

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

**for:**

**BRADLEY POINT FILING NO. 1**

**Located near:**

**HWY 85/87 AND S. ACADEMY BLVD. INTERSECTION  
EI PASO COUNTY, CO**

**Prepared for:**

**BRADLEY POINT, LLC  
2010 Fox Mountain Point  
Colorado Springs, CO 80906  
719-491-3101**

**Prepared by:**

**M&S Civil Consultants, Inc.  
212 N. Wahsatch Ave., Suite 305  
Colorado Springs, CO 80903  
719-955-5485**



**CIVIL CONSULTANTS, INC.**

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

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# Stormwater Management Facility Operation and Maintenance (O&M) Manual

## I. Compliance with Stormwater Facility Maintenance Requirements

All property owners are responsible for ensuring that stormwater facilities installed on their property are properly maintained and that they function as designed. In some cases, this maintenance responsibility may be assigned to others through special agreements. The maintenance responsibility for a stormwater facility may be designated on the subdivision plat, the site development plan, and/or within a maintenance agreement for the property. Property owners should be aware of their responsibilities regarding stormwater facility maintenance. Maintenance agreement(s) associated with this property are provided in Appendix A.

In some cases, the El Paso County (EPC) may agree to provide the required inspection and maintenance for some or all private stormwater facilities. In these cases, an EPC maintenance agreement will be included in Appendix A for those facilities that are agreed to be included in the EPC routine maintenance program.

## 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 Operation and Maintenance (O&M) Manual.

**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 EPC on an annual basis. The annual reporting form shall be provided to EPC prior to May 31st of each year.**

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 EPC.

Property owners are not required to provide Inspection and Maintenance Reports for stormwater facilities that have been agreed to be maintained by EPC. These reports will be generated through EPC's inspection & maintenance program.

Delete?

## 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. A thoughtful maintenance program will include measures to address these potential contaminants, and will save money and time in the long run. Key points to consider in your maintenance program include:

- Educate property owners/residents to be aware of how their actions affect water quality, and how they can help reduce maintenance costs.
- Keep 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 and put the sweepings back on the lawn.
- 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

All stormwater management facilities located on the site have both a designated access location as well as a maintenance easement. Refer to the Stormwater Facilities Map located in Appendix H for access and easement locations.

#### V. Safety

the maintenance easement is now a blanket easement over the property. Explain how the site can be reasonably used to access the ponds for inspection and maintenance.

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

If a toxic or flammable substance is discovered, leave the immediate area and contact the local Sheriff at 911.

Potentially dangerous (e.g., fuel, chemicals, hazardous materials) substances found in the areas must be referred to the local Sheriff's Office immediately for response by the Hazardous Materials Unit. The emergency contact number is 911.

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop. If a vertical drop is identified within the pond 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, contact the local Sheriff's Office immediately.**

## **VI. Field Inspection Equipment**

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

- Protective clothing and boots.
- Safety equipment (vest, hard hat, confined space entry equipment).
- Communication equipment.
- Operation and Maintenance Manual 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 must be periodically inspected to ensure that they function as designed. The inspection will determine the appropriate maintenance that is required for the facility.

### **A. Inspection Procedures**

All stormwater management facilities are required to be inspected by a qualified individual at a minimum of once per year. Inspections should follow the inspection guidance found in the SOP for the specific type of facility. (Appendix C of this manual).

### **B. Inspection Report**

The person(s) 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 should be inspected on an annual basis at a minimum. In addition, all facilities should be inspected after a significant precipitation event to ensure the facility is draining appropriately and to identify any damage that occurred as a result of the increased runoff.

### Inspection Scoring

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

- 0 = No deficiencies identified.
  - 1 = Monitor – Although maintenance may not be required at this time, a potential problem exists that will most likely need to be addressed in the future. This can include items like minor erosion, concrete cracks/spalling, or minor sediment accumulation. This item should be revisited at the next inspection.
  - 2 = Routine Maintenance Required – Some inspection items can be addressed through the routine maintenance program (See SOP in appendix A). 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 EPC on an annual basis. The verification and the inspection form(s) shall be reviewed and submitted by the property owner or property manager.

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

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

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

### A. Maintenance Categories

Stormwater 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. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with EPC; however, completed inspection and maintenance forms shall be submitted to EPC for each inspection and maintenance activity.

### Restoration Work

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

### B. Maintenance Personnel

Maintenance personnel must 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 contractor completing the required maintenance items. The form shall then be reviewed by the property owner or an authorized agent of the property owner and submitted on an annual basis to the **Southeast Metro Stormwater Authority.**

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



## **APPENDIX A**

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

This PRIVATE INFILTRATION 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) and BRADLEY POINT, LLC, A COLORADO CORPORATION (**Developer**). The above may occasionally be referred to herein singularly as “Party” and collectively as “Parties.”

Recitals

- A. 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
- B. WHEREAS, Developer desires to develop on the Property an industrial use to be known as, **Bradley Point Filing No. 1**; and
- C. 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 land use on Developer’s promise to construct adequate drainage, water runoff control facilities, and stormwater quality structural Best Management Practices (“BMPs”) for the subdivision; and
- D. 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
- E. 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
- F. 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

G. WHEREAS, developers in El Paso County have historically chosen water runoff infiltration 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

H. WHEREAS, Developer desires to construct for the land use two (2) Infiltration Water Quality Basins/stormwater quality BMP(s) (“infiltration basins/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 infiltration basins/BMP(s); and

I. WHEREAS, Developer desires to construct the infiltration basins/BMP(s) on property that will be platted as **Bradley Point Filing No.1**, and as set forth on **Exhibit B** attached hereto; and

J. WHEREAS, Developer shall be charged with the duties of constructing, operating, maintaining and repairing the infiltration basins/BMP(s) on the property described in **Exhibit B**; and

K. WHEREAS, it is the County’s experience that developers historically have not properly cleaned and otherwise not properly maintained and repaired these infiltration basins/BMPs, and that these infiltration basins/BMPs, when not so properly cleaned, maintained, and repaired, threaten the public health, safety and welfare; and

L. 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 infiltration 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 infiltration basins/BMP(s) serving this land use due to the Developer/Owner’s failure to meet its obligations to do the same; and

M. WHEREAS, the County conditions approval of this land use on the Developer’s promise to so construct the infiltration basins/BMP(s), and further conditions approval on the promise to reimburse the County in the event the burden falls upon the County to so clean, maintain and/or repair the infiltration basins/BMP(s) serving this land use; and

N. WHEREAS, the County could condition 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 promises contained herein; and

O. WHEREAS, the County, in order to secure performance of the promises contained herein, conditions approval of this land use upon the Developer’s grant herein of a perpetual Easement over the Property for the purpose of allowing the County to periodically access, inspect, and, when so necessary, to clean, maintain and/or repair the infiltration basins/BMP(s).

## 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 agrees 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 itself and its respective successors and assigns.
3. Construction: Developer shall construct on the Property described in **Exhibit B** attached hereto and incorporated herein by this reference, two (2) Infiltration Water Quality Basins/BMP(s) (“infiltration basins/BMP(s)”). Developer shall not commence construction of the infiltration basins/BMP(s) until the County has approved in writing the plans and specifications for the infiltration basins/BMP(s) and this Agreement has been signed by all Parties and returned to the PCD. Developer shall complete construction of the infiltration basins/BMP(s) in substantial compliance with the County-approved plans and specifications for the infiltration basins/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 infiltration basins/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 for this subdivision is recorded in the records of the El Paso County Clerk and Recorder. Rough grading of the infiltration basins/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 Developer agrees for itself and its successors and assigns, that it will regularly and routinely inspect, clean and maintain the infiltration basins/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 infiltration basins/BMP(s) shall be planted or allowed to grow on the infiltration basins/BMP(s).
5. Creation of Easement: Developer hereby grants the County a non-exclusive perpetual easement upon and across the Property described in **Exhibit B**. The purpose of the easement is to allow the County to access, inspect, clean, repair and maintain the infiltration

basins/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 infiltration basins/BMP(s).

6. County's Rights and Obligations: Any time the County determines, in the sole exercise of its discretion, that the infiltration basins/BMP(s) is not properly cleaned, maintained and/or otherwise kept in good repair, the County shall give reasonable notice to the Developer, that the infiltration basins/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 infiltration basins/BMP(s).

7. Reimbursement of County's Costs / Covenant Running With the Land: The Developer agrees and covenants, for itself and its successors and assigns, that it will reimburse the County for its costs and expenses incurred in the process of completing construction of, cleaning, maintaining, and/or repairing the infiltration basins/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 execution of this Agreement is condition of land use approval.

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 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: Developer agrees, for itself, its 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 infiltration basins/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, or their 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 infiltration basins/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 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, 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.

IN WITNESS WHEREOF, the Parties affix their signatures below.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 2023, by: **Bradley Point, LLC**

By: \_\_\_\_\_  
**Stephen J. Schnurr, Owner**

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 2023, by \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Witness my hand and official seal.

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

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

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 2023, by:

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

By: \_\_\_\_\_  
Craig Dossey, Executive Director  
Planning and Community Development  
Authorized signatory pursuant to LDC

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 2023, by \_\_\_\_\_, Executive Director of Planning and Community Development of El Paso County, Colorado.

Witness my hand and official seal.

