4.0 Routine Site O&M

Routine operation and maintenance (O&M) at the Site apply to facilities and structures remaining after closure. These include the ponds and surface water control features, landfills, passive groundwater treatment systems, erosion controls, and revegetation efforts. These O&M activities are summarized below with detailed procedures and manuals provided in attachments or referenced documents.

4.1 Ponds and Surface Water Control Features

Ongoing O&M of Site surface water retention ponds and surface water control features will continue in order to provide ecological benefits, stormwater retention capacity, and dam safety. Some control features (i.e., flumes and weirs) are also important to the remedy, via their use in water quality considerations. The ponds will continue to be used primarily as stormwater management facilities. Ponds and other structures will be operated and maintained in accordance with the *Operations and Maintenance Plan for the Rocky Flats Surface Water Control Project* (O&M Plan for Site Dams) (Attachment B1) and the ERP (Attachment B2).

The O&M Plan for Site Dams details water management practices, operations, maintenance, and monitoring for the 12 surface water retention ponds and other major stormwater management structures. The following details are provided:

- Infrastructure descriptions—Detailed descriptions of dams, ponds, spillways, outlet works, diversion structures, functional channels (FCs), and canals;
- Pond management practices—Overview of water management strategies under both normal and emergency[1] conditions for all Site ponds;
- Operating instructions—Instructions for pond drawdown rates, drain bed valve operation, outlet works operation, and methods for evaluating and reporting unusual conditions;
- Maintenance and inspection instructions—Discussion of operating record generation and maintenance/inspection instructions for dams, ponds, spillways, outlet works, pipe crossings, diversion dams, FCs, and canals;
- Monitoring instructions—Detailed instructions for monitoring data collection associated with pond water levels, piezometer water levels, seepage, and dam structures (displacement, movement monuments, and inclinometers); and
- Appendixes—Detailed information for dam characteristics, operation logs, monthly observation reports, piezometer field data collection logs, flume ratings, inspection and maintenance schedules, engineering drawing references, report references, contractor and supplier references, capacity charts and graphs, dam location and access, permanent instrumentation characteristics, piezometer characteristics, and routine data reports.

The Site retention pond dams are all earthen structures that are monitored, maintained, and inspected to ensure dam safety. State dam hazard classifications range from “High Hazard Dam” (highest concern with loss of human life expected if dam fails) to “No Public Hazard (NPH)

[1]Detailed emergency response procedures are contained in the ERP (Attachment B2). Any references to emergency operations in the O&M Plan are subject to modification by the ERP. In case of discrepancies between the O&M Plan and the ERP, the ERP will take precedent.

Dam" (lowest concern with no loss of human life expected if dam fails, and damage only to the dam owner's property expected). The Landfill Dam and Dams A-4, B-5, and C-2 are "Low Hazard Dams" (no loss of human life or significant downstream damage expected); all other dams are "NPH." As a BMP, a series of action levels and corresponding response actions have been developed to prevent overtopping, uncontrolled discharge, and/or actual dam failure. These action levels and response actions are delineated in the ERP (Attachment B2). The ERP also describes response actions required in the event of an actual or potential unplanned release, the emergency discharge of water from retention ponds at the Site, or the actual or potential failure of a dam.

Only water containment/conveyance structures within the COU are managed by the DOE-LM (Figure 4−1). Diversion structures and canals/ditches located in the POU that have the potential to affect DOE facilities in the COU will be periodically inspected by DOE-LM. Any unacceptable observations will be reported to USFWS. DOE also actively maintains any RFLMA-required monitoring equipment located outside of the COU (e.g., flumes, flow meters, and so forth).

4.1.1 Data Collection Protocols

The actual decision process for managing pond operations and conducting pond and dam monitoring and maintenance activities is detailed in the O&M Plan for Site Dams (Attachment B1) and the ERP (Attachment B2). This section provides a summary of field and telemetry data collection for decision support.

