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US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON, FORT STEWART/HUNTER ARMY AIRFIELD
DIRECTORATE OF PUBLIC WORKS
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FORT STEWART, GEORGIA 31314-5048

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Memorandum for Contractors

Subject: The Directorate of Public Works (DPW) Policy Letter #10 – Dry Detention Basins
(Revised 30 NOV 2016)

1. References.

- A. Federal Clean Water Act (CWA), as amended (33 U.S.C.1251 et seq.), and Clean Water Act stormwater regulations 40 CFR 122.26.
- B. Executive Orders #13693 Planning for the Federal Sustainability in the Next Decade – 2015.
- C. Policy Memo 19 JAN 10, Office of the Under Secretary of Defense, DoD Implementation of Stormwater Requirements under Section 438 of the Energy Independence and Security Act.
- D. Georgia Water Quality Control Act, as amended, O.C.G.A. §12-5-20 et seq., and the Rules for Water Quality Control, Chapter 391-3-6, promulgated pursuant thereto, as amended.
- E. Erosion & Sedimentation Control Act, as amended, O.C.G.A. §12-7-1 et seq., and the Rules for Erosion & Sedimentation, Chapter 391-3-7, promulgated pursuant thereto, as amended.

- 2. **Purpose.** This policy replaces the former Policy Letter #10 and reestablishes the Directorate of Public Works policy concerning erosion and sedimentation controls, standards, and specifications for dry detention basins and stormwater controls for flooding.
- 3. **Applicability.** This policy applies to all contractors and government employees at Fort Stewart and Hunter Army Airfield (FS/HAAF).
- 4. **Responsibilities.** The following are the minimum standards for contractors to use to ensure uniformity of the use of dry detention basins throughout the Installation.
 - A. FS/HAAF must comply with the State of Georgia National Pollutant Discharge Elimination Systems Permitting; reference the DPW Policy Letter #11, FS/HAAF Construction Site Runoff Control, and FS/HAAF Post-Construction New-Redevelopment requirements which can be found with other Stormwater Management documents at the following web link:
<http://www.stewart.army.mil/info/?id=515>.

Therefore, overall stormwater designs must focus on maintaining or restoring the hydrologic performance of the watershed in its pre-development condition. Traditional, centralized stormwater management connects impervious surfaces to efficiently route stormwater to regional or site specific detention facilities to mitigate peak flow. Although these facilities may be successful in reducing the peak flow rate to the pre-development level immediately downstream of these facilities they serve, this approach may become ineffective in addressing the water quality of surface runoff and reducing downstream flooding since a greater volume of stormwater still runs off from these developed areas below the peak flow rate.

As noted above, centralized stormwater practices must now be replaced with Green Infrastructure and Low Impact Development (GI/LID) stormwater control practices. The GI/LID approach focuses on disconnecting impervious surfaces, and intercepts and treats surface runoff at the source. GI/LID stormwater control practices utilize Best Management Practices (BMPs), such as bio-retention, rain gardens, vegetative enhanced swales, and other infiltration practices, which increase groundwater recharge and improves surface water quality along with detention and extended detention basins (EDBs), which protect stream channels and reduces downstream flooding. The objective of the GI/LID method is to reduce the volume of stormwater required to be detained and effectively improve water quality via the treatment-train GI/LID BMPs.



Dry Detention Basins:

A dry detention basin is a surface storage basin or facility designed to provide water quality control through detention of stormwater runoff.



Extended Detention Basins:

An (EDB) is a basin designed to detain stormwater for many hours after stormwater runoff ends. This BMP is similar to a detention basin used for flood control, except EDBs use a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. The EDBs drain time for the water quality volume (WQ_v) is recommended to remove a significant portion of total suspended solids (TSS).