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

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

Approved as to Content and Form:

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

EXHIBIT A





212 N Wahsatch Ave, Ste 305  
Colorado Springs, CO 80903  
Mail to: PO Box 1360  
Colorado Springs, CO 80901  
719.955.5485

**LEGAL DESCRIPTION  
BLANKET DRAINAGE AND ACCESS EASEMENT  
EXHIBIT "A"**

A PARCEL OF LAND IN THE SOUTHEAST QUARTER (SE1/4) OF SECTION 3, T15S, R66W OF THE 6TH P.M., EL PASO COUNTY, COLORADO MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF PARCEL 1, "ROCKY MOUNTAIN MATERIALS AND ASPHALT EXEMPTION PLAT MAP" AS RECORDED UNDER REC. NO. 211713132 IN THE RECORDS OF EL PASO COUNTY, COLORADO;  
THENCE N49°09'00"E ALONG THE SOUTHERLY LINE THEREOF 363.30 FEET TO THE SOUTHEAST CORNER OF SAID PARCEL;  
THENCE S36°35'31"E A DISTANCE OF 762.98 FEET;  
THENCE S36°32'54"E A DISTANCE OF 609.95 FEET;  
THENCE S48°15'16"W A DISTANCE OF 256.33 FEET TO A POINT ON AFORESAID EASTERLY RIGHT-OF-WAY OF HIGHWAY 85/87;  
THENCE ALONG SAID RIGHT-OF-WAY LINE THE FOLLOWING FOUR (4) COURSES;  
1) THENCE N40°49'47"W A DISTANCE OF 823.77 FEET;  
2) THENCE N89°57'24"W A DISTANCE OF 6.60 FEET;  
3) THENCE N40°47'37"W A DISTANCE OF 58.44 FEET;  
4) THENCE N40°50'47"W A DISTANCE OF 486.58 FEET TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS A CALCULATED AREA OF 424,094 SQUARE FEET (9.736 ACRES MORE OR LESS).

BASIS OF BEARINGS: A PORTION OF THE EASTERLY RIGHT-OF-WAY OF HIGHWAY 85/87 (EAST LAS VEGAS STREET) BEING MONUMENTED AT THE SOUTHEAST WITH A NO. 5 REBAR WITH AN ORANGE PLASTIC CAP STAMPED "PLS 25965" AND AT THE NORTHWEST WITH A NO. 5 REBAR WITH AN ORANGE PLASTIC CAP STAMPED "PLS 25965", AND BEARS N40°50'47"W, A DISTANCE OF 486.58 FEET. THE UNIT OF MEASUREMENTS IS THE U.S. SURVEY FOOT.

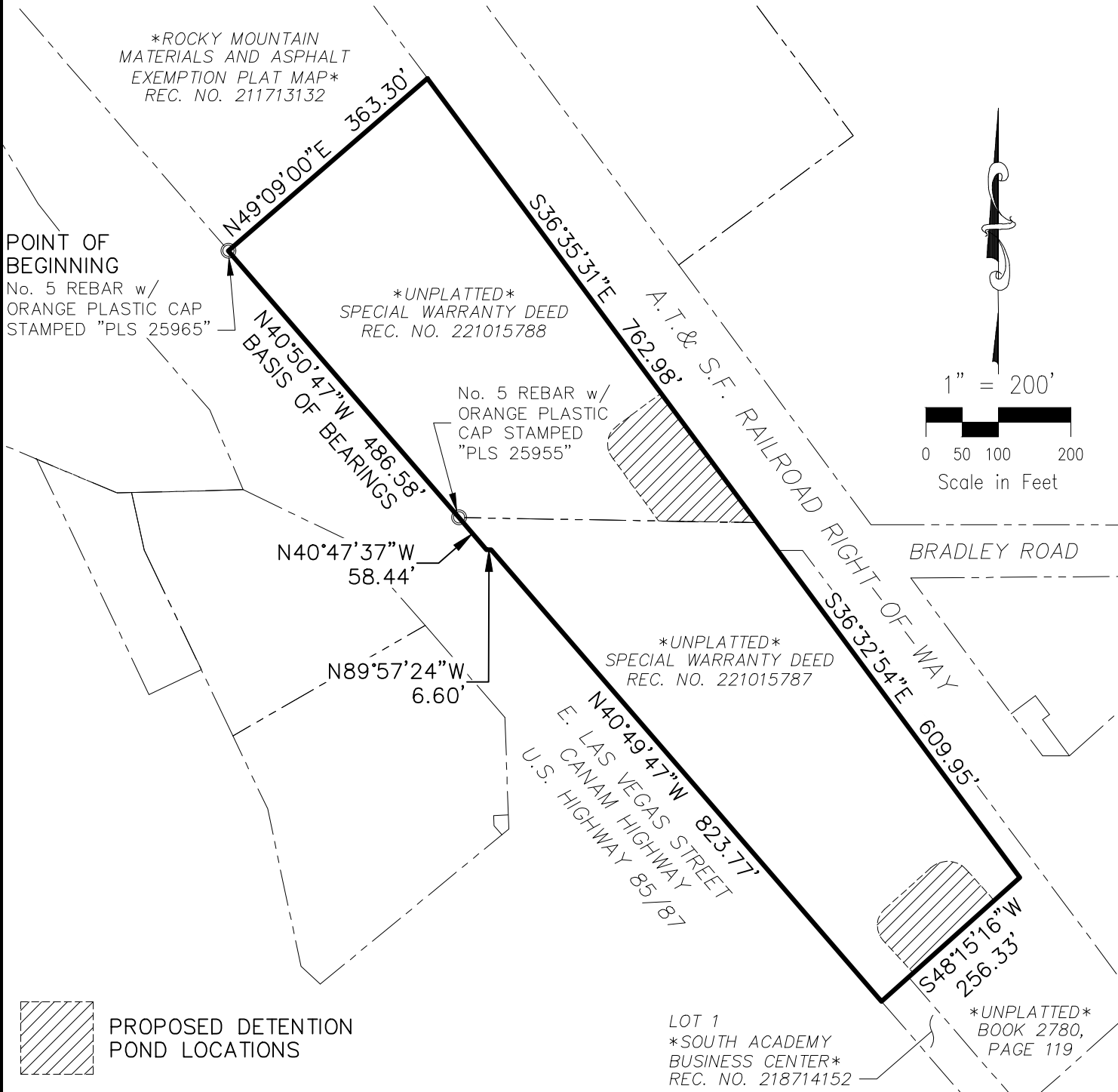
PREPARED BY:

---

VERNON P. TAYLOR, COLORADO P.L.S. NO. 25966                      DATE  
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC

**EXHIBIT B**

# BLANKET DRAINAGE AND ACCESS EASEMENT EXHIBIT "B"



**NOTES:**

THIS SKETCH IS INTENDED FOR CLARIFICATION OF THE LEGAL DESCRIPTION ONLY. THIS SKETCH IS NOT INTENDED TO REPRESENT A LAND SURVEY PLAT NOR AN IMPROVEMENT LOCATION SURVEY PLAT.

BLANKET EASEMENT  
EXHIBIT "B"  
JOB NO. 70-091  
DATE PREPARED: 04/20/2023  
DATE REVISED:



212 N. WAHSATCH AVE., STE 305  
COLORADO SPRINGS, CO 80903  
PHONE: 719.955.5485

## **APPENDIX B**

## Appendix B

### General Location and Description of Stormwater Management Facilities

#### A. General Site Description

Bradley Point Filing No. 1 14 is a 9.736 acre site consisting of a 4.886 acre and 4.850 acre lots that will function as materials storage yards. The site is located north of the Highway 85/87 and South Academy Boulevard intersection in El Paso County. The parcel is bound to the northeast by a railroad, northwest by a similar material storage site, and southeast by vacant land, and southwest by U.S. Highway 85/87. Drainage for Lot 1 is directed south and east to a proposed Infiltration Basin (Pond 1). Drainage for Lot 2 is directed southeast to a proposed Infiltration Basin (Pond 2).

Pond 1 is located within Lot 1 of the Bradley Point Filing No. 1 subdivision. Improvements to Pond 1 will be required per the development of Bradley Point Filing No. 1. Pond 2 is located within Lot 2 of the Bradley Point Filing No. 1 subdivision. Improvements to Pond 2 will be required per the development of Bradley Point Filing No. 1.

#### B. General Stormwater Management Description

Stormwater within Lot 1 is conveyed via overland and collected by swales which flow to a culvert which conveys runoff to the bottom of an infiltration basin located near the southeast corner of Lot 1. Stormwater within Lot 2 is conveyed via overland and collected by swales which flow to a culvert which conveys runoff to the bottom of an infiltration basin located near the southeast end of Lot 2. The ponds provide 500 year storage and water quality treatment for surface runoff. Flows from Lot 1 and Lot 2 that reach Pond 1 and Pond 2, respectively, are retained onsite and allowed to infiltrate into the soils. The facility is owned and maintained by the Bradley Point Filing No. 1.

#### C. Stormwater Facilities Site Plan

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

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

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

Lot 1 and Lot 2 of Bradley Point Filing No. 1- each contain a single infiltration pond which will collect the developed runoff onsite where they can slowly be released back to the soils and into the groundwater aquifer. The site utilizes Level I MDCIA – More impervious base material drains to a grass swale, then to the pond. The onsite native grass swales keep flows low and shallow, facilitating sedimentation. Approx. 0.441 acres (Lot 1) and 0.307 acres (Lot 2) of proposed land (pervious surface) within the project has been set aside for the facility.

### **Storage Facilities**

Pond 1 submitted for Bradley Point Filing No. 1- contains an infiltration pond which will store in excess of the 500 year volume of 0.792 ac-ft. The 100 year volume is estimated at 0.626 ac-feet. Pond 2 submitted for Bradley Point Filing No. 1- contains an infiltration pond which will store in excess of the 500 year volume of 0.731 ac-ft. The 100 year volume is estimated at 0.577 ac-feet.

