HUNTER ARMY AIR FIELD
STORMWATER POLLUTION PREVENTION PLAN
VOLUME I

Updated By:

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Hunter Army Airfield SWP3

STORMWATER POLLUTION PREVENTION PLAN CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Thomas C. Fry
Signature Duly Authorized Representative

_ Thomas C. Fry
Name of Duly Authorized Representative

Chief, DPW Environmental Division
Title of Duly Authorized Representative

10/23/2012
Date

LIST OF ACRONYMS

AST	Aboveground storage tank
BMP	Best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
CVWF	Central Vehicle Wash Facility
DPW	Directorate of Public Works
ECO/ ECNCO	Environmental Compliance Officer/ Environmental Compliance Non-Commissioned Officer
ED	Environmental Division
ESPCP	Erosion and Sedimentation Pollution Control Plan
FS/HAAF	Fort Stewart/Hunter Army Airfield
GA EPD	Georgia Environmental Protection Division
GASWCC	Georgia Soil and Water Conservation Commission
2012-GA IGP	Georgia Industrial General NPDES Permit--2012
GH	Good Housekeeping
ISCP	Installation Spill Contingency Plan
IWTP	Industrial Wastewater Treatment Plant
LID	Low Impact Development
MGD	Million gallons per day
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination Systems Permitting

LIST OF ACRONYMS (Continued)

NSD	Non-Stormwater discharge
PM	Preventative maintenance
POL	Petroleum, oils, and lubricants
PPMs	Potential pollutant materials
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments Reauthorization Act
SO	Safety Officer
SPCC Plan	Spill Prevention, Countermeasures, and Control Plan
SWP2	Stormwater Pollution Prevention--Team
SWP3	Stormwater Pollution Prevention Plan
STP	Sewage treatment plant
TO	Training Officer
USAR	United States Army Reserve
USEPA	United States Environmental Protection Agency
UST	Underground storage tank

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APPENDICES

1.0 INTRODUCTION

1.1 Regulations and Compliance

Section 402(p) of the Water Quality Act of 1987 requires that operators of facilities, including Federal Installations, which discharge stormwater associated with industrial activity, obtain permits under the National Pollutant Discharge Elimination System (NPDES) to reduce pollutant loadings and improve the quality of stormwater discharges. In response to these statutes, the United States Environmental Protection Agency (USEPA) promulgated final regulations for permit applications associated with stormwater discharges from industrial activities on November 16, 1990 (USEPA Stormwater regulations; 55 CFR 47989, 56 CFR 12097, 56 CFR 56547, 57 CFR 11393, 40 CFR Parts 122 through 124; and additional related regulations promulgated by State and local regulatory agencies; USEPA, 1990, p. 47990). Under these regulations, Federal facilities, including U.S. Army (Army) Garrison and U.S. Army Reserve (USAR) Installations are required to submit a permit application (group or individual) or a Notice of Intent (NOI) for coverage by a general permit on or before October 1, 1992. As part of the USEPA and individual States' general permit requirements, Army and USAR Installations are also required to develop a Stormwater Pollution Prevention Plan (SWP3), including elements of Best Management Practices (BMPs) designed to minimize pollution through training, awareness, and source control.

In addition, most Army Installations are also regulated as small Municipal Separate Storm Sewer Systems (MS4s) under Phase II Stormwater Rules. Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated or non-point sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation. Operators of Phase II-designated small MS4s and small construction activities are required to apply for NPDES permit coverage under a general or an individual permit, respectively, and to implement stormwater discharge management controls BMPs. Fort Stewart and Hunter Army Airfield (FS/HAAF) filed for coverage under the State of Georgia MS4 NPDES Permit GAG480000 for Stormwater Discharges Associated At Military Facilities in 2009.

One key aspect of the Phase II Rule is its “No Exposure Exclusion.” A conditional no exposure exclusion is available to all categories of Phase I regulated industrial activities (except construction activities) who can certify that all industrial materials and activities are protected by a storm-resistant shelter or all industrial activity is performed indoors to prevent exposure to rain, snow, snowmelt, and/or runoff and performs quarterly inspections to ensure the no exposure exclusion is maintained. FS/HAAF have various industrial activities, such as vehicle maintenance and tactical equipment maintenance facilities, tanker fuel truck storage, rotary and fixed wing aircraft maintenance, washracks, fueling operations, and storage which are performed outdoors and in open spaces; therefore, not eligible for the “No Exposure Exclusion”.

1.2 Definitions

The definition of "stormwater discharges associated with industrial activities" addresses point source discharges. Section 502 (14) of the Clean Water Act (CWA) defines the term "point source" as "any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container from which pollutants are or may be discharged to Waters of the State or the United States"

An example of a point source discharge at a typical Army Installation would be the surface runoff from a vehicle/tactical equipment maintenance facility, military vehicle/equipment parking, fueling operation areas, or warehouses and loading docks which discharge directly into a storm sewer, or into a nearby tributary or creek. The point source discharge occurs where the storm runoff is physically discharged into the stormwater collection system or Waters of the State. The following industrial activities at Army Installations are subject to the stormwater regulations:

- **Facilities subject to stormwater effluent guidelines.** The 2012 Georgia Industrial General Permit (2012-GA IGP) has a list of stormwater specific effluent limitations in Part 6.2.2 Effluent Limitation Monitoring of the permit. Presently there is one (1) industrial activity which is in this category at Fort Stewart, runoff from non-hazardous waste landfills 40CFR Part 445, Subpart B, with effluent limitations listed in Sector 8 of the GA IGP part 8.L.10. The other facilities are covered under the Part 6.2.b. (Part 6.2.2) and c. (Appendix C) Required Monitoring.

- **Manufacturing activities.** A munitions manufacturing plant that discharges some wastes to nearby streams would be an example of this type of activity.

- **Hazardous waste treatment, storage, or disposal facilities.** Most active Army and USAR Installations operate hazardous waste storage facilities under a 90-day permit with the satellite collection sites limited to a maximum of 55 gallon drums of wastes. Some of these facilities may not be covered or fully contained, and stormwater runoff from these areas may contain pollutants, which are subsequently discharged to nearby streams.

- **Landfills, land application sites, and open industrial dumps.** Most Army Installations operate landfills for disposal of domestic and construction/demolition debris. Closed landfills, subject to current closure regulations, may be exempt if a permanent cover has been or is ready to be installed. Only landfills that have accepted industrial and domestic wastes or construction/demolition debris are subject to the stormwater regulations.

- **Recycling facilities such as yards for scrap metal, spent batteries, salvage, and automobiles.** Many active Army Installations operate recycling operations where recyclables are processed prior to shipment.

- **Steam electric generating facilities.** Plants generating steam electric power generation using coal, natural gas, oil, nuclear energy, etc., to produce a steam source, inclusive of coal handling areas and dual facilities that could employ a steam boiler are regulated under this permit.

- **Transportation facilities.** These include Army transportation and equipment maintenance facilities where vehicle maintenance, tactical equipment maintenance facilities, rail marshalling areas, vehicular washing, military vehicle parking and storage, warehousing, and any support activities occur.

- **Sewage treatment plants (STPs).** STPs are regulated under separate NPDES permits. However, stormwater runoff from STPs with a design capacity of over 1 million gallons per day (MGD) is covered by the regulations. The 2012-GA IGP, notes discharges of stormwater from these types of facilities covers areas which discharge to the collection system that are not directed to the STP permitted discharge point (e.g. parking areas, or surface common areas surrounding the plant).

- **Certain other facilities** having materials exposed to precipitation or surface run-on. For example, an area where batteries and other materials that may leach contaminants are stored where they are exposed to rainfall would be regulated.

The Municipal Separate Storm Sewer Systems permitting covers non-industrial areas or Non-Point Source discharges of Army Installations, such as roads and maintenance, parking lots, residential and administrative structures and the stormwater collection systems which are not covered under the 2012-GA IGP. The Hunter Army Airfield MS4 Municipal Operations Facilities Listing can be found in Table 3.2.

1.3 SWP3 Development

The stormwater regulations establish that this SWP3 shall include each industrial activity at HAAF covered by this permit. The SWP3 shall be prepared in accordance with good engineering practices and shall identify potential sources of pollution, which may reasonably be expected to affect the quality of stormwater discharges associated with industrial activity from the facility. In addition, the plan shall outline and describe the implementation of practices intended to reduce the pollutants in these discharges and to ensure compliance with the terms and conditions of the permit. Facilities must implement the provisions of the SWP3 required under this plan as a condition of the permit.

1.3.1 SWP3 Preparation

Elements of the plan are described in the USEPA Baseline General Permit requirements under 40 CFR 122, Volume 57, Number 175. The Plan has been developed to meet specific requirements of Part 5. STORMWATER POLLUTION PREVENTION PLANS of the 2012 State of Georgia Industrial General Permit No. GAR050000, Authorization to Discharge under the National Pollutant Discharge Elimination System, Stormwater Discharges Associated with Industrial Activity, provided in Appendix A to this document. Detailed guidelines for developing SWP3s are provided in the manual prepared by USEPA (February 2009) and within the 2012-GA IGP Contents of the SWP3 section 5.1 through 5.4. Data, information, and illustrations included in the plan were obtained from files and other plans and documents available.

1.3.2 SWP3 Revisions

The Hunter Army Airfield Master SWP3 and activity-specific SWP3s shall be reviewed at a minimum, annually, or whenever significant changes in operations or procedures occur that have the potential to impact stormwater quality, and amended as required per the 2012-GA IGP. To monitor and provide a record of amendments, all amendments shall be recorded in Table 1.1 of the HAAF Master SWP3. Amendments include structural modifications and implementation of best management practices (BMPs). More information on these required revisions is provided in Section 6.0.

1.4 Stormwater Pollution Prevention Plan Overview

The Hunter Army Airfield Master SWP3 includes the following sections:

- Planning and Organization (Section 2.0)
- Assessment (Section 3.0)
- BMP Identification (Section 4.0)
- Implementation and Management (Section 5.0)
- Evaluation/Monitoring (Section 6.0)
- General Requirements (Section 7.0)
- References (Section 8.0)

TABLE 1.1 AMENDMENT LOG	
Date	**Description**
Mar 2010	Updated Master SWP3 signature page with Designated Authorized Individual and signature
Sep 2010	Table 3.1 – Updated List of Industrial Activities
Sep 2010	Table 3.3 – Updated Significant Spills for the past three years
Sep 2010	Section 6.3 – MFR: Annual Comprehensive Stormwater Management Evaluation FY 10
Sep 2010	Table 6.4.2 – Updated of 2010 Significant Spills
Sep 2010	Appendix H – Activity Specific SWP3's
Sep 2010	Appendix J – TMDL Sample Report
Sep 2010	Appendix J – Inert Landfill Sample Report
Sep 2010	Appendix J – Recycling Sample Report
Oct 2010	Appendix A-c – Updated Phase II Stormwater Permit from GAG610000 to GAG480000
Oct 2010	Removed Appendix M: Previous Appendix L is now Appendix K and previous Appendix M is now Appendix L
Aug-Oct 2012	Master SWP3 revisions, updates with 2012—GA IGP: permit verbiage and Parts, Industrial Activity, Municipal Operations and AST Listings, additions to Appendices (DPW Policy Letters #11 Stormwater Program Management, Construction Site Runoff Control, Post-Construction New Development/Re-Development and 2012 DPW Policy Letter #10--Dry Detention Basins requirements), ensured correlation of page numbers with Table of Contents, and obtained Master SWP3 Certification Signature of Designated Delegated Authority.

2.0 PLANNING AND ORGANIZATION

This section identifies the Stormwater Pollution Prevention (SWP2) Team that will be responsible for the implementation and management of the SWP3 at FS/HAAF.

2.1 Stormwater Pollution Prevention Team

The SWP2 Team is responsible for implementing the SWP3 at FS/HAAF. The SWP2 Team reports to the FS/HAAF Installation Commander.

2.2 Team Members

The following will be members of the SWP2 Team, with delegated responsibility from the FS/HAAF Installation Commander to develop, implement, modify, and provide required reports on the SWP3 and related activities:

- FS/HAAF Director of Public Works (DPW) or DPW Duly Authorized Delegated Authority (DPW Environmental Division Chief, Environmental Prevention & Compliance Branch Chief).

- FS/HAAF Environmental Prevention and Compliance Branch, Environmental Division (EPCB), Section Leader Infrastructure Compliance Programs.

- FS/HAAF Stormwater Program Manager, Environmental Prevention and Compliance Branch, Environmental Division

- FS/HAAF Installation Safety Officer (SO)

- Activity Specific Environmental Compliance Officers/Environmental Compliance Non-Commissioned Officers (ECOs/EC-NCOs)

The specific duties of each SWP2 Team member are shown in Table 2.1. The names and phone numbers of the team are provided in Table 2.2.

TABLE 2.1
SPECIFIC DUTIES OF THE SWP2 TEAM

Title	Duties
Directorate of Public Works (DPW) or the Duly Authorized Delegated Authority, DPW Environmental Division, Chief and/or the Environmental Prevention & Compliance Branch Chief, Environmental Division	(1) Overall responsibility for the implementation of the SWP3. Signs documents and certificates required in the SWP3. Schedules regular and emergency meetings of the SWP3. Reviews and approves the SWP3, its modifications, and updates. (2) Delegates responsibility for implementation of the elements of the SWP3. (3) Coordinates final preparation, review, and approval of the SWP3. Coordinates implementation of compliance phase. Prepares cost estimates, or delegates this preparation, and approves of implementation of Plan for BMPs.
Directorate of Public Works Section Leader Infrastructure Compliance Programs-Stormwater Program Manager (Environmental Prevention & Compliance Branch, Environmental Division)	(1) Monitors compliance with scheduled activities in the Plan. Prepares annual inspection review documents and submits to DPW. (2) Conducts or contracts annual inspection of activities where risk of stormwater pollution potential is highest and certification of dry-weather discharges from outfalls. (3) Conducts or contracts for the annual inventory of primary potential pollutants as required by OSHA. (4) Develops and maintains a database reflecting the inventory of primary potential pollutants in conjunction with Installation Safety Officer. (5) Prepares preliminary designs of BMPs and their implementation. (6) Maintains updated records of spills as part of the SPCCP and updates files on the SWP3, reflecting recent spills and measures to prevent them. Coordinates with State and Federal regulators for modifications to the Plan. (7) Updates the Hazardous Materials/Waste Management Standard Operating Procedures (HMWMSOP) to meet requirements of the SWP3. Conducts inspections of hazardous waste sites at the Installation to ascertain compliance with the HMWMSOP and the SWP3. Coordinates the management and disposal of hazardous waste and toxic materials that can cause stormwater pollution as described in the SWP3. (8) Develops appropriate training programs in conjunction with activity directors.
Installation Safety Office	(1) Assists the Environmental Division in conducting an annual potential pollutant inventory and developing/ maintaining a potential pollutant database. Maintains Material Safety Data Sheets. (2) Performs or contracts for inspections as specified in the Installation safety manual to ensure compliance with the OSHA and SWP3 requirements for management and disposal of primary potential pollutants.
Activity ECOs/EC-NCOs (General)	(1) Monitors compliance with scheduled activities in the SWP3. Prepares inspection documentation and submits to the Environmental Division. (2) Monitors activity operations for changes which may affect the SWP3 and notifies the Environmental Division and DPW any such changes. (3) Assists with annual potential pollutant inventory/inspection. (4) Assists the Environmental Division in the development of training programs for personnel in his/her specific activity area. Responsible for notifying EPCB when training updates are necessary. (5) Assists the Environmental Division in developing and tailoring training programs for personnel in specific activity areas. Ensures that personnel in each area receive the necessary training.

TABLE 2.2
NAMES AND PHONE NUMBERS OF THE SWP2 TEAM

Names	Phone (work)
FS/HAAF Director, Public Works/Duly Authorized Delegated Authority-Environmental Division	912-767-8356 912-767-2010
FS/HAAF DPW Environmental Division, Section Leader Infrastructure, Compliance Programs	912-767-2010
FS/HAAF Stormwater Program Manager	912-767-0271
FS/HAAF Installation Safety Officer	912-767-7880
Activity Environmental Compliance Officers and Non-Commission Officers (Activity ECOs/EC-NCO)	(See Volume II for current Activity Specific ECO/EC-NCO phone numbers)

3.0 ASSESSMENT

An assessment of industrial areas that present potential sources of pollution to storm runoff was conducted as required under the stormwater regulations (Part IV.D.2 of GAR000000 of 2000 and 2006 GA IGP). Industrial activities that may contribute to stormwater pollution, and are covered by the regulations, were inspected during an initial site assessment conducted at Fort Stewart in December 2000. Additional information was obtained through follow-up telephone conversations with Installation personnel and during review meetings held at the Installation November 2001. The regulated industrial activities were re-inspected during a reassessment of the SWP3 conducted at Fort Stewart during July 2002 and in May 2004. Since that time there have been revisions or updates performed annually as required for compliance. The most recent, were updates incorporating new requirements of the 2012- Georgia Industrial General Permit (2012-GA IGP) GAR050000, May - December, 2012.

3.1 <u>Industrial Activities</u>

Upon re-evaluation of Industrial Activities and Municipal Activities, "point source" and "non point source", respectively, it was been determined that there are Thirty-Five (35) facilities at HAAF which have been identified as "industrial activities" subject to the requirements of the Stormwater Regulations under the Clean Water Act. Table 3.1 summarizes the industrial activities at HAAF requiring permit coverage of point source discharges of stormwater to the Waters of the State of Georgia. In addition to the regulated activities, other non-point source operations were also evaluated during the initial site assessment due to their potential to contribute to stormwater pollution. As previously noted in Section 1.2 Definitions, the HAAF MS4 Municipal Operations Facilities Listing can be found in Table 3.2. The non-point source activities sheet flow and do not have an actual discernible outfall(s), or the discharge point is covered by another NPDES Permit, which are not covered by the 2012-GA IGP includes:

- Housing Maintenance Facility and Car Wash
- Hospital (Loading Dock and Maintenance Shop)
- Food Service Halls (Loading Docks)
- Veterinary Clinics (Dog Kennels)
- Wastewater Treatment Facilities (stormwater sheet flows or discharges to the existing NPDES permitted discharge point)
- Fire Department
- Post Exchange Services Shopping Center

- Recycling Processing Station
- Inert Landfills (yard waste)

3.2 Installation Site Map

Part 5.1.2.3 of 2012-IGP stormwater permit requires the inclusion of a site map in the SWP3, indicating the locations of industrial areas that may be potential sources of pollution to stormwater. Appendix B contains a map that illustrates the locations of those “industrial activities” areas at HAAF requiring permit coverage of point source discharges of stormwater to the Waters of the State of Georgia.

3.3 Storm Drainage System and Stormwater Outfalls

The Installation has a storm drainage system comprised of storm sewer pipes, catch basins and drop inlets, concrete culverts, and grass drainage ditches/swales. Pipes are made of corrugated metal, clay and concrete. These structural features are primarily found in areas where impervious surfaces and development are located (i.e., roads and buildings). In the less developed areas of the Installation, stormwater drainage is primarily overland flow following the topography of the land. There are 7 major drainage systems at HAAF. These are listed in Table 3.3.

3.4 Routine Facility Inspections

3.4.1 Quarterly Inspections

Part 4.1 of the 2012-GA IGP requires routine facility inspections of industrial activities must be performed quarterly (i.e., once each calendar quarter) although in many instances, more frequent inspections (e.g., monthly) may be appropriate for some of the types of equipment, process, and control measures of areas of the facility with significant activities and materials exposed to stormwater. These inspections must be performed during the periods when the facility is in operation. These routine inspections must be performed by qualified personnel (for definition, see Appendix A--General Permits) with at least one member of the pollution prevention team participating.

At least once each calendar year, the routine facility inspection must be conducted during a period when a stormwater discharge is occurring per the 2012-GA IGP; however, due to the number of industrial activities and the travel distances of these industrial activities on HAAF, it makes it physically restrictive to complete this action as required. Therefore, HAAF has developed a schedule for performing the rain event inspections on a rotational basis, to ensure every facility is inspected at least once during the permit cycle of five (5) years.

The quarterly inspections must be documented with the findings of each routine facility inspection performed and maintained onsite with the Activity Specific SWP3 as required in Part 5.4. At a minimum, documentation of each routine facility inspection must include:

a. Inspection date and time;
b. Name(s) and signature(s) of the inspector(s) [signature in accordance with Appendix B.7 of the 2012-GA IGP];
c. Weather information and description of any discharges occurring at the time of the inspection;
d. Any previously unidentified discharges of pollutants from the facility for the previous three (3) years;
e. Any control measures needing maintenance or repairs;
f. Any failed control measures that need replacement;
g. Any incidents of noncompliance observed; and
h. Any additional control measures needed to comply with the permit requirements.

Any corrective action required as a result of a routine facility inspection must be performed consistent with Part 3 of the 2012-GA IGP.

3.4.2 Quarterly Visual Assessment of Stormwater Discharges

Part 4.2.1 of the 2012-GA IGP requires Quarterly Visual Assessments Documentation to be kept with the SWP3 of the industrial outfalls for the following water quality characteristics at least once a quarter:

a. Color;
b. Odor;
c. Turbidity;
d. Floating solids;
e. Settled solids;
f. Suspended solids;
g. Foam;
h. Oil sheen; and
i. Other obvious indicators of stormwater pollution.

This requirement is performed with automated stormwater samplers established at specific strategic collection locations for substantially identical industrial outfalls, to collect samples during 0.10 inch rain events.

3.4.3 Substantially Identical Outfalls

Part 6.1.1 of the 2012-GA IGP states: If a facility has two or more outfalls which discharge substantially identical effluents, based on the similarities of the general industrial activities and control measures, exposed materials that may significantly contribute pollutants to stormwater, and runoff coefficients of their drainage areas, the effluent of just one of the outfalls may be visually monitored quarterly and report that the results also apply to the substantially identical outfall(s).

The majority of the industrial activities have substantially identical outfalls; therefore Automated Stormwater Samplers were installed on receiving waterbodies to collect the quarterly visual samples of the 0.10 inch rainfall events. When samples are collected they are visually monitored for the aforementioned characteristics noted in section 3.4.2, and photo documented. The automatic sample collection system was developed as an early warning of any potential pollutants during operational or non-operational hours, due to the types of industrial activities associated with Military Facilities. This allows stormwater program personnel to document and track any potential source of a pollutant in the event the visual samples warrant. For documentation of HAAF visual stormwater outfalls monitoring see Appendix H (Master SWP3 Manual Volume III).

However, the allowance for monitoring only one of the substantially identical outfalls is not applicable to any outfalls with numeric effluent limitations or to outfalls that discharge to an impaired stream segment. The monitoring for numeric effluent limit as identified in Part 6.2.2, and the monitoring of each outfall to an impaired stream segment as identified in Appendix C of the 2012-GA IGP.

3.5 <u>Stormwater Monitoring Data</u>

The industrial activities included in this Master SWP3 have stormwater monitoring requirements pursuant to the Georgia NPDES General Industrial Permit for Stormwater Discharges Associated with Industrial Activity. Monitoring and collection of stormwater samples for analysis and documentation of the monitoring of industrial activities must be consistent with the procedures described in the 2012-GA IGP Part 6, Appendix B, Appendix C and any additional sector-specific requirements in Parts 8, respectively as noted in the 2012-GA IGP.

3.5.1 Measurable Storm Events:

This includes the following types of required analytical monitoring, one or more of which may apply to the industrial activity discharge:

a. Annual benchmark monitoring (Part 6.2.1);
b. Annual effluent limitation monitoring (Part 6.2.2);
c. Monitoring of discharges to an impaired stream segment (Appendix C); and
d. Other monitoring as required by GA EPD (Part 6.2.4).

HAAF completed the benchmark monitoring and sampling requirements as required during the 2006 GA Industrial General Permit cycle and passed; therefore, this sampling has and continues to be performed on an annual basis. Additionally, the annual effluent limitation monitoring for the Recycling Center (scrap metals) was performed during the previous 2006 permit cycle and will continue through the 2012-GA IGP cycle as required, inclusive of any other facilities which require annual effluent limitation monitoring under the 2012-GA IGP.

