



**Stormwater Management Facility  
Operation and Maintenance (O&M) Plan  
Template**

**for:**

***Homestead North at Sterling Ranch Filing No. 1***

**Located at:**

***Northeast of the intersection of  
Briargate Parkway and Vollmer Road***

**Prepared for:**

***SR Land, LLC  
20 Boulder Crescent, Suite 200  
Colorado Springs, CO 80903***

**Prepared by:**

***JR Engineering, LLC  
5475 Tech Center Drive, Colorado Springs, CO 80919***

***9/9/22  
PCD Project No. SF-22-13***

**Stormwater Management Facility  
Inspection and Maintenance (I&M) Plan**

**Table of Contents**

- I. Compliance with Stormwater Facility Maintenance Requirements**
- II. Inspection & Maintenance- Annual Reporting**
- III. Preventative Measures to Reduce Maintenance Costs**
- IV. Access and Easements**
- V. Safety**
- VI. Field Inspection Equipment**
- VII. Inspecting Stormwater Management Facilities**
  - A. Inspection Procedures
  - B. Inspection Report
  - C. Verification of Inspection and Form Submittal
- VIII. Maintaining Stormwater Management Facilities**
  - A. Maintenance Categories
  - B. Maintenance Personnel
  - C. Maintenance Forms

**Appendices**

- Appendix A** - Maintenance Agreement(s)
- Appendix B** - Description of Stormwater Management Facilities
- Appendix C** - Standard Operation Procedures (SOP) for Extended Detention Basins; Grass Buffers and Grass Swales
- Appendix D** - Inspection Form(s)
- Appendix E** - Maintenance Form(s)
- Appendix F**- Stormwater Facilities Map; Facility plan and detail sheets

## **Stormwater Management Facility Inspection and Maintenance (I&M) Plan**

### **I. Compliance with Stormwater Facility Maintenance Requirements**

All property owners are responsible for ensuring stormwater facilities installed on their property are properly maintained and function as designed. Sterling Ranch Metro District may elect to assign many of the management and maintenance functions described in this plan to a third party. Sterling Ranch Metro District is aware of their responsibilities regarding stormwater facility maintenance. Maintenance agreement(s) associated with this property are provided in Appendix A.

### **II. Inspection & Maintenance – Annual Reporting**

Requirements for the inspection and maintenance of stormwater facilities, as well as reporting requirements are included in this Stormwater Management Facility Inspection and Maintenance (I&M) Plan.

**Verification that the Stormwater facilities have been properly inspected and maintained; submittal of the required Inspection and Maintenance Forms and Inspector qualifications shall be provided to the Owners Representative, and to El Paso County upon request.**

Copies of the Inspection and Maintenance forms for each of the stormwater facilities are located in Appendix D and E. A standard annual reporting form is provided in Appendix F. Each form shall be reviewed and submitted by the property owner or property manager to:

El Paso County  
Department of Public Works - Stormwater  
3275 Akers Drive  
Colorado Springs, CO 80922

### **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 in the first place. Common pollutants include sediment, trash & debris, chemicals, dog wastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. Sterling Ranch Metro District's maintenance program includes measures to address these potential contaminants. Depending on the storm water quality facilities installed on the site the maintenance program includes:

- Educate property owners/residents to be aware of how their actions affect water quality, and how they can help reduce maintenance costs.
- Keep properties, streets and gutters, and parking lots free of trash, debris, and lawn clippings.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lawn care to minimize the use of chemicals and pesticides.

- Sweep paved surfaces regularly and dispose the sweepings properly.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.
- Do not store materials outdoors (including landscaping materials) unless properly protected from runoff.

#### **IV. Access and Easements**

Sterling Ranch Metro District shall prepare a drawing showing all stormwater management facilities located on the site including designated access locations as well as required easements. Maintenance access has been provided to the pond via two 12' maintenance access paths with 12" of class 2 road base atop a compacted subgrade. It is anticipated that any equipment or vehicles using the maintenance path will not exceed the provided with and any larger equipment will not be used. Refer to the Stormwater Facilities Map located in Appendix F for access and easement locations.

#### **V. Safety**

Keep safety considerations at the forefront of inspection procedures at all times. Likely hazards should be anticipated and avoided. Sterling Ranch Metro District personnel should never enter a confined space (outlet structure, manhole, etc) without proper training or equipment. A confined space should never be entered without at least one additional person present and without using appropriate personal protection equipment.

If a toxic or flammable substance is discovered, leave the immediate area and call 911.

Vertical drops and fall hazards may be encountered in areas located within and around the facility. Sterling Ranch Metro District shall 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.

**If any hazard is found within the facility area that poses an immediate threat to public safety, call 911.**

#### **VI. Field Inspection Equipment**

Sterling Ranch Metro District's inspectors shall have the appropriate equipment to take to the field. 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 Management Facilities:

- Protective clothing and boots.
- Safety equipment (vest, hard hat, confined space entry equipment).
- Communication equipment.
- Inspection and Maintenance Plan for the site including stormwater management facility location maps.
- Clipboard.
- Stormwater Facility Maintenance Inspection Forms (See Appendix D).
- 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). However, this equipment should be available in the vehicle driven to the site.

## **VII. Inspecting Stormwater Management Facilities**

The quality of stormwater entering the waters of the state relies heavily on the proper operation and maintenance of permanent best management practices. Stormwater management facilities shall be periodically inspected to ensure they function as designed. The inspection will determine the appropriate maintenance required for the facility.

### **A. Inspection Procedures**

All stormwater management facilities shall be inspected by a qualified individual at a minimum of once per year. See the *City of Colorado Springs/El Paso County Drainage Criteria Manual* for general guidelines for an inspector. Inspections will follow the inspection guidance found in the SOP for the specific type of facility. (Appendix C of this plan).

### **B. Inspection Report**

Sterling Ranch Metro District's personnel or inspector conducting the inspection activities shall complete the appropriate inspection report for the specific facility. Inspection reports are located in Appendix D.

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. All facilities shall be inspected on an annual

basis at a minimum. In addition, all facilities shall 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 (See SOP in appendix C). 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 of 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.

### C. Verification of Inspection and Form Submittal

The Stormwater Management Facility Inspection Form provides a record of inspection of the facility. Inspection Forms for each facility type are provided in Appendix D. Verification of the inspection of the stormwater facilities, the

facility inspection form(s), and Inspector Qualifications shall be provided to the Owners Representative, and to El Paso County if requested. The verification and the inspection form(s) shall be reviewed and submitted by Sterling Ranch Metro District or his property manager.

Refer to Section II of this Plan regarding the annual reporting of inspections.

## **VIII. Maintaining Stormwater Management Facilities**

Stormwater management facilities shall be properly maintained to ensure 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 management facility maintenance programs are separated into three broad categories of work. These categories are based largely on the Urban Drainage and Flood Control District's Maintenance Program for regional drainage facilities. The categories are separated based upon the magnitude and type of the maintenance activities performed. A description of each category follows:

#### **Routine Work**

The majority of this work consists of scheduled mowings 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 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 with El Paso County; however, completed inspection and maintenance forms shall be submitted to El Paso County for each inspection and maintenance activity with the annual report.

#### **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. The Sterling Ranch Metro District shall correspond with El Paso County and submit completed maintenance forms to the owner's representative & El Paso County, if requested, for each maintenance activity.

#### **Rehabilitation Work**

This work consists of large-scale maintenance and major improvements

needed to address failures within the stormwater management facilities. This work requires consultation with El Paso County and may require an engineering design with construction plans to be prepared for review and approval. This work may also require more specialized maintenance equipment, surveying, construction permits or assistance through private contractors and consultants. If these items are needed the Sterling Ranch Metro District shall correspond with El Paso County and submit completed maintenance forms to El Paso County for each maintenance activity.

