THERMAL DESORPTION WORK PLAN
WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON
VOL. I

PREPARED FOR:

Burlington Northern Railroad
2000 First Interstate Center
999 Third Avenue
Seattle, Washington 98104-1105

Submitted To:

Burlington Northern Railroad
2000 First Interstate Center
999 Third Avenue
Seattle, Washington 98104-1105

January 30, 1995

WILLIAMS PROJECT NO: 0365-001-110

Prepared By:
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ACRONYMS

AAC	Acceptable Ambient Concentration
acfm	actual cubic feet per minute
AOC	Administrative Order on Consent
APCE	air pollution control equipment
ASTM	American Society for Testing and Materials
AWFSO	automatic waste feed shutoff
BHC	1,2,3,4,5,6-Hexachlorocyclohexane
BRA	Baseline Risk Assessment
Btu	British thermal unit
BNRR	Burlington Northern Railroad
CEM	Continuous emissions monitor
CFR	Code of Federal Regulations
CPVC	chlorinated polyvinyl chloride
DDT	1,1'-(2,2,2-Trichloroethylidene)bis[4-chlorobenzene]
EA	Ecological Assessment
gpm	gallons per minute
HAS	health and safety
HASP	Health and Safety Plan
ID	induced draft
ISCST-2	Industrial Source Complex Short Term air dispersion model
LDRs	Land Disposal Restrictions
LTTD	Low Temperature Thermal Desorption
mg/kg	milligrams per kilogram
NaOH	sodium hydroxide
NEC	National Electric Code
NFPA	National Fire Protection Association
NPL	National Priorities List
OCL	organochlorine
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
ppm_v	parts per million by volume
psig	pounds per square inch, gauge
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RAO	Response Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
scfm	standard cubic feet per minute
WOODS	WOODS Industries Site
THC	total hydrocarbons
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VO	vent open
w.c.	water column
Williams	Williams Environmental Services, Inc.

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SECTION 1

INTRODUCTION

1.1 SITE DESCRIPTION AND HISTORY

The site is located in an industrial area in the city limits of Yakima, Washington, within the Northwest Quarter of the Northeast Quarter of Section 31, Township 13 North, Range 19 East, West Meridian (Figure 1, Site Location Map). The Woods Industries Site consists of two areas formerly leased from Burlington Northern Railroad (BNRR) to Woods Industries who sublet a portion of the site to Akland Irrigation. The entire area that was leased from BNRR covers approximately four acres.

The site is flat and includes the Crop King/Woods Industries buildings formerly used to formulate pesticides on the north part of the site and the buildings formerly used by Akland Irrigation for storage and retail of irrigation supplies on the south part of the site.

For approximately 50 years, BNRR and its predecessors leased the site to industrial lessees. The area leased by Woods Industries was used for the contract formulation of market-grade pesticides from technical-grade material from approximately 1938 until May 1985, when the lease was terminated by BNRR because of environmental concerns.

Waste from the formulation process and laboratory was discharged to a french drain/sump area on the site. The french drain/sump area was an excavated area with rows of vertically set, perforated drums sitting on and covered by timbers with approximately two feet of construction rubble and soil backfill leveled at grade.

The Akland Irrigation area of the site was used primarily for the sales, storage, and maintenance of irrigation equipment. The middle portion of the Akland Irrigation area contained two discharge lagoons. These lagoons were used to collect and discharge liquids carried by pipeline from the Woods Industries area. The lagoons were filled in with surrounding soil and debris including metal scraps, between approximately 1973 and 1977, based on interpretation of aerial photographs. The lagoon area was then used for storage of irrigation equipment. The sanitary wastes from the site were discharged to the public sanitary sewer system.

After Woods Industries' lease was terminated in May 1985, Woods Industries removed some personal property from the site, and BNRR assumed control of the property.

In December 1985, the U.S. Environmental Protection Agency (USEPA) issued a Removal Action Order, which, among other things, required that a detailed plan for site characterization be developed and executed. A site Characterization Plan was prepared and executed in 1986 by Morrison-Knudson Engineers, Inc., (MKE), BNRR's contractor at that time.

Based on the results of the preliminary site characterization, elevated concentrations of p,p'-DDD (DDD), p,p'-DDT (DDT), p,p'-DDE (DDE), lead, zinc, hexachlorobenzene, and bis(2-ethylhexyl)phthalate were found in soil samples collected from the site. This preliminary study concluded that DDT was the most widely spread of the pesticides in soil.

Pesticides, volatile organic compounds, and primary metals were detected in groundwater samples collected from five wells installed during this preliminary investigation.

RI Investigation Activities

The RI investigations were performed in accordance with the requirements of Consent Order Number 1087-03-18-106 as amended June 28, 1990, and the RI/FS Work Plans approved by the USEPA. The investigations were performed in two phases. Phase I was performed in 1990 and Phase II was performed mostly in 1991. Some additional tasks, such as disposal of drummed drill cuttings and well development water, were performed in 1992. In summary, the RI field tasks performed to evaluate groundwater impact included:

- installation of nine wells in addition to those installed during the preliminary investigation and groundwater sample collection from these nine wells and five existing on-site wells once in 1990 and 1991;

- collection of off-site groundwater samples from six commercial or residential wells.

- evaluation of site hydrogeologic characteristics on groundwater flow direction and formation material grain size; and

- analysis of groundwater samples for metals, volatile organic compounds, hexachlorobenzene, pesticides, and other parameters.

The RI field tasks performed to evaluate soil impact included:

- collection of surficial and subsurface soil samples;

- analysis of soil samples for metals, volatile organic compounds, hexachlorobenzene, pesticides, ethylene thio urea, and other parameters; and

- analysis of select soil samples for Toxicity Characteristic Leaching Procedure (TCLP) parameters for use in evaluating disposal and treatment options.

The RI field tasks performed to evaluate on-site buildings included:

- collection of composite samples from building interiors; and

- inspection and sampling of building contents for asbestos-containing materials.

Removal Actions

Removal actions to date consist of building demolition and soil removal activities and are described in the following paragraphs.

Building demolition removal activities, occurring in January and February 1993, were performed to reduce physical and toxic health hazards and to facilitate future site remediation. Building demolition activities are described in the Building Demolition Final Report dated March 26, 1993.

Soil removal activities occurring from March 29 through September 24, 1993, included the excavation and temporary storage of approximately 19,000 cubic yards of soil that presented a threat to groundwater, which also included the soils that present a toxic health hazard. This removal action reduced contaminant concentrations to acceptable levels under an industrial future-use scenario as defined under the State of Washington's Model Toxics Control Act (MTCA). Soil removal activities were performed in accordance with Administrative Order Number 1087-03-18-106 and are described in the Soil Removal Final Report dated October 13, 1993.

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SECTION 2

PROJECT OVERVIEW AND ORGANIZATION

2.1 PROJECT OVERVIEW

Thermal desorption has been selected as the treatment alternative to complete the Removal Action activities and meet the requirements of the Response Action Objective (RAO) memorandum for the Woods Industries Site in Yakima, Washington. Williams will use their Low Temperature Thermal Desorption unit (LTTD) to treat approximately 19,000 tons of pesticide contaminated soil. The treated soil will then be sampled and analyzed. The results of these analyses will be compared to the treatment goals established for the soils exiting the thermal desorption process. Treated soils will be used as backfill on site. Oversized material is discussed in Section 3.5.1. Treatment goals for soils are described in Section 7.1, Table 7-1 and air emission goals are outlined in Table 7-2.

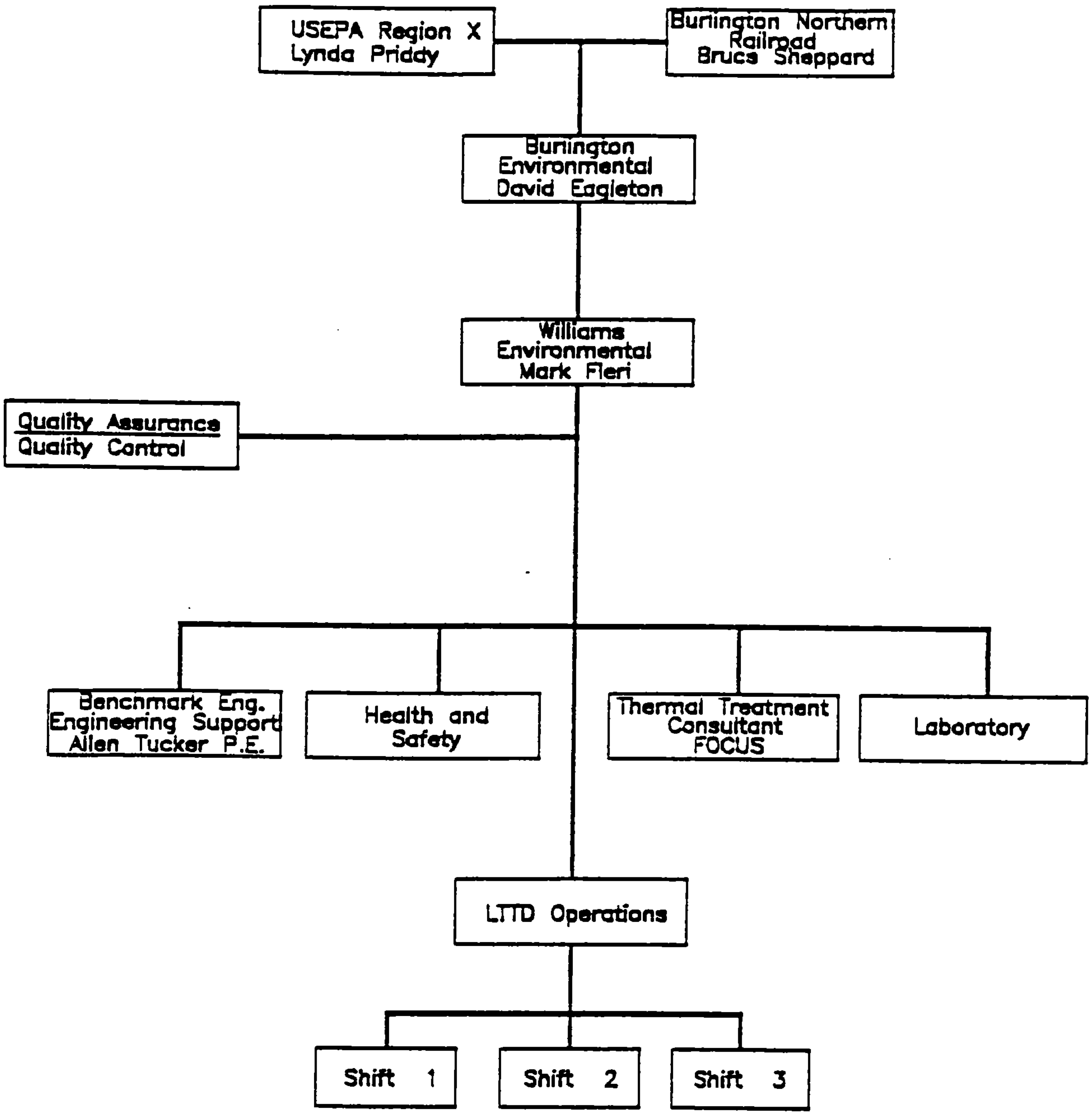
Following approval of the Thermal Desorption Work Plan by USEPA, and upon receipt of a notice to proceed from BNRR, Williams will begin mobilization of the LTTD system to the site in accordance with the schedule presented in Section 5.0.

After steady-state operations are achieved, a Performance Test will be conducted. Upon approval of the Performance Test Report by USEPA Region X, Williams will initiate full production of the LTTD system and complete the treatment of the contaminated soils. After the stockpiled soils and the soils below the stockpiles have been treated and laboratory confirmation received that all treated soils meet the cleanup criteria, the system will be decontaminated and demobilized from the site.

2.2 PROJECT ORGANIZATION

2.2.1 Organization Chart

The organizational structure for this project is presented in Figure 2-1. A summary of the responsibilities of each person or organization is presented in Section 2.2.3.



ORGANIZATIONAL STRUCTURE
FIGURE 2-1

2.2.2 Job and Organization Titles

Job and organizational titles for the key management individuals and organizations are as follows:

- WOODS Project Manager
- USEPA Region X
- Principal in Charge
- Quality Assurance/Quality Control (QA/QC) Manager
- Health and Safety Officer
- Project Manager
- Thermal Treatment Consultant
- Performance Test Subcontractor(s)
- Site Manager
- Shift Supervisor/Chief Operator
- LTTD Operators and Maintenance Personnel
- Material Handling and Service Personnel.

2.2.3 Relationship and Responsibilities of Organization

Responsibilities of Burlington Environmental and Williams will be similar to that of Burlington Environmental and Olympus for soil removal activities. Burlington Environmental will provide oversight and Williams will be the Contractor. Burlington Environmental will have an on-site coordinator. An independent Thermal Treatment Consultant will be used during the performance test activities and will be subcontracted under Williams. Williams will be responsible for all material handling associated with soil treatment which includes excavating beneath existing stockpiles and final site grading.

Sampling excavations beneath stockpiles and haul roads prior to demobilization will be the responsibility of Burlington Environmental. Implementation of the health and safety program will be the responsibility of Williams.

2.2.4 Job Descriptions for Williams' Personnel

Principal in Charge

The Principal in Charge (Dr. Z. L. Taylor) is the corporate officer with overall responsibility for the financial, operational, and health and safety aspects of the project. The Principal in Charge interacts with the client, regulatory agencies, and the Williams Project Manager as required.

QA/QC Manager

The responsibilities of Williams' QA/QC Manager are presented in Section 15.2.

Health and Safety Officer

The responsibilities of Williams' Health and Safety Officer are presented in Section 14.2.

Williams' Project Manager

The Project Manager is the key professional responsible for the day-to-day technical and administrative management of the project. He reports directly to the Principal-in-Charge and is responsible for day-to-day operations. He manages the job site administrative activities including purchasing, payroll, and other job records. Periodic and ongoing reports are prepared and distributed as required. Job cost and budget compliance are the responsibility of the Project Manager who will interface directly with the Corporate Controller on routine financial matters. He is responsible for all health and safety matters on-site but he is subject to audit and review of the corporate Health and Safety Officer. He is responsible for all testing and compliance matters, subject to the audit and review of the Corporate QA/QC Officer. He manages all subcontractors employed at the site including all performance testing personnel. He is responsible for sample collection, maintaining appropriate chain of custody forms, and recording analytical results as required. He is responsible for training and directing personnel to operate all equipment in compliance with safety standards and regulatory requirements. All site security and disciplinary matters are the responsibility of the Project Manager.

Thermal Treatment Consultant

The Thermal Treatment Consultant provides third party oversight during the performance test. This includes observation of sampling activities, review of monitoring and data collection procedures, and verification that the Thermal Treatment Plan is properly implemented. In addition, the Thermal Treatment Consultant will assist in identifying any irregularities or deficiencies associated with the test.

Performance Test Subcontractor

The Performance Test Subcontractor will provide the equipment and manpower required to sample and analyze the stack gas and soils streams in accordance with the approved performance testing plan. A performance test report will be prepared to document the results of the performance test.

Site Manager

The Site Manager will be responsible for on-site operations. The Site Manager will be on site full-time and dedicated to this project. His duties will include coordinating the activities of all facility personnel to meet the objective of safely processing the stockpiled soil and meeting all objectives described in the Thermal Desorption Work Plan. The Site Manager will control personnel requirements, training, and employee discipline. The Site Manager will be responsible for overseeing soil handling, desorption system operation, and all auxiliary operation duties. He will be responsible for maintaining spare parts, tools, and trained personnel for the repair and upkeep of the LTTD and associated equipment.

The Site Manager will be responsible for overseeing the safety and environmental control procedures to protect health and the environment. The Site Manager reports directly to the Project Manager.

Shift Supervisor

The Shift Supervisor will be responsible for the operation and for supervising the activities of Operators and Material Handlers. This person has the responsibility of maintaining safe and efficient operation of all soil handling and processing functions, including the movement of feed and treated soil to and from the LTTD system. Duties include coordinating soil handling and processing, analyzing problems, and responding to emergencies. On the off-shifts and weekends, the Shift Supervisor is responsible for all personnel and activities at the site.

The Shift Supervisor will maintain a safe operation by continuous review of the facility's operating procedures, housekeeping requirements, and OSHA and USEPA regulations. The Shift Supervisor will maintain effective communications with operating and management personnel. This will include reports of activities during the shift as well as other written and verbal communications pertinent to the completion of the job duties.

LTTD Operators, Assistant Operators, Maintenance and Health & Safety Personnel

Operators and Maintenance Personnel of the LTTD equipment will be trained to the following standards:

Receive job-specific training, such as operations of equipment, trouble shooting and maintenance.

Receive site-specific training in operation and maintenance of:

- Rotary dryer and soil feed mechanisms
- Baghouse
- Thermal oxidizer
- Treated soil handling equipment
- Auxiliary equipment
- Material handling equipment
- Emergency equipment.

A description of the job duties is as follows:

The employees assigned to this position will be responsible for the operation of the LTTD. Specific duties will be to:

- Feed soil to the dryer in accordance with prescribed operating conditions
- Monitor the process by means of control room instruments
- Make adjustments to controls as necessary to ensure proper operation
- Respond to system alarms in order to restore normal conditions or shut down operating units
- Record specified parameters in the operating log at the required frequencies
- Monitor the operation of the baghouse
- Operate the treated soil collection system
- Monitor the operation of fans and blowers
- Maintain equipment and instruments as required.
- Maintain accurate records of activities performed and processes monitored
- Maintain the workplace in a safe and orderly manner
- Perform other related duties as directed by supervisor.

Material Handling and Service Personnel

Employees working in this position will be trained to the following minimum standards:

- Receive all training designated as "job-specific"

- Complete site-specific training in the operation of material handling equipment, including:
  - Pumps, valves and related controls
  - Quick-connect hoses and manifolds
  - Screen operation
  - Conveyors and feeders
  - Front-end loaders, backhoes and fork lift trucks
  - Tractors and dump trucks
  - Sampling procedures and devices

- Proper use of facility safety procedures and equipment

- Proper use of spill control and cleanup equipment.