The annual effluent limits monitoring related to Part 8 of the 2012-GA IGP industrial activities includes the following:

a. P1 Land Transportation and Warehousing
b. K1 Hazardous Waste Treatment, Storage, or Disposal Facilities
c. O1 Steam Electric Generating Facilities
d. L1 Landfills, Land Application Site and Open Dumps

3.6 Potential Sources of Pollutants

An inventory of the areas at HAAF where industrial activities may discharge pollutants in stormwater was compiled from existing facility plans, staff interviews, and field reconnaissance. These areas are listed in Section 3.1. A site layout map of HAAF showing the locations of each regulated and non-regulated industrial activity is included in Appendix B. An assessment of each regulated industrial activity detailing the site-specific potential sources of pollutants is included in Appendix G-Master SWP3-Activity Specific SWP3s Volume II.

Appendix G-Master SWP3-Activity Specific SWP3s Volume II includes materials stored at each of the activity specific industrial activity assessed in this plan, including inside and outside material storage, and indicates which materials are exposed to precipitation. Materials inside buildings are included when it is possible that a spill could impact stormwater quality.

Storage tanks were inventoried as part of the assessment of HAAF. At the industrial activities listed in Section 3.1, a total of seventy-eight (78) aboveground storage tanks (ASTs) were in place at the time of the reassessment. For complete listings of ASTs and stored material see appendix D.

3.7 Inventory of Potential Pollutants

Types and quantities of materials that present a potential for stormwater pollution were inventoried at the regulated industrial facilities at HAAF. A list of potential stormwater pollutants is shown in Table 3.4.

3.8 Identification of Non Stormwater Discharges

Non stormwater discharges (NSDs) include any discharges of water used in manufacturing or industrial processes through a stormwater system or some other conduit, or by overland flow, to Waters of the State or the US. There are four (4) types of NSD that occurs at HAAF. These NSDs are: (1) Clear Rinse Facility, where fixed and rotary winged aircraft perform rinsing of the aircraft for the removal of salts which causes corrosion, the facility is a closed-loop system; (2) WWTP, Motorpools washracks which discharge to the WWTP; (3) the Fire Department training activities, and; (4) hydrant flushing water, which discharges into nearby ditches. Additionally, non-stormwater discharges are assessed during the site specific Industrial Activity Specific Annual Comprehensive Compliance Industrial Stormwater Inspections and documented accordingly.

3.9 Spill Prevention Plan

At the time of the initial site assessment and implementation of the SWP3, HAAF had a Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) that had been implemented in 2000; this plan has since been revised in 2005, 2010, and at the time of the HAAF Master SWP3 revisions for the 2012-GA IGP, the SPCC Plan was currently under revision. It is a statutory requirement that SPCC plans be updated at least every five (5) years and whenever there are relevant operational changes.

The significant spills, according to the Installation Spill Record, that have occurred at the HAAF Facility during the past three years are listed below in Table 3.3. Significant spills include petroleum spills in excess of 50 gallons or hazardous materials released within a 24-hour period in excess of reportable quantities under Section 311 of the Clean Water Act and Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

3.10 Risk Assessment of Potential Stormwater Contamination

An assessment of areas at HAAF with the highest potential for stormwater contamination was prepared as part of the SWP3. The following procedure was used for the assessment. Industrial activities and associated areas were inspected and assessed for their potential to release pollutants to stormwater. The evaluation included outdoor storage of materials, equipment maintenance, aboveground storage tanks, landfills, vehicle washing areas, and pesticide mixing and storage areas. Storage practices and/or existing BMPs, as well as the activity's proximity to surface waters or stormwater inlets that discharge to surface waters, were assessed for each area. Most or all material storage at HAAF is covered or contained. In most cases, pollutants would be washed over land during a precipitation event, and most would be absorbed into the soil, trapped in poly packs, Hazwaste lockers with secondary containment, drop inlet structures, secondary containment, concrete berms and housekeeping pads or the vegetated zones prior to reaching surface water. The potential for pollutants from HAAF to enter stormwater and enter surface waters appears to be low to moderate at the time of the site assessment. Implementation of BMPs, discussed in Sections 4.0 and 5.0, will reduce the pollution potential of the Installation to a "low" rating. Table 3.5 lists the various major industrial activities and their potential to contribute to stormwater pollution.

TABLE 3.1

LIST OF INDUSTRIAL ACTIVITIES, HUNTER ARMY AIRFIELD, GEORGIA

Industrial Facility	Bldg. No.	Outdoor Storage of PPMs[1]	Unloading/ Loading Areas for PPMs	Aboveground Storage Tank/Used POLs	Motor pool with Maintenance Shop	Hazardous Waste Generators/ Accumulation	Solid Waste Management Units	Wash Racks/ Areas	Underground Storage Tanks (AAFES)	Oil-Water Separator
Directorate of Plans, Training, Mobilization, and Security Airfield Division Truscott Air Terminal	7920	X	X	X		X		X		
1/3 and 3/3 Aviation Motorpool	1208-1210	X	X	X	X	X		X		X
1/75 Ranger Regiment Maintenance Facility	1360	X	X	X	X	X		X	X	X
117th Georgia Air National Guard Maintenance Facility	8593	X	X	X	X	X		X		X
Army Aviation Support Facility #3	850	X	X	X	X	X		X		X
Directorate of Logistics Government Owned/Contractor Operated Universal Fuels POL Island	8680-8684	X	X	X		X				X
603rd Aviation Support Battalion Maintenance Facility	811-813	X	X	X	X	X		X		X
Bravo 2/3 Aviation Maintenance Facility	7901	X	X	X	X	X		X		X
2/3 and 4/3 Aviation Aircraft Maintenance Facility	860	X	X	X	X	X		X		X
224th Military Intelligence Battalion Motorpool	1327	X	X	X	X	X		X		X
603rd Aviation Support Battalion Maintenance Facility	1310	X	X	X	X	X		X		X
603rd Aviation Support Battalion Headquarters Support Maintenance Facility	1158	X	X	X	X	X				
1/3 and 3/17 Aviation Aircraft Maintenance Facility	850	X	X	X	X	X		X		X
224 Military Intelligence Battalion Aircraft Maintenance Facility	1130-1132	X	X	X	X	X		X		X
Aviation Brigade Consolidated Motor pool	1336	X	X	X	X	X		X		X

TABLE 3.1

LIST OF INDUSTRIAL ACTIVITIES, HUNTER ARMY AIRFIELD, GEORGIA

Industrial Facility	Bldg. No.	Outdoor Storage of PPMs[1]	Unloading/ Loading Areas for PPMs	Aboveground Storage Tank/Used POLs	Motor pool with Maintenance Shop	Hazardous Waste Generators/ Accumulation	Solid Waste Management Units	Wash Racks/ Areas	Underground Storage Tanks (AAFES)	Oil-Water Separator
Marine Reserve Training Center Motorpool	1281	X	X		X	X				
Directorate of Logistics Government Owned/Contractor Operated Universal Fuels Retail Fuel Point	1422	X	X	X		X			X	X
3/160th Special Operations Aviation Regiment Motorpool	8005	X	X	X	X	X		X	X	X
3/160th Special Operations Aviation Regiment Aviation Maintenance Facility	7902	X	X	X	X	X				
U.S. Coast Guard Air Station	830	X	X	X	X	X		X		X
260th Quartermasters Battalion Motorpool	1420	X	X	X	X	X		X		X
Directorate of Public Works Hazardous Waste Handling Facility	720	X	X	X		X				
Directorate of Public Works Recycling Center	727	X	X	X						
Directorate of Logistics Government Owned/Contractor Operated Universal Fuels Bulk Fuel Storage Facility	7006-7009	X	X	X		X				
Aviation and Missile Command Maintenance Facility	840-842	X	X		X	X				
Directorate of Public Works Operation & Maintenance Division Central Energy Plant	1036	X	X			X				
Directorate of Morale, Welfare, & Recreation Auto Craft Shop Maintenance Facility	1288	X	X	X	X	X		X		X
Directorate of Public Works Operation & Maintenance Division Equipment Maintenance Facility	719	X	X	X	X	X				

TABLE 3.1

LIST OF INDUSTRIAL ACTIVITIES, HUNTER ARMY AIRFIELD, GEORGIA

Industrial Facility	Bldg. No.	Outdoor Storage of PPMs[1]	Unloading/ Loading Areas for PPMs	Aboveground Storage Tank/Used POLs	Motor pool with Maintenance Shop	Hazardous Waste Generators/ Accumulation	Solid Waste Management Units	Wash Racks/ Areas	Underground Storage Tanks (AAFES)	Oil-Water Separator
Directorate of Public Works Operation & Maintenance Division Waste Water Treatment Plant	712	X	X	X		X				
Directorate of Public Works Operation & Maintenance Division Vehicle and Equipment Storage	1023-1024	X	X	X		X		X		X
Army Air Force Exchange Services HAAF Corner Express	931		X						X	
Canoochee Power Electric Membership Cooperative Equipment Storage Facility	1035	X	X			X				
Directorate of Logistics Purge Facility	1351-1352		X	X		X				X
Directorate of Logistics Maintenance Facility	8657		X	X	X	X				
Army Air Force Exchange Services Gas Kiosk	8804	X	X						X	

Table 3.2 LIST OF MUNICIPAL OPERTATIONS (NON-POINT SOURCE) HAAF			
Number	**Bldg. No.**	**Municipal Operation Facilities Name**	**Type of Activity**
1.	8045	Aviation and Missile Command	Aircraft Engine Test Cell
2.	8454	Morale, Welfare & Recreation (MWR) Maintenance	Storage & Maintenance Facility
3.	8212	MWR Hunter Golf Course Equipment & Maintenance	Storage & Maintenance Facility
4.	1060	Directorate of Public Works (DPW) Operations & Maintenance (O&M) Services Division Pest Control	Storage & Equipment- Pest Control Mixing Facility
5.	N/A	DPW O&M Services Division Inert Landfill	Yard Waste Landfill
6.	6020	Army Air Force Exchange Service (AAFES) Post Exchange (PX)	Shopping Center & Parking Lot
7.		Balfour Beatty Corporation-Residential Housing	Housing Maintenance Facility & POV Car Wash

TABLE 3.3
WATER BODIES THAT COULD BE AFFECTED BY STORMWATER FROM INDUSTRIAL ACTIVITIES AT HAAF

Name	Location
Casey Canal to Vernon River	Cantonment Area--Housing
Harmon Canal to Vernon River	Cantonment Area--Golf Course
Lamar Canal to Little Ogeechee River	Cantonment Area--Northern portion of the Airfield, Bulk Fuels Storage, POL Island, Motorpools & Tactical Equipment Facilities
Forest River to Little Ogeechee River	Cantonment Area--Southwestern portion of the Airfield and Training Areas

TABLE 3.4
HAAF SIGNIFICANT SPILLS FOR THE PAST THREE YEARS

Date	Location	Type	Quantity	Action Taken
9 SEP 08	North Schmidt St.	Hydraulic Fluid	30-35 gallons	Contained with dry sweep and sand. Hydraulic line was shut off and plugged.
28 OCT 08	Building 1252	JP-8	30 gallons	Fuel line was shut off and capped. Dry sweep was used to clean the spill.
28 NOV 08	Education Center Building 1290	Latex Paint	50-60 gallons	Contained with booms, socks, absorbent pads, and dry sweep.
18 JAN 11	1404 Stanley Avenue	Wastewater	2500 gallons	Repaired the force main.
2 MAR 11	Leonard Neal Street	Wastewater	100 gallons	Wastewater removed via vacuum truck, affected area limed.
12 MAR 11	HAAF Recreational Park	Wastewater	300 gallons	Wastewater removed via vacuum truck, affected area limed.
29 APR 11	Consolidated Motorpool Building #1336	JP-8	55 gallons	Absorbent sock where used to block the stormwater drop inlet and dry sweep was used to clean up the released JP-8.
22 SEP 11	South Perimeter Road near Saber Hall	Wastewater	500 gallons	Affected area was limed.
13 OCT 11	Bulk Fuel Storage Facility	JP-8	250 gallons	JP-8 was contained in the bermed area. JP-8 and water flowed through oil/water separator.
8 DEC 11	POL Island	JP-8	9500 gallons	Contractor hired to remediate the site.
17 JUL 12	Building #110	Wastewater	100 gallons	Wastewater removed via vacuum truck, affected area limed.

TABLE 3.5
ASSESSMENT OF POLLUTION POTENTIAL FROM INDUSTRIAL ACTIVITIES AT HAAF

Industrial Facility	Potential Pollutants	Pollution Potential		
		High	Medium	Low
90-day Hazwaste Storage	Paint, used oil, anti-freeze, JP-8 Batteries, Cleaners Solvents			X
GOCO Bulk Fuels Storage, POL Island, Retail Fuel Point and Mission Essential Fueling Facility	Mogas, JP-8, Diesel & E-85			X
DPW Pest Control Facility	Pesticide			X

4.0 BEST MANAGEMENT PRACTICES IDENTIFICATION

4.1 Definition of Best Management Practices

Best management practices (BMPs) are measures used to prevent or reduce the potential for pollution from any type of activity. BMPs encompass a wide range of corrective and preventative measures, and may include structural controls, process alternatives, material storage and handling procedures, personnel training, schedules of activities, preventative maintenance, environmental documentation (e.g., SPCC Plan, NPDES permits, inspections), prohibitions on practices, and other management practices to prevent or reduce stormwater pollution. In essence, they are anything that may be identified as a method, short of actual treatment, to prevent or minimize stormwater pollution, or to prevent toxic or hazardous substances from entering the environment in general.

At a minimum, the Installation must implement baseline BMPs, which are typically simple and inexpensive. Advanced (source control or structural) BMPs are more costly, and are generally implemented on a site- or on an activity-specific basis. These types of BMPs are often dependent on available funds, timing, and other crucial factors. The following section describes baseline BMPs that are currently being implemented at Fort Stewart, and offers guidelines about how to select more advanced BMPs that are tailored to specific pollutant sources. Recommended and Advanced BMP practices for Construction and Industrial Activities are discussed in Appendices E, F and in the Activity Specific SWP3s-Appendix G (Under Separate Cover) Volume II.

4.2 Baseline BMPs

Baseline BMPs are practices that are inexpensive, relatively simple, and applicable to a wide variety of industries and activities. According to USEPA's Industrial Stormwater Pollution Prevention Plans Guidance (February 2009), baseline BMPs includes the following:

- Good Housekeeping/Preventative Maintenance
- Visual Inspections
- Spill Prevention Control and Countermeasure Plan (SPCC Plan)
- Sediment and Erosion Control Practices
- Management of Runoff
- Employee Training
- Recordkeeping and Reporting

General descriptions of these BMPs are outlined in Sections 4.2.1 through 4.2.7.

4.2.1 Good Housekeeping/Preventative Maintenance

Good housekeeping is comprised of practices designed to maintain a clean and orderly work environment, which reduces the possibility of accidental spills caused by mishandling or misplacement of chemicals and equipment. Good housekeeping practices are generally the most effective and least costly measures to prevent stormwater runoff contamination from areas engaged in industrial activities. A good housekeeping program includes the following components:

- **Routine Cleanup Operations** - These include: maintaining clean, dry ground surfaces and regularly picking up and disposing of trash and waste material in the appropriate receptacles. This is especially important where vehicle maintenance is performed outside or where material storage areas are exposed to precipitation.

- **Careful Material Storage Practices** - These include: storing containers away from direct traffic routes to prevent accidental spills and damage to containers; storing containers in covered areas on pallets or providing secondary containment to contain spills, leaks, and drips; and segregating incompatible materials. Access to materials should be restricted to authorized personnel and materials should be stored in a secure location.

- **Material Inventory Procedures**. These include: maintaining an inventory of all materials present at the Installation to help identify which materials and activities pose the highest potential risk to the environment. All industrial activities are required to maintain an inventory of materials, which, if discharged to the storm sewer system, would be considered a pollutant. The inventory should include: identifying all chemical substances used and obtaining a copy of MSDSs for each; labeling all containers to clearly show the name and type of substance; and clearly marking on the inventory which materials require special handling, storage, use, or disposal. A master list of chemicals, fuels, and petroleum, oils and lubricants utilized at the Installation should be maintained by the Environmental Division.

A Preventative Maintenance program includes the regular inspection and maintenance, not only of stormwater management control structures (e.g., fuel tanker berms and oil/water separators), but also equipment and systems that can impact stormwater quality (e.g., aboveground storage tanks, secondary containment, and housekeeping pads). Preventative maintenance procedures in place at Fort Stewart, focuses on all aspects of the program. A preventative maintenance program includes the following:

- **Proper Maintenance of Equipment** - This shall include inspections, testing, and, when necessary, repairs of equipment on a regular basis in order to detect leaks or other defects that could cause breakdowns or failures that could result in discharges of pollutants to stormwater. When maintenance must be performed outdoors, ensure the appropriate spill prevention BMPs are utilized and storm drain protection is implemented.

- **Aboveground Storage Tanks (ASTs)** - Regular inspections of the ASTs will, on occasion, identify problems that need to be remedied. These problems, such as leaky joints and valves, deteriorated piping and tank walls, and insufficient or degenerated secondary containment, and replacing the batteries of secondary containment interstitial space alarms shall be corrected promptly after they have been identified.

4.2.2 Visual Inspections

Preventing pollution of stormwater runoff from an industrial activity requires good housekeeping in areas where materials are handled, stored, or transferred in conjunction with preventative maintenance of process equipment and systems. Such practices are described in the above sections. Regular visual inspections are a means to ensure that all of the elements of the plan are in place and working properly. These involve informal and formal inspections of areas and equipment to ensure that housekeeping procedures, preventative maintenance, training, and other BMPs are followed. The frequency of visual inspections is performed on a daily, weekly and monthly basis for the types, mode of storage, and amounts of materials handled at the activity, existing BMPs, and any other factor that may be relevant to the facilities to prevent stormwater pollution. These inspections shall be periodically performed during storm events.

Informal visual inspections are not meant to be a comprehensive evaluation of the entire stormwater pollution prevention program. Rather, they are meant to be a routine inspection of the activity to identify conditions, which may give rise to contamination of stormwater runoff with pollutants from the activity, such as valves, aboveground storage tanks, secondary containment, housekeeping pads and fuel truck containment areas. The documentation involved is notation of any problems (e.g., a leaking valve and the secondary containment and housekeeping stormwater release logs), utilizing the daily, weekly and monthly stormwater inspection checklist and the corrective action(s) taken. These inspections shall be kept at each specific industrial activity for three (3) years for record of compliance.

Formal visual inspections consist of a typical visual inspection along with written and/or photographic documentation of the inspection. Observations, such as failure to use drip pans during fluid changes on vehicles, improperly stored materials or wastes, leaking valves or pipes associated with aboveground storage tanks, and fuel truck containment berms, secondary containment and/or housekeeping pads do not have appropriate stormwater release logs for record of compliance, shall be written on a dated inspection form or marked on a checklist (whichever is deemed appropriate). This documentation shall be maintained as part of the SWP3 for a minimum of three (3) years.

4.2.3 Spill Prevention and Response Procedures

The 2012-GA IGP Requirements (Part 2.1.2.4. b. c. & d.) establish that the permittees identify procedures for spill prevention and response. Spill prevention and response procedures should be developed for the facility based on the spill potential scenarios identified, reflecting a consideration of the potential magnitude of spills, the types of materials spilled, and the variety of potential spill locations. Specific procedures may be needed to correspond with particular chemicals on site. The spill response procedures should include the following:

- Identification of locations where spills have the greatest potential to occur.
- Identification of standard and pollutant materials handling procedures.
- Identification of spill response "team" responsible for implementing the spill response plan.
- Safety measures.
- Procedures to notify appropriate authorities providing assistance (police, fire, hospital)
- Procedures for spill containment, diversion, isolation, and cleanup.
- Safety equipment such as respirators, eye guards, protective clothing and fire extinguishers.

- Spill response equipment such as booms, barriers, sweeps, absorbents, containers, etc.

For Fort Stewart, these procedures are documented in the Installation Spill Prevention, Control, and Countermeasures (SPCC) Plan and in an Installation Spill Contingency Plan.

4.2.4 Erosion and Sediment Control Practices

Erosion is a natural process in which soil and rock material is loosened and removed by wind or water. Sedimentation occurs when soil particles are suspended in surface runoff and deposited in streams and other water bodies. Areas subject to erosion include areas where, for whatever reason, soil is exposed and is subject to removal by wind and/or water. These could include: soil stockpiles; stream banks; steep slopes; and construction and demolition areas.

Methods used to limit and control erosion include:

- Leaving as much vegetation on site as possible.
- Minimizing the time that soil is exposed or stabilizing the disturbed soils as soon as possible.
- Preventing runoff from flowing across disturbed areas (diverting flow).
- Slowing down the runoff flowing across the site.
- Providing vegetated drainage ways for the increased runoff (using grass swales rather than concrete drains).

The 2012-GA IGP Requirements (Part 2.1.2.5) require the SWP3 to identify industrial areas with high erosion potential and develop BMPs to limit erosion. Some Army Installations, as a result of the types of activities that occur on the site (i.e., training, ordnance detonations, earth-moving operations), have Erosion and Sedimentation Control Plans (E&SCPs) that address most of the SWP3 requirements. However, a SWP3 shall address only erosion/sedimentation issues directly related to the regulated industrial activities.

The USEPA and State of Georgia require that a SWP3 be developed and implemented for any construction site conducting land-disturbing activities impacting 1.0 or more acres of land. FS/HAAF’s Environmental Division has prepared specific guidelines for implementing erosion and sediment pollution controls at construction sites. The guidance titled “Construction Site Runoff Control” address three size categories of construction activities depending on the area that is disturbed—5,000 s/f or greater, 0.75 acres or greater, and any sites 50.0 acres or greater of land disturbance at one time. Additionally, a guidance titled "Post-Construction New Development and Re-Development" addresses the requirements for post-construction structural BMPs for projects 5,000 s/f or greater as required with the Department of Defense 2010 requirements for implementation of Energy Independence and Security Act-Section 438 (DoD EISA-Section 438) for stormwater runoff reduction of the 95th percentile rain event, water quality, aquatic and flood protection. A copy of the guidance is provided in Appendix D

4.2.5 Management of Runoff

Although USEPA lists management of runoff as a baseline BMP, this is generally associated with some type of structural control, or advanced BMP. Samples of nonstructural controls would be the use of silt fence, Belted Silt Retention Fence system, sand bags, waddles, Filtrexx Filter Soxx, or other easily movable items for use in runoff control. Structural or advanced BMPs are discussed in Section 4.4. As previously noted Fort Stewart has a guidance titled "Post-Construction New Development and Re-Development" which addresses the requirements for post-construction structural BMPs for management of runoff to be implemented for projects which addresses the State and Federal stormwater runoff reduction, water quality, aquatic and flood protection. A copy of the guidance is provided in Appendix D.

4.2.6 Employee Training

Several types of training can be used to inform and train employees on stormwater pollution prevention. In-house training for proper equipment operation and maintenance, material and waste storage practices, and good housekeeping procedures, for example, can be excellent sources of pollution prevention information. Training shall be documented, and the SWP2 team shall develop a schedule for training activities required to meet the goals of the SWP3. The Environmental Division Chief will perform a key role in implementing training. To avoid redundancy, the training of Installation personnel for existing plans such as the Installation Spill Contingency Plan/Spill Prevention Control and Countermeasure Plan (ISCP/SPCCP) shall satisfy certain components of the SWP3 (e.g., spill prevention and response). Materials handling training of Installation personnel provided in Right-To-Know regulations and hazardous waste contingency training shall satisfy certain components of the SWP3 (e.g., material management practices). Monthly safety meetings also provide a good forum for disseminating information to fulfill stormwater training requirements. Fort Stewart has, implemented, an ECO training program which is given five (5) times per year.

4.2.7 Recordkeeping and Reporting

Records of employee training, inspection documentation, material inventory printouts, spill records, and other important information are integral to the implementation of the SWP3. Spills, leaks, and other incidents that could potentially impact stormwater should be reported to the Environmental Division as soon as possible. A detailed discussion of this requirement is provided in Section 6.0.