Decision factors include safe pond capacity, actual pond elevation, current and projected flow rates into and out of the ponds, and several indicators of dam integrity such as piezometer readings, inclinometer readings, and cracks or sloughs of embankment material. The information needs are as follows:

- Pond inflow rates into Ponds A-3, A-4, B-5, and C-2 (can be continuously monitored with telemetry for daily to hourly averages with instantaneous measurement capability);[2]
- Pond elevations for Ponds A-3, A-4, B-5, and C-2 and the Landfill Pond (can be continuously monitored with telemetry for daily to hourly averages with instantaneous measurement capability);
- Measurements from piezometers within dams (as an indication of water pore pressure in dam structures; can be continuously monitored with telemetry for periodic averages with instantaneous measurement capability at Ponds A-3, A-4, B-5, and C-2 and the Landfill Pond);

[2] Critical measurements, such as pond inflow rates and elevations, require hourly monitoring capability.

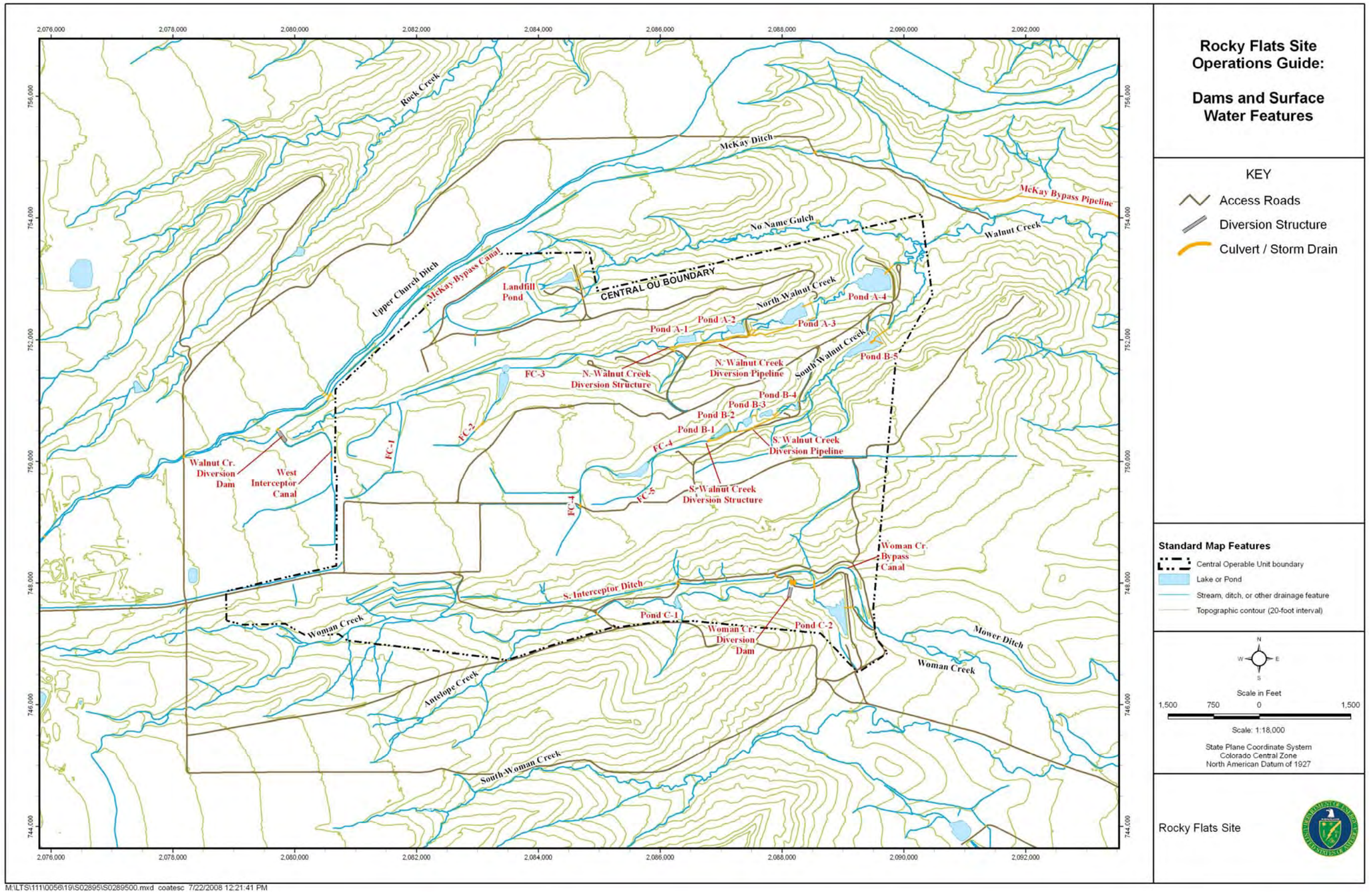

Figure 4−1. Rocky Flats Dams and Surface Water Features

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- Results from an expert system that rates the above inputs to determine whether to release water from a dam under emergency conditions (the ERP provides details that describe this logic);
- Pond discharge (outflow) rates from Ponds A-3, A-4, B-5, and C-2 (pumped or through outlets; daily to hourly averages with instantaneous measurement capability using telemetry);
- Weather predictions (affects the weighting factors in the expert system);
- Routine periodic dam inspections and observations as detailed in Attachment B1;
- Annual dam inspections by a qualified engineer for Dams A-3, A-4, B-5, C-2, and the Landfill Dam;
- Triennial dam inspections by a qualified engineer for Dams A-1, A-2, B-1, B-2, B-3, B-4, and C-1;[3]
- Crest monument movement monitoring; and
- Inclinometer monitoring.

Monitoring and inspection requirements to safely operate the dams are presented in Table 4−1.

4.1.2 Data Evaluation

The actual decision process for managing pond operations and conducting pond and dam monitoring and maintenance activities is detailed in the O&M Plan for Site Dams (Attachment B1) and the ERP (Attachment B2).