#### B. Maintenance Personnel

Sterling Ranch Metro District's maintenance personnel shall be qualified to properly maintain stormwater management facilities. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

#### C. Maintenance Forms

The Stormwater Management Facility Maintenance Form provides a record of maintenance activities. Maintenance Forms for each facility type are provided in Appendix E. Maintenance Forms shall be completed by the Sterling Ranch Metro District's contractor completing the required maintenance items. The form shall then be reviewed by the Sterling Ranch Metro District or an authorized agent of the property owner and submitted to El Paso County, when requested.

Refer to Section II of this Plan regarding the annual reporting of inspections and maintenance activities performed.



# **A P P E N D I X A**

## **Stormwater Maintenance Agreement Template**

**PRIVATE DETENTION BASIN /  
STORMWATER QUALITY BEST MANAGEMENT PRACTICE  
MAINTENANCE AGREEMENT AND EASEMENT**

This PRIVATE DETENTION BASIN / STORMWATER QUALITY BEST MANAGEMENT PRACTICE MAINTENANCE AGREEMENT AND EASEMENT (Agreement) is made by and between EL PASO COUNTY by and through THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO (Board or County) SR LAND, LLC and CLASSIC SRJ LAND, LLC (Developer) and STERLING RANCH METROPOLITAN DISTRICT NO. 3 (Metro District), a quasi-municipal corporation and political subdivision of the State of Colorado. The above may occasionally be referred to herein singularly as “Party” and collectively as “Parties.”

Recitals

A. WHEREAS, the District provides various municipal services to certain real property in El Paso County, Colorado referred to as HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1; and

B. WHEREAS, Developer is the owner of certain real estate (the Property or Subdivision) in El Paso County, Colorado, which Property is legally described in Exhibit A attached hereto and incorporated herein by this reference; and

C. WHEREAS, Developer desires to plat and develop on the Property a subdivision to be known as HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1; and

D. WHEREAS, the development of this Property will substantially increase the volume of water runoff and will decrease the quality of the stormwater runoff from the Property, and, therefore, it is in the best interest of public health, safety and welfare for the County to condition approval of this subdivision on Developer’s promise to construct adequate drainage, water runoff control facilities, and stormwater quality structural Best Management Practices (“BMPs”) for the subdivision; and

E. WHEREAS, Chapter 8, Section 8.4.5 of the El Paso County Land Development Code, as periodically amended, promulgated pursuant to Section 30-28-133(1), Colorado Revised Statutes (C.R.S.), requires the County to condition approval of all subdivisions on a developer’s promise to so construct adequate drainage, water runoff control facilities, and BMPs in subdivisions; and

F. WHEREAS, the Drainage Criteria Manual, Volume 2, as amended by Appendix I of the El Paso County Engineering Criteria Manual (ECM), as each may be periodically amended, promulgated pursuant to the County’s Colorado Discharge Permit System General Permit (MS4 Permit) as required by Phase II of the National Pollutant Discharge Elimination System (NPDES), which MS4 Permit requires that the County take measures to protect the quality of stormwater from sediment and other contaminants, requires subdividers, developers, landowners, and owners of facilities located in the County’s rights-of-way or easements to provide adequate permanent stormwater quality BMPs with new development or significant redevelopment; and

G. WHEREAS, Section 2.9 of the El Paso County Drainage Criteria Manual provides for a developer's promise to maintain a subdivision's drainage facilities in the event the County does not assume such responsibility; and

H. WHEREAS, developers in El Paso County have historically chosen water runoff detention basins as a means to provide adequate drainage and water runoff control in subdivisions, which basins, while effective, are less expensive for developers to construct than other methods of providing drainage and water runoff control; and

I. WHEREAS, Developer desires to construct for the subdivision One (1) detention basin/stormwater quality BMP(s) ("detention basin/BMP(s)") as the means for providing adequate drainage and stormwater runoff control and to meet requirements of the County's MS4 Permit, and to provide for operating, cleaning, maintaining and repairing such detention basin/BMP(s); and

J. WHEREAS, Developer desires to construct the detention basin/BMP(s) on property that is or will be platted as TRACT F as indicated on the final plat of the subdivision, and as set forth on Exhibit B attached hereto; and

K. WHEREAS, Developer shall be charged with the duty of constructing the detention basin/BMP(s) and the Metro District shall be charged with the duties of operating, maintaining and repairing the detention basin/BMP(s) on the Property described in Exhibit B; and

L. WHEREAS, it is the County's experience that subdivision developers and property owners historically have not properly cleaned and otherwise not properly maintained and repaired these detention basins/BMPs, and that these detention basins/BMPs, when not so properly cleaned, maintained, and repaired, threaten the public health, safety and welfare; and

M. WHEREAS, the County, in order to protect the public health, safety and welfare, has historically expended valuable and limited public resources to so properly clean, maintain, and repair these detention basins/BMPs when developers and property owners have failed in their responsibilities, and therefore, the County desires the means to recover its costs incurred in the event the burden falls on the County to so clean, maintain and repair the detention basin/BMP(s) serving this Subdivision due to the Developer's or the Metro District's failure to meet its obligations to do the same; and

N. WHEREAS, the County conditions approval of this Subdivision on the Developer's promise to so construct the detention basin/BMP(s), and further conditions approval on the Metro District's promise to reimburse the County in the event the burden falls upon the County to so clean, maintain and/or repair the detention basin/BMP(s) serving this Subdivision; and

O. WHEREAS, the County could condition subdivision approval on the Developer's promise to construct a different and more expensive drainage, water runoff control system and BMPs than those proposed herein, which more expensive system would not create the possibility of the burden of cleaning, maintenance and repair expenses falling on the County; however, the County is willing to forego such right upon the performance of Developer's and the Metro District's promises contained herein; and

P. WHEREAS, the County, in order to secure performance of the promises contained herein, conditions approval of this Subdivision upon the Developer's grant herein of a perpetual

Easement over a portion of the Property for the purpose of allowing the County to periodically access, inspect, and, when so necessary, to clean, maintain and/or repair the detention basin/BMP(s); and

Q. WHEREAS, Pursuant to Colorado Constitution, Article XIV, Section 18(2) and Section 29-1-203, Colorado Revised Statutes, governmental entities may cooperate and contract with each other to provide any function, services, or facilities lawfully authorized to each.

### Agreement

NOW, THEREFORE, in consideration of the mutual Promises contained herein, the sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Incorporation of Recitals: The Parties incorporate the Recitals above into this Agreement.

2. Covenants Running with the Land: Developer and the Metro District agree that this entire Agreement and the performance thereof shall become a covenant running with the land, which land is legally described in Exhibit A attached hereto, and that this entire Agreement and the performance thereof shall be binding upon themselves, their respective successors and assigns.

3. Construction: Developer shall construct on that portion of the Property described in Exhibit B attached hereto and incorporated herein by this reference, One (1) detention basin/BMP(s). Developer shall not commence construction of the detention basin/BMP(s) until the El Paso County Planning and Community Development Department (PCD) has approved in writing the plans and specifications for the detention basin/BMP(s) and this Agreement has been signed by all Parties and returned to the PCD. Developer shall complete construction of the detention basin/BMP(s) in substantial compliance with the County-approved plans and specifications for the detention basin/BMP(s). Failure to meet these requirements shall be a material breach of this Agreement, and shall entitle the County to pursue any remedies available to it at law or in equity to enforce the same. Construction of the detention basin/BMP(s) shall be substantially completed within one (1) year (defined as 365 days), which one year period will commence to run on the date the approved plat of this Subdivision is recorded in the records of the El Paso County Clerk and Recorder. Rough grading of the detention basin/BMP(s) must be completed and inspected by the El Paso County Planning and Community Development Department prior to commencing road construction.