4.3 Inventory of Baseline BMPs

As part of the SWP3, an inventory of existing baseline BMPs at Fort Stewart was completed. Descriptions of the existing and recommended baseline BMPs for each of the regulated industrial activities are detailed in the individual site-specific assessments provided in Appendix G-Activity Specifics SWP3s.

4.3.1 Good Housekeeping/Preventative Maintenance

The following Good Housekeeping/Preventative Maintenance (GH/PM) program has been implemented at Fort Stewart industrial facilities. The GH/PM Program includes certain implementation elements and is combined with the visual inspection program. At each industrial activity, the GM/PM coordinator is the Environmental Compliance Officer (ECO) for that activity.

4.3.1.1 Responsibilities of the GH/PM Coordinator

The responsibilities of the ECO are shown in Table 4.1. All documentation associated with GH/PM inspections, reports, or inventories shall be maintained by the ECO and at the Environmental Division.

4.3.1.2 Employee Awareness Program

The FS/HAAF SWP2 Team as part of their ECO training program developed an employee awareness program on good housekeeping practices, aimed at preventing or minimizing stormwater pollution. The program includes presentations and training on the effects of poor/good housekeeping practices on stormwater pollution. The Environmental Division is responsible for the continued development and implementation of the employee awareness plan. This program, as well as employee training, is presented at least five (5) times annually.

4.3.2 Visual Inspections Program

As part of the GH/PM program, a visual inspections program is maintained at each of the regulated activities that may contribute to stormwater pollution. The visual inspections program, based on the items shown in Table 4.2, includes the following major elements:

- Identification of conditions that may give rise to pollution of stormwater.
- Verification that measures used to eliminate or reduce stormwater pollution is working effectively.
- The Visual Inspections Program has two components. The first is an on-going inspection program to identify any condition that may give rise to contamination of stormwater runoff. Items to be inspected by the ECO include: stored vehicles (leaks), material storage areas, secondary containment/fuel truck containment berms, housekeeping pads, and any potential erosion problems. These inspections are documented and kept on the specific activities site by the ECO (daily, weekly, monthly visual inspections and secondary containment/housekeeping pads release logs).
- On a quarterly and annual basis, formal inspections are performed. Formal inspection checklists are used to document the inspection of all applicable potential stormwater pollution sources. Additionally, non-stormwater discharges are assessed during the site specific Industrial Activity Specific Annual Comprehensive Compliance Inspections and documented accordingly. The formal visual inspections are performed by the Environmental Division and ECO.
- The Environmental Division, to aid the ECO in performing their visual inspection, developed a one page daily stormwater checklist streamlined to incorporate tables 4.1 and 4.2.

4.3.3 Spill Prevention and Response

A Spill Prevention, Control, and Countermeasures (SPCC) Plan is available for FS/HAAF and is managed by the Environmental Division. The Installation maintains a spill log and has a Spill Contingency Plan (SCP) Handbook, which outlines spill response procedures.

4.3.4 Erosion and Sediment Control

The 2012-GA IGP Part 2.1.2.5 requires the SWP3 to identify areas with a significant potential for erosion, as well as develop BMPs to provide erosion control and stabilization. FS/HAAF utilizes the U.S. Army Corps of Engineers-Low Impact Development Guidance, Georgia Stormwater Management Manual/Coastal Stormwater Supplement, Georgia Soil and Water Conservation Commission, and Natural Resources Conservation Services Sediment and Erosion Pollution Control Plans for all construction sites. Under normal operating circumstances, there does not appear to be a significant potential for erosion at the regulated industrial activities at the Installation. As part of the visual inspections program, the ECO and/or Environmental Division check their respective activities and surrounding areas for any potential erosion problems.

4.4 <u>Advanced Best Management Practices</u>

This section identifies advanced BMPs currently in place, as well as additional recommended advanced BMPs in areas where they are needed.

4.4.1 Inventory of Advanced BMPs

An inventory of site-specific existing and planned advanced BMPs at HAAF was developed based on observations made during the site reassessment. In addition to the baseline BMPs in the SWP3, the SWP2 Team will implement advanced BMPs, which are specifically developed to address particular pollutant sources or activities, such as containment for fuel tanker trucks, housekeeping pads for ASTs and curbing of washracks. Factors that will be considered in the implementation include:

- Cost and effectiveness
- Opportunities for reductions in quantity of pollutants, reuse, and recycling of materials.
- Low Impact Development (LID) where and when applicable.

Descriptions of the existing, planned, and recommended advanced BMPs for each of the regulated industrial activities are detailed in the individual site-specific assessments provided in Appendix G-Master SWP3-Activity Specific SWP3s Volume II.

TABLE 4.1
RESPONSIBILITIES OF THE ENVIRONMENTAL COMPLIANCE OFFICER

- Each building or facility at Fort Stewart where activities result or can result in discharges of pollutants to stormwater from an industrial activity will designate a Soldier or Civilian employee as the Environmental Compliance Officer.

- Good housekeeping activity coordination will be included in the job responsibilities of the designated Soldier or Civilian employee. The duties of the Environmental Compliance Officer will include:

(1) ECOs will conduct daily, weekly and monthly informal inspections of equipment, materials, and systems at each building/facility and surrounding areas that are subject to potential leaks or spills. These inspections will be recorded on a weekly inspection log (such as that shown in Appendix E). Unless deficiencies are noted, this will be the only documentation provided in conjunction with the weekly inspection. The daily, weekly and monthly inspection should include an inspection of the following equipment:

  - Pipes
  - Storage tanks and secondary containments berms
  - Process and material handling equipment
  - Stormwater management devices (oil/water separators; catch basins; and other structural BMPs; ensure secondary containment & housekeeping pad stormwater release logs are utilized)
  - Pumps
  - Pressure vessels

(2) ECOs will perform the Quarterly formal inspections of each building/facility and surrounding areas with the ENRD RCRA or Stormwater Compliance Officers using the checklists attached in Appendix E. Inspections will be documented on these checklists and kept on file for a minimum of three (3) years at each industrial activity.

(3) ECOs will perform the Comprehensive Annual Stormwater Inspections with the ENRD Stormwater Compliance Officer, conducting an annual inventory of chemical substances present in the building/facility. This inventory will meet the requirements of the OSHA-required inventory of chemicals and toxic substances and for any updates to the Activity Specifics which is required.

(4) ECOs will maintain a current file of the Material Safety Data Sheets (MSDS), and labeling each container of chemical substances in the building/facility with the proper label as designed by the U.S. Department of Transportation (DOT) regulations.

(5) ECOs will ensure the labeling of chemical containers will be in accordance with OSHA, EPA, DOT, and other applicable Federal, State, or Local requirements. The ECOs shall have access to these documents as needed.

(6) ECOs will maintain a log of the daily, weekly and monthly informal inspections within the building/facility. Reports on the inspections as requested by the DPW will be prepared by the Environmental Compliance Officer.

(7) ECOs will redline Activity Specifics, preparing an inventory of each facility's systems and equipment that, upon failure, could result in discharges (leaks or spills) of potential stormwater pollutants is current.

(8) During the Comprehensive Annual Stormwater Compliance Inspections any redlines of the SWP3 Activity Specifics will be gathered from the ECO and/or documented by ENRD to update existing plans and mapping of the facilities. Updates of each facility will be provided to the ECO for compliance record upon completion.

TABLE 4.2
GOOD HOUSEKEEPING/PREVENTATIVE MAINTENANCE
ENVIORNMENTAL COMPLIANCE OFFICER
INSPECTION GUIDELINES

Use these guidelines during the informal and formal inspections.

* The informal inspections will be visual and will be only need to be documented in a permanent log showing date of inspection, name of inspector, deficiencies, and corrective action. These informal inspections should be kept for a period of three (3) years as required under the General Industrial Permit.

* The formal inspections will be documented in a checklist report, listing each piece of equipment or system at the facility inspected and any deficiencies noted. The ENRD will prepare a report on the inspections and will provide a copy to the Environmental Compliance Officer. These inspections must be kept for a period of three (3) years as required under the General Industrial Permit.

GOOD HOUSEKEEPING

1. Are outside areas clean and organized?
2. Are drips or leaks from equipment or pipes being contained?
3. Is adequate space provided in work areas to minimize spills?
4. Is garbage removed regularly?
5. Are walkways and passageways easily accessible and free of materials that could be spilled?
6. Is there evidence of dust from painting, sanding, or other industrial activities?
7. Is a checklist for the cleanup procedures of spilled materials posted in the work area?
8. Are specific duties for good housekeeping included in each employee's work plan?
9. Are good housekeeping reminders and posters visible in work area?
10. Are the results of scheduled housekeeping inspections posted?
11. Are chemicals and wastes properly labeled?
12. Are Spill Kits located in areas where the greatest potential of a spill could be?
13. Are Spill Kits kept stocked of appropriate materials for spill cleanup (e.g. absorbent pads, booms, dry sweep, etc…)?

PREVENTATIVE MAINTENANCE

Inspect (and, if necessary, test) equipment that could result in leaks/spills, such as:

- Pipes;
- Storage tanks and secondary containment/berms;
- Process and material handling equipment;
- Stormwater management devices (such as oil/water separators or grease traps, secondary containment or housekeeping pads);

To ensure that the equipment is being properly maintained/repaired and for the detection of leaks or defects which could result in discharges of chemicals to stormwater.

5.0 IMPLEMENTATION AND MANAGEMENT

This section documents the management responsibilities of the FS/HAAF staff and the schedule and approach to meet the SWP3 implementation requirements.

5.1 SWP3 Implementation and Management

Continued implementation and management of the SWP3 takes place at the installation level. The key elements of the implementation phase include:

- Recommendation and installation of BMPs.
- Continued development and management of the training program.
- Scheduling of annual inspections and reviews.

Implementation and management of the SWP3 at FS/HAAF is required by 2012-GA IGP Part 5. Stormwater Pollution Prevention Plan, Part 5.4. Failure to implement the plan can result in severe civil penalties to the Army and officials responsible for the management of the SWP3. Fort Stewart employees responsible for implementing elements of the plan will be trained to carry out the delegated responsibilities. The responsibility for continued implementation of the SWP3 rests with the Chief of the DPW Environmental Division at Fort Stewart. A summary of the implementation elements is shown in Table 5.1.

5.2 Staff for Implementation of BMPs Plan

The staff responsible for the continued implementation and management of the plan is outlined below. Individual responsibilities for the continued implementation and management of the BMPs plan at FS/HAAF will be as follows:

- The FS/HAAF Directorate of Public Works will have overall responsibility for continued implementation and management of the SWP3.

- The Environmental Division and/or a qualified contractor will be responsible for monitoring the continued implementation of all phases of the plan, paying particular attention to schedules and timetables.

- Units/activities commanders, managers, tenant organizations, or directors within FS/HAAF will provide the required staff within each building or facility to attend training and implement elements of the BMPs plan as proposed in this SWP3.

5.3 Baseline BMPs and Advanced BMPs Implementation

Implementation schedules for the new recommended Baseline and Advanced BMPs at FS/HAAF are summarized in Table 5.2.

5.4 Employee Training

Employee training programs have been implemented at Fort Stewart to inform personnel at all levels of responsibilities regarding the components and goals of the SWP3. Training has been and will continue to be conducted annually, due to personnel turnover. The training addresses each component of the SWP3; including how and why tasks are to be implemented. The training will also be documented. The implementation checklist in Table 5.1 broadly outlines training programs for each of the following activities:

* Spill prevention and response
* Good housekeeping
* Material management practices

Appendix J provides a detailed outline of the training program daily schedule developed by the Fort Stewart Environmental Division for the ECO Course.

TABLE 5.1

OUTLINE OF THE IMPLEMENTATION PHASE

A. Implement appropriate controls:

1. Develop a schedule for implementation.

3. Assign specific individuals with responsibility for implementing aspects of the plan and/or monitoring implementation.

4. Ensure that the Installation Commander approves of the implementation schedule and strategy, and schedule regular times for reporting progress to the Installation Commander (Environmental Quality Control Committee-Meetings Quarterly).

B. Continue to provide employee training in the following areas:

1. Spill prevention and response
   - Identify potential spill areas and drainage routes, including information on past spills and causes.
   - Report spills to appropriate individuals, without penalty.
   - Specify material handling procedures and storage requirements.
   - Implement spill response procedures.

2. Good housekeeping
   - Require regular vacuuming and/or sweeping.
   - Promptly clean up spilled materials to prevent polluted runoff.
   - Identify places where brooms, vacuums, absorbents, foams, neutralizing agents, and other good housekeeping and spill response equipment are located.
   - Display signs reminding employees of the importance and procedures of good housekeeping.
   - Discuss updated procedures and report on the progress of practicing good housekeeping at every meeting.
   - Provide instruction on securing drums and containers, and frequently checking for leaks and spills.
   - Outline a regular schedule for housekeeping activities to allow you to determine that the job is being done.

3. Material management practices
   - Neatly organize materials for storage.
   - Identify all toxic and hazardous substances stored, handled, and produced on site.

C. Continued Implementation of the Training Program:

1. Take into account how often the employees at the facility should be trained
   - Complexity of management practices.
   - Existing environmental training program.

2. Regularly evaluate the effectiveness of employee training.

TABLE 5.2 IMPLEMENTATION SCHEDULE FOR BASELINE BMPs	
BASELINE BMP [1]	**IMPLEMENTATION SCHEDULE (After Plan Approval)**
GOOD HOUSEKEEPING/PREVENTATIVE MAINTENANCE	
Provide drip pans for vehicles at the DPW Motor Pool, as needed	On-going
Create an SOP for the use of vehicle wash racks and steam cleaning areas	Completed 2008-2009; reference Evaluation and Recommendations for Washracks-FS/HAAF
Provide stormwater pollution literature to activities and to outlaying communities (public awareness)	On-going
Develop SOP for prompt cleanup of spilled materials	On-going
SPILL PLANNING AND RESPONSE	
Post spill response procedures at all Motor Pools and POL Storage Area	On-going
Provide spill response training	ECO/ECNCO Courses-5 times annually
Provide spill kits at all motor pools and POL storage areas.	On-going
OTHERS	
All other baseline BMPs should be initiated immediately unless currently ongoing.	On-going

[1] These BMPs are already being practiced at FS/HAAF. This Master SWP3 formalizes the implementation schedule and ensures that all Industrial Activities will continue to implement the baseline BMPs.

6.0 EVALUATION/MONITORING

The objective of this section is to document the mechanisms that are used at FS/HAAF in evaluating the management of the SWP3. The plan will be reviewed annually and updated as necessary. The reviews and potential updates are required, and can be accomplished by the Environmental Division, the SWP2 Team, or by a contractor.

6.1 SWP3 Compliance

As required by the 2012-GA IGP, the SWP3 will be evaluated and updated regularly. The Environmental Division will evaluate the information collected during the year and identify or eliminate appropriate BMPs. The following tasks will be the responsibility of the Environmental Division:

- Evaluations of industrial sites to determine if regulatory requirements apply after implementation of BMPs. In some instances, application of effective BMPs could result in the prevention of stormwater discharges to surface waters, eliminating the regulatory requirements on the activity/facility documenting compliance with the non-exposure exemption. For example, roofing an area exposed to rainfall, or berming a site and providing a recovery system for spilled materials, can eliminate the need for regulation.

- Maintenance of all inspections and reports, and revisions to the plan as needed.

An outline of the evaluation/monitoring steps is shown in Table 6.1.

6.2 SWP3 Updates

The SWP3 at HAAF shall be reviewed at a minimum annually (see Section 6.3), and amended as required per 2012-GA IGP, depending upon the frequency of operational or equipment changes. The Environmental Division will be responsible for conducting or coordinating the review internally or through qualified consultants. Any formal updates of the SWP3 will require re-certification.

In addition, the SWP3 will be amended whenever there is a major change in design, construction, operation, and/or maintenance of "industrial activities" which may impact the potential discharge of stormwater pollutants. The Environmental Division will also periodically review the plan to determine its compliance with conditions of the 2012-GA IGP and other environmental or regulatory permits.

6.3 Comprehensive Annual Compliance Evaluation

A comprehensive annual compliance evaluation of the stormwater drainage system associated with individual activities discussed in this plan will be conducted by the Environmental Division or a qualified contractor to determine if any pollutants are entering the storm drainage system. The first inspection will be completed no later than 12 months after implementation of the plan, and will include the following elements:

- Physical inspections of stormwater drainage areas for evidence of pollution entering the drainage system.
- Identification of any non-stormwater discharges (NSDs) not detected or not occurring during the initial certification. Additionally, non-stormwater discharges are assessed during the site specific Industrial Activity Specific Annual Comprehensive Compliance Inspections and documented accordingly.
- Where applicable sampling any NSDs and analyzing the samples for a schedule of parameters dictated by the potential pollutants in the outfall.
- Identification, inspection, and review of the performance of existing structural and non-structural BMPs at the Installation to determine their efficiency in reducing discharges of any pollutants.
- Evaluate the effectiveness of BMPs to reduce pollutant loadings.
- Determination of any new or changed regulations that may affect the outcome of the inspection, and their incorporation into the plan.
- Prepare a report summarizing inspection results and follow-up actions, the inspection date, personnel conducting the inspection, incidents of noncompliance or certification of individual activity compliance with the plan (see table 6.2)
- Sign the report, and store it with the Master SWP3.

In addition to the annual comprehensive site compliance evaluation a quarterly site compliance evaluation is required under 2012-GA IGP--GAR050000 Part 4.1.1, a copy of the report form is included as table 6.3.

6.3.1 Reports of Inspections

Each site specific industrial activity at HAAF shall be evaluated or inspected, at a minimum, annually. To monitor and provide a record of evaluations/inspections, findings shall be recorded on the following Evaluation/Inspection Report form (Table 6.2). The evaluation/inspection and any subsequent maintenance activities performed shall be documented, recording date and time of the inspection, individual (s) making the inspections, and a narrative description of the activity's pollution control equipment, operations, and stormwater conveyance system. The Chief of the Environmental Division, or his/her designated representative—Stormwater Program Manager, will sign the annual compliance evaluation/inspection report. Copies will be kept at the Environmental Division offices, and are subject to review by Federal and State regulators.

6.3.2 SWP3 Post-Inspection Revisions

Revisions to the Activity Specific SWP3 (s) must be made within thirty (30) days after completion of the field inspection to be in compliance with the 2012-GA IGP. The Environmental Division will revise the plan to document potential stormwater pollution sources and descriptions of any control measures needed. The revised activity specific plan (s) will be submitted to the SWP2 Team within 30 calendar days after the field inspection is completed for review.

6.3.3 Changes to BMPs

Within sixty (60) days after the field inspection is completed, the Environmental Division will implement, or begin implementation of, any necessary changes in BMPs, additional BMPs, or other pollution prevention measures deemed necessary following the inspection and changes to the SWP3. Funding resources or any authorization that must be obtained outside the Installation, however, may affect the implementation schedule.

6.4 Record Keeping and Internal Reporting

The management of the SWP3 requires detailed documentation; otherwise, Fort Stewart may be subject to penalties by the State and Federal regulators. A separate filing system is maintained for management of the SWP3. Key items in the filing system are discussed in Section 6.4.1.

Record keeping is an important element of the HAAF SWP3. Analysis of past incidents can help to detect problems and prevent similar incidents. The Environmental Division is responsible for keeping all records relative to the SWP3, its implementation, compliance, reviews, updates, and reports.

6.4.1 Purpose and Types of Records

Record keeping of SWP3 activities at HAAF includes:

- Updated copies of the plan.
- Supporting documents to the plan, including field notebooks, drawings and maps.
- Records of stormwater quality flow data and outfall monitoring (Appendix H/ Volume III)
- Records of annual review, inspections, certifications, and updates.
- Records of employee training.
- Records of any correspondence from Federal and state regulators concerning the plan and its implementation.
- Any other document pertinent to the plan deemed necessary by the Environmental Division.

6.4.2 Records of Spills

Incidents of spills or other discharges of pollutants must be reported as part of the compliance phase. Records of spills, leaks, or other discharges at HAAF are maintained as part of the SPCC Plan (refer to section 3.8), for one year after expiration of the stormwater permit, and are reviewed to determine if they meet the following SWP3 requirements:

- Date, time, weather, duration, cause, environmental problems, response procedures, parties notified, recommended revisions to BMPs, changes in operating procedures and/or equipment to avoid future similar incidents.

- A formal written report as described in 40 CFR 117.3 (Determination of reportable Quantities) and 40 CFR 302.4 (Designation of Hazardous Substances).

- A checklist of procedures to notify appropriate FS/HAAF personnel, including names and telephone numbers (office and home).

TABLE 6.1
COMPONENTS OF THE EVALUATION/MONITORING PHASE

A. Annual Site Inspection/BMP Evaluation

1. Inspect stormwater drainage areas for evidence of pollutants entering the drainage system.
2. Evaluate the effectiveness of measures to reduce pollutant loadings and to determine whether additional measures are needed.
3. Observe structural measures, sediment controls, and other stormwater BMPs to ensure proper operation.
4. Inspect any equipment needed to implement the plan, such as spill response equipment.
5. EPA requirements state that the plan is to be revised as needed within 30 days of inspection.
6. Implement, or begin implementation, any necessary changes associated with baseline BMPs in a timely manner, but at least within 60 days of the inspection.
7. Prepare a report summarizing inspection findings and follow-up actions, the date of the inspection, and personnel who conducted the inspection.
8. Identify any incidents of noncompliance or certify that the facility is in compliance with the plan.
9. All incidents of noncompliance must be documented in the inspection report; where there are no incidents of noncompliance, the inspection report must contain a certification that the facility is in compliance with the plan.

B. Recordkeeping and Internal Reporting Procedures

1. Spills, leaks, and other discharges.
   a. The date and time of the incident, weather conditions, duration, cause, environmental problems, response procedures, parties notified, recommended revisions of the BMP program, operating procedures, and/or equipment needed to prevent recurrence.
   b. Formal written reports.
   c. A list of procedures for notifying the appropriate installation personnel, and the names and telephone numbers of the responsible employees.
2. Inspections and maintenance activities logs.
   a. Field notebooks.
   b. Timed and dated photographs.
   c. Video tapes.
   d. Drawings and maps.
3. Keeping records updated.
   a. The correct name and address of the facility.
   b. The correct name and location of receiving waters.
   c. The number and locations of discharge points.
   d. Principal products and production rates (where appropriate).

C. Plan Revisions

1. Ensure compliance with any permit conditions that apply to the facility.
2. Provide accurate representation of facility features and operations.

Table 6.2
Stormwater Pollution Prevention Plan (SWP3)
Annual Comprehensive Site Compliance Evaluation/Inspection Report

SECTION 1: Evaluation Information	
Installation: HAAF, GA **Unit:** **Master SWP3 Part Number:** **Evaluation Date:** **Evaluation Completed By:** **Activity POC:**	
SECTION 2: Annual Site Evaluation Findings	
Finding #1:	
Action Required:	
Finding #2:	
Action Required	
Finding #3	
Action Required	
Finding #4	
Action Required	

Table 6.2 Contd.
Storm Water Pollution Prevention Plan (SWP3)
Annual Comprehensive Site Compliance Evaluation/Inspection Report

Evaluation Date:

Unit:

SECTION 3: Corrective Actions: (The Environmental Compliance Officer (ECO) shall, for each violation listed in Section 2, indicate the corrective action taken and the date of completion and/or implementation)	
Item 1: **Corrective Action**	**NOTE Example: Env Div will supply the ECO w/sketch of design, for temporary containment.**
Item 2: **Corrective Action**	
Item 3: **Corrective Action**	
Item 4: **Corrective Action**	
The ECO's signature indicates that the above corrective actions have been implemented. Corrective actions should be designed to prevent future recurrence of the items listed in Section 2, Page 1. ____________________ ____________________ __________ ECO Name (Please Print) ECO Signature Date	
SECTION 4: Summary of Quarterly Inspections This section provides a summary of quarterly inspections performed for the twelve month period prior to the annual evaluation.	
SECTION 5: Certification	
The undersigned hereby certifies and attest that the information contained in this report is accurate and to the best of my knowledge is true and complete. __Inspector____________________ ____ _________________ Name (Please Print) Stormwater Program (Signature) Date __ ___________________ ____ __________________ Name (Please Print) Stormwater Program Manager (Signature) Date	

The ECO is to sign Section 3 indicating corrective action(s) have been implemented for findings listed in Section 2, Page 1. After signing, the report is to be returned to the Stormwater Program Manager at the DPW, Environmental Division, Fort Stewart/HAAF. The Stormwater Program Manager will verify the corrective actions, sign Section 5, Page 2 for certification, and forward a completed copy of the report to the unit for inclusion in the Activity Specific SWP3. The original will be maintained with the Master SWP3 at the Environmental Division Fort Stewart/HAAF.