A description of the job duties for the material handling and service personnel includes the following:

- Maneuver trailers, fork lift trucks, front-end loaders, backhoes and dump trucks
- Collect and process soil samples
- Prepare soil for feeding by sorting and screening
- Keep records of job-related activities
- Maintain the workplace in a safe and orderly manner
- Maintain spill cleanup equipment in good condition
- Perform other related duties as directed by supervisor.

3

SECTION 3

PROCESS DESCRIPTION

3.1 GENERAL

The process described in this section employs Williams' Low Temperature Thermal Desorption Unit (LTTD). The process will treat soils at temperatures between approximately 700°F and 1100°F in order to volatilize the hazardous organic constituents in the soil and achieve cleanup levels as outlined in the Technical Specifications. A description of the major items of equipment which comprise Williams' LTTD is presented in Section 4.

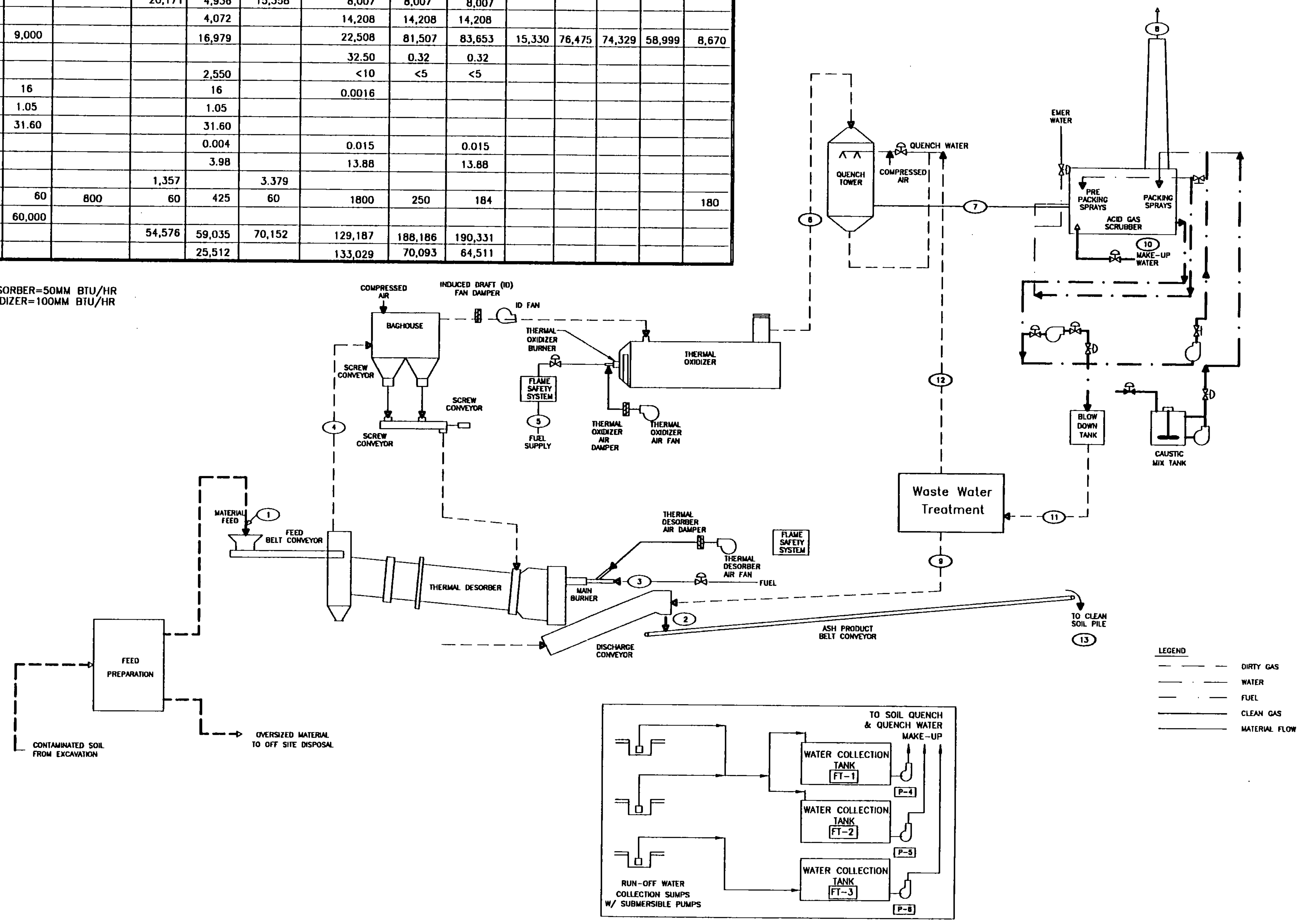
The thermal desorber will be used to volatilize moisture and organics contained in the excavated soil during this project. The off-gases from the desorber are then treated with a baghouse to remove particulate matter. Further removal of organics contained in the gas stream is accomplished by a thermal oxidizer. Following the oxidizer, a scrubber will remove 99% of the HCl present in the off-gases. A process flow diagram complete with a heat and material balance is shown in Figure 3.1.

3.2 FEED PROCESSING

The feed material for this project consists of soil which has been previously excavated and stockpiled on site and some soils located under the stockpile. The soil will be removed from the stockpile with a front-end loader and delivered to the feed unit (SF-FU) where it will be screened into a feed hopper. An apron feeder will move the soil from the hopper to a belt conveyor which will elevate the soil to the feed belt (SF-BC-4) at the desorber. The speed of the apron feeder is regulated from the control room and used to set the soil feed rate to the desorber at approximately 30 tons per hour. The feed belt contains a load cell for the continuous weighing of the feed soils. The instantaneous and cumulative weights are displayed in the control room. Testing procedures and sampling will be performed as outlined in the Performance Test Plan. Re-sampling/re-analysis/re-extraction may only be considered if problems in the analytical procedures or sampling procedures are identified; otherwise, soil piles that fail to meet cleanup standards will be re-treated. EPA will make the decision on whether another sample may be taken for a specific pile as opposed to a pile being re-treated. The failed pile will be moved from the verification holding area to the wastefeed stockpile area. The failed pile will be treated as the production schedule allows. The amount of re-treated material will be deducted monthly based on the production sheets. (One pile represents one day's production.)

	UNITS of MEASURE	(1) WASTE FEED	(2) TREATED SOIL	(3) KILN BURNER	(4) KILN OFFGAS	(5) SECONDARY BURNER	(6) SECONDARY OFFGAS	(7) QUENCHER OFFGAS	(8) STACK GAS	(9) DUST CONTROL	(10) MAKE UP WATER	(11) BLOW DOWN	(12) RECYCLE WATER	(13) QUENCHED SOIL
DRY GAS	LB/HR			53,219	42,056	70,152	106,679	106,679	106,679					
DRY SOLIDS	LB/HR	51,000	43,350											43,350
THERMAL CAPACITY	MM BTU/HR			30		73								
N2	LB/HR			33,048	33,048	51,415	84,463	84,463	84,463					
O2	LB/HR			20,171	4,936	15,358	8,007	8,007	8,007					
CO2	LB/HR				4,072		14,208	14,208	14,208					
H2O	LB/HR	9,000			16,979		22,508	81,507	83,653	15,330	76,475	74,329	58,999	8,670
HCL	LB/HR						32.50	0.32	0.32					
PARTICULATE	LB/HR				2,550		<10	<5	<5					
CARBON	LB/HR	16			16		0.0016							
HYDROGEN	LB/HR	1.05			1.05									
CHLORINE	LB/HR	31.60			31.60									
SO2	LB/HR				0.004		0.015		0.015					
NO2	LB/HR				3.98		13.88		13.88					
FUEL USAGE	LB/HR			1,357		3.379								
TEMPERATURE	degrees F	60	800	60	425	60	1800	250	184					180
TOTAL MASS SOLID	LB/HR	60,000												
TOTAL GAS MASS	LB/HR			54,576	59,035	70,152	129,187	188,186	190,331					
TOTAL GAS VOLUME	ACFM				25,512		133,029	70,093	64,511					

NOTE:
BURNER CAPACITY OF THERMAL DESORBER=50MM BTU/HR
BURNER CAPACITY OF THERMAL OXIDIZER=100MM BTU/HR



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TPU4

WOODS INDUSTRIES

PROCESS FLOW DIAGRAM FOR 4TPU

4PFD

DATE 10/6/94

DIRECTORY: WES\JOBS\ACTIVE WOODS\DWGS

FILENAME 4PFD-WOD.dwg

DWG NO. FIG. 3-1

3.3 SOIL TREATMENT

A countercurrent thermal desorber (PC-RD) is used to volatilize the moisture and organic constituents from the soil. The desorber has internal flights to ensure intimate contact between the soils and desorbed gases. The soils enter at the same end where the exhaust gases leave. The exit gas temperature will not exceed 450°F. The actual gas exit temperature will be determined by the performance test. While the soil passes through the desorber, the soil temperature initially rises to 212°F as water is removed. After the moisture has been removed, the soils move toward the discharge end of the desorber where the soil temperature increases to approximately 800°F or greater. Since countercurrent flow is utilized, high exit soil temperatures can be readily obtained. The desorber is constructed of a special alloy designed specifically to withstand temperatures up to 1200°F.

The treated soils move through the dryer and enter the Dobson collar prior to exiting the rotary dryer. The Dobson collar is an expansion in the shell of the dryer to allow the baghouse fines to mix with the treated soils. The collar serves two purposes. The first purpose is to add additional residence time for the treatment of the baghouse fines so that a thorough and controlled treatment can be performed. The second purpose is to reduce the gas flow through the collar itself. The reduction of the gas flow prevents the baghouse fines from re-entraining into the gas stream and allows for further treatment. After exiting the Dobson Collar, the treated, conditioned soil enters into a pugmill where it is discharged to a belt conveyor for stacking. The treated soils are removed from the stacking area by a front-end loader to the verification holding area for subsequent analyses. After meeting the clean-up goals, the treated soils will be used as backfill on-site. Appendix S contains the correspondence to date on the description of the Dobson collar. Included in this appendix is a mechanical drawing, a program output of the calculated retention time in the collar and various correspondence that has resulted in the ultimate selection of the collar.

Heated air is provided to the desorber by a gas fired burner (PC-BR). This burner is located away from the dryer so that no direct oxidizing flame comes in contact with the soils. Combustion air for the burner is provided by a separate blower, but the overall draft is maintained by an I.D. fan (BH-ID) located after the baghouse. The pressure at the burner end of the desorber is monitored and the I.D. fan damper is regulated to maintain a negative pressure inside the desorber at all times.

3.4 GAS CLEANING

The gas stream leaving the desorber contains particulates, moisture, metals, acid gases and volatilized organics. This stream must be treated to remove the particulate and organic matter in order to achieve air emission standards before the gas is discharged to the atmosphere. A baghouse dust collector (BH-DC) and a thermal oxidizer (SC-TO) will be used to achieve these removals.

The baghouse utilizes a pulse jet type cleaning system. A maximum air to cloth ratio of 5:1 is provided. The polyimide bag material (P-84) provides excellent removal efficiency and has a maximum continuous operating temperature of 500°F.

The air from the desorber enters the baghouse below 450°F. After passing through the filter bags, the particulate free gas exits the baghouse at about 400°F.

The baghouse dust is removed from the baghouse hoppers by screw conveyors (BH-SC-1/5) which discharge into two other totally enclosed screw conveyors (BH-SC-6/7) for transfer to the Dobson Collar portion of the desorber. (See Section 3.3, Soil Treatment).

After removal of particulates, the gas stream enters the thermal oxidizer (SC-TO) where the oxidation of the volatile organic compounds occurs. The oxidation efficiency of the organics depends on the temperature inside the thermal oxidizer, the turbulence of the gases, and the retention time of the gases inside the thermal oxidizer chamber. The chamber is sized to provide sufficient retention time (> 2 seconds) at 1800°F and has a high intensity vortometric burner to provide the temperature and turbulence required to oxidize the organics. After the organics have been oxidized, the clean gases are quenched to reduce their temperature, then are passed through the scrubber to remove any further particulates and acid gases, and finally through the stack (AB-ST) to the atmosphere. The clean stack gases will be monitored using a continuous emissions monitoring (CEM) system (see Table 4.1).

3.5 PROCESS RESIDUAL STREAMS

The LTTD operation and associated tasks will generate the following residual streams:

- oversize debris too large for treatment (> 3 inches cube)
- treated soil prior to laboratory confirmation
- water collected from pad area runoff (such as operations pad area)
- scrubber water blowdown
- baghouse dust.

3.5.1 Oversized Material and Debris

Thermal desorption requires a significant amount of material handling. A cutoff size will be established through experience in handling the on-site soils to determine which material will be screened out. A Powerscreen with two levels of mesh grating (grid design) will be utilized for the screening operations. Through observations made during soil removal activities conducted at the site, BNRR and the USEPA are aware that the soil excavated and placed in the temporary soil storage piles contain approximately 35 to 45 percent "oversized material". This oversized material will not be treated by the thermal desorption process because it cannot be handled via the material handling equipment involved with the thermal desorption process.

As discussed in the Draft Feasibility Study, it is believed that contaminants adhere preferentially to finer particles (silts, clays and humic materials) and contamination of larger materials is related to the adhesion of finer particles to the exterior of larger ones. Observations made during soil removal activities at the site revealed that the exterior of the larger materials are relatively free of finer materials adhering to their surface.

To evaluate the disposition of the oversized material, with the USEPA's approval, BNRR has collected composite samples of oversized material which are in the process of being crushed and analyzed for several indicator chemicals.

The results of these analyses will be compared to the treatment goals established for the soils exiting the thermal desorption process which will be used as backfill on-site. BNRR understands that oversized material which is below the treatment goals will be suitable to be used as backfill without additional treatment.

Debris will be handled similarly as in building demolition and soil removal. Contaminated debris will be disposed of at Chemical Waste Management's Arlington, Oregon facility. Clean debris will be disposed of at a local sanitary landfill. The ultimate fate of the debris found at the Woods Site will be limited by the individual material's character and degree of contamination. Where appropriate, the material will be re-used or recycled. No visibly contaminated material will be recycled or disposed of in a sanitary or municipal landfill. If the material is believed to be contaminated based on visual observation, the material will be cleaned, if practical, or disposed of at a facility permitted to accept the waste as appropriate.

Williams anticipates hauling soils to a wastefeed stockpile as is shown in Figure 12-1. Engineering controls will be used to prevent fugitive dust emissions where applicable.

3.5.2 Treated Soil Prior to Laboratory Confirmation

Treated soils exit the rotary dryer and pass into the enclosed discharge screw conveyor to be re-moisturized. A negative pressure is maintained on the discharge conveyor to capture any steam from the re-moisturizing process. The treated, conditioned soil then discharges from the screw conveyor to a belt conveyor for stacking. The stacking conveyor is capable of producing treated soil piles in excess of 400 tons. The treated soils are removed from the stacking area by a front-end loader to the verification holding area for subsequent sampling and analysis. Sampling will occur after the treated soil has been conditioned with carbon treated water. While awaiting laboratory confirmation, soil piles remain within the confines of the containment area and are covered by plastic sheeting. The covering helps prevent dusting due to wind and runoff due to rain. Any runoff that may occur from the treated soil piles will be collected in a sump and further treated by the unit's aqueous phase carbon adsorption system. Sludgy material that settles in the sumps will be removed periodically, mixed with contaminated soil to reduce the moisture content, and reprocessed through the thermal desorption system. Any sludge collected after treatment of the contaminated soil has been completed will be placed in the dryer, heated to remove moisture, and then processed. Only minimal amounts of sludge are anticipated. After lab results have been obtained to confirm that the treated piles have passed analysis, the soils will be used as backfill on-site.

3.5.3 Run-off Water

Water collected as run-off from the pad area will be stored in three frac tanks located on the pad. This water may be used to supplement the water requirement for conditioning the treated soil, or for dust control on untreated material as applicable. The runoff water will be treated with carbon to ensure that the treated soil is not re-contaminated by this water. No sampling of this run-off water is necessary. Its acceptability is determined by the criteria that it does not affect treated soil quality. Carbon treated water will not be used for dust control or for dust suppression of the treated soils after the soil has been sampled and determined to comply with the clean-up levels. For soils that have already been confirmed as meeting clean-up levels, only city water or treated water that has been analyzed and approved may be used for dust control and conditioning of these soils. Untreated run-off water will not be used for dust control or conditioning of any treated soils. City water will be used for dust control of the haul roads. The spent carbon will be disposed of/regenerated at Westates Carbon's Parker, Arizona facility, or Westates Morgantown, West Virginia facility. Williams proposes to sample the carbon at a frequency of one sample per 1,000,000 gallons of water treated in order to determine whether it is spent. The estimated life span of the carbon units is in excess of four years.

3.5.4 Scrubber Water Blowdown

Effluent from the acid gas scrubber, or blowdown, will be routed to the aqueous phase carbon adsorption units where it will be treated in the same manner as run-off water collected from the pad area. Treatment with carbon will ensure that the treated soil is not re-contaminated by this water, which may be used to supplement the water requirement for conditioning the treated soil, and quench water for the gas stream. Carbon treated water will not be used for dust control or for dust suppression of the treated soils after the soil has been sampled and determined to comply with the clean-up levels. For soils that have already been confirmed as meeting clean-up levels, only city water or treated water that has been analyzed and approved may be used for dust control and conditioning of these soils. Untreated run-off water will not be used for dust control or conditioning with any treated soils. City water will be used for dust control of the haul roads.