In the event construction is not substantially completed within the one (1) year period, then the County may exercise its discretion to complete the project, and shall have the right to seek reimbursement from the Developer and its respective successors and assigns, for its actual costs and expenses incurred in the process of completing construction. The term actual costs and expenses shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tool and equipment costs, supply costs, and engineering and design costs, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to correct the matter. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the Provisions arising herein, the County shall be entitled to its damages and costs, including reasonable attorney fees, regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

4. Maintenance: The Metro District agrees for itself and its successors and assigns, that it will regularly and routinely inspect, clean and maintain the detention basin/BMP(s), and otherwise keep the same in good repair, all at its own cost and expense. No trees or shrubs that will impair the structural integrity of the detention basin/BMP(s) shall be planted or allowed to grow on the detention basin/BMP(s).

5. Creation of Easement: Developer hereby grants the County and the Metro District a non-exclusive perpetual easement upon and across that portion of the Property described in [Exhibit B](#). The purpose of the easement is to allow the County and the Metro District to access, inspect, clean, repair and maintain the detention basin/BMP(s); however, the creation of the easement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the detention basin/BMP(s).

6. County's Rights and Obligations: Any time the County determines, in the sole exercise of its discretion, that the detention basin/BMP(s) is not properly cleaned, maintained and/or otherwise kept in good repair, the County shall give reasonable notice to the Developer, the Metro District and their respective successors and assigns, that the detention basin/BMP(s) needs to be cleaned, maintained and/or otherwise repaired. The notice shall provide a reasonable time to correct the problem(s). Should the responsible parties fail to correct the specified problem(s), the County may enter upon the Property to so correct the specified problem(s). Notice shall be effective to the above by the County's deposit of the same into the regular United States mail, postage pre-paid. Notwithstanding the foregoing, this Agreement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the detention basin/BMP(s).

7. Reimbursement of County's Costs / Covenant Running With the Land: The Developer and the Metro District agree and covenant, for themselves, their respective successors and assigns, that they will reimburse the County for its costs and expenses incurred in the process of completing construction of, cleaning, maintaining, and/or repairing the detention basin/BMP(s) pursuant to the provisions of this Agreement.

The term "actual costs and expenses" shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tools and equipment costs, supply costs, and engineering and design costs, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to correct the matter. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the provisions arising herein, the County shall be entitled to its damages and costs, including reasonable attorney's fees, regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

8. Contingencies of Subdivision Approval: Developer's and the Metro District's execution of this Agreement is a condition of subdivision approval. Additional conditions of this Agreement include, but are not limited to, the following:

- a. Conveyance of TRACT F, as indicated on the final plat of the subdivision, from Developer to the Metro District (which will include a reservation of easement in favor of the County for purposes of accessing, inspecting, cleaning, maintaining, and repairing the detention basin/BMP(s)), and recording of the Deed for the same; and

- b. A copy of the Covenants of the Subdivision, if applicable, establishing that the Metro District is obligated to inspect, clean, maintain, and repair the detention basin/BMP(s).

The County shall have the right, in the sole exercise of its discretion, to approve or disapprove any documentation submitted to it under the conditions of this Paragraph, including but not limited to, any separate agreement or amendment, if applicable, identifying any specific maintenance responsibilities not addressed herein. The County's rejection of any documentation submitted hereunder shall mean that the appropriate condition of this Agreement has not been fulfilled.

9. Agreement Monitored by El Paso County Planning and Community Development Department and/or El Paso County Department of Public Works: Any and all actions and decisions to be made hereunder by the County shall be made by the Director of the El Paso County Planning and Community Development Department and/or the Director of the El Paso County Department of Public Works. Accordingly, any and all documents, submissions, plan approvals, inspections, etc. shall be submitted to and shall be made by the Director of the Planning and Community Development Department and/or the Director of the El Paso County Department of Public Works.

10. Indemnification and Hold Harmless: To the extent authorized by law, Developer and the Metro District agree, for themselves, their respective successors and assigns, that they will indemnify, defend, and hold the County harmless from any and all loss, costs, damage, injury, liability, claim, lien, demand, action and causes of action whatsoever, whether at law or in equity, arising from or related to their respective intentional or negligent acts, errors or omissions or that of their agents, officers, servants, employees, invitees and licensees in the construction, operation, inspection, cleaning (including analyzing and disposing of any solid or hazardous wastes as defined by State and/or Federal environmental laws and regulations), maintenance, and repair of the detention basin/BMP(s), and such obligation arising under this Paragraph shall be joint and several. Nothing in this Paragraph shall be deemed to waive or otherwise limit the defense available to the County pursuant to the Colorado Governmental Immunity Act, Sections 24-10-101, *et seq.* C.R.S., or as otherwise provided by law.

11. Severability: In the event any Court of competent jurisdiction declares any part of this Agreement to be unenforceable, such declaration shall not affect the enforceability of the remaining parts of this Agreement.

12. Third Parties: This Agreement does not and shall not be deemed to confer upon or grant to any third party any right to claim damages or to bring any lawsuit, action or other proceeding against either the County, the Developer, the Metro District, or their respective successors and assigns, because of any breach hereof or because of any terms, covenants, agreements or conditions contained herein.

13. Solid Waste or Hazardous Materials: Should any refuse from the detention basin/BMP(s) be suspected or identified as solid waste or petroleum products, hazardous substances or hazardous materials (collectively referred to herein as "hazardous materials"), the Developer and the Metro District shall take all necessary and proper steps to characterize the solid waste or hazardous materials and properly dispose of it in accordance with applicable State and/or Federal environmental laws and regulations, including, but not limited to, the following: Solid Wastes Disposal Sites and Facilities Acts, §§ 30-20-100.5 – 30-20-119, C.R.S., Colorado Regulations Pertaining to Solid Waste Disposal Sites and Facilities, 6 C.C.R. 1007-2, *et seq.*, Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k, and Federal Solid Waste Regulations 40 CFR Ch. I. The County shall not be responsible or liable for identifying,

characterizing, cleaning up, or disposing of such solid waste or hazardous materials. Notwithstanding the previous sentence, should any refuse cleaned up and disposed of by the County be determined to be solid waste or hazardous materials, the Developer and the Metro District, but not the County, shall be responsible and liable as the owner, generator, and/or transporter of said solid waste or hazardous materials.

14. Applicable Law and Venue: The laws, rules, and regulations of the State of Colorado and El Paso County shall be applicable in the enforcement, interpretation, and execution of this Agreement, except that Federal law may be applicable regarding solid waste or hazardous materials. Venue shall be in the El Paso County District Court.

15. Limitation on Developer’s Obligation and Liability: The obligation and liability of the Developer hereunder shall only continue until such time as the Final Plat as described in Paragraph Three (3) of the Recitals set forth above is recorded and the Developer completes the construction of the detention basin/BMP(s) and transfers all applicable maintenance and operation responsibilities to the Metro District. By execution of this agreement, the Metro District agrees to accept all responsibilities and to perform all duties assigned to it, including those of the Developer, as specified herein, upon transfer of TRACT F from Developer to the Metro District.

IN WITNESS WHEREOF, the Parties affix their signatures below.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

SR LAND, LLC

By: \_\_\_\_\_

JAMES MORLEY, MANAGER

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by JAMES MORLEY, MANAGER SR LAND, LLC.

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

CLASSIC SRJ LAND, LLC

By: \_\_\_\_\_

DOUGLAS STIMPLE, MANAGER

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by DOUGLAS STIMPLE, **MANAGER CLASSIC SRJ LAND, LLC.**

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

**STERLING RANCH METROPOLITAN DISTRICT NO. 3**

By: \_\_\_\_\_  
**DOUGLAS STIMPLE, PRESIDENT**

Attest:

By: \_\_\_\_\_  
**LOREN J. MORELAND, SECRETARY**

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by **DOUGLAS STIMPLE, PRESIDENT, STERLING RANCH METROPOLITAN DISTRICT NO. 3.**

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

**BOARD OF COUNTY COMMISSIONERS  
OF EL PASO COUNTY, COLORADO**

By: \_\_\_\_\_



\_\_\_\_\_, Executive Director  
Planning and Community Development Department  
Authorized signatory pursuant to LDC

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_,  
20\_\_, by \_\_\_\_\_, Executive Director of El Paso County Planning and Community  
Development Department.