[3] Dam C-1 was breached in 2005; breaching of Dams A-1, A-2, and B-1 through B-4 is scheduled to be complete in 2009. Once concurrence is received from the Colorado State Engineer that these dams are no longer jurisdictional under the State Dam Regulations, most aspects of maintenance and inspection will no longer be required. These changes will be reflected in future revisions of the O&M Plan for Site Dams, the ERP, and this RFSOG.

Table 4−1. Monitoring and Inspection Requirements for Safe Operation of Site Dams

Data Types Monitored	Dam A-1	Dam A-2	Dam A-3	Dam A-4	Dam B-1	Dam B-2	Dam B-3	Dam B-4	Dam B-5	Dam C-2	Landfill Dam
Inflow rate (telemetry measurement)	—	—	24/day [GS13]	24/day [GS12]	—	—	—	—	24/day [GS10]	24/day [SW027]	—
Discharge rate (telemetry measurement)	—	—	24/day [GS12]	24/day [GS11]	—	—	—	—	24/day [GS08]	24/day [GS31]	—
Discharge rate (field measurement during discharge)	—	—	1/day	1/day	—	—			1/day	1/day	—
Pond elevation (telemetry measurement)	—	—	24/day	24/day	—	—	—	—	24/day	24/day	24/day
Pond elevation (field measurement)	1/month	1/month	2/month	2/month	1/month	1/month	1/month	—	2/month	1/month	2/month
Piezometers (telemetry measurement)	—	—	4/day	4/day	—	—	—	—	4/day	4/day	4/day
Piezometers (field measurement)	—	—	1/month	1/month	1/month	—	1/month	—	1/month	1/month	1/month
Routine dam observation	1/month	1/month	1/month	1/month	1/month	1/month	1/month	1/month	1/month	1/month	1/month
Detailed dam inspection	1/3 years	1/3 years	1/year	1/year	1/3 years	1/3 years	1/3 years	1/3 years	1/year	1/year	1/year
Inclinometer (field measurement)	—	—	—	2/year	—	—	—	—	2/year	2/year	—
Crest monument movement (field measurement)	—	—	—	2/year	—	—	—	—	4/year	2/year	—
Assessment of pond volumes and estimated evaporative losses for Broomfield Water Lease	1/month	1/month	2/month*	2/month*	1/month	1/month	1/month	1/month	2/month*	1/month	2/month*
Use of computer expert system to predict pond filling and discharge events	as needed	as needed	as needed	as needed	as needed	as needed	as needed	as needed	as needed	as needed	as needed

Notes: Specific automated gauging station locations are, for example, shown as [GS12]
— = Not applicable
* Special “event” reports may be required by the Lease Agreement based on change in stored volumes.

