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TECHNICAL REPORT FOR REMEDIAL ACTION SOUTHERN MARYLAND WOOD TREATING SITE HOLLYWOOD, MARYLAND

the IT group

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LIST OF ACRONYMS AND ABBREVIATIONS

AOP ..... Advanced Oxidation Process
bgs ..... below ground surface
BTDU ..... Batch Thermal Desorption Unit
C&D ..... Construction and Demolition
CBD ..... Commerce Business Daily
CPM ..... Continuous Process Monitor
CSA ..... Clean Soil Area
CTDU ..... Continuous Thermal Desorption Unit
cy ..... cubic yard
DRO ..... Diesel Range Organic
ETG ..... ETG Environmental, Inc.
FAR ..... Federal Acquisition Register
FFS ..... Focused Feasibility Study
FID ..... Flame Ionization Detector
FTO ..... Flameless Thermal Oxidizer
gpm ..... gallons per minute
GSA ..... Government Services Administration
H&S ..... Health and Safety
HDPE ..... High Density Polyethylene
ICF KE ..... ICF Kaiser Engineers
IPS ..... Inclined Plate Separator
IR ..... Incidence Rate
IT ..... IT Corporation
JSA ..... Job Safety Analysis
LWIR ..... Lost Workday Incidence Rate
MDE ..... Maryland Department of the Environment
MRT ..... Mix/Reaction Tank
MSDS ..... Material Safety Data Sheet
NAPL ..... Non-Aqueous Phase Liquid
NPL ..... National Priorities List
O&M ..... Operation and Maintenance
OHM ..... O.H. Materials
OSHA ..... Occupational Safety and Health Administration
OWS ..... Oil/Water Separator
PAH ..... Polynuclear Aromatic Hydrocarbon
PCP ..... pentachlorophenol
PEL ..... Permissible Exposure Limit
PFD ..... Process Flow Diagram
PID ..... Photoionization Detector
PLC ..... Program Logic Control
POP ..... Proof of Performance
PPE ..... Personal Protective Equipment
PRAP ..... Proposed Remedial Action Plan
QA/QC ..... Quality Assurance/Quality Control
QAPP ..... Quality Assurance Project Plan
QC ..... Quality Control
RA ..... Remedial Action
RCP ..... Recycled Concrete Product
RCRA ..... Resource Conservation and Recovery Act
RI/FS ..... Remedial Investigation/Feasibility Study
ROD ..... Record of Decision
SAP ..... Sampling and Analysis Plan
SMCDEH ..... St. Mary's County Department of Environmental Hygiene

SMECO..... Southern Maryland Electric Company
SMWT..... Southern Maryland Wood Treating Corporation
SOP ..... Standard Operating Procedure
SSHO..... Site Safety and Health Officer
SVOC..... Semi-volatile Organic Compound
TCLP..... Toxicity Characteristic Leaching Procedure
TDU ..... Thermal Desorption Unit
TERC..... Total Environmental Restoration Contract
THC ..... Total Hydrocarbon Content
TPH DRO ..... Total Petroleum Hydrocarbons – Diesel Range Organics
TPH GRO ..... Total Petroleum Hydrocarbons – Gasoline Range Organics
TSS..... Total Suspended Solids
USACE ..... U.S. Army Corps of Engineers
USEPA..... U.S. Environmental Protection Agency
UV..... Ultraviolet
VOC..... Volatile Organic Compound
VRS ..... Vapor Recovery System
WESP ..... Wet Electrostatic Precipitator
WTP..... Water Treatment Plant

1.0 INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

The Southern Maryland Wood Treating (SMWT) Superfund Site is located on Route 235 South, one mile north of the town of Hollywood. The site is approximately 25 acres in size and is part of a larger 96 acre parcel of land. Access to the site is through a chain-linked fence directly off Route 235, also known as Three Notch Road. The site is bounded by wooded, agricultural and residential land uses. There was an on-site freshwater pond, that was removed during the treatment and backfilling of Pit 4, discharging to Old Tom's Run (also referred to as the "West Tributary") at the southwestern portion of the site. The tributary flows into Breton Bay and finally into the Potomac River. The northern and eastern portions of the site are generally flat, with mostly grassed and wooded areas. The western and southern portions of the site slope toward the sedimentation pond located in the southwestern corner. Prior to remediation there was an approximately 4.5 acre area completely surrounded by an underground steel sheet pile wall.

As a result of the 1990 Interim Remedial Response Action, a steel sheet pile wall was installed around an area of high contamination and subsequently labeled as the "containment area" or "Pit 4". The various buildings and structures that served the wood treating facility were substantially demolished in 1993, with the exception of a pole barn used for wood storage and a small building used as an office. A large fenced in Equipment Decontamination facility located in the north-central section of the site was constructed in 1990 during this action, as well as a water treatment plant to be used to treat contaminated surface water from the pond. Both facilities were removed during final demobilization after remedial activities were completed.

1.2 SITE HISTORY AND BACKGROUND

From 1965 to 1978, the SMWT Corporation operated the site as an industrial wood treating and wood preserving facility. The process involved handling and storage of hazardous chemicals and the pressure treating, curing and drying of untreated lumber. This operation resulted in the contamination of soils, groundwater, surface water and stream sediments with the wood preserving chemicals, pentachlorophenol (PCP) and creosote.

In the early 1970s, the St. Mary's County Department of Environmental Hygiene (SMCDEH) responded to a request from the SMWT Corporation to install a new on-site well. Upon SMCDEH's inspection, evidence of potential contamination was suspected and the well application was denied. After conducting sampling, analyses and further inspections, environmental contamination was confirmed. This led to the issuance of a Consent Decree with the state of Maryland in November 1980 to completely restore the site.

The U.S. Environmental Protection Agency (USEPA) initiated its first response action on March 14, 1985. During this action, approximately 1400 cubic yards (cy) of contaminated pond sediments were stabilized with cement kiln dust and encapsulated in an impermeable synthetic liner located in the former lagoon area (Pit 4).

USEPA proposed that the site be added to the National Priorities List (NPL) on October 1, 1984, and the listing was finalized on June 1, 1986. In 1988, USEPA concluded a Remedial Investigation and Feasibility Study (RI/FS) at the site. Based on their findings, an initial Record of Decision (ROD) was issued on June 29, 1988. The ROD called for the 1) construction of a subsurface barrier wall around the former lagoon area; 2) excavation of contaminated soils; 3) on-site incineration of soils; 4) incineration of tank sludge and liquids; 4) pumping and treatment of contaminated groundwater; and 5) remaining building demolition.

Phase I – Construction of a Sheet Pile Barrier Wall, isolating the upper aquifer around the former lagoon process and pond area, was completed in November 1990. This was subsequently referred to as the "containment area" or Pit 4. In May 1992, design of the incineration system and groundwater treatment facility had reached 95% completion. Nonetheless, due to cost considerations and opposition to onsite incineration, the design work was suspended and a Focused Feasibility Study (FFS) was initiated to explore other options.

Meanwhile, a second removal action was initiated in June 1993 to address certain immediate environmental threats at the site. This included building demolition, off-site disposal of tank contents, removal and disposal of 350 drums of investigation-derived waste, sediment recovery, dam construction to contain pond wastes from migrating to the West Tributary, collection trench construction and construction of a contaminated water treatment facility.

The FFS, which started in May 1992, was concluded in February 1995. USEPA released a Proposed Remedial Action Plan (PRAP), which called for on-site thermal desorption instead of incineration as a preferred alternative to address earlier concerns. After the required Public comment period, this remedy was adopted and a ROD issued on September 8, 1995. This selected remedy was deemed to meet all criteria applicable to Federal and State standards and still be cost-effective. The remedy employed a permanent solution, maximized resource recovery and satisfied the statutory preference to reduce toxicity, mobility, or volume as a principal element. The ultimate goal of this action was to allow unrestricted use of this property; therefore, residential cleanup standards were dictated.

The execution of this project was administered through the Total Environmental Restoration Contract (TERC) held by ICF Kaiser Engineers (ICF KE) with USEPA construction oversight by the U.S. Army Corps of Engineers (USACE) – Baltimore District. In April 1999, the environmental portion of ICF KE was acquired by IT Corporation (IT). IT successfully completed this project.

1.3 PROJECT OVERVIEW AND CHRONOLOGY OF EVENTS

ICF KE began detailed planning, vendor selection, and procurement on the SMWT project, Task Order No. 16 in June 1997. Two major subcontracts involved the selection of vendors for the design/construction of a new water treatment facility and the "design/build/operate" thermal desorption subcontractor. O.H. Materials (OHM) was awarded the treatment facility contract and ETG Environmental, Inc. (ETG) the thermal desorption work. Site mobilization commenced in late fall of 1997. Construction of the new water treatment facility (WTP-2) began in October 1997 and assembly of the thermal desorption units in January 1998. Onsite Laboratories, Inc., was awarded the initial subcontract for analytical site services but was later replaced by IT's own facility and chemist. All other work such as project management and administration, Health and Safety, Quality Control, sampling, excavation, water treatment operation and maintenance (O&M) was performed by ICF KE and IT.

As part of the contract requirements, a formal Proof of Performance (POP) test was required to allow full-scale operation of the Thermal Desorption Unit (TDU) systems. This test was successfully completed on both the Batch Thermal Desorption Unit (BTDU) and Continuous Thermal Desorption Unit (CTDU) thermal treatment systems in June 1988. Likewise, upon completion of the Water Treatment Plant (WTP) Performance Test, WTP-2 was given the permission to operate in June 1998. Therefore, full scale treatment operations commenced in July 1998. Thermal processing continued until the end of August 1999 by ETG and was subsequently self-performed and finished by IT in October 2000.

Demobilization and site restoration planning began in February 2000 and a preliminary plan was developed based on a July 2000 start date. Subsequently, the demobilization schedule was condensed and placed on a fast track to compensate for additional treatment quantities encountered. Demobilization activities included a major auction of all government property considered as "surplus", decontamination of all process equipment, trimming of the sheet pile wall, demolition of the site buildings, and recycling of concrete pads. Site restoration activities included backfill, grading, soil amendment via application of a compost material commercially known as LeafGro™ and hydroseeding with an approved USEPA seed mix. Demobilization was completed in December 2000; however, due to weather conditions and growth season concerns, a portion of the composting and hydroseeding was suspended until early spring of 2001.

Project Closeout activities began in December 2000 and are expected to be completed in the fall of 2001. This task involves attaining release of liens from all vendors and subcontractors who performed work on the SMWT project, document control and archiving, finalization of all property issues, completion of all required technical reports and resolving of any disputes.

The following is a chronological table of major events that provide an overall timeframe for the execution of the SMWT project:

Date	Description of Event
September 8, 1995	ROD signed
October 1997	Site Mobilization
Oct 1997 – April 1998	Construction of WTP-2
November 1997	Construction of Process Pad
Jan 1998 – May 1998	Assembly of TDUs
March 1998	WTP Performance Test of WTP-2
June 1998	POP Testing of Thermal Units
July 1998	Full-Scale Operation of Treatment Operations
May 1998 – April 1999	Pit 1 Excavation and Backfill
June 1998 – Jan 1999	Pit 2 Excavation and Backfill
December 1998	Decision to Suspend Operation of Batch Units
Jan 1999 – May 1999	Pit 3 Excavation and Backfill
Jan 1999 – Oct 2000	Pit 4 Excavation and Backfill
Jan 2000 – Oct 2000	Pit 5 Excavation and Backfill
April 1999 – Aug 1999	Install/Operation of Pit 4 Dewatering System
April 1999	IT Takeover of ICF KE
April 1999	Additional POP Test to Allow Production Rate Increase
Sep 1999 – Jan 2000	Decontamination and Demobilization of Batch Units
August 28, 1999	IT Takeover of Thermal Operations from ETG
September 1999	Hurricane "Floyd" Event
October – Dec 1999	Refurbishment of CTDU Systems
Dec 31, 99 – Jan 1, 00	Implement Y2K Plan
February 2000	Begin Demobilization Planning
Mar 2000 – Aug 2000	West Tributary Remediation
September 2000	Composting and Overseeding of Pits 2 and 3
October 6, 2000	Complete Soils Processing/Begin Demobilization
October 2000	Government Sale of Surplus Equipment
October 2000	Quarter 3, 2000 Monitoring Well Sampling
October 2000	Final Composting/Seeding and Temporary Seeding of Pit 4
Oct-Nov 2000	Final Composting/Seeding of Pit 5 Areas and Pit 1
November 2000	Final Composting/Seeding of WTP-1/WTP-2 Areas
December 2000	Demobilization Complete
December 2000	Begin Project Closeout Process
December 2000	Quarter 4, 2000 Monitoring Well Sampling
Feb 26 – Mar 3, 2001	Remaining Areas Composted and Seeded
March 28, 2001	Quarter 1, 2001 Monitoring Well Sampling by RMC
June 2001	Complete Closeout Process

CTDU = Continuous Thermal Desorption Unit
ETG = ETG Environmental, Inc.
ICF KE = ICF Kaiser Engineers
IT = IT Corporation
POP = Proof of Performance
RD = Remedial Design
RMC = Resource Management Concepts, Inc.
ROD = Record of Decision
TDU = Thermal Desorption Unit
WTP = Water Treatment Plant

2.0 CONSTRUCTION ACTIVITIES

2.1 SITE PREPARATION

Site preparation activities included set up of facilities to support the remediation effort. These included temporary office trailers, decon facilities, sanitation facilities, temporary electrical power and telephone service and a platform truck scale. Other services included trash removal and disposal, security, perimeter fencing installation and/or modifications, site lighting and production well installation.

On the construction and process side, areas were cleared and grubbed, graded and backfilled with existing materials except where outside stone or recycled concrete product (RCP) was required for stabilization reasons. Haul roads were constructed to access the site work and accommodate the flow of traffic. Southern Maryland Electric Company (SMECO) installed the direct burial electrical cable to provide power to operate the intended process equipment and system support loads. Once SMECO had completed their task of providing primary power and transformers to the site, local electrical companies were hired to complete the secondary electrical hookups.

2.2 WATER TREATMENT PLANT #2 AND MOD TANK CONSTRUCTION

The WTP was designed to handle up to 70 gallons per minute (gpm) of oily contaminated condensates, decon pad wash down, and water from the Pit 4 containment pond. The system included collection tanks, an oil/water separator, chemical flocculent addition/reaction tanks, a clarifier, sand filtration unit, ultraviolet (UV) oxidation system, peroxide addition, permanganate treatment, pH adjustment, a filter press and four 6,000 lb activated carbon absorbtion vessels.

The building was a 40 ft x 80 ft x 24 ft high pre-designed fabricated metal construction with two large roll type doors and two personnel passages. The floor was 10-inch thick concrete with steel rebar reinforcement.

The existing WTP-1 consisted of two large sand filters, a stainless steel clarifier, a small oil/water separator, chemical addition/reactor tanks, pH control and two smaller activated carbon absorbtion vessels. The building was similar in construction to that of WTP-2 but only measured 30 ft x 36 ft x 15 ft high. The floor was concrete construction.

All treated water was pumped back to the Mod Tank. This was an open top tank used to store water for re-use in the TDU treatment process. The tank consisted of a single high density polyethylene (HDPE) sidewall and bottom liner supported by modular steel framework. The tank was installed on a graded subsurface, a layer of fine sand and an impermeable HDPE liner as a secondary precaution. An earthen berm was also constructed around the perimeter of the Mod Tank. The bottom HDPE liner was draped over this berm to complete the secondary containment measure.

2.3 CLEAN SOIL AREA, PROCESS PAD, POLE BARNS CONSTRUCTION

An approximate 200 ft x 200 ft area was constructed immediately adjacent to the CTDU process pad. This area was referred to as the Clean Soil Area (CSA) and was designed to hold approximately 700 tons of treated soil per bin area awaiting analytical determination. The area was constructed from both on-site fill and off-site aggregate borrow. The area was divided into twelve bin areas, which were separated using interlocking poured concrete barrier blocks to form walls. The barrier blocks were approximately 2 ft x 2 ft x 6 ft and stacked two high.

The TDU process pad was 120 ft x 200 ft x 6-inch thick, wire-mesh reinforced concrete with a 4-inch perimeter curb for containment. The pad was poured on top of a 12-inch sub base of crushed aggregate and geotextile fabric layer. Three troughs were poured in-place to route process liquid piping or electrical cables. A French drain was installed along the north side of the pad and sewer piping leading into the Pit 4 pond. This was designed to handle any surface run-on that could eventually be treated by the WTPs. Four drain sumps were installed on the process pad to collect any wash down, drips or run-on to the process pad. All water collected here was either stored temporarily in 10,000-gallon Condensate Storage tanks or pumped directly to the WTP for processing. The process pad was equipped with photo-sensitive lighting mounted on perimeter wooden poles.

Two pole barns were constructed to protect the screened soils from weather impacts prior to treatment. The construction consisted of several 36-inch diameter concrete columns to anchor the upright poles that provided the support for the wooden truss and corrugated metal roofing. The measurements of the two barns were 50 ft x 150 ft x 30 ft high and 40 ft x 120 ft x 30 ft high. The barns were equipped with overhead lighting and roof drains to direct precipitation away from the work area.

2.4 THERMAL PROCESS EQUIPMENT DESCRIPTION

ETG's system consisted of two types of thermal desorption systems. Two of each system were initially provided to treat the contaminated soils. The CTDUs were designed to handle less contaminated, 10-12% moisture, and less than 2-inch sized materials. Conversely, the BTDUs were designed to handle higher contaminated, oversized and more cohesive materials. Both systems were indirect flame, No. 2 Fuel-fired and designed for 24 hours/day, 7 days/week operation.

2.4.1 Batch Thermal Desorption Units

The BTDUs consisted of trailer mounted batch units capable of processing 7-10 cy per batch at approximately 12-18 hour intervals. These units were heated by a single flame nozzle firing into a center mounted heat tube with auxiliary radial heat tubes. The contaminated material was contained within the treatment drum which revolved around the heated tube surfaces. Steel flights were welded to the inside of the treatment drum similar to that of a cement truck. Thus, rotation in one direction would provide retention, mixing and de-lumping up of materials being treated and rotation in the opposite direction for discharging the treated materials. A vacuum pressure was applied within the drum to enhance desorption and maintain an oxygen deficient atmosphere. Thus, the contaminated materials were indirectly heated to first release water and then organics, which were collected in the Vapor Recovery System (VRS).

Each system had its own skid-mounted VRS. Each VRS consisted of vacuum pump air blowers, hot cyclone, solids knock-out vessels or impingers, shell and tube heat exchangers, pumps and condensate recovery tanks. Treated materials were conveyed through a water-cooled screw conveyor to a temporary pile to be consolidated in the CSA awaiting analytical results. The BTDU systems shared a single water chilling system and a non-contact cooling tower and Flameless Thermal Oxidizer (FTO). The FTO was the final polishing unit to remove any residual organics prior to atmospheric discharge. A Continuous Process Monitor (CPM) was used to monitor discharge. Further details and process flow diagrams can be found in the April 1988 "*Low Temperature Thermal Desorption Units – Proof of Performance/Summary of Full Scale Operations*".