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Approved as to Content and Form:

\_\_\_\_\_  
Assistant County Attorney

## Exhibit A

A PARCEL OF LAND LOCATED IN THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 27, THE SOUTHEAST QUARTER OF SECTION 28, SECTION 33, AND THE WEST HALF OF SECTION 34, ALL IN TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE SOUTH LINE OF THE SOUTHWEST QUARTER OF SECTION 34, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M., AS MONUMENTED AT THE SOUTHWEST CORNER OF SAID SOUTHWEST QUARTER BY A 2-1/2" ALUMINUM CAP STAMPED "LS 11624" AND AT THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER BY A 2-1/2" ALUMINUM CAP STAMPED "LS 11624", SAID LINE BEARS N89°14'14"E A DISTANCE OF 2,722.69 FEET.

COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF SECTION 34, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN;

THENCE N74°13'21"W A DISTANCE OF 2,835.33 FEET, TO A POINT ON THE NORTHEASTERLY BOUNDARY LINE OF STERLING RANCH FILING NO. 3 RECORDED UNDER RECEPTION NO. 222714995 IN THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER AND THE POINT OF BEGINNING;

THENCE ON THE NORTHERLY BOUNDARY LINE OF SAID STERLING RANCH FILING NO. 3, THE FOLLOWING THREE (3) COURSES:

1. N40°32'14"W A DISTANCE OF 48.86 FEET;
2. N76°13'42"W A DISTANCE OF 113.48 FEET;
3. S76°19'20"W A DISTANCE OF 65.62 FEET;

THENCE DEPARTING SAID NORTHERLY LINE, THE FOLLOWING FIVE (5) COURSES:

1. N13°40'40"W A DISTANCE OF 22.11 FEET;
2. N01°19'20"E A DISTANCE OF 18.32 FEET;
3. N70°06'35"E A DISTANCE OF 170.61 FEET;
4. S58°40'40"E A DISTANCE OF 19.87 FEET;
5. S13°40'40"E A DISTANCE OF 44.22 FEET, TO A POINT ON THE NORTHERLY LINE OF THAT 80' ACCESS AND UTILITY EASEMENT RECORDED UNDER RECEPTION NO. 214100441;

THENCE ON THE NORTHERLY AND WESTERLY LINES OF SAID EASEMENT, THE FOLLOWING THREE (3) COURSES:

1. N76°19'20"E A DISTANCE OF 1,779.02 FEET, TO A POINT OF CURVE;
2. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 1,460.00 FEET, A CENTRAL ANGLE OF 62°50'51" AND AN ARC LENGTH OF 1601.47 FEET, TO A POINT OF TANGENT;
3. N13°28'29"E A DISTANCE OF 1,168.84 FEET;

THENCE DEPARTING THE WESTERLY LINE OF SAID EASEMENT, N31°31'31"W A DISTANCE OF 49.50 FEET;

THENCE ON A LINE BEING 15.00 FEET NORTHERLY OF AND PARALLEL WITH THE SOUTHERLY LINE OF THAT 160' ACCESS AND UTILITY EASEMENT RECORDED UNDER RECEPTION NO. 214100441, THE FOLLOWING THREE (3) COURSES:

1. N76°31'31"W A DISTANCE OF 232.57 FEET, TO A POINT OF CURVE;
2. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 2,065.00 FEET, A CENTRAL ANGLE OF 26°05'19" AND AN ARC LENGTH OF 940.26 FEET, TO A POINT OF TANGENT;
3. N50°26'12"W A DISTANCE OF 400.79 FEET;

THENCE THE FOLLOWING FOUR (4) COURSES:

1. S39°33'48"W A DISTANCE OF 14.16 FEET;
2. N79°16'20"W A DISTANCE OF 242.01 FEET;
3. N35°23'49"W A DISTANCE OF 25.39 FEET;
4. N39°33'48"E A DISTANCE OF 124.30 FEET;

THENCE ON A LINE BEING 15.00 FEET NORTHERLY OF AND PARALLEL WITH THE SOUTHERLY LINE OF SAID 160' ACCESS AND UTILITY EASEMENT, N50°26'12"W A DISTANCE OF 717.72 FEET, TO THE SOUTHEASTERLY CORNER OF BRIARGATE PARKWAY, AS SHOWN ON THE PLAT OF STERLING RANCH FILING NO. 1 RECORDED UNDER RECEPTION NO. 218714151;

THENCE ON THE EASTERLY AND NORTHERLY RIGHT-OF-WAY LINE OF SAID BRIARGATE PARKWAY, THE FOLLOWING TWO (2) COURSES:

1. N39°33'48"E A DISTANCE OF 130.00 FEET;
2. N50°26'12"W A DISTANCE OF 810.00 FEET, TO A POINT ON THE EASTERLY RIGHT-OF-WAY LINE OF VOLLMER ROAD;

THENCE ON SAID EASTERLY RIGHT-OF-WAY LINE, N39°33'48"E A DISTANCE OF 1,018.96 FEET;

THENCE DEPARTING SAID EASTERLY RIGHT-OF-WAY LINE, THE FOLLOWING SIXTEEN (16) COURSES:

1. S50°28'09"E A DISTANCE OF 220.07 FEET;
2. N39°31'51"E A DISTANCE OF 20.92 FEET;
3. S50°26'12"E A DISTANCE OF 574.81 FEET;
4. S36°32'11"E A DISTANCE OF 65.00 FEET, TO A POINT OF NON-TANGENT CURVE;
5. ON THE ARC OF A CURVE TO THE RIGHT WHOSE CENTER BEARS N36°32'11"W, HAVING A RADIUS OF 1,043.00 FEET, A CENTRAL ANGLE OF 05°38'09" AND AN ARC LENGTH OF 102.59 FEET, TO A POINT OF REVERSE CURVE;

6. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 755.00 FEET, A CENTRAL ANGLE OF 19°32'10" AND AN ARC LENGTH OF 257.43 FEET, TO A POINT OF TANGENT;

7. S39°33'48"W A DISTANCE OF 33.69 FEET;

8. S50°26'12"E A DISTANCE OF 365.58 FEET;

9. S19°42'21"W A DISTANCE OF 180.77 FEET;

10. S32°15'45"W A DISTANCE OF 71.66 FEET;

11. S41°47'19"W A DISTANCE OF 88.37 FEET;

12. S14°57'52"W A DISTANCE OF 155.36 FEET;

13. S03°04'57"E A DISTANCE OF 108.15 FEET;

14. S78°59'19"E A DISTANCE OF 116.25 FEET;

15. S35°23'49"E A DISTANCE OF 25.33 FEET;

16. S39°33'48"W A DISTANCE OF 138.78 FEET;

THENCE ON A LINE BEING 15.00 FEET SOUTHERLY OF AND PARALLEL WITH THE NORTHERLY LINE OF SAID 160' ACCESS AND UTILITY EASEMENT, THE FOLLOWING THREE (3) COURSES:

1. S50°26'12"E A DISTANCE OF 682.86 FEET, TO A POINT OF CURVE;

2. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 1,935.00 FEET, A CENTRAL ANGLE OF 26°05'19" AND AN ARC LENGTH OF 881.07 FEET, TO A POINT OF TANGENT;

3. S76°31'31"E A DISTANCE OF 232.57 FEET;

THENCE THE FOLLOWING NINE (9) COURSES:

1. N58°28'13"E A DISTANCE OF 49.50 FEET;

2. N13°28'29"E A DISTANCE OF 10.00 FEET;

3. S76°31'32"E A DISTANCE OF 80.00 FEET;

4. S13°28'29"W A DISTANCE OF 10.00 FEET;

5. S31°31'31"E A DISTANCE OF 49.51 FEET;

6. S76°31'31"E A DISTANCE OF 10.00 FEET;

7. S13°28'38"W A DISTANCE OF 130.00 FEET;

8. N76°31'31"W A DISTANCE OF 10.00 FEET;

9. S58°28'29"W A DISTANCE OF 49.50 FEET, TO A POINT ON THE EASTERLY LINE OF SAID 80' ACCESS AND UTILITY EASEMENT;

THENCE ON EASTERLY AND SOUTHERLY LINES OF SAID 80' ACCESS AND UTILITY EASEMENT, THE FOLLOWING THREE (3) COURSES:

1. S13°28'29"W A DISTANCE OF 1,168.84 FEET, TO A POINT OF CURVE;

2. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 1,540.00 FEET, A CENTRAL ANGLE OF 62°50'51" AND AN ARC LENGTH OF 1,689.22 FEET, TO A POINT OF TANGENT;

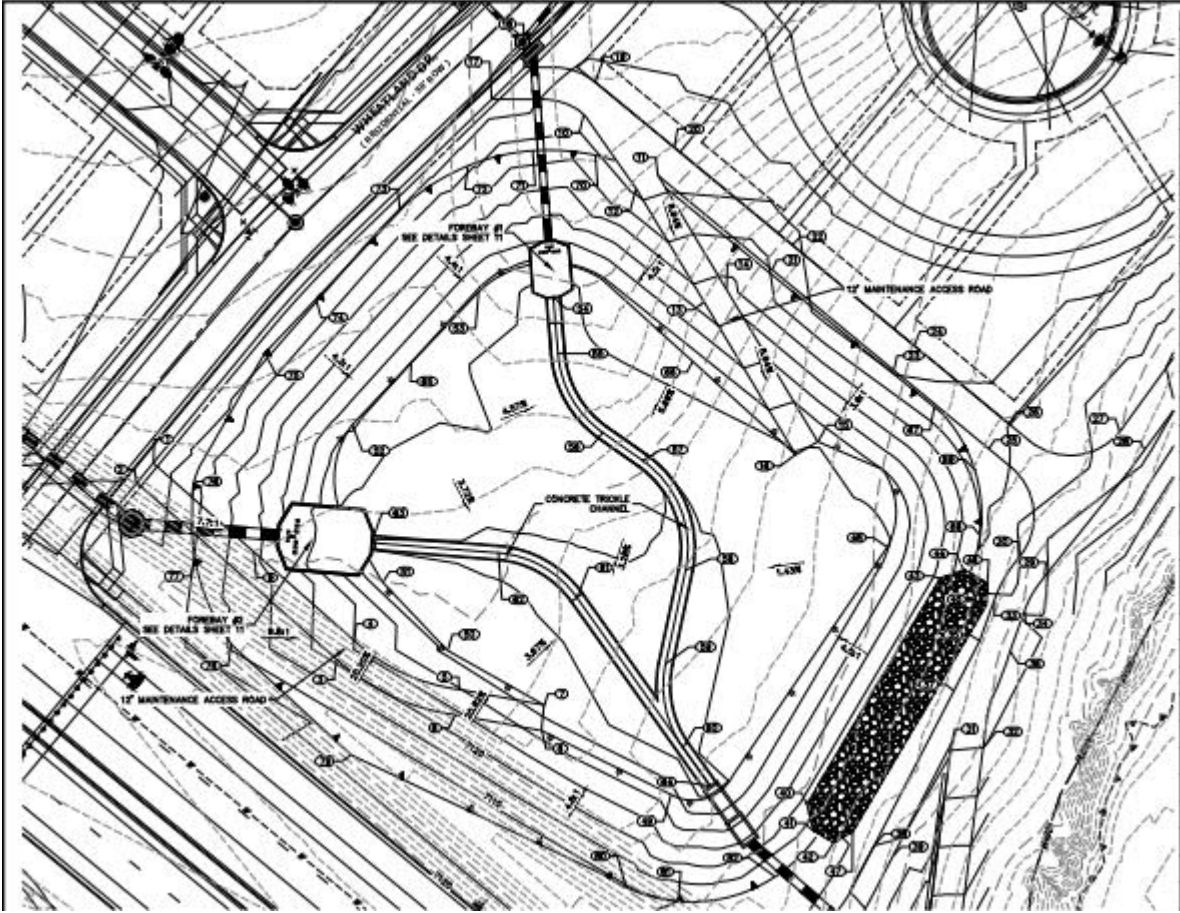
3. S76°19'20"W A DISTANCE OF 1,779.02 FEET;

THENCE DEPARTING THE SOUTHERLY LINE OF SAID 80' ACCESS AND UTILITY EASEMENT, S13°40'40"E A DISTANCE OF 15.90 FEET, TO THE POINT OF BEGINNING.

CONTAINING A CALCULATED AREA OF 1,886,972 SQUARE FEET OR 43.3189 ACRES.

Exhibit B

POND NE CORNER OF WHEATLAND AND BRIARGATE



# **A P P E N D I X B**

## **General Location and Description of Stormwater Management Facilities**

## Appendix B

### General Location and Description of Stormwater Management Facilities

#### A. General Site Description

The Homestead North at Sterling Ranch site is comprised of 42 acres of single family residential lots. The site is located east of Vollmer Road and north of Briargate Parkway. There is one pond associated with the Homestead North at Sterling Ranch development. The pond is located northeast of the intersection of Briargate Parkway and Wheatland Dr.

#### B. General Stormwater Management Description

All stormwater is conveyed via swales and conventional reinforced concrete pipe (RCP) to one detention basin that provide detention and water quality treatment. Developed runoff is released to Sand Creek at or below historic rates.

#### C. Stormwater Facilities Site Plan

Inspection or maintenance personnel may utilize the Stormwater Facilities Map located in Appendix F for locating the stormwater facilities within this development.

#### D. On-Site Stormwater Management Facilities

##### **Volume Reduction Facilities**

Residential Site utilizes Level I MDCIA –Impervious surfaces are routed through grass-covered areas.

##### **Storage Facilities (Detention)**

Detention for the site is provided in the full spectrum water quality and detention pond. See the Facilities Map located in Appendix F for location of pond.

##### **Water Quality Facilities**

Water quality is provided in the the full spectrum ponds.

##### **Source Control Best Management Practices**

Residential Site does not include any nonstructural BMPs.



# **A P P E N D I X C**

## **Standard Operating Procedures**

**For:**

**Extended Detention Basins (EDBs)**

# Standard Operation Procedures for Inspection and Maintenance

## Extended Detention Basins (EDBs)

September 2010

# TABLE OF CONTENTS

EDB-1	Background.....	3
EDB-2	INSPECTING EXTENDED DETENTION BASINS (EDBs).....	3
EDB-2.1	Access and Easements .....	3
EDB-2.2	Stormwater Management Facilities Locations .....	3
EDB-2.3	Extended Detention Basin (EDB) Features.....	3
EDB-2.3.1	Inflow Points.....	4
EDB-2.3.2	Forebay.....	5
EDB-2.3.3	Trickle Channel (Low-Flow) .....	6
EDB-2.3.4	Bottom Stage .....	7
EDB-2.3.5	Micropool .....	8
EDB-2.3.6	Outlet Works .....	9
EDB-2.3.7	Emergency Spillway.....	10
EDB-2.3.8	Upper Stage (Dry Storage) .....	10
EDB-2.3.9	Miscellaneous .....	12
EDB-2.4	Inspection Forms .....	13
EDB-3	MAINTAINING EXTENDED DETENTION BASINS (EDBS) .....	13
EDB-3.1	Maintenance Personnel .....	13
EDB-3.2	Equipment.....	13
EDB-3.3	Safety.....	14
EDB-3.4	Maintenance Forms .....	14
EDB-3.5	Maintenance Categories and Activities.....	14
EDB-3.6	Routine Maintenance Activities.....	15
EDB-3.6.1	Mowing.....	15
EDB-3.6.2	Trash/Debris Removal .....	16
EDB-3.6.3	Outlet Works Cleaning .....	16
EDB-3.6.4	Weed Control .....	16
EDB-3.6.5	Mosquito/Algae Treatment.....	16
EDB-3.7	Minor Maintenance Activities .....	16
EDB-3.7.1	Sediment Removal.....	17
EDB-3.7.2	Erosion Repair .....	17
EDB-3.7.3	Vegetation Removal/Tree Thinning.....	18
EDB-3.7.4	Clearing Drains/Jet-Vac .....	18
EDB-3.8	Major Maintenance Activities .....	18
EDB-3.8.1	Major Sediment Removal.....	19
EDB-3.8.2	Major Erosion Repair .....	19
EDB-3.8.3	Structural Repair .....	20

## **EDB-1 BACKGROUND**

Extended Detention Basins (EDBs) are one of the most common types of Stormwater Management Facilities utilized within the Front Range of Colorado. An EDB is a sedimentation basin designed to “extend” the runoff detention time, but to drain completely dry sometime after stormwater runoff ends. The EDB’s drain time for the water quality portion of the facility is typically 40 hours. 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.