- B. As referenced within the Georgia Stormwater Management Manual and Coastal Stormwater Supplement (GASWMM/CSS), water quantity management practices can only be used to manage the post-construction stormwater runoff rates and volumes generated by larger, less frequent rainfall events (e.g. 1-year, 24-hour event, and 25-year, 24-hour event). They provide little, if any, stormwater runoff reduction or stormwater quality protection (Storm Water Management (SWM) Criteria #1 & #2, respectively). Consequently, it is recommended they be used in conjunction with GI/LID practices and general application stormwater management practices to completely satisfy the aquatic resource protection (SWM Criteria #3), overbank flood protection (SWM Criteria #4), and extreme flood protection (SWM Criteria #5) criteria presented in the GASWMM/CSS. Two (2) of the water quality management practices that may be used in coastal Georgia with GI/LID treatment-trains include:

- Dry Detention Basins
- Extended Detention Basins

C. General Description

Dry detention or EDBs are surface facilities intended to provide for the temporary storage of stormwater runoff to reduce downstream water quality impacts. These facilities temporarily detain stormwater runoff, releasing the flow over a period of time. They are designed to completely drain following a storm event and are normally dry between rain events.

Dry detention basins are intended to provide overbank flood protection (peak flow reduction of the 25-year storm) and can be designed to control the extreme flood (100-year) storm event.

Dry EDBs provide downstream channel protection through extended detention of the channel protection volume, and can also provide 25-year and 100-year control.

Both dry detention and EDBs provide limited pollutant removal benefits and are not intended for water quality treatment. Detention-only facilities must be utilized with a treatment-train approach with other GI/LID structural control BMPs which provide treatment of the WQv requirement. Compatible multi-objective use of dry detention facilities is strongly encouraged.

D. Design Criteria and Specifications

Dry detention and EDBs should be incorporated into the overall stormwater design for development and redevelopment projects as follows:

1) Location

Dry detention and EDBs are to be located downstream of other GI/LID structural control BMPs which are typically used in combination with detention controls for treatment of the WQv. The detention facilities are located downstream from the water quality controls either on-site or combined into a regional or neighborhood facility. See Section 3.1 GASWMM/CSS and the United States Environmental Protection Agency Technical Guidance for Implementation of Section 438 for more information on the use of multiple structural controls such as GI/LID in a treatment-train.

- The maximum contributing drainage area to be served by a single dry detention or EDB is 75 acres.
- EDBs are well suited for watersheds with a least five impervious acres up to approximately one square mile of watershed. Smaller watersheds can result in an orifice size prone to clogging. Larger watersheds and watersheds with base flows can complicate the design and reduce the level of treatment provided. EDBs are also well suited where flood detention is incorporated into the same basin. The depth of the seasonal high groundwater table should be investigated. Groundwater depth should be one (1) or more feet below the bottom of the basin in order to keep this area dry and maintainable.
- Always maximize the distance between the inlet and outlet. It is best to have a basin length (measured along the flow path from inlet to outlet) to width ratio of at least 2:1.

A longer flow path will minimize short circuiting and improve reduction of TSS. To achieve this ratio, it may be necessary to modify the inlet and outlet points through the use of pipes or swales.

2) General Design

- Dry detention basins are sized to temporarily store the volume of runoff required for a minimum of 24 hours and to provide overbank flood protection (i.e. reduce the post-development peak flow of the 25-year storm event to the pre-development rate), and control the 100-year storm.

EDBs are size to provide extended detention of the channel protection volume for a minimum of 72 hours and can also provide additional storage volume for normal detention (peak flow reduction) of the 25-year and 100-year storms.

Routing calculations must be used to demonstrate that the storage volume is adequate. Hydraulic considerations are needed to ensure the basin is sized to store the entire (or remaining volume after installation of GI/LID BMPs) WQ_v (removal of TSS by 80%) and the outlet structure must be sized as to provide desired hydraulic detention time of 24 hours as a minimum for the 1-year, 24-hour storm.

