree roots can damage structures and invade pipes/ channels thereby blocking flows. Also, trees growing in the upper and lower stages of the EDB 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 imperative. All trees and woody vegetation should be removed that is growing in the bottom of the EDB or near structures (inflows, trickle channels\* *Please note Pond 6 does not contain any trickle channels*), outlet structure, emergency spillways, etc.). Any trees or woody vegetation in the EDB should be limited to the upper portions of the pond banks.

*Frequency* – Nonroutine – As necessary based on inspections.

## iii. **Aquatic Plant Harvesting**

Harvesting of vegetation may also be desirable for nutrient removal. When removing vegetation from the pond. Care should be taken so as not to leave areas of disturbed soil susceptible to erosion. Proper erosion and sediment controls should be implemented until vegetative cover is established if removal of vegetation results in disturbed soils.

*Frequency* – Nonroutine – As necessary based upon inspections.

## iv. **Clearing Drains/Jet-Vac**

An EDB contains many structures, openings, and pipes that can be frequently clogged with debris. These blockages can result in a decrease of hydraulic capacity and also create standing water (nuisances) in areas outside of the micro-pool\* (*\*Please note that Pond 6 does not contain a micro-pool*). 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. See **CONTACT INFORMATION, INSPECTION & MAINTENANCE PROVIDERS** document.

Remove all references to Pond 6.

*Frequency* – Nonroutine – As necessary based upon inspections.

## I. **Major Maintenance Activities**

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All this work requires consultation with the El Paso County to ensure the proper maintenance is performed. This

work requires that the Public Works – Stormwater engineering staff review the original design and construction drawings to access the situation and assign the necessary maintenance. See **CONTACT INFORMATION, INSPECTION & MAINTENANCE PROVIDERS** document. This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants.

The Major Maintenance Activities are summarized in Table 4, and further described in the following sections.

**Table 4**  
**Summary of Major Maintenance Activities**

<b>Maintenance Activity</b>	<b>Minimum Frequency</b>	<b>Look For</b>	<b>Maintenance Action</b>
<b>Major Sediment Removal</b>	As needed – based upon scheduled inspections.	Large quantities of sediment; reduced pond capacity	Remove and dispose of sediment. Repair vegetation as needed.
<b>Major Erosion Repair</b>	As needed – based upon scheduled inspections.	Severe erosion including: gullying; excessive soil displacement; areas of settlement; holes.	Repair erosion – find cause of problem and address to avoid future erosion.
<b>Structural Repair</b>	As needed – based upon scheduled inspections.	Deterioration and/or damage to structural components, i.e. broken concrete, damaged pipes, outlet works.	Structural repair to restore the structure to its original design.

**i. 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 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 and approval from the El Paso County Public Works – Stormwater engineering staff.

**ii. 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.

### iii. **Structural Repair**

Remove all references to Pond 6.

An EDB includes a variety of structures that can deteriorate or be damaged during the course of routine maintenance. These structures include items like outlet works, trickle channels\*, forebays\*, inflows and other features (\*Please note that Pond 6 does not contain trickle channels or forebays). Some of the minor structural repairs can be performed by your in-house operations staff. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with the El Paso County Stormwater Engineering Staff should take place prior to all structural repairs.

*Frequency* – Nonroutine – Repair as needed based upon inspections.