In the winter of 1999, the operation of the BTDU systems were suspended and re-evaluated due to poor uptime, high repair costs and safety concerns with recent Occupational Safety and Health Administration (OSHA) confined space entry rescue regulations. In summer of 1999, the final decision was made to abandon, decontaminate and demobilize the BTDU treatment systems. It was also later proven that by pre-blending and other process modifications, almost all soils could be successfully treated in the CTDUs. Therefore, no further discussion of the BTDUs will be covered in this report.

2.4.2 Continuous Thermal Desorption Units

Each CTDU consisted of a trailer mounted, continuous feed rotating kiln, capable of processing 10-15 tons per hour dependent on feed concentration, moisture, soil properties and other considerations. These units were divided into three firing zones with a pre-designed 13 burner nozzle arrangement. The inner shell was 60 inch diameter x 50 feet long. The actual trailer was approximately 70 feet long. A short section of flighting was welded to the feed end and a pattern of steel lifters also welded throughout the drum to promote material de-clumping. Feeding of the system was accomplished initially by screw conveyors and a single screw feeding system. These were eventually replaced with a Powerscreen feeder, an inclined rubber belt conveyor and a twin-screw feeder. The retention time was set at a minimum of 15 minutes at a minimum soil exit temperature of 900°F to assure complete treatment. Each VRS was comprised of a Hot Cyclone, Quencher/Rod Deck Scrubber, a Wet Electrostatic Precipitator (WESP), an FTO and a Water Cooling Tower. A Pugmill mixer and radial stacking conveyor was located on the discharge end of each CTDU to cool and hydrate treated materials prior to stacking. The stacked treated materials were then transferred to the CSA bins, sampled and analyzed for backfill criteria.

The thermal systems were manually operated by local control panels and Program Logic Control (PLC) processors. A central console and data logging system was provided to monitor each individual thermal treatment unit's processes. This central console was located in the Control Trailer on the process pad. Atmospheric discharge was measured as Total Hydrocarbon Content (THC) at the end of the discharge stack. This was accomplished by a continuous sampling of the discharge air streams fed into individual unit flame ionization detectors (FIDs). THC was continuously monitored, recorded, and equipped with an alarm system to alert personnel of any permit exceedences.

3.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

Soils with contaminant concentrations in excess of the established clean-up levels were excavated for on-site treatment. These action levels were specified in the ROD dated September 8, 1995. Eight carcinogenic polynuclear aromatic hydrocarbon (PAH) compounds are used to calculate the benzo(a)pyrene equivalent concentrations. These compounds were selected based on their prevalence at the SMWT site, and because they presented the greatest risk to human health and the environment. The concentration obtained from laboratory analysis for each compound is multiplied by a scaling factor to obtain a risk-based concentration.

The eight compounds and their scaling factors are shown in the table below. If the sum of the eight scaled concentrations exceeded 0.1 mg/kg, then the clean-up level was exceeded for surface soil, and the soil was excavated. Clean surface soil was backfilled at a depth of zero to two feet below final grade. If the sum of the eight scaled concentrations exceeded 1.0 mg/kg, then the clean-up level was exceeded for subsurface soil, and the soil was excavated. Subsurface soil was backfilled at depths greater than 2 feet below final grade.

Benzo(a)pyrene Equivalence

Compound	Benzo(a)pyrene Scaling Factor
benzo(a)anthracene	0.1
benzo(b)fluoranthene	0.1
benzo(k)fluoranthene	0.01
benzo(a)pyrene	1.0
Chrysene	0.001
dibenzo(a,h)anthracene	1.0
indeno(1,2,3-cd)pyrene	0.1
Carbazole	0.003

The USEPA established clean-up levels for PCP in March 1999. This was due to the presence of soil with elevated levels of PCP in conjunction with low levels of benzo(a)pyrene concentrations. These clean-up levels were determined to be 5,000 µg/kg for surface soil and 1,700 µg/kg for subsurface soil.

3.1 SAMPLING AND ANALYSIS PLAN (SAP)

The approved "*Sampling and Analysis Plan for Remedial Activities*" was submitted to USACE in June 1998, with a revision in December 1998, and a final revision in January 1999. This plan includes procedures for taking samples, sample frequency, analytical methods, and project goals. Five major areas of field activities were covered. These are:

- Perimeter Air Monitoring – Baseline, POP and Full Scale
- Soil and Sediment Excavation – Five (5) Pits, West tributary
- Thermal Desorption – POP, TDU Operations
- Wastewater Treatment – WTP-2 (new) and WTP-1 (existing)
- Groundwater Sampling – Quarterly, Pre-Construction and Post-Construction

Additionally, three other major topics were covered: decontamination requirements, on-site treatment requirements and off-site transportation and disposal. Further details are contained in the above referenced document.

3.2 QUALITY ASSURANCE PROJECT PLAN (QAPP)

The approved "*Quality Assurance Project Plan*", was submitted to USACE in June 1998. This plan included details of how the project was managed from a Quality Assurance aspect. The major aspects covered in this plan included:

- Project Organization and Responsibilities

- Data Quality Objectives – Requirements for each Field Activity listed above, cleanup criteria, chemical data measurement
- Sample Management – Identification System, Containers, Preservatives, Holding Times, Documentation, etc.
- Analytical Procedures – Soil, Water, Stack Air Methods, Perimeter Air, Calibration, Detection Limits and Field Testing
- Internal Quality Control (QC) Checks – USEPA QC and USACE Requirements, Field QC Rinse/Equipment Blanks, Trip Blanks, Duplicate Samples, Source Water and Temperature Blanks
- Data Reduction, Validation and Reporting – Procedures employed
- Corrective Action – Procedures and Remedies for Non-Compliance
- Quality Assessments – Document Review and Control, Various Phase Checklists, Laboratory and Field Audits, Daily QC Reporting
- Quality Control Reporting – Daily and Monthly Internal QC Reports, Monthly Wastewater Plant Effluent Regulatory Report

3.3 THERMAL SYSTEM OPERATION

The system operation can best be described by the process flow diagram (PFD) contained in Appendix A. In summary, once soils have been deemed in excess of closure guidelines, they were excavated, weighed and stockpiled under the pole barns for pre-screening. Besides screening of materials to remove oversized materials, attempts were made to pre-blend higher contaminated soils with less contaminated soils, and wetter soils with drier soils to homogenize the feed to the CTDUs. This is very important for optimization of any continuous treatment system. Therefore, soils were sampled and tested for moisture content, PAH concentration and other important characteristics.

The screened soils were fed into a Powerscreen/belt feeder with a front end loader. The material coming from this feeder was conveyed by an inclined belt to a twin screw feed hopper. The feed hopper contained a level control system, which together with the belt feeder on the screening plant formed a feedback loop control system to maintain a consistent feed rate. Once the material entered the Calciner, treatment was accomplished by thermally heating of soils to approximately 1000°F to desorb the organic constituents of the soil. Each Zone was specifically designed to thoroughly treat the contaminated soils. Indirect heat was supplied by No. 2 oil burners and a constant stream of nitrogen at the rotating seals. The nitrogen, together with recycling a portion of the burner exhaust gas, were key measures in maintaining a low oxygen, non-combustible atmosphere in the Calciner drum.

The hot treated soils were transferred by a discharge screw conveyor into the Pugmill mixer, which mixed, cooled, and hydrated the treated soil. The steam and particulate carry over from this process were collected by the CTDU scrubber system. An inclined stacker conveyor was used to form treated soil stockpiles. All treated soils were placed into storage bins in the CSA awaiting final resolution. Based on analytical outcome, the soils were used as surface/sub-surface backfill. There were only 1,546 tons of soil requiring retreatment through the CTDUs for the entire project.

CTDU exhaust gases, desorbed contaminants, steam vapors and entrained particulates first entered the Hot Cyclone for initial heavy particulate removal. The heavy solids were discharged into the pugmill and blended with the discharged treated soils. The remainder of the vapor stream was subject to a quencher/rod deck scrubber to remove oils and particulates. In addition to the scrubbing action, a WESP was employed to remove aerosols and other sub-micron particle. Finally, a regenerative FTO was used to polish the air stream before its release to the atmosphere.

All condensates and oils were stored and/or directly transferred to the WTP. All treated water was re-used by the CTDUs as make-up water, or for soil cooling and rehydration.

3.4 SOILS OPERATION AND PIT MANAGEMENT

There were five (5) main areas excavated at the SMWT site referred to as Pits 1 - 5 and two other areas called the "West Tributary" and "Miscellaneous" identified hot spots. In general, soils were excavated by means of a crawler-mounted excavator, loaded into articulated dump trucks, weighed on a platform truck scale and stockpiled underneath the pole barns awaiting screening and/or blending prior to thermal processing. In March 2000, the truck scale had to be eliminated due to discovery of a diesel plume beneath the scale foundation. At this point, an electronic bucket scale was substituted to measure the volume of soil being processed.

The actual soil volumes excavated from each of these pits exceeded the quantities and boundaries delineated from previous studies. The following table summarizes the expected vs. actual quantities (in Tons) excavated from each of the five pits and the stream area.

Location	Expected Tons[1]	Actual Tons[2]
Pit 1	22,800	52,578
Pit 2	1,800	3,949
Pit 3	2,600	12,823
Pit 4	114,500	179,431
Pit 5	400	24,213
West Tributary	2,900	600
Miscellaneous		55
Total Tons	145,000	273,649

(1) refer to ROD, EPA, September 1995.
(2) includes soils treated on-site and off-site.

3.4.1 Pit #1 Excavation

Pit 1, the former Land Treatment Area and Spray Irrigation Area, was the first area to be excavated. USACE approved the last open grids in Pit 1 to be closed on October 23, 2000, based on verification sample results.

Pit 1, comprised of the Spray Irrigation Area and The Land Treatment Area, were areas of creosote (PAHs) and PCP contamination created in 1982 as the result of SMWT Corporation's failed attempt to remediate the site. An order from the State of Maryland (1980) required complete restoration of the site. The Spray Irrigation Area was created when SMWT sprayed the liquids from the lagoons into the woods at the southwest end of the site. The Land Treatment Area was created when SMWT excavated the remaining sludge in the lagoons, mixed the sludge with wood chips, composted sewage, and top soil, and spread the mixture over an area in the southwest portion of the site.

Excavation of Pit 1 began in May 1998, and initial backfilling was completed in April 1999. Additional treated soil, segregated into subsurface and surface criteria material, was stockpiled on top of Pit 1, until it could be used as backfill for Pit 4. Following approval of the final site grading plan, Pit 1 was graded to two feet below final elevation and the top two feet replaced with surface criteria material. Grading and seeding of Pit 1 was completed on December 2, 2000.

Based on previous reports, the volume of soil to be excavated from Pit 1 was estimated to be 22,800 tons. The total amount of soil removed from Pit 1 was 52,600 tons. The increase in excavated soil was due to additional contamination discovered to the north and west.

Soils that were used to backfill Pit 1 were treated by the TDUs. After the treated soil was sampled and verified to meet established levels, it was stockpiled into surface or subsurface piles. All subsurface soil was backfilled in areas that were greater than 2 feet deep. Pit 1 was backfilled with both surface and

subsurface criteria soil. Following approval of the final site grading plan, Pit 1 was graded to two feet below final elevation and the top two feet replaced with surface criteria material.

During December 2000, Pit 1 was amended with 2 inches of LeafGro™, tilled into the top 6 inches, and then fertilized and seeded in accordance with the May 1999 *SMWT Stabilization and Seeding Plan*. The seed mixture contained the USEPA recommended variety of native grasses, including Annual Grain Rye, Annual Rye, Flatpea, Deer Tongue, Little Bluestem, Big Bluestem, Switch Grass, Perennial Rye, and Red Fescue. Areas seeded after December 1 also had an additional 25 pounds per acre of Annual Rye added to the seed mix. Slow release fertilizer, 29-3-4 (N-P-K), was applied at an application rate of 125 pounds per acre. Wood fiber mulch was applied as a tacking agent at a rate of one ton per acre.

Details of Pit 1 sampling and results are included in *Pit 1 Closure Report, December 2000.*

3.4.2 Pit #2 Excavation

Pit 2 was the second area to be excavated. Pit 2 was located between the former Northeast Tank Area (Pit 3) and the former Land Treatment Area (Pit 1), within the drainage swale to the East Tributary. The surface soil in this area was contaminated with carcinogenic PAHs and, to a lesser extent, PCP. Excavation began in Pit 2 in June 1998, and sampling began on October 23, 1998. USACE approved the last grid of Pit 2 to be backfilled on December 24, 1998, based on excavation sample results. Backfilling of Pit 2 was completed on January 15, 1999. Final grading and seeding of Pit 2 was completed in May 1999.

Based on previous reports, the volume of soil to be excavated from Pit 2 was estimated to be 1,800 tons. The total amount of soil removed from Pit 2 was 3,949 tons. The increase in excavated soil was due to additional contamination discovered to the east and west.

The bins that were used to backfill Pit 2 were treated by the TDUs between the dates of December 24, 1998 and January 15, 1999. The treated soil was sampled and approved for use as either surface or subsurface backfill based on established clean-up levels. Due to multiple bins of each type of soil, it is difficult to determine where each bin of soil was backfilled. However, care was taken to backfill subsurface soil in areas that were greater than 2 feet deep. Soil meeting surface backfill criteria was used for backfilling the top 2 feet.

On May 28, 1999, Pit 2 was fertilized and seeded in accordance with the May 1999 *SMWT Stabilization and Seeding Plan*. The seed mixture contained the USEPA recommended variety of native grasses, including Annual Grain Rye, Flatpea, Deer Tongue, Little Bluestem, Big Bluestem, Switch Grass, Perennial Rye, and Red Fescue. Fertilizer was applied in accordance with the St. Mary's County Cooperative Extension Service's recommended ratio of 50-15-10 pounds per acre (N-P-K).

Additional seeding was done later in the season to improve growth, which was impacted by the summer drought. In July 1999, Pit 2 was re-seeded with Winter King Rye (Annual Rye). In October 1999, erosion control matting was installed in areas of Pit 2 that had experienced high rates of erosion. The areas were seeded again at that time to promote stable vegetation growth.

Details of Pit 2 sampling and results are included in *Pit 2 Closure Report, June 2000.*

3.4.3 Pit #3 Excavation

Pit 3 (the former Northeast Tank Area) was the third area to be excavated. USACE approved the last open grid in Pit 3 to be backfilled on March 17, 1999, based on verification sample results. Due to tank leakage and storage of treated wood in the area, the surface soil was contaminated with carcinogenic PAHs and, to a lesser extent, PCP. Excavation began in Pit 3 on October 27, 1998, and backfilling of Pit 3 was completed in May 1999. Grading and seeding of Pit 3 was completed in June 1999.

Based on previous reports, the volume of soil to be excavated from Pit 3 was estimated to be 2,600 tons. The total amount of soil removed from Pit 3 was 12,800 tons. The excavated area of Pit 3 expanded farther south, east and west than was originally anticipated. The south fenceline bordering the pit was moved back approximately 50 feet from its original location. Additionally, railroad tracks once ran along the far east section of Pit 3. Samples were taken of the railroad bed every 30 feet along the east

portion of the SMWT property. With the exception of 2 samples, all were above the clean-up levels for surface soil. This is summarized in a January 12, 1999 memo to USACE entitled *Railroad Bed Samples.* The section of the railroad bed located within Pit 3 was excavated and verified to meet clean-up levels. In order to prevent cross-contamination, this area was lined with polyethylene before backfilling.

The bins that were used to backfill Pit 3 were treated by the TDUs between March and May 1999. After the soil was sampled and verified to meet established levels, it was stockpiled into surface or subsurface piles. All subsurface soil was backfilled in areas that were greater than 2 feet deep; however, due to multiple bins of each type of soil being stockpiled, it is difficult to determine exactly where each bin of soil was backfilled. However, Pit 3 was primarily backfilled with surface criteria soil, with subsurface criteria soil reserved for backfilling into Pit 1 and Pit 4.

On May 28, 1999, Pit 3 was fertilized and seeded in accordance with the May 1999 *SMWT Stabilization and Seeding Plan.* The seed mixture contained the USEPA recommended variety of native grasses, including Annual Grain Rye, Flatpea, Deer Tongue, Little Bluestem, Big Bluestem, Switch Grass, Perennial Rye, and Red Fescue. Fertilizer, 50-15-10 (N-P-K), was applied in accordance with the St. Mary's County Cooperative Extension Service's recommended application rate.

Additional seeding was done later in the season to improve growth, which was impacted by the summer drought. In July 1999, Pit 3 was re-seeded with Winter King Rye (Annual Rye). In October 1999, silt fencing and straw bales were installed in areas of Pit 3 that had experienced high rates of erosion. The areas were seeded again at that time to promote stable vegetation growth.

During June 2000, grading soils stockpiled from the construction of the TDU pad, were spread in the western section of Pit 3. In subsequent months, this subsurface soil was removed and placed in Pit 4, the area covered with treated soil meeting surface criteria, regraded to final contours, and seeded with annual rye.

In September 2000, Pit 3 was amended with one-half inch of LeafGro™. The silt fences were removed and replaced with one super-silt fence and one row of straw bails along the southern fenceline of Pit 3. The swale above this area was covered with erosion netting. Pit 3 was reseeded with the previously recommended seed mixture.

Details of Pit 3 sampling and results are included in *Pit 3 Closure Report, October 2000.*

3.4.4 Pit #4 Excavation

Six unlined lagoons, used for disposal of liquid waste from the former wood treating process, were located in the southern portion of the site. This disposal practice resulted in the contamination of subsurface soils with non-aqueous phase liquids (creosote) to a depth of up to 40 feet, where a confining layer of clay stopped the vertical migration of contaminants. East of the lagoons was the process area, including buildings and tanks associated with wood treatment operations.

In 1988, USEPA concluded a site investigation and feasibility study and issued a ROD. Included in the ROD was a requirement for the construction of a subsurface barrier wall around the former lagoons and process area. The area within the barrier, a sheetpile wall installed in 1990, became known as the Containment Area or Pit 4.

Pit 4 was the fourth area to be excavated. Excavation of Pit 4 began in January 1999, and backfilling, final grading, and seeding was completed in October 2000. USACE approved the last open grid in Pit 4 to be backfilled on July 12, 2000.

Based on previous reports, the volume of soil to be excavated from Pit 4 was estimated to be 114,500 tons. The total amount of soil removed from Pit 4 was 179,400 tons. The increase in excavated soil was due to additional subsurface contamination discovered to the east and south within the barrier.