### **Water Quality Facilities**

Pond 1 submitted for Bradley Point Filing No. 1- Full Spectrum Detention Facility contains an Infiltration Pond for water quality. The pond has been designed and shall be constructed as follows.

WQCV Required=	0.142 ac-ft (UD-BMP)
Q5 Volume Required=	0.153 ac-ft
Q100 Volume Required=	0.626 ac-ft
Q500 Volume Required=	0.792 ac-ft

Embankment Elevation	5784.00
Bottom of Pond Surface	5777.00

Pond 2 submitted for Bradley Point Filing No. 1- Full Spectrum Detention Facility contains an Infiltration Pond for water quality. The pond has been designed and shall be constructed as follows.

WQCV Required=	0.127 ac-ft (UD-BMP)
Q5 Volume Required=	0.141 ac-ft
Q100 Volume Required=	0.577 ac-ft
Q500 Volume Required=	0.731 ac-ft

Embankment Elevation	5778.00
Bottom of Pond Surface	5772.00

Runoff reaching the ponds will slowly infiltrate in the soils. Concrete forebays have been provided in the ponds which will dissipate energy and prevent local scour.

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

Proposed construction BMP's (silt fence, vehicle tracking, straw bale barriers, erosion control fabric and extended detention facility) will capture any sedimentation caused by construction before it can make it into the existing downstream tributaries. The water quality method meets the intent of treating impervious areas, based on the guidelines as set forth in the City of Colorado Springs/El Paso County Drainage Criteria Manual – Volume II.

## **APPENDIX C**

# Standard Operation Procedures for Inspection and Maintenance

## Infiltration Basins (IFBs)

April 2023



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## **IFB-1 BACKGROUND**

Infiltration Basins (IFBs) are uncommon types of Stormwater Management Facilities utilized within the Front Range of Colorado. An IFB consists of a forebay, a flat surfaced area of soil media (sometimes covered with grass or sod), and a flat soil media bed. The IFBs serve as permanent storage of the Water Quality Capture Volume (WQCV). During a storm, runoff enters the forebay where it acts as a buffer to slow the flow of runoff until the runoff enters the IFBs. The runoff within the IFB gradually infiltrates into the underlying in-situ material filling the void spaces of the material. IFBs provide for filtering and absorption of pollutants in the stormwater. IFBs prevent the outfall of on-site runoff to downstream facilities. The IFB's drain time for the water quality portion of the facility is typically 12 hours.

IFBs are an adaptation of a sand filter basin used for flood control, with the primary difference is the addition of forebays and no release or 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 surrounding basin. The IFB does not utilize an outlet structure, which extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal.

## **IFB-2 INSPECTING INFILTRATION BASINS (IFBs)**

### **IFB-2.1 Access and Easements**

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

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

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

### **IFB-2.3 Infiltration Basin (IFB) Features**

IFBs have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another. Therefore, it is critical that each feature of the IFB is properly inspected and maintained to ensure that the overall facility functions as it was intended. Below is a list and description of the most common features within an IFB and the corresponding maintenance inspection items that can be anticipated:

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

IFB Features	Sediment Removal	Mowing/ Weed Control	Trash & Debris Removal	Erosion	Overgrown Vegetation Removal	Removal/ Replacement	Structure Repair
Inflow Points	X		X	X			X
Forebay	X		X				X
Pond Bottom & Sides (In-Situ Material)	X	X	X	X	X	X	X
Filter Media	X		X		X	X	X
Embankment		X	X	X	X		

### IFB-2.3.1 Inflow Points

Inflow Points into the IFBs 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 IFB. In some instances, an inflow point could be a drainage channel or ditch that flows into the facility.

IFBs are designed to treat only the WQCV. The WQCV is a volume of water that runs off a site during an 80<sup>th</sup> percentile event. Any amount over the WQCV is allowed to go to a detention facility without water quality treatment. An energy dissipater is typically immediately downstream of the discharge point into the IFB to protect from erosion. In some cases, the storm sewer outfall can have a cut-off wall immediately below the structure to prevent undercutting of the outfall from erosion.

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

*a. Riprap Displaced* – Many times, because the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap apron appears to have settled, soil is present between the riprap, or the riprap has shifted, maintenance may be required to ensure future erosion is prevented.

*b. Erosion Present*– 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.

*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 IFB 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 into the basin. 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.

### IFB-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 IFB. 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 that are found with forebays are as follows:*

*a. Sediment/Debris Accumulation* – Because this feature of the IFB 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 IFB. Routine sediment removal from the forebay can **significantly** reduce the need for

dredging of the main portion of the IFB using specialized equipment (long reach excavators). Routine removal of sediment from the forebay can **substantially** decrease the long-term sediment removal costs of an IFB.

*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.

### IFB-2.3.3 Pond Bottom and Sides (In-Situ Material)

The bottom and sides stages are designed to store the smaller runoff events, assist in keeping the majority of the basin dry resulting in easier maintenance operations, and enhances the facilities pollutant removal capabilities. This area of the IFB may develop wetland vegetation. The in-situ filter media is the main pollutant removal component of the IFB. The filter media consists of 24-inches of in-situ material. The filter media removes pollutants through several different processes, including sedimentation, filtration, infiltration and microbial uptake. With proper maintenance of the forebay(s), the upper stage should not experience much sedimentation; however, bottom elevations should be monitored to ensure adequate volume.

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

Filtration is the main pollutant removal mechanism of IFBs. When the stormwater runoff migrates down through the filter media, many of the

particulate pollutants are physically strained out as they pass through the filter bed of in-situ material and are trapped on the surface or among the pores of the filter media.

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

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

*The typical maintenance items that are found with the pond bottom and sides (in-situ material) are as follows:*

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

The upper basin is the most visible part of the IFB, and therefore the aesthetics are important. Adequate and properly maintained vegetation can greatly increase the overall appearance and acceptance of the IFB by the public. In addition, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond. 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.

*b. Sediment/Pollutant Removal* - Although IFBs should not be utilized in areas where large concentrations of sediment and other pollutants will enter the IFB, it is inevitable that some sediment and other pollutants will enter the IFB. Most sediment will be accumulated in the forebay, however finer suspended particles will migrate to the filter media. Excessive amounts of sedimentation will result in a loss of storage volume. These sediments need to be removed to ensure proper infiltration rates of the stormwater runoff. It may be more difficult to determine if this area has accumulated sediment without conducting a field survey.

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

*d. Infiltration Rate Test* - An infiltration test may be necessary to ensure proper functioning of the in-situ filter media. The infiltration test can be conducted by filling the filter material with water. The sand filter needs to drain completely within 12-hours of the filling. If the drain time for the basin is longer than 12-hours, the filter is in need of maintenance.

*e. 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 and in increased dredging/maintenance of the IFB.

*f. Maintenance Access* – Most IFBs 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 and/or that access is available from adjacent properties.

#### IFB-2.3.4 Embankments

Some IFBs utilize irrigated turf grass embankments to store the WQCV.

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

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

*b. Erosion* – Inadequate vegetative cover may result in erosion of the embankments. Erosion that occurs on the embankments can cause clogging of the in-situ material.

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

*d. Mowing/woody growth control/weeds present* – The presence of plant material not part of the original landscaping, such as wetland

plants or other woody growth, can result in difficulty in performing maintenance activities. This plant material may indicate a clogging of the in-situ filter media and may require additional investigation.

#### IFB-2.3.5 Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the IFB. This category on the inspection form is for maintenance items that are commonly found in the IFB, 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 IFBs, even though they are required to be located in tracts with drainage easements. Property owners may place landscaping, trash, fencing, or other items within the easement area that may affect maintenance or the operation of the facility.

*b. Graffiti/Vandalism* – Damage to the IFB infrastructure can be caused by vandals. If criminal mischief is evident, the inspector should forward this information to the local Sheriff's Office.

*c. Public Hazards* – Public hazards include items such as vertical drops of greater than 4-feet, containers of unknown/suspicious substances, exposed metal/jagged concrete on structures. **If any hazard is found within the facility area that poses an immediate threat to public safety, contact the local Sheriff at 911 immediately!**

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

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

#### **IFB-2.4 Inspection Forms**

IFB 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 the El Paso County per the requirements of the Operations and Maintenance Manual. These inspection forms shall be kept indefinitely and made available to the El Paso County upon request.



## **IFB-3 MAINTAINING INFILTRATION BASINS (IFBS)**

### **IFB-3.1 Maintenance Personnel**

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

### **IFB-3.2 Equipment**

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

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

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

### **IFB-3.3 Safety**

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

### **IFB-3.4 Maintenance Forms**

The IFB Maintenance Form provides a record of each maintenance operation performed by maintenance contractors. The IFB 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 the El Paso County per the requirements of the Operations and Maintenance Manual. The IFB Maintenance form is located in Appendix E.

### **IFB-3.5 Maintenance Categories and Activities**

A typical IFB Maintenance Program will consist of three broad categories of work: Routine, Minor, and Major. Within each category of work, a variety of maintenance activities can be performed on an IFB. A maintenance activity can be specific to each feature within the IFB, 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 IFB.

A variety of maintenance activities are typical of IFBs. 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:

### **IFB-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. It also includes activities such as weed control. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with the El Paso County; however, completed inspection and maintenance forms shall be submitted to the EPC for each inspection and maintenance activity.