Table 6.3
Stormwater Pollution Prevention Plan (SWP3)
Quarterly Site Compliance Inspections Report

Installation: HAAF

Unit: **Example**

Building No.:

SWP3 Part Number:

Evaluation Date:

Evaluation Completed By: Environmental Stormwater Personnel

Findings and Corrective Actions

Finding	Corrective Action
No compliance violations observed.	No corrective action needed.

The ECO's validation indicates that the above corrective actions will be implemented. Corrective actions should be designed to prevent future recurrence of the listed findings.

Environmental Compliance Officer **ECO Validation Date**

Signature:

Summary of Quarterly Inspection Scores

1st Quarter:			
2nd Quarter:			
3rd Quarter:			
4th Quarter:			

The undersigned hereby certifies and attests that the information contained herein is accurate and to the best of his or her knowledge is true and complete.

Certified By **Certification Date**
Inspector

Signature:

Approved By **Approval Date:**
Stormwater Program Manager

Signature:

Note: The ECO is to sign indicating corrective action(s) will be implemented for findings listed. The Stormwater Program Manager at the DPW, Environmental Branch, Fort Stewart/HAAF will forward a completed copy of the report to the unit for inclusion in the Activity Specific SWP3.

Comments:

7.0 GENERAL REQUIREMENTS

7.1 Administrative Requirements

This section provides guidance on some of the administrative requirements to manage an effective SWP3. These requirements should be reviewed prior to conducting annual re-inspections and evaluations to ensure that all are addressed.

7.2 Schedule and Deadlines

FS/HAAF has a Georgia general National Pollutant Discharge Elimination Systems (NPDES) stormwater permit (2012- GA IGP No.GAR050000) for industrial activities. A copy of this permit is provided in Appendix A.

7.3 Signatures

The Master SWP3 is considered a compliance document, and must be certified by a key official of the Installation. The FS/HAAF Installation Commander, or his/her designee, will sign the plan. If the signature authority is to be delegated, this must be indicated in writing, and the authorization included in the plan. At FS/HAAF the Director of Public Works (DPW), DPW Environmental Division has been designated as the authorized authority to sign these documents as well as other compliance documents. There are potential civil and criminal penalties for submitting false information in the plan. The overall SWP3 certification is provided at the front of this document.

7.4 Plan Disposition and Public Access

A copy of the SWP3 will be kept at all times at the office of the Directorate of Public Works, Environmental Division. The plan shall be retained, along with reports of inspections, spills, etc., for a period of one year after expiration of the permit.

The SWP3 is considered a public document (under Section 308(b) of the Clean Water Act), and upon request through proper channels, copies will be provided to any organization or citizen. The following procedure will be used for open requests:

1. All requests must be written.

2. Any requests received through Federal or State regulatory agencies will be forwarded to the Environmental Division.

   a. Within 10 days after receipt of the request, the Environmental Division will submit a copy of the plan to the requestor, documented in a letter.
   b. A copy of the letter will be kept in the SWP3 files at the office of the Environmental Division.
   c. A copy will also be submitted to the regulatory agency that forwarded the request.

3. Requests received directly by the Installation will be forwarded to the Environmental Division. The Environmental Division will:

   a. Acknowledge receipt of the request in writing to the requestor within 5 days after receipt of the request.
   b. In the same communication, advise requestor that all requests for copies of the SWP3 must be forwarded to the appropriate Federal/State regulator.
   c. A copy of the letter to the requestor will be kept in the SWP3 files at the office of the Environmental Division.

7.5 Regulatory-Required Plan Modifications

State and Federal regulatory agencies, most likely the Georgia EPD, can require modifications to the plan. Changes required by the permitting authorities will usually be completed within 30 working days after receipt of request for modifications, depending on the scope of the modification and the availability of funds. A signed certification that the modifications have been completed will be prepared by the Environmental Division and submitted to the permitting authority by the Directorate of Public Works or by his/her designated representative.

APPENDIX A

HUNTER ARMY AIRFIELD STORMWATER GENERAL PERMITS

APPENDIX A-a

STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITIES GAR050000

APPENDIX A-b

STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES GAR100001-02

APPENDIX A-c

MUNICIPAL SEPARATE STORM SEWER SYSTEMS
AT MILITARY FACILITIES
STORMWATER PERMIT
GAG480000

APPENDIX B

INSTALLATION MAP WITH INDUSTRIAL ACTIVITIES
(In Pocket)

APPENDIX C

CONSTRUCTION SITE RUNOFF CONTROL GUIDANCE AND BEST MANAGEMENT PRACTICES-- EROSION & SEDIMENTATION CONTROLS

Fort Stewart/Hunter Army Airfield
Stormwater Guidance For Construction Site Runoff Control

1. The following Erosion and Sedimentation Control Standards shall apply to any land disturbance activity on Fort Stewart/Hunter Army Airfield which is not exempted from the O.C.G.A. 12-7-1 Georgia Erosion & Sedimentation Control Act, 1975 (amended 2003), and all waters entering the storm drain systems generated on any developed lands, reference; Federal Clean Water Act, and GA Water Quality Control-Chapter 391-3-6.03, and the National Pollutant Discharge Elimination System (NPDES) MS4 Permit Part IV. B.4.

2. General Provision

a. Plans for those land disturbing activities which are not excluded from this guidance shall contain provisions for application of soil erosion and sedimentation control measures and practices. The provisions shall be incorporated into the erosion and sedimentation control plans.

b. Soil erosion and sedimentation control measures and practices shall conform to the minimum requirements of 4.b. of this guidance. The application of measures and practices shall apply to all features of the site, including street and utility installations, utility rights of way, drainage facilities and other temporary and permanent improvements. Measures shall be installed to prevent or control erosion and sedimentation pollution during all stages of any land disturbing activity.

c. For construction projects, the design professional must inspect the initial sediment storage requirements and perimeter control best management practices (BMPs) which the design professional designed per the approved Erosion & Sedimentation Pollution Control Plan (E&SPCP) within seven (7) days after the installation. The design professional shall determine if these BMPs have been installed and are being maintained as designed. The design professional shall report the results of the inspection to the primary permittee within seven (7) days and the permittee must correct all deficiencies within two (2) business days of receipt of the inspection report from the design professional unless weather related site conditions are such that additional time is required.

3. Submission- Notice of Intent (NOI)

a. Any activity subject to a construction NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Directorate of Public Works (DPW) Environmental Division prior to the allowing of discharges to the MS4.

b. The "operator" and/or "owner" of any construction activity that is required to have a NPDES Permit to Discharge Stormwater Associated with Construction Activity shall submit a copy of the Notice of Intent (NOI) to the DPW Environmental Division Stormwater Program Manager, for review and coordination, to ensure Natural Resources Conservation Service or the

Soils District has "technical oversight" of the E&SPCP, prior to any submittals of the NOI as required to the Georgia Environmental Protection Division (GA EPD).

c. The copy of the NOI may be delivered either in person, email, or by mailing to:

DPW Environmental Division
Stormwater Program Manager
1550 Veterans Parkway, Bldg. 1137
Fort Stewart, Georgia 31314-4940
Russell.moncrief@us.army.mil

d. An "operator" and/or "owner" performing any land disturbance on FS/HAAF must have documentation of the State Erosion & Sedimentation certified personnel prior to commencement of any land disturbing activity and readily available at the project site.

e. An "operator" and/or "owner" is in violation of the NPDES Permitting and this erosion and sedimentation control standards if the "operator" and/or "owner" operates a facility that is discharging stormwater associated with a construction activity without having submitted a copy of the NOI to the DPW Environmental Division.

4. Minimum Requirements

No discharges shall cause violations of Georgia's in-stream water quality standards as provided by the Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03.:

a. Any entity or sub-contractor shall meet all requirements of the current State General Construction Permits and Erosion & Sedimentation Controls;

b. Any entity or contractor shall provide a plan that demonstrates use of BMPs, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the State Soil and Water Conservation Commission as of January 1 of the year in which the land disturbing activity was permitted to prevent or reduce the pollution of waters of Georgia.

c. Stripping of vegetation, re-grading and other development activities shall be conducted in a manner so as to minimize erosion;

d. Cut-fill operations must be kept to a minimum;

e. Development plans must conform to topography and soil type so as to create the lowest practical erosion potential;

f. Whenever feasible, natural vegetation shall be retained, protected and supplemented;

g. The disturbed area and the duration of exposure to erosive elements shall be kept to a practicable minimum;

h. Disturbed soil shall be stabilized as quickly as practicable;

i. Temporary vegetation or mulching shall be implemented as soon as practicable to protect all exposed areas not under active construction during development;

j. Permanent vegetation and structural erosion control practices shall be installed as soon as practicable;

k. To the extent necessary, sediment in run-off water must be trapped by the use of debris basins, sediment basins, silt traps, or similar measures until the disturbed area is stabilized. As used in this paragraph, a disturbed area is stabilized when it is brought to a condition of continuous compliance with the requirements of O.C.G.A. 12-7-1 et.seq;

l. Adequate provisions must be provided to minimize damage from surface water to the cut face of excavations or the sloping of fills;

m. Cuts (including ditches, trenches, swales, and etc.) and fills may not endanger adjoining property;

n. Fills may not encroach upon natural watercourses or constructed channels in a manner so as to adversely affect other facilities;

o. Grading equipment must cross flowing streams by means of bridges or culverts. When such methods are not feasible, the applicant shall include a provision in the erosion and sedimentation control plan showing how the crossings will be accomplished, provided that such crossings are kept to a minimum;

p. Land-disturbing activity plans for erosion and sedimentation control shall include provisions for treatment or control of any source of sediments and adequate sedimentation control facilities to retain sediments on-site;

q. There is established a 25 foot buffer along the banks of all state waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, except where the GA EPD determines to allow a variance that is at least as protective of natural resources and the environment, where otherwise allowed by the Director pursuant to O.C.G.A. 12-28, or where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion control measures are incorporated in the project plans and specifications, and are implemented; provided, however, the buffers of at least 25 feet established pursuant to part 6 of Article 5, Chapter 5 of Title 12, the Georgia Water Quality Control Act, shall remain in force unless a variance is granted by the Director as provided in this paragraph.

The following requirements shall apply to any such buffer:

(1) No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed state of vegetation until all land-disturbing activities on the construction site are completed. Once the final stabilization of the site is achieved, a buffer may be thinned or trimmed of vegetation as long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed;

(2) The buffer shall not apply to the following land-disturbing activities, provided that they occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream; cause a width of disturbance of not more than 50 feet within the buffer; and adequate erosion control measures are incorporated into the project plans and specifications and are implemented to prevent scouring of the banks:

(a) Stream crossings for water lines;

(b) Stream crossings for sewer lines;

(c) Stream crossings for fences

(3) The buffer shall not apply to the following land-disturbing activities for aerial utility lines at stream crossings, provided that:

(a) The new utility line right-of-way width does not exceed 200 linear feet,

(b) Utility lines are routed and constructed so as to minimize the number of stream crossings and disturbances to the buffer,

(c) Only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and

(d) Functional native riparian vegetation is re-established in any bare or disturbed areas within the buffer.

(4) The buffer shall not apply to the following land-disturbing activities for Stream crossings for roadway drainage culverts and bridges (for example) provided that:

(1) The GA EPD Approved Guidelines by Georgia Department of Transportation are utilized;

(a) Installation or maintenance of drainage structures classified as a culvert; cause a width of disturbance of not more than 50 feet within the buffer measured from the end of the culvert wing walls;

(b) Installation or maintenance of bridges; cause a width of disturbance of not more than 100 feet within the buffer measured from each end of the bridge.

The Plan shall include a description of the stream crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification.

Note any of the above requirements q. (1) thru (4) do not exempt the requirements for 404 wetland permitting.

5. Exemptions from Permitted Land Disturbing Activities

Although, an NOI is not required, the erosion & sedimentation control best management practices must be incorporated and utilized for any land disturbance. In addition, as required by the State, a minimum Level 1A Erosion & Sedimentation Certified Trained Individual must be on the site during any land disturbance activity.

a. Infrastructure construction projects that result in land disturbance of less than five (5) acres and **consist solely** of routine maintenance for the original purpose of the facility that is performed to maintain the original line and grade and the hydraulic capacity, as applicable. Ensuring as a minimum, implementation and maintenance of best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the State Soil and Water Conservation Commission as of January 1 of the year in which the land disturbing activity is being conducted.

In order to be eligible for this exemption the project must comply with the following conditions:

(1) No mass grading shall occur on the project,

(2) The project shall be stabilized by the end of each day with temporary or permanent stabilization and

(3) The project shall have duration of less than 90 calendar days.

b. Discharges of stormwater associated with railroad construction projects and emergency re-construction conducted pursuant to the Federal Railway Safety Act, the Interstate Commerce Commission Termination Act and which **consist solely** of routine maintenance for the original purpose of the facility that is performed to maintain the original line and grade and the hydraulic capacity, as applicable. The construction activity should, at a minimum, implement and maintain best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation consistent with the requirements of the Federal Railway Safety Act and applicable requirements of the Clean Water Act.

c. Construction work less than three-quarters (< 0.75) of an acre conducted **outside of the 25 foot buffer** along the banks of all State waters requiring a buffer: Any entity or sub-contractor that is responsible, either directly or indirectly, for the construction, installation, or maintenance of smaller structures or minor land disturbing activities (such as home gardens, landscaping, repairs, maintenance work, fences, storage buildings, concrete and asphalt repair work, parking lot expansions, sidewalks, access roads, guard towers, and other related activities which result in minor soil erosion). Ensuring as a minimum, the EISA-Section 438 federal requirements for new development and redevelopment are adhered to for projects 5,000 square feet or greater, and the implementation and maintenance of best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the State Soil and Water Conservation Commission as of January 1 of the year in which the land disturbing activity is being conducted.

In order to be eligible for this exemption the project must comply with the following conditions:

(1) No mass grading shall occur on the project,

(2) The project shall be stabilized by the end of each day with temporary and/or permanent stabilization and

(3) The project shall have duration of less than ninety (90) calendar days.

Note any of the above requirements or exemptions 5.a. thru 5.c. do not exempt the requirements for 404 wetland permitting, stream buffers, or EISA-Section 438.

BEST MANAGEMENT PRACTICES
EROSION & SEDIMENTATION CONTROLS

1.0 CONSTRUCTION SEQUENCING

The timing of land disturbing activities and installation of erosion and sedimentation control measures must be coordinated to minimize water quality impacts. In terms of major activities, the BMP system is typically installed in reverse order, starting with sediment capturing devices, followed by key runoff control measures and runoff conveyances, and finally involving major land clearing activities after the minimization and capture elements are in place. Often, construction operations which generate significant off-site sediment have failed to sequence activities in the proper order.

2.0 SURFACE STABILIZATION

2.1 Mulching

A protective blanket of straw or other plant residue, gravel, or synthetic material applied to the soil surface to minimize raindrop impact energy and runoff, foster vegetative establishment, reduce evaporation, insulate the soil, and suppress weed growth. Mulch provides immediate protection, and straw mulch is also typically used as a matrix for spreading plant seed. Organic mulches such as straw, wood chips, and shredded bark have been found to be the most effective. Straw typically requires some kind of tacking, such as liquid emulsions or netting. Netting may also be needed to hold mulch in place on slopes. Mats made from a wide variety of organic and synthetic materials are useful in establishing grass in channels and waterways, and they promote seedling growth. Mulching assists in the first, source reduction, and second, conveyance, stages of a BMP system.

2.2 Permanent Seeding

Establishment of perennial vegetative cover with seed to minimize runoff, erosion, and sediment yield on disturbed areas. Disturbed soils typically require amendment with lime, fertilizer, and roughening. Seeding should be done together with mulching. Mixtures are typically most effective, and species vary with preferences, site conditions, climate, and season. Permanent seeding assists in the first, source reduction stage of a BMP system.

2.3 Riprap

A layer of stone designed to protect and stabilize areas subject to erosion, slopes subject to seepage, or areas with poor soil structure. Riprap is used on slopes where vegetation cannot be established, channel slopes and bottoms, stormwater structure inlets and outlets, slope drains, streambanks (see STREAMBANK BMPs, click HERE), and shorelines. It should be a well-graded mixture of stone sizes, and should be underlain by a filter blanket of gravel, sand and gravel, or synthetic material to prevent soil movement into or through the riprap. Riprap can assist in all stages of a BMP system.

2.4 Sodding

Permanent stabilization of exposed areas by laying a continuous cover of grass sod. Sod is useful for providing immediate cover in steep critical areas and in areas unsuitable for seed, such as flowways and around inlets. Sod must be rolled over after placement to ensure contact, and then watered. Sodded waterways and steep slopes may require netting and pegging or stapling. Sodding assists in the first, source reduction, and second, conveyance, stages of a BMP system.

2.5 Surface Roughening

Roughening a bare, sloped soil surface with horizontal grooves or benches running across the slope. Grooves can be large-scale, such as stair-step grading with small benches or terraces, or small-scale, such as grooving with disks, tillers, or other machinery, or with heavy tracked machinery which should be reserved for sandy, non-compressible soils. Roughening aids the establishment of vegetative cover, improves water infiltration, and decreases runoff velocity, assisting in the first, source reduction, and second, pollutant transport, stages of a BMP system.

2.6 Temporary Gravel Construction Access

A graveled area or pad located at points where vehicles enter and leave a construction site, this BMP provides a buffer area where vehicles can drop their mud and sediment to avoid transporting it onto public roads, to control erosion from surface runoff, and to help control dust. This measure assists in the third, pollutant capture stage of a BMP system.

2.7 Temporary Seeding

Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary stabilization for erosion control on disturbed soils that will not be brought to final grade for more than approximately one month. Seeding is facilitated by fertilizing and surface roughening. Broadcast seeds must be covered by raking or chain dragging, while hydroseed mixtures are spread in a mulch matrix. Temporary seeding assists in the first, source reduction stage of a BMP system.

2.8 Topsoiling

Preserving and subsequently re-using the upper, biologically active layer of soil to enhance final site stabilization with vegetation. Topsoiling should not be conducted on steep slopes. Stockpiled soil should be contained with sediment barriers, and temporarily seeded for stability. Surfaces which will receive topsoil should be roughened just prior to spreading the soil to improve bonding. Spread topsoil should be lightly compacted to ensure good contact with the subsoil. Topsoil can act as a mulch, promoting final vegetation establishment, increasing water infiltration, and anchoring more erosive subsoils, assisting in the first, source reduction, and second, pollutant transport, stages of a BMP system.

3.0 RUNOFF CONTROL MEASURES

3.1 Runoff Diversion

A structure that channels upslope runoff away from erosion source areas, diverts sediment-laden runoff to appropriate traps or stable outlets, or captures runoff before it leaves the site, diverting it to locations where it can be used or released without erosion or flood damage. Diversions include graded surfaces to redirect sheetflow, diversion dikes or berms which force sheetflow around a protected area, and stormwater conveyances (swales, channels, gutters, drains, sewers) which intercept, collect and redirect runoff (USEPA, 1992). Diversions can be either temporary or permanent in nature. Temporary diversions include excavation of a channel along with placement of the spoil in a dike on the down gradient side of the channel, and placement of gravel in a ridge below an excavated swale. Permanent diversions are used to divide a site into specific drainage areas, should be sized to capture and carry a specific magnitude of design storm, and should be constructed of more permanent materials. A water bar is a specific kind of runoff diversion that is constructed diagonally at intervals across a linear sloping surface such as a road or right-of-way that is subject to erosion. Water bars are meant to interrupt the accumulation of erosive volumes of water through their periodic placement down the slope, and divert the resulting segments of flow into adjacent undisturbed areas for dissipation. Runoff diversions assist in the second, conveyance, stage of a BMP system.

4.0 RUNOFF CONVEYANCE MEASURES

4.1 Grass-Lined Channel

A swale vegetated with grass, which is dry except following storms and serves to convey specified concentrated stormwater runoff volumes, without resulting in erosion, to disposal locations. Typical uses include roadside swales, outlets for runoff diversions, site stormwater routing, and drainage of low areas. Channels should conform to the natural drainage patterns. Channels are not meant to collect sediment, as it will reduce their conveyance capacity. Lining with geotextile or other material is required if design flows are to exceed 2 feet per second. Channel vegetation should be allowed to establish before flows are introduced. Channels assist in the second, conveyance, stage of a BMP system

4.2 Hardened Channel

A channel with erosion-resistant linings of riprap, paving, or other structural material designed for the conveyance and safe disposal of excess water without erosion. Hardened channels replace grass-lined channels where conditions are unsuitable for the latter, such as steep slopes, prolonged flows, potential for traffic damage, erodible soils, or design velocity over 5 feet per second. Channels assist in the second, conveyance, stage of a BMP system.

4.3 Paved Flume

A small concrete-lined channel to convey water down a relatively steep slope without causing erosion. Flumes serve as stable, permanent elements of a stormwater system receiving drainage from above a relatively steep slope, typically conveyed by diversions, channels, or natural drainage ways. Setting the flume well into the ground is important, particularly on fill slopes. Some means of energy dissipation should be provided at the outlet, and an inlet bypass route should be available for extreme flows. Flumes assist in the second, conveyance, stage of a BMP system.

4.4 Temporary Slope Drain

Flexible tubing or conduit extending temporarily from the top to the bottom of a cut or fill slope for the purpose of conveying concentrated runoff down the slope face without causing erosion. These are generally used in conjunction with diversions to convey runoff down a slope until permanent water disposal measures can be installed. Temporary slope drains assist in the second, conveyance, stage of a BMP system.

5.0 OUTLET PROTECTION

5.1 Level Spreader

An outlet designed to convert concentrated runoff to sheet flow and disperse it uniformly across a slope without causing erosion. This structure is particularly well-suited for returning natural sheet flows to exiting drainage that has been altered by development, especially for returning sheet flows to receiving ecosystems such as wetlands where dispersed flow may be important for maintain pre-existing hydrologic regimes. The outlet's receiving area must be uniformly sloped and not susceptible to erosion. Particular care must be taken to construct the outlet lip completely level in a stable, undisturbed soil to avoid formation of an outlet channel and subsequent erosion. Erosion-resistant matting of some kind may be necessary across the outlet lip depending on expected flows. Alternative designs to minimize such channeling include hardened structures, stiff grass hedges, and segmenting discharge flows into a number of smaller, adjacent spreaders. The level spreader is often used as an outlet for runoff diversions. Level spreaders assist in the second, conveyance, stage of a BMP system.

5.2 Outlet Stabilization Structure

A structure designed to control erosion at the outlet of a channel or conduit by reducing flow velocity and dissipating flow energy. This should be used where the discharge velocity of a structure exceeds the tolerances of the receiving channel or area. Designs will vary based on discharge specifics and tail water conditions. A riprap-lined apron is the most commonly used practice for this purpose because of its relatively low cost and ease of installation. Riprap stilling basins or plunge pools should be considered in lieu of aprons where overfalls exit at the ends of pipes or where high flows would require excessive apron length. Outlet stabilization structures assist in the second, conveyance, stage of a BMP system.

6.0 SEDIMENT TRAPS AND BARRIERS

6.1 Block and Gravel Inlet Protection

A temporary sediment control barrier formed around a storm drain inlet by the use of standard concrete block and gravel, to filter sediment from stormwater entering the inlet prior to stabilization of the contributing area soils, while allowing use of the inlet for stormwater conveyance. The height of the barrier should allow overflow into the inlet and not let overflow bypass the inlet to unprotected lower areas. An alternative design eliminates the blocks and involves only a gravel doughnut around the inlet. This practice can be used in combination with other temporary inlet protection devices, such as excavation and fabric. Inlet protection structures assist in the third, capture, stage of a BMP system.