Treated soil, after approval for backfilling, was segregated into surface (67% of the treated soil) and subsurface (33% of the treated soil) criteria material and stockpiled on top of Pit 1. Due to material handling considerations, soil was stockpiled until particular grids in Pit 4 were approved for backfilling. Only material meeting surface criteria was used to backfill the final two feet of Pit 4. This was ensured by placing grading stakes within Pit 4, before surface material was backfilled, showing that the final grade elevations would be more than 2 feet above the subsurface material.

The sheetpile wall surrounding Pit 4 was cut off to a minimum depth of three feet below final grade. One section of the sheetpile wall, approximately 15 feet long, near grids 22 and 23, was removed completely to permit groundwater to flow out of the containment area. The excavation trench that permitted removal of this portion of the sheetpile wall was filled with rock to help communicate groundwater from Pit 4 into the sedimentation basin directly below Pit 4. The general grading in this area of Pit 4 was also gently sloped to minimize sediment and erosion from surface water which might impact the stream below Pit 4.

Backfilling and final grading of Pit 4 was completed in October 2000. Pit 4 was then amended with 2 inches of LeafGro™, tilled into the top six inches, and then fertilized and seeded in accordance with the May 1999 *SMWT Stabilization and Seeding Plan*. The seed mixture contained the USEPA recommended variety of native grasses, including Annual Grain Rye, Annual Rye, Flatpea, Deer Tongue, Little Bluestem, Big Bluestem, Switch Grass, Perennial Rye, and Red Fescue. Slow release fertilizer, 29-3-4 (N-P-K), was applied at a rate of 125 pounds per acre. Wood fiber mulch was applied as a tacking agent at a rate of one ton per acre.

Details of Pit 4 sampling and results are included in *Pit 4 Closure Report, July 2001*.

3.4.5 Pit #5 Excavation

Pit 5, northeast of Pit 4, was the last excavation area to be completed. USACE approved the last grid in Pit 5 to be backfilled on October 23, 2000, based on verification sample results.

Pit 5 encompassed shallow contamination between Pit 4 and the Thermal Desorption Treatment Area, the sprung structure area, and haul roads northeast of Pit 4. Pit 5A, contained within Pit 5 and identified during the remedial activities, was related to a diesel plume discovered in the soils adjacent to and northeast of the sheetpile wall.

Excavation of Pit 5 began in January 2000, and backfilling of Pit 5 was completed in October 2000. Treated soil, which was approved for backfilling and segregated into subsurface and surface criteria material, was stockpiled on top of portions of Pit 5, until it could be used as backfill for Pit 5. Only material meeting surface criteria was used to backfill the final two feet of Pit 5. This was ensured by placing grading stakes within Pit 5, before surface material was backfilled, showing that the final grade elevations would be more than 2 feet above the subsurface material. Final surface grading and seeding of Pit 5, which followed backfilling activities, was completed on 2 December 2000, except for an area under stockpiled fill material in Grids 8 and 9 which was reseeded in March 2001.

Based on previous reports, the volume of soil to be excavated from Pit 5 was estimated to be 400 tons. The total amount of soil removed from Pit 5 was 24,200 tons. The increase in excavated soil was due to additional surface contamination discovered to the southeast and subsurface diesel contamination south of the proposed excavation area.

The bins that were used to backfill Pit 5 were treated by the TDUs between June 2000 and October 2000. After the soil was sampled and verified to meet established levels, it was stockpiled into surface or subsurface piles. All subsurface soil was backfilled in areas that were greater than 2 feet deep; however, due to multiple bins of each type of soil being stockpiled, it is not known exactly where each bin of soil was backfilled. Pit 5 was backfilled with both surface and subsurface criteria soil.

During December 2000, Pit 5 was amended with 2 inches of LeafGro™, tilled into the top six inches, and then fertilized and seeded in accordance with the May 1999 SMWT Stabilization and Seeding Plan. The seed mixture contained the USEPA recommended variety of native grasses, including Annual Grain Rye, Annual Rye, Flatpea, Deer Tongue, Little Bluestem, Big Bluestem, Switch Grass, Perennial Rye, and Red Fescue. Because seeding was conducted during December, an additional 25 pounds per acre of Annual Rye was added to the seed mixture. Grids 8 and 9 were seeded in March 2001. Slow release fertilizer, 29-3-4 (N-P-K), was applied at a rate of 125 pounds per acre. Wood fiber mulch was applied as a tacking agent at a rate of one ton per acre.

Details of Pit 5 sampling and results are included in *Pit 5 Closure Report, July 2001*.

3.4.6 West Tributary Remediation

In the spring of 2000, IT began remediation of the wetland areas of the west tributary of Old Tom's Run below the SMWT site. This remediation is detailed in *Stream Restoration Plan, August 2000.*

The Pre-Design Study (Dames and Moore, 1992) suggested contaminants were transported from on-site surface soils to stream sediments through surface runoff/erosion. Storm events that caused the waste lagoons to overflow into the stream, or contaminated groundwater which infiltrated the freshwater pond that fed into the west tributary, were other proposed routes for introducing contamination into the west tributary.

Wetlands associated with the west tributary consisted of 0.18 acres of steep-banked stream channel, 0.91 acres of braided swampy stream channel, and 0.77 acres of seeps alongside the channels.

The initial SMWT west tributary remediation began in 1999 by verifying the "hot spots" identified in 1992. Verification samples were obtained during July and September 1999 from the 15 previously sampled locations plus depositional and discolored areas. Phase I excavations proceeded in February and March 2000 based upon the verification sample results. The original excavation was limited to the surficial 6-inches of sediment. Post excavation samples were then collected to determine if the contamination was removed. The post excavation samples revealed that the contamination was deeper than initially thought. Subsequent Phase II excavations to depths of 18 to 24 inches removed the remaining sediments contaminated above cleanup criteria.

IT began sampling activities in the west tributary on July 28, 1999. Previous sampling locations were resampled and analyzed by the on-site laboratory using Method SW846 8270C.

In order to define the horizontal extent of contamination in the upper and lower reaches of the west tributary, thirty-six new locations were sampled during December 1999 and January 2000. These samples were collected from the surficial six inches in the streambed and surrounding wetland areas. Eleven locations contaminated above criteria were located in the upper reach or lower reach of the west tributary. There were no locations in the middle reach above cleanup criteria. The eastern tributary and the drainage gullies between the eastern tributary and Pit 1, Pit 2, and Pit 3 areas of the site were also sampled. There were no locations in the drainage gullies or eastern tributary above cleanup criteria.

The initial work plan for excavation activities in the upper and lower reach of the west tributary was finalized on February 17, 2000. This plan outlined excavation and sampling activities for the identified contaminated locations in the upper and lower reaches of the west tributary. By this date, the freshwater pond referred to in earlier Pre-Design Study or Work Plan documents had been excavated along with other contaminated soils inside the sheetpile wall.

On May 10, 2000, IT met with USACE to discuss changes and updates to the excavation plan. For the remainder of May and June excavation and sampling activities continued with additional samples collected at depths of up to 3 feet below ground surface (bgs). This sampling confirmed that contamination did not extend more than 18 inches bgs.

From June 16 through July 7, 2000, fourteen new transects were sampled and analyzed. Transect locations intersected the original Dames and Moore locations, plus two locations further downstream, SE 54 and SE 115. Transects consisted of three locations between the wetland boundary at three depths— 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches. Final analysis, including off-site laboratory verification of on-site results above cleanup criteria, identified three additional samples above cleanup criteria

Selection of the transect locations was based on rational techniques, selecting one sample near the original Dames and Moore locations and two other locations in depressions or discolored areas between the wetland boundaries. The results of the transect sampling showed that the downstream extent of contamination was upstream of the confluence of the east and west tributaries (SE05) near the McKay property line. The results also showed that the middle reach of the west tributary was not contaminated, and the upper reach of the west tributary had been remediated below cleanup criteria.

Phase III excavations removed the remaining contaminated sediments. The downstream areas were reached by placing swamp mats between the end of the stone and geotextile access road and the

locations to be excavated. The excavator carried the excavated sediments between the identified locations and the dump truck.

3.4.7 Miscellaneous "Hot Spots" Excavation

Various locations were surface excavated and confirmed clean from areas not discussed above.

- On August 26, 2000, a small excavation to remove treated timbers from near the entrance gate was made. One on-site screening sample and one off-site verification sample was collected from the excavation bottom. Samples results demonstrated that the area was not contaminated.
- On September 20 through 27, 2000, sixteen on-site screening samples were collected between WTP-2 and Pit 5 alongside the road where the condensate line was removed. Results demonstrated that the resulting trench was not contaminated.
- On November 2, 2000, six off-site verification samples were collected from an excavation on the hillside, east of the sediment basin. The presence of mineral seeps in this area raised concerns that PAH contamination may have remained in the hillside. These verification samples demonstrated that the basin side slopes did not contain any residual pockets of creosote or PCP contamination.
- On December 12, 2000, four composite off-site verification samples were collected that demonstrated that the area around the WTP was not contaminated.
- December 17, 2000, five off-site verification samples were collected that demonstrated that the area between the decon trailer, decon pad, and Pit 5 was not contaminated.

3.5 SITE SAMPLING

3.5.1 Excavation Verification Sampling

Screening frequency and screening locations were determined by field observations of the subsurface conditions using a judgmental sampling approach. Screening was conducted at any location where contamination was suspected due to soil appearance, subsurface conditions observed during excavation, or other factors. Such factors included subsurface heterogeneities such as sandy lithology which may have acted as a contaminant channel, or perched water pockets. Screening sample frequency was an order of magnitude greater than verification sample frequency.

Immediately following sample collection, the samples were taken to the on-site laboratory for PAH, carbazole and PCP analyses. The on-site laboratory typically delivered sample results within 24 hours.

If results from screening were within 10% of action levels, a sample was collected for off-site soil verification sampling. If screening results were greater than 10% of action levels, the excavation was advanced to an extent that was based on field observations. This screening process was used for both horizontal and vertical directions of excavation.

On March 5, 1999, EPA issued a non-significant change to the ROD establishing a PCP cleanup level for soils. EPA determined that this additional cleanup level was necessary based on soil prior sampling data gathered since the remedial action began in June 1998. The data showed areas on the site where PCP concentrations in the soil were elevated but where carcinogenic polyaromatic hydrocarbons (CPAHs) concentrations where below the cleanup levels. The non-significant change to the ROD established a surface soil cleanup level of 5 mg/kg PCP and 1.7 mg/kg PCP for subsurface protection of groundwater.

When the excavation limit of the entire pit or grid had been determined through on-site screening, the soil was sampled for off-site analysis to verify that the vertical and horizontal extent of the excavation left no soil contamination in excess of the established cleanup criteria. Verification samples were collected on the bottom and sidewalls of the excavation for PAH, carbazole and PCP analyses.

Samples for horizontal verification were collected from the sidewalls of each pit at 100-foot intervals. The depth of the excavation determined how many samples were collected at each interval, as follows:

- In excavations that were 10 feet or shallower, two soil samples were collected from the sidewall at each sampling location. One sample was collected from the sidewall at 0 to 2 feet bgs, and the other sample from 2 feet bgs to the bottom of the excavation.
- Three soil samples were collected from the sidewall in excavations that exceeded 10 feet total depth. One sample was collected from 0 to 2 feet bgs, and the remaining two samples were collected based on two criteria:
  - (a) If there was a change in the soil type, both soil types were sampled separately.
  - (b) If there was not a soil type change, the sidewall from 2 feet bgs to the bottom of the excavation was divided in half, and a sample was collected from the top and bottom half.

When sample screening indicated that the total depth of the excavation had been reached, verification sampling took place on the floor of the excavation. Sample locations were located on the nodes and the centers of 100-foot grids. In addition, if two soil types were identified within a 100-foot grid, both were sampled.

When verification sample results exceeded cleanup criteria, the process reverted to the initial excavation and screening process.

3.5.2 WTP Performance Test Report

ICF KE conducted an acceptance test of the new WTP (WTP-2) at the SMWT Site from March 6, 1998 to March 13, 1998. This task was authorized under Task Order 16, for USACE, Baltimore District. Details of test results were presented in *New Water Treatment Plant Acceptance Test Report, January 1999.*

The wastewater treatment system was comprised of two systems, WTP-1 and WTP-2. WTP-1 functioned as the treatment system facility for the stormwater pond located within the containment area. WTP-2 was designed to treat the water from the stormwater pond located in the containment area (as necessary), the condensate from the thermal desorption system and water generated from dewatering of excavations. The acceptance test for WTP-2 was conducted to evaluate system performance and to verify the ability to achieve Maryland Department of the Environment (MDE) discharge criteria.

The three major wastewater streams generated by remediation activities at the site were the groundwater, stormwater, and TDU condensate. A treatment flow diagram from *Data Report for Water Treatment Plant Monthly Sampling--Quarterly Report, November 2000* is attached to the appendix of this report.

The acceptance test criteria required that WTP-2 treat wastewater, to below discharge limits, operating at the design flow rate (70 gpm) for seven days (24 hours per day). The acceptance test was performed in accordance with the *SMWT Water Treatment System Technical Specifications, Section 01652.*

Following WTP-2 construction, system start-up and prove out began. A static pressure test commenced on February 3, 1998. All tanks were filled with treated water from WTP-1 without pressure to check for leaks. Several leaks were found. After repairs were made, an operating pressure test was conducted to check for additional leaks and equipment operability. The plant was run with treated water from WTP-1. The test was divided into two 24-hour periods. The first period began at 2:30 p.m. on February 17 and ended at 10:30 p.m. on February 18. During the first 24-hour period, WTP-2 was shutdown for a few hours for adjustments. The second period began at 8:45 p.m. on February 19, and ended at 9 p.m. on February 20, 1998. No significant leaks were found. As require by the test specification, WTP-2 operated continuously for the last 24 hours of the 48-hour test.

Following the operating pressure test, the equalization tanks (T-111 and T-112) were emptied. They were re-filled with water from the stormwater pond located in the containment area, and the

acceptance test began on the afternoon of February 24. On February 25, the test was stopped due to problems with pH and excessive solids loading to the plant. On the evening of February 27, the acceptance test was re-started, but the sand filter overflowed early on the morning of February 28. The overflow problem was attributed to some shipping tape found obstructing the annulus of the clean sand return. The tape was removed, and the test was re-started on the afternoon of February 28. The sand filter overflowed again a few hours later, and the test was stopped. It was concluded that the filter sand was overloaded with solids, and the shipping tape may have aggravated the problem. The sand was removed because it was determined to be too fouled to be cleaned with normal back flushing. New sand was installed and back-flushed to removed fines in accordance with manufacturer's recommendations. The sand filter was then returned to normal operation.

The acceptance test was re-started at 1:00 p.m. on March 6, 1998. From that point onward, WTP-2 operations were steady. Treated water was re-circulated back to the stormwater pond located in the containment area to avoid discharge of effluent before sample results were received. On March 9, approximately 5,000 gallons of water that was collected from the stormwater pond located in the containment area in the fall of 1997 was released back to the stormwater pond from temporary holding tanks in order to increase the contamination levels of the influent. Water from the contaminated area french drain system was also added to the stormwater pond located in the containment area on March 10, 11, and 12, prior to the sampling events on those days. The seven-day test was completed at 1:00 p.m. on March 13, 1998.

Results indicate that the WTP successfully treated pond water to well below discharge criteria, although the influent concentrations of numerous contaminants were also below the discharge criteria.

3.5.3 TDU Proof of Performance Test

This test, including performance standards, was described in detail in the document *Proof of Performance, Summary of Full-scale Operations*, dated April 1998. The test was successful and showed that the TDUs produce clean soil while meeting applicable air emission standards.

During POP testing, one batch and one continuous TDU were tested to demonstrate attainment of soil performance, WTP discharge and air emission standards. The goal of the POP testing was to demonstrate that each type of thermal desorption system could achieve backfill criteria and operate within stack emission limits.

Both batch and continuous TDUs demonstrated that they could produce soil that met surface cleanup criteria. The untreated soil used during the test was representative of the worst case contamination expected at the site. The CTDU also produced hot cyclone dust that met all cleanup criteria except during one of the three tests which did not meet surface benzo(a)pyrene equivalent criteria. Both CTDUs were re-configured to segregate hot cyclone dust back into a separate hopper container for sampling and disposal off-site if required. Hot cyclone dust and impinger sludge generated during the BTDU test did not meet criteria. This material was retreated in the thermal desorption process. Screening sampling results over a period of several months after the POP test indicated that the hot cyclone material met the subsurface backfill criteria. The CTDU hot cyclones were afterwards reconfigured to direct the hot cyclone dust into the treat soil discharge screw auger to simplify the operation.

Both batch and continuous TDUs produced air emissions that met applicable air emission standards. All contaminants of concern met emission limits with a large margin of safety; in most cases, several orders of magnitude below standards. The smallest margin was for benzene, which was approximately five times less than allowable limits, even if assumed that the highest levels of benzene measured during the test occurred on all four units at the same time.

The WTP produced water that met all applicable discharge standards except nitrogen (in the form of ammonia and total). Elevated levels of ammonia and nitrogenous compounds were due to the nitrogen purge employed in the CTDUs, i.e., the Cyanamid process. Water was not discharged to the on-site stream until confirmation showed that all limits were met.

Results indicated that the treatment process; thermal desorption followed by condensate treatment, removed contamination as expected. High concentrations of contaminants were measured in

the untreated soil and TDU condensate, but concentrations were below criteria (delisting and hazardous waste characterization) in the treated soil, WTP effluent (except nitrogenous compounds) and stack gases. This indicated that the contaminants (along with water) in the untreated soil were desorbed in the TDU, captured in the VRS with the condensate and treated by UV oxidation and carbon adsorption at the WTP (except nitrogenous compounds). In the batch process, contaminants were also captured in the impinger sludge. Contaminants remaining in the gas phase after the vapor recovery system were further removed in the FTO. All stack gas emissions after the FTO met all air emission standards.

3.5.4 TDU Proof of Performance Re-Testing

In the spring of 1999 after several months of successful soil treatment using the on-site thermal desorption process, it became apparent that the CTDUs were likely capable of operating at a higher feed rate. To prove that an increase in feed rate would continue to produce treated soil and air emissions that meet the performance standards, additional POP testing was required.

The POP Retest was conducted in April 1999 on the one CTDU that had not been tested in the original POP Test. The BTDUs were not tested because they were no longer in operation. The Retest was conducted in accordance with the document Proof of Performance, Summary of Full Scale Operations Addendum (April 1999). Three replicate tests were run at an average feed rate of 13.6 tph. Sampling included untreated soil, treated soil, hot cyclone dust, stack emissions, FTO inlet, site perimeter volatile organic compounds (VOCs) and particulates, and numerous sampling locations at the on-site WTP. The untreated soil used during the Retest was representative of some of the worst-case contamination expected at the site, and had a relatively high moisture content, greater than 10%.