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

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

MAINTENANCE ACTIVITY	MINIMUM FREQUENCY	LOOK FOR:	MAINTENANCE ACTION
Mowing	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 2"-4"
Trash/Debris Removal	Twice annually	Trash & debris in IFB	Remove and dispose of trash and debris
Inflow Works Cleaning	As needed - after significant rain events – twice annually min.	Clogged inflow structure; ponding water	Remove and dispose of debris/trash/sediment to allow outlet to function properly
Weed control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist

IFB-3.6.1 Mowing

Occasional mowing is necessary to limit unwanted vegetation and to improve the overall appearance of the IFB. Native vegetation should be mowed to a height of 2-to-4 inches tall. Grass clippings should be collected and disposed of properly.

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

IFB-3.6.2 Trash/Debris Removal

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

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

IFB-3.6.3 Inflow Works Cleaning

Debris and other materials can clog the inflow work’s pipe or forebay. 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.

#### IFB-3.6.4 Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the IFB. 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 herbicide.

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

#### **IFB- 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 EPC and require completed inspection and maintenance forms to be submitted to EPC for each inspection and maintenance activity. In the event that the IFB needs to be dewatered, care should be given to ensure sediment, in-situ material and other pollutants are not discharged. All dewatering activities shall be coordinated with EPC.

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

MAINTENANCE ACTIVITY	MINIMUM FREQUENCY	LOOK FOR:	MAINTENANCE ACTION
<b>Sediment Removal</b>	As needed; typically every 1 –2 years	Sediment build-up; decrease in pond infiltration rate	Remove and dispose of sediment
<b>Erosion Repair</b>	As needed, based upon inspection	Rills/gullies forming on side slopes, forebay, 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

#### IFB-3.7.1 Sediment Removal

Sediment removal is necessary to maintain the original design volume of the IFB and to ensure proper function of the infrastructure. Regular sediment removal (minor) from the forebay, and inflow(s) 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 EPC Engineering Staff to ensure design volumes/grades are achieved.

The infiltration rate of the IFB needs to be checked in order to ensure proper functioning of the IFB. Generally, an IFB should drain completely within 12-hours of a storm event. If drain time exceed the 12-hour drain time, then maintenance of the in-situ material shall be required. At a minimum, the top 3-inches of in-situ material should be removed at each removal period. Additional amounts of in-situ material may need to be removed if deeper sections of the pond are contaminated. New material will need to be placed back into the IFB when the total amount of material removed reaches 9-inches. This may take multiple maintenance events to accomplish. It is critical that only material matches the classification of the existing in-situ material or meets the American Society for Testing and Materials (ASTM) C-33 standard be utilized in the replacement of the filter media.

**Existing In-Situ Material**

<b>US Standard Sieve Size (Number)</b>	<b>Total Percent Passing (%)</b>
9.5 mm (3/8 inch)	90-100
4.75 mm (No. 4)	80-100
2.36 mm (No. 10)	55-95
1.18 mm (No. 20)	25-90
600mm (No. 40)	10-80
300mm (No. 100)	2-60
150mm (No. 200)	1-40

**ASTM C-33 Sand Standard**

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

Other types of sand and soil material may lead to clogging of the SFB. The minor sediment removal activities can typically be addressed with shovels, rakes and smaller equipment. Major sediment removal activities will require larger and more specialized equipment. The major sediment removal activities will also require surveying with an engineer's level, and consultation with EPC Engineering Staff to ensure design volumes/grades are achieved.

Stormwater sediments removed from IFBs 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 and trickle channel may be necessary as frequently as every 1-2 years.

#### IFB-3.7.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper function of the IFB, minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to in-situ material, energy dissipaters, to rills and major gullies in the embankments and inflow points. 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 EPC engineering staff.

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

#### IFB-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 IFB. Tree roots can damage structures and invade pipes/channels thereby blocking flows. Also, trees growing in the upper and lower stages of the IFB 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 IFB or near structures (inflows, trickle channels, outlet works, emergency spillways, etc) should be removed. Any trees or woody vegetation in the IFB should be limited to the upper portions of the pond banks.

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

### IFB-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 EPC to ensure the proper maintenance is performed. This work requires that the engineering staff review the original design and construction drawings to assess the situation and assign the necessary maintenance. **A public improvements permit shall be required for all major maintenance activities.** This work may also require more specialized maintenance equipment, design/details, surveying, or assistance through private contractors and consultants. In the event that the basin needs to be dewatered, care should be given to ensure sediment, filter material and other pollutants are not discharged. Consultation with EPC is required prior to any dewatering activity.

**Table – IFB-4  
Summary of Major Maintenance Activities**

<b>MAINTENANCE ACTIVITY</b>	<b>MINIMUM FREQUENCY</b>	<b>LOOK FOR:</b>	<b>MAINTENANCE ACTION</b>
Major Sediment Removal	As needed – based upon scheduled inspections	Large quantities of sediment; reduced pond capacity or infiltration rate	Remove and dispose of sediment. Repair vegetation as needed
Major Erosion Repair	As needed – based upon scheduled inspections	Severe erosion including gullies, excessive soil displacement, areas of settlement, holes	Repair erosion – find cause of problem and address to avoid future erosion
Structural Repair	As needed – based upon scheduled inspections	Deterioration and/or damage to structural components – broken concrete, damaged pipes	Structural repair to restore the structure to its original design

#### IFB-3.8.1 Major Sediment Removal

In very rare cases, the in-situ material of the IFB may be contaminated so badly that the first 24-inches of the in-situ material may need to be removed. Major sediment removal consists of removal of large quantities of sediment or removal of sediment from vegetated areas. Care shall be given when removing large quantities of sediment and sediment deposited in vegetated areas. Large quantities of sediment need to be carefully removed, transported and disposed of. Vegetated areas need special care to ensure design volumes and grades are preserved.

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

### IFB-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.

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

### IFB-3.8.3 Structural Repair

An IFB includes a variety of structures that can deteriorate or be damaged during the course of 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 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 EPC Engineering Staff should take place prior to all structural repairs.

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

#### Reference:

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



# Standard Operation Procedures for Inspection and Maintenance

## Grass Buffers and Grass Swales (GB-GS)

April 2023

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## **GB-GS-1 BACKGROUND**

Grass Buffers and Grass Swales are common types of Stormwater Management Facilities utilized within the Front Range of Colorado. Grass Buffers and Grass Swales promote filtration, infiltration, and settling to reduce runoff volume.

Grass Buffers are uniformly graded and densely vegetated areas of turf grass. They are designed to accommodate sheet flow rather than concentrated or channelized flow. They are typically located adjacent to impervious areas such as parking lots or along roads. Grass Buffers are designed to evenly distribute runoff across the width of the buffer to achieve uniform sheet-flow conditions. A flow spreader may be incorporated for this purpose. In some cases, grass buffers may have underdrain systems.

Grass Swales are densely vegetated drainage ways with low-pitched side slopes that collect and convey runoff. Design of their longitudinal slope and cross section forces the flow to be slow and shallow, thereby facilitating sedimentation while limiting erosion. Berms or check dams may be installed perpendicular to the flow to decrease the slope and slow down the flow. Grass swales are used in open space and landscaped areas to collect and convey overland flows, and can be used as an alternative to curb and gutter (when approved by the County Engineer) to collect and convey street flows. Some grass swales are designed with underdrain systems.

### Channels

## **GB-GS-2 INSPECTING GRASS BUFFERS AND SWALES (GB-GS)**

### **GB-GS-2.1 Access and Easements**

Inspection and maintenance personnel may utilize the stormwater facility map located in Appendix G containing the locations of the access points and maintenance easements of the GB-GSs within this development.

### **GB-GS-2.2 Stormwater Management Facilities Locations**

Inspection and maintenance personnel may utilize the stormwater facility map located in Appendix G containing the locations of the GB-GSs within this development.

### **GB-GS-2.3 Grass Buffer - Grass Swale (GB-GS) Features**

GB-GSs are unique stormwater quality facilities, in that they are typically viewed as landscaping or ground cover, and are often overlooked as water quality treatment facilities. GB-GSs have a number of features designed to serve a particular function. It is important for maintenance personnel to understand the function of each of these features. Below is a list of the common features of a Grass Swale or Grass Buffer and the corresponding maintenance inspection items anticipated:

**Table GB-GS-1**  
**Typical Inspection & Maintenance Requirements Matrix**

GB-GS Features	Sediment Removal	Mowing/ Weed Control	Trash & Debris Removal	Erosion	Removal/ Replacement	Structure Repair
Swale Bottom	X	X	X	X		
Side Slope		X	X	X		
Buffer Strip	X	X	X	X		
Inflows	X	X	X	X	X	X
Underdrain System*					X	
Grade Control/ Level Spreader				X		X
Irrigation System					X	

**GB-GS-2.3.1 Grass Swale Bottom and Side Slopes; Grass Buffer Strips**

Grass Swales and Grass Buffers require general maintenance of the turf grass and repair of any rill or gully development. The bottom and side slopes of grass swales and the area of grass buffer strips should be maintained with dense vegetative cover, and should not be eroded or bare. Inspection over the first few years will help to determine if any problems are developing.

*The typical maintenance items required at the side slopes and bottoms of grass swales and within grass buffer areas are as follows:*

*a. Sediment Accumulation* – The purpose of the grass swale or buffer is to slow down flow and allow sedimentation to occur. To prevent a loss in performance of the swale or buffer, sediment that accumulates must be removed on a timely basis.

*b. Vegetation Sparse* – Grass Swales and Buffers rely on a healthy, dense cover of grass to decrease the flow velocities and promote sedimentation and infiltration. Grasses that are diseased, dying or otherwise damaged should be replaced. All bare areas should be reseeded or patched. Causes which contribute to the damaged grass cover, including lack of adequate irrigation, traces of pedestrian or vehicular traffic, uncontrolled weeds, excessive sedimentation accumulation, etc., should be identified and remedied.