- Storage volume greater than 100 acre-feet are subject to the requirements of the Georgia Safe Dams Act (see Appendix H of the GASWMM) unless the facility is excavated to this depth.
- Vegetated embankments shall have side slopes no steeper than 3:1 or 4:1 (horizontal to vertical). The basin side slopes should be stable and gentle to facilitate maintenance and access. Slopes that are flatter should be utilized to allow for conventional maintenance equipment, and for improved safety and aesthetics. Riprap protected embankments shall be no steeper the 3:1.
- The maximum depth of the basin should not exceed four (4) feet. The final grade of the basin floor shall be no deeper than one (1) foot above the seasonal high groundwater table.
- Areas above the normal high water elevations of the detention facility should be sloped towards the basin to allow drainage. Careful finish grading is required to avoid creation of upland surface depressions that may retain runoff. A low flow or pilot channel across the facility bottom from the inlet to the outlet (often constructed with geotextile underlayment and riprap) is recommended to convey low flows and prevent standing water conditions.

- Forebay Designs for EDBs: The forebay provides an opportunity for larger particles to settle out in an area that can be easily maintained. The length of the flow path through the forebay should be maximized and the slope minimized to encourage settling.
 - a) The appropriate size of the forebay may be as much a function of the level of development in the tributary area as it is a percentage of the WQ_v .
 - b) When portions of the watershed remain disturbed for an extended period of time, the forebay size will need to be increased due to the potentially high sediment load. The forebay outlet should be sized to release 2% of the un-detained peak 100-year discharge.
 - c) A soil riprap berm with 3:1 side slopes (or flatter) and a pipe outlet or concrete wall with a notch outlet should be constructed between the forebay and the main EDB.
 - d) Micropool EDBs are a variation of the standard wet extended detention basin that have only a small permanent pool (i.e. micropool). The micropool provides enough storage for approximately 10% of the stormwater runoff volume generated by the target runoff reduction rainfall event (e.g. 85th percentile rainfall event). The remainder of the stormwater runoff volume generated by the target runoff reduction rainfall event is managed in an extended detention zone provided immediately above the micropool and released over an extended 24-hour period.
- The following areas will be sodded: (1) Bottom of the detention basin, (2) Inside side slopes of the detention basin, and (3) Outward, 10 feet from the edge of the detention basin. All other disturbed areas will be seeded with temporary and permanent grasses (contact the Natural Resources Conservation Service for appropriate seasonal seed mixes. Utilization of erosion control blankets and permanent and/or temporary, as required, for prevention of erosion rills is required.
- Adequate maintenance access must be provided for all detention basins.
- All detention basins within 1,000 feet of any housing and/or school facility shall be secured with a four (4) foot chain link style fence.
- During construction of any project on FS/HAAF, the following erosion and sedimentation BMPs are not permitted:
 - a. Man made haybales
 - b. The use of slotted board dams as a retrofit on less than 30 acres is not permitted. Instead, a perforated half-round pipe with a stone filter ring must be utilized.

3) Inlet and Outlet Structures

- There are a wide variety of outlet structure types, the most common of which are orifices, perforated risers, pipes/culverts, shape-crested weirs, broad-crested weirs, V-notch weirs, proportional weirs, and combination outlets. Reference Section 2.3 of the GASWMM/CSS for more information on the design criteria for outfall structures.
- Each of the above outlet types has a different design purpose and application:
 - a) Water quality and channel protection flows are normally handled with smaller, more protected outlet structures such as reverse slope pipes, hooded orifices, orifices located within screened pipes or risers, perforated plates or risers, and V-notch weirs.
 - b) Larger flows, such as overbank protection and extreme flood flows, are typically handled through a riser with different sized openings, through an overflow at the top of a riser (drop inlet structure), or a flow over a broad crested weir or spillway through the embankment. Overflow weirs can also be of different heights and configurations to handle control of multiple design flows.
- Inflow channels are to be utilized with flared riprap aprons. A sediment forebay sized to 0.10 inches per impervious acre of contributing drainage area should be provided for dry detention and EDBs that are in a treatment-train with off-line water quality treatment structural controls.