The following is an overview of the results:

Air Emissions – Average air emissions for VOCs, semi-volatile organic compounds (SVOCs), and dioxins met applicable air emissions standards with some margin of safety, several orders of magnitude for most contaminants. The standards were developed assuming that both CTDUs would be operating simultaneously and that the BTDUs would not be operating. Even at the inlet to the FTO, almost all VOCs were below the emissions standards, giving some confirmation that the VRS was effective in condensing VOC contaminants from the gas phase before it enters the FTO. Samples of SVOCs and dioxins could not be collected at the FTO inlet due to clogging of the sampling apparatus. All required samples from the outlet stack of the FTO were obtained including SVOCs and Dioxins.

Perimeter samples for VOCs were below action levels except one upwind sample for benzene which only slightly exceeded the action level. Particulate levels were all below the action level.

Treated Soil – Treated soil samples exceeded the cleanup criteria during two test runs and met subsurface cleanup criteria during one test run. Historical data collected before the retest shows that this is the first instance where treated soil exceeded the cleanup criteria. This soil was retreated in the CTDUs. The most highly contaminated soils available were used in the Re-POP test in order to fully determine the treatment capabilities of the CTDUs.

Hot Cyclone Dust – Hot cyclone dust samples exceeded the cleanup criteria during two test runs and met the subsurface cleanup criteria during one test run. Historical data collected since the original POP test showed that this was the first instance where the hot cyclone dust did not meet cleanup criteria.

WTP Effluent – The WTP produced water that met all effluent standards except phenol, selenium, cyanide, BOD, TKN, and ammonia. These results were consistent with previous monthly sampling results. Treated water was recycled to the thermal desorption process for cooling and soil rehydration and was not discharged to the stream.

These results demonstrated that even when treating very highly contaminated soil with a relatively high moisture content, the air emissions were still well within allowable emissions standards. Although the treated soil and hot cyclone dust did not meet cleanup criteria during all test runs, the data was useful for determining the limits of the thermal desorption process, and for making decisions on the contaminant level and moisture content of the soil, and the allowable feed rate for the remainder of the project.

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To ensure that treated soil and cyclone dust met the cleanup levels, a soil blending plan was instituted. This entailed sampling different types of feed material that had potentially different contaminant levels and/or moisture contents. In this way, more highly contaminated and/or wetter soil could be blended with less contaminated or drier soil before being fed to the CTDUs. This process ensured that highly contaminated, wetter soil like that treated during the Retest would not be fed directly to the CTDUs before blending.

Based on the results of the Retest, historical data, and recent data collected since the Retest was completed, the maximum allowable feed rate was increased to 13.6 tph ± 10%. With a soil blending plan in place and continued routine sampling, the process was monitored closely to ensure that all performance standards were achieved.

3.5.5 Daily/Weekly/Monthly Sampling

Treated Soil – Excavated soils were transported to the thermal desorption unit (TDU) pad and processed in the continuous thermal desorption units (CTDUs). Sampling and analysis of treated material was conducted to verify that the established soil clean-up levels were met. One composite sample was collected from every bin, having 700 tons or less of treated soil, and analyzed by the off-site laboratory. On November 23, 1998, under the authorization of the USACE, this procedure was modified so that each bin was sampled for PAH and carbazole (B(a)P equivalence) only and one out of ten bins was sampled for pesticides, herbicides, TCLP PAHs, TCLP metals, TCLP SVOCs, total cyanide and sulfide. On December 15, 1998, pesticide and herbicide analyses were eliminated since all previous analytical results for these chemicals had consistently been non-detects. On February 15, 1999, treated soil analysis for TCLP SVOCs was eliminated and replaced with analysis for total SVOCs. These changes are summarized in a memo to the USACE entitled *SMWT Site Sampling and Analysis Plan, Major Changes*, dated March 22, 1999. Total cyanide and sulfide analysis was eliminated in March 1999, after 10 bins were consecutively sampled and shown to contain no detectable concentrations of the compounds. This is summarized in a March 2, 1999 memo to the USACE entitled "*Total Cyanide/Sulfide Sampling*".

After thermally treated soil was sampled and verified to meet established levels, it was stockpiled into surface or subsurface piles.

Perimeter Air Monitoring – Air monitoring was conducted throughout the RA to ensure that emissions produced as a result of excavation and materials handling activities were at acceptable levels at the perimeter of the site. Perimeter air monitoring was conducted as follows:

- Prior to RA to establish a baseline
- During POP testing
- During full-scale operations

Based on the types of contaminants found at the site, creosote and PCP, the most likely sources of airborne contaminants resulting from remedial activities would be VOCs released from the soil directly into the air and SVOCs sorbed to particulate matter or dust that might become airborne. Therefore, the perimeter air monitoring program was designed to address these two possible emissions sources and included monitoring for VOCs and particulate matter. VOCs were collected in SUMMA passivated canisters monthly, and particulates were monitored daily using portable infrared Data Rams. Monthly reports were presented to USACE in memorandum form summarizing the data.

Hot Cyclones – The TDU hot cyclone dust was sampled monthly and analyzed for total SVOCs and Toxicity Characteristic Leaching Procedure (TCLP) extracts for PCP, Resource Conservation and Recovery Act (RCRA) eight metals, and PAHs. Untreated soil was also sampled at this time and analyzed for VOCs, SVOCs, and density. Hot cyclone and untreated soil results were transmitted monthly by memorandum.

Untreated Soil – Feed stock soils for treatment by the TDUs were sampled daily and analyzed in the on-site laboratory for PAHs, carbazole, and PCP. During the excavation of Pit 5, feed soils were also analyzed for diesel. This data was presented as a weekly update during the Wednesday morning progress meetings with USEPA, MDE, and USACE.

WTPs Discharge – All operational WTPs were sampled monthly for parameters to assess compliance with MDE discharge criteria, even if discharge to the stream did not occur. Quarterly reports were presented to USACE entitled *Data Report For Water Treatment Plants.*

Groundwater Sampling – Groundwater sampling was conducted quarterly from monitoring wells. Sample collection and results were presented in quarterly reports to USACE, entitled *Quarterly Groundwater Monitoring Report.*

3.5.6 Geoprobe© Sampling Event

Borings were completed every 50 feet around the perimeter of the sheet-pile wall, as well as in selected locations inside of Pit 4, and on the TDU pad corners. Additional boring samples were also taken around the truck scale area to determine the extent of diesel contamination in Pit 5. Seventeen samples were located around the surface of the sheet-pile wall and on the corners of the TDU pad. Fourteen borings were completed inside of Pit 4. Details as to sample locations and test results are contained in the *Pit 4 Closure Report, July 2001* and *Pit 5 Closure Report, July 2001.*

Diesel range organic (DRO) compounds were reported in five sample locations around the truck scale area. The action level for DRO was 10 mg/kg. The contamination was deepest (28 feet) at GP-5 near the sheet-pile wall, and became more shallow in the samples taken farther east toward the Mod Tank. Slight DRO contamination was noted to a depth of 22 feet in GP-5.5C, which was located off the northwest corner of the Mod Tank.

3.5.7 OSHA Compliance Monitoring

Air quality monitoring at the SMWT site consisted of both "real time" air monitoring and "integrative" periodic air sampling. The instruments used for air monitoring included: Photoionization Detectors (PIDs) for Volatile Organic Carbon (VOC); Multi-gas Analyzers for Oxygen, Lower Explosion Limit and Carbon Monoxide; Miniram© for dust and aerosols; various Draeger© tubes for specific compound detection. Periodic air sampling was accomplished by use of Gillian© air pumps and Summa© canisters. Various collection media included: cassette filters, charcoal tubes, XAD tubes and passive air monitors.

The frequency of testing was dictated by differing site operations and/or conditions. Whenever new tasks were initiated, extra care was taken to ensure employee safety and the proper level of safety was used. All analytical results were posted for all employees to review. Also, each individual employee who took part in a personnel air monitoring study was provided an individual copy of his/her results. At no time were the Permissible Exposure Limits (PELs) exceeded throughout the excavation and thermal treatment operations.

4.0 PRODUCTION SUMMARY AND NOTABLE HIGHLIGHTS

4.1 THERMAL TREATMENT SYSTEM

The thermal treatment systems operated between June 1998 until October 6, 2000. The BTDUs processed 1,644 tons of contaminated material before they were shut down. Process rates through the continuous units were held at a maximum throughput rate of 12.1 tons per day until the retest or second POP. The new throughput rate established was 15 tons per day. The following table provides a summary of total materials processed at the SMWT site.

Description	Quantity, Tons
Contaminated Soils Treated	270,584
Re-Processed Soils	1,546
Lime Usage, Feed Prep	411
Total TDU Process Throughput	**272,541**

The unit cost for soil treatment was $300/cy for 183,300cy. Using a conversion factor of 1.5 tons/cy, this equates to $200/ton for 275,000 tons. The ROD estimate for this alternative was $320/cy for 97,000cy or $213/ton in year 2000 dollars (assuming 4% inflation).

4.1.1 FTO Incident

On April 7, 2000, a deflagration and a small residual fire occurred on the TDU pad at the SMWT site in the vicinity of the FTO and the Carbon bypass units on CTDU #2. No personnel injuries were sustained, however, some property damage did occur. The flame arrestor upstream of the incident did operate properly to contain the incident. A team of both corporate and on-site IT employees was commissioned to investigate the root cause of the incident and to recommend and institute measures to prevent a recurrence.

The root cause was determined to be a combination of factors, which included: 1) build-up of PAHs from high material feed concentration carry over; 2) partial blockage in the FTO inlet piping and/or bed packing; and 3) FTO Forced Draft (FD) fan belt slippage.

Recommendations and preventive measures instituted after the investigation included the following:

- Disassembly and cleanout of all FTO piping
- Strict monitoring of material feed organic concentration
- Periodic shutdown and visual inspection of the FTO inlet piping
- Installation of additional back-pressure instrumentation
- Grounding of the FTO FD fan and the Carbon Bypass units
- Installation of new chemically resistant valves
- Periodic change out of the FTO bed packing
- Completion of FTO Safety and Operation Inspection Lists on a periodic basis
- Re-design of the WESP condensate blowdown system

By adhering to these measures, no further FTO incidences recurred.

4.1.2 Shutdown of the WESP

Operation of the WESP proved problematic with high maintenance and power requirements. In October 1999, Method 5 testing was performed to demonstrate that particulate emission limits could be met with the high voltage to the WESP turned off.

Particulate testing was conducted by Air Recon, Inc. in accordance with 40 CFR 60, Appendix A. Four tests were proposed for either TDU#1 or TDU#2. Three tests with the high voltage to the WESP turned off, and one test with the WESP on. Five tests were actually completed. Three tests were conducted at the FTO outlet of TDU#2 with the WESP voltage off and one test with the WESP voltage turned on. One additional test was also conducted at the FTO outlet of TDU#1 with the WESP voltage off. Sampling included untreated feed soil and particulate stack emissions. The untreated soil used during the test was representative of worst-case contamination found at the site and with a relatively high moisture content (i.e., greater than 10%).

A summary of the test results were provided in *Method 5 Test Results, November 1999* and the full text of Air Recon, Inc. test results were attached as Appendix A to that report. The following is an overview of the results:

Air Emissions – COMAR 26.11.06.03(B) Emissions for particulates shall not exceed 0.05 gr/dscf (grains per dry standard cubic foot). Emissions met the applicable standard by a safety factor of 10. The standards were developed assuming that both TDUs would be operating simultaneously. There was no significant difference between particulate emissions with the WESP high voltage on or off.

Untreated Soil – Levels of PAH contaminates were typical of highly contaminated soil being treated. Moisture content was also greater than 10 percent.

These results demonstrate that even when treating very highly contaminated soil with a relatively high moisture content, the particulate emissions are still well within allowable emissions standards. These results were presented to USACE, MDE and USEPA, and the request to operate the WESP with the high voltage turned off was granted.

4.1.3 *Clarifier Treatment System*

A clarifier treatment system was added to the thermal treatment system to improve scrubbing efficiency and help reduce corrosion by reduction of solids and pH control in the Rod Deck and the WESP systems. The system included a clarifier, pH adjustment, a 3cy Filter Press, Mix Tank and various pumps and controls (Appendix A-3). The system proved to be successful in reducing downtime, maintenance, extended life of piping systems, and reduced solids loading to the WTP.

4.2 WATER TREATMENT PLANT

4.2.1 Hurricane

In September 1999, rainfall from hurricane Floyd caused the pond in Pit 4 to overflow. On September 21st and 22nd, samples of the stormwater runoff were collected from this event, both from the north pond and the south pond in Pit 4. Sediment from the overflow discharge area was collected and also analyzed for VOCs, SVOCs, ammonia, and amenable cyanide. Water samples met the State of Maryland effluent criteria and the sediment sample met surface soil criteria.

Pit 4 water from two previous storm events when overflows occurred was sampled. First in February 1998 and again in March 1998. One sample was collected on February 5, 1998, and analyzed for VOCs, SVOCs, and TSS. The analytical results showed that the outfall was in compliance with the State of Maryland effluent criteria except for TSS (76 mg/L, above the 45 mg/L maximum limit).

Another sample was collected from the Pit 4 pond after a storm on March 19, 1998, and analyzed for VOCs, SVOCs, and TSS. The analytical results showed that the outfall was in compliance with the State of Maryland effluent criteria except for pentachlorophenol (76 µg/L, above the 20 µg/L maximum limit) and phenol (31 µg/L, above the 26 µg/L maximum limit). 2,4-Dimethylphenol was at 19 µg/L, above the average limit of 18 µg/L, but below the maximum limit of 36 µg/L.

4.2.2 WTP-1

By the fourth quarter of 1999, the wastewater treatment system at the SMWT site comprised three systems, WTP-1, WTP-2 and WTP-3. All three systems were designed to meet MDE discharge standards.

WTP-1 functioned as the treatment system facility for the stormwater pond and the deep wells located within the Containment Area. WTP-1 consisted of the following unit processes:

- Oil/water separation with a tank settling basin and oil-absorbing pads;
- Iron and manganese precipitation through caustic pH adjustment;
- Clarification, pressure sand filtration;
- Carbon adsorption; and
- Acid pH adjustment to discharge standards.

4.2.3 WTP-2

WTP-2 provided treatment of the water from the Containment Area, the condensate from the thermal desorption system and dewatering of excavations. WTP-2 operated as a continuous process, comprised of the following sub-elements:

- Removal of high metals concentration;
- Reduction of suspended solids;
- Sludge dewatering;
- Reduction of organic compounds using an UV oxidation process; and
- Removal of organics by carbon adsorption.

4.2.4 WTP-3

To treat surface water introduced into Pit 4 after Hurricane Floyd in September 1999, water was treated by a skid-mounted treatment system designated WTP-3. The source water motive force was a portable 75 Hp diesel pump which pumped the water from the containment area to the treatment facility. WTP-3 consisted of the following unit processes:

- Removal of solids by filtration;
- Removal of organics by liquid phase carbon;
- Removal of amenable cyanide by ferric sulfate addition and special proprietary resin; and
- Post pH adjustment to discharge standards by 10% sulfuric acid addition.

Acceptance testing consisted of treatment, recirculation to the pond, and sampling three times in a 24-hour period. Samples were analyzed for SVOCs (PAHs and PCP), ammonia, amenable cyanide, BOD, DO, pH, iron, TSS and turbidity. Results were below discharge criteria.

WTP-3 was brought online on September 29, 1999 to treat water from the north and south ponds located in Pit 4. Water in these ponds had shown levels of cyanide, ammonia, PCP, and PAHs in previous sampling events. WTP-3 was sampled on October 18 in accordance with the SAP. The only exceedence during the first round of sampling was BOD, which was slightly above the average discharge criteria, and well below maximum discharge criteria.

WTP-3 effluent began discharging to the stream on October 15, 1999, following approval from the USACE. WTP-3 effluent water had been sampled twice a week for amenable cyanide, ammonia, SVOCs and BOD, to ensure that discharge criteria was continuing to be met. On October 31, WTP-3 was taken off-line after the water level in the ponds had sufficiently decreased.

WTP-3 was next brought online on December 12, 1999 to treat additional rain water from the north and south ponds located in Pit 4. Results from samples collected December 15 show exceedences

of cyanide and pH in the final effluent above the maximum discharge limit. The phenol, ammonia, BOD, and lead levels were above their average discharge limits but below their maximum discharge limits. WTP-3 discharged to the stream between December 12 and December 15.

WTP-3 was sampled monthly for the duration of the project during months when there was surface water in Pit 4 to treat. Eventually, water needs at the TDU were such that WTP-3 seldom discharged to the stream, discharging instead to WTP-1 or WTP-2.

During the demobilization phases of the project, WTP-3 was used to treat and recirculate water for decontamination purposes.

4.3 EXCAVATION OPERATION

Excavation and removal was carried out in the various pit areas as discussed in the previous sections by conventional excavating equipment (excavators, dozers, articulated dump trucks and front-end loaders). All areas were generally dry, except for Pit #4, which required a dewatering system provided by Moretrench. This system operated during the late spring and summer months of 1999. Water generated by this system was handled by the WTPs. As discussed in Section 3.4, all areas grew in size and/or volume from the original projections, except for the West Tributary. Several types of soils and debris deposits were encountered during the project, which required some additional or special handling. In one case, wet clayey soils were pre-mixed with lime to de-clump and dry the soils for thermal processing. In another case, highly contaminated hardpan was encountered that proved deleterious to the CTDU system. These materials were eventually sent offsite for disposal. The final special case involved the removal of placed aggregate in the Mod Tank areas and uncovering of a concrete slab that required removal to chase an unexpected diesel plume.

The following table summarizes the entire project excavation summary.

Description	Quantity, Tons
Contaminated Soils	270,584
Contaminated Hardpan/Clay Mixture	1,773
Contaminated Hardpan/Clay/Stone Mixture	318
Non-Hazardous Debris/Stone From Pits 1,2,3,4	644
Non-Hazardous Debris/Stone From Pit 5	300
Non-Hazardous Concrete From Pits 4, 5	75
Total Material Excavated	**273,694**

4.4 STREAM ACTIVITIES

Details of stream sampling and remediation activities are contained in *Stream Restoration Plan, August 2000.*

The west tributary is a small stream along the southwestern site boundary. The stream has been divided into segments: swale, detention basin, upper reach, middle reach and lower reach. Two access roads were used to reach the remediated areas: an existing logging road running parallel to the west tributary, and a haul road constructed from the top of the hill behind the former Pit 1 area. The west tributary begins as a small channel, or swale, originating from surface water runoff from the site and the adjacent agricultural field, north and west. A continuously running spring, located in the adjacent field, also contributes to the stream headwaters. The detention basin receives water from the swale and the

former Pit 4 area. The detention basin drains into the upper reach, located on the fringe of a forested area. The middle reach, located on a forested hillside, is a fast moving channel that has a distinct firm silty clay bank and bed. The channel of the middle reach is approximately 3 to 5 feet wide. The vegetation surrounding the channel is that of a mature forest. The lower reach, located at the base of the hill, is slower moving with a less defined channel. This section of stream has a sandy bed and bank and becomes braided as it enters a forested wetland. An abandoned beaver dam is located between the middle and lower reach.