6.2 Excavated Drop Inlet Protection

A temporary excavated area around a storm drain drop inlet or curb inlet designed to trap sediment prior to discharge into the inlet. This practice allows use of the permanent inlet early in the development prior to stabilization of the contributing area soils. Frequent maintenance is required. This practice can be used in combination with other temporary inlet protection devices, such as fabric and block and gravel. Inlet protection structures assist in the third, capture, stage of a BMP system.

6.3 Fabric Drop Inlet Protection

A temporary fabric barrier placed around a drop inlet to help prevent sediment from entering storm drains during construction operations, while allowing use of the inlet for stormwater conveyance. The height of the barrier should allow overflow into the drop inlet and not let overflow bypass the inlet to unprotected lower areas. This practice can be used in combination with other temporary inlet protection devices, such as excavation and block and gravel. Inlet protection structures assist in the third, capture, stage of a BMP system.

6.4 Sediment Basin/Rock Dam

An earthen or rock embankment located to capture sediment from runoff and retain it on the construction site, for use where other on-site erosion control measures are not adequate to prevent off-site sedimentation. Sediment basins are more permanent in nature than sediment traps, and can be designed as permanent features of a development. Basins are most commonly used at the outlets of diversions, channels, slope drains, or other runoff conveyances that discharge sediment-laden water. Earthen basins should use barrel and riser discharge structures, while rock dams can be designed to discharge over the top of the embankment, where a crest should be constructed as the low point. Smaller gravel should line the inside face of the rock dam. Sediment basins and rock dams assist in the third, capture, stage of a BMP system.

6.5 Sediment Fence (Silt Fence)/Straw Bale Barrier

A temporary sediment barrier consisting of filter fabric buried at the bottom, stretched, and supported by posts, or straw bales staked into the ground, designed to retain sediment from small disturbed areas by reducing the velocity of sheet flows. Because silt fences and straw bales can cause temporary ponding, sufficient storage area and overflow outlets should be provided. Ends must be well-anchored (USEPA, 1993). Sediment fences and straw bale barriers assist in the third, capture, stage of a BMP system.

6.6 Sediment Trap

A small, temporary ponding basin formed by an embankment or excavation to capture sediment from runoff. Traps are most commonly used at the outlets of diversions, channels, slope drains, or other runoff conveyances that discharge sediment-laden water. It is important to consider provisions to protect the embankment from failure from runoff events that exceed the design capacity. Plan for non-erosive emergency bypass areas. Make traps readily accessible for periodic maintenance. High length-to-width ratios minimize the potential for short-circuiting. The pond outlet should be a stone section designed as the low point. Sediment traps assist in the third, capture, stage of a BMP system.

6.7 Sod Drop Inlet Protection

A permanent grass sod sediment filter area around a storm drain drop inlet for use once the contributing area soils are stabilized. This area is well-suited for lawns adjacent to large buildings. Inlet protection structures assist in the third, capture, stage of a BMP system.

6.8 Vegetated Filter Strip (VFS)

A low-gradient vegetated area that filters solids from overland sheet flow. VFSs can be natural or planted, should have relatively flat slopes, and should be vegetated with dense-culmed, herbaceous, erosion-resistant plant species. The main factors influencing removal efficiency are the vegetation type and condition, soil infiltration rate, and flow depth and travel time, which are affected by size of contributing area, and slope and length of strip. Channelized flows decreases the effectiveness of VFSs. VFSs are often used as buffers bordering on construction areas. Level spreaders are often used to distribute runoff evenly across the VFS (Dillaha, 1989; USEPA, 1993).

APPENDIX D

HUNTER ARMY AIRFIELD
COMPLETE ABOVEGROUND STORAGE TANK (AST) LISTING
78-- ASTs

Hunter Army Airfield (HAAF) Table 3.1.1b Facility Oil Storage Inventory and Tank Hazard Identification Aboveground Petroleum Storage Tanks as Fort Stewart Responsibilities on HAAF														
Tank ID #	Bldg #	Location	Product Stored	Tank Capacity (gallons)	Type Materials of Construction	Year Installed	Tank Status	Good Engineering Practice	Type of Failure	Lighting/ Fencing	Secondary Containment Capacity (gallons)	Secondary Containment Adequate? (Y or N)	Flow Direction Receiver	Containment Diversion Structure
100	100	Generator AST	Diesel	250	Double-walled steel in concrete	Unknown	Generator	Interstitial gauge, spill catchment basin, level gauge	Tank rupture	Y/Y	>250	Y	SE toward road and into storm water inlet along road	Double-Walled Tank
711	711	Water Tower Well	Diesel	250	Single-walled steel	Unknown	Recycling	Visual site gauge, spill catchment basin	Tank rupture	Y/Y	180	N	Surrounding area is grass. Catch basin approximately 5 feet down gradient.	Inadequate Steel Secondary Containment Dike
712	712	WWTP Generator	Diesel	250	Single-walled steel	Unknown	Recycling	Level gauge, interstitial leak view port, spill catchment basin	Tank rupture	Y/Y	>250	Y	East 10 feet to storm drain inlet	Double-Walled Tank
719	719	DPW Maintenance	Used oil	1,000	Double-walled steel in concrete	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	N/Y	>1,000	Y	Across pavement 100 feet to storm drain inlet along road	Double-Walled Tank
722-1	722	Hunter AAF PDO Yard (Hazardous Waste Facility)	Off-Spec JP-8 and Used Oil	18,000	Double-walled steel in concrete	Unknown	Recycling	Level gauge, Scully system on trucks	Tank rupture	Y/Y	27,071	Y	West approximately 500 feet to drainage ditch going northwest	Double-Walled Tank
722-2	722	Hunter AAF PDO Yard (Hazardous Waste Facility)	Off-Spec JP-8 and Used Oil	18,000	Double-walled steel in concrete	Unknown	Recycling	Level gauge, Scully system on trucks	Tank rupture	Y/Y	27,071	Y	West approximately 500 feet to drainage ditch going northwest	Double-Walled Tank

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722-3	722	Hunter AAF PDO Yard (Hazardous Waste Facility)	Off-Spec JP-8 and Used Oil	18,000	Double-walled steel in concrete	Unknown	Recycling	Level gauge, Scully system on trucks	Tank rupture	Y/Y	25,348	Y	West approximately 500 feet to drainage ditch going northwest	Double-Walled Tank
722-4	722	Hunter AAF PDO Yard (Hazardous Waste Facility)	Off-Spec JP-8 and Used Oil	18,000	Double-walled steel in concrete	Unknown	Recycling	Level gauge, Scully system on trucks	Tank rupture	Y/Y	25,348	Y	West approximately 500 feet to drainage ditch going northwest	Double-Walled Tank
722-5	722	Hunter AAF PDO Yard (Hazardous Waste Facility)	Used Antifreeze	5,000	Double-walled steel in concrete	Unknown	Recycling	Level gauge, Scully system on trucks	Tank rupture	Y/Y	22,392	Y	West approximately 500 feet to drainage ditch going northwest	Double-Walled Tank
802	802	Refuel AST on Flight line/Used by 224 MI	JP-8	1,000	Double-walled steel	Unknown	Mission Support	level gauge, spill catchment basin, interstitial gauge with alarm	Tank rupture	N/Y	>1,000	Y	South across pavement to roadside drainage inlet	Double-Walled Tank
830-1	830	Coast Guard	Diesel	6,000	Single-walled steel	Unknown	Mission Support	Level gauge, HLA, LLA, spill kit	Tank rupture	Y/Y	13,883	Y	Across pavement 50 feet to storm drain inlet along road	Concrete Dike (Fill port located outside secondary containment)

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830-2	830	Coast Guard	Diesel	6,000	Single-walled steel	Unknown	Recycling	Level gauge, HLA, LLA, spill kit	Tank rupture	Y/Y	13,883	Y	Across pavement 50 feet to storm drain inlet along road	Concrete Dike (Fill port located outside secondary containment)
830-3	830	Coast Guard	Used oil	650	Double-walled steel in concrete	Unknown	Recycling	Spill catchment basin, level gauge, interstitial monitoring port	Tank rupture	Y/Y	>650	Y	Inside a roofed and diked area, any water in the dike will be pumped out	Double-Walled Tank
830-4	830	Coast Guard	JP-8	650	Double-walled steel in concrete	Unknown	Recycling	Spill catchment basin, level gauge, interstitial monitoring port	Tank rupture	Y/Y	>650	Y	Inside a roofed and diked area, any water in the dike will be pumped out	Double-Walled Tank
830-5	830	Coast Guard	Gasoline	500	Double-walled steel in concrete	Unknown	Recycling	Spill catchment basin, level gauge, interstitial monitoring port	Tank rupture	Y/Y	>500	Y	Inside a roofed and diked area, any water in the dike will be pumped out	Double-Walled Tank
850-1	850	1-3 AVN	Used oil	250	Single-walled steel (very rusty)	Unknown	Recycling	Spill catchment basin	Tank rupture	N/Y	1,788	Y	South across tarmac, no storm water inlets visible	Concrete Dike
850-2	850	1-3 AVN	Off-spec JP-8	500	Single-walled steel (very rusty)	Unknown	Recycling	Spill catchment basin	Tank rupture	N/Y	2,287	Y	South across tarmac, no storm water inlets visible	Concrete Dike
850-3	850	1-3 AVN	Used Oil	650	Double-walled steel	Unknown	Recycling	Spill catchment basin, level gauge	Tank rupture	Y/Y	>650	Y	Pump truck	Inside concrete diked and roofed POL storage area

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850-4	850	1-3 AVN	Off-spec JP-8	650	Double-walled steel	Unknown	Recycling	Spill catchment basin, level gauge	Tank rupture	Y/Y	>650	Y	Pump truck vacuums out	Inside concrete diked and roofed POL storage area
850-5	850	1-3 AVN	Off-spec JP-8	500	Single-walled steel (very rusty)	Unknown	Recycling	Spill catchment basin	Tank rupture	N/Y	2,287	Y	South across tarmac, no storm water inlets visible	Inside concrete berm and roofed POL storage area
860-1	860	2-3 AVN	Used oil	250	Single-walled steel (very rusty)	Unknown	Recycling	Spill catchment basin	Tank rupture	N/Y	1,819	Y	North toward pavement, then across the tarmac toward the south	Concrete Dike (Drain valve is broken, tank is submersed in water and very rusty)
860-2	860	2-3 AVN	Off-spec JP-8	250	Single-walled steel (very rusty)	Unknown	Recycling	Spill catchment basin	Tank rupture	N/Y	1,819	Y	North toward pavement, then across the tarmac toward the south	Concrete Dike
931	931	Gas Station Shoppette	Diesel	Unknown	Unknown	Unknown	Generator	Visual site gauge inside	Tank rupture	Y/Y	Unknown	N	Grass and drainage ditch approximately 30 feet	Unknown
935	935	Gas Station Shoppette	Diesel	1,000	Single-walled steel	Unknown	Recycling	Visual site gauge, spill catchment basin	Tank rupture	Y/Y	224	N	Grass and drainage ditch approximately 30 feet	Inadequate Secondary Containment Dike
1013-1	1013	DPW Yard	#2 Diesel	2,400	Single-walled steel	Unknown	Recycling	Spill catchment basin	Tank rupture	Y/Y	20,624	Y	North to creek 5 feet immediately adjacent to dike	Concrete Dike

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1013-2	1013	DPW Yard	#2 Diesel	2,400	Single-walled steel	Unknown	Recycling	Spill catchment basin	Tank rupture	Y/Y	20,624	Y	North to creek 5 feet immediately adjacent to dike	Concrete Dike
1013-3	1013	DPW Yard	#2 Diesel	2,400	Single-walled steel	Unknown	Recycling	Spill catchment basin	Tank rupture	Y/Y	20,624	Y	North to creek 5 feet immediately adjacent to dike	Concrete Dike
1013-4	1013	DPW Yard	MOGAS	2,400	Single-walled steel	Unknown	Recycling	Spill catchment basin	Tank rupture	Y/Y	20,624	Y	North to creek 5 feet immediately adjacent to dike	Concrete Dike
1013-5	1013	DPW Yard	MOGAS	2,400	Single-walled steel	Unknown	Recycling	Spill catchment basin	Tank rupture	Y/Y	20,624	Y	North to creek 5 feet immediately adjacent to dike	Concrete Dike
1013-6	1013	DPW Yard	Used oil storage for OWS skimmer storage	250	Double-walled steel in concrete	Unknown	Recycling	Interstitial gauge, spill catchment basin, level gauge	Tank rupture	Y/Y	>250	Y	North to creek 5 feet immediately adjacent to dike	Double-Walled Tank
1034	1034	WWTP Pump for Generator	Diesel for Generator	250	Double-walled steel	Unknown	Mission Support	Interstitial gauge, spill catchment basin, level gauge	Tank rupture	Y/Y	>250	Y	North 10 feet to drainage ditch immediately adjacent	Double-Walled Tank
1128	1128	Oil Analysis Lab	Used oil from analyses	500	Single-walled steel	Unknown	Recycling	None	Tank rupture	Y/Y	1200	Y	Southwest across parking area then into storm drain inlet	Steel Box around tank (covered steel secondary containment)

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1130-1	1130	603rd ASB	Used oil	500	Double-walled steel	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	Y/Y	>500	Y	Southwest to parking lot and into storm drain	Double-Walled Tank
1130-2	1130	603rd ASB	Off-spec JP-8	1,000	Double-walled steel	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	Y/Y	>1,000	Y	Southwest to parking lot and into storm drain	Double-Walled Tank
1158	1158	603rd ASB	Off-spec JP-8	500	Double-walled steel	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	Y/Y	>500	Y	Southwest to parking lot and into storm drain	Double-Walled Tank
1203	1203	559TH QM	Used oil	1,000	Double-walled steel	Unknown	Recycling	Level gauge, interstitial gauge	Tank rupture	Y/Y	>1,000	Y	North 5 feet to wash rack ditch (tank is inside wash rack berm), then piped to OWS and to WWTP	Double-Walled Tank
1205	1205	Water Tower Pump House	Diesel	250	Double-walled steel	Unknown	Recycling	Level gauge, interstitial leak view port	Tank rupture	Y/Y	>250	Y	West toward storm drain that flows north under road	Double-Walled Tank
1253	1253	Flight line	Off-spec JP-8	500	Double-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial gauge	Tank rupture	Y/Y	>500	YY	East 100 feet to storm drain	Double-Walled Tank

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1288	1288	Auto Craft	Used oil	500	Double-walled steel	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	Y/Y	>500	Y	West across pavement then south into grass	Double-Walled Tank
1310	1310	1310	Used oil	500	Double-walled steel	Unknown	Recycling	Visual clock gauge, Interstitial alarm	Tank rupture	Y/Y	>500	Y	Bermed curb to contain flow over parking lot, concrete drainage ditch located 50 feet down gradient	Double-Walled Tank
1323-1	1323	Boiler Generator	Diesel	1,000	Double-walled steel	Unknown	Mission Support	Interstitial port, spill catchment basin, level gauge	Tank rupture	Y/Y	>1,000	Y	East 25 feet to drainage ditch	Double-Walled Tank
1323-2	1323	Sewage Lift Station	Diesel	500	Double-walled steel	Unknown	Mission Support	Interstitial gauge, spill catchment basin, level gauge	Tank rupture	Y/Y	>500	Y	East 50 feet to ditch	Double-Walled Tank
1327-1	1327	224 MI	Used oil	1,000	Double-walled steel	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	Y/Y	>1,0000	Y	West 100 feet across parking lot to ditch	Double-Walled Tank
1327-2	1327	224 MI	Used oil	500	Double-walled steel	Unknown	Recycling	Interstitial gauge with alarm, spill catchment basin, level gauge	Tank rupture	Y/Y	>500	Y	West 100 feet across parking lot to ditch	Double-Walled Tank

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1336-1	1336	Aviation Brigade Motor Pool	Off-spec JP-8	1,000	Double-walled steel (rusty)	Unknown	Recycling	Interstitial gauge with alarm, level gauge	Tank rupture	Y/Y	>1,000	Y	South 10 feet to ditch immediately adjacent	Double-Walled Tank
1336-2	1336	Aviation Brigade Motor Pool	MOGAS	500	Double-walled tank	Unknown	Recycling	Interstitial gauge, level gauge, spill catchment basin	Tank rupture	Y/Y	>500	Y	East 100 feet to drainage ditch	Double-Walled Tank
1336-3	1336	Aviation Brigade Motor Pool	Used oil	1,000	Double-walled tank	Unknown	Recycling	Interstitial gauge, level gauge, spill catchment basin	Tank rupture	Y/Y	>1,000	Y	East 100 feet to drainage ditch	Double-Walled Tank
1336-4	1336	Aviation Brigade Motor Pool	JP-8	5,000	Double-walled steel	Unknown	Recycling	Interstitial gauge, level gauge, spill catchment basin	Tank rupture	Y/Y	>5000	Y	East 200 feet to storm drain	Double-Walled Tank
1353	1353	260th QM Purge Facility	Used oil from wash rack (closed loop system)	6,000	Double-walled steel	Unknown	Recycling	Interstitial gauge, level gauge, spill catchment basin	Tank rupture	Y/Y	>6,000	Y	North 20 feet to storm drain inlet	Double-Walled Tank
1353	1353	260 QM Petroleum Laboratory	Off-spec JP-8	2,000	Double-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial gauge with alarm	Tank rupture	Y/Y	>2,000	Y	West into low lying asphalt covered area	Double-Walled Tank
1420-1	1420	260 QM Yard	Used oil	500	Double-walled steel	Unknown	Recycling	Audible overfill alarms	Tank rupture	Y/Y	>500	Y	West across pavement into storm water inlet	Double-Walled Tank

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Tank ID #	Bldg #	Location	Product Stored	Tank Capacity (gallons)	Type Materials of Construction	Year Installed	Tank Status	Good Engineering Practice	Type of Failure	Lighting/ Fencing	Secondary Containment Capacity (gallons)	Secondary Containment Adequate? (Y or N)	Flow Direction Receiver	Containment Diversion Structure
1420-2	1420	260 QM Yard	Off-spec JP-8	1,000	Double-walled steel	Unknown	Recycling	Audible overfill alarms	Tank rupture	Y/Y	>1,000	Y	West across pavement into storm water inlet	Double-Walled Tank
1420-3	1420	260 QM Yard	Off-spec JP-8	1,000	Double-walled steel	Unknown	Recycling	Audible overfill alarms	Tank rupture	Y/Y	>1,000	Y	West across pavement into storm water inlet	Double-Walled Tank
1440-1	1440	Tuttle Clinic	Used Oil	Unknown	Single-walled steel	Unknown	Recycling	None	Tank rupture	Y/Y	0	N	Storm water inlet 5 feet down gradient	None
1440-2	1440	Tuttle Clinic	Diesel	2,000	Unknown	Unknown	Recycling	Veeder Root Alarm	Tank rupture	Y/Y	Unknown	N	30 feet down gradient to storm water inlet	Unknown
7901	7901	Bravo 159 AVB	Used Oil	500	Double-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial gauge	Tank rupture	Y/Y	>500	Y	North 100 feet to storm drain	Double-Walled Tank
7902	7902	160th SOAR	Used Oil	1,000	Double-walled Fiber vault	Unknown	Recycling	level gauge, spill catchment basin, interstitial gauge with alarm	Tank rupture	Y/Y	>1,000	Y	North 50 feet to storm drain	Double-Walled Tank
8005-1	8005	3-160th SOAR	Used oil	1,000	Double-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>1,000	Y	Northwest toward forest	Double-Walled Tank
8005-2	8005	3-160th SOAR	Off-spec JP-8	995	Single-walled steel (very rusty)	Unknown	Recycling	Spill catchment basin	Tank rupture	Y/Y	0	N	Northwest toward forest	None

Hunter Army Airfield (HAAF) Table 3.1.1b														
Facility Oil Storage Inventory and Tank Hazard Identification														
Aboveground Petroleum Storage Tanks as Fort Stewart Responsibilities on HAAF														
Tank ID #	Bldg #	Location	Product Stored	Tank Capacity (gallons)	Type Materials of Construction	Year Installed	Tank Status	Good Engineering Practice	Type of Failure	Lighting/ Fencing	Secondary Containment Capacity (gallons)	Secondary Containment Adequate? (Y or N)	Flow Direction Receiver	Containment Diversion Structure
8045-1	8045	Engine Test Stand (AmCom)	JP-8	500	Double-walled steel	Unknown	Mission Support	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>500	Y	Southwest toward drainage ditch going northwest	Double-Walled Tank inside concrete dike
8045-2	8045	Engine Test Stand (AmCom)	JP-8	500	Double-walled steel	Unknown	Mission Support	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>500	Y	Northwest toward drainage ditch going northwest	Double-Walled Tank inside concrete dike
8050-1	8050	New Control Tower	Diesel	500	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial gauge	Tank rupture	Y/Y	>500	Y	West to drainage ditch	Double-Walled Tank
8050-2	8050	New Control Tower	Hydraulic Oil	100	Single-walled steel	2003	Mission Support	None	Tank rupture	Y/Y	0	N	Out door of building and across grass to the northwest	None
8090	8090	TVOR on the Flight line	Diesel	200	Double-walled steel	Unknown	Generator	Interstitial monitoring	Tank rupture	N/Y	>200	Y	Would pool locally	Double-Walled Tank
8212-1	8212	Golf Course	Diesel	250	Single-walled steel	Unknown	Mission Support	level gauge	Tank rupture	N/Y	202	N	Southeast 25 feet to drainage ditch	Inadequate Steel Secondary Containment
8212-2	8212	Golf Course	Diesel	1,000	Single-walled steel	Unknown	Mission Support	None	Tank rupture	N/Y	0	N	South 50 feet to drainage ditch	None
8212-3	8212	Golf Course	Unleaded Gasoline	500	Single-walled steel	Unknown	Mission Support	None	Tank rupture	N/Y	748	Y	West 15 feet to roadside ditch	Steel Secondary Containment

Hunter Army Airfield (HAAF) Table 3.1.1b														
Facility Oil Storage Inventory and Tank Hazard Identification														
Aboveground Petroleum Storage Tanks as Fort Stewart Responsibilities on HAAF														
Tank ID #	Bldg #	Location	Product Stored	Tank Capacity (gallons)	Type Materials of Construction	Year Installed	Tank Status	Good Engineering Practice	Type of Failure	Lighting/ Fencing	Secondary Containment Capacity (gallons)	Secondary Containment Adequate? (Y or N)	Flow Direction Receiver	Containment Diversion Structure
8632	8632	Ammo Supply	Diesel	250	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>250	Y	Northeast to drainage ditch	Double-Walled Tank
8654	8654	Sabre Hall-S. of B building	Diesel	250	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>250	Y	Would go toward the south and pool locally	Double-Walled Tank
8658	8658	Sabre Hall-S. of B building	Used oil	500	Double-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>500	Y	Northwest to storm drain	Double-Walled Tank
8674	8674	Sabre Hall	Diesel	250	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	>250	Y	West 150 feet to drainage ditch	Double-Walled Tank
8680	8680	Sabre Hall	Used oil	500	Single-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	0	N	West 100 feet to drainage ditch	None
9001	9001	Wilmington Island Outer Marker Generator	Diesel	250	Single-walled steel with some rust	Unknown	Generator	level gauge	Tank rupture	Y/Y	0	N	Flat area, grassy, would likely pool locally	None
8054 A	8054 A	Past Coast Guard	Diesel	250	Single-walled steel	Unknown	Recycling	level gauge, spill catchment basin, interstitial port	Tank rupture	Y/Y	0	N	Southwest to storm drain inlet	None

Hunter Army Airfield (HAAF) Table 3.1.1b Facility Oil Storage Inventory and Tank Hazard Identification Aboveground Petroleum Storage Tanks as Fort Stewart Responsibilities on HAAF														
Tank ID #	Bldg #	Location	Product Stored	Tank Capacity (gallons)	Type Materials of Construction	Year Installed	Tank Status	Good Engineering Practice	Type of Failure	Lighting/ Fencing	Secondary Containment Capacity (gallons)	Secondary Containment Adequate? (Y or N)	Flow Direction Receiver	Containment Diversion Structure
8054 B-1	8054 B	Control Tower	Diesel	6,000	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial port	Tank rupture	N/Y	>6,000	Y	South to storm drain inlet	Double-Walled Tank
8054 B-2	8054 B	Control Tower	Diesel	420	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial port	Tank rupture	N/Y	>420	Y	South to storm drain inlet	Double-Walled Belly Tank
8054 B-3	8054 B	Control Tower	Diesel	250	Double-walled steel	Unknown	Generator	level gauge, spill catchment basin, interstitial port	Tank rupture	N/Y	>250	Y	South to storm drain inlet	Double-Walled Belly Tank
8054 B-4	8054 B	Control Tower	Diesel	2,000	Double-walled steel	Unknown	Generator	level gauge, HLA, interstitial gauge, spill catchment basin	Tank rupture	N/Y	>2,000	Y	South to storm drain inlet	Double-Walled Tank

APPENDIX E

DPW POLICY #11--STORMWATER MANAGEMENT PROGRAM

2012 DPW POLICY LETTER #10--DRY DETENTION BASINS

POST-CONSTRUCTION STORMWATER MANAGEMENT GUIDANCE FOR NEW DEVELOPMENT AND RE-DEVELOPMENT

BEST MANAGEMENT PRACTICES
POST CONSTRUCTION CONTROL MEASURES
REFERENCE INFORMATION

IMSE-STW-PW

NOV 0 4 2011

MEMORANDUM FROM DPW

MEMORANDUM FOR CONTRACTORS AND TENANTS

SUBJECT: DPW Policy Letter # 11 - Stormwater Management Program

1. REFERENCES.

a. Federal Clean Water Act (CWA) at 33 U.S.C. §1251, *et seq;* and its implementing regulations found at 40 CFR § 122.26, *et seq*.

b. Section 438 of the Energy Independence and Security Act at 42 U.S.C. §17094.

c. Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, 5 October 2009.

d. Georgia Water Quality Control Act, O.C.G.A. §12-5-20, *et seq.*, and its implementing rules found at Ga. Admin. Comp. ch. 391-3-6, *et seq*.

e. Georgia Erosion & Sedimentation Control Act, O.C.G.A §12-7-1, *et seq.*, and its implementing rules found at Ga. Admin. Comp. ch. 391-3-7, *et seq*.

f. Deputy Under Secretary of Defense (Installations and Environment) Memorandum, DoD Implementation of Storm Water Requirements under Section 438 of the Energy Independence and Security Act, 19 January 2010.

g. AR 200-1, Environmental Protection and Enhancement, 13 December 2007.