*c. Erosion Present* – Lack of adequate vegetative cover or excessive flow velocities may result in rill or gully development, and erosion of the swale or buffer strip. Erosion will require maintenance to prevent further damage to the area and to prevent sediment transport.

*d. Standing Water/Boggy Areas* – Grass swales and buffers are generally intended to drain and be dry in between rain events. If areas

of standing water are present, the swale or buffer may need to be evaluated for proper grade to ensure drainage or the addition of underdrains. In some cases, where underdrains are used, the underdrains should be inspected to ensure that they are not clogged.

### GB-GS-2.3.2 Inflow Points

Inflow points are the points of stormwater discharge into the swale or buffer. Inflow points are typically pipe outfalls, other grass swales or buffers, or curb cuts from upstream impervious areas, such as parking lots. Some form of energy dissipation is typically provided immediately downstream of the inflow point into the grass swale or buffer. Energy dissipation devices may include riprap aprons, or flow spreader devices.

*The typical maintenance items required at inflow points are as follows:*

*a. Riprap Displaced/Rundown Damaged* – Often, because of, the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap rundown or apron appears to have settled, if soil is present between the riprap, or if the riprap has shifted, maintenance may be required to ensure future erosion is prevented.

*b. Erosion Present/Outfall Undercut* – In some situations, an energy dissipater may have not been provided, or may not have been sized, constructed, or maintained appropriately and erosion has occurred. Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility.

*c. Sediment Accumulation* – Because of the turbulence in the water created by the energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in performance, sediment that accumulates in this area must be removed on a timely basis.

### GB-GS-2.3.3 Underdrain System

Some grass swales and buffers that have a flatter slope or soils which do not allow adequate percolation or are in areas with a continuous base flow may have been installed with an underdrain system. Underdrains typically consist of a layer of geotextile fabric, gravel storage area and perforated PVC pipe. The geotextile fabric is utilized to prevent the filter material from entering the underdrain system. The gravel storage area allows for storage of treated stormwater runoff prior to the discharge of the runoff through the perforated PVC pipe.

*The typical maintenance activities required for the underdrain system are as follows:*

With proper maintenance of the grassed areas, there should be a minimum amount of maintenance required on the underdrain system. Generally, the only maintenance performed on the underdrain system is jet-vac cleaning in the event it becomes clogged.

#### GB-GS-2.3.4 Grade Control Level Spreader

Grass swales installed in areas with steep longitudinal slopes often necessitate the use of grade control checks or drop structures. Grade control structures are typically either concrete walls or rip rap structures that serve to provide a reinforced drop at specific locations in the channel, reducing the longitudinal slope between the control structures.

Level Spreaders are installed on the upstream of grass buffers to evenly distribute flows along the design length. Level spreaders may consist of slotted curbing, modular block porous pavement, level walls or other spreader devices.

*The typical maintenance activities required for grade control structures and level spreaders are as follows:*

*a. Erosion present* – Grade control structures and level spreaders are provided to reduce the potential for erosion of the grassed swale or buffer areas. Erosion within the vicinity of the control structure or level spreader indicates the structure is not functioning as intended and requires maintenance to prevent future erosion and damage. Or, review the original design if erosion becomes chronic.

*b. Structural damage* – Structural damage can occur at anytime along the life of the facility. Typically, structural damage occurs with the deterioration of concrete, including cracking, spalling or settling and the erosion and deterioration of the riprap structures. Level spreaders may settle unevenly creating low areas, which concentrate the flows. Partial or full replacement may be required depending on the extent of the damage.

#### GB-GS-2.3.5 Irrigation

Grass Buffers and Grass Swales depend on healthy, dense turf grass to function, and therefore require an irrigation system, to provide a consistent water supply. Typically, the condition of the grass cover will

provide evidence of the effectiveness and maintenance needs of the irrigation system.

*The typical maintenance activities required for irrigation systems are as follows:*

Irrigation systems will generally require routine periodic maintenance and adjustment to ensure proper amounts of water are being applied given the weather conditions, and that they are providing coverage to all areas of the grass to eliminate bare spots.

#### GB-GS-2.3.6 Miscellaneous

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

*a. Encroachment in Easement Area* – The El Paso County requires GB-GS be located in tracts or 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. Public Hazards* – Public hazards include items such as containers of unknown/suspicious substances, and exposed metal/jagged concrete on structures. If any unknown/suspicious hazard is found within the facility area that poses an immediate threat to public safety, call 911 immediately.

*c. Burrowing Animals/Pests* – Prairie dogs and other burrowing rodents may cause damage to the GB-GS features and negatively affect the vegetation within the GB-GS.

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

#### **GB-GS-2.4 Inspection Forms**

GB-GS 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 the El Paso County per the requirements of the Inspection and Maintenance Plan. These inspection forms shall be kept indefinitely and made available to the El Paso County upon request.

## **GB-GS-3 MAINTAINING GRASS BUFFERS & GRASS SWALES (GB-GS)**

### **GB-GS-3.1 Maintenance Personnel**

Maintenance personnel must be experienced to properly maintain GB-GSs. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

### **GB-GS-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 a GB-GS:

- 1.) Mowing Tractors
- 2.) Trimmers (extra string)
- 3.) Shovels
- 4.) Rakes
- 5.) All Surface Vehicle (ASVs)
- 6.) Engineers Level (laser)
- 7.) Erosion Control Blanket(s)
- 8.) Mulch
- 9.) Sod or Seed (See seed mix in the Rules and Regulations Regarding Stormwater (Quality) Discharge for Construction Activities, Std Det. SM, Seeding & Mulching)
- 10.) Illicit Discharge Cleanup Kits
- 11.) Trash Bags
- 12.) Jet-Vac Equipment
- 13.) 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.

### **GB-GS-3.3 Maintenance Forms**

The GB-GS Maintenance Form provides a record of each maintenance operation performed by maintenance contractors. The GB-GS 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 the El Paso County per the requirements of the Inspection and Maintenance Plan. The GB-GS Maintenance form is located in Appendix E.



**GB-GS-3.4 Maintenance Categories and Activities**

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

A variety of maintenance activities are typical of GB-GSs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of the GB-GS or underdrain system. Below is a description of each maintenance activity, the objectives, and frequency of actions.

**GB-GS-3.5 Routine Maintenance Activities**

The majority of this work consists of scheduled mowing, trash and debris pickups and landscape care for the GB-GS during the growing season. It also includes activities such as weed control. These activities normally will be performed numerous times during the year. These items do not require any prior approval by the El Paso County, however, completed inspection and maintenance forms shall be submitted to the El Paso County for each inspection and maintenance activity in accordance with the Inspection and Maintenance plan.

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

**Table GB-GS-2  
Summary of Routine Maintenance Activities**

<b>Maintenances Activity</b>	<b>Minimum Frequency</b>	<b>Indication Action is Needed:</b>	<b>Maintenance Action</b>
<b>Trash/Debris Removal</b>	Twice annual and before mowing	Trash and debris in GB-GS	Remove and properly dispose of trash and debris
<b>Mowing</b>	Routine – as necessary to maintain 2” – 4” grass height	Excessive grass height/aesthetics	2” – 4” grass height for turf grass; 4” to 6” for native grass
<b>Irrigation (Not Automatic)</b>	As needed to maintain healthy grass	Areas of insufficient or excess watering	Water as needed to maintain healthy grass; (follow watering regulations)
<b>Weed Control</b>	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/herbicide or hand pull; consult a local Weed Inspector
<b>Mosquito Treatment</b>	As needed, based upon inspections	Standing water/ mosquito habitat	Perform maintenance to eliminate standing water*; Treat w/EPA approved chemicals
<b>Level Spreader (Grass Buffer Only)</b>	As needed, based upon inspections	Evidence of uneven flow/localized erosion	Look for cause; repair, fill or revegetate areas of erosion
<b>Rodent Damage</b>	As needed, based upon inspections	Holes, small piles of dirt, raised burrows	Evaluate damage; contact Parks Dept. or Division of Wildlife for guidance

\*See Section GB-GS-2.3.1d for further discussion

#### GB-GS-3.5.1 Trash/Debris Removal

Trash and debris must be removed from the GB-GS area to allow for proper functioning and to improve aesthetics. This activity must be performed prior to mowing operations.

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

#### GB-GS-3.5.2 Mowing

Routine mowing of the turf grass embankments is necessary to maintain an appropriate grass height and to improve the overall appearance of the GB-GS. Turf grass should be mowed to a height of 2 to 4- inches (4 – 6- inches for native grass) and shall be bagged to prevent potential contamination of the filter media, especially if there is an underdrain system.

*Frequency – Routine – as necessary to maintain grass height.*

#### GB-GS-3.5.3 Irrigation

Irrigation systems should be maintained in proper working order to provide an adequate water supply to support the grass cover. When automatic irrigation systems are not available, alternate methods for providing a water supply during times of drought must be provided.

Automatic irrigation systems should be maintained routinely throughout the growing season to ensure that they are providing the appropriate amounts of water, and are providing complete coverage of the area. Sprinkler heads should be adjusted as necessary, and checked for broken or missing parts.

*Frequency - Routine as needed throughout the growing season, plus the following:*

SPRING: Start up the system and test for even coverage and correct timer settings.

SUMMER: Test for even coverage and correct timer settings.

FALL: Drain and winterize the system.