3.5.5 Baghouse Dust

The baghouse, located prior to the oxidizer and other APCE, is the primary means of particulate removal for the system. Because of its position in the treatment process, there will be no buildup of soil particulate in the equipment subsequent to the baghouse. Particulate collected from the baghouse will be returned to the hot end of the rotary dryer for further treatment. The increased diameter at the hot end of the rotary dryer, from 8.5 feet to 10 feet, increases the soil residence time and provides lower air velocities to allow for further treatment of the particulate if residual contamination does exist. Both the soils and the soil particulate will receive full, controlled treatment before discharge from the rotary dryer. Following treatment, the soils will be analyzed to ensure that they meet established cleanup standards.

EPA has requested that Williams provide control of baghouse fines to the Dobson Collar so the flow of fines does not exceed the rate which was demonstrated during the performance test. Williams has agreed to install a dust flow monitor to measure the dust feed rate to the desorber and institute an AWFSO if the feed rate demonstrated during the performance test is exceeded. Williams has expressed concern that such a device will not work effectively. However, the EPA understands that technical problems may arise on-site that make it impossible for Williams to comply with requirements as delineated in this plan. If such a situation arises, EPA will work with Williams to resolve the problem, which may mean modification of a requirement.

Additionally, EPA has instructed Williams to stop the baghouse dust feed to the desorber in the case of any AWFSO. Both the EPA and Williams have legitimate concerns pertaining to the implications of stopping the dust feed to the desorber in the event of any AWFSO. As a compromise, based on the operation of the unit during clean soil shakedown, Williams will attempt to stop the dust feed in the desorber in the event of an AWFSO. Williams will conduct a "test" during clean soil shakedown in order to determine the length of time the baghouse dust feed to the desorber can be stopped before excessive dust buildup in the baghouse becomes a significant problem. Based on the results of this test, Williams will install a timer which will allow the dust feed to the desorber to restart after some approved length of time as demonstrated during the test. This action would prevent a buildup of dust in the baghouse in the event of a prolonged AWFSO. The exceptions to restarting the dust feed would be AWFSOs for ID fan failure, burner malfunction, power failure, positive pressure excursion, and low soil temperature.

4

SECTION 4

EQUIPMENT DESCRIPTION

The process equipment for this project is configured for six primary trailers plus auxiliary material handling and fuel storage units. The composition of each trailer is:

Trailer 1

The desorber unit includes the rotary dryer (PC-RD), feed belt (SF-BC-4), and thermal desorber burner (PC-BR).

Trailer 2

The baghouse unit includes the baghouse dust collector (BH-DC), baghouse discharge conveyors (BH-SC-1/5), dust transfer conveyors (BH-SC-6/7), I.D. damper (DF-2-B) and induced draft blower (BH-ID). Auxiliary equipment includes air compressors.

Trailer 3

The thermal oxidizer unit includes the thermal oxidizer (SC-TO) and thermal oxidizer burner (SC-BR).

Trailer 4

The control unit houses the control panel, data logger, PLC, CPU, and CEM analyzers. In addition, the motor control center and a small work shop area are contained in this trailer.

Auxiliary material handling equipment includes the feed processing unit (SF-FU), stacking conveyor and tool trailer.

Trailer 5

The scrubber unit includes the vertical packed bed acid absorber (AB-SCR).

Trailer 6

The quench trailer includes the quencher vessel (QU-V) and the stack (AB-ST).

4.1 EQUIPMENT DESCRIPTION

Figure 3.1 shows the process flow diagram of the LTTD with heat and mass balances. The system consists of a feed processing unit, thermal desorber, baghouse, thermal oxidizer, quench tower, induced draft fan, acid gas scrubber, emergency vent, burner systems, control trailer and soil feeding system. The pollution control system is state-of-the-art, with a baghouse, thermal oxidizer and acid gas scrubber. The system is designed to treat more than 40 tons per hour of soil at 15-20% moisture content and will meet the performance requirement for reducing the organochlorine (OCL) pesticide levels from contaminated soil at the Woods Industries Site. The major components of the system are described below.

Feed Processing Unit

Material handling can often be a major operational challenge in the thermal treatment process. Soils with high clay and moisture content are difficult to handle compared with sandy soils. The feed processing unit of the LTTD system is specially designed and built to handle difficult clays. Because operational parameters can be modified to accommodate variable feed conditions, mixing or blending of waste feed material is generally not required.

Contaminated soils at the Woods Industries site contain a large amount of cobbles. Other debris, such as metal bands and pipes may also be present. Therefore, the contaminated soil will be pre-screened prior to thermal desorption processing. A Powerscreen with two levels of grating will be utilized. Size screening enhances the efficiency of thermal treatment and protects the integrity of the feed and discharge systems of the unit. The material is initially screened to remove particles larger than three inches, as well as other large debris. The handling of oversized material is discussed in Section 3.5.1. Miscellaneous debris present in the stockpile, such as metal bands and pipes, will be handled similarly to that during soil removal and disposed of properly in a RCRA permitted landfill, tentatively Chemical Waste Management's Arlington, Oregon facility.

Screening of cobbles will take place in an exclusion zone area adjacent to the stockpiles. The area will be cleaned as necessary following completion of the screening operation. Should dusting be a significant problem, Williams will have the necessary equipment (tarps, etc.) on-site during the project to cover the screens if necessary.

The prescreened soil is delivered to the feed hopper by a front-end loader. The soil is re-screened through a bar grate, then passes into the hopper of the apron feeder (SF-FU) and onto the feed belt conveyor (SF-BC-4). Williams' material handling units are equipped with several different screen sizes. The screen size to be used during production operations will be selected on the optimum unit performance prior to the performance test. Measurements from the weigh belt scale provide the pay basis for the project. The speed of the drag chain on the apron feeder is adjustable to control the soil feed flow rate. The weigh belt conveyor transfers metered soils into the entrance breeching of the rotary dryer (PC-RD).

Handling of waste feed material will be kept to a minimum to prevent entrainment of dust and vapors in the air. Williams anticipates hauling untreated soils directly from the stockpiles to a wastefeed stockpile adjacent to the feed processing unit. Administrative controls such as speed limits and covering dump trucks during transport, if necessary, will be used to minimize fugitive dust emissions where applicable. Vibratory screening will be performed to separate cobbles and other debris from the stockpiles. Screening operations have the potential to create dust depending on soil conditions and characteristics, but Williams will make every effort to minimize fugitive dust emissions. It is not anticipated local exhaust ventilation will be required to meet the required levels of airborne concentrations of dust and vapors during the normal processing of feed material. Engineering controls, such as Williams covering the feed soil and stacking conveyors, will be implemented by Williams to further reduce the potential for fugitive emissions.

All operations will be closely monitored in accordance with the Health and Safety Plan and if airborne concentrations exceed 10 mg per cubic meter of air for dust or 5 ppm for vapors, additional control measures will be initiated.

Thermal Desorber

The thermal desorber (PC-RD) consists of a rotary dryer with internal flights for lifting and showering the solids through the hot gas stream. The repeated spilling action veils the material through the hot gas stream, raising the soil temperature between 400°F to 1000°F. The desired soil temperature depends on the physical characteristics of contamination and the cleanup levels required. Moisture is evaporated and hazardous waste constituents in the soil are volatilized or desorbed.

Operation of the dryer is countercurrent, with heat supplied by a direct-fired burner (PC-BR). Retention time in the dryer varies based on dryer speed and the slope of the unit, and is typically between 15 to 20 minutes. Countercurrent flow of gas and solids gives greater heat transfer efficiency with a given inlet-gas temperature. The discharge end of the rotary dryer is constructed of Inconel to withstand temperatures up to 1200°F. The system is flexible enough to process high moisture (up to 40%) and organic content (up to 10%) in the soil.

Treated soils exit the dryer through the discharge end, breeching into the discharge conveyor (AS-DC). The process soils are quenched in the pugmill to cool the material and suppress fugitive dust emissions. A stacking conveyor (AS-BC-4) is used to generate temporary treated soil stockpiles which are then sampled for verification analyses.

Gases exit the rotary dryer through the transition ductwork above the feed input. The temperature of the off-gases is monitored to prevent any condensation of organic compounds in the duct and the baghouse. Operation of the dryer at a rate of 30 tons per hour will require a fuel use of 1357 lb/hr of propane. The estimated amount of heat loss is 5 percent.

Dobson Collar

The Dobson Collar is an expansion in the shell of the dryer to allow the baghouse fines to mix with the treated soils. The dryer expands from the 8.5 foot diameter dryer to the 10.5 foot Dobson Collar which houses the conveying and mixing mechanism to mix the solids and baghouse fines. The collar serves two purposes. The first purpose is to add additional residence time for the treatment of the baghouse fines so that a thorough and controlled treatment can be performed. The second purpose is to reduce the gas flow through the collar itself. The reduction of the gas flow prevents the baghouse fines from re-entrainment into the gas stream and allows for further treatment. The retention time in the collar has been calculated at approximately eight to ten minutes. This will allow time for the dust to mix with soils in the dryer and to mix with hot gases from the dryer. Appendix S contains the correspondence to date on the description of the Dobson Collar. Included in this appendix is a mechanical drawing, a program output of the calculated retention time in the collar, and various correspondence that has resulted in the ultimate selection of the collar.

EPA has requested that Williams provide control of baghouse fines to the Dobson Collar so that the flow of fines does not exceed the rate which was demonstrated during the performance test. Williams believes that the flow of fines to the baghouse is directly proportional to the soil feed rate. Therefore, the baghouse fines entering the Dobson Collar at any time will be proportional to the feed rate. Williams believes that flow control of the baghouse fines to the Dobson Collar is unneccesary and will cause immense operational problems. If technical problems result from the use of flow control mechanisms, the EPA will work with Williams to resolve the problem, which may mean modification of a requirement. EPA will determine, in consultation with BNRR and Williams, whether the flow meter is working properly.

The baghouse hoppers are designed to direct the flow of fines to the screw conveyors and provide minimal capacity for fines accumulation. If a flow control strategy is implemented and a reduction of the fines is restricted to the collar based on the results of the performance test, accumulation of fines in the baghouse could possibly result. This occurrence would be self perpetuating (the accumulation of the fines would cause the screw conveyors to flow full causing the flow mechanism to slow down in order to accommodate the selected fines flow rate from the performance test) and would cause unit operations to be halted. Based on the operation of the unit during clean soil shakedown, Williams will attempt to stop the dust feed to the desorber in the event of an AWFSO. As agreed, Williams will conduct a "test" during clean soil shakedown in order to determine the length of time the baghouse dust feed to the desorber can be stopped before excessive dust buildup in the baghouse becomes a significant problem. Based on the results of this test, Williams will install a timer which will allow the dust feed to the desorber to restart after some approved length of time as demonstrated during the test. This action would prevent a buildup of dust in the baghouse in the event of a prolonged AWFSO. The exceptions to restarting the dust feed would be AWFSOs for ID fan failure, burner malfunction, power failure, positive pressure excursion, and low soil temperature.

Williams is presently gathering information for the design and manufacturing of the requested modifications from the EPA. The design will utilize a variable speed motor operated by a PID controller. The flow of the fines will be monitored by a solids flow meter which will be linked to the controller. The controller will have a read out which is accessible to the board room operator. The output from the flow meter will be continuously monitored and recorded. Use of the meter will be demonstrated during the shakedown period. Based on consultation among EPA, BNRR and Williams, if operation of the device proves unsuccessful during the shakedown period, the EPA will relieve Williams of the AWFSO requirement on baghouse fines maximum feed rate for the remainder of the project.

Baghouse

Off-gases from the desorber are processed to remove particulates. Particulates in the gas stream are filtered in the baghouse (BH-DC). The baghouse is designed to give a maximum air to cloth ratio of 5:1 and provide above 99% efficiency for removal of particulates. The bag material is P-84, which can withstand temperatures in the range of 500°F and has excellent resistance to corrosive atmospheres.

The baghouse cleans by pulse jets of compressed air that expand the flexible bags and dislodge the filter cakes. Particulate collected from the baghouse will be returned to the hot end of the rotary dryer for further treatment. The increased diameter at the hot end of the rotary dryer increases soil residence time and provides lower air velocities to allow for further treatment of the particulate. This closes the solids loop in the treatment process.

The baghouse is the Best Available Control Technology (BACT) for controlling particulate emissions. Stack tests with P-84 fabric have demonstrated particulate loading of less than 0.05 gr/dscf, ensuring a significant margin of safety relative to the federal standard of 0.08 gr/dscf described in 40 CFR 264 Subpart O. For this project, Washington state requirements allow for a maximum particulate emission of 0.03 gr/dscf, corrected to 7% O_2. This is a much more stringent requirement than that set forth by RCRA. Additionally, a target emission rate of 30 ng/dscm is being set for dioxins and furans.

Thermal Oxidizer

The gases from the baghouse enter the oxidizer (SC-TO) where they are heated to the required temperature (permit condition) for about 2 seconds in a 4-6% oxygen rich atmosphere to assure complete oxidation of the OCL pesticides. The destruction of the pesticides in the flue gas depends on the residence time, turbulence and temperature. The oxidizer is sized to provide sufficient residence time and is installed with a high intensity burner to provide the turbulence necessary to oxidize chlorinated compounds. Oxidization of organic compounds yields carbon dioxide, water vapor, and hydrochloric acid (chlorinated compounds).

$$C_xH_y + O_2 + N_2 \Rightarrow CO_2 + H_2O + O_2 + N_2$$
$$C_xH_yCl_z + O_2 + N_2 \Rightarrow CO_2 + H_2O + HCl + O_2 + N_2$$

The thermal oxidizer unit is fabricated of 3/16 inch carbon steel and is approximately 12 feet in diameter and 87 feet long. The combustion chamber is insulated with a blanket of 1-inch thick K wool and 4-inch thick center-mounted ceramic Z block modules. Castable refractory lines the bottom of the chamber. The high intensity burner (SC-BR), mounted in the center of the chamber's end, has a rating of 97 million Btu/hr. Fuel usage for the thermal oxidizer will be 3379 lb/hr of propane at a feed rate of 30 tons per hour.

The temperature of the gas can be raised as high as 2100°F in the thermal oxidizer to ensure complete oxidation and destruction of chlorinated hydrocarbons. The operating temperature for this waste will be typically maintained at 1800°F. Gas residence time is greater than two seconds. Gases that exit through the oxidizer are cooled to adiabatic saturation temperature in the quench tower (QU-V). Destruction and removal efficiency for principal organic hazardous constituents (POHCs) in the thermal oxidizer will meet or exceed 99.99%.

Quench Tower

The quench tower (QU-V) is designed to reduce the flue gas temperature prior to its introduction into the scrubber. The quench is capable of removing more than 40 million Btu/hr from the flue gas stream by mixing with a large quantity of water. The quench is designed to handle more than 200,000 ACFM at 1800°F and reduce the flue gas temperature to approximately 185°F (the adiabatic saturation temperature). The spray headers will spray a total of 400 gpm of recirculated water, of which 60 to 80 gpm fresh water will be required for evaporation. Water will be purged from the quench at about 12 gallons per minute. This blowdown will be treated by the unit's wastewater treatment equipment prior to being reused in the process. Any solid material collected in the liquid bag filters will be introduced into the wastefeed stockpile for further treatment.

Acid Gas Scrubber

The acid gas scrubber (AB-SCR) is designed to neutralize any acids formed during the oxidation process. Particulates and acidic gases are effectively removed by a packed bed scrubber. The scrubber has a design capacity of approximately 190,000 ACFM. Caustic will be used as the neutralizing solution and the efficiency of the scrubber is greater than 99% for gaseous HCl. The material of construction is FRP, which is highly resistant to hydrochloric acid. The gases from the scrubber are discharged at adiabatic saturation temperature from the stack. The blowdown water from the scrubber will be used to quench the soil exiting the thermal desorber. Its acceptability is determined by the criteria that it does not affect treated soil quality. The mist eliminator mounted in the scrubber discharge end will remove the liquid carryover by the gas stream. Effluent from the LTTD scrubber will be routed to the aqueous phase carbon units.

Induced Draft Fan

An induced draft (ID) fan provides the driving force for the movement of gases in the system. It will maintain negative pressure in the thermal desorber and baghouse to prevent fugitive emissions.

Because of the ID fan's positioning in the treatment process, the remainder of the system (thermal oxidizer and APCE) will be under positive pressure. However, the level of control for fugitive emissions on the positive side of the ID fan will be equivalent to that provided on the negative side. Subsequent to the ID fan, there are no openings or access ports in the equipment prior to the stack from which fugitive emissions could occur. All flanges and joints are tightly sealed in order to prevent any leaks from the system. In addition, all equipment, including flanges and seals, will be visually inspected on a daily basis to ensure that no emissions are occurring from locations other than the stack.

Table 4.1 provides a description of the major equipment items which are referenced in Section 3 (Process Description) and Figure 3.1, Process Flow Diagram.

Water Treatment System

The water treatment system is designed to handle scrubber blowdown and water generated from run-off on-site. Williams proposes to use sump pumps located at the decon pad, wastefeed pad, and the verification holding pads to collect run-off rainwater. This water will be transferred by the sump pumps into a "collection tank" (capacity 20,000 gallons) where solids will be allowed time to settle. The water in the collection tank will then be filtered down to 200 μm prior to treatment by the Westates ASC 2000 carbon units. Each unit contains approximately 1200 lbs. of granular activated carbon. After treatment through the carbon unit the treated water is transferred to the process water tanks. The water from these frac tanks will be used during production to quench the treated soil and gas stream.