4.2 Landfills

The PLF consists of approximately 22 acres with an engineered Resource Conservation and Recovery Act (RCRA) Subtitle C-compliant cover. A diversion channel surrounds the landfill and diverts runoff away from the landfill to No Name Gulch. The PLF has a seep collection and passive aeration treatment system that discharges into the Landfill Pond. A gas extraction system is also built into the landfill and allows subsurface gas to vent out into the atmosphere. The PLF will be managed in accordance with the *Present Landfill Monitoring and Maintenance Plan and Post-Closure Plan, Rocky Flats Environmental Technology Site* (PLF M&M Plan) (Attachment D2).

The Original Landfill (OLF) consists of approximately 20 acres with an engineered soil cover. The final cover consists of a 2-foot-thick Rocky Flats Alluvium soil layer that was constructed over both a regraded surface and buttress fill. The original surface was regraded to provide a consistent slope. A 20-foot-high, 1,000-foot-long soil mass buttress fill was placed at the toe of the landfill. Erosion is controlled by a series of diversion berms that divert runoff from the cover and into lined perimeter channels. The two perimeter channels collect runoff from the diversion berms and carry it away from the landfill. The OLF will be managed in accordance with the *Landfill Monitoring and Maintenance Plan, Rocky Flats Environmental Technology Site, Original Landfill* (OLF M&M Plan) (Attachment D1).

Inspections of the PLF and OLF will be conducted on a set frequency as set forth in the corresponding monitoring and maintenance plans referenced above (Attachments D2 and D1, respectively) and RFLMA (Attachment A2). Changes to the inspection frequency can be developed and documented through the RFLMA consultation process. Results will be evaluated during the periodic CERCLA review process. The findings and observations of the landfill inspections will be submitted to EPA and CDPHE and presented in the annual report. As outlined in the controlling documents, results of the inspections, except water monitoring results, will be transmitted to EPA and CDPHE within 1 month of completion of the inspection. Water monitoring results will be included in the appropriate quarterly report. Inspections and monitoring activities will include groundwater and surface water sampling, and observations of subsidence/consolidation, slope stability, soil cover, vegetation, stormwater management structures, institutional controls, and erosion in surrounding features so that corrective actions can be taken in a timely manner.

Settlement monuments that monitor for settlement or slope instability will be surveyed by a land surveyor at a frequency designated by each landfill's respective monitoring and maintenance plan. In addition to the settlement monuments, the OLF has seven inclinometers that were installed in boreholes to monitor for slope changes over time. The inclinometers will be monitored periodically, per the monitoring frequency prescribed in the OLF M&M Plan. The OLF inclinometer boreholes also have piezometers with data loggers installed, and the data will be downloaded periodically at the time the inclinometer monitoring is done.

4.3 Groundwater Plume Treatment Systems

Contaminated groundwater beneath the Site is currently being treated in four systems: the Mound Site Plume Treatment System (MSPTS), the East Trenches Plume Treatment System

(ETPTS), the Solar Ponds Plume Treatment System (SPPTS), and the PLFTS. The groundwater treatment systems are designed to treat contaminated groundwater containing volatile organic compounds (VOCs) or elevated nitrates and uranium.

The MSPTS, ETPTS, and SPPTS each consist of a groundwater collection trench with a collection sump that feeds water to the treatment cells. Under normal operations, the treatment cells are configured so that water flows through the cells in series for treatment and then to the metering manholes for release to the subsurface or surface.

The fourth system, the PLFTS, receives the diverted flow from the north and south components of the Groundwater Intercept System (GWIS) and flow from the PLF Seep. This combined flow is routed across an engineered aerating surface that causes VOCs in the water to volatilize.

Sampling and analysis at these treatment systems are addressed in Section 6.1 and are performed in compliance with RFLMA (Attachment A2).