The swale area, along the westside of Pit 4, was formed when the sheetpile wall was installed. The swale area has been rerouted four feet west of its channel so that the sheetpile could be cut off below grade. The swale captures and channelizes the runoff and spring water from the adjacent agricultural area, north and west. This area will be monitored for erosion until USEPA and MDE determine that monitoring is no longer required.

The swale terminates in a detention basin sited at the lower end of Pit 4. The detention basin was constructed to absorb energy and assist with the settling of suspended solids. The basin was designed to receive the up slope drainage, approximately 9 acres, from the swale and Pit 4. The basin is comprised of a rip-rap plunge wall/bowl and an adjacent vegetated wetland. The shape of the basin conforms to the contours of the area with an approximate size of 5,000 square feet. The rip-rap plunge wall/bowl is approximately 20 feet wide and extends 10 to 14 feet to maintain a 2 to 1 grade. The bowl portion is approximately 6 to 8 feet in depth and filled with rip-rap. The remainder of the basin has a natural bottom with earthen banks. The basin has an average depth between 2 and 3 feet, approximately 1.5 feet below the adjacent stream. The weir crest, the height of discharge, has an elevation equal to that of the stream at the point of discharge, approximately 115 feet above sea level. Stone was used to support and stabilize the side walls of the basin. Seeps on the eastern wall were directed into the basin and a berm was placed along the existing logging road above the seeps to redirect the surface runoff away from the seep area. Two stone weir outlets were constructed to allow the water to flow into the main and secondary stream. The stone weir outlet has a depth of 1.5 feet and a minimum width of 4 feet. The natural portion was shaped and graded using a 6-inch lift of topsoil, seeded and stabilized. This area will be monitored until USEPA and MDE determine that monitoring is no longer required.

The upper reach of the west tributary below the area containing the detention basin was not contaminated and is an undisturbed area.

The middle reach of the west tributary is a fast moving channel that has a distinct bank and is approximately 3 to 5 feet wide. The middle reach was determined to be clean and is an undisturbed area.

The lower reach of the West Tributary is slow moving and the channel is less defined. The stream becomes braided and enters a forested wetland. Isolated "hot spots" and continuous areas of contamination were found in depressed areas. The "hot spots" were located at the extreme end of the west tributary. This area includes approximately 300 feet of the west tributary above its confluence with the east tributary. The continuous area begins where the logging road terminates at the west tributary and continues downstream approximately 250 feet to the Learning Center property line. The lower reach of the west tributary required several different types of restoration techniques. The isolated pockets that were remediated and the locations where swamp mats were utilized and removed were raked and graded to soften the slope between the adjacent undisturbed land and the remediated areas. The area was seeded with the Lower Reach Mix and annual ryegrass. This area will be monitored until USEPA and MDE determine that monitoring is no longer required.

The upper section of the lower reach was backfilled to surrounding grade with bank run. Large tree stumps were also placed right side up along and within the excavation area. The area was seeded with the Lower Reach Mix and annual ryegrass. This area will be monitored until USEPA and MDE determine that monitoring is no longer required.

The pre-existing logging road was not used by heavy equipment and was seeded with haul road seed mix at the completion of remediation activities. A portion of the logging road will be used to reach monitoring wells MW27R and MW37D and will be monitored for erosion while access to those wells is required.

The constructed haul road was used by heavy equipment and was seeded with haul road seed mix at the completion of remediation activities. Earthen berms were constructed and the area was stabilized with a biodegradable matting to hold the soil and seed in place. Hay bales were placed across the bottom of haul road to prevent sediment from reaching the west tributary. This area will be monitored for erosion until USEPA and MDE determine that monitoring is no longer required.

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5.0 DECONTAMINATION AND DEMOBILIZATION

5.1 DEVELOPMENT AND PLANNING

In February 2000, detailed planning was initiated for both demobilization and property disposition. The experience and "lessons learned" from the recent Drake Chemical RA in Lock Haven PA were used to prepare an initial plan as a basis to begin sequencing and tasking of both demobilization and property activities. The demobilization Manager from the Drake Site was responsible for preparing this preliminary plan. The Property Disposition Manager from Drake provided SMWT with a framework for dealing with both Government and IT property. Gordon Chin, the on-site Thermal Project Manager was assigned the task of managing both of these efforts.

The Demobilization Plan consisted of division of the SMWT site into 11 discrete areas and logical sequencing of each area to achieve the final goal of demobilization. Each area was then broken down into individual step-by-step tasks and resource loaded. After compiling and leveling of the manpower and equipment requirements, a preliminary schedule and budget was drafted. The original schedule was spread over a 16-week period with both 7 days/week, 24 hours/day and 5 days/week, 10 hours/day work weeks. Due to increased soil volumes encountered, the schedule was compressed to a 12-week schedule. This required revamping of the original logic and further area subdivision and re-sequencing tasks to accomplish this effort.

The Property Plan consisted of task identification, milestone scheduling and review of both current Federal Acquisition Register (FAR) regulations and IT policies. A property team was formed and an on-site IT supervisor was assigned as a lead. A site wide inventory was updated and re-tagging of all equipment performed. Once a complete list of all property was compiled, the list was broken down into logical sub-lists according to final disposition and managed accordingly. The plan was reviewed by IT's Corporate Property Manager and found to be in compliance. A Vendor-Buyback program was instituted to attempt to recover monies for unused "still in the box" type expendables. Several suppliers did cooperate by crediting the Government for returned items.

In the summer of 2000, a corporate review of both plans and budgeting and tracking mechanisms took place. The plan was approved and weekly demobilization/property meetings were instituted to monitor and inform all parties of plan progress. Once the actual demobilization started in October, daily meetings were held every afternoon to review progress, efficiency and unexpected issues. By mid-December, all trailers and personnel were demobilized from the site.

5.2 SURPLUS GOVERNMENT PROPERTY AUCTION

Taking advantage of the "lessons learned" from the Drake Site thermal project and other factors, it was decided to start early and auction off all government property. The Government Services Administration (GSA) was also considered as an outlet for auctioning off surplus equipment, but this option did not prove to be as efficient. Therefore, a formal solicitation was drafted and issued to sell off all Government owned property, except for heavy construction equipment that was not purchased on this project. This equipment was transferred for use at a Superfund Site in Florida.

IT was responsible for drafting the original solicitation, advertising and conducting a site property inspection to the prospective bidders. The Commerce Business Daily (CBD), local newspapers and trade journals were used to advertise the sale. The issuance of the offer, subsequent revisions, questions and answers, and evaluation of bids were handled by the USACE, Baltimore District. The auction proved to be very successful and recovered approximately $450,000 for the project.

5.3 EQUIPMENT DECONTAMINATION AND DISASSEMBLY

All demobilization tasks were categorized and individual Job Safety Analyses (JSA) were written and reviewed by Health and Safety (H&S) prior to initiation of each new activity. Different equipment and vessels required varying degrees of disassembly, product removal, and decontamination. All process lines and vessels were flushed or evacuated by pumping or vacuum truck. Certain process equipment required stepwise disassembly in order to effect proper decontamination. Once a unit was disassembled, its individual components were clearly marked for re-assembly.

Decontamination was accomplished by varying means. Both cold and hot high-pressure water washing was employed. For severe staining, sand blasting was required. Approved chemicals were also utilized for cleaning of oily stains, which were not conducive to sand blasting. All equipment was inspected and certified clean by an H&S Officer. In certain case-by-case instances, an economical evaluation was made whether to decontaminate certain items or opt for off-site disposal.

5.4 WASTE HANDLING AND DISPOSAL

The proper disposition of all residual wastes was an integral part of the demobilization plan. Wastes generated fell into four major categories: RCRA or Non-RCRA hazardous waste; Solid or Liquid waste; salvageable scrap; construction and demolition debris. Vendor solicitation, waste profiling, and quantity estimates were developed to determine the most cost-effective means for handling these materials. In the case of hazardous materials, these vendors were already in place to handle ongoing waste streams. For the non-RCRA materials and scrap, vendors were evaluated and subcontracted.

The following four tables are a complete project summary of all wastes which were removed from the site. Construction and demolition debris and recycled scrap volumes were not recorded.

RCRA HAZARDOUS SOLID WASTE DISPOSAL SUMMARY

Description	Quantity, Tons
Contaminated Hardpan/Clay Mixture	1,773
Contaminated Hardpan/Clay/Stone Mixture	318
Filter Cake (Process Fines/PAHs)	1,389
Dewatered Tank Sludges (Process Fines/PAHs)	747
Spent Carbon From WTP Process	154
Hazardous Debris From Demobilization Activities	625
Total RCRA Solids T & D	**5,006**

NON-RCRA HAZARDOUS SOLID WASTE DISPOSAL SUMMARY

Description	Quantity, Tons
Debris/Stone From Pits 1,2,3,4	644
Debris/Stone From Pit 5	300
Concrete From Pits 4, 5	75
Total Non-RCRA Solids T & D	**1,019**

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RCRA HAZARDOUS LIQUID DISPOSAL SUMMARY

Description	Quantity, Gallons
Hazardous DNAPL From Pit #4 Dewatering	3,300
Hazardous Sludge/Water Removed From WTP #1	4,000
Hazardous Waste Solvent From On-Site Lab	170
Total RCRA Liquids T & D	**7,470**

NON-RCRA HAZ LIQUID DISPOSAL SUMMARY

Description	Quantity, Gallons
#2 Oil/Sludge Mixture From Tank Cleaning	2,533
Diesel/Water Mixture From Decon Pad Sump	925
Decon Water From Demobilization Activities	16,233
Oil/Water Mixture From Demobilization Activities	375
Waste Oils From Maintenance Activities	207
Gasoline/Diesel Mixture From Demobilization Activities	85
Total Non-RCRA Liquids T & D	**20,358**

5.5 SHEET PILE WALL TRIMMING

The "containment area" or Pit 4 was enclosed within a steel interlocking sheet pile wall. The entire length of the wall was trimmed within elevation minus 3.0 feet from final grade to meet restoration requirements. This task entailed excavating to within close proximity of the wall to remove soil deposits and torch cutting the wall to meet specifications. The trimmed wall sections were removed by lifting with an excavator and stockpiled for further trimming as necessary to meet the acceptable scrap salvage dimensions. Approximately, 1,800 linear feet or an estimated 11,000 square feet of sheet wall was sectioned and reclaimed at a local scrap salvage yard. All credits for this and other salvageable scrap were credited to the Government.

5.6 BUILDING AND CONCRETE STRUCTURES DEMOLITION

There were four major above ground structures and approximately 750 cy of concrete pads and foundations for demolition and disposal. The four above ground structures were the two pole barns behind the thermal process pad and the two water treatment facilities located behind Pit #1. In all cases, on-site IT personnel and equipment were used for the demolition of the above ground structures. An

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economical evaluation was made to determine the most cost-effective means for handling of the concrete demolition. This work was awarded to a local concrete demolition and recycling contractor.

All steel and concrete was recycled at local facilities. All C&D debris was disposed at an off-site commercial landfill.

5.7 BACKFILL AND GRADING

Final backfill and grading was managed with the aid of the IT Civil Engineering department. A conceptual grading plan was drafted by using pre-existing contour information, process data and clean material stockpile quantity surveys. The ultimate goals of the plan were to assure adequate "surface clean" cover, proper drainage and re-tuning of the site to "as close as possible" pre-existing surface elevations. The conceptual plan was essentially a model that was closely monitored to account for real time changes and best current information. Periodic cut and fill calculations and contour adjustments were made from field information fed into this grading model.

In addition to the engineering support provided by IT, Flora Surveying was subcontracted to provide field stakeout support. Flora was responsible for providing contour stakeouts, 2-foot "surface clean" cover verification and final as-built documentation. All cover verification data is contained in the individual Pit reports.

5.8 VEGETATION AND SOIL AMENDMENT

The project required the use of an approved USEPA, low maintenance seed mix and fertilizer application to be used throughout the site restoration process. This mix was first applied by a hydro-seeder to Pits #2 and #3. These two areas were backfilled with thermally treated soils without any topsoil or other soil amendment. Due to the nature of the desorption process, the treated material is stripped of practically all organic content. Upon inspection of these areas, the USEPA voiced their dissatisfaction with the spotty growth, which was attributed to lack of organics to enhance and sustain long-term vegetative growth. Therefore, the decision was made to evaluate topsoil and other alternative means to amend the organic content of the thermally treated soils.

Three options were evaluated from a technical and cost viewpoint: locally available topsoil, organic compost derived from municipal WTP sludge, and organic compost made from leaf and other vegetative clippings. The results of the evaluation showed LeafGro™, organic compost from vegetative matter, to be most beneficial both technically and cost-wise. Due to its high organic content, an application of two inches (2") tilled into the top 6-inch layer of soil would provide more than adequate organic content to meet USEPA's recommendations. The LeafGro™ also had the added benefit, like topsoil, of no restrictions in growing of food or tobacco crops. Approximately 4,500cy of this material were spread onto the SMWT site. The areas requiring hydro-seeding were completed in 2000 except for 3.5 acres. Weather conditions delayed seeding until too late in the 2000 growing season, and these remaining areas were seeded in March 2001.

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6.0 HEALTH AND SAFETY

Site H&S was executed in accordance to the following documents: *USACE Safety and Health Requirements Manual, EM-385*, *OSHA – 29CFR 1926.65*, and IT's site-specific HASP. The site-specific plans were periodically reviewed and revised as site conditions warranted.

In general, the normal level of protection was Level "D": hard hats, eye protection, hearing protection and steel-toed safety boots and rubber overboots. Upgrades were mandated as certain levels of contamination were exceeded or when certain tasks were performed that increased the levels of contaminant exposure. Upgrades to Levels "C" and "B" were required on an "as needed basis". Additional personal protective equipment (PPE) included respiratory protection, impermeable hand protection, face shields, shin guards, and impermeable outerwear.

All PPE selection was based on known contaminants and permissible exposure concentrations. A JSA was written for each task performed prior to task initiation with reviews by the Site Safety and Health Officer (SSHO) and the USACE. Material Safety Data Sheets (MSDSs) were kept onsite and updated as new chemicals or materials were approved for on-site use.

The following table illustrates the incidence rates (IRs) and lost workday incidence rates (LWIRs) for the SMWT project starting with mobilization in October 1997 through demobilization in December 2000.

Year	Manhours	Incidents		Rates	
		Recordable	Lost Time	IR	LWIR
1997	104,737	4	0	7.64	0
1998	165,810	4	0	4.82	0
1999	135,273	6	0	8.87	0
2000	105,180	5	0	9.51	0
Totals	**511,000**	**15**	**0**	**5.87**	**0**

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7.0 FINAL INSPECTION AND CERTIFICATION

7.1 SITE INSPECTIONS

Several site walk-through inspections were conducted by USACE to point out any deficiencies that required correction prior to acceptance. A "Punchlist" was drafted and updated periodically to document these citations and record the corrective action date. Although all outstanding issues were addressed at the end of demobilization in December 2000, successful vegetative growth was still in question.

An inspection was conducted in March 2001 by USACE and several observations were made that would require additional restoration effort, these included minor areas of erosion and limited cover growth. IT was contacted by the USACE and a site meeting was set up between IT's Project Manager and the landscaping subcontractor. A walkthrough was made to observe and determine which areas were warranty items. These items were addressed by the subcontractor in April 2001.

7.2 SUMMARY OF DATA VALIDATION

Data validation determines the acceptability or unacceptability of the data quality based on a set of pre-defined criteria. Data validation is defined as the systematic process for reviewing a data package against a set of criteria to provide assurance that the data is adequate for its intended uses. These criteria depend upon the type(s) of data involved and the purpose for which data are collected. The intended use of the data and the associated acceptance criteria for data quality was determined before the data collection effort begins. The validation services for the sampling efforts were performed by IT. A combination of *USEPA-SW846, Third Edition, Test Methods for Evaluating Solid Waste, Update III (USEPA, 1996)*, laboratory standard operating procedures (SOPs), and/or *USEPA Region III Innovative Approaches to Data Validation for USEPA Region III (June 1995)* were used in providing validation support for this project. The analytical method and laboratory SOP were used to provide the QC criteria, and the USEPA Region III guidelines were used to provide the validation qualifier schemes.

Data packages were validated to ensure compliance with specified analytical, Quality Assurance/Quality Control (QA/QC) requirements, data reduction procedures, data reporting requirements, and required accuracy, precision, and completeness criteria. This includes (as applicable), but is not limited to:

- Sample preservation and holding times;
- Instrument performance check;
- Calibration (initial and continuing);
- Blanks;
- Matrix spike and spike duplicate recoveries;
- Sample duplicate;
- Surrogate spike recoveries;
- Laboratory control samples;
- Interference check sample (for metals);
- Serial dilution (for metals);
- Internal standards and retention times; and
- Quantitative verification.

All of the data obtained using USEPA performance based methods were validated. Results were assessed for accuracy and precision of laboratory analysis to determine the limitations and quantity of data. The quality of the data collected in support of the sampling activity was considered acceptable, unless qualified rejected "R" or blank qualified "B" during the validation process. Samples qualified "J", "UJ", "L", "UL", or "K" were considered acceptable as estimated.

The data validated included the treated samples during the initial POP of the TDUs, monthly TDU/WTP monitoring samples, groundwater samples, hot cyclone, and soil verification samples. The parameters by activity are noted below.

DATA VALIDATION PARAMETERS

Activity	Parameters
Proof of Performance	Dioxins/Furans
TDU/WTP Monitoring	VOCs, Total Petroleum Hydrocarbons – Gasoline Range Organics (TPH GRO), Total Petroleum Hydrocarbons – Diesel Range Organics (TPH DRO), Total Phosphorus, Total Kjeldahl Nitrogen, SVOCs, PAHs, Metals, Fluoride, Ammonia Nitrogen, Amenable Cyanide, Mercury, Total Recoverable Phenolics, Nitrate/Nitrite, TSS, and Trivalent Arsenic.
Groundwater Samples	PCP, SVOCs, PAHs, Total Kjeldahl Nitrogen, Total Phosphorus, Metals, Fluoride, Amenable Cyanide
Hot Cyclone Samples	TCLP Herbicides, TCLP Pesticides, TCLP Metals, TCLP VOCs, TCLP SVOCs, TCLP PAHs, total metals, PAHs, TPH DRO, TPH GRO, specific gravity, and percent solids.
Soil Verification Samples	PAHs, Carbazole, Pentachlorophenol.