AS-PM	Soil Conditioning Pugmill	
	Type:	Continuous flow, double shaft
	Capacity:	50 - 100 TPH, 12' length
	Drive:	Dual 30 hp motors/reducers
	Dust Suppression:	Water injection
AS-BC-4	Stacking Conveyor	
	Type:	Enclosed belt conveyor
	Stacking Radius:	50'
	Belt Size:	30" wide x 60' long
	Drive:	10 hp electric
	Dust Control:	Covers
BH-DC	Baghouse Dust Collector	
	Type:	Mobile pulse jet dust collector
	Nominal Flowrate:	35,000 acfm
	Filter Area:	9,975 square feet
	Filter Material:	P-84
	Maximum Temperature:	510°F
	Air to Cloth Ratio:	5:1 (maximum), 3.5:1 (design)
BH-SC-1/5	Baghouse Discharge Conveyors	
	Type:	12" screw conveyors (5)
	Drive:	5 hp electric each
BH-SC-6/7	Dust Transfer Conveyors	
	Type:	12" screw conveyor (2)
	Drive:	7.5 hp electric
BH-ID	Induced Draft Blower	
	Type:	Industrial radial blade centrifugal
	Size:	29 inch inlet
	Horsepower:	250 (dual 125s)
	Nominal Flowrate:	35,000 acfm
	Construction:	Carbon Steel
	Manufacturer and Model:	Northern Blower Exhaust Fan
	Damper:	Multi-louvered

SC-TO	Thermal Oxidizer	
	Volume:	5,899 cubic feet
	Velocity:(cross sectional)	34.9 feet per second
SC-BR	Thermal Oxidizer Burner	
	Manufacturer:	Hauck Powerstar Model # SJP 520
	Capacity:	97 MM BTU/hr
	Fuel:	Propane/Natural Gas
	Blower:	Hauck Turbo, 100 hp, 7300 scfm Hauck Tertiary, 60 hp, 12,100 scfm
	Fuel Pump:	Blackmer #LGL1, 20 gpm, 3 hp, 1750 rpm
AB-ST	Stack	
	Inside Diameter:	60"
	Exit Height (from grade):	70 ft
CEM	Continuous Emissions Monitoring System	
	Model:	HC500-2D
	Company:	Columbia Scientific Industries Corp.
	Parameters:	Carbon monoxide, oxygen
	Analyzers:	FID, NDIR, Paramagnetic
CH	Control House	
	Type:	Enclosed, trailer mounted, climate controlled
PLC	Programmable Logic Controller	
	Model:	SLC 500
	Company:	Allen-Bradley Co.
	Type:	Modular Rack System
	Software:	Allen-Bradley Advanced Programming Software (APS)
	Application:	Provides start-up sequencing and system interlock control

QU-V	<u>Quench Tower</u>	
	Type:	Horizontal venturi wetted elbow
	Capacity:	200,000 ACFM
	Inlet Temp:	1800°F
	Outlet Temp:	185°F
	Coolant:	400 gpm
AB-SCR	<u>Scrubber</u>	
	Type:	Vertical packed-bed acid absorber
	Efficiency:	99% removal efficiency of HCL
	Capacity:	190,000 ACFM
	Mist Elimination:	Mesh-type 99% removal efficiency
	Materials:	FRP/PPE/SS
	Pumps:	(4) 20 hp

4.2 CONTROL SYSTEM DESCRIPTION

The control room for the LTTD is inside a mobile trailer. Three sides of the control room are glass paneled so the chief operator can simultaneously monitor the process variables and can also view the operations outside the control room. The equipment motors and pumps are started and stopped via START-STOP PULL BUTTONS located on the panel in the control room trailer. The control room is insulated and can be heated or cooled as per the requirement. The pressure in the control room is kept positive to prevent dusting from outside.

Process Variable Recording

Several process variables are continuously recorded. Among these are the waste soil feed rate; temperature at the exit of the dryer, thermal oxidizer and quencher; differential pressure across the baghouse; dryer draft; dryer soil discharge end hood pressure; and stack gas carbon monoxide concentration. A complete list of the process variables continuously recorded is shown in Table 6.2. This data is recorded by a Kaye Instruments Digistrip 4 Plus data logger. Descriptions and specifications for this model are included in Appendix B. In addition, stack gas flow rate will be monitored and recorded through correlations to the ID fan amperage.

The control strategy for the system is straight forward. The dryer exit gas temperature is controlled manually by the dryer fuel control valve to maintain the temperature less than 500°F. The thermal oxidizer exit temperature is automatically controlled by the burner fuel control valve to maintain temperature at the set point. The inlet gas temperature to the acid gas scrubber controls the quench tower water control valve to maintain the scrubber inlet gas temperature.

4.3 CONTINUOUS EMISSION MONITORING

The Continuous Emission Monitoring (CEM) system shall be installed and certified prior to operation of the LTTD to provide real time stack gas monitoring. The system, at a minimum, will monitor oxygen, carbon monoxide, and opacity. Stack sampling protocols for the O_2 and CO CEMs will be in accordance with 40 CFR, Part 266, Appendix IX.

The continuous monitoring instruments shall be integrated with the data management system. The monitoring data will be interfaced with the waste feed cut-off system so that the LTTD system is shutdown if emissions exceed the operational range established during the performance test. CEM specifications can be found in Appendix G.

4.4 KEY PERSONNEL OPERATING EQUIPMENT

Key operations personnel having primary responsibility for the LTTD are outlined below. Detailed resumes describing training and qualifications are provided in Appendix N.

a.	Testing/Startup	Mark Fleri
b.	Operations	Mark Fleri
c.	Maintenance	Mark Fleri
d.	Laboratory	Nate Heinrich, Mark Johnson
e.	Control Room	Mark Fleri
f.	Air Emission Testing	Mark Fleri
g.	Certification of Operation of Equipment	Mark Fleri
h.	Certification of Safety of Equipment	Ron Huggins

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SECTION 5

PROJECT SCHEDULE

A preliminary work schedule is presented in Figure 5-1. All schedule activities are indexed based on the date that BNRR receives an approval from the USEPA. BNRR will issue a notice to proceed to Williams upon receipt of approval from the USEPA.

Site preparation activities will be completed and utilities will be installed during the initial five (5) weeks of the project. LTTD system mobilization will be initiated during the second week of the project. After a two (2) week setup period, startup will commence. Two weeks are allocated for startup.

Williams anticipates to begin startup operations with clean soils. After a thorough shakedown of the unit including its control systems and demonstration of the proposed AWFSOs, the unit will begin production with the contaminated soils to ready the unit and crew for the upcoming performance test.

During the performance test, contaminated soils in the roll-off boxes, including only pesticide contaminated soils, will be treated in the same manner as soil from production operations. No more than one-third of the contaminated soil will be treated during the performance test. Williams recognizes that treating contaminated soils for both the performance test, interim, and normal operations will not commence without approval from the EPA's OSC.

The LTTD system will treat contaminated soils during the startup and shakedown period for a total of not more than 360 operating hours. Operating hours include only that time when contaminated soil is being fed to the system. Approximately 192 hours are slated for shakedown of the unit with approximately 168 hours scheduled for certification of the CEM system. During the shakedown period, treated soil will be analyzed as per Table 9-2.

The performance test is scheduled to start as early as the second week after startup is initiated and no later than the third week after startup is initiated. Preliminary performance test results for particulate emissions will be available within a week after the completion of the performance test. A draft performance test report will be submitted to USEPA Region X within 28 days after the conclusion of the performance test, subject to the timely receipt of final analytical results. Between the conclusion of the performance test and the time that authorization is received from USEPA Region X for full production operations, soil processing will continue at a limited production rate. Operations will follow the feed restrictions as specified below, based on preliminary data and report submittals prior to submittal of the final performance test report and risk assessment addendum:

i. Day 0 - 50%, contingent on submittal within one week of the operating ranges portion of the performance test burn report, including a computer disk in a format which allows the data to be manipulated to perform a check on the calculations performed to establish the ranges, and to allow the adjustment of the ranges during the interim burning period to be at least as conservative as is reflective of the performance test operating conditions. Strip chart data would need to be digitized or somehow converted into a format which could be manipulated as described above.

ii. 60% after submittal of i. above, and:
- particulate in the stack gas (preliminary)
- HCl in the stack gas (preliminary)
- Free chlorine in the stack gas (preliminary).

iii. 75% after submittal of i. and ii. above, and
- particulate in the stack gas (final)
- HCl in the stack gas (final)
- Free chlorine in the stack gas (final)
- Carbon dioxide and oxygen in the stack gas
- Carbon monoxide in the stack gas
- Moisture content in the stack gas
- POHC in the feed soil, treated soil, scrubber blowdown, and the stack gas.

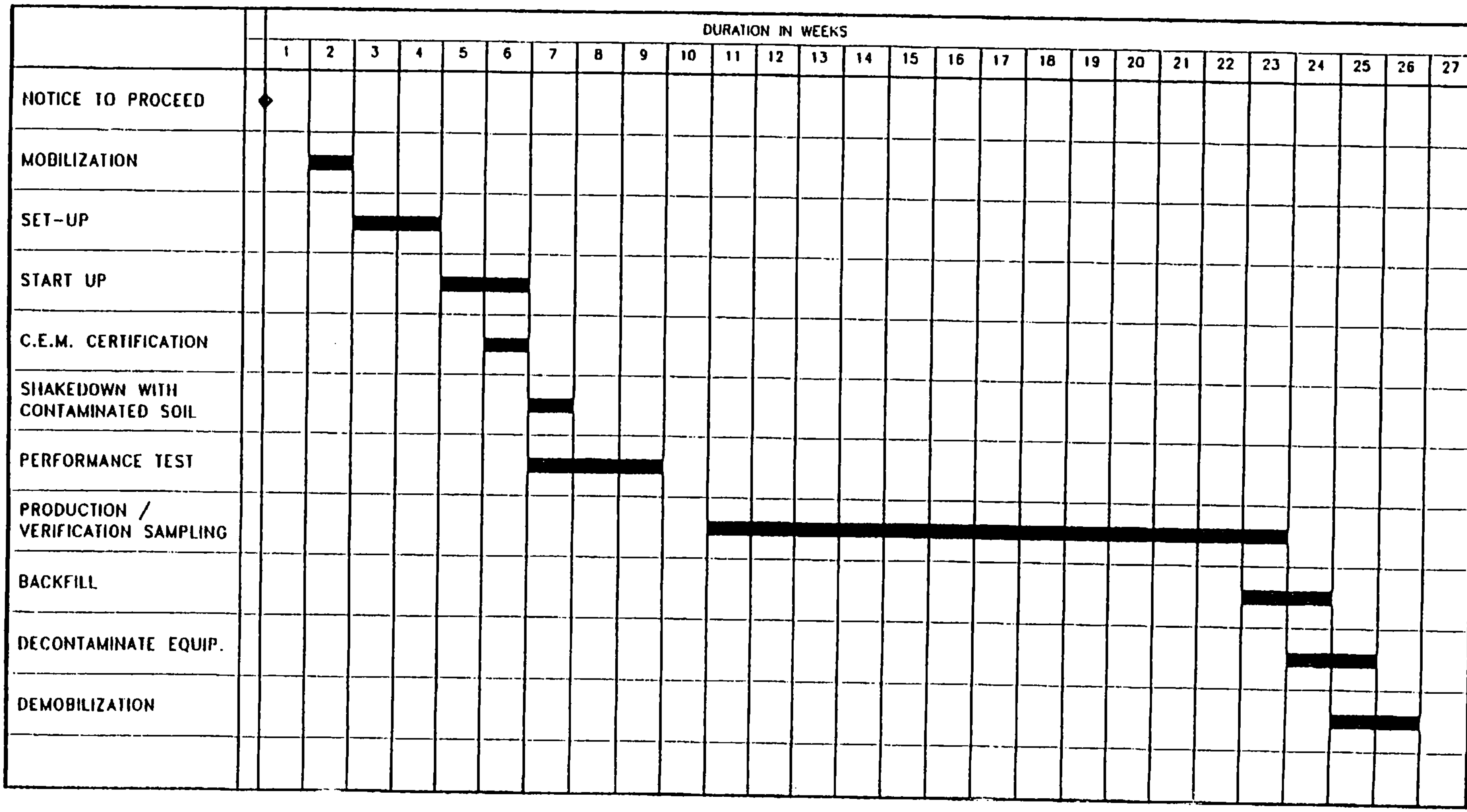
After authorization is received from USEPA Region X, which will be based on the final performance test report including the risk assessment, full scale production operations will be resumed. Production operations are projected to last for approximately 11 weeks based on the operating restrictions above. An additional 2 week period will be set aside for verification sampling. The projected operating schedule is based on 24 hours of operation per day for 7 days per week. Final selection of a daily operating schedule will be based on the results of the performance test as described in Section 7.2.

Two weeks are included in this schedule to accommodate the removal of soils beneath the northern and southern stockpiles.

Two weeks are included in the schedule for equipment and pad decontamination. An additional two weeks are included in the schedule for equipment demobilization.

The work schedule shows overlap for all activities which occur after startup. This is to accommodate startup problems which may occur and provide flexibility in the overall schedule.

FIGURE 5-1
WOODS INDUSTRIES SITE
PROJECT SCHEDULE



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PROJECT SCHEDULE

WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON

AER

5-1

6

SECTION 6

PROCESS CONTROL, MONITORING, AND EMERGENCY PROCEDURES

6.1 OVERVIEW

Williams has provided instrumentation for process control of feed rates, temperatures, pressures, burner efficiency, and gas stream contents. In addition, the system is designed to provide for the control and orderly management of any upset condition that may potentially occur during operations. This system also provides documentation of key operating variables to verify operating conditions. A description of startup, shakedown and shutdown procedures will be provided in the Operations and Maintenance (O&M) Manual, Appendix L.

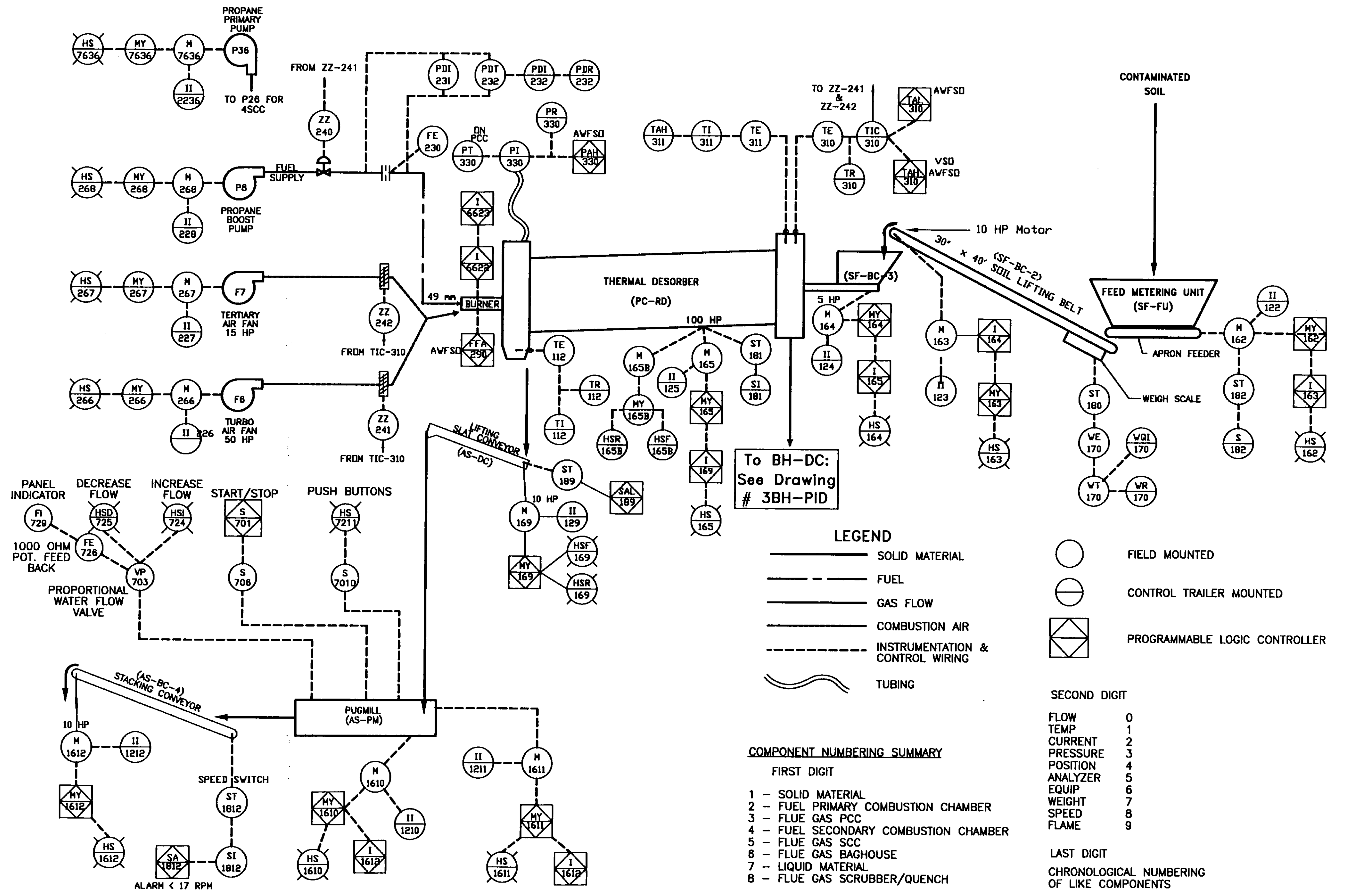
An industrial programmable logic controller (PLC) is provided for proper startup sequencing and system interlock control. An engineering "cut sheet" is provided in Appendix I.

The overall control system is shown on the process instrumentation and controls diagrams, Figures 6-1 through 6-4. The key process control parameters are shown in Table 6-1.

The feed rate of the soil is monitored by a weigh belt located on the feed conveyor. The readout in the control room gives instantaneous feed rate in tons per hour plus integrated totals. Pressures are registered on standard industrial pressure and vacuum gauges (magnahelics) for low pressures and draft with industrial Bourdon tube gauges for high pressures. Temperatures are measured by k-type thermocouples installed well into the oxidizer gases to obtain accurate temperature measurement.

Certain specific process upsets can create situations where timely actions are required to insure safety, protect equipment, and prevent the emission of particulates, gases, or liquids from the system at rates that exceed regulatory standards. Two automatic control actions are provided to address the most probable upsets, failures, or emergencies. These are Vent Opening (VO) and Automatic Waste Feed Shutoff (AWFSO). These events are listed in Table 6-2.