O&M requirements for these treatment systems and a guide for media replacement are contained in the *Operation and Maintenance Manual for Rocky Flats Groundwater Treatment Systems* (O&M Manual for Groundwater Treatment Systems) (Attachment C1) and the PLF M&M Plan (Attachment D2). Each system must be routinely inspected and maintained to ensure continued flow and treatment. The effectiveness of the treatment cells is influenced by the permeability of the media. At the MSPTS and ETPTS, the surface of the media can develop a crust that must be broken up regularly to ensure an even flow through the media in the treatment cell. This is not a concern at the SPPTS or the PLFTS. The MSPTS, ETPTS, and to a lesser extent the SPPTS, are also equipped with automated instrumentation that allows more detailed evaluation of system performance, and these components require occasional maintenance.

Routine inspection and maintenance at the MSPTS and ETPTS include:

- Checking water levels;
- Servicing flow meters;
- Checking valves and piping;
- Cleaning effluent lines;
- Disaggregating the top surface of reactive media; and
- Inspecting the instruments and plumbing in the associated instrument vaults.

Where system effluent flow is monitored using a flume and bubbler line, as is currently the case at the MSPTS, ETPTS, and SPPTS, the related components will be inspected on a monthly basis and cleaned/adjusted/recalibrated as warranted. This requires confined space entry; only properly trained and authorized personnel shall perform this task, and all the requirements associated with the confined space being worked shall be followed.

Data transmission from the instrument vaults will be checked weekly, and instruments will be calibrated quarterly as appropriate; portions of these activities require connection to the data loggers with a computer.

At the SPPTS, routine inspection and maintenance include:

- Checking water levels;
- Servicing flow meters;
- Checking valves and piping;
- Cleaning effluent lines; and
- Checking and servicing the solar panels, batteries, and pump.

At the PLFTS, routine inspection and maintenance include:

- Checking piping, manholes, grates, and steps for damage and proper operation; and
- Removing anything that may be blocking flow.

In addition, replacement of the reactive media is occasionally needed at the MSPTS, ETPTS, and SPPTS. See Section 14.0 for information on waste disposal.

4.4 Erosion Control and Revegetation

The final phase of closure included the implementation of erosion controls, including revegetation. Revegetation requirements for the Site have been established and are described in the *Rocky Flats, Colorado, Site Revegetation Plan* (RFSRP) (Attachment E5). The selection and application of erosion control materials varied throughout the former RFP/RFETS, depending on area-specific contaminant levels, physical conditions, proximity to surface water, and slope and soil characteristics. The primary goals of erosion control and revegetation will continue to be protection of surface water quality and enhancement of wildlife habitat.

The *Erosion Control Plan for Rocky Flats Property Central Operable Unit* (ECP) (Attachment E8) provides the regulatory approach, applicability, and scope of erosion control activities for the Site. It also lists various BMPs and how erosion controls will be implemented and monitored at the Site. Erosion controls serve to protect the reclaimed areas from significant erosion and promote infiltration and ET of surface water. These areas are designed to require minimal maintenance but will be inspected on a routine basis (per the ECP) to ensure they are functioning correctly. If a revegetated area is seriously affected by any surface erosion or deposition, such as from a heavy storm event, the area will be repaired. Repairs may include placing and grading fill material or topsoil. After the erosion feature is repaired, the area will be reseeded, and an appropriate erosion control material applied.

Erosion control inspections are made weekly in the Preble's mouse habitat (as required in the *Programmatic Biological Assessment for Department of Energy Activities at the Rocky Flats Environmental Technology Site* [PBA] Part II [Attachment E4]) until the area has become revegetated to the point where the vegetation has established and the erosion controls no longer serve a purpose. At other Site locations, erosion controls are inspected and observed as LMS personnel go about their day-to-day business, after significant storm events, and per the ECP.[4] Areas that have problems or appear susceptible to erosion will be reported. Conducting routine, ad-hoc, and after-storm inspections is important and will minimize the cost of maintenance or

[4] Significant storm events are defined as 1 inch or more of rain in a 24-hour period or significant melt of a 10-inch or more snowstorm.

repairs. The erosion control monitoring methodology is outlined in the *Rocky Flats, Colorado, Site Erosion Control Monitoring and Maintenance Inspection Procedure* (Appendix K). Erosion control inspections are also performed during the annual Site inspection.