Structural stormwater controls are designed to be either on-line or off-line. On-line structural controls must be able to handle the entire range of storm flows. Off-line facilities, such as bio-retention areas and infiltration trenches, are designed to receive only a specified flow rate through the use of a flow regulator (i.e. diversion structure, flow splitter, etc.). Flow regulators are typically used to divert the WQ_v to an off-line structural control sized and designed to treat and control the WQ_v . After the design runoff flow has been treated and/or controlled meeting this WQ_v , it is returned to the conveyance system or on-line structure.

A key decision is whether to locate a BMP on-line or off-line. On-line refers to locating a BMP such that all of the runoff from the upstream watershed is intercepted and treated by the BMP. A single on-line BMP should be designed to treat both onsite runoff and upstream (offsite) runoff. Locating BMPs off-line requires that all onsite catchment areas flow through the BMP(s) prior to combining with flows from the upstream (offsite) watershed.

Designers should also be aware the WQ_v BMPs, especially those that promote infiltration, could result in volume reductions for flood storage. These volume reductions are most pronounced for frequently occurring events, but even in the major event some volume can be achieved if WQ_v reduction BMPs are widely used on a site.

- For a dry detention basin, the outlet structure must be sized as to provide desired hydraulic detention time of 24 hours as a minimum for the 1-year, 24-hour storm (based upon hydrological routing calculations) and can consist of a weir, orifice, outlet pipe, combination outlet, or other acceptable control structure. Small outlets that will be subject to clogging or are difficult to maintain are not acceptable.

The inlet and outlet structure must be separated as much as possible to avoid short-circuiting. Positioning of these structures and/or orifices should be above the dry detention basin bottom to provide space to capture sediment and minimize resuspension of any TSS captured in the basin. The inlet must be designed to safely bypass flows which would exceed the design volume and dissipate flow energy at concentrated points of inflow. This also will limit erosion and promote particle sedimentation.

- For EDBs, a low flow orifice capable of releasing the channel protection volume over 24 hours must be provided. The channel protection orifice should have a minimum diameter of three (3) inches and should be adequately protected from clogging by an acceptable external trash rack. The orifice diameter may be reduced to one (1) inch if internal orifice protection is used (e.g. an over perforated vertical stand pipe with 0.5 inch orifices or slots that are protected by wirecloth and a stone filtering jacket). Adjustable gate valves can also be used to achieve this equivalent diameter. Reference Section 2.3.1 (Outlet Structures) of the GASWMM/CSS for more information on the design of outlet structures.
- Seepage control or anti-seep collars should be provided for all outlet pipes.
- A conveyance shall be installed from all inlets to outlets. The inlet and outlet conveyance final grade is to be a minimum of one (1) foot above the seasonal high groundwater table elevation. The conveyance is required to be lined with geotextile and four (4) inches of stone over same (graded 2-4 inches of stone). The conveyance is to be a minimum of four (4) feet wide.
- Riprap, plunge pools or pads, or other energy dissipaters are to be placed at the end of the outlet to prevent scouring and erosion. Reference Section 4.5 of the GASWMM for more information on energy dissipation design.
- An emergency spillway is to be included in the stormwater basins design to safely pass the extreme flood flow. The spillway prevents pond water levels from

IMSH-PW

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overtopping the embankment and causing structural damage. The emergency spillway must be designed to the State of Georgia guidelines for dam safety and located so that downstream structures will not be impacted by spillway discharges. Reference Appendix H of the GASWMM for more information on the State of Georgia guidelines for dam safety.

- A minimum of one (1) foot of freeboard must be provided, measured from the top of the water surface elevation for the extreme flood, to the lowest point of the embankment not counting the emergency spillway.
5. **Exceptions.** Request for exceptions to this policy will be reviewed on a case by case basis and must be authorized by the Director of Public Works.
 6. **Proponent.** The DPW is the proponent for this policy. The point of contact is DPW, Environmental Division at commercial (912) 767-2010 or DSN 870-2010.


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