EDBs are an adaptation of a detention basin used for flood control, with the primary difference is the addition of forebays, micro-pools and a slow release outlet design. Forebays are shallow concrete “pans” located at the inflow point to the basin and are provided to facilitate sediment removal within a contained area prior to releasing into the pond. These forebays collect and briefly hold stormwater runoff resulting in a process called sedimentation, dropping sediment out of the stormwater. The stormwater is then routed from the forebay into the concrete trickle channel and upper basin, the large grassy portion of the basin. The EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. An EDB should have a small micro-pool just upstream of the outlet. This micro-pool is designed to hold a small amount of water to keep sediment and floatables from blocking the outlet orifices.

## **EDB-2 INSPECTING EXTENDED DETENTION BASINS (EDBs)**

### **EDB-2.1 Access and Easements**

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix F containing the location(s) of the access points and maintenance easements of the EDB(s) within this development.

### **EDB-2.2 Stormwater Management Facilities Locations**

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix F containing the location(s) of the EDB(s) within this development.

### **EDB-2.3 Extended Detention Basin (EDB) Features**

EDBs have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another. For example, if a forebay is not properly maintained, it could negatively affect 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 the overall facility functions as it was intended. Below is a list and description of the most common features within an EDB and the corresponding maintenance inspection items that can be anticipated:

**Table EDB-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
Low-flow channel	X		X	X	X		X
Bottom Stage	X	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		

#### EDB-2.3.1 Inflow Points

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 (riprap 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 typical maintenance items 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. Depending on the nature of the maintenance the use of heavy equipment and proper bedding material may be required to repair the riprap. See Section EDB-3.5 – EDB-3.8.

*b. 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 to the structure(s) and sediment transport within the facility. If there is any

question to whether the original design is inadequate, a qualified engineer should review the situation to avoid chronic maintenance repairs if it is a design issue.

*c. 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.

*d. Structural Damage* – Structural damage can occur at 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.

*e. Woody Growth/Weeds Present* – Undesirable vegetation can grow in and around the inflow area to an EDB 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. 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). In addition, noxious weeds growing in the facility can result in the loss of desirable native vegetation and impact adjacent open spaces/land.

### EDB-2.3.2 Forebay

A forebay is a solid surface (pad), typically constructed of concrete, immediately downstream of the inflow point. The forebay is designed to capture larger particles and trash to prevent them from entering the main portion of the EDB. The solid surface is designed to facilitate mechanical sediment removal (skid steer). The forebay typically includes a small diameter discharge pipe or v-notch weir on the downstream end and designed to drain the forebay in a specified period of time to promote sedimentation. The forebays vary in size and depth depending on the design and site constraints.

*The typical maintenance items found with forebays are as follows:*

*a. Sediment/Debris Accumulation* – Because this feature of the EDB is designed to provide the initial sedimentation, debris and sediment frequently accumulate in this area. If the sediment and debris is not removed from the forebay on a regular basis, it can significantly affect the

function of other features within the EDB. Routine sediment removal from the forebay can **significantly** reduce the need for dredging of the main portion of the EDB using specialized equipment (long reach excavators). Routine removal of sediment from the forebay can **substantially** decrease the long-term sediment removal costs of an EDB.

*b. Concrete Cracking/Failing* – The forebay is primarily constructed of concrete, which cracks, spalls, and settles. Damage to the forebay can result in decreased performance and impact maintenance efforts.

*c. Drain Pipe/Weir Clogged* – Many times the drainpipe or weir can be clogged with debris, and prevent the forebay from draining properly. If standing water is present in the forebay (and there is not a base flow), the forebay is most likely not draining properly. This can result in a decrease in performance and create potential nuisances with stagnant water (mosquitoes).

*d. Weir/Drain Pipe Damaged* – Routine maintenance activities, vandalism, or age may cause the weir or drain pipe in the forebay to become damaged. Weirs are typically constructed of concrete, which cracks and spalls. The drainpipe is typically smaller in diameter and constructed with plastic, which can fracture.

### EDB-2.3.3 Trickle Channel (Low-Flow)

The trickle channel conveys stormwater from the forebay to the micro-pool of the EDB. The trickle channel is typically made of concrete. However, grass lined (riprap sides protected) is also common and can provide for an additional means of water quality within the EDB. The trickle channel is typically 6-9 inches in depth and can vary in width.

*The typical maintenance items found with trickle channels are as follows:*

*a. Sediment/Debris Accumulation* – Trickle channels are typically designed with a relatively flat slope that can promote sedimentation and the collection of debris. Also, if a trickle channel is grass lined it can accumulate sediment and debris at a much quicker rate. Routine removal of accumulated sediment and debris is essential in preventing flows from circumventing the trickle channel and affecting the dry storage portion of the pond.

*b. Concrete/Riprap Damage* – Concrete can crack, spall, and settle and must be repaired to ensure proper function of the trickle channel. Riprap can also shift over time and must be replaced/repared as necessary.

*c. Woody Growth/Weeds Present* – Because of the constant moisture in the area surrounding the trickle channel, woody growth (cottonwoods/willows) can become a problem. Trees and dense shrub type vegetation can affect the capacity of the trickle channel and can allow flows to circumvent the feature.

*d. Erosion Outside of Channel* – In larger precipitation events, the trickle channel capacity will likely be exceeded. This can result in erosion immediately adjacent to the trickle channel and must be repaired to prevent further damage to the structural components of the EDB.

#### EDB-2.3.4 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, assists in keeping the majority of the basin bottom dry resulting in easier maintenance operations, and enhances the facilities pollutant removal capabilities. This area of the EDB may develop wetland vegetation.

*The typical maintenance items found with the bottom stage are as follows:*

*a. Sediment/Debris Accumulation* – The bottom stage can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.

*b. 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 (see EDB 2.3.5), 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).

*c. Bank Erosion* – The bottom stage is usually a couple feet deeper than the other areas of the ponds. Erosion can be caused by water dropping into the bottom stage if adequate protection/armor is not present. Erosion in this area must be mitigated to prevent sediment transport and other EDB feature damage.

*d. Mosquitoes/Algae Treatment* – Nuisance created by stagnant water can result from improper maintenance/treatment of the bottom stage. 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



bottom stage may be necessary to reduce these impacts to adjacent homeowners.

*e. Petroleum/Chemical Sheen* – Many indicators of illicit discharges into the storm sewer systems will be present in the bottom stage area of the EDB. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

#### EDB-2.3.5 Micro-pool

The micro-pool is a concrete or grouted boulder walled structure directly in front of the outlet works. At a minimum, the micro-pool is 2.5 feet deep and is designed to hold water. The micro-pool is critical in the proper function of the EDB; it allows suspended sediment to be deposited at the bottom of the micro-pool and prevents these sediments from being deposited in front of the outlet works causing clogging of the outlet structure, which results in marshy areas within the top and bottom stages.

*The typical maintenance items found with micro-pools are as follows:*

*a. Sediment/Debris Accumulation* – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain the micro pool volume, depth, and proper function of the outlet structure.

*b. 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 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).