2. APPLICABILITY. This policy is applicable to Contractors and Tenants on Fort Stewart/Hunter Army Airfield.

3. PURPOSE. To provide guidance on the Stormwater Management Program.

4. POLICY. The Installation's stormwater systems are regulated under National Pollutant Discharge Elimination System (NPDES) Permits, as defined in above references.

a. To protect water quality, the Installation is required to have a stormwater management program that reduces the discharge of pollutants from industrial activities, construction activities, and

IMSE-STW-PW
SUBJECT: DPW Policy Letter # 11 - Stormwater Management Program

the Municipal Separate Storm Sewer System (MS4) to the "maximum extent technically feasible."

b. For any new development and redevelopment that occurs on the Installation, the stormwater management program must include best management practices (BMPs) for construction site stormwater runoff control and post-construction stormwater management.

c. For new development or redevelopment of 5,000 sq ft or greater that occurs on the Installation, the stormwater management program must include, to the "maximum extent technically feasible," additional stormwater low impact development BMPs.

d. All personnel are required to comply with the Installation's Stormwater Management Plan, as detailed in the following documents located on the Team Stewart web site at http://www.stewart.army.mil/dpw/EN_Downloads.asp.

(1) Stormwater Pollution Prevention Plan (SWP3) for Industrial Activities

(2) Municipal Separate Storm Sewer Systems (MS4) Notices of Intent

(3) Illicit Discharge, Detection and Elimination (IDDE) Plan

(4) Stormwater Guidance for Construction Site Stormwater Runoff Control

(5) Post-Construction Stormwater Management Guidance for New Development and Redevelopment

(6) Stormwater Maintenance Standard Operating Procedures

5. PROPONENT. The DPW Environmental Division is the proponent for this policy at commercial (912) 767-2010.

ROBERT R. BAUMGARDT
Director, Public Works

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON, FORT STEWART / HUNTER ARMY AIRFIELD
DIRECTORATE OF PUBLIC WORKS
1587 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314

REPLY TO
ATTENTION OF

IMSH-PW

MEMORANDUM FOR CONTRACTORS

SUBJECT: DPW Policy Letter #10 – Dry Detention Basins (Revised 14 March 2012)

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 #13423 Energy Independence and Security Act-2007, and #13514 Federal Leadership in Environmental, Energy, and Economic Performance-2009; Section 438-Stormwater.

   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 memorandum replaces the former Policy Letter #10 and re-establishes the Directorate of Public Works policy concerning erosion and sedimentation controls, standards, and specifications for dry detention basins and stormwater controls for flooding.

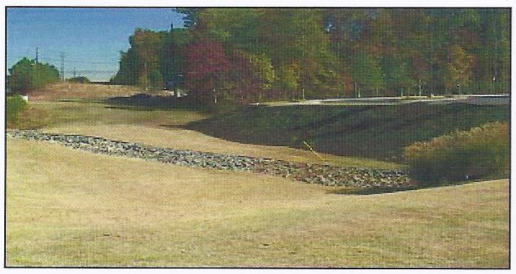
3. APPLICABILITY. This policy applies to all contractors and government employees at Fort Stewart and Hunter Army Airfield.

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.

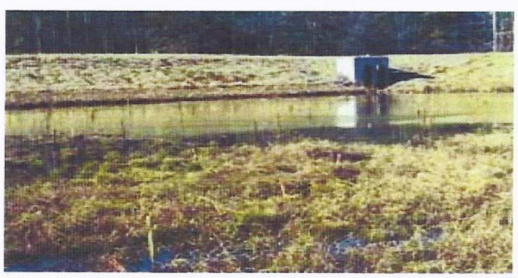
   a. Fort Stewart/Hunter Army Airfield (FS/HAAF) must comply with the State of Georgia National Pollutant Discharge Elimination Systems Permitting reference; the DPW Stormwater Policy #11, FS/HAAF Construction Site Runoff Control and FS/HAAF Post-Construction New-Redevelopment requirements which can be found with other Stormwater Management documents at the following web link: http://www.stewart.army.mil/dpw/EN_Downloads.asp .

   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 *Low Impact Development* (LID) and *Green Infrastructure* (LID/GI) stormwater control practices. The LID/GI approach focuses on disconnecting the impervious surfaces and intercepts and treats surface runoff at the source. LID/GI 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, which protect stream channels, and reduces downstream flooding. The objective of the LID/GI method is to reduce the volume of stormwater required to be detained and effectively improve water quality via the treatment train LID/GI BMPs.



Dry Detention Basins-Description:
A dry detention basin is a surface storage basin or facility designed to provide water quantity control through detention of stormwater runoff.



Extended Detention Basins (EDBs)-Description
An extended detention basin (EDB) is a basin designed to detain stormwater for many hours after storm runoff ends. This BMP is similar to a detention basin used for flood control, however; the EDB uses 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 (WQv) 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, 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 LID/GI 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 quantity management practices that may be used in coastal Georgia with LID/GI treatment trains include:

- Dry Detention Basins
- Extended Detention Basins

c. General Description

Dry detention basins or Extended Detention basins (EDBs) are surface facilities intended to provide for the temporary storage of stormwater runoff to reduce downstream water quantity 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 LID/GI structural control BMPs which provide treatment of the water quality volume requirements. 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:

e. Location

Dry detention and EDBs are to be located downstream of other LID/GI general application structural controls (*bioretention, sand filters, infiltration trench and enhanced swale*) which are typically used in combination with detention controls for treatment of the water quality volume (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 LID/GI 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 at 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 seasonable 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 the 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 from inlet to outlet 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.

f. 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 sized 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 LID/GI BMPs) water quality design volume (removal of Total Suspended Solids [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 volumes 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 than 3:1.

- The maximum depth of the basin should not exceed 4 feet. The final grade of the basin floor shall be no deeper than one (1) foot above seasonal high water table.

- Areas above the normal high water elevations of the detention facility should be sloped toward 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 WQv.

b) When portions of the watershed may 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 a concrete wall with a notch outlet should be constructed between the forebay and the main EDB.

d) Micropool EDBs: Micropool extended detention basins are a variation of the standard wet extended detention pond 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, ten 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, 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 one-thousand (1000) 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 best management practices are not permitted:

1) Man made "haybales"

2) The use of slotted board dams as a retrofit on less than 30 acres is not allowed. Instead, a perforated half-round pipe with a stone filter ring must be utilized.

g. Inlet and Outlet Structures

There are a wide variety of outlet structure types, the most common of which are, orifices, perforated risers, pipes/culverts, sharp-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 *Outlet Structures*.

Each of the above outlet types has a different design purpose and application:

1) 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.

2) 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 stabilized with flared riprap aprons, or the equivalent. A sediment forebay sized to 0.10 inches per impervious acre of contributing drainage should be provided for dry detention and EDBs that are in a treatment train with off-line [(1)] water quality treatment structural controls.

[(1)] 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 bioretention areas, and infiltration trenches on the other hand 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 WQv to an off-line structural control sized and designed to treat and control the WQv. After the design runoff flow has been treated and/or controlled meeting this WQv, it is returned to the conveyance system or "on-line" structure.*

A key decision 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 though the BMP(s) prior to combining with flows from the upstream (offsite) watershed.

Designers should also be aware that WQv 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 reduction in detention storage volume can be achieved if WQv-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 hydrologic 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 structures must be separated as much as possible to avoid short-circuiting and the positioning of these structures and/or orifices should be above the dry detention basin bottom to provide space for captured sediments and to 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 3 inches and should be adequately protected from clogging by an acceptable external trash rack. The orifice diameter may be reduced to 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 works.

- 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 water table elevation. The conveyance is required to be lined with geo-textile and with four inches (4") of stone over same (Graded 2"- 4" stone). The conveyance is to be a minimum of 4 feet wide.

- Riprap, plunge pools or pads, or other energy dissipators are to be placed at the end of the outlet to prevent scouring and erosion (See Section 4.5 of the GASWMM, *Energy Dissipation Design*, for more guidance).

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

- A minimum of 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. PROPONENT: The Directorate of Public Works (DPW) is the proponent for this policy. The point of contact is DPW, Environmental Division, at commercial (912) 767-2010 or DSN 870-2010.

Robert R. Baumgardt
Director, Public Works

Fort Stewart/Hunter Army Airfield
Post Construction Stormwater Management Guidance
For New Development and Redevelopment

1. Stormwater Management Plans (SWMP)

All development activity which is greater than 5,000 square feet and/or are required to submit a Notice of Intent for National Pollutant Discharge Elimination System Permitting Requirements for Construction and Land Disturbance Activity on FS/HAAF shall have an approved Stormwater Management Plan (SWMP). A SWMP shall be valid for one year from the date of approval by the Directorate of Public Works (DPW) Environmental Division. The minimum design requirements for the SWMP shall include the following:

1.1.1 Utilization of Better Site Design Practices for Stormwater Management

All site designs shall implement a combination of approaches collectively known as stormwater better site design practices, as described in the Georgia Stormwater Management Manual (SWMM)-Coastal Stormwater Supplement (CSS) and the United States Environmental Protection Agency (USEPA) Technical Guidance for EISA-2007 Section 438 Implementation-DEC 2009. All sites shall also be designed to conform to the Energy Independence and Security Act (EISA) 2007 Section 438 with utilization of the USEPA Technical Guidance in conjunction with the CSS, to meet standards, contained herein.

Such practices include conservation of natural features, use of Low Impact Development (LID) techniques for site design, reduction of impervious cover, and utilization of natural features for stormwater management.

1.1.2 Stormwater Runoff Quality

All stormwater runoff generated from a site shall be adequately treated before discharge. Stormwater management systems (which can include both structural stormwater controls and better site design practices) must be designed to remove 80% of the calculated average annual post-development total suspended solids (TSS) load and be able to meet any other additional watershed- or site-specific water quality requirements. A stormwater management system complies with this performance standard if:

a. It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the stormwater runoff volume resulting from the 95th percentile rain event of a site as required under the USEPA Technical Guidance for EISA-2007 Section 438 Implementation-DEC 2009;

b. Appropriate structural stormwater controls are selected, designed, constructed, and maintained according to the specified criteria in the GA SWMM/CSS and the USEPA Tech Guidance EISA Section 438-DEC 2009; and

c. Runoff from hotspot land uses and activities [such as, industrial activities and/or fueling operations] is adequately treated and addressed through the use of appropriate structural stormwater controls and pollution prevention practices.

1.1.3 Stream Channel and Aquatic Resource Protection

Stream channel protection shall be provided to both downstream and on-site channels by utilizing all of the following three approaches:

a. 24-hour extended detention storage of the 1-year, 24-hour return frequency storm event.

b. Erosion prevention measures such as energy dissipation and velocity control, as referenced in Section 4.5 of Volume 2 of the Georgia Stormwater Management Manual; and Chapter 4 Section 4.4.3 of the Coastal Stormwater Supplement.

c. Preservation of the applicable stream buffer a minimum of 25 feet.

This requirement may be waived for sites that discharge directly into piped stormwater drainage systems, larger streams, creeks, rivers, or wetlands where the reduction in flows will not have an impact on channel integrity.

1.1.4 Overbank Flood Protection

Downstream overbank flood protection shall be provided by controlling the post-development peak discharge rate to the pre-development rate for the 2-year through the 50-year, 24-hour return frequency storm event, as referenced in Section 4.5 of Volume 2 of the Georgia Stormwater Management Manual; and Chapter 4 Section 4.4.4 of the Coastal Stormwater Supplement. This requirement does not apply provided the following:

a. The development directly discharges into open waters; or

b. Provisions are made to provide a conveyance system with adequate capacity to carry stormwater flows to open waters.

1.1.5 Flood Plain Protection

The Federal Emergency Management Agency defines floodplains as areas subject to a one percent or greater chance of flooding in any given year. Floodway encroachment, including structures, fill placement, etc… is prohibited unless certification with supporting technical data is provided by a registered professional engineer demonstrating that the encroachment will not result in any increase in flood elevations.

Flood plain protection shall be provided such that there is no increase in flood elevations, either upstream or downstream, for the 100-year, 24-hour return frequency storm event, as referenced in Section 4.5 of Volume 2 of the Georgia Stormwater Management Manual. Furthermore, any encroachments in the 100-year flood plain shall meet the requirements of the Chapter 4 Section

4.4.5 of the Coastal Stormwater Supplement, State Flood Damage Prevention requirements, and the Executive Order #11988 Floodplain Management; which requires federal service agencies to avoid construction or management practices that will adversely affect floodplains, unless it is found that:

a. There is no practical alternative, and

b. The proposed action has been designed to minimize harm to or within the floodplain.

1.1.6 Hydrologic Analysis

A hydrologic analysis, both upstream and downstream, shall be performed to determine the following:

a. Adequate capacity of the receiving system.

b. Whether there are any additional impacts in terms of peak flow increase or water elevations while meeting Minimum Standards (1.1.1) through (1.1.5), above.

c. This analysis shall be performed at the outlet(s) of the site, and downstream at each tributary junction to the point(s) in the conveyance system where the area of the portion of the site draining into the system is less than or equal to 10% of the total drainage area above that point or to a point identified by the Division.

1.1.7 Groundwater Recharge

Annual groundwater recharge rates shall be maintained to the maximum extent technically feasible through the use of nonstructural methods as described in the Georgia Stormwater Management Manual/Coastal Stormwater Supplement, and the USEPA Technical Guidance for Implementation of the EISA-2007 Section 438-DEC 2009.

a. The annual recharge from the post-development site shall approximate the annual recharge from the pre-development, based on soil types.

b. Stormwater runoff from a hotspot site [industrial and/or fueling operations] or land use shall not be infiltrated without effective pretreatment.

1.1.8 Stormwater Management System Operation and Maintenance

The stormwater management system, including all structural stormwater controls and conveyances, shall have an operation and maintenance plan to ensure that it continues to function as designed. The operation and maintenance plan must provide:

a. A stormwater system inspection and maintenance checklist (reference Appendix A), and expected life cycle for replacement of stormwater structural controls. The plan must include relevant contact information (phone number and address) for the original design engineer. The developer shall be responsible for all maintenance through the warranty period.

b. The routine and non-routine maintenance tasks to be undertaken.

c. A post construction schedule for inspection and maintenance of the stormwater structural controls for the DPW Environmental Division to perform as required. All records of inspection and maintenance must be maintained for each control for a period of five (5) years. These records must be available for review by the DPW Environmental Division at all times. Failure to maintain the records will be a violation of this Guidance.

d. Any necessary legally binding maintenance agreements. If the development or redevelopment includes a subdivision, there must be clear and concise note(s) referring to the operation and maintenance plan on the tenant's or property leasee. All agreements and plats must clearly specify that all property owners within the subdivision or tenant's property are responsible.

e. Estimated annual inspection, maintenance, and operating costs.

f. If any time the DPW Environmental Division determines that the plan is not effective, then the DPW Environmental Division may require changes as necessary to guarantee adequate operation of the stormwater management system.

g. Drainage structures internal to the proposed land development activity will be designed for the 25 year, 24 hour storm event. The SWMP must include a demonstration that none of the storm inlets will overtop during the 25 year storm event.

h. The SWMP shall include a Hydrologic/ Hydraulic Report prepared and certified by a Registered Professional Engineer licensed to practice engineering in the State of Georgia. The report shall be prepared in accordance with the standards of the Georgia Stormwater Management Manual-Coastal Stormwater Supplement and the USEPA Technical Guidance for Implementation of EISA-2007 Section 438-DEC 2009.

i. Land Disturbing Activities, such as timber harvest, demolition, grading, grubbing or development cannot be implemented until provisions of this stormwater guidance have been met.

j. Record Drawings of the Stormwater Management Facilities by a registered professional engineer are required, prior to turn over to the Government. Record Drawings shall be prepared in accordance with DPW Engineering and Master Planning Divisions Policies.

k. For development of a project in phases, a stormwater master plan is required to indicate how the requirements of this stormwater guidance will be met. This does not preclude the requirement of a SWMP for each phase as it is being developed. The master plan of multi-phased developments shall consolidate stormwater management facilities as much as practical.

2. <u>Maintenance and Inspection</u>

a. In no case can alterations be made to the stormwater management facilities which may impact perpetual access for inspections of any stormwater management facility or BMP which is to be inspected by the DPW Environmental, or maintained by the DPW Services Division Operations & Maintenance, tenant organization, or lessee.

b. The DPW Environmental Division shall determine inspection schedules necessary to enforce the provisions of this guidance.

c. The DPW Environmental Division, bearing proper credentials and identification, shall be permitted to enter, in accordance with state and federal law, all properties for regular inspections, periodic investigations, observation, measurement, enforcement, sampling and testing, in accordance with provisions of this Guidance. The Director, Public Works or duly authorized designee DPW Environmental Division shall duly notify the owner of said property or the representative on site, except in the case of an emergency.

d. The DPW Environmental Division, bearing proper credentials and identification, shall be permitted to enter, in accordance with state and federal law, all properties for which the Fort Stewart/Hunter Army Airfield DPW holds a negotiated easement of tenant owned or leased properties for inspection, repairs, maintenance and other purposes related to any portion of the stormwater management facilities lying within said easements or leased lands.

e. Measurements, tests and analyses performed by the DPW Environmental Division or required of any discharger to the MS4 shall be in accordance with 40 CFR Part 136, unless another method is approved by GA EPD.

f. If, after inspection, the condition of a stormwater management facility presents an immediate danger to the public health, environment, or because of unsafe conditions or improper maintenance, the DPW Environmental Division, shall have the right to take action as may be necessary to protect the public and make the stormwater management facility safe.

g. If, after inspection, the condition of a tenant owned or leased lands stormwater management facility presents immediate danger to the public health, environment, or because of unsafe conditions or improper maintenance, the DPW Environmental Division, shall have the right to take action as may be necessary to protect the public and make the stormwater management facility safe.

h. If, after inspection, the condition of the stormwater management facility results in a violation of this Guidance, the DPW Environmental Division will notify the DPW Services Division Operations & Maintenance and/or the tenant owned or leased lands point of contact of the stormwater management facility of the violation and the corrections which were or will need to be implemented with timelines for completion.

BEST MANAGEMENT PRACTICES
POST CONSTRUCTION CONTROL MEASURES
REFERENCE INFORMATION

1.0 POST CONSTRUCTION CONTROL MEASURES

There is a number of control measures used to reduce the levels of pollutants in stormwater that has been exposed to pollutant sources. Stormwater control practices can employ inexpensive techniques, such as settling, biological uptake of substances, and infiltration to treat stormwater. These techniques will remove some portion of most common pollutants and the practices presented here will apply to most situations. However, in situations involving very sensitive waters or unusual pollutants, it is possible that more sophisticated techniques will be required to meet NPDES discharge standards or other requirements. For those situations where more sophisticated techniques are needed, you may wish to investigate some of the references listed at the end of the section. This section presents common stormwater control practices in use today. Each BMP includes a general description of the practice, lists a range of pollutant reduction for various pollutants, and presents some general design considerations, advantages and disadvantages.

1.1 DRY DETENTION BASINS (reference DPW Engineering Policy Letter #10 for any design guidance and proper installations for Fort Stewart/HAAF)

Dry detention basins, also called dry detention devices and ponds, temporarily detain a portion of stormwater runoff for a specified length of time, releasing the stormwater slowly to reduce flooding and remove a limited amount of pollutants. They are referred to as "dry detention" because these devices dry out between rain events. Pollutants are removed by allowing particulates and solids to settle out of the water. Overall pollutant removal in dry detention devices is low to moderate. Important reasons for use of dry detention basins are reducing peak stormwater discharges, controlling floods and preventing downstream channel scouring.

There are several types of dry detention devices, the most common being the dry detention basin and the extended dry detention basin. These are structures, which hold a certain amount of water from a storm and which release the water through a controlled outlet over a specified time period based on design criteria. The extended detention basin drains more slowly or may retain a permanent pool of water. The major failure of these basins is that the release of water is often too slow to empty the basin before the next storm. Since the basin is partially full, only a portion of the design runoff volume from the next storm is detained and the remainder is bypassed directly into the stream. With little or no detention, few pollutants are removed from the runoff. Such failures can be prevented through adequate design and maintenance to keep the inlets and outlets open. Many dry basins have partially failed or are not meeting design performance due to clogging of inlets or outlets. Dry detention basin effectiveness is rated low to moderate compared to other stormwater BMPs. Typical dry basin removal efficiencies are listed below for selected pollutants.

DRY DETENTION BASIN POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients Total phosphorus Total nitrogen	 Low Low
Sediment Total suspended solids	 High
Metals Lead Zinc	 Moderate to High Moderate
Organic Matter Biochemical and chemical Oxygen demand (BOD or COD)	 Moderate
Oil and Grease	Low
Bacteria	High

1.2 Design Considerations

Design of dry detention basins includes locating proper sites for construction of the basin, calculating the appropriate detention time, treatment of the expected range in volumes of stormwater from storms, and maintenance procedures and schedules. The stormwater should be held for at least 24 hours for maximum pollutant removal. Soils should be permeable to allow the water to drain from these basins between storms and the water table should be more than two feet below the bottom of the basin (to avoid a permanent pool of water in the basin during wet weather). A forebay is a section of the basin separated from the main part of the basin by a wall or dike and which receives the incoming stormwater. Forebays help capture debris and sand deposits, which accumulate quickly, and thereby ease routine cleaning.