#### GB-GS-3.5.4 Weed Control

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

Consultation with a local Weed Inspector is highly recommended prior to the use of herbicide. Herbicides should be utilized sparingly and as a last resort. All herbicide applications should be in accordance with the manufacturer's recommendations.

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

#### GB-GS-3.5.5 Mosquito Treatment

GB-GS facilities are intended to drain, and should not have areas of standing water which creates mosquito habitat. Causes of the standing water or boggy conditions should be investigated and remediated as necessary to eliminate the standing water. Only EPA approved chemicals should be applied in accordance with the recommendations of the manufacturer. See Section GBGS-2.3.1d.

*Frequency – As needed based upon inspections.*

#### GB-GS-3.5.6 Level Spreader (Grass Buffer only)

Evidence of uneven flow and localized erosion downstream of the level spreader indicates the flow is not evenly distributed along the length of the spreader. Areas of erosion should be repaired, filled and revegetated. Causes for the erosion should be investigated and repaired.

*Frequency – As needed based upon inspections.*

#### GB-GS-3.5.7 Rodent Damage

Small holes, piles of dirt, and raised burrows are evidence of rodent damage. Damaged areas should be repaired and revegetated. Consultation with an animal control specialist or the Division of Wildlife may be required for persistent problems.

*Frequency – As needed based on inspections.*

### **GB-GS-3.6 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, hand tools, and small equipment. These items do not require approval by the El Paso County. Completed inspection and maintenance forms shall be submitted to the El Paso County for each inspection and maintenance activity. These minor maintenance activities are to be used for the grass swales, grass buffers, channels, and riprap berms onsite as applicable and deemed necessary by inspection. Maintenance activities for drainage facilities include mowing, trash/debris removal, outlet works

cleaning, & weed control. For additional detail on these activities, see table GB-GS-2 above.

**Table GB-GS-3  
Summary of Minor Maintenance Activities**

<b>Maintenances Activity</b>	<b>Minimum Frequency</b>	<b>Indication Action is Needed:</b>	<b>Maintenance Action</b>
<b>Sediment Removal</b>	As needed	Sediment build-up	Remove and properly dispose of sediment
<b>Erosion Repair</b>	As needed, based upon inspection	Rills and gullies forming on slopes and other areas	Repair eroded areas and revegetate; address cause
<b>Vegetation Removal</b>	As needed, based upon inspection	Trees, willows, shrubs impeding flow	Remove vegetation; restore correct grade and surface
<b>Revegetation</b>	As needed, based upon inspection	Areas without grass	Replace grass by sodding or seeding
<b>Level Spreader (Grass Buffer Only)</b>	As needed, based upon inspections	Evidence of uneven flow; erosion; or rills/gullies	Repair sections of level spreader and address cause
<b>Fertilization or Soil Amendment</b>	As needed, minimize fertilization	Grass with pale color; areas with poor grass growth not due to irrigation problems	Consult with turf specialist; Test soil
<b>Vehicle Tracks (Along Roadways)</b>	As needed, based upon inspections	Depressions from vehicle tracks; vegetation damage	Repair and fill depressions; sod or seed damaged areas

**GB-GS-3.6.1 Sediment Removal**

Sediment removal is necessary to ensure proper function of the grass swale or buffer. Care should be taken when removing sediment to prevent damage to the turf grass and surrounding areas. Excessive amounts of sediment are an indication of upstream erosion or lack of adequate BMPs during construction activities. Causes for contributions of excess sediment should be investigated and addressed.

*Frequency – As needed based upon inspections.*

**GB-GS-3.6.2 Erosion Repair**

The repair of eroded areas is necessary to ensure the proper functioning of the GB-GS or channel, to minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to vegetation and embankments, to rills and gullies in the embankments and inflow points. The repair of eroded areas may require the use of excavators, riprap, new poured-in-place concrete, and sod. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system, if present, does not occur. Major erosion in a GS-GB is

generally the result of excessive velocities caused by steep slopes. It may be necessary to make design improvements to the swale or buffer when erosion becomes a major maintenance item.

*Frequency – As necessary, based upon inspections.*

#### GB-GS-3.6.3 Vegetation Removal

Weeds, Shrubs, Willows and other unwanted vegetation that develops in the grass swale or buffer area may impede the flow and cause standing water or back flow problems. It is necessary to remove unwanted vegetation as soon as it appears. Remove the unwanted vegetation, and restore the correct grade. Revegetate with seed or sod. Supplement irrigation as needed until new vegetation is sufficiently established.

*Frequency – As necessary, based upon inspections.*

#### GB-GS -3.6.4 Revegetation

Bare areas should be repaired as soon as possible. Repair bare areas with appropriate grass seed or sod. Supplement irrigation as needed until new vegetation is sufficiently established. Causes of the problem, such as inadequate water supply or diseased grasses, should be investigated and resolved.

*Frequency – As necessary, based upon inspections.*

#### GB-GS-3.6.5 Level Spreader

Level Spreaders that are no longer level, or have developed damaged areas of cracking or spalling, allow flows to concentrate in these depressed areas instead of being distributed over the length of the structure. Also, build-up of grasses along the edge of the spreader may create an uneven flow distribution. Rills, gullies and other erosion that develop downstream of level spreaders should be repaired and reseeded or sodded. Causes of the erosion should be investigated and addressed.

*Frequency – As necessary, based upon inspections.*

#### GB-GS-3.6.6 Fertilization/Soil Amendment

Grass Buffers and Swales rely on healthy, dense turf in order to function properly. Grasses that appear to be diseased, dying or unhealthy may require amendments. Fertilizers should be applied in

the minimum amounts recommended by the manufacturer. Check for insect infestation also.

*Frequency – As necessary, based upon inspections.*

**GB-GS-3.6.7 Vehicle Tracks**

GB-GSs adjacent to roadway sections or drive aisles in parking lots may be damaged by vehicle tracks. Rutted areas should be filled in and revegetated as soon as possible. Frequent problems associated with vehicle traffic (such as around corners) may require a barrier or sign to avoid vehicular traffic within the grassed areas.

*Frequency – As necessary, based upon inspections.*

**GB-GB-3.7 Major Maintenance Activities**

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All of this work requires consultation with the El Paso County Water Staff to ensure the proper maintenance is performed. This work requires the El Paso County Stormwater and Engineering Staff review the original design and construction drawings to assess the situation before approval of the proposed maintenance. This work may also require more specialized maintenance equipment, design/details, submittal of plans to the El Paso County for review and approval, surveying, or assistance through private contractors and consultants.

**Table GB-GS-4  
Summary of Major Maintenance Activities**

<b>Maintenances Activity</b>	<b>Minimum Frequency</b>	<b>Look for:</b>	<b>Maintenance Action</b>
<b>Major Sediment/ Pollutant Removal</b>	As needed – based upon scheduled inspections	Large quantities of sediment	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 – level spreader, grade control structures, irrigation components, and ponding water	Structural repair to restore the structure to its original design
<b>GB-GS/Channel Rebuild</b>	As needed – due to complete failure of BMP	Removal of filter media and underdrain system	Contact El Paso County Water Staff

### GB-GS-3.7.1 Major Sediment/Pollutant Removal

Major sediment removal consists of removal of large quantities of pollutants/sediment /landscaping material. Stormwater sediments removed from GB-GS or channels do not meet the regulatory definition of “hazardous waste”. However, these sediments can be contaminated with a wide array of organic and inorganic pollutants and handling must be done with care to insure proper removal and disposal. Sediments should be transported by motor vehicle only after they are dewatered. All sediments must be taken to a licensed landfill for proper disposal. Should a spill occur during transportation, prompt and thorough cleanup and disposal is imperative. Vegetated areas need special care to ensure design volumes and grades are preserved or may need to be replaced due to the removal activities.

*Frequency – Non-routine – Repair as needed, based upon inspections.*

### GB-GS-3.7.2 Major Erosion Repair

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

*Frequency – Non-routine – Repair as needed, based upon inspections.*

### GB-GS-3.7.3 Structural Repair

A GB-GS generally includes level spreader and grade control structure that can deteriorate or be damaged during the service life of the facility. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with the El Paso County Water and Engineering Staff shall take place prior to all structural repairs.

*Frequency – Non-routine – Repair as needed, based upon inspections.*

### GB-GS-3.7.4 GB-GS Rebuild

In very rare cases, a GB-GS or channel may need to be rebuilt. Generally, the need for a complete rebuild is a result of improper construction, improper maintenance resulting in structural damage to the underdrain system, if present, or extensive contamination of the

GB-GS. Consultation with the El Paso County Water and Engineering Staff shall take place prior to any rebuild project.