*c. 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. If mosquitoes are breeding within the micro-pool this may also be an indication there is significant sediment build-up that is reducing the depth of the micro-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.

*d. Petroleum/Chemical Sheen* – Many indicators of illicit discharges into the storm sewer systems will be present in the micro-pool area of the EDB. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

#### EDB-2.3.6 Outlet Works

The outlet works is the feature that drains the EDB in specified quantities and periods of time. The outlet works 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 works is essential in ensuring the long-term operation of the EDB.

*The typical maintenance items found with the outlet works are as follows:*

*a. Trash Rack/Well Screen Clogged* – Floatable material entering the EDB will most likely make its way to the outlet structure. This material is 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.

*b. 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.

*c. 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 affect the designed discharge rates for water quality and/or flood control. Modification of the orifice plates is not allowed without approval from El Paso County Public Works Department, Engineering Control Division.

*d. Manhole Access* – Access to the outlet structure is necessary to properly 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.

e. *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).

#### EDB-2.3.7 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 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 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 EDB, the riprap may shift or dislodge due to flow. Depending on the nature of the maintenance the use of heavy equipment and proper bedding material may be required to repair the riprap. See Section EDB-3.5 – EDB-3.8.

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. *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.

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

#### EDB-2.3.8 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 bottom stage 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 bottom stage, micro-pool, and forebay(s), the upper stage should not experience much sedimentation; however, bottom elevations should be monitored to ensure adequate volume.

*The typical maintenance items found with upper stages are as follows:*

*a. Vegetation Sparse* – The upper basin 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. In addition, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond.

*b. Woody Growth/Undesirable Vegetation* – Although some trees and woody vegetation may be acceptable in the upper basin, some thinning of cottonwoods and willows may be necessary. Remember, the basin will have to be dredged to ensure volume, and large trees and shrubs will be difficult to protect during that operation.

*c. 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 if the ground is saturated. If this inspection item is checked, make sure you have identified the root cause of the problem.

*d. Sediment Accumulation* – Although other features within the EDB are designed to capture sediment, the upper storage area will collect sediment over time. Excessive amounts of sedimentation will result in a loss of storage volume. It may be more difficult to determine if this area has accumulated sediment without conducting a field survey.

Below is a list of indicators:

1. Ground adjacent to the trickle channel appears to be several inches higher than the concrete/riprap trickle channel.
2. Standing water or boggy areas in upper stage
3. Uneven grades or mounds
4. Bottom Stage, Micro-pool, or Forebay has excessive amounts of sediment

*e. Erosion (banks and bottom)* – The bottom grades of the dry storage area 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 bottom stage/micro-pool.

*f. 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 works.

*g. 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.

#### EDB-2.3.9 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.

*a. Encroachment in Easement Area* – Private lots/property can sometimes be located very close to the EDBs, even though they are required to be located in tracts with drainage easements. Property owners may not place landscaping, trash, fencing, or other items within the easement area that may adversely affect maintenance or the operation of the facility.

*b. 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 El Paso County Police Department.

*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, call 911 immediately!**

*d. Burrowing Animals/Pests* – Prairie dogs and other burrowing rodents may cause damage to the EDB features and negatively affect the vegetation within the EDB.

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

## **EDB-2.4 Inspection Forms**

EDB Inspection forms are located in Appendix D. 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. These inspection forms shall be kept indefinitely and made available to El Paso County upon request.

## **EDB-3 MAINTAINING EXTENDED DETENTION BASINS (EDBS)**

### **EDB-3.1 Maintenance Personnel**

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

### **EDB-3.2 Equipment**

It is imperative 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 basic 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.) Riprap (Minimum - Type M, or as shown on the approved civil plans)
- 14.) Filter Fabric
- 15.) Erosion Control Blanket(s)

- 16.) Seed Mix (See seed mix in the *Rules and Regulations Regarding Stormwater (Quality) Discharge for Construction Activities*, Std Det. SM, Seeding & Mulching)
- 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 Inspection and Maintenance Plan

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.

### **EDB-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 having a significant vertical drop. If a vertical drop within the EDB is identified as greater than 48" in height, make the appropriate note/comment on the maintenance inspection form.

### **EDB-3.4 Maintenance Forms**

The EDB Maintenance Form provides a record of each maintenance operation performed by maintenance contractors. The EDB Maintenance Form shall be filled out in the field after the completion of the maintenance operation. 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. The EDB Maintenance form is located in Appendix E.

### **EDB-3.5 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.

A variety of maintenance activities 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:

### EDB-3.6 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 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 with El Paso County; however, completed inspection and maintenance forms shall be submitted to El Paso County for each inspection and maintenance activity in accordance with the Inspection and Maintenance Plan.

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

**TABLE – EDB-2  
Summary of Routine Maintenance Activities**

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
<b>Mowing</b>	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 4" to 6"
<b>Trash/Debris Removal</b>	Twice annually	Trash & debris in EDB	Remove and dispose of trash and debris
<b>Outlet Works Cleaning</b>	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
<b>Weed control</b>	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist
<b>Mosquito Treatment</b>	As needed	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

#### EDB-3.6.1 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. Grass clippings should be collected and disposed of properly.

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



#### EDB-3.6.2 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 minimum of twice annually and should be done after significant storm events.

#### EDB-3.6.3 Outlet Works Cleaning

Debris and other materials can clog the outlet work'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 significant rainfall event or concurrently with other maintenance activities.

#### EDB-3.6.4 Weed Control

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. Consultation with the local Weed Inspector is highly recommended prior to the use of an herbicide. All herbicide applications should be applied in accordance with the manufacturer's recommendations.

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

#### EDB-3.6.5 Mosquito/Algae Treatment

Treatment of permanent pools 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.

### **EDB- 3.7 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 require prior correspondence with El Paso County Water Staff and require completed inspection and maintenance forms to be submitted to the El Paso County Water Staff for each inspection and maintenance activity.

**Table – EDB-3  
Summary of Minor Maintenance Activities**

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
<b><u>Sediment Removal*</u></b>	As needed; typically every 1 –2 years	Sediment build-up; decrease in pond volume	Remove and dispose of sediment
<b>Erosion Repair</b>	As needed, based upon inspection	Rills/gullies forming on side slopes, trickle channel, other areas	Repair eroded areas Revegetate; address source of erosion
<b>Vegetation Removal/Tree Thinning</b>	As needed, based upon inspection	Large trees/wood vegetation in lower chamber of pond	Remove vegetation; restore grade and surface
<b>Drain Cleaning/Jet Vac</b>	As needed, based upon inspection	Sediment build-up /non draining system	Clean drains; Jet Vac if needed

\*Usually from the forebay, trickle channel, and/or micro-pool

**EDB-3.7.1 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, inflow(s), and 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.

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. Prompt and thorough cleanup is important should a spill occur during transportation.

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

**EDB-3.7.2 Erosion Repair**

The repair of eroded areas is necessary to ensure the proper function of the EDB, minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to trickle channels, energy dissipaters, 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, spillways, and adjacent to structures will require consultation with El Paso County Stormwater and Engineering Staff.

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

#### EDB-3.7.3 Vegetation Removal/Tree 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 that is growing in the bottom of the EDB or near structures (inflows, trickle channels, outlet works, emergency spillways, etc) should be removed. Any trees or woody vegetation in the EDB should be limited to the upper portions of the pond banks.

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

#### EDB-3.7.4 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 create standing water in areas outside of the 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.

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

### **EDB-3.8 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 El Paso County to ensure the proper maintenance is performed. This work requires El Paso County Stormwater Staff review the original design before approval of the proposed maintenance. **A ESQCP permit shall be required for all major maintenance activities.** This work may also require more specialized maintenance equipment, design/details, submittal of plans to El Paso County for review and approval, surveying, or assistance through private contractors and consultants.

**Table – EDB-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 gullies, 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 – broken concrete, damaged pipes, outlet works	Structural repair to restore the structure to its original design

**EDB-3.8.1 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.

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 El Paso County Stormwater and Engineering Staff to ensure design volumes/grades are achieved. Pond volume recertification will be required in accordance with El Paso County’s drainage criteria manual.