1.3 Advantages

Dry detention basins are capable of removing significant amounts of particulate pollutants and have proven effective at reducing peak storm flows. An appreciable body of knowledge has been accumulated on the design and maintenance of these structures. Detention basins can serve small to rather large areas and are usually readily incorporated into the design of the overall development. Existing dry basins built to control stormwater peak flows can be modified to provide extended detention for stormwater.

1.4 Disadvantages

Dry basins can be unsightly, especially if floating and other debris accumulate in them. Basins should be located where they are not easily seen or where they can be concealed with landscaping. Dry basins are not very effective in removing soluble pollutants from stormwater. Also, many pollutants that settle out are re-suspended in the next storm flow and are discharged into the stream. Many dry basins end up with permanent pools of water because runoff from previous storms has not either flowed out or infiltrated before another storm occurs.

The standing water can be a nuisance and an eyesore to residents. Because they take up large areas, dry detention basins are generally not best suited for high-density residential developments. Sites must allow easy access for equipment to maintain and clean the basin and remove sediment. The appearance of some dry detention basins has been improved by planting hardy wildflowers in the bottom. Residents' acceptance of a "wildflower basin" is much higher than of an unadorned open basin. The maintenance costs associated with dry detention basins are higher than other stormwater treatment devices.

1.5 Maintenance

Maintenance of dry detention basins is both essential and costly. General objectives of maintenance are to prevent clogging, prevent standing water and prevent the growth of weeds and wetland plants. This requires frequent unclogging of the outlet and mowing. Normal maintenance costs can range from 3-5% of construction costs on an annual basis (Schueler 1987). Cleaning out sediment, which is expensive, will be necessary in 10 to 20 years' time. Cleaning involves digging out the accumulated sediment, mud, sand and debris with earth-moving equipment.

2.0 INFILTRATION (EXFILTRATION) DEVICES

Infiltration refers to the process of water entering into the soil. The predominant means by which these infiltration devices evacuate their treatment volume is through water movement through the soil. There are a number of devices used to treat stormwater that make use of infiltration to remove pollutants and to recharge or replenish the ground water. Infiltration devices include infiltration basins, infiltration trenches and dry wells. The term exfiltration is also frequently used in reference to these BMPs, coming from the perspective of the device rather than its setting. Properly designed infiltration devices can closely reproduce the water balance that existed pre-development, providing ground water recharge, control of peak flows from stormwater and protection of streambanks from erosion due to high flows. A significant advantage of infiltration is that in areas with a high percentage of impervious surface, infiltration is one of the few means to provide significant groundwater recharge. Infiltration devices can remove pollutants very effectively through adsorption onto soil particles, and biological and chemical conversion in the soil. Infiltration basins with long detention times and grass bottoms enhance pollutant removal by allowing more time for settling and because the vegetation increases settling and adsorption of sediment and adsorbed pollutants. Although infiltration is a simple concept, infiltration devices must be carefully designed and maintained if they are to work properly. Poorly installed or improperly located devices fail easily. It is critical that infiltration devices only be used where the soil is porous and can absorb the required quality of stormwater. Maintenance needs for infiltration devices are higher than other devices partly because of the need for frequent inspection. Nuisance problems can occur, especially with insect breeding, odors and soggy ground.

Pollutant removal capability for infiltration basins that exfiltrate the entire amount of captured stormwater is shown below. Other infiltration devices which exfiltrate only part of the captured stormwater (some of the stormwater is discharged to receiving waters on the surface) have lower removal effectiveness.

INFILTRATION DEVICES POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients Total phosphorus Total nitrogen	 High High
Sediment Total suspended solids	 Very High
Metals Trace metals (sediment-bound)	Very high
Organic Matter Biochemical and chemical Oxygen demand (BOD)	Very High
Oil and Grease	High
Bacteria	Very High

2.1 Design Considerations

Some infiltration devices (infiltration trenches, dry wells, and catch basins) can be constructed under parking lots and roads, taking very little land from other uses. Other infiltration devices take up considerable areas, depending on their size and the drainage area served. Locating smaller infiltration devices is fairly easy so that large downstream devices can be replaced with a number of small structures upstream and still achieve the same control of stormwater. Infiltration devices require permeable soils and reasonably deep water tables. Smaller infiltration devices such as dry wells or basins can be located near buildings to capture the runoff from roofs and other impervious surfaces.

2.2 Advantages

Infiltration devices help replenish the ground water and reduce both stormwater peak flows and volume. Pollutant removal can be very high for many pollutants. Because they take up little land area and are not highly visible, many underground infiltration devices can be located close to residential and commercial areas.

2.3 Disadvantages

Infiltration techniques work only where the soils are permeable enough that the water can exit the storage basin and enter the soil. These devices have a high failure rate. Infiltration devices must have sediment removed before the stormwater enters the device to prevent clogging of the soil. The water table must be at least two feet under the bottom of the device.

2.4 Maintenance

Maintenance requirements include regular inspections, cleaning of inlets, mowing and possible use of observation wells to maintain proper operation. Infiltration basins and sediment removal devices used to prevent clogging of other infiltration devices must have the sediment removed regularly. If an infiltration device becomes clogged, it may need to be completely rebuilt.

6.0 POROUS PAVEMENT; DESIGN AND USES

Porous pavement is an alternative to conventional pavement that is intended to reduce imperviousness and consequently minimize surface runoff. Porous pavement follows one of two basic designs. First, it may be comprised of asphalt or concrete that lacks the finer sediment found in conventional cement. This formulation is usually laid over a thick base of granular material (Urbonas and Stahre, 1993). Second, porous pavement may be formed with modular, interlocking open-cell cement blocks laid over a base of coarse gravel (Urbonas and Stahre, 1993). A geo-textile fabric underlying the gravel prevents the migration of soil upward into the gravel bed. Both designs typically include a reservoir of coarse aggregate stone beneath the pavement for stormwater storage prior to exfiltration into surrounding soils (Schueler et al., 1992). Use of porous pavement requires permeable soils with a minimum depth of two feet from the seasonal high water table. Traffic must be restricted to exclude heavy vehicles. Its use is not advisable in specific "hot spots" (industrial operations, fuel service stations or near groundwater well recharge zones) or areas expecting high levels of off-site sediment input, including chemicals and sand used in snow removal operations.

6.1 Pollutant Removal

The porous pavement itself functions less as a treatment BMP and more as a conveyance BMP to the other necessary component of the design, the underlying aggregate chamber, which functions as an infiltration device. As with other infiltration devices, treatment is provided by adsorption, filtration, and microbial decomposition in the sub-soil surrounding the aggregate chamber, as well as by particulate filtration within the chamber. Operating systems have been shown to have high removal rates for sediment, nutrients, organic matter, and trace metals. These rates are largely due to the reduction of mass loadings of these pollutants through transfer to groundwater (Schueler et al., 1992).

6.2 Advantages and Disadvantages

The big disadvantage of porous pavement is that sites have a high failure rate, due to clogging either from improper construction, accumulated sediment and oil, or resurfacing (Schueler et al., 1992). Excessive sediment will cause the pavement to rapidly seal and become ineffective (Urbonas and Stahre, 1993). The modular, interlocking, open-cell concrete block type tends to remain effective for considerably longer than asphalt or concrete porous pavement. Porous pavement must be maintained frequently to continue functioning. Quarterly vacuum sweeping and/or jet hosing is needed to maintain porosity, and this may constitute one to two percent of the initial construction costs (Schueler et al., 1992).

Positive attributes include the diversion of potentially large volumes of surface runoff to groundwater recharge, providing both water quality and quantity benefits. While more expensive than conventional pavement, it can also eliminate the need for more involved stormwater drainage, conveyance, and treatment systems, offering a valuable option for spatially constrained urban sites. Porous pavement may be most beneficial in watersheds with high percentages of impervious surface and high volumes of runoff. Its use is typically recommended for lightly trafficked satellite parking areas and access roads. Increased infiltration at the source (parking lots, etc.) will reduce both the volume of runoff and the delivery of associated pollutants to water bodies.

7.0 SAND FILTERS

Sand filters are a type of stormwater control device used to treat stormwater runoff from large buildings, access roads and parking lots. As the name implies, sand filters work by filtering stormwater through beds of sand. Small sand filters are installed underground in trenches or pre-cast concrete boxes. Large sand filters are above-ground, self-contained sand beds that can treat stormwater from drainage areas as much as five acres in size.

Pollutant removal for sand filters varies depending on the site and climate. Overall removal for sediment and trace metals is better than removal of more soluble pollutants because the filter functions by simply straining small particles out of the stormwater. Below is a list of removal efficiency.

SAND FILTER POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients Total phosphorus Total nitrogen	 Moderate Moderate
Sediment	Very High
Metals Trace metals (sediment-bound)	Very High
Organic Matter Biochemical oxygen demand (BOD)	Moderate
Oil and Grease	High
Bacteria	Moderate

7.1 <u>Design Considerations</u>

Sand filters remove pollutants by settling out particles in the pretreatment devices and by straining out particles in the filter. Underground sand filters built in two-chambered precast concrete boxes cannot handle large drainage areas. Moderate to large parking lots should be the largest areas drained to underground sand filters. Sand filters constructed underground should have pretreatment or settling chambers that hold 540 cubic feet of water for each acre of drainage area contributing stormwater to the sand filter (Shaver 1992). For two-chambered sand filters, the volume of the filter chamber should equal the volume of the settling chamber and the sand filter bed should be 18 inches deep (Shaver 1992). The surface area of both the settling and filter chambers should have 360 square feet of area for each acre of drainage area (Shaver 1992). Above-ground sand filters, built on the land surface, can handle drainage areas up to five acres in size. The sand filter bed should be 18 inches deep. Above-ground sand filters may use grassed filter strips, grassed swales or large basins to pretreat the incoming stormwater to prevent clogging of the sand filter.

7.2 Advantages

Sand filters can be installed underground in urban settings and be kept out of sight, or above ground for large drainage areas. Sand filters can provide effective reduction of the more common urban pollutants in stormwater. Sand filters have demonstrated long lifetimes and consistent pollutant removal when properly maintained. Maintenance for sand filters is simple and inexpensive. Mosquito breeding is usually not a problem, even in underground settling chambers that hold pools of water for long periods. Shaver (1992) reports that oil and grease in the stormwater form a sheen on the water which prevents mosquito growth.

7.3 Disadvantages

Sand filters are more expensive to construct than infiltration trenches. If heavy equipment is to be used for maintenance, construction costs are significantly higher. Sand filters on the land surface are considered unattractive. No stormwater detention is provided by sand filters. Sand filters have only limited pollutant removal for a number of pollutants.

7.4 Maintenance

Sand filters require frequent but simple maintenance. Maintenance for smaller, underground filters is usually and best done manually. Normal maintenance requirements include raking of the sand surface and disposal of accumulated trash. The upper few inches of dirty sand must be removed and replaced with clean sand when the filter clogs. The pretreatment devices must be cleaned to remove sediment and debris.

8.0 VEGETATIVE PRACTICES

Vegetation can be used to reduce the velocity of stormwater, which helps stormwater infiltrate into the soil and settle particulates, as well as prevent erosion. Such use of vegetation occurs in filter strips, grassed swales, riparian areas, and landscaping of wet, dry and infiltration basins. Vegetation is often employed as part of a BMP system, to remove particulates and slow runoff before it enters another treatment device. Two frequently used vegetative measures, filter strips and grassed swales, sometimes called biofilters, are described in this section. Another vegetative measure, the buffer strip or buffer zone, was described above under preventive measures.

8.1 Filter Strips

Filter strips are typically bands of close-growing vegetation, usually grass, planted between pollutant source areas and a receiving water. They also can be used as outlet or pretreatment devices for other stormwater control practices. Filter strips can include shrubs or woody plants that help to stabilize the grass strip, or can be composed entirely of trees and other natural vegetation.

Such strips or buffers are used primarily in residential areas around streams or ponds. Filter strips do not provide enough runoff storage or infiltration to significantly reduce peak discharges or the volume of storm runoff. For this reason, a filter strip should be viewed as only one component in a stormwater management system. At some sites, filter strips may help reduce the size and cost of downstream control facilities.

Filter strips reduce pollutants such as sediment, organic matter and many trace metals by the filtering action of the vegetation, infiltration of pollutant-carrying water and sediment deposition. Although studies indicate highly varying effectivenesses, trees in strips can be more effective than grass strips alone because of the trees' greater uptake and long-term retention of plant nutrients. Properly constructed forested and grassed filter strips can be expected to remove more than 60 percent of the particulates and perhaps as much as 40 percent of the plant nutrients in urban runoff. Filter strips fail very easily if they are not maintained regularly. Filter strips function best when they are level in the direction of stormwater flow toward the stream. This orientation makes for the finest sheetflow through the strip, increasing infiltration and filtering of sediment and other solids. To prevent erosion channel formation, a level spreader should be situated along the top edge of the strip. Level spreaders are designed to disperse concentrated flows evenly over a larger area. One type of level spreader is a shallow trench filled with crushed stone. The lower edge of the level spreader must be exactly level if the spreader is to work properly.

8.2 Grassed Swales

Grassed swales are earthen channels covered with a dense growth of a hardy grass such as Tall Fescue or Reed Canary grass. Swales are used primarily in single-family residential developments, at the outlets of road culverts, and as highway medians. Because swales have a limited capacity to convey runoff from large or intense storms, they often lead into concrete lined channels or other stable stormwater control structures. Swales may provide some reduction in stormwater pollution through infiltration of runoff water into the soil, filtering of sediment or other solid particles, and slowing the velocity and peak flow rates of runoff. These processes can be enhanced by adding small (4-10 inches high) dams across the swale bottom, thereby increasing detention time.

Pollutants are removed from surface flow by the filtering action of the grass, sediment deposition, and/or infiltration into the soil. The pollutant-removing effectiveness of swales has been assessed as moderate to negligible depending on many factors, including the quantity of flow, the slope of the swale, the density and height of the grass, and the permeability of the underlying soil. Research on grassed swales has found varying levels of pollutant removal ranging from 30 to 90 percent reduction in solids and 0 to 40 percent reductions in total phosphorus loads. Vegetative BMPs can reduce the amounts of the following pollutants in stormwater.

VEGETATIVE PRACTICES POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients	Low
Sediment	Moderate
Metals Trace metals	 Moderate
Organic Matter	Low
Oil and Grease	Moderate
Bacteria	Low

8.3 Design Considerations

Vegetative practices remove pollutants by encouraging infiltration into the ground, reducing runoff velocity and allowing particles to settle, and by absorbing some pollutants. To be effective, vegetative practices require flat areas that are large in relation to the drainage area, and deep water tables. Swales should have as little slope as possible to maximize infiltration and reduce velocities. Filter strips should not be used where slopes exceed 15 percent; best performance occurs where the slope is 5% or less. The height of grass in filter strips and swales can affect the pollutant removal. Taller grass will slow velocities more but grass cut to a short length may take up more plant nutrients.

8.4 Advantages

Vegetative practices are inexpensive and generally easy to maintain with common procedures such as mowing and trimming. Vegetation is usually pleasing to residents. Filter strips and grassed swales are easily located and constructed. Vegetation is highly effective in preventing erosion and thus controlling sediment in stormwater runoff.

8.5 Disadvantages

Vegetative practices remove only small amounts of pollutants. These practices do little to control peak storm flows or reduce stormwater volumes.

8.6 Maintenance

Maintenance of vegetation includes periodic inspection, mowing, fertilizer application and repair of washed-out areas and bare spots. Filter strip maintenance basically involves normal grass- or

shrub-growing activities such as mowing, trimming, removing clippings or replanting when necessary. Strips that are used for sediment removal may require periodic regrading and reseeding of their upslope edge because deposited sediment can kill grass and change the elevation of the edge such that uniform flow through the strip can no longer be obtained. Swale maintenance basically involves normal grass-growing activities such as mowing and resodding when necessary.

9.0 WETLANDS, CONSTRUCTED

Interest has steadily increased in the United States over the last two decades in the use of natural physical, biological, and chemical aquatic processes for the treatment of polluted waters. This interest has been driven by growing recognition of the natural treatment functions performed by wetlands and aquatic plants, by the escalating costs of conventional treatment methods, and by a growing appreciation for the potential ancillary benefits provided by such systems. Aquatic treatment systems have been divided into natural wetlands, constructed wetlands, and aquatic plant systems (USEPA, 1988). Of the three types, constructed wetlands have received the greatest attention for treatment of stormwater pollution. Constructed wetlands are a subset of created wetlands designed and developed specifically for water treatment (Fields, 1993). They have been further defined as:

Engineered systems designed to simulate natural wetlands to exploit the water purification functional value for human use and benefits. Constructed wetlands consist of former upland environments that have been modified to create poorly drained soils and wetlands flora and fauna for the primary purpose of contaminant or pollutant removal from wastewaters or runoff (Hammer, 1992).

Constructed wetlands as defined here are not typically intended to replace all of the functions of natural wetlands, but to serve as do other water quality BMPs to minimize point source and non-point source pollution prior to its entry into streams, natural wetlands, and other receiving waters. Constructed wetlands which are meant to provide habitat, water quantity, aesthetic and other functions as well as water quality functions (termed created, restored, or mitigation wetlands (Hammer, 1994) typically call for different design considerations from those used solely for water quality improvement, and such systems are not addressed here. In fact, debate continues over the advisability of intentionally combining primary pollution control and habitat functions in the same constructed facilities. Nonetheless, constructed wetlands can provide many of the water quality improvement functions of natural wetlands with the advantage of control over location, design, and management to optimize those functions.

Constructed wetlands vary widely in their pollutant removal capabilities, but can effectively remove a number of contaminants (Bastian and Hammer, 1993; Bingham, 1994; Brix, 1993; Corbitt and Bowen, 1994; USEPA, 1993). Among the most important removal processes are the purely physical processes of sedimentation via reduced velocities and filtration by hydrophytic vegetation. These processes account for the strong removal rates for suspended solids, the particulate fraction of organic matter (particulate BOD), and sediment-attached nutrients and metals. Oils and greases are effectively removed through impoundment, photo degradation, and microbial action. Similarly, pathogens show good removal rates in constructed wetlands via sedimentation and filtration, natural die-off, and UV degradation. Dissolved constituents such as soluble organic matter, ammonia and ortho-phosphorus tend to have lower removal rates. Soluble organic matter is largely degraded aerobically by bacteria in the water column, plant-attached algal and bacterial associations, and microbes at the sediment surface.

Ammonia is removed largely through microbial nitrification (aerobic)-denitrification (anaerobic), plant uptake, and volatilization, while nitrate is removed largely through denitrification and plant uptake. In both cases, denitrification is typically the primary removal mechanism. The microbial degradation processes are relatively slow, particularly the anaerobic steps, and require longer residence times, a factor, which contributes to the more variable performance of constructed wetlands systems for these dissolved constituents.

Phosphorus is removed mainly through soil sorption processes, which are slow and vary based on soil composition, and through plant assimilation and subsequent burial in the litter compartment. Consequently, phosphorus removal rates are variable and typically trail behind those of nitrogen.

Metals are removed largely through adsorption and complexation with organic matter. Removal rates for metals are variable, but are consistently high for lead, which is often associated with particulate matter.

Constructed wetlands can be expected to achieve or exceed the pollutant removal rates estimated for wet pond detention basins and dry detention ponds. Generalized ranges of removal for various pollutants are given below.

CONSTRUCTED WETLANDS POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients Total phosphorus Total nitrogen	High Moderate
Sediment Suspended solids	Very High
Metals Trace metals (sediment-bound)	High
Organic Matter Biochemical oxygen demand (BOD)	Moderate
Oil and Grease	Very High
Bacteria	High

9.1 Design Considerations

The use of constructed wetlands for stormwater treatment is still an emerging technology, hence there are no widely accepted design criteria. However, certain general design considerations do exist. It is important first to drop stormwater inflow velocities and provide opportunity for initial sediment deposition with facilities which can be periodically maintained and which avoid the likelihood of entraining deposited sediment in subsequent inflows. It is important to maximize the nominal hydraulic residence time and to maximize the distribution of inflows over the treatment area, avoiding designs which may allow for hydraulic short-circuiting. Emergent macrophytic vegetation plays a key role, intimately linked with that of the sediment biota, by providing attachment sites for periphyton, by physically filtering flows, as a major storage site for carbon and nutrients, as an energy source for sediment microbial metabolism, and as a gas exchange vector between sediments and air. Thus, it is important to design for a substantial native emergent vegetative component. Anaerobic sediment conditions should be ensured to allow for long-term burial of organic matter and phosphorus. A controlled rate of discharge is the last major physical design feature. While an adjustable outfall may seem desirable for fine-tuning system performance, regulatory agencies often require a fixed design to preclude subsequent inappropriate modifications to this key feature. The outfall should be fitted with some form of skimmer or other means to retain oil and grease. Plants must be chosen to withstand the pollutant loading and the frequent fluctuation in water depth associated with the design treatment volume. It is advisable to consult a wetlands botanist to choose the proper vegetation.

Use of constructed wetlands has expanded recently to the treatment of solid waste landfill leachate. Experimental work to date has shown promise for this application as a low-cost alternative to collection and transport to wastewater facilities. Leachate from solid waste landfills can vary widely in composition, but is often sufficiently high in BOD, ammonium, iron, and manganese, and sufficiently reduced as to be toxic to plant and animal life. An interception trench with predominantly open water habitat successfully intercepted and improved a leachate groundwater plume from a municipal solid waste landfill (Dornbush, 1989). In addition to dilution effects, the leachate quality was apparently improved by processes resulting from aeration of the anoxic groundwater. Hydrogen sulfide, methane, and carbon dioxide gases were believed to be oxidized, while high carbonate content provided for chemical precipitation of metals in the aerobic environment. Surface et al. (1993) obtained significant, low-cost improvement of leachate using subsurface flow wetland systems. They found that substrate mixtures of sand and gravel achieved significant removals of BOD, ammonium, iron, manganese, potassium, and phosphorus, and provided better treatment than pure coarse or pea gravel media. All media types showed seasonal performance patterns.

Location of constructed wetlands in the landscape can be an important factor in their effectiveness. Mitsch (1993) observed in a comparison of experimental systems using phosphorus as an example that retention as a function of nutrient loading will generally be less efficient in downstream wetlands than in smaller upstream wetlands. He also cautioned that the downstream wetlands could retain more mass of nutrients, and that a placement tradeoff might be optimum. Mitsch observed that creation of in-stream wetlands is a reasonable alternative only in lower-order streams, that such wetlands are susceptible to reintroduction of accumulated pollutants in large flow events as well as being unpredictable in terms of stability. Such systems would likely require higher maintenance and management costs.

Constructed wetlands are most effective as part of a BMP system which includes minimization of initial runoff volumes through the positioning of pervious landscaping features, routing of runoff to maximize infiltration, use of pervious pavement, grass swales, swale checks, or other measures, pre-treatment of collected runoff to minimize sediment and associated pollutant loads, and off-line attenuation of larger storm event runoff to optimize wetland performance and minimize downstream erosion-related water quality impacts.

9.2 Advantages

Properly constructed and maintained wetlands can provide very high removal of pollutants from stormwater. Constructed wetlands can be used to reduce stormwater runoff peak discharges as well as water quality benefits. Constructed wetlands can serve a dual role in controlling stormwater pollution and providing a pleasing natural area. Wetlands are highly valued by residents; therefore they can be given high visibility, they can serve as attractive centerpieces to developments and recreation areas, and they typically increase property values (Schueler, 1987; Shaver, 1992). Constructed wetland systems can provide ground water recharge in the area, thus lessening the impact of impervious surfaces. This recharge can also provide a groundwater subsidy to the surficial aquifer, which can benefit local vegetation and decrease irrigation needs.

9.3 Disadvantages

Constructed wetlands may contribute to thermal pollution and cause downstream warming. This may preclude their use in areas where sensitive aquatic species live. They are not a competitive option compared to other treatment methods where space is a major constraint. The ponded water may be a safety hazard to children.