7.3 FINAL SITE TOPOLOGY MAP

Flora Surveyor Associates, Inc. was contracted to perform all on-site survey work at the SMWT site and produce any final deliverables. Working in conjunction with IT's Civil Engineering's conceptual grading plan, a final site topographic map was constructed. The purpose of this map is to document pit locations, fencing boundaries, site contours, access road locations and additional surface features added to the project site. These include an overflow scour basin at the outlet of Pit #4, a 6" PVC pipe that drains the access road entrance into Pit #1 and a culvert draining Pit #1 into Pit #3.

8.0 OPERATION AND MAINTENANCE

8.1 MONITORING WELL SAMPLING SCHEDULE

Monitoring well sampling schedule and requirements are detailed in *SMWT Post Closure Monitoring Plan, February 2001*. The table below illustrates the monitoring schedule through 2004.

	March	June	September	December
2001	Monitoring Wells	Monitoring Wells	Monitoring Wells Upland Monitoring Stream Monitoring	Monitoring Wells
2002	Monitoring Wells	Monitoring Wells	Monitoring Wells Upland Monitoring Stream Monitoring	
2003	Monitoring Wells		Monitoring Wells Upland Monitoring Benthic Study	
2004	Monitoring Wells		Monitoring Wells	

Informal inspections will occur after storm events whenever the possibility that significant erosion may have occurred in the stream or upland areas during the first year of monitoring. Each monitoring report submitted shall also contain sections that report on the general condition of the stream areas and upland areas. Particular emphasis must be placed on areas that may become subject to erosion if corrective actions are not taken.

The perimeter monitoring well network consists of the following thirteen wells listed below.

Well ID	Install Date	Total Depth (ft. bgs)	Screen Length (ft.)	Well Diam. (in.)	Measuring Point Elevation (ft. above MSL)	Ground Surface Elevation (ft. above MSL)	Screen Interval (ft. bgs)	
							Top	Bottom
MW-17R	8/00	35.25	10	4	152.97	150.63	25	35
MW-20D	12/86	65	10	4	151.61	150.23	52	62
MW-32	8/00	27	10	4	141.93	139.63	17	27
MW-33	9/00	18	10	4	134.70	132.86	8	18
MW-14	7/86	13.5	5	4	132.76	130.48	5.5	10.5
MW-34D	9/00	48	15	4	132.05	129.71	33	48
MW-35	9/00	31	10	4	148.64	146.55	21	31
MW-21D	12/86	65	10	4	147.73	146.60	53	63
MW-13	7/86	31.5	10	4	146.19	144.32	18.5	28.5
MW-27R	9/00	12	5	4	131.34	128.81	7	12
MW-37D	8/00	37	6	4	122.34	119.95	31	37
MW-36	9/00	20	10	4	137.31	134.66	10	20
MW-38	9/00	12	4	4	128.69	127.44	8	12

Note: Wells MW-20D, 34D, 21D, and 37D are screened in the deep aquifer. All are double-cased.
bgs = below ground surface
MPE = measuring point elevation (top of the riser)
MSL = mean sea level

Well MW-21D is a deep monitoring well, clustered with shallow well MW-13, located downgradient of the Spray Irrigation Area. This well was originally installed in 1986 to "evaluate the vertical and horizontal groundwater flow directions in the Chesapeake Group and to determine groundwater quality and potential for deeper water-bearing zone contamination" (RI/FS, p. 19). The 63-

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foot deep well is screened in sand, with the bottom of the screen placed 2 feet above the lower confining clay.

Well MW-20D is a deep monitoring well, clustered with shallow well MW-17R, located along the northern boundary of the site. This well, installed in 1986, is positioned hydraulically upgradient of the site. The 62-foot deep well is screened in sand, with the bottom of the screen placed 3 feet above the lower confining clay. These wells will serve as background wells.

Well MW-37D is a deep monitoring well, installed along the west side of the logging road that runs parallel to the west tributary of Old Tom's Run. This well will provide a means for sampling groundwater in the deep aquifer, downgradient of the primary source of contamination. MW-27R is a shallow monitoring well, installed across the logging road from MW-37D, downgradient of the former Pit 4 area.

MW-32 was installed along the eastern boundary of the site, downgradient of Pits 1 and 2. MW-33 was installed along the eastern boundary of the site, downgradient of Pits 2 and 3. These wells, which are located in topographic lows, are downgradient of the Northeast Tank Area and a portion of the Land Treatment Area.

Because of the radial flow of groundwater away from the Land Treatment Area, MW-35 was installed to intercept shallow groundwater flow between MW-14 and MW-13, and downgradient of the Land Treatment Area.

Well MW-36 was installed along the western boundary of the site, where there is the least amount of buffer between the site and the adjacent property. This well will provide groundwater data downgradient of Pit 5 and the TDU pad location.

Well MW-38 was installed within the boundaries of Pit 4. This well will provide data on groundwater emanating from the treated soil contained within the sheetpile wall.

Deep monitoring well MW-34D, nested with shallow monitoring well MW-14, intercepts the generally southeasterly deep aquifer flow across the site.

8.1.1 Stream Monitoring Schedule

Long-term monitoring of the stream will occur annually, starting in September 2001 through September 2003, or until USEPA and MDE determine that monitoring is no longer required. More frequent, informal inspections will also follow significant stormwater events during the first year to ensure that the mitigation area is not subjected to severe erosion without prompt corrective actions. Stream monitoring schedule and requirements are detailed in *SMWT Post Closure Monitoring Plan, February 2001*.

Specific areas, within the disturbed areas, will be selected based on the best professional judgement of personnel experienced in wetland studies. Plots will be selected in the non-disturbed and disturbed areas in the same manner. Disturbed areas also include those areas between the source areas where heavy equipment traversed the wetland to reach and remove the contamination.

Each plot will be surveyed so that the same plots may be utilized each year. One meter square plots will be located in disturbed and representative undisturbed areas. The goal is to normalize the total herbaceous cover of the restored areas when compared to baseline plots, undisturbed areas with similar characteristics, to determine the overall success of the seeding.

The monitoring will determine the success of the herbaceous species, both planted and volunteer species, within the restored wetlands. Areal cover will be estimated by measuring the area that would be covered by projecting above ground plant structures (stems and leaves) perpendicularly onto the ground. The sampling area will be a square meter plot. Cover measurements will be made from a point of view directly above each plot. Within each plot, the pooled coverage of all herbaceous species will be recorded to the nearest five percent. The percent cover and wetland frequency indicator value of each species will be recorded.

If the levels of success are not met due to the death, lack of vigor of the plant material, or the installed plant material being out-competed by non-desirable species, then the deficiencies must be

corrected by reinstallation. If non-desirable species, such as the invasive weeds, *Phragmites australis* (common reed) and *Lythrum salicaria* (Purple loosestrife), invade the area they will be managed to limit competition with the planting. Invasive species coverage is compared to the coverage of such species present in the reference plot. Invasive species coverage will not exceed the reference plot concentration. Management of non-desirable species will be achieved by pulling or manual cultivation. In instances of a non-desirable species monoculture, the select areas will be chemically treated.

8.1.2 Site Vegetation

The basin was designed to receive the up slope drainage, approximately 9 acres, from the swale and Pit 4. The basin is comprised of a rip-rap plunge wall/bowl and an adjacent vegetated wetland. The shape of the basin conforms to the contours of the area with an approximate size of 5,000 square feet. The natural portion was shaped and graded using a 6-inch lift of topsoil, seeded and stabilized. The seed mix used was a commercial facultative wetland seed mix indicative to the region. The seed mix listed below as "Detention Basin Floor Seed Mix – Low Maintenance Mixture" was sown at a rate of 20 pounds per acre with a companion crop of annual rye (*Lolium multiflorum)*. The area was then stabilized with a biodegradable jute mat to hold the soil and seed in place.

Detention Basin Floor Seed Mix – Low Maintenance Mixture			
Percent	**Botanical Name**	**Common Name**	**Indicator**
20.0%	*Agrostis alba*	Red Top	FACW
20.0%	*Agrostis stolonifera*	Creeping Bentgrass	FACW
20.0%	*Carex vulpinoidea*	Fox Sedge	OBL
20.0%	*Poa palustris*	Fowl Bluegrass	FACW
20.0%	*Puccinellia distans*	Alkaligrass	OBL

The lower reach of the west tributary required several different types of restoration techniques. The isolated pockets that were remediated and the locations where swamp mats were utilized and removed were raked and graded to soften the slope between the adjacent undisturbed land and the remediated areas. These areas were seeded with the Lower Reach Mix at the rate of 20 pounds per acre. An additional 5 pounds per acre of annual ryegrass (*Lolium multiflorum*) was added to the seed mix as a companion crop and to aid in erosion control.

The upper section of the lower reach was backfilled to surrounding grade with bank run. Large tree stumps were also placed right side up along and within the excavation area. The area was seeded with the Lower Reach Mix and annual ryegrass, as above. The area that received the backfill was covered with a jute mat after it had been seeded to further aid in erosion control.

Lower Reach Wetland Mix			
Percent	**Botanical Name**	**Common Name**	**Indicator**
40.0%	*Elymus virginicus*	Virginia Wild Rye	FACW-
22.5%	*Polygonum arifolium*	Tearthumb	OBL
17.5%	*Leersia oryzoides*	Rice Cutgrass	OBL
15.0%	*Juncus effusus*	Soft Rush	FACW+
2.5%	*Lobelia cardinalis*	Cardinal Flower	FACW+
2.5%	*Saurus cernuus*	Lizard's Tail	OBL

The upland haul road was removed and returned to original grade. At the base of the upland haul road, a hay bale check damn was installed to slow the flow of water and to direct the surface water away

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from the restored areas. Low, earthen check damns were installed to slow the flow of water on steeper slopes of the haul road. The soil beneath the road was loosened with excavating equipment to a depth of one foot. The entire area was seeded with the Haul Road Mix to expedite the stabilization. The area was then stabilized with a biodegradable jute mat to hold the soil and seed in place.

Haul Road Seed Mix			
Percent	**Botanical Name**	**Common Name**	**Indicator**
25-50	*Lolium perenne*	Perennial Ryegrass	FAC
25-50	*Secale cereale*	Grain Rye	FAC
25-50	*Lolium multiflorum*	Annual Ryegrass	FAC

The soil on the logging road was loosened with excavating equipment to a depth of two to three inches. The logging road was then seeded with the Haul Road Mix to prevent erosion. The portion of the logging road above the detention basin was bermed to direct surface water runoff to the lower end of the detention basin.

9.0 SUMMARY OF PROJECT COSTS

The following table is provided to illustrate the cost allocation between the various tasks assigned under Delivery Order 16. Funding provided was allocated between the State of Maryland (10%) and CERCLA (90%).

Delivery Order 16	Description	Actual Cost to Date
Funding Source 1	Project Management	$ 2,472,395
Funding Source 2	Work Plans	$ 293,691
Funding Source 3	Mobilization	$ 1,930,322
Funding Source 4	Remediation	$ 43,846,325
Funding Source 5	Demobilization	$ 68,9401
Funding Source 6	Technical Report	$ 38,474
Funding Source 7	Operations and Maintenance	$ 3,775,430
Funding Source 8	Standard Contract Total	$ 1,834,842
Funding Source 9	Unclassified Cost	$ 4,070

Details for actual RA costs are contained in Appendix A. The cost analysis table provides a cost summary for each major RA cost element.

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10.0 CONCLUSION AND LESSONS LEARNED

The following is a general list of conclusions drawn and lessons learned from the operations at the SMWT project. This list was compiled with the intention that future projects may benefit from some of the shortcomings at this site and/or learn how to avoid major errors by employing some of the solutions presented herein. More detailed lists were documented and are included in Appendix "A".

- Batch Vacuum Thermal Desorption Units, intended for processing highly contaminated, wet soils, exhibited poor throughput performance. For projects with large amounts of soil, highly contaminated or wet soils could be blended with regular feed soil as a more efficient process.
- Vapor Recovery System components were undersized in light of the fact that soil was much more contaminated than expected.
- Water Treatment Plant components such as the UV/OX system never worked properly due to the constantly changing wastewater stream. Solids loading to the plant was much higher than expected. Bag filters, mud boxes, and a filter press were installed to deal with this situation.
- Equipment layout should be carefully planned to allow sufficient access for maintenance, safety concerns and protection from adverse elements, like dust and excess heat.
- Sensitive instrumentation such as the CPM system should be housed in environmentally controlled and protected enclosures.
- The use of open trenching in the TDU pad for placement of electrical cables should not be considered when exposure to chemical attack is possible.
- Abrasion was one of the single most severe factors contributing to maintenance problems and downtime. It is a compounding factor that increases with velocity, temperature, exposure time, etc.
- A thorough study of the nature of soils to be processed and chemicals encountered will provide invaluable information when selecting materials of construction and resistance requirements.
- A thorough understanding of material handling is essential to the treatment process.
- Good quality dry compressed air will prolong equipment life and reduce overall maintenance costs.
- Foaming and suppression agents should be a design consideration in contact scrubber or WESP operating units.
- Correct design of the fuel delivery system will prolong the life of the burner oil pumps and reduce flame failures.
- Since almost all treated water effluent was re-used by the TDU treatment process, the quality of this water is as important as the outfall discharge criteria. Particulate loading, chemical characteristics, pH, etc. are all very important factors that can adversely affect the overall efficiency of the thermal process. This is especially evident in the scrubbing process and pump seal water flushing.
- Instrumentation design and requirements are important to the safe and efficient operation of any process unit operation.
- The government sale of all equipment deemed as "surplus" at the end of the project is a very worthwhile and effective means for handling government furnished property.
- Early and thorough demobilization planning proved successful, especially in accelerating the project schedule to overcome unexpected soil volume growth.
- Sandblasting is an effective means of decontaminating tar stained surfaces and should be considered in demobilization planning.