The VO action allows ambient air to be introduced into the process gas steam just prior to the baghouse. This is accomplished by opening a damper that supplies air to the main cross over duct before it enters the baghouse plenum chamber. The major purpose of the VO is to protect the air pollution control equipment (APCE) from high gas temperature excursions. The location of the vent is on the draft side of the I.D. Fan. This allows air to be introduced into the system while eliminating fugitive emissions.



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TPU4

Process & Instrumentation

PID for #4PCC

4PCC

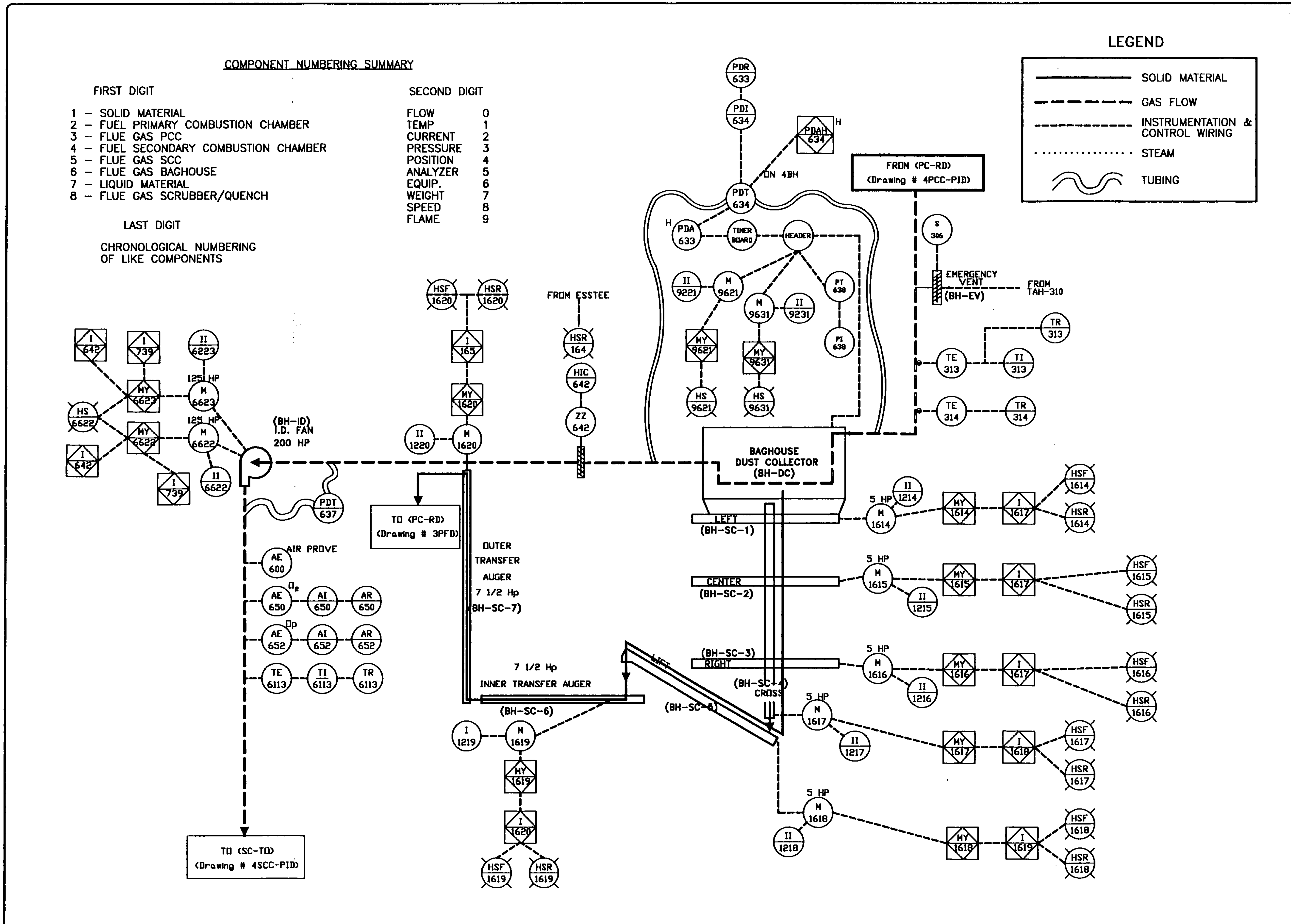
DATE 10/28/94

FIGURE 6.1

DIRECTORY: \WESI\Equipmnt\4TPU\4PCC

FILENAME 4PCC-PID.dwg

DWG NO. 4PCC – PID



CREATED
REVISIONS
9/7/94
DATE
LTR.
BY

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WILLIAMS

TPU4

PROCESS & INSTRUMENTATION

PID FOR #4 BAGHOUSE

4BH

DATE 10/28/94

FIGURE 6.2

DIRECTORY: \WESA\Equipmnt\4TPU\4BH

FILENAME 4BH-PID.dwg

DWG NO. 4BH-PID

COMPONENT NUMBERING SUMMARY

FIRST DIGIT

1 – SOLID MATERIAL
2 – FUEL PRIMARY COMBUSTION CHAMBER
3 – FLUE GAS PCC
4 – FUEL SECONDARY COMBUSTION CHAMBER
5 – FLUE GAS SCC
6 – FLUE GAS BAGHOUSE
7 – LIQUID MATERIAL
8 – FLUE GAS SCRUBBER/QUENCH

SECOND DIGIT

FLOW	0
TEMP	1
CURRENT	2
PRESSURE	3
POSITION	4
ANALYZER	5
EQUIP	6
WEIGHT	7
SPEED	8
FLAME	9

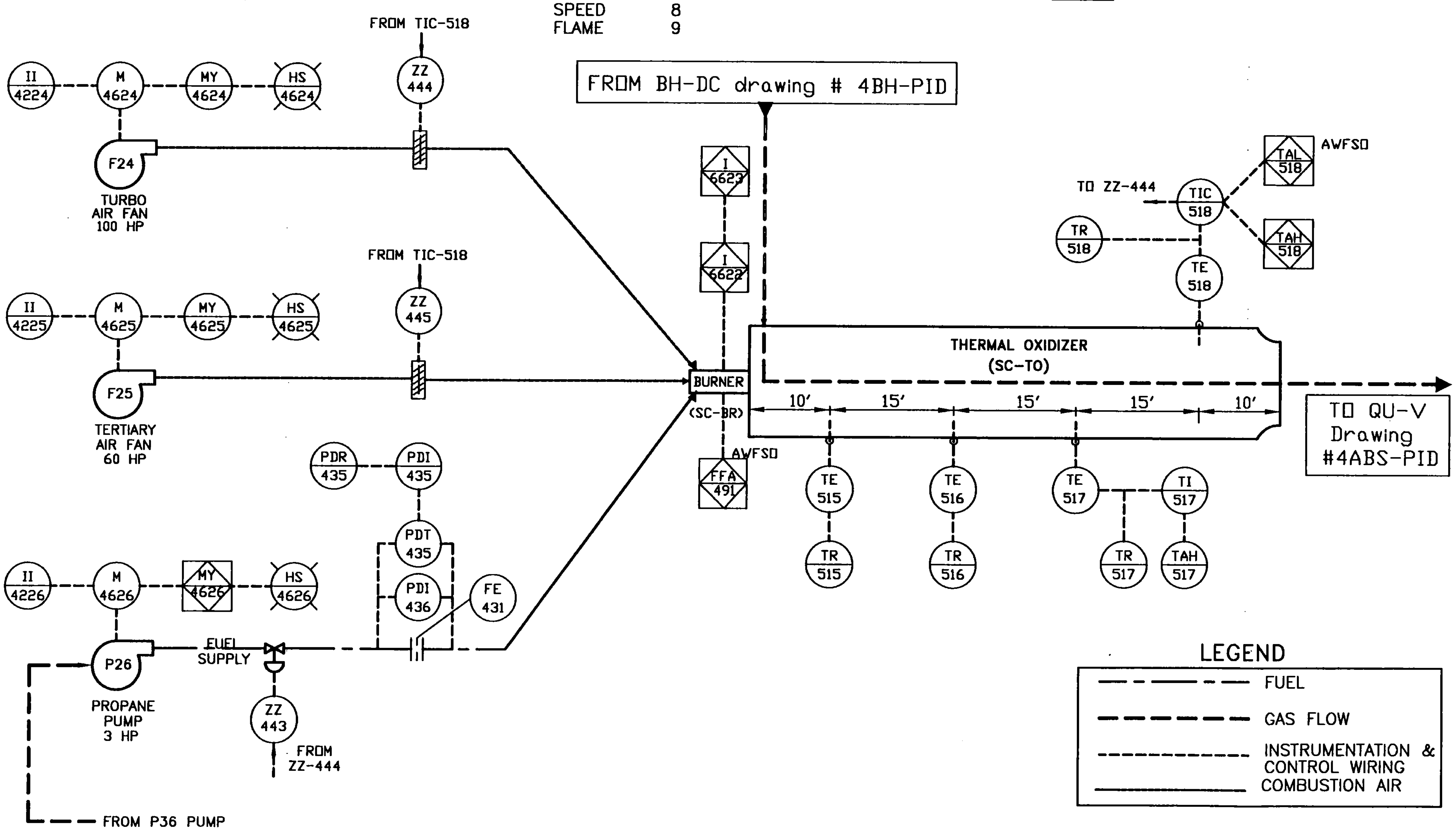
LAST DIGIT

CHRONOLOGICAL NUMBERING OF LIKE COMPONENTS

FIELD MOUNTED

CONTROL TRAILER MOUNTED

PROGRAMMABLE LOGIC CONTROLLER



LEGEND

FUEL
GAS FLOW
INSTRUMENTATION & CONTROL WIRING
COMBUSTION AIR

LTR.	DATE	BY
-	9/5/94	LEW

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WILLIAMS

TPU4

PROCESS & INSTRUMENTATION

PID FOR #4 SCC
(THERMAL OXIDIZER)

4SCC

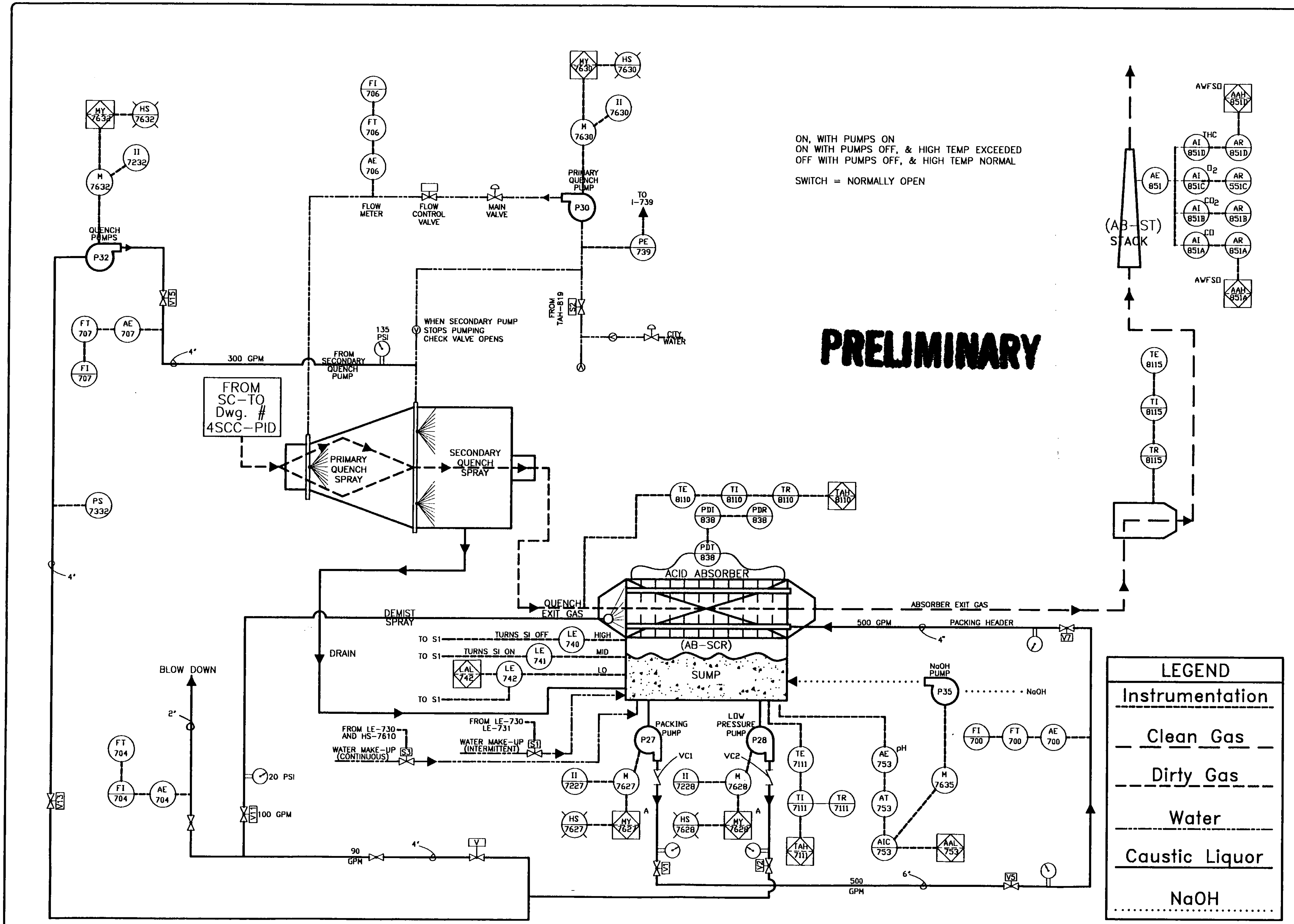
DATE 10/28/94

FIGURE 6.3

DIRECTORY: \WESA\Equipmnt\4TPU\4SCC

FILENAME 4SCC-PID.dwg

DWG NO. 4SCC-PID



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TPU4

PROCESS & INSTRUMENTATION

PID FOR #4 ABS & #4QU
HORIZONTAL PACKED BED SCRUBBER

4ABS

DATE 11/23/94

FIGURE 6.4

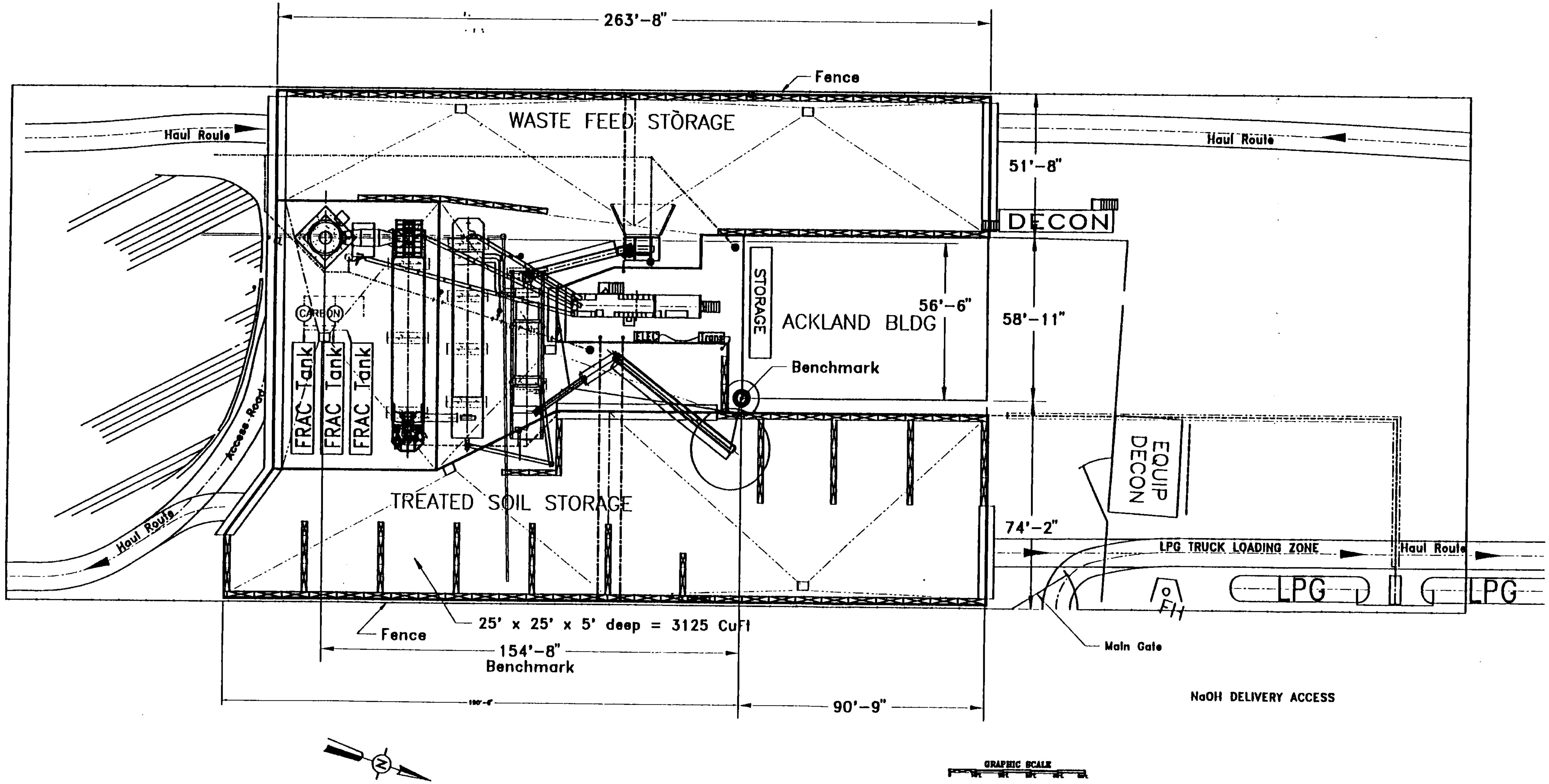
DIRECTORY: \WESA\Equipmnt\4TPU\4ABS

FILENAME 4ABS-PID.dwg

DWG NO. 4ABS-PID

NOTES:

CENTER OF SCRUBBER IS MASTER DATUM POINT.
ALL EQUIPMENT LOCATED PERPENDICULAR TO FENCES.
SEE DWG 4WODPAD2 FOR PAD DIMENSIONS
SEE DWG 4WODPAD3 FOR SECTION VIEWS



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TPU4

WESI*TPU4 FOR WOODS JOB

PAD LAYOUT

SITE

DATE	11/3/94
FIGURE 12.2	
DIRECTORY:	\WES\JOBS\ACTIVE WOODS\DWGS
FILENAME	4WD-SITE.dwg
DWG NO.	4Woods Site

The AWFSO action shuts down the feed belt conveyor to the rotary dryer. This is accomplished by interlocks in the control system. The major purpose of the AWFSO is to discontinue processing soil if process operating conditions are outside of established limits.