*Frequency – Non-routine – As needed based upon inspections.*



## **APPENDIX D**

# INFILTRATION BASIN (IFB) INSPECTION FORM

Date: \_\_\_\_\_

Subdivision/Business Name: Bradley Point Filing No. 1

Inspector: \_\_\_\_\_

Subdivision/Business Address: North of HWY 85/87 & S. Academy Blvd. Intersection

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.) Pond Bottom and Sides (In-Situ Material)**

- Mowing/Woody Growth Control
- Sediment/Pollutant Removal
- In-Situ Replacement
- Infiltration Rate Test
- Erosion (banks and bottom)
- Maintenance Access

**4.) Embankments**

- Vegetation Sparse
- Erosion
- Trash/Debris
- Mowing/Woody Growth Control

**5.) 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 El Paso County upon request.

**GRASS BUFFER-GRASS SWALE (GB-GS)  
INSPECTION FORM**

Date: \_\_\_\_\_

Subdivision/Business Name: Bradley Point Filing No. 1

Inspector: \_\_\_\_\_

Subdivision/Business Address: North of HWY 85/87 & S. Academy Blvd. Intersection

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.) Grass Swale Bottom & Side Slopes**

- \_\_\_ Sediment /Debris Accumulation
- \_\_\_ Vegetation Cover
- \_\_\_ Erosion Present
- \_\_\_ Standing Water/Boggy Areas

**2.) Grass Buffer**

- \_\_\_ Sediment /Debris Accumulation
- \_\_\_ Vegetation Cover
- \_\_\_ Erosion Present
- \_\_\_ Standing Water/Boggy Areas

**3.) Inflow Points**

- \_\_\_ Rip Rap Displaced/Rundown or Pipe Damage
- \_\_\_ Erosion Present/Outfall Undercut
- \_\_\_ Sediment Accumulation

**4.) Underdrain System**

- \_\_\_ Standing water/Not draining
- \_\_\_ Evidence of clogged system

**5.) Grade Control**

- \_\_\_ Erosion Present
- \_\_\_ Structural Damage

**6.) Grade Control**

- \_\_\_ Erosion Present
- \_\_\_ Structural Damage
- \_\_\_ Unlevel/Uneven Distribution of flow

**7.) Irrigation**

- \_\_\_ General Grass Condition
- \_\_\_ Bare Spots
- \_\_\_ Broken Sprinkler Heads

**8.) Miscellaneous**

- \_\_\_ Encroachment in Easement Area
- \_\_\_ 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 El Paso County upon request.

## **APPENDIX E**

**INFILTRATION BASIN (IFB)  
MAINTENANCE FORM**

Subdivision/Business Name: Bradley Point Filing No. 1  
Subdivision/Business Address: North of HWY 85/87 & Academy Blvd.  
intersection

Completion Date: \_\_\_\_\_  
Contact Name: \_\_\_\_\_

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

**MAINTENANCE ACTIVITIES PERFORMED**

**ROUTINE WORK**

- \_\_\_ MOWING
- \_\_\_ TRASH/DEBRIS REMOVAL
- \_\_\_ INFLOW WORKS CLEANING
- \_\_\_ WEED CONTROL (HERBICIDE APPLICATION)

**RESTORATION WORK**

- \_\_\_ SEDIMENT REMOVAL
  - \_\_\_ INFLOW POINT
  - \_\_\_ FOREBAY
- \_\_\_ EROSION REPAIR
  - \_\_\_ INFLOW POINT
  - \_\_\_ FOREBAY
- \_\_\_ VEGETATION REMOVAL
  - \_\_\_ INFLOW(S)
  - \_\_\_ UPPER STAGE
  - \_\_\_ BOTTOM AND SIDE STAGES

**REHABILITATION WORK**

- \_\_\_ SEDIMENT REMOVAL (DREDGING)
  - \_\_\_ BOTTOM STAGE
  - \_\_\_ UPPER STAGE
- \_\_\_ EROSION REPAIR
  - \_\_\_ UPPER STAGE
  - \_\_\_ BOTTOM AND SIDE STAGES
- \_\_\_ STRUCTURAL REPAIR
  - \_\_\_ INFLOW
  - \_\_\_ FOREBAY

OTHER \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ESTIMATED TOTAL MANHOURS: \_\_\_\_\_

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

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

**GRASS BUFFER-GRASS SWALE (GB-GS)  
MAINTENANCE FORM**

Subdivision/Business Name: Bradley Point Filing No. 1  
Subdivision/Business Address: North of HWY 85/87 & Academy Blvd.  
intersection

Completion Date: \_\_\_\_\_  
Contact Name: \_\_\_\_\_

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

**MAINTENANCE ACTIVITIES PERFORMED**

**ROUTINE WORK**

- \_\_\_ MOWING
- \_\_\_ TRASH/DEBRIS REMOVAL
- \_\_\_ INFLOW WORKS CLEANING
- \_\_\_ WEED CONTROL (HERBICIDE APPLICATION)

**RESTORATION WORK**

- \_\_\_ SEDIMENT REMOVAL
  - \_\_\_ INFLOW POINT
  - \_\_\_ SWALE BOTTOM
  - \_\_\_ SIDE SLOPE
  - \_\_\_ BUFFER STRIP
  
- \_\_\_ EROSION REPAIR
  - \_\_\_ INFLOW POINT
  - \_\_\_ SWALE BOTTOM
  - \_\_\_ SIDE SLOPE
  - \_\_\_ BUFFER STRIP
  - \_\_\_ GRADE CONTROL/LEVEL SPREADER
  
- \_\_\_ REVEGETATION
  - \_\_\_ SWALE BOTTOM
  - \_\_\_ SIDE SLOPE
  - \_\_\_ BUFFER STRIP

**REHABILITATION WORK**

- \_\_\_ SEDIMENT REMOVAL (DREDGING)
  - \_\_\_ SWALE BOTTOM
  - \_\_\_ INFLOW POINT
  
- \_\_\_ EROSION REPAIR
  - \_\_\_ INFLOW POINT
  - \_\_\_ SWALE BOTTOM
  - \_\_\_ SIDE SLOPE
  - \_\_\_ BUFFER STRIP
  
- \_\_\_ STRUCTURAL REPAIR
  - \_\_\_ INFLOW
  - \_\_\_ UNDERDRAIN
  - \_\_\_ LEVEL SPREADER

OTHER \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ESTIMATED TOTAL MANHOURS: \_\_\_\_\_

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

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

## **APPENDIX F**

Annual Inspection and Maintenance Reporting Form  
for  
Stormwater Facilities

*(This form to be submitted to EPC prior to May 31 of each year)*

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

**To: El Paso County Department of Public Works  
Attn: Stormwater Facility Operations and Maintenance Program  
2880 International Circle, Suite 7437 South Fairplay Street  
Colorado Springs, CO 80922**

**Re: Certification of Inspection and Maintenance; Submittal of forms**

Property/Subdivision Name: \_\_Bradley Point Filing No. 1\_\_\_\_\_

Property Address: \_\_North of HWY 85/87 & S. Academy Blvd. intersection\_\_\_\_\_

Contact Name: \_\_\_\_\_ Stephen J. Schnurr \_\_\_\_\_

I verify that the required stormwater facility inspections and required maintenance have been completed in accordance with the Stormwater Facilities Maintenance Agreement and the Operations and Maintenance Manual associated with the above referenced property.

The required Stormwater Facility Inspection and Maintenance forms are hereby provided.

\_\_\_\_\_  
Name of Party Responsible for Inspection  
& Maintenance

\_\_\_\_\_  
Property Owner

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Signature



## **APPENDIX G**

**OPERATION AND MAINTENANCE SITE PLANS  
INFILTRATION BASIN (IFB)  
CHECKLIST FOR REQUIRED ITEMS**

**PLAN AND PROFILE SHEET**

Plan view shall include:

- Location and labels for all major features of IFB (inflow structure(s), forebay, access road, maintenance access ramps, embankment, etc.)
- Contours
- Other utilities in vicinity of IFB
- Cross-reference to IFB Operation and Maintenance Details sheet
- Linework for right-of-way lines, lot lines, easements, and tracts

Profile view shall include:

- Location and labels for all major features of IFB (inflow structure(s), forebay, access road, maintenance access ramps, embankment, etc.)
- Invert elevations at major features of IFB (inflow structure(s), forebay(s))
- Water quality water surface elevation
- Water surface elevation of all applicable storm events
- Label for upper and bottom stages for IFB

**DETAIL SHEET**

Detail sheet shall include:

- Volume provided by the IFB forebay, including the WQCV
- WQCV drain time
- Seed mix
- Total mow area including approximate mow boundaries on each side of IFB
- Duplicate the following tables from the "Standard Operation Procedure for Infiltration Basin Inspection and Maintenance" document:
  - o Inspection and Maintenance Requirements at Specific IFB Features
  - o Summary of Routine Maintenance Activities for an IFB
  - o Summary of Minor Maintenance Activities for an IFB
  - o Summary of Major Maintenance Activities for an IFB
- Water quality inflow works detail
- Water quality plate detail
- Maintenance access road detail
- Forebay edge detail (or cross section) which includes maximum allowed sediment depth in forebay
- Forebay release structure detail

**OPERATION AND MAINTENANCE SITE PLANS  
GRASS BUFFERS/GRASS SWALES (GB/GS)  
CHECKLIST FOR REQUIRED ITEMS**

**PLAN SHEET**

Plan view shall include:

- Location of grass swale(s) and/or buffer(s)
- Contours
- Linework for right-of-way lines, lot lines, easements, and tracts
- Labels for streets adjacent to grass swale(s)/buffer(s)
- Linework for all storm sewer structures
- Cross-reference to GB/GS Operation and Maintenance Details sheet

**DETAIL SHEET**

Detail sheet shall include:

- Duplicate the following tables from the "Standard Operation Procedure for Grass Buffers and Grass Swales Inspection and Maintenance" document:
  - Typical Inspection and Maintenance Requirements Matrix
  - Summary of Routine Maintenance Activities
  - Summary of Minor Maintenance Activities
  - Summary of Major Maintenance Activities
- Typical grass swale and/or buffer section including typical horizontal and vertical dimensions, side slopes, subgrade material, and underdrain (if applicable)
- Underdrain details (if applicable) including trench dimensions, perforated PVC dimensions, and trench fill material