9.4 Maintenance

Constructed wetlands have an establishment period during which they require regular inspection to monitor hydrologic conditions and ensure vegetative establishment. Vegetation establishment monitoring and long-term operation and maintenance, including maintenance of structures, monitoring of vegetation, and periodic removal of accumulated sediments, must be provided for to ensure continued function (Wetzel, 1993; Bingham, 1994). Maintenance costs vary depending on the degree to which the wetlands are intended to serve as popular amenities. Frequent initial maintenance to remove opportunistic species is typically required if a particular diverse, hydrophytic regime is desired. Operators of wetlands may need to control nuisance insects, odors, and algae.

10.0 WETLANDS, NATURAL AND RESTORED

The many water quality improvement functions and values of wetlands are now widely recognized. At the same time, concern has grown over the possible harmful effects of toxic pollutant accumulation and the potential for long-term degradation of wetlands from altered nutrient and hydraulic loading that can occur with the use of wetlands for water treatment. Because of these concerns, the use of natural wetlands as treatment systems is restricted by federal law (Fields, 1993). Most natural wetlands are considered "waters of the United States" and are entitled under the CWA to protection from degradation by NPS pollution. Natural wetlands do function within the watershed to improve water quality, and protection or restoration of wetlands to maintain or enhance water quality is acceptable practices. However, NPS pollutants should not be intentionally diverted to wetlands for primary treatment. Wetlands must be part of an integrated landscape approach to NPS control, and cannot be expected to compensate for insufficient use of BMPs within the up gradient contributing area. Restored wetlands are subject to the same restrictions as unmodified natural wetlands. Wetlands created from upland habitat for the purpose of mitigating the loss of other wetlands as required by regulatory agencies are generally also subject to the same restrictions as natural wetlands. Constructed wetlands which have been defined as a subset of created wetlands that are designed and developed specifically for water treatment (Fields, 1993); clearly are not intended for the same protections as natural wetlands, and can serve as valuable treatment BMPs.

11.0 WET RETENTION PONDS

Wet retention ponds, also called wet detention basins, or wet basins or ponds, maintain a permanent pool of water in addition to temporarily detaining stormwater. The permanent pool of water enhances the removal of many pollutants. These ponds fill with stormwater and release most of it over a period of a few days, slowly returning to its normal depth of water. Several mechanisms in wet ponds remove pollutants including: settling of suspended particulates; biological uptake, or consumption of pollutants by plants, algae and bacteria in the water; and decomposition of some pollutants. Wet ponds have some capacity to remove dissolved plant nutrients, an important characteristic to protect lakes, rivers and estuaries from eutrophication.

Wet ponds can be used in most locations where there is enough space to locate the pond. Because of the permanent pool of water, wet ponds can remove moderate to high amounts of most pollutants and are more effective in removing plant nutrients than most other devices. Also, the large volume of storage in the pond helps to reduce peak stormwater discharges which, in turn, helps control downstream flooding and reduces scouring and erosion of streambanks.

Construction costs for wet ponds can be somewhat high because the ponds must be large enough to hold the required volume of runoff and to contain the permanent pool of water. Maintenance costs run about 3-5% of the construction cost per year (Schueler 1987).

Pollutant removal is rated as moderate to high compared with other stormwater devices. Typical wet pond removal efficiencies are listed below for each pollutant.

WET POND POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients Total phosphorus Total nitrogen	Moderate to High Moderate
Sediment Total suspended solids	High
Metals Lead Zinc	High Moderate
Organic Matter Biochemical and chemical oxygen demand (BOD or COD)	Moderate
Oil and Grease	High
Bacteria	High

11.1 Design Considerations

Wet ponds should be designed to displace the older stormwater with the newer stormwater, which ensures the proper amount of holding time. If the design is improper, short-circuiting can occur where the newer stormwater flows directly to the outlet, bypassing the main part of the wet pond. Short-circuiting causes the new stormwater to be released too soon, preventing pollutant removal and settling of sediment. Basic considerations for the installation of wet retention ponds are location, the inflow runoff volume, hydraulic residence time, permanent pool size and maintenance. Volumes of stormwater runoff and normal discharge available for the permanent pool must be calculated by trained hydrologists before constructing a wet pond. Long, narrow ponds or wedge-shaped ponds are preferred shapes to minimize short-circuiting of storm flows. These shapes also will lessen the effects of wind, which can stir up sediment and sediment-bound pollutants. Pond shape, depth and surrounding fringe areas must be considered to maximize the effectiveness of the basin. Marsh plants around the pond help remove pollutants, provide habitat and hide debris.

11.2 Advantages

Because people find these ponds to be aesthetically pleasing, wet ponds can be sited in both low and high visibility areas. Quite often, residents feel that the permanent pool of water enhances property values as well as the aesthetic value of the area. The outlet must be sized to provide adequate time for pollutant removal, yet discharge the stormwater before the next storm occurs. Wet retention ponds have been used to provide wildlife habitat and they may be a focal point for a recreation area. Wet ponds are one of the most effective and reliable devices for removing pollutants from stormwater.

11.3 Disadvantages

One disadvantage of wet retention basins is that they may contribute to thermal pollution and cause downstream warming. This may preclude their use in areas where sensitive aquatic species live. Wet ponds are not well suited to very small developments because of their large size. Wet ponds may flood prime wildlife habitat; and there are sometimes problems with nuisance odors, algae blooms and rotting debris when the ponds are not properly maintained. Wetland plants may need to be harvested or removed periodically to prevent releasing plant nutrients into the water when the plants die. The pool of water presents an attractive play area to children; hence, there may be safety problems.

11.4 Maintenance

The maintenance costs of wet ponds are estimated at 3-5% of construction cost per year. Wet ponds require regular inspection, removal of sediment according to a regular schedule of maintenance, regular mowing, and regular cleaning and repair of inlets and outlets. Operators of wet ponds must control nuisance insects, weeds, odors, and algae; inspect and repair pond bottoms; and harvest deciduous vegetation prior to the onset of fall as necessary. Mosquitoes can be controlled in wet ponds with fish of the Gambusia family which eat the mosquito larvae. The Gambusia can survive the winters in North Carolina if the permanent pool is at least three feet deep. Another control method which does not use insecticides is monthly application of briquettes containing bacteria which cause a disease in mosquitoes. The application needs to be done only in the warmer months. The bacteria can be purchased at hardware and garden stores.

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BEST MANAGEMENT PRACTICES
POST CONSTRUCTION CONTROL MEASURES

APPENDIX A
Fort Stewart/Hunter Army Airfield
Stormwater System Maintenance-Inspection Checklist

Fort Stewart / Hunter Army Airfield
Stormwater System Maintenance-Inspection Checklist

Installation: Circle one **Fort Stewart / Hunter Army Airfield**

Collection System (MS4 sub basin) ______________ **BMP ID#** _____ **Associated Building #(s)** __________

Location/GPS: **Latitude:** _______ ⁰ ______' _____" N **Longitude:** ______ ⁰ ______' _____" W

Proponent Responsible For Maintenance: DPW Services Division Roads & Grounds

Contact: DPW Environmental Branch Stormwater Program 767-2010 / 0271

Evaluation Date:

Evaluation Completed by:

Circle type of system: Retention/Wetland Pond - Detention Basin - Bioretention Cell – Rain Garden - Open Channel*

***Open Channel Type: Stream, Ditch, Swale, Catch Basin, Curb Inlet, Headwalls or Open Pipe**

Findings	**Yes**	**No**	**Maintenance Required?**	**Comments**
1. Contributing Drainage Area. a. Excessive trash / debris				
b. Bare / Exposed soil				
c. Evidence of erosion				
2. Inlets and Outlets (headwalls, open pipes, outfall weirs, catch basins, curb inlets, etc…) a. Excessive sediment accumulation	**Yes**	**No**		
b. Structural defects				
c. Evidence of clogging				
d. Evidence of erosion				
3. Facility Condition. a. Evidence of erosion	**Yes**	**No**		
b. Excessive sediment accumulation				
c. Exposed or bare soils				
d. Evidence of pollutants				
e. Presence of woody vegetation				
f. Evidence of dead vegetation				
g. Excessive trash/debris				
h. Evidence of standing water				

Fort Stewart / Hunter Army Airfield
Stormwater System Maintenance-Inspection Checklist

Site Description-Additional comments:
Sketch Facility

APPENDIX F

ADVANCED BMPs FOR INDUSTRIAL STORMWATER

INDUSTRIAL STORMWATER BMPs

1.0 INTRODUCTION

Process wastewaters which are discharged as point sources from industrial operations are regulated under the Clean Water Act (1987), Section 402, through the NPDES program. Improvements to the quality of such discharges should be targeted through technology-based modifications under facility NPDES permits. This section does not address primary treatment of such process wastewaters. In the 1987 Water Quality Act amendments to the CWA, stormwater discharges from industrial activities were brought under the NPDES permitting program. This section discusses BMPs which industries can utilize to minimize water quality impacts from their stormwater discharges to meet NPDES stormwater permit requirements as well as BMPs which can provide supplemental treatment for process wastewaters.

This section discusses best management practices (BMPs) to minimize and mitigate contamination of industrial stormwater runoff. Two distinct types of stormwater management practices are presented. The first subsection addresses the use of preventive measures (largely nonstructural practices) to control stormwater pollution. The latter subsection discusses control measures (structural practices). The descriptions are general in nature to introduce and explain the practices. More detailed information is available in other sources listed in the References.

2.0 BEST MANAGEMENT PRACTICES PREVENTIVE MEASURES

Preventive measures, sometimes called source controls, are management techniques that reduce the exposure of materials to stormwater, thereby limiting the amount of pollutants picked up by water. Since our discussion is oriented toward users who are experiencing existing water quality problems, it is focused more on mitigative measures, and therefore first line planning actions are not discussed here. However, many measures that mitigate existing water quality problems are preventive in nature, and these are discussed in the following section. Such practices use alternative maintenance procedures, education of management and technical personnel, or redesign of structures to reduce the amounts of pollutants entering stormwater and accumulating on impervious areas. Preventive measures are very cost-effective ways to manage stormwater runoff. Usually they require no land area, no construction and can be implemented with moderate effort. The following practices present methods for using source reduction to control stormwater pollutants.

2.1 Debris Removal

Stormwater control and conveyance structures require frequent debris removal to maintain proper function. Litter and wastes can clog inlets, catch basins, and outlets, lead to overflows, erosion and unintended flooding, and make these devices ineffective in stormwater pollutant removal. Grates on inlets and outlets should be easily cleaned by maintenance crews. Industrial stormwater permittees should be required to regularly clean inlets, catch basins, clean-out access points, and outlets. Forebays can be installed where feasible prior to entry into ponds. Forebays are very useful in promoting proper maintenance and cleaning. They are easily cleaned and separate much of the sediment, associated pollutants, and trash and floatables from the main pond. Paving portions of the forebay allows easy access for maintenance equipment. Hard bottoms can also be made permeable through the use of turf blocks or flexible revetment.

2.2 Education Programs

Education programs can be considered a nonstructural BMP that should be implemented for everyone. Many people will adapt new methods or use alternative materials if they are simply informed of techniques that can reduce the impacts on receiving waters. Industry employees can learn to properly handle and store materials and dispose of industrial wastes through in-house training courses, videotape presentations and interactive seminars. Local government agencies, such as the Cooperative Extension Service and the Industrial Extension Service often have educational materials to use in training. Local governments can sponsor public presentations, school programs and mailings aimed at children and adults. Industries, municipalities and homeowners can also learn how to use fertilizer and pesticides correctly to maintain their lawns and gardens without polluting the water.

2.3 Exposure Reduction

The best and one of the least expensive ways to reduce or eliminate pollutants in stormwater is to limit the exposure of materials that are potential pollutants to rainfall or runoff. Perhaps the best example is the now-required use of covered storage facilities for road salt. Covering the salt prevents exposure of the salt to rain, which reduces the pollution of the streams and ground water.

Other ideas for exposure reduction are:

Move or Remove. Industries, municipalities and homeowners can eliminate much pollution by reducing or eliminating exposure by simply moving materials indoors or removing materials, products, devices and outdoor manufacturing activities that contribute to stormwater pollution when exposed to the weather. Particularly, use or removal of rarely used materials that are stored outdoors can be simple and effective.

Inventory. An inventory of the items on commercial and industrial sites that are exposed to rain may provide useful information and a starting point for exposure-reduction activities. Examples are raw material stockpiles, stored finished products, and machinery or engines which leak fuel and oil. Any chemical, fuel, oil or liquid that is spilled or leaks onto the ground potentially pollutes stormwater runoff and ground water.

Covering. The partial or total physical enclosure of stockpiled or stored material, loading/unloading areas, or processing operations, this BMP is applicable to industrial, commercial, and residential source elements such as storage areas for dry chemicals, plant impervious areas, and surface impoundments used for waste storage and disposal. Drainage from a covering is captured and directed around potential contamination areas. This measure is useful for mitigating pollutants such as metals, oils and greases, and toxic and hazardous chemicals (USEPA, 1992). Covering is most effective as part of a system of BMPs which also addresses interception of runoff prior to contact with potential sources of contamination, as well as BMPs which address treatment of contaminated discharge from such sources.

Exposure Minimization. Implementing "Just-In-Time" (JIT) management of materials and finished products to minimize the amount of materials in the stockyard and at the loading dock. JIT management uses very precise scheduling and intensive management to keep the amount of raw or finished products to a minimum, reducing waste, storage costs and clutter. It is intended to reduce overhead and make the workplace more efficient; however, it can also reduce stormwater pollution by reducing exposure of materials to rain.

Maintenance. Site cleaning to reduce the amount of pollutants available to enter stormwater. Recycling of empty drums and removal of hazardous substances and wastes as soon as possible. Grading and seeding of old stockpile areas and bare areas to reduce erosion and improve appearance. Preventive maintenance to reduce leaks, breakdowns, spills and accidents. Replacement of worn seals, fittings and other parts before they leak or break. Maintenance of all pollution control devices in good working order. This will help to reduce pollution in all areas; for instance, air pollution control devices can reduce the amount of toxic substances and particulates, which can get washed into stormwater runoff.

Good Housekeeping. Cleaning and trash pickup of grounds, parking lot and road sweeping, and disposal of old, unused equipment.

Training, Prevention Programs. Spill prevention and response programs and training to prepare commercial and industrial employees to prevent and respond to spills.

2.4 Minimization of Pollutants

Significant stormwater pollution can be avoided by removing potential pollutants from the watershed, using alternative chemicals, using alternative practices, recycling or reducing the use of polluting chemicals and other materials. In addition to the management methods presented here, many innovative ideas can be used to reduce pollutants at specific sites. Industrial and commercial managers and residential dwellers are in the best position to devise alternative and innovative procedures and new techniques that avoid or reduce pollutants, and can be given guidance, incentives, and thought-provoking encouragement to do so.

Good examples of pollutant minimization are:

Collection/Recycling. Community hazardous waste and waste oil recycling centers. These activities remove some of the most polluting substances from places where the substances can enter stormwater runoff.

Separation. Connecting the drains from vehicle washing areas to the municipal sewer or sanitary sewer system to prevent discharge of the wash water into a nearby stream, if permitted by the local government.

Substitution. Using non-toxic or non-hazardous materials in place of hazardous materials, such as water-based degreasers and water-based inks to reduce the amount of solvents and chemicals that enter the environment.

2.5 Parking Lot and Street Cleaning

Street cleaning is usually performed to improve the appearance of streets and access roads; however, it can reduce pollutants in runoff if it is performed regularly. Another benefit of street cleaning is that pipes and outlets in detention structures and ponds are less likely to become clogged. New street sweeping machines pick up much finer materials than older models, a feature designed to help reduce the transport of sediment-bound pollutants. Disposal of street sweeping wastes may pose a problem because of possible high levels of lead, copper, zinc and other wastes from automobile traffic. Testing of street sweepings may be appropriate to determine appropriate disposal or reuse alternatives. Some municipalities and industries have found that street sweepings can be used as cover in sanitary landfills. Industries could be required to regularly sweep access roads, parking lots, truck aprons and loading dock areas. Homeowners should be educated not to use streets and curbs as disposal areas. Yard wastes and grass clippings can be disposed of in compost piles and the compost used around shrubs and in flower beds.

2.6 Runoff Diversion

Structures that channel runoff away from pollutant source areas include graded surfaces to redirect sheetflow, diversion dikes or berms which force sheetflow around a protected area, and stormwater conveyances (swales, channels, gutters, drains, sewers) which intercept, collect and redirect runoff. Diversion features are useful in industrial settings to prevent contamination with pollutants such as metals, oils and greases, and toxic and hazardous chemicals (USEPA, 1992).

2.7 Secondary Containment

Storage volume provided by depressed basins, dikes, berms, curbing, or retaining walls, for the capture of unintentional material releases within industrial operations to prevent release into the environment. The facility should be sized to provide at least 110% of the volume of the largest container involved, plus that of the 10-year recurrence interval rainfall event, if exposed to the atmosphere. It should be constructed of material that is sufficiently impervious to prevent external seepage, and that is compatible with the chemicals to be contained. Typical construction materials include concrete, asphalt, and clay. A layer of crushed limestone or clamshell over the base can help neutralize spilled acids. Such facilities provide for temporary containment of hazardous pollutants, and should be equipped with pumping systems for removal rather than drainage systems (USEPA, 1992). Secondary containment is most effective as part of a system of BMPs which includes safety practices to minimize the risk of spills occurring.

3.0 STRUCTURAL BMPs OIL AND GREASE TRAP DEVICES

A number of devices are used to remove oil and grease from stormwater. One type, commonly known as oil-water separators, is mechanical devices manufactured by various industrial equipment manufacturers and usually installed at industrial sites. These devices employ various mechanisms, some of which are proprietary, to separate oil from stormwater, which is then discharged to a treatment plant or to a receiving water. Oil-water separators usually require support from the manufacturer and are best used where these devices can be properly maintained and frequently inspected, such as at industrial sites. Information concerning these devices, their installation, use and requirements can be obtained from the manufacturer or a consultant.

Another type of oil and grease removal device is the oil and grease trap catch basin (or oil and grit separator). These catch basins are underground devices used to remove oils, grease, other floating substances and sediment from stormwater before the pollutants enter the storm sewer system. They are usually placed to catch the oil and fuel that leak from automobiles and trucks in parking lots, service stations, and loading areas. A third type of device is a simple skimmer and control structure used at the outlet of a sediment basin (forebay), typically used prior to discharge into a larger detention device.

This section discusses the latter two designs. A popular design for the oil and grease trap catch basin uses three chambers to pool the stormwater, allow the particulates to settle and remove the oil. As the water flows through the three chambers, oils and grease separate either to the surface or sediments and are skimmed off and held in the catch basin. The stormwater then passes on to the storm sewer or into another stormwater pollution control device. Because these devices are relatively small and inexpensive, they can be placed throughout a drainage system to capture coarse sediments, floating wastes, and accidental or illegal spills of hazardous wastes. Oil and grease trap catch basins can reduce maintenance of infiltration systems, detention basins and other stormwater devices. Since these catch basins detain stormwater for only short periods, they do not remove other pollutants as effectively as facilities that retain runoff for longer periods. However, these basins can be effectively used as a first stage of treatment to remove oil and sediment from stormwater before it enters another, larger stormwater pollution control device.

The second design involves an open sedimentation basin with a skimmer plate extending below the ponding control elevation at the outlet. Stormwater velocities are reduced in this sump, dropping out coarse sediment and separating oils and greases and floatables, which are retained in the basin by the skimmer as the stormwater discharges to a larger detention device or off-site. These sediment sump/skimmers are often designed larger than the underground chambers, have longer detention times, and thus remove more of the sediments and oils and greases.

Pollutant removal varies depending on the basin volume, flow velocity, and the depth of baffles and elbows in the chamber design. Well maintained catch basins should remove the following levels of pollutants, with the open sump/skimmer design showing somewhat higher levels.

OIL AND GREASE TRAP POLLUTANT REMOVAL	
Pollutant	**Estimated Removal Efficiency**
Plant Nutrients	None
Sediment Total suspended solids	Low
Metals Trace metals	Low
Oil and Grease	High
Organic Matter	Low

Bacteria	Low

3.1 Design Considerations

Oil and grease trap catch basins can be installed in most areas. Drainage areas flowing into the catch basin must be no larger than two acres and the catch basin must be large enough to handle dry weather flows that enter the basin. These catch basins can be installed in almost any soil or terrain, which allows their use near or at the impervious surfaces contributing heavily to the stormwater runoff. Little land area is taken up by catch basins as they require only enough area for proper maintenance. Oil and grease skimmer design is essentially that of a sedimentation basin with a control structure discharge that allows for mounting of a skimmer plate. The plate should extend sufficiently below the lowest discharge level to preclude siphoning of the water surface by the discharge.

3.2 Advantages

Oil and grease trap catch basins are inexpensive and easily installed in most areas. Since these devices are underground, there should be few complaints concerning appearances. These catch basins can be used very effectively as part of a system of stormwater controls to remove oily pollutants and coarse sediment before they enter another stormwater control device. Also small catch basins can be distributed over a large drainage area, which may prove advantageous over constructing a single large structure downstream. Sediment basins with skimmers are simpler and more easily maintained than the chamber design, tend to be larger and more effective in their role, and allow for photo degradation of hydrocarbons in addition to settling.

3.3 Disadvantages

Pollutant removal is low for contaminants other than oil, grease and coarse sediment for both types of systems. Both must have the accumulated sediment removed or cleaned out frequently to prevent sediment-bound pollutants from being stirred up and washed out in subsequent storms. Sediment removal removes the oil and grease because these pollutants eventually bind to the sediment. The chamber type is more difficult to maintain because of its enclosed, underground design, and typically is less efficient than the sediment basin because it tends to be smaller. Odors are sometimes a problem.

3.4 Maintenance

Oil and grease trap catch basins require regular inspection and cleaning at least twice a year to remove sediment, accumulated oils and grease, floatables, and other pollutants. Sump/skimmers require periodic but less frequent sediment removal. Wastes removed from these systems should be tested to determine proper disposal methods. The wastes may be hazardous; therefore, maintenance costs should be budgeted to include disposal at a proper site.

4.0 REFERENCES:

USEPA, 1992. *Storm Water Management For Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices*. EPA 832-R-92-006. U.S. Environmental Protection Agency, Office Of Water, Washington, DC.

USEPA, Industrial Stormwater Pollution Prevention Plans Guidance-February 2009. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

APPENDIX G

ACTIVITY-SPECIFIC SWP3s
(Under Separate Cover)
Volume II

APPENDIX H

OUTFALL VISUAL SAMPLING
(Under Separate Cover)
Volume III

APPENDIX I

INDUSTRIAL STORMWATER NUMERIC LIMIT EFFLUENT SAMPLING

(Under Separate Cover)

Volume IV

APPENDIX J

ECO COURSE DAILY SCHEDULE

Hunter Army Airfield SWP3

DAY 1:

Class Sign-In	0900
Day Course Overview	↓
Applicable Environmental Policy	
Environmental Regulations	
Video (20 mins)	
Environmental Pollution	1200
LUNCH	**1200-1300**
Washracks	1300
Recycling Procedures	↓
Building a SOP	
Video (15 mins)	
SOP Content	
Spill Response	1700

DAY 2:

Intro/Quiz #1	0900
Video	↓
Health Effects	
Used Product Management	
Hazardous Material/Hazardous Waste	
MSDS Overview	
Storage	
Containers/Labels/Marking	
SAPs	1200
LUNCH	**1200-1300**
Waste Management Branch – Landfill & Recycling	1300
HAZMART Program	
HAZ-Waste Turn-in (Bldg #1157) Site Visit	1700

DAY 3:

Intro/Quiz #2	0900
Environmental Inspections	↓
POL Storage	
Inspection Sheets	
ECO Responsibilities	1200
LUNCH	**1200-1300**
Motorpool Inspection Tour	1300
Industrial Wastewater Tour	↓
Classroom Discussion	1700

DAY 4:

Intro/Quiz #3	0900
Storm Water	↓
Water/Wastewater	
Forestry	1215
LUNCH	**1215-1300**
Cultural Resources	1300
Fish and Wildlife	↓
Wetlands	
Range Control	1630

DAY 5:

Course Review	0900
Final Test	↓
Turn-in Test and Course Evaluation Sheet	

APPENDIX K

EPD FORMS