In addition to automatic controls described above, operators are trained to respond to any other abnormal process operating conditions. Potential abnormal operating conditions and operator responses are described below.

6.2 EMERGENCY OR UPSET CONDITIONS

Instrumentation is provided to monitor process conditions, to provide data for assuring compliance with regulatory requirements, and to assure appropriate process response, control, operations flexibility, safety interlocks, and shutdown features. The safety interlocks and shutdown features comprise a major portion of the control system. The conditions under which the Automatic Waste Feed Shut Off (AWFSO) system and vent opening (VO) operate are noted in Table 6.2. Emergency and redundant (backup) equipment are listed in Table 6.3.

6.3 EMERGENCY PROCEDURES

Certain specific process upsets can create situations where timely actions are required to ensure safety, protect equipment, or prevent the unauthorized emission of soils, gases or liquids from the system. Two automatic control actions are provided to address the most probable upsets, failures, or emergencies. These are the VO and AWFSO.

The VO action allows ambient air to be introduced into the process gas stream just prior to the baghouse. The VO is designed such that air may enter only from the outside, eliminating concerns of hot gases bypassing the air emissions train. This is accomplished by opening a damper to the main crossover duct before it enters the baghouse plenum chamber. The major purpose of the VO is to protect the gas train components from high temperature excursions. Since the VO is located prior to the induced draft fan, outside air is pulled into the system and passes through the air pollution control equipment. A negative draft is maintained throughout the process to prevent any fugitive emissions.

The AWFSO action shuts down the feed belt conveyor to the desorber as well as the baghouse dust transfer to the desorber. This is accomplished by interlocks in the control system. The major purpose of the AWFSO is to discontinue processing if conditions are outside acceptable limits for adequate treatment of the soil or gas streams. Demonstration of the AWFSOs will take place prior to the performance test and once per operating week thereafter unless an AWFSO occurs during production for that operating week. Should more than 7 AWFSOs occur within a one week period

(Friday to Friday), reasonable measures will be taken to contact Agency personnel to gain approval for re-start of the unit. Agency approval will also be sought for AWFSOs occurring as a result of ID fan failure.

Williams will also report to the EPA and make a reasonable effort to gain approval for restart in the event of a positive pressure excursion subsequent to the first week of contaminated soil shakedown. Prior to the end of the first week of contaminated soil shakedown, positive pressure excursions will be included as part of the seven (7) AWFSOs within one (1) operating week that require reporting and approval for restart.

In addition to the above procedures, several process upset conditions and their corresponding corrective actions have been identified for this project and may also be discussed in the Contingency Plan. These are described below with reference to instrument identification on Figures 6-1 through 6-4.

a. Partial or Complete Stoppage of Soil Feed

The stoppage of waste feed (if it is not observed by the operator) will be first identified as an increase in desorber exit gas temperature followed by a decrease in desorber pressure. An increase in desorber temperature is covered under (e). Should the feed be interrupted, the operator will idle the plant with heat in the system until feed is restored.

b. Soil and Baghouse Dust Feed Rates Too High

The feed rate of soil and baghouse dust will be approximately equal during each replicate test run. The maximum allowable soil and baghouse dust feed rates will be determined from the average of the highest average soil and baghouse dust feed rates demonstrated during each sampling run. In addition, the instantaneous feed rate data (one-minute values) will be evaluated and an instantaneous feed rate limit will be set for the soil and baghouse dust based on averaging the maximum hourly value from each hour of the test run and then averaging these three test run averages. The soil feed will be shut off if the maximum soil feed rate is exceeded, based on a 60-minute rolling average, or if the instantaneous maximum level is exceeded. The baghouse dust feed will be shut off if the maximum baghouse dust feed rate is exceeded, based on a 60-minute rolling average, or if the instantaneous maximum level is exceeded, except as specified on page 27. An AWFSO for instantaneous feed rate is included as part of the interlock package. All process monitoring modes will be the same during the performance test and post test operations. The final limits will be determined during the performance test.

c. Puffing or Sudden Occurrence of Fugitive Emissions

The desorber draft is monitored continuously. The operator will manually increase draft via the induced draft (I.D.) fan if the draft is less than -0.01" w.c. (water column).

d. Failure of Forced Air Supply

The Burner Management System (BMS) will automatically trip the burner if the forced draft fan fails.

e. Process Temperature Too High

An operating desorber off-gas temperature of about 425°F has been selected. When the temperature goes above the 425°F setpoint, there will be a proportional decrease in fuel to the desorber. If the temperature reaches a predetermined maximum value of 450°F, all fuel and waste feed flow will be stopped. If the temperature exceeds 500°F, a VO will occur.

A thermal oxidizer temperature of approximately 1800°F (permit condition) has been selected. If the temperature rises above 2000°F, the operator will manually begin to decrease the fuel to the burner. If the temperature is still increasing and exceeds 2100°F, then the thermal oxidizer burner will be shut-down causing both an AWFSO and the primary burner to be shut down, also. The 2100°F limit is to protect all down stream equipment.

f. Process Temperature Too Low

An operating desorber off-gas temperature setpoint of about 425°F has been selected. When the temperature goes below 425°F, there will be a proportional increase in fuel to the desorber. If the temperature reaches a predetermined minimum value of 250°F, waste feed flow will be stopped.

During the initial 20 minutes after startup, desorber off-gas temperature will be used instead of soil temperature to monitor system performance. Initially, this temperature will be set at 250ºF. However, if 250ºF proves to be too high during startup and shakedown, the suggested A2 limit will be re-evaluated.

The thermal oxidizer alarm temperature initially will be 1700°F. If the temperature falls below this level, an AWFSO will result. The final value for this parameter will be based on the time-weighted average during all runs of the performance test.

g. Soil Temperature Too Low

One performance test consisting of three replicate runs will be conducted at approximately the same thermal desorber exit soil temperature. Based on successful completion of the testing, the allowable operating limits will specify a minimum thermal desorber exit soil temperature equal to the average of the lowest average temperature demonstrated during each test run. Soil feed will be automatically shut off if the thermal desorber exit soil temperature falls below the minimum allowable value based on a 20-minute rolling average limit. In addition, an instantaneous minimum temperature will be established based on averaging the minimum hourly value from each hour of the test run and then averaging these three test run averages. The 20-minute rolling average limit and the instantaneous limit will not be activated during the first 20 minutes of operation after startup. Instead, desorber off-gas temperature will be used as the alternate monitoring parameter during the initial 20 minutes after startup. Williams will install a 20 minute timer to ensure that the rolling average for soil temperature is activated.

h. Desorber Pressure Too High (Loss of Vacuum)

The desorber draft is monitored continuously. The operator will manually increase draft via the I.D. fan if the draft approaches -0.01" w.c. An instantaneous AWFSO will result if the draft is less than -0.01" w.c.

i. Baghouse Differential Pressure Too Low

A low baghouse differential pressure may be an indication of low gas flow or filter bag failure. This parameter will be continuously monitored, with a differential pressure less than 1" w.c. causing an AWFSO. If the differential pressure exceeds 2" w.c. during the performance test, it will revert to an A1 parameter.

j. High Reading of CO

Carbon Monoxide in the stack gas is an indication of poor combustion. CO spikes are frequently transitory and last less than three minutes in length even if no correction of the condition is made. If the CO concentration in the stack gas increases above 100 ppm_V, an AWFSO will result and an alarm will sound and the operators will respond by increasing the temperature and/or air flow. The operator will check the data logger and the strip charts to define the cause of the upset condition. The strip charts will be a visual indication of a trend leading to high CO. The waste material feed will be stopped if the CO concentration in the exit gas exceeds 100 ppm_V (corrected to seven percent O_2), based on a sixty-minute rolling average calculated by the data logger. The CO concentration in the stack gas will be recorded and monitored continuously. Excess feed will be represented by a fluctuation of desorber temperature, high pressure, high CO, etc., in the dryer. Each of the above triggers appropriate responses, as detailed in (b) and (d) of this section.

k. Sudden Loss of Refractory Lining

This is an unusual occurrence and is indicated by hot spots on the thermal oxidizer. It will signal the operator to perform an orderly system shutdown for inspection.

l. Increase in Quench Chamber Flue Gas Temperature

The quench chamber exit gas temperature will be monitored and recorded continuously. The operating setpoint is 200°F. Deviation from this setpoint will trigger a proportional increase or decrease in the water flow to the quench chamber, and if necessary, will start the emergency quench water pump. Should the temperature after the quench chamber exceed 250°F, the waste feed to the desorber will be automatically stopped. Should water flow to the spray tower be interrupted, an alarm will sound in the control trailer, the emergency water sprayer will be activated, the waste feed will be stopped automatically, the fuel feed will be shut off, the induced draft fan damper closed, and the induced draft fan shut down.

m. Partial or Complete Stoppage of Water or pH Control to the Scrubber

If this condition occurs, waste feed will be stopped, and water levels, pumps and alkaline solution supply systems will be inspected. If water recirculation stops, the vent will be opened.

n. Deposition of Solids in the Scrubber

This occurrence requires a shutdown to clean out the scrubber internals.

o. pH Value of Scrubber Water Outside of Specification

A pH monitoring and control system will adjust the caustic inlet flow rate to maintain the setpoint pH level of 8. Williams will establish a 20-minute rolling average based on the performance test, as well as an instantaneous value based on averaging the minimum hourly value from each hour of a test run and then averaging the three test run averages to determine the instantaneous AWFSO. If pH in the acid gas absorber deviates from specifications, the alkaline supply will be checked and restored as quickly as possible.

p. Oxygen in the Thermal Oxidizer Less Than 3%

Eight percent O_2 in the stack gas corresponds to approximately 55% more oxygen than that required for the stoichiometric reaction of the fuel and waste. A range of 25-75% excess air is considered proper for the combustion of VOC and hydrocarbons in the gas stream. The amount of O_2 in the stack gas will be monitored, and when it drops below 4.0% (approximately 25% excess air), an alarm will sound and the air flow will be increased proportionally. An instantaneous AWFSO will occur if the exit gas oxygen concentration falls below 3%. Based on results of the performance test, this A2 parameter may be re-evaluated.

q. Indication of Failure of the I.D. Fan

The fan operation will be monitored with an ammeter equipped with an alarm relay. If the induced draft fan fails, both the fuel and the waste feed flow will be stopped at once, and the emergency vent will open.

r. Failure of Treated Material Handling System

When the processed soil handling system fails, the operator will inspect the system and idle or shut down as necessary.

s. Power Failure

In the event of a power failure, feed and fuel are interrupted. This sequence also occurs when the induced draft fan stops.

t. External System Fire

ABC fire extinguishers will be strategically placed; however, the fire department will be called on any major system fires.

u. Burner System Safety Controls

The gas burner system includes a standard industrial interlock system that shuts the burner system down if:

* Flame is detected during pre-ignition,
* Pilot fails to ignite,
* Burner fails to ignite, or
* Loss of flame after ignition.

v. Additional Safety Interlocks

Several other events that will cause an AWFSO to occur include a minimum packed bed scrubber flowrate, maximum stack gas flowrate, and the air pollution control equipment purge rate. These rates will be monitored during the Performance Test and AWFSOs will be determined based on the results of those test runs. The APC recycle water flowrate and purge rate will be set based on the time-weighted average during all the runs of the performance test.

All AWFSOs and VOs are also explained in the Performance Test Plan. Table 3-2 summarizes the shut-off conditions, as well as Table 6.2 of the Work Plan.

Table 6.1
Key Process Parameters

Instrument Tag #	Parameter	Description	Typical Range	Normal Operating Conditions[1]	Upset Condition	Upset Condition Cause	Result
TI-311	Temperature	Thermal desorber exit gas(a)	300-450°F	425°F	Low <250°F	High feed rate, increase in moisture content.	Poor desorption, condensation in baghouse.
					High >450°F High-High > 500°F	Low Feed rate, decrease in moisture content.	Damage to bag filter.
TI-112	Temperature	Soil discharge (a)	450-1000°F	800°F	Low <700°F[1] (20 minute rolling average)	Poor desorption, burner malfunction, feed rate too high, feed condition changed.	Low soil temperature
TI-518	Temperature	Thermal Oxidizer Outlet	1700-1900°F	1800°F	Low <1700°[2]F	Burner Malfunction. Moisture content high.	Low exit gas temperature,
				2100°F	High >2100°F	Fan failure. Low throughput.	High exit gas temperature, possible equipment damage.

(1) Based on average of lowest average temperature demonstrated during each test run.
(2) Based on time-weighted average of all test runs.

Table 6.1
Key Process Parameters
Continued

Instrument Tag #	Parameter	Description	Typical Range	Normal Operating Conditions	Upset Condition	Upset Condition Cause	Result
P-330	Pressure	Thermal Desorber burner end (a)	-0.01 to -0.1 inches of H_2O	-0.05 inches of H_2O	Low <-0.2	No feed	Low gas flows.
					High >-0.01	High feed moisture content	Dryer overpressure.
PDI-634	Pressure	Baghouse pressure differential	1 - 8 inches of H_2O	2 inches of H_2O	Low <1	Low gas flow Filter bag failure	Particulate emissions
					High >8	Filter bags blinded, flow obstruction. Low temperature.	Reduced throughput
PDI-637	Pressure	I.D. Fan pressure differential	12 - 20 inches of H_2O	17 inches of H_2O	Low (a)	Bypassing or filter bag failure.	
					High (a)	Flow obstruction in system. Reduced throughput.	

(a) Determined during clean soil shakedown, approved by agency, verified during performance test.

Table 6.1.
Key Process Parameters
Continued

Instrument Tag #	Parameter	Description	Typical Range	Normal Operating Conditions	Upset Condition	Upset Condition Cause	Result
P-228	Pressure	Compressed air header	80 - 120 psi	90 psi	Low < 80	Compressor failure/ leakage. Baghouse solenoid failure.	Engage standby compressor.
AI-851A	CO	Continuous Emission Monitor	0 - 3000 ppm	10 ppm 1 hr rolling average corrected to 7% O_2	High >100 (1 hr. rolling average)	Incomplete oxidation	AWFSO
AI-554	O2	Continuous Emission Monitor	3 - 25%	4%	Low < 3 High > 25	Air starved, burner adjustment Excess air, burner adjustment	See CO Excessive fuel Consumption
	Opacity	Continuous Emission Monitor		< 20%	High > 20	Bag leakage	Opacity Alarm

Table 6-2. Automatic Waste Feed Shutoff Conditions To Be Compiled With During All Phases of Contaminated Soil Processing

Control Parameters (a)	Instrument Number	Cutoff Conditions	Value	Comments
Soil feed rate (ton/hr)	WQI-170	High	> 30	60-minute rolling average AWFSO
Soil feed rate (ton/hr)	WQI-170	High	(d)	Instantaneous AWFSO
Baghouse dust feed rate (tons/hr)	TBD	High	> 3	60-minute rolling average AWFSO
Baghouse dust feed rate (tons/hr)	TBD	High	(d)	Instantaneous AWFSO
Thermal desorber pressure (inches w.c.)	PI-330	High	> -0.01	Instantaneous AWFSO
Thermal desorber exit soil temperature (°F)c	TI-112	Low	< 700	20-minute rolling average AWSFO
Thermal desorber exit soil temperature (°F)c	TI-112	Low	(b)	Instantaneous AWFSO
Thermal desorber exit gas temperature (°F) as Alternative measure of performance initial 20 minutes	TIC-310	Low	< 250	Instantaneous AWFSO
Thermal desorber exit gas temperature (°F)	TIC-310	High	> 450	Instantaneous AWFSO
Thermal desorber exit gas temperature (°F)	TIC-310	High-high	> 500	Instantaneous VO
Thermal desorber exit gas temperature (°F)	TIC-310	Low	< 250	Instantaneous AWFSO
Thermal oxidizer exit gas temperature (°F)	TIC-518	Low	< 1,700	Instantaneous AWFSO
Thermal oxidizer exit gas temperature (°F)	TIC-518	High	> 2,100	Instantaneous AWFSO
Quench exit gas temperature (°F)	TI-819	High	> 250	Instantaneous AWFSO
Stach gas carbon monoxide (ppmv)	AIC-851A	High	> 100 (e)	60-minute rolling average AWFSO
Stack gas oxygen (%)	AIC-851C	Low	< 3	Instantaneous AWFSO
ID Fan current (amp)	II-6622, 6623	High	(d)	Instantaneous AWFSO
APC recycle water flow rate	FT-700,701 FT-706,707	Low	(d)	Instantaneous AWFSO
APC purge rate (gpm)	FI-704	Low	(d)	Instantaneous AWFSO
Baghouse differential pressure (inches w.c.)	PDI-633	Low	< 1	Instantaneous AWFSO
Packed bed scrubber recycled water pH	AIC-753	Low	(b)	20-minute rolling average AWFSO
Packed bed scrubber recycled water pH	AIC-753	Low	< 4	Instantaneous AWFSO
ID Fan failure	II-6622,6623	-	-	Instantaneous AWFSO
Burner system failure	NA	(f)	-	Instantaneous AWFSO
Power failure	NA	(g)	-	Instantaneous AWFSO

Notes:
(a) See Figure 6-1 of the Thermal Desorption Work Plan for locations of major process instruments
(b) Determined during performance test
(c) Limits not in effect during first 20 minutes of operation
(d) Determined during clean soil shakedown, approved by agency, verified during performance test
(e) Corrected to 7% oxygen
(f) Burner management system flame out indication
(g) Programmable logic controller power failure indication

Table 6.3

Emergency and Backup Equipment

ITEM	APPLICATION
Backup pumps	Process water supply Quench tower supply Scrubber makeup water
Backup compressor	Compressed air

SECTION 7

PERFORMANCE CRITERIA

7.1 OVERVIEW

Performance standards include cleanup criteria for treated soils and stack emission standards. Compliance with the performance standards will be demonstrated during the Performance Test and during Production Operations. Clean-up goals for treated soil are summarized in Table 7-1. This section presents an overview of performance standards that will be demonstrated, and the numerical values for each performance standard. Detailed information on the Performance Test Standards is described in the Performance Test Work Plan.