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

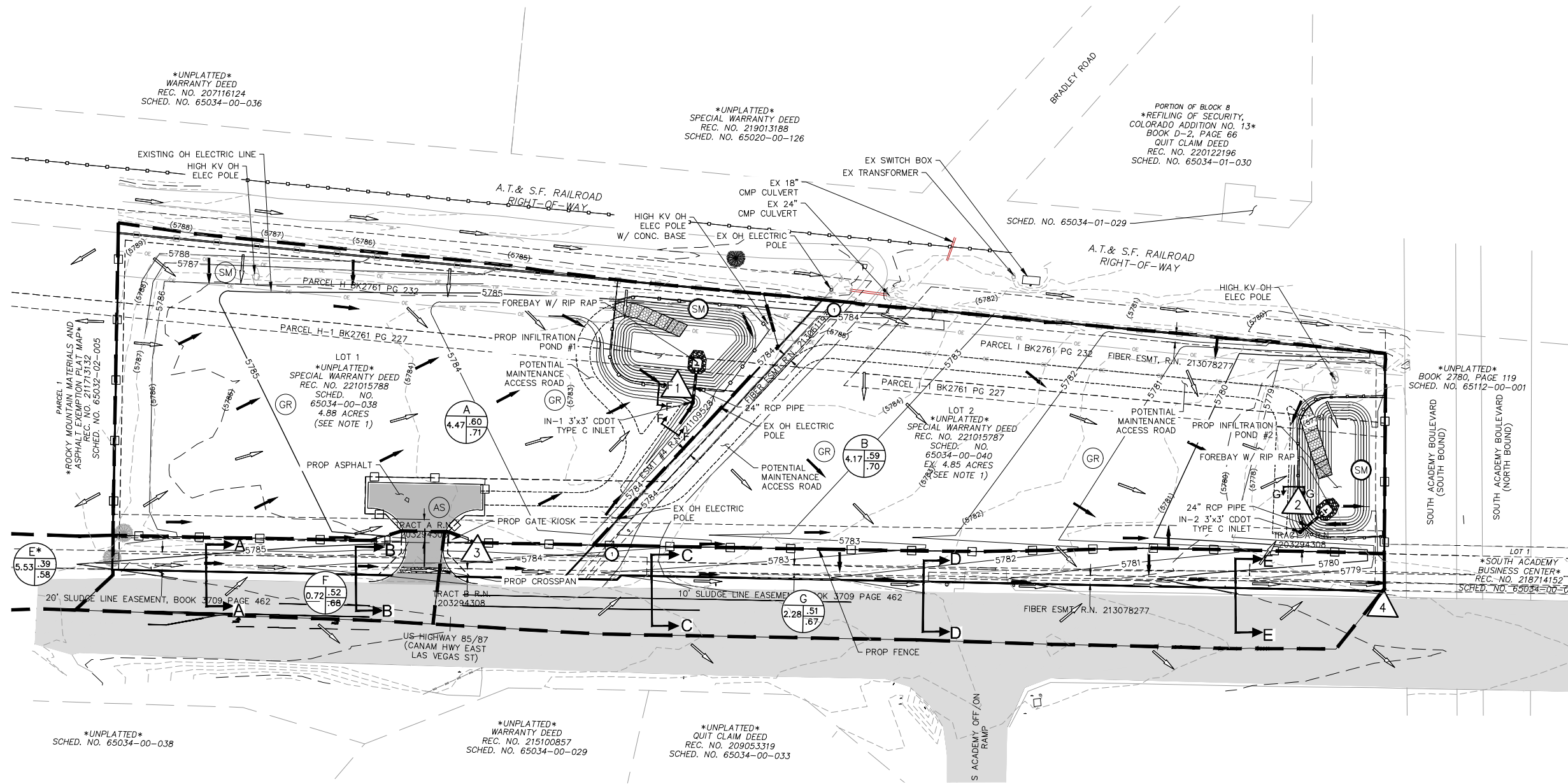
Stormwater facilities map shall include:

- Labels for all streets (includes linework for edge of street and street name)
- Linework for right-of-way lines, lot lines, and tracts
- Linework and labels for all major drainageways
- 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)

## **APPENDIX H**

# BRADLEY POINT FILING NO. 1 - STORMWATER FACILITIES MAP

AP NO. 65034-00-038 AND AP NO. 65034-00-040 ON HIGHWAY 85/87 (EAST LAS VEGAS STREET)  
IN SECTION 3, T15S R66W, 6th P.M., EL PASO COUNTY, COLORADO



### LEGEND

BASIN DESIGNATION: 661L (0.07, 90, 95) C5, C100

ACRES: 0.07, 90, 95

PIPE RUN REFERENCE LABEL: 4

SURFACE DESIGN POINT: 5

BASIN BOUNDARY: Dashed line

100 YEAR FLOOD BOUNDARY: Long dashed line

PROP MAJ CONT: Solid line with '7070'

PROP MIN CONT: Dashed line with '7072'

EXIST MAJ CONT: Solid line with '(7070)'

EXIST MIN CONT: Dashed line with '(7072)'

EX OR EXIST: Solid line

FUT: Dashed line

PROP: Dotted line

ADJ. PROPERTY BOUNDARY: Long dashed line

OE: Solid line with 'OE'

PROPOSED STORM SEWER PIPE: Solid line with 'S'

PROP CONCRET FENCE: Solid line with 'F'

EMERGENCY OVERFLOW DIRECTION: Arrow with 'E'

PROPOSED RIPRAP: Stippled area

MAINTENANCE/ACCESS ROAD ABOVE EURV: Stippled area

MAINTENANCE/ACCESS ROAD BELOW EURV: Stippled area

EXISTING FLOW DIRECTION ARROW: Arrow

PROPOSED FLOW DIRECTION ARROW: Arrow with 'P'

ACCESS TO BE REMOVED AND NOT TO BE USED DURING CONSTRUCTION: Circle with 'X'

GR: Circle with 'GR'

SM: Circle with 'SM'

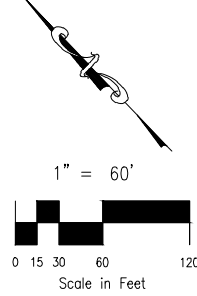
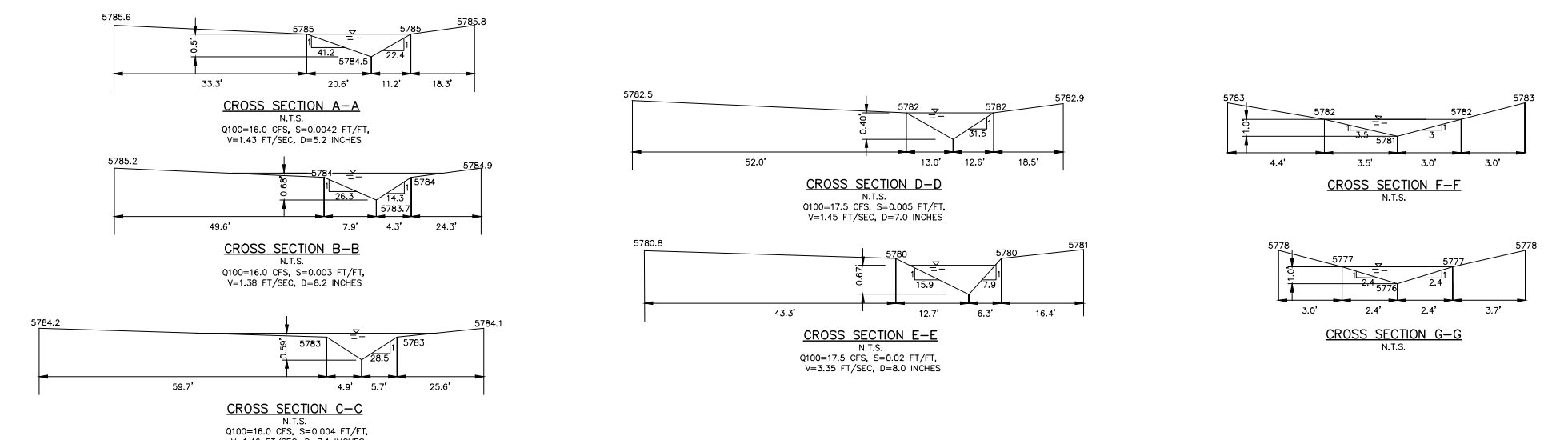
AS: Circle with 'AS'

### BASIN SUMMARY

BASIN	AREA (ACRES)	Q <sub>5</sub>	Q <sub>100</sub>
A	4.47	9.9	19.7
B	4.17	9.0	18.0
E	5.53	6.5	16.2
F	0.72	1.4	3.0
G	2.28	4.0	8.8

### DESIGN POINT SUMMARY

DESIGN POINT	Q <sub>5</sub>	Q <sub>100</sub>	BASIN	STRUCTURE
1	9.9	19.7	A	PROPOSED INLET 1
2	9.0	18.0	B	PROPOSED INLET 2
3	6.6	16.0	E, F	ROADSIDE DITCH
4	7.4	17.5	G, DP 3	ROADSIDE DITCH



- ### NOTES:
1. PARCELS ARE UNDER THE SAME OWNERSHIP
  2. \* REFER TO OFFSITE BASIN E IN EXISTING CONDITIONS
  3. FENCES AND SIGNAGE ADDED TO PREVENT ON-SITE, STORED MATERIALS FROM ENTERING THE PONDS.
  4. EROSION CONTROL BLANKET SHALL BE USED ON SLOPES GREATER THAN 4:1.

BRADLEY POINT FILING NO. 1  
PROPOSED DRAINAGE MAP  
DATE SUBMITTED: 04/20/23 SHEET 1 OF 1

212 N. WAHSATCH AVE., STE 305  
COLORADO SPRINGS, CO 80903  
PHONE: 719.955.5485