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APPENDIX A

PROCESS FLOW DIAGRAM

WTP-2 PROCESS FLOW DIAGRAM

TDU CLARIFIER FLOW DIAGRAM

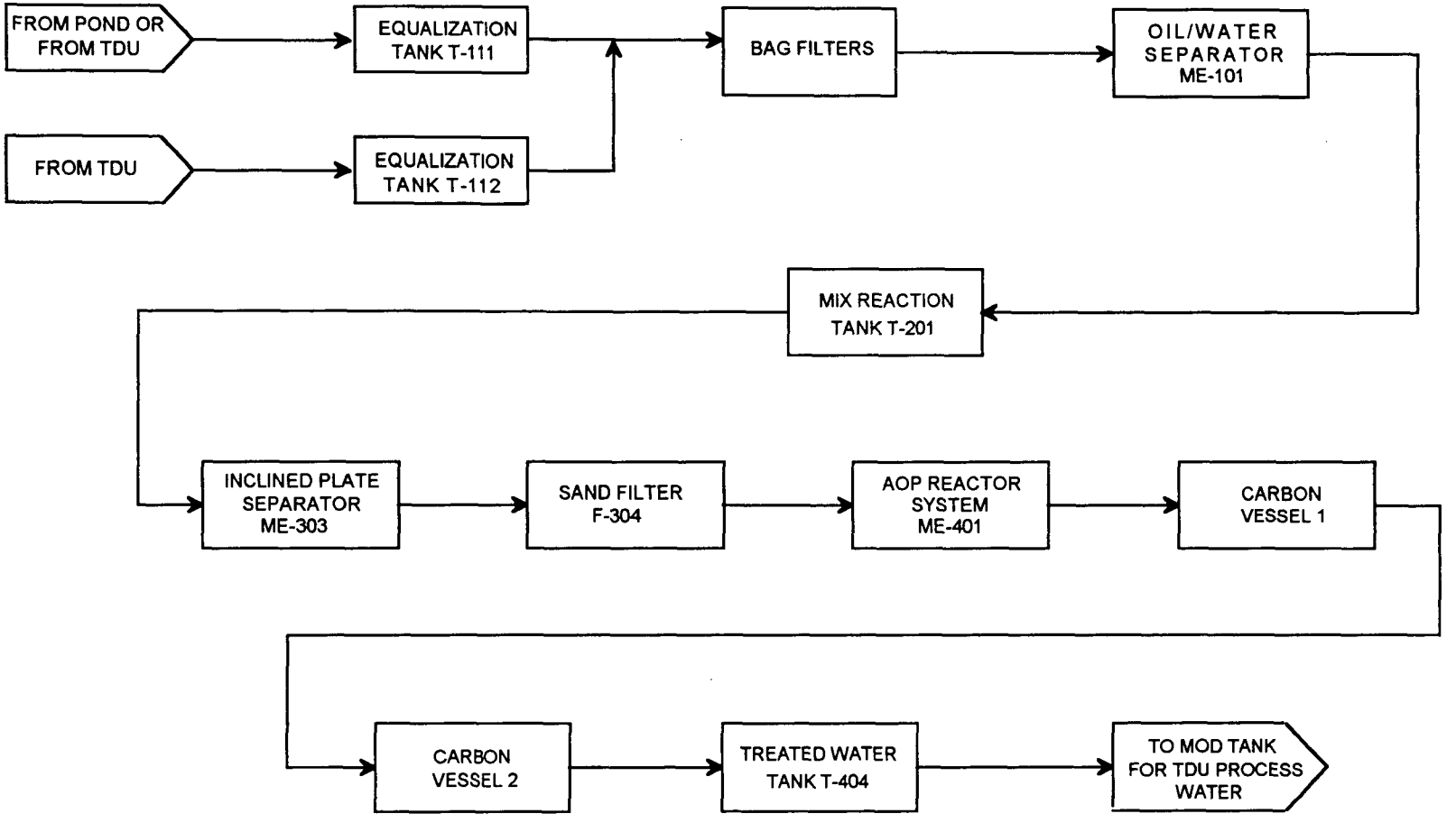
PUGMILL GAS SCAVANGE FLOW DIAGRAM

PROCESS IMPROVEMENTS AND DOWNTIME REDUCTION UPDATE

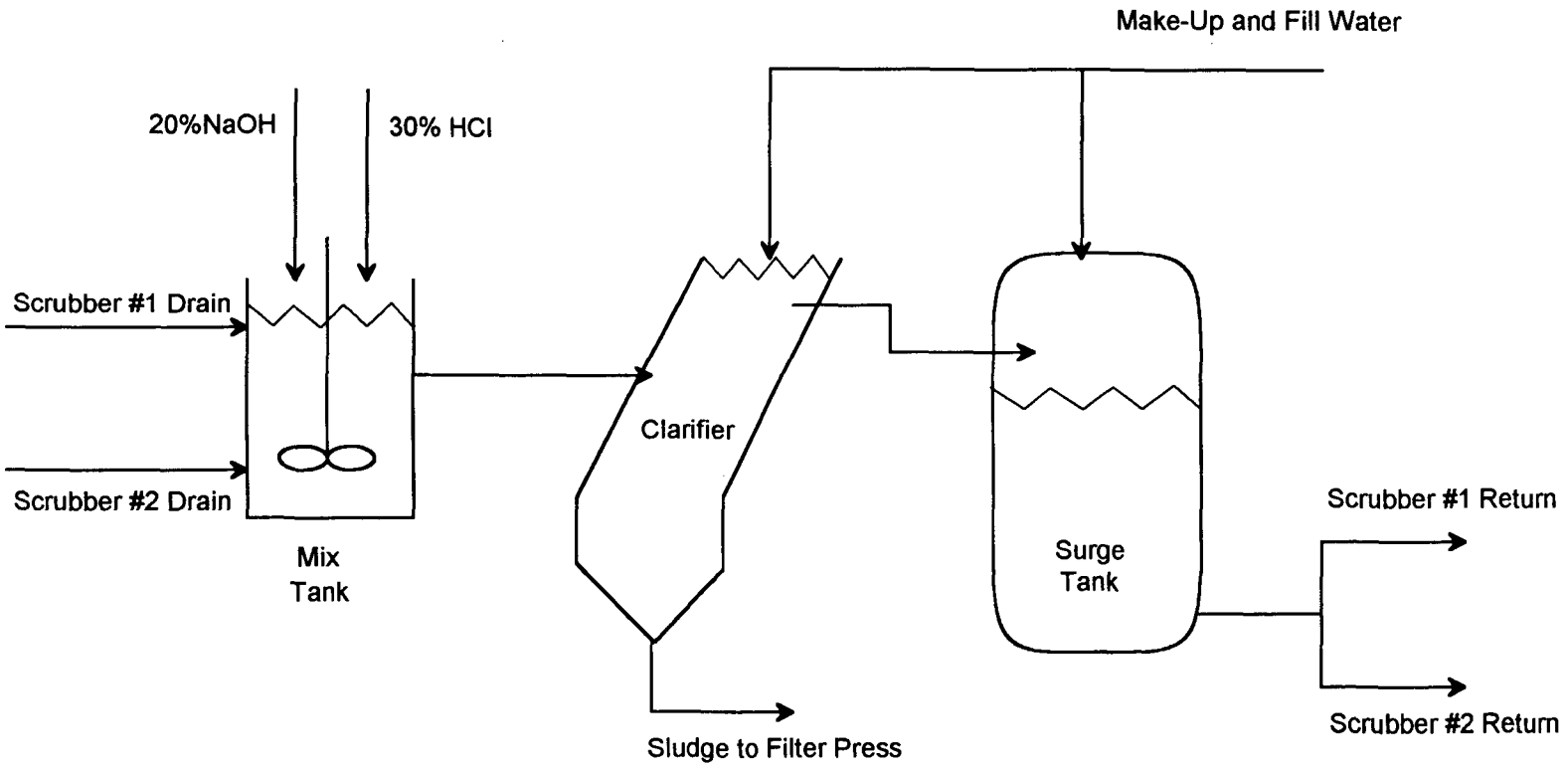
SITE AS-BUILT SURVEY

COST ANALYSIS

Water Treatment Plant -2
Process Flow Diagram



Clarifier Flow Diagram



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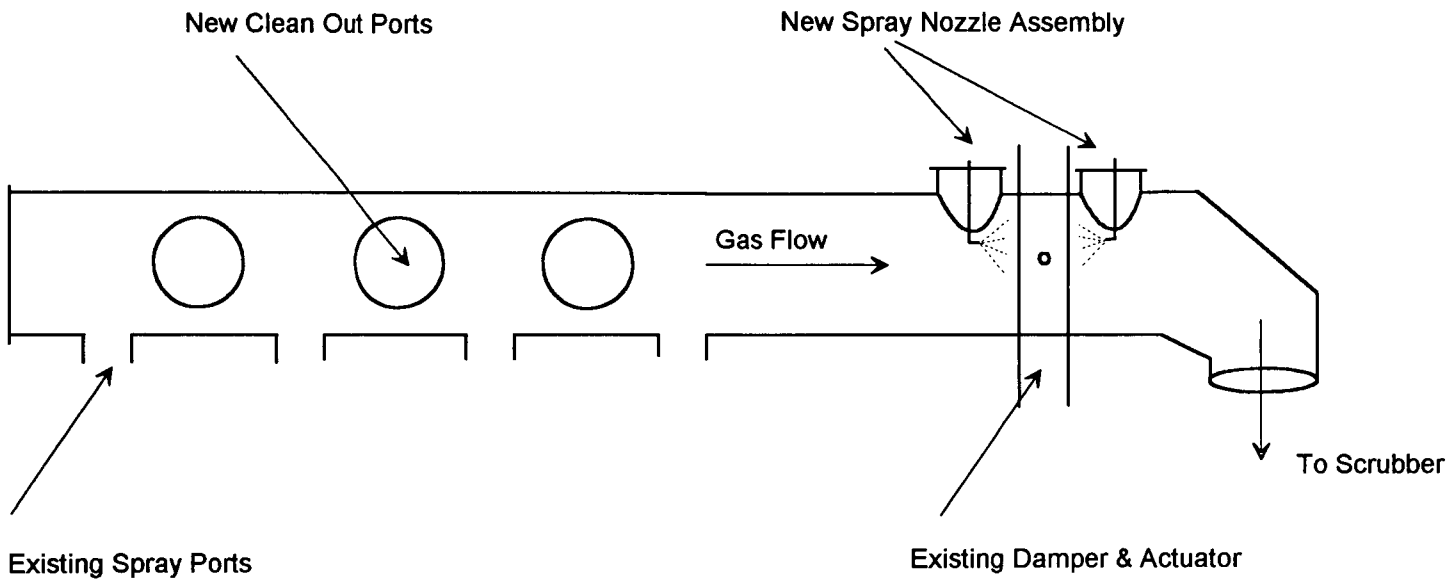
Pugmill Dust Scavange Flow Diagram



PROCESS IMPROVEMENTS AND DOWNTIME REDUCTION UPDATE

Key Accomplishments

- ***Mechanical Pump Seal and Seal Water Flush System Development, Fall 1998–*** The project was overrun with numerous downtime and maintenance problems with the installed VRS pumping system. Leaking seals required constant housekeeping, generating excess water for treatment and created potential safety hazards. The solution required a combination of cost, materials of construction and seal type evaluation, in order to provide a reliable system. Furthermore, the system devised had to meet the operating constraints of the overall treatment process and the unanticipated abrasive nature of the indigenous soils. Presently, the system is successfully utilizing rebuildable, easy to install cartridge type Tungsten Carbide and Silicon Carbide seals with an external "non-product" water flush and a 5.0 micron filter bag system. Additionally the seal water system is alarmed and protected by a controlled design back-up water source to protect the seals from running dry. To date ***no downtime*** has been attributable to seal failure and/or lack of operating pumps. Time spent in maintaining the pump seals has dropped off dramatically. Approximately $13,000 of replacement parts was recovered from the original supplier, which were used to implement this program.

For the most part, reliability remains good. However, seal failures are occurring at a rate of 2-3 per month. Some failures are attributable to a Heat Exchanger cross-contamination event in May 1999. Other failure were traced to operator errors.

- ***Vapor Recovery System (VRS) Spray Nozzles, Fall 1998*** – The VRS system provided included 316 SS full cone spray nozzles. The spray nozzles were essential for the efficient operation of the VRS system components. The majority of the nozzles are committed to 24-hour per day, 7-day per week duty and subject to unanticipated abrasive solids loading and considerable liquid velocities. In fact, under present conditions, it was noted that a new set of WESP nozzles wore out in less than three weeks. The cost of downtime and replacement of VRS nozzles was excessive and detrimental to overall project uptime goal. The solution required cost and materials of construction evaluation. Presently, three-piece, replaceable Stellite tipped 316 SS jacketed nozzles are successfully being used in the severe full-time duty applications. For the maintenance wash-only applications, it was determined that the original 316 SS nozzles were still cost effective. Periodic inspections have revealed no visible deterioration in any of the Stellite nozzles replaced over three (3) months ago. Maintenance downtime and replacement costs have been more than offset by this change.

The life of the in-place nozzles are now approaching seven (7) months without failure. These are checked at least once per month.

- ***Oxygen Gas Conditioning System, Fall 1998*** – The system was provided with an under-designed Oxygen analyzing system. Electrochemical O_2 cells were being used without any gas conditioning system directly in line on a wet and dusty gas stream. The result was the constant replacement of O_2 cells and signal wiring. This was detrimental to safe and proper operation of the Vapor Recovery System (VRS) and the entire process. The CTDU operators were also burdened with taking hand-held readings every one-half to one hour. The solution required investigation and evaluation of available industrial systems. Cost-effectiveness was also a consideration. Several end user and Applications Engineering integrators were interviewed and consulted. The selected system uses a *Peltier Effect* electronic plate gas condenser with a metered rotameter flow regulator, a sintered 0.2 micron glass filtering system and a single diaphragm remote sampling pump.

Despite the severe operating conditions, the systems have proven reliable with minimal maintenance. Also, CTDU operator time has been freed up considerably to spend more time on other process monitoring duties. One failure to date was proven to be a faulty NEMA enclosure, which resulted in a $5000 replacement system at no charge to the project.

A failure in one of the sample pumps was experienced in May 1999 that required the pump to be rebuilt. The cause is believed to be an influx of organic condensate that damaged the pump diaphragm and other internal moving parts.

- ***Cooling Tower Drift Reduction, November 1998*** – Considerable water carry-over or drift was being experienced on the process pad. This condition caused unnecessary water utilization, unsightly and potentially unsafe working conditions (especially with the anticipation of winter freezing weather conditions). Prior to investment of any capital expenditure, the Cooling Tower process conditions, performance and design were reviewed with the manufacturer to try to alleviate the drift problem. In particular, two process adjustments were made to reduce carry-over. These include drift arm alignment and distributor arm rotational speed adjustment. After optimizing the present unaltered systems, it was decided that these results were unsatisfactory and that additional modifications were necessary to further reduce the drift. The final modification to the Cooling Towers involved the installation of a hood assembly to increase drift velocity, the addition of a secondary mist eliminator and the replacement of the distributor arms to match the correct water pump flow. Currently, the system modifications have essentially eliminated almost all drift carry-over.

- ***Piping Modifications at the Mod Tank and Level Control Systems at the Condensate and Process Water Tanks, Spring 1999*** – Several downtime events involving loss of process water required for treated soils re-hydration and process water make-up, warranted investigation into the cause and solution to this problem. It appears that the cause was excess suction lift and poorly glued PVC piping. By modifying the suction line and considerable re-piping, downtime caused by loss of pump suction has been eliminated. Based on my recommendation, ICF KE has also installed a back-up pump to supply process water to the Process Tank.

Another source of downtime and Operator time consumption was associated with maintaining level in the Process Water Tank. Several events were recorded in which Operator error allowed this tank to run empty. A working level system was greatly needed to automate this task. ICF KE initially tried an ultrasonic level control system, which proved to be unsuccessful. Based on ETG's recommendation, a pneumatic Bubbler System was installed. ETG and a local electrical company under the supervision of Chris Riley and me were responsible for the installation. Similar systems were also installed in the two on-site Condensate Tanks. These controls have proven to be both reliable and accurate and require minimal maintenance. This system has also freed up Operator and QC time to devote more attention to other process monitoring tasks.

In April 1999, Condensate 2 Tank level system failed. The failure occurred just after a violent thunderstorm. The LED readout was sent back to the Manufacturer and deemed operational. Upon further investigation, it was determined that the Fisher Rosemount transmitter was not emitting a signal that is most likely due to bad circuit board or damaged transmitter. We are still waiting for a failure analysis from the manufacturer.

- ***Nitrogen Delivery Manifold Freeze-Ups, Spring 1999*** – On several occasions during the recent Winter months, the Nitrogen delivery system pressure was discovered to be at a critically low pressure. This was due to both excessive use and extremely cold weather. Loss of nitrogen for this reason is a potential downtime and safety situation. Based on our supplier's recommendations, two different systems were recommended: a Delivery Manifold Electrical Heating System and a Dual Vaporizing System. The latter was chosen based on safety concerns and cost impact. No freeze-ups have occurred since the installation of the Vaporizers. The associated cost impact is negligible ($75 per month) compared to the added protection from potential downtime.

- ***Cooling Tower Fouling of Internal Packing, January 1999*** – After a discussion with a chemical supplier, concerning Cooling Tower fouling, two suggestions were given to alleviate this problem. The first suggestion involved the use of biocides and dispersants. Secondly, the question of blowdown rate was raised. It appears that the original ETG piping design was altered during construction in favor of decreasing Cooling Tower blowdown by directly re-

hydrating the treated soils with process water. This condition allows for both inorganic and organic build-up in the Cooling Tower sump. In mid-January the piping was changed to allow re-hydration to occur directly from the Cooling Tower sump. The resultant benefits include less Cooling Tower fouling and associated packing replacement costs ($11,000 per event); less downtime maintenance and increased Cooling Tower efficiency, which ultimately increases production capacity. The use of biocides and/or oxidizers followed by a dispersant is currently being evaluated.

- ***Conversion from Screw Auger Discharge to Radial Stacking Belt Conveyors, September 1998*** – A major source of downtime was attributable to breakdowns incurred from the original discharge system. The ability to meet production capacity requirements was also in question. Due to the variable consistency and flow of the treated soils being hydrated in the pugmill, a more forgiving system was required to convey the process output. Based on ETG recommendations, the screw augers were removed and the existing framework modified to accept a 24 inch wide, hi-temperature belt conveying systems. These modified systems have proven to be both reliable and capable of keeping pace with production.

- ***Installation of Powerscreen Shredding Belt Feeders, June 1998*** – Considerable downtime and production capacity during inclement weather and unanticipated high moisture feed was being experienced with the original bar screen/screw auger feeder. The flow consistency of feed materials also caused excessive process variability in temperatures, oxygen levels and pressures. In order to alleviate the above problems and optimize the system process, Powerscreen belt feeders with shredding capability were installed. The current systems have proven to be both reliable in less favorable operating conditions and have successfully helped to reduce overall process parameter variability.

- ***Installation of Twin Screw Feeders and Modifications, November/December 1998*** – The site was experiencing a high occurrence of breakdowns associated with the original feed systems. Breakdowns were due to both exceeding throughput design capacity and unanticipated material conditions. Mechanical and electrical overloading of the 20 HP drives was a common fault, which was caused by excessive debris and high moisture content material. A laborer was required to pick out large pieces of debris, as well as, poke the material in the feed hopper to prevent bridging. The most prevalent problem, however, was the dramatic wear on the screw flighting. The wear was attributable to the unanticipated level of abrasion of the feed soils, which produced both maintenance headaches and decreased production as the flighting wore. Production decreased by as much as 50% within one-two weeks of new replacement flights. By increasing the rotational speed of the screws, some production could be made up. However, by increasing speed, not only was wear accelerated but also the conditions for overloading. After an extensive evaluation, 40 HP Twin Screw Feeders with hard-faced flighting were selected, engineered and installed.

After installation and testing of the new units, material throughput guaranteed by the manufacturer was not being met. Additionally, material was still bridging in the feed hopper. Based on ETG's recommendations the screw flighting type and configuration were modified. All ribbon flighting up to the discharge housing was removed and replaced with full flighting and the original pitch patterns were modified. After these changes were made, the Twin-Screw Feeders perform to satisfaction. To address abrasive wear, hard-facing was applied by the manufacturer. The selected materials have proven to be very durable. The materials applied were Eutectic R8811 on the edges and McKay 263 on the working faces. Since that time ETG has also used this hard facing on other screw applications including Pugmill paddles with positive results. The net results are increased uptime and throughput capacity, regardless, of less than favorable feed characteristics.

- ***Automatic Hopper Level Control System, February 1999*** – As part of the Twin-Screw conversion project that was partially justified by the elimination of a feed Laborer, an automatic level control systems and closed circuit televisions were installed. By manually setting of the Powerscreen feed belt speed based on remote observance from the CCTVs, these systems have eliminated the need for the feed Laborers. A savings of two (2) Laborers per shift was realized.

ORIGINAL (Red)

- ***Upgrade to 20 HP VFD Calciner Cylinder Drives, Spring 1999*** – The project was experiencing numerous motor faults due to miscalculation of the necessary horsepower and torque rating required to meet the design production rate. The supplied 10 HP motor drives were inadequate and presented an obstacle to meeting project and design production rates. After deliberations with ABB Raymond Preheater, the claim was finally resolved and two 20 HP Atlas Planetgear drives and new Allen-Bradley VFDs replaced. Since these replacements, there have not been any cylinder drive motor faults due to over-amping. Approximately $50,000 in equipment was recovered for the project at ABB's expense.

- ***Anti-Foam Agent Evaluation and Implementation, December 1998*** – An overwhelming amount of downtime can be attributed to foam generation caused by the feed material. The generation of foam causes upsets in the VRS Rod Deck Scrubbers and WESP systems. The problem causes false readings in the VRS vessel sumps and subsequent fouling of the vessel walls and internal components. In order to get the system functional, as much as, a 4-6 hour shutdown is required. This unanticipated condition is controllable to some extent by anti-foam chemicals and pre-screening/segregation/blending of suspect foam producing untreated soils.

Initially, the most effective product found was Betz-Dearborn AF724. Generally, this product worked satisfactorily and decreased the number of upsets. However, as the weather got colder, it was discovered that this product actually separated and lost its effectiveness. Furthermore, it was also found out that over-dosage caused the foaming problem to worsen. After evaluation testing and discussions with Betz-Dearborn, a new product was substituted, AF780 in April 1999.

- ***Dusting, Fall 1999*** – Frequently there was an unacceptable level of dust being discharged from pug mill discharge to the radial stacking belts. The recommended fix, to design and install damper cleaning sprays (Appendix A-4), corrected the previous failures of the dust control damper actuators.

- ***Acid Gas Induced Corrosion, Fall 1999*** – Chlorine induced corrosion occurred in the units-most notably on the internal surfaces of the FTOs. Control of pH was implemented in the process water flow on the TDU pad (Appendix A-3 and Section 4.1.3).

- ***Failure of the WESP Units, Fall 1999*** – The WESP units failed to maintain designed charge, due to moist conditions within the units, and were ineffective. The proposed fix, to add a purge gas re-heater, was not implemented and the high voltage power to the WESP units was turned off (Section 4.1.2).