7.2 SOIL TREATMENT PERFORMANCE CRITERIA

The soil treatment performance standards are designed to satisfy all Removal Action based criteria as described below. Other performance criteria established by the USEPA related to the RI/FS will also be satisfied as discussed below.

7.2.1 OCL Pesticides and Metals

During the performance test, the levels of target compounds remaining in treated soil will be compared to previously established allowable cleanup goals listed in Table 7.1. The compounds are listed below.

- Aldrin
- alpha-BHC
- beta-BHC
- chlordane
- gamma-BHC
- p,p'-DDD
- p,p'-DDE
- Mercury
- Heptachlor
- Heptachlor epoxide
- Methoxychlor
- p,p'-DDT
- Dieldrin
- Endrin
- Hexachlorobenzene
- Toxaphene
- Arsenic
- Lead
- Dioxins

Note: Williams does not purport that its LTTD will treat dioxins to below proposed cleanup goals for soil at the Woods Industries site.

Table 7.1 PROPOSED CLEANUP GOALS FOR SOIL
WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON

Parameter[1]	Goal (mg/kg)
Aldrin	0.0588
Arsenic[2]	20
alpha-BHC	0.159
beta-BHC	0.556
gamma-BHC	0.769
Chlordane	0.769
p,p'-DDD	4.17
p,p'-DDE	2.94
p,p'-DDT	2.94
Dieldrin	0.0625
Endrin	24
Heptachlor	0.2
Heptachlor epoxide	0.1
Hexachlorobenzene	0.6
Lead[2]	250
Mercury[2]	1
Methoxychlor	400
Toxaphene	0.909
Dioxins[3]	0.001

1 Goals are based on Residential Method B. If soil cleanup levels are greater than Residential Method B, then institutional controls are required according to WAC 173-30-740 (1)(c)(iii).

2 Williams' unit does not treat metals and does not guarantee these clean-up levels for metals. If cleanup goals for metals are exceeded, the soil will be deposited as specified in the consent order.

3 As per the agreement between USEPA/BNRR, one soil sample will be collected during each performance test run for analysis. Sampling will be performed according to EPA's letter of April 20, 1994.

7.3 AIR EMISSION CRITERIA

The air pollution control equipment for the LTTD was designed to satisfy all Removal Action based criteria. Air emission limits will be based on Washington Administrative Code (WAC) Chapter 173-460, Controls for New Sources of Toxic Air Pollutants. Tentative compounds to be evaluated are listed in Table 7-2 while estimated air emissions and air emission limits are presented in Table 7-3.

TABLE 7-2

TENTATIVE COMPOUNDS TO BE EVALUATED

Organics (1)	Metals(2)	Products of Incomplete Combustion(3)	Criteria Pollutants
Aldrin	Antimony	*Acetone	CO
alpha-BHC	Arsenic	Acetonitrile	PM_{10}
beta-BHC	Barium	Acrylonitrile	HCl
gamma-BHC	Beryllium	*Benzaldehyde	Cl_2
Chlordane	Cadmium	*Benzene	SO_2
p,p'-DDD	Chromium	*Benzoic acid	NO_2
p,p'-DDE	Lead	Benzyl alcohol	
p,p'-DDT	Mercury	Camphene	
Dieldrin	Selenium	Chlorobenzene	
Endrin	Silver	Chloroethane	
Heptachlor	Thallium	*Chloroform	
Heptachlor epoxide	Nickel	Chloromethane	
Hexachlorobenzene		p,p'-DDE	
Methoxychlor		Dichlorobenzene	
Toxaphene		Dihydrofuranone	
		Ethanol	
		*Ethylbenzene	
		Hexachloropentadiene	
		*Methylene chloride	
		Methylphenol	
		Methylphenylether	
		Nitrobenzene	
		*Phenol	
		Styrene	
		*Toluene	
		Trichlorobenzene	
		Trichlorofluoromethane	
		*1,1,1-Trichloroethane	
		Trichloromethane	
		Vinyl Chloride	
		Xylene	
		Dioxins/furans	

(1) Listed are all organic indicator chemicals from the Baseline Risk Assessment (Burlington Environmental, 1992).

(2) Arsenic, lead, and mercury are indicator chemicals. Other metals will be evaluated if the soil pile sampling results indicate that emitted levels may exceed adjusted Tier 1 levels.

(3) PICs are based on past experience with similar technologies, literature review, and a structural analysis.

* Detected at FMC.

TABLE 7-3

LTTD PERFORMANCE CRITERIA FOR STACK EMISSIONS

PESTICIDES

Parameter	Avg. Conc. in Soil(1) (mg/kg)	Estimated Annual Constituent Ground Level Conc. ($\mu g/m^3$)(2)	Goal ($\mu g/m^3$)(3)
Aldrin	1.94	1.25E-06	0.0002
alpha-BHC	1.50	9.63E-07	0.64(5)
beta-BHC	3.00	1.93E-06	0.64(5)
gamma-BHC	1.87	1.20E-06	0.64(5)
Chlordane	4.48	2.88E-06	0.0027
p,p'-DDD	23.22	1.49E-05	(4)
p,p'-DDE	10.98	7.05E-06	(4)
p,p'-DDT	5.98	3.84E-06	0.01
Dieldrin	7.80	5.01E-06	0.0002
Endrin	2.99	1.92E-06	0.12(5)
Heptachlor	1.49	9.57E-07	0.00077
Heptachlor epoxide	4.92	3.16E-06	0.0004
Hexachlorobenzene	16.06	1.03E-05	0.002
Methoxychlor	57.05	1.49E-05	13.32(5)
Toxaphene	673.25	4.32E-04	0.003

(1) Based on arithmetic average of concentrations detected in the northern and southern stockpiles.
(2) Estimated from EPA Screen Model at 99.99% DRE.
(3) Goals are based on WAC Maximum Allowable Annual Ground-Level concentrations.
(4) By-product of DDT; unit risk factors needed to calculate regulatory limits were not available.
(5) Converted from a 24-hour average to an annual average by multiplying with a factor of 0.4.

TABLE 7-3
LTTD PERFORMANCE CRITERIA FOR STACK EMISSIONS
TIER I & TIER II LEVELS BASED ON NEW SAMPLING DATA - 30 TPH
ROLL-OFF BOXES

Metal	Avg. Conc. in Soil (mg/kg)	Feed Rate(1) (g/hr)	Tier I Limit (g/hr)	Pass/ Fail	Emission Rate(2) (g/hr)	Tier II (g/hr)	Pass/ Fail
Antimony	100	2721.6	240	F	272.2	240	F
Arsenic	5.1	138.8	1.9	F	13.88	1.9	F
Barium	290	7892.6	40,000	P	197.32	40,000	P
Beryllium	0.11	3.0	3.4	P	0.0075	3.4	P
Cadmium	0.84	22.9	4.6	F	2.29	4.6	P
Chromium	16.5	449.1	0.68	F	1.12	0.68	F
Lead	45.5	1238.3	72	F	123.83	72	F
Mercury	0.956	26.0	240	P	13.0	240	P
Silver	1.9	51.7	2400	P	2.59	2400	P
Thallium	< 0.2	< 5.4	240	P	< 0.54	240	P

SOUTHERN STOCKPILE

Metal	Avg. Conc. in Soil (mg/kg)	Feed Rate(1) (g/hr)	Tier I Limit (g/hr)	Pass/ Fail	Emission Rate(2) (g/hr)	Tier II Limit (g/hr)	Pass/ Fail
Antimony	40.2	1094.1	240	F	109.41	240	P
Arsenic	9.7	264.0	1.9	F	26.4	1.9	F
Barium	122	3320.4	40,000	P	83.01	40,000	P
Beryllium	0.10	2.7	3.4	P	0.0068	3.4	P
Cadmium[5]	ND	4.1	4.6	P	0.41	4.6	P
Chromium	17.3	470.8	0.68	F	1.18	0.68	F
Lead	44.7	1216.6	72	F	121.66	72	F
Mercury[5]	ND	1.4	240	P	0.7	240	P
Silver	3.1	84.4	2400	P	4.22	2400	P
Thallium	< 0.2	< 5.4	240	P	< 0.54	240	P

TABLE 7-3
LTTD PERFORMANCE CRITERIA FOR STACK EMISSIONS
(continued)

NORTHERN STOCKPILE

Metal	Avg. Conc. in Soil (mg/kg)	Feed Rate(1) (g/hr)	Tier I Limit (g/hr)	Pass/ Fail	Emission Rate(2) (g/hr)	Tier II Limit (g/hr)	Pass/ Fail
Antimony	< 40.0	< 1088.6	240	F	108.86	240	P
Arsenic	8.8	239.5	1.9	F	23.95	1.9	F
Barium	142	3864.7	40,000	P	96.62	40,000	P
Beryllium	0.18	4.9	3.4	F	0.012	3.4	P
Cadmium[5]	ND	4.1	4.6	P	0.41	4.6	P
Chromium	10.4	283.0	0.68	F	0.707	0.68	F
Lead	40.9	1113.1	72	F	111.31	72	F
Mercury	0.226	6.2	240	P	3.1	240	P
Silver	1.6	43.5	2400	P	2.18	2400	P
Thallium	< 0.2	< 5.4	240	P	< 0.54	240	P

(1) Based on 30 TPH feed rate

(2) Tier I and Tier II limits pursuant to 40 CFR 266.106

(3) Based on estimate of metals partitioning and APCE removal efficiencies, <u>Guidance on Metals and HCl Controls for Hazardous Waste Incinerators</u>, Volume IV of the Hazardous Waste Incinerator Guidance Series, August, 1989, EPA/530-SW-90-004.

(4) If Tier II limit is exceeded, site specific modeling and risk analysis (Tier III) must be performed.

(5) Detection limits for Cadmium & Mercury are: Cd 0.30 mg/kg, Hg 0.10 mg/kg. To determine the feed rate and the stack emission rate, one half the detection limit was used.

TABLE 7-3
LTTD PERFORMANCE CRITERIA FOR STACK EMISSIONS
TIER I & TIER II LEVELS BASED ON NEW SAMPLING DATA - 20 TPH
ROLL-OFF BOXES

Metal	Avg. Conc. in Soil (mg/kg)	Feed Rate(1) (g/hr)	Tier I Limit (g/hr)	Pass/ Fail	Emission Rate(2) (g/hr)	Tier II (g/hr)	Pass/ Fail
Antimony	100	1814.4	240	F	181.47	240	P
Arsenic	5.1	92.5	1.9	F	9.25	1.9	F
Barium	290	5261.7	40,000	P	131.55	40,000	P
Beryllium	0.11	2.0	3.4	P	0.0050	3.4	P
Cadmium	0.84	15.3	4.6	F	1.53	4.6	P
Chromium	16.5	299.4	0.68	F	0.74	0.68	F
Lead	45.5	825.5	72	F	82.55	72	F
Mercury	0.956	17.3	240	P	8.67	240	P
Silver	1.9	34.5	2400	P	1.73	2400	P
Thallium	< 0.2	< 3.6	240	P	< 0.36	240	P

SOUTHERN STOCKPILE

Metal	Avg. Conc. in Soil (mg/kg)	Feed Rate(1) (g/hr)	Tier I Limit (g/hr)	Pass/ Fail	Emission Rate(2) (g/hr)	Tier II Limit (g/hr)	Pass/ Fail
Antimony	40.2	729.4	240	F	72.94	240	P
Arsenic	9.7	176.0	1.9	F	17.6	1.9	F
Barium	122	2213.6	40,000	P	55.34	40,000	P
Beryllium	0.10	1.8	3.4	P	0.0045	3.4	P
Cadmium[5]	ND	2.7	4.6	P	0.27	4.6	P
Chromium	17.3	313.9	0.68	F	0.79	0.68	F
Lead	44.7	811.1	72	F	81.11	72	F
Mercury[5]	ND	0.9	240	P	0.45	240	P
Silver	3.1	56.3	2400	P	2.81	2400	P
Thallium	< 0.2	< 3.6	240	P	< 0.36	240	P

TABLE 7-3
LTTD PERFORMANCE CRITERIA FOR STACK EMISSIONS
(continued)

NORTHERN STOCKPILE

Metal	Avg. Conc. in Soil (mg/kg)	Feed Rate(1) (g/hr)	Tier I Limit (g/hr)	Pass/ Fail	Emission Rate(2) (g/hr)	Tier II Limit (g/hr)	Pass/ Fail
Antimony	< 40.0	< 725.7	240	F	72.57	240	P
Arsenic	8.8	159.7	1.9	F	15.97	1.9	F
Barium	142	2576.5	40,000	P	64.41	40,000	P
Beryllium	0.18	3.3	3.4	P	0.0080	3.4	P
Cadmium5	ND	2.7	4.6	P	0.27	4.6	P
Chromium	10.4	188.7	0.68	F	0.47	0.68	F
Lead	40.9	742.1	72	F	74.21	72	F
Mercury	0.226	4.1	240	P	2.07	240	P
Silver	1.6	29.0	2400	P	1.45	2400	P
Thallium	< 0.2	< 3.6	240	P	< 0.36	240	P

(1) Based on 20 TPH feed rate
(2) Tier I and Tier II limits pursuant to 40 CFR 266.106
(3) Based on estimate of metals partitioning and APCE removal efficiencies, Guidance on Metals and HCl Controls for Hazardous Waste Incinerators, Volume IV of the Hazardous Waste Incinerator Guidance Series, August, 1989, EPA/530-SW-90-004.
(4) If Tier II limit is exceeded, site specific modeling and risk analysis (Tier III) must be performed.
(5) Detection limits for Cadmium & Mercury are: Cd 0.30 mg/kg, Hg 0.10 mg/kg. To determine the feed rate and the stack emission rate, one half the detection limit was used.

TABLE 7-3
LTTD PERFORMANCE CRITERIA FOR STACK EMISSIONS
(continued)

ADDITIONAL PARAMETERS

Parameter	Estimated Emission(1)	Allowable Emission
HCl	0.32 lb/hr	4.0 lb/hr
Free Chlorine(2)	0 lb/hr	
Particulates	< 0.03 gr/dscf	0.03 gr/dscf (7.811 lb/hr)

(1) Estimated emission at 30 tons per hour.
(2) Emission based on assumption that all chlorine is converted to HCl.

SECTION 8

PERFORMANCE TEST PLAN

The Performance Test Plan is presented in Appendix A. The Performance Test will be conducted to determine operating conditions under which the LTTD system meets all soil treatment and air emissions criteria. These conditions will be used to set process operating parameter limits to ensure that all applicable soil treatment and stack emission standards are met during Production Operations.

The Performance Test will be conducted prior to Production Operations. An independent stack sampling subcontractor will be retained to collect all required stack samples. The subcontractor's qualifications will be submitted for USEPA review and made a part of the Thermal Desorption Work Plan after receipt of USEPA approval.

The Performance Test has been developed in conjunction with FOCUS Environmental. Details of the plan are similar to those outlined below.

- LTTD Startup/Shakedown;
- LTTD System Performance;
- Sampling, Analysis, and Monitoring Procedures;
- Test Schedule;
- Test Protocol;
- Planned Operating Conditions for the Emissions Control Equipment;
- Performance Test Objectives;
- QA/QC Procedures;
- Test Results; and
- Post Test Operation.

9

SECTION 9

SAMPLING, ANALYSIS AND MONITORING PLAN FOR PRODUCTION OPERATIONS

9.1 SAMPLING PLAN

During production operations, one (1) composite sample of the treated soil will be taken daily. This composite sample will consist of four grab samples, each taken at approximately six hour intervals during normal operations. This represents approximately one composite sample per every 580 tons of treated soil. The samples will be collected in compliance with EPA SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", using the procedure described in Table 9-1. For operations prior to the Performance Test, the sampling procedure outlined in Table 9-2 will be followed.

9.2 ANALYSIS PLAN

Each treated soil sample will be analyzed for the 18 indicator chemicals listed in Table 7.1 during the performance test and until a decision has been made by BNRR and the EPA to reduce the number of parameters to demonstrate that the clean-up goal criteria are being met.

9.3 MONITORING PLAN

The principal process and continuous emissions parameters that will be monitored are discussed in detail in Section 6. Table 6-1, Key Process Parameters, describes the process and emissions parameters that will be monitored during LTTD operations. Table 6-2 lists the parameters that will be continuously recorded during LTTD operations.

Table 9-1. Soil Sampling Procedures for Production Operations

Sample name:	Treated soil
Locations:	Discharge screw conveyor or treated soil stockpile
Equipment:	Scoops and containers Wide-mouth glass jars Gloves, eye protection, hard hat
Frequency:	6 hour intervals
Procedures:	Treated Soil: Collect an equal quantity of soil from the discharge screw conveyor or treated soil stockpile at each time interval with a scoop and transfer the grab sample to a container. At the end of each operating day, composite the sample in a container and transfer a portion to one 4 oz. container. Each time grab sample is taken, record sampling time and approx-mate weight of final samples on sample collection sheets. Attach sample numbers to jars and vials and label with date, sample name and test-run number. Sample coordinator accepts custody of samples and records sample numbers and collection data in field log book. Samples are placed on ice in shipping container which is stored in the sample holding area separate from the container supply area.
References:	Test Methods for Evaluating Solid Waste, SW846, Third Edition, 1986 revised 1990.

Table 9-2. Soil Sampling Procedures for Pre-Performance Test Operations

Sample name:	Treated soil
Locations:	Discharge screw conveyor or treated soil stockpile
Equipment:	Scoops and containers Wide-mouth glass jars Gloves, eye protection, hard hat
Frequency:	1 hour intervals
Procedures:	Treated Soil: Collect an equal quantity of soil from the discharge screw conveyor or treated soil stockpile at each time interval with a scoop and transfer the grab sample to a container. At the end of each operating day, composite the sample in a container and transfer a portion to one 4 oz. container. Each time grab sample is taken, record sampling time and approx-mate weight of final samples on sample collection sheets. Attach sample numbers to jars and vials and label with date, sample name and test-run number. Sample coordinator accepts custody of samples and records sample numbers and collection data in field log book. Samples are placed on ice in shipping container which is stored in the sample holding area separate from the container supply area.
References:	Test Methods for Evaluating Solid Waste, SW846, Third Edition, 1986 revised 1990.

SECTION 10

SECURITY PLAN

Once Williams begins 24-hour per day operations, security will be provided by Williams personnel. They will control entry to and exit from the facility and monitor the premises continuously. Williams will utilize the existing security fence to control access to the property.

Access to the site will be controlled by a locked gate/buzzer system. If the system fails to work, EPA will require a guard-attended entrance. It is the EPA's intent that site gates be locked at all times. However, an inside quick release system will be used for rapid exit from the site during emergencies.

The area containing the rotary dryer, the untreated soil stockpile, and the treated soil stockpile is defined as an exclusion zone as shown on Figure 12-1. All sides of the exclusion zone will be enclosed by a three foot high visibility fence. Access to the exclusion zone will be limited to the vehicle entrance and the decontamination (or interface) trailer. Two access gates are provided to include the main vehicle gate and an emergency gate. These gates will remain unlocked during normal operations.

All personnel, including both workers and visitors, will log in and out on daily forms in the office area. The office area is located outside of the exclusion zone. The log will note the time, name, company affiliation, and purpose of the visit (for visitors). Visitors are required to provide identification when they sign in. All vehicles will be parked in the designated parking area. No vehicles other than soil material handling equipment, service, and emergency vehicles will be allowed to enter the exclusion zone.

If a security violation occurs, the Williams Project Manager will prepare a security report that notes the time and date of the incident and a description of what happened.

There will be warning signs mounted on the outside of the perimeter fencing. They will be clearly visible from all avenues of approach from a distance of 25 feet. The signs will read:

DANGER - DO NOT ENTER - AUTHORIZED PERSONNEL ONLY

11

SECTION 11

SITE PREPARATION

11.1 GENERAL

Site preparation will be performed prior to mobilization of the LTTD system to provide access to the site and to construct an operations area for the unit. A parking area will be designated for personal vehicles. Parking will be provided outside the fenced area on Hansen's property. The parking area will also act as a barrier, preventing non-site related vehicles and persons from utilizing the area along the east fence line near the treated soil storage piles and the treatment equipment.

11.2 UTILITY CONNECTIONS

11.2.1 Electrical Connection

Williams will secure a temporary electrical service connection from the power company at an existing pole located inside the security fencing. An overhead service line will be run from the pole to the unit. Electrical requirements are:

- Phase: 3 phase
- Voltage: 480 volts
- Amperage: 1200 amps.

Electrical wiring to the motor control center will be hard wired in conduit conforming to the National Electric Code (NEC). Electrical and control umbilicals are routed to components through cable trays on the containment pad.

11.2.2 Installation of Piping

Potable water from the existing building one inch water supply line will be provided for use in temporary facilities, quenching of processed soil and off-gases, and decontamination. A temporary connection will also be made to the fire hydrant on site if more water is required than is available through the existing building line. Williams will arrange for metering and installation of a backflow preventer for the temporary connection with the City of Yakima water system. The potable water for LTTD operations will flow through buried polyvinyl chloride (PVC) pipe. The temporary piping crossing the site will be buried in a one foot deep trench. If necessary, engineering controls, such as heat tracing of the pipes, will be employed to ensure that the pipes remain operable during all weather conditions. The subsurface installation of the pipe will minimize obstruction of equipment operation in the area of the pipe. Potable water will also be piped to the personnel decontamination trailer, the quench, and rotary dryer discharge screw conveyor, and to a location where it will be available for equipment and containment pad wash down.

11.2.3 Fuel

Propane will be used as fuel for the system. Liquid propane will be obtained from a local supplier, who will install a 30,000 gallon portable propane tank. Temporary supports will be constructed for the tank. The temporary supports will conform to National Fire Protection Association (NFPA) standards. Propane will be supplied to the site by tank trucks.

11.2.4 Communications

Telephone lines will be provided to the office and control room. Two way portable radios will also be used by on-site personnel.

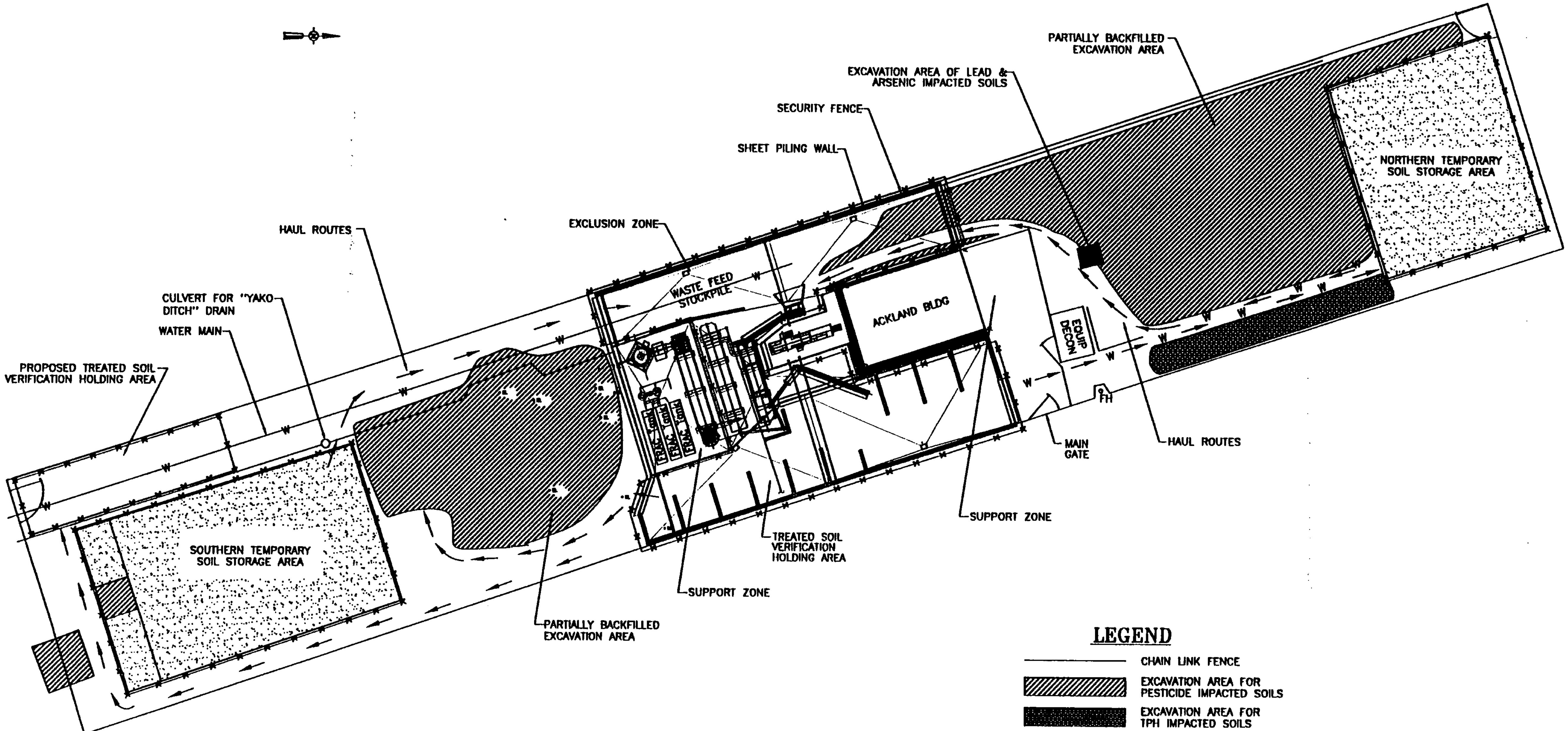
11.2.5 Sanitary Facilities

Sanitary chemical toilets will be provided on site, along with personnel decontamination facilities.

11.3 WORK PAD CONSTRUCTION

A concrete or asphalt work pad will be constructed on-site between the Akland building and the southern excavation area. The pad will serve several purposes, primarily providing a firm foundation for the LTTD. The pad will be approximately 38,000 ft^2 in size with a 6" curbing around the outer limits and between the various zones. The pad will help to contain spills and stormwater runoff. Additionally, it will prevent contamination of the area underneath the unit. The containment pad also aids in maintaining a cleaner work area during storm events, thus preventing deterioration of working conditions.

12



LEGEND

CHAIN LINK FENCE

EXCAVATION AREA FOR PESTICIDE IMPACTED SOILS

EXCAVATION AREA FOR TPH IMPACTED SOILS

TEMPORARY SOIL STORAGE AREA

FH FIRE HYDRANT

BOUNDRY OF EXCLUSION ZONE

HAUL ROUTES

GRAPHIC SCALE

40' 0 40 80FT.

Williams Environmental Services
WILLIAMS
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

WESI•TPU4 FOR WOODS JOB

SITE LAYOUT

SITE

DATE 11/15/94

FIGURE 12.1

DIRECTORY: \WESI\JOBS\ACTIVE WOODS\DWGS

FILENAME WOD-SIT4.dwg

DWG NO. WOD-SIT4

SECTION 12

MOBILIZATION

12.1 OPERATIONS PAD

The operations pad, or containment pad, is to be constructed on level ground between the Akland building and the southern excavation area. Much of the clearing and grading at the site was performed along with previous excavation activities. Therefore, the proposed area for construction of the pad should require very little preparation prior to installation of the pad. Additionally, small concrete pads currently exist at the site and may be incorporated into the operations pad for the LTTD.

As stated previously, the primary purpose of the pad is to provide a firm foundation for the LTTD. Another major reason for the operations pad is containment of spills and stormwater runoff. The outer limits of the pad, as well as the boundaries between the various work zones, will be guarded by 6" curbing. The curbing will prevent any spills or rainwater landing on the pad from leaving the area. Sumps located in each zone will collect water runoff on the pad and pump it to the unit's wastewater treatment system for cleaning. Minor sloping of the pad will cause all water to flow towards the sumps for collection and treatment.

In addition to curbing, interior fencing will be used to separate the stockpiled waste, material and thermal desorber from the remainder of the operations pad and the other work zones.

12.2 FENCE INSTALLATION

The site will be divided into three zones; 1) exclusion zone, 2) contaminant reduction zone and 3) support zone. Zones will be established and clearly delineated. Figure 12-1, Site Layout, illustrates the orientation and approximate location of process equipment, support facilities and work zones. Figure 12-2 shows the equipment layout.

The exclusion zone includes the area around the rotary dryer and the adjacent area where active cleanup operations are performed as shown in Figure 12-1. The exclusion zone is separated from the other zones by a three foot high visibility fence. Entrance to the exclusion zone must be made through the decontamination trailer or vehicle entrance gate.

The contaminant reduction zone includes the personnel decontamination area, and areas of the work pad used for decontamination.

The support zone includes all other portions of the site not listed above which are used for storage and support functions, and the remaining area where the control trailer and air pollution control equipment are located.

12.3 LTTD UNIT MOBILIZATION

Upon receipt of notice to proceed, Williams will begin assembling equipment, materials, and supplies that will be required for shipment to the site. A progressive shipment scheme for items will be used, with equipment for the activities planned shipped as needed. The intent of this scheme is to minimize the accumulation of unnecessary material at the site, thus eliminating congestion that may adversely slow the equipment and facility installation process.

Supervision of the thermal desorption equipment piping and instrumentation will be provided by Williams personnel. Qualified local labor may be used to perform rigging and erection of the equipment.

12.3.1 Erection of Equipment

The first step in equipment erection is to position the trailer-mounted equipment on the work pad. Next, the rigid ductwork connecting the rotary dryer to the offgas treatment trailer is placed in position and connected. The ductwork from the baghouse to the thermal oxidizer is connected next. The stack will be assembled and then erected by crane. The soil discharge screw conveyor and the dust transfer conveyor are then installed. The feed processing unit will be positioned last.

12.3.2 Rotary Dryer Trailer

The rotary dryer and dryer feed conveyor are mounted on a single trailer. The trailer is positioned three feet from the curb as shown on the site drawing. The unit is leveled and chocked in place. All other trailers are placed relative to the location of the rotary dryer trailer. The soil discharge conveyor is delivered on a separate flatbed trailer and mounted on the dryer trailer at the site.

12.3.3 Baghouse Trailer

The baghouse trailer contains the baghouse and ID fan. This trailer is positioned parallel to the rotary dryer trailer. This trailer is separated from the rotary dryer trailer by a distance of approximately 8 feet to allow for connections and service.

The ductwork between the rotary dryer and baghouse/quench trailer, dust transfer conveyor, and electrical wiring will be connected. High temperature sealant will be used on all metal to metal ductwork joints. Electric wiring between trailers will be protected with portable cable trays.

12.3.4 Thermal Oxidizer Trailer

The thermal oxidizer will be delivered, placed on the work pad, and connected to the baghouse trailer by ductwork. The thermal oxidizer will be placed parallel to the baghouse trailer.

Two liquid-phase activated carbon adsorption columns will be skid mounted and delivered by truck. The columns will be placed adjacent to the baghouse trailer. The liquid-phase activated carbon adsorption columns will be connected to the scrubber blowdown system by chlorinated polyvinyl chloride (CPVC) piping. The piping will be protected from mechanical damage by piping trays similar to the electrical connections.

12.3.5 Acid Gas Scrubber/Quencher

The acid gas scrubber/quencher is trailer mounted and will be positioned parallel to the thermal oxidizer where the appropriate ductwork and electrical connection will be made.

12.3.6 Feed Unit

The feed unit is a separate mobile unit. This unit will be positioned to align its discharge with the feed conveyor on the rotary dryer unit.

12.3.7 Stack

The stack will be delivered to the site in sections. After the scrubber/quencher trailer is installed, the stack will be assembled and erected. Required foundations or guy wire anchors will be installed prior to erecting the stack.

12.4 STARTUP PROCEDURES

The following startup procedures will be followed to establish steady-state operation of the LTTD before soil is introduced to the system. The major tasks involved in a normal startup are as follows:

1. Prepare for safe startup.

2. Verify that utilities are connected and operational.

3. Verify that instrumentation and control systems are operational:

   - Check motor rotation
   - Check interlock system
   - Check manual override
   - Check CEM system

4. Start the ID fan and combustion air fans.

5. Start water to quench chamber.

6. Start discharge screw conveyor and rotary dryer rotation.

7. Start rotary dryer burner and set the burner on low fire.
   Start thermal oxidizer burner and set burner on low fire.

8. Start bringing rotary dryer exit gas operating temperature up to normal following heatup schedule. Raise temperature in automatic control mode.

9. Verify normal operation of air pollution control system.

10. When rotary dryer temperatures are in normal range, verify that all interlocks are clear for soil feed.

11. Start solids feed. Verify that soil discharge temperature stabilizes in normal range.

12.5 PAD AND EQUIPMENT DECONTAMINATION

After processing of the contaminated material is complete, (including processing of contaminated soils located under the stockpiles) preparation for demobilization will begin. All remaining soil residues will be removed from the LTTD unit. Decontamination will be limited to the work pad and equipment which comes into contact with the contaminated soil. Soil and sediments from the work pad will be processed prior to decontamination.

The feed system and stacking conveyor will be pressure cleaned. The discharge screw conveyor's cover will be removed for easy pressure cleaning.

All organic residues will be removed from the interior of the rotary dryer by heating the unit at 800°F for 1 hour. The exterior of the rotary dryer and the baghouse will be washed and pressure cleaned. The baghouse, because of its pulse jets of compressed air, will be free of residues and require no further decontamination. During operation, the pulsing frequency will be determined based on soil characteristics and the amount of carryover experienced. The baghouse will be inspected two (2) weeks after operations commence and monthly thereafter to ensure the bags are free of residue. The exterior surface of the quench chamber will be cleaned. Additionally, the interior of the scrubber will be cleaned of any residues. These residues will be tested for contamination and, if necessary, treated accordingly by Williams. The remaining pieces of equipment will require no further decontamination procedures other than washing and pressure cleaning of the exterior surfaces.

The containment pad will be given a final cleaning by high pressure wash. All decontamination water will be treated on-site by activated carbon adsorption, and applied to the treated soil to quench and remoisturize the soil or discharged to the sanitary sewer in accordance with the terms of a temporary City of Yakima wastewater discharge permit to be obtained by Williams.

The liquid phase carbon adsorption units will be removed from the site after decontamination of the exterior by washing and pressure cleaning. After removal from the site, the contents of the activated carbon system will be regenerated by Westates in accordance with all applicable regulations, or disposed of in accordance with all applicable regulations. Hazardous waste manifests will be completed for the spent activated carbon.

12.6 DEMOBILIZATION

Upon completion of decontamination activities and confirmation that cleanup criteria have been achieved, the thermal desorption system and support equipment installed by Williams will be dismantled and removed from the site. Equipment will be disassembled in reverse order of erection and promptly removed from the site. All construction debris generated by Williams will be removed by Williams.