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

**EDB-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. Any condition/repair affecting design grades or pond volumes requires consultation with El Paso County Stormwater and Engineering Staff.

*Frequency* – Nonroutine – Repair as needed based upon inspections.  
EDB-3.8.3 Structural Repair

An EDB includes a variety of structures that can deteriorate or be damaged during the course of use and routine maintenance. 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. These structures include items like outlet works, trickle channels, forebays, inflows and other features. In-house operations staff can perform some of the minor structural repairs. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with El Paso County and Engineering Staff shall take place prior to all structural repairs.

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

# **A P P E N D I X D**

## **Inspection Forms**

**EXTENDED DETENTION BASIN (EDB)  
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.)
- \_\_\_ Woody Growth/Weeds Present

**2.) Forebay**

- \_\_\_ Sediment/Debris Accumulation
- \_\_\_ Concrete Cracking/Failing
- \_\_\_ Drain Pipe/Wier Clogged (not draining)
- \_\_\_ Wier/Drain Pipe Damage

**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

This inspection form shall be kept indefinitely and made available to the City of Aurora upon request.

# **A P P E N D I X E**

## **Maintenance Forms**



**EXTENDED DETENTION BASIN (EDB)  
MAINTENANCE FORM**

Subdivision/Business Name: \_\_\_\_\_ Completion Date: \_\_\_\_\_

Subdivision/Business Address: \_\_\_\_\_ Contact Name: \_\_\_\_\_

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

**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: \_\_\_\_\_

EQUIPMENT/MATERIAL USED: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COMMENTS/ADDITIONAL INFO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This Maintenance Activity Form shall be kept indefinitely and made available to the City of Aurora upon request.

# **A P P E N D I X F**

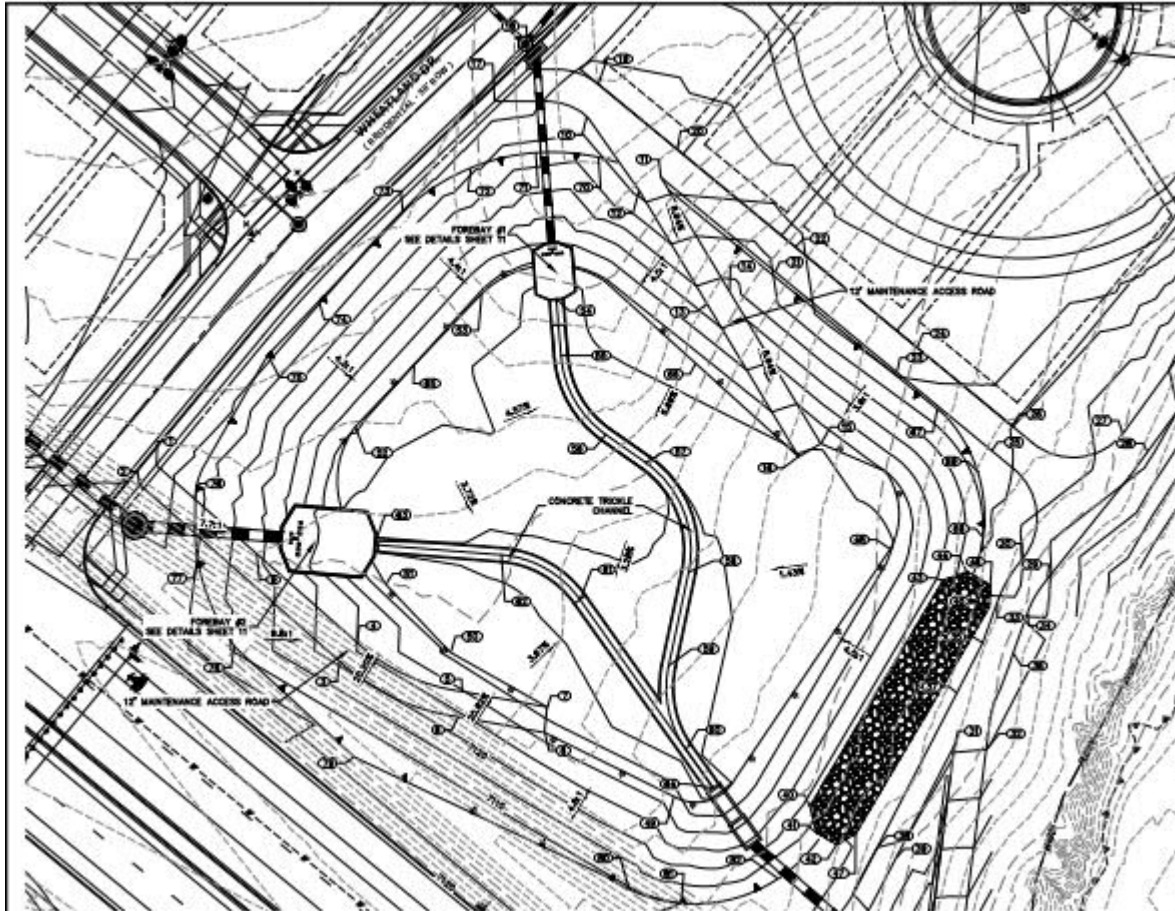
## **Inspection and Maintenance Site Plan(s)**

### **Check Lists**

**Facilities Map Checklist**

**EDB Checklist**

POND NE CORNER OF WHEATLAND AND BRIARGATE



**INSPECTION AND MAINTENANCE SITE PLANS  
STORMWATER FACILITIES MAP  
CHECKLIST FOR REQUIRED ITEMS**

Stormwater facilities map shall include:

- Labels for all streets (includes line work for edge of street and street name)
- Line work for right-of-way lines, lot lines, and tracts
- Line work and labels for all major drainage ways
- Label roadways, developments, etc adjacent to project site
- Labels for all BMPs being constructed on project site including a summary table when multiple BMPs are present
- Legend for identifying features/line types on drawing (optional)

# **INSPECTION AND MAINTENANCE SITE PLANS EXTENDED DETENTION BASIN (EDB) CHECKLIST FOR REQUIRED ITEMS**

## **PLAN AND PROFILE SHEET**

Plan view shall include:

- Location and labels for all major features of EDB (inflow structure(s), forebay, micro-pool, trickle channel, access road, outlet work(s), spillway, maintenance access ramps, embankment, etc.)
- Contours
- Other utilities in vicinity of EDB
- Cross-reference to EDB Operation and Maintenance Details sheet
- Line work for right-of-way lines, lot lines, easements, and tracts
- Hatch indicating permanent water elevation in micro-pool.

Profile view shall include:

- Location and labels for all major features of EDB (inflow structure(s), forebay, micro-pool, trickle channel, access road, outlet work(s), spillway, maintenance access ramps, embankment, etc.)
- Invert elevations at major features of EDB (inflow structure(s), forebay, micro-pool, outlet work(s))
- Permanent pool elevation of micro-pool
- Water quality water surface elevation
- Water surface elevation of all applicable storm events
- Label for upper and bottom stages for EDB

## **DETAIL SHEET**

Detail sheet shall include:

- Volume provided by the EDB forebay and micro-pool, including the WQCV
- WQCV drain time
- Seed mix
- Total mow area including approximate mow boundaries on each side of EDB
- Duplicate the following tables from the "Standard Operation Procedure for Extended Detention Basin Inspection and Maintenance" document:
  - o Inspection and Maintenance Requirements at Specific EDB Features

- Summary of Routine Maintenance Activities for an EDB
  - Summary of Minor Maintenance Activities for an EDB
  - Summary of Major Maintenance Activities for an EDB
- Water quality outlet works detail
- Water quality plate detail
- Maintenance access road detail
- Trickle channel typical section
- Forebay edge detail (or cross section) which includes maximum allowed sediment depth in forebay
- Forebay release structure detail
- Spillway detail(s), including cutoff wall