- ***High Solids in the VRS, Fall 1999*** – High solids caused abrasive wear to pumps and VRS system components. The proposed fix, to design and install a stand-alone clarifier system, was implemented (Appendix A-3 and Section 4.1.3).

- ***Inoperative Instrumentation, Fall 1999*** – Inoperative process required instrumentation was replaced and upgraded to meet the intended service.

Other Improvements Implemented or Planned to Decrease Downtime and Reduce Cost:

- Pugmill Shaft Upgrade to Schedule 120 Pipe for added tensile strength and life, summer 1999.

- Discharge Screw Shaft Upgrade to Schedule 80 Pipe for added tensile strength and life, summer 1999.

- Replacement of Ceramic Hanger Bearings with Stellite for increased mechanical strength and temperature rating, summer 1999.

- EPDM Heat Exchanger Gasket Replacement to resist effects of oils and cresols, summer 1999.

- I.D. Fan Motor Shaft Redesign to prolong motor life, summer 1999.

ORIGINAL (Red)

- Flame Arrestor Maintenance Bypass Line to optimize system parameters and eliminate associated downtime, winter 1998.
- Relocation of Stacker Conveyor to decrease bearing failure and tail roll build-up, summer 1999.
- Higher Temperature Rated Belt Scrapers to increase life expectancy and decrease tail roll build-up, summer 1999.
- Combustion Fan (CTDU #2) Relocation to decrease dust exposure and reduce flame failures and burner maintenance, summer 1999.
- Rod Deck Bleed Process Modifications to isolate foam to the Rod Deck (more forgiving), increase WESP efficiency (lower temperatures and no foam) and decrease overall VRS system solids loading, spring 1999.
- Rockwell Automation PLC Maintenance Training for key ETG personnel, June 1998.
- THC Analyzers System Maintenance Program to prevent any associated downtime, fall 1998.
- Installation of a magnet over the feed belt conveyor to remove metal debris before it entered the kiln, spring 1999.
- Fuel Oil Pressure Regulation and Sub-micron Filtration System installation to reduce flame failures and burner maintenance, spring 1999.
- Twin Screw Chain Oilers to prolong chain life and reduce replacement costs and associated downtime, summer 1999.
- Installation of Basket Strainer on Condensate line to help prevent line blockage to WWTP, spring 1999.
- PLC program changes to implement a true one pump-one standby system on the VRS to reduce pump wear and replacement costs, spring 1999.
- Pugmill Manifold Spray Nozzle Redesign to effectively reduce dust, re-hydrate treated soils and decrease plugging and associated downtime, spring 1999.

Other Changes Implemented to Meet Project Compliance:

- PLC Program Changes to reduce Stack Openings, fall 1998.
- Installation of Ground Fault Detection System to forewarn of any potential line failures and employee safety protection, December 1998.
- Nitrogen Purge Procedure of WESP for added employee safety protection, April 1999.

IT CORPORATION

DACA31-95-D-0083 Baltimore TERC

US Army Corps of Engineers

Delivery Order 16

Southern Maryland Wood Treatment Site

April 2001

Cost Account	Description	Actual Cost		Commitments		Estimate to Complete	Estimate at Completion			Budgets			Variance Budget-EAC
		This Period	To Date	Accruals	Total		Current	Previous	Variance	Approved	Baseline	Changes	
Funding Source: 1. Project Management													
10101	Pre-Award (Closed)	0	602	0	602	0	602	602	0	602	2,556	-1,954	0
10201	Pre-Mob Meetings & Briefings (Closed)	0	22,109	0	22,109	0	22,109	22,109	0	22,109	24,292	-2,183	0
10202	Pre-Mob Monthly Reports (Closed)	0	23,217	0	23,217	0	23,217	23,217	0	23,217	25,009	-1,792	0
10203	Pre-Mob Administration (Closed)	0	91,397	0	91,397	0	91,397	91,397	0	91,397	92,682	-1,285	0
10204	Pre-Mob Site Visits (Closed)	0	4,935	0	4,935	0	4,935	4,935	0	4,935	6,673	-1,738	0
10301	Post-Award - Meetings & Briefings (Closed)	0	127,855	0	127,855	0	127,855	127,855	0	129,879	109,879	20,000	2,024
10302	Post Award Monthly reports	435	79,605	0	79,605	4,000	83,605	88,170	4,565	72,842	67,842	5,000	-10,763
10303	Post Award Administration	13,631	1,779,341	0	1,779,341	33,602	1,812,943	1,813,382	440	1,839,534	1,398,134	441,400	26,591
10304	Post Award Site Visits (Closed)	0	52,719	0	52,719	0	52,719	52,719	0	57,603	41,603	16,000	4,884
10401	PM, Engr, Procurement (Closed)	0	275,014	0	275,014	0	275,014	275,014	0	275,014	295,836	-20,822	0
10501	Admin Support for WTP (Closed)	0	3,460	0	3,460	0	3,460	3,460	0	3,460	5,000	-1,540	0
10502	Purch/Procurement for WTP (Closed)	0	12,141	0	12,141	0	12,141	12,141	0	12,141	12,773	-632	0
Funding Source: 1. Project Management Total		**14,066**	**2,472,395**	**0**	**2,472,395**	**37,602**	**2,509,997**	**2,515,002**	**5,005**	**2,532,733**	**2,082,279**	**450,454**	**22,736**

Delivery Order 16 — Southern Maryland Wood Treatment Site — April 2001

Cost Account	Description	Actual Cost		Commitments		Estimate to Complete	Estimate at Completion			Budgets			Variance Budget-EAC
		This Period	To Date	Accruals	Total		Current	Previous	Variance	Approved	Baseline	Changes	
Funding Source: 2. Work Plans													
30100	Schedule & WBS Draft (Closed)	0	2,631	0	2,631	0	2,631	2,631	0	2,631	5,396	-2,765	0
30101	Schedule & WBS Final (Closed)	0	1,484	0	1,484	0	1,484	1,484	0	1,484	2,511	-1,027	0
30200	QC/Sampling & Analysis - Draft (Closed)	0	32,508	0	32,508	0	32,508	32,508	0	32,508	35,385	-2,877	0
30201	QC/Sampling & Analysis - Final (Closed)	0	61,294	0	61,294	0	61,294	61,294	0	61,294	63,477	-2,183	0
30300	POP Plan - Draft (Closed)	0	15,979	0	15,979	0	15,979	15,979	0	15,980	18,789	-2,809	1
30301	POP Plan - Final (Closed)	0	47,098	0	47,098	0	47,098	47,098	0	49,947	59,947	-10,000	2,849
30400	SEC Plan - Draft (Closed)	0	9,144	0	9,144	0	9,144	9,144	0	9,144	10,396	-1,252	0
30401	SEC Plan - Final (Closed)	0	1,393	0	1,393	0	1,393	1,393	0	1,393	1,569	-176	0
30500	Health & Safety Plan - Draft (Closed)	0	12,662	0	12,662	0	12,662	12,662	0	12,662	13,619	-957	0
30501	Health & Safety Plan - Final (Closed)	0	7,430	0	7,430	0	7,430	7,430	0	7,430	12,030	-4,600	0
30601	90% Plans and Specs (Closed)	0	66,674	0	66,674	0	66,674	66,674	0	66,674	68,557	-1,883	0
30602	100% Plans and Specs (Closed)	0	35,394	0	35,394	0	35,394	35,394	0	35,394	35,585	-191	0
Funding Source: 2. Work Plans Total		**0**	**293,691**	**0**	**293,691**	**0**	**293,691**	**293,691**	**0**	**296,541**	**327,261**	**-30,720**	**2,850**

ORIGINAL red

Delivery Order 16 — Southern Maryland Wood Treatment Site — April 2001

Cost Account	Description	Actual Cost: This Period	Actual Cost: To Date	Commitments: Accruals	Commitments: Total	Estimate to Complete	Estimate at Completion: Current	Estimate at Completion: Previous	Estimate at Completion: Variance	Budgets: Approved	Budgets: Baseline	Budgets: Changes	Variance Budget-EAC
Funding Source: 3. Mobilization													
40100	Temporary Space (Closed)	0	16,997	0	16,997	0	16,997	16,997	0	16,997	17,400	-403	0
40200	Site Brush and Grub (Closed)	0	22,460	0	22,460	0	22,460	22,460	0	22,460	23,017	-557	0
40300	Roadways (Closed)	0	275,886	0	275,886	0	275,886	275,886	0	275,886	276,464	-578	0
40400	Decontamination Pad (Closed)	0	6,680	0	6,680	0	6,680	6,680	0	6,680	7,493	-813	0
40500	Portable Truck Scale (Closed)	0	70,610	0	70,610	0	70,610	70,610	0	70,610	70,922	-312	0
40600	Clean Soil Stockpile Area (Closed)	0	202,990	0	202,990	0	202,990	202,990	0	202,990	204,296	-1,306	0
40700	Soil Treatment Area (Closed)	0	204,320	0	204,320	0	204,320	204,320	0	204,320	204,359	-39	0
40800	Pit 5 Area (Closed)	0	33,476	0	33,476	0	33,476	33,476	0	33,476	35,641	-2,165	0
40900	Support Area Construction (Closed)	0	175,333	0	175,333	0	175,333	175,333	0	175,333	180,325	-4,992	0
41000	Thermal Desorption Unit Mob (Closed)	0	867,380	0	867,380	0	867,380	867,380	0	867,380	873,989	-6,609	0
41101	Mobilization, Site Prep & Utilities (Closed)	0	47,084	0	47,084	0	47,084	47,084	0	47,084	48,000	-916	0
41102	Foundation (Closed)	0	7,106	0	7,106	0	7,106	7,106	0	7,106	7,150	-44	0
Funding Source: 3. Mobilization Total		**0**	**1,930,322**	**0**	**1,930,322**	**0**	**1,930,322**	**1,930,322**	**0**	**1,930,322**	**1,949,056**	**-18,734**	**0**

Delivery Order 16 — Southern Maryland Wood Treatment Site — April 2001

Cost Account	Description	Actual Cost: This Period	Actual Cost: To Date	Commitments: Accruals	Commitments: Total	Estimate to Complete	Estimate at Completion: Current	Estimate at Completion: Previous	Estimate at Completion: Variance	Budgets: Approved	Budgets: Baseline	Budgets: Changes	Variance Budget-EAC
Funding Source: 4. Remediation													
50101	Equipment Capital Costs (Closed)	0	4,434,621	0	4,434,621	0	4,434,621	4,434,621	0	4,447,405	4,477,405	-30,000	12,784
50102	Process Startup (Closed)	0	2,351,812	0	2,351,812	0	2,351,812	2,351,812	0	2,356,650	2,356,650	0	4,838
50103	Processing - ETG	0	10,688,067	0	10,688,067	0	10,688,067	10,688,067	0	10,700,577	11,230,577	-530,000	12,510
50104	Processing - IT	0	9,023,620	0	9,023,620	0	9,023,620	9,026,620	3,000	8,840,000	5,350,000	3,490,000	-183,620
50201	Health and Safety (Closed)	0	1,681	0	1,681	0	1,681	1,681	0	2,000	2,000	0	319
50202	Equipment Capital Costs (Closed)	0	1,903,601	0	1,903,601	0	1,903,601	1,903,601	0	1,904,552	1,904,552	0	951
50203	Building Construction (Closed)	0	124,507	0	124,507	0	124,507	124,507	0	125,000	125,000	0	493
50204	Syst Shakedown, Start-up, Manual (Closed)	0	178,566	0	178,566	0	178,566	178,566	0	179,000	179,000	0	434
50205	Demobilization, Closure Report (Closed)	0	56	0	56	0	56	56	0	0	0	0	-56
50301	Health and Safety - Labor	-203	2,582,250	0	2,582,250	0	2,582,250	2,582,453	203	2,481,587	2,041,587	440,000	-100,663
50302	Health and Safety - Equipment	0	156,828	0	156,828	0	156,828	156,828	0	162,211	140,211	22,000	5,383
50303	Health and Safety - Expendables	0	138,941	0	138,941	0	138,941	138,941	0	148,644	110,644	38,000	9,703
50304	Health and Safety - Training (Closed)	0	47,497	0	47,497	0	47,497	47,497	0	46,375	42,375	4,000	-1,122
50401	Soils - Labor	-3,914	2,246,969	0	2,246,969	1,000	2,247,969	2,253,082	5,114	2,011,563	905,563	1,106,000	-236,406
50402	Soils - Equipment	-16	2,226,148	13,436	2,239,584	0	2,239,584	2,239,709	125	2,344,424	1,513,359	831,065	104,840
50403	Soil Storage Structure (Closed)	0	315,772	0	315,772	0	315,772	315,772	0	320,685	320,685	0	4,913
50501	Sampling - Labor	2,769	863,280	0	863,280	0	863,280	860,522	-2,758	832,595	582,595	250,000	-30,685

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Cost Account	Description	Actual Cost: This Period	Actual Cost: To Date	Commitments: Accruals	Commitments: Total	Estimate to Complete	Estimate at Completion: Current	Estimate at Completion: Previous	Estimate at Completion: Variance	Budgets: Approved	Budgets: Baseline	Budgets: Changes	Variance Budget-EAC
50502	Sampling - Equipment/Vehicle (Closed)	0	116,108	-1,626	114,482	0	114,482	116,108	1,626	128,177	128,177	0	13,695
50503	Sampling - Laboratory Costs	0	2,400,058	2,855	2,402,913	0	2,402,913	2,400,058	-2,855	2,440,559	1,977,354	463,205	37,646
50600	Security	0	411,603	0	411,603	0	411,603	411,603	0	413,868	313,868	100,000	2,265
50700	Dewatering Horiz Well Installation (Closed)	0	221,147	0	221,147	0	221,147	221,147	0	221,819	221,819	0	672
50800	Pumps (Closed)	0	72,885	0	72,885	0	72,885	72,885	0	91,659	88,659	3,000	18,774
50900	Sheet Pile Wall Removal	0	17,988	0	17,988	0	17,988	17,988	0	34,976	19,976	15,000	16,988
51000	Tiebacks (Closed)	0	75,301	0	75,301	0	75,301	75,301	0	75,253	134,253	-59,000	-48
51100	Product Disposal	0	1,990,591	0	1,990,591	0	1,990,591	1,990,591	0	1,703,732	588,732	1,115,000	-286,859
51101	Sludge Handling	0	389,778	0	389,778	0	389,778	389,778	0	430,000	200,000	230,000	40,222
51200	West Tributary (Closed)	0	102,283	0	102,283	0	102,283	102,283	0	46,058	16,058	30,000	-56,225
51300	Soil Replacement	0	71,800	0	71,800	0	71,800	71,800	0	68,902	37,902	31,000	-2,898
51400	Vegetation	12,530	92,933	8,280	101,213	0	101,213	94,998	-6,214	99,483	22,483	77,000	-1,730
51500	Oversize Debris Handling	0	473,353	0	473,353	0	473,353	473,353	0	470,000	410,000	60,000	-3,353
51600	Pre and Post-Const GW Mon	0	126,282	0	126,282	0	126,282	126,282	0	132,000	90,000	42,000	5,718
Funding Source: 4. Remediation Total		**11,168**	**43,846,325**	**22,945**	**43,869,270**	**1,000**	**43,870,270**	**43,868,509**	**-1,761**	**43,259,754**	**35,531,484**	**7,728,270**	**-610,517**
Funding Source: 5. Demobilization													
61000	Decontaminate/Dismantle	2,320	689,401	2,044	691,445	0	691,445	689,881	-1,564	750,000	600,000	150,000	58,555
Funding Source: 5. Demobilization Total		**2,320**	**689,401**	**2,044**	**691,445**	**0**	**691,445**	**689,881**	**-1,564**	**750,000**	**600,000**	**150,000**	**58,555**

ORIGINAL red

Delivery Order 16 — Southern Maryland Wood Treatment Site — April 2001

Cost Account	Description	Actual Cost: This Period	Actual Cost: To Date	Commitments: Accruals	Commitments: Total	Estimate to Complete	Estimate at Completion: Current	Estimate at Completion: Previous	Estimate at Completion: Variance	Budgets: Approved	Budgets: Baseline	Budgets: Changes	Variance Budget-EAC
Funding Source: 6. Technical Report													
71000	Technical Report - Draft	6,598	38,474	0	38,474	2,500	40,974	36,876	-4,098	33,000	33,000	0	-7,974
72000	Technical Report - Final	0	0	0	0	17,323	17,323	17,323	0	45,000	8,000	37,000	27,677
Funding Source: 6. Technical Report Total		**6,598**	**38,474**	**0**	**38,474**	**19,823**	**58,297**	**54,199**	**-4,098**	**78,000**	**41,000**	**37,000**	**19,703**
Funding Source: 7. Operations & Maintenance													
80100	O & M Support Area	-549	762,633	0	762,633	3,160	765,793	768,582	2,789	721,509	486,509	235,000	-44,284
80200	Staff for Treatment System	0	1,603,774	0	1,603,774	0	1,603,774	1,603,774	0	1,550,603	1,310,603	240,000	-53,170
80300	WTP O & M	0	1,246,716	0	1,246,716	0	1,246,716	1,246,716	0	1,216,513	1,006,672	209,841	-30,203
80400	O & M Dewatering System (Closed)	0	162,307	0	162,307	0	162,307	162,307	0	164,137	126,137	38,000	1,830
Funding Source: 7. Operations & Maintenance Total		**-549**	**3,775,430**	**0**	**3,775,430**	**3,160**	**3,778,590**	**3,781,379**	**2,789**	**3,652,762**	**2,929,921**	**722,841**	**-125,828**
Funding Source: 8. Standard Contract													
66666	Mod #8 Additional Funding	0	0	0	0	0	0	0	0	1,200,000	1,200,000	0	1,200,000
88888	Fee	0	1,834,842	0	1,834,842	0	1,834,842	1,834,842	0	1,192,507	2,173,800	-981,293	-642,335
Funding Source: 8. Standard Contract Total		**0**	**1,834,842**	**0**	**1,834,842**	**0**	**1,834,842**	**1,834,842**	**0**	**2,392,507**	**3,373,800**	**-981,293**	**557,665**
Funding Source: 9. Unclassified Cost													
77777	ICF Closed	370	-197	3,200	3,003	0	3,003	2,633	-370	0	0	0	-3,003
99990	IT Equipment Dispatch	106	4,267	0	4,267	-106	4,161	4,161	0	0	0	0	-4,161
Funding Source: 9. Unclassified Cost Total		**476**	**4,070**	**3,200**	**7,270**	**-106**	**7,164**	**6,794**	**-370**	**0**	**0**	**0**	**-7,164**
Report Total		**34,079**	**54,884,950**	**28,189**	**54,913,139**	**61,479**	**54,974,619**	**54,974,619**	**0**	**54,892,619**	**46,834,800**	**8,057,819**	**-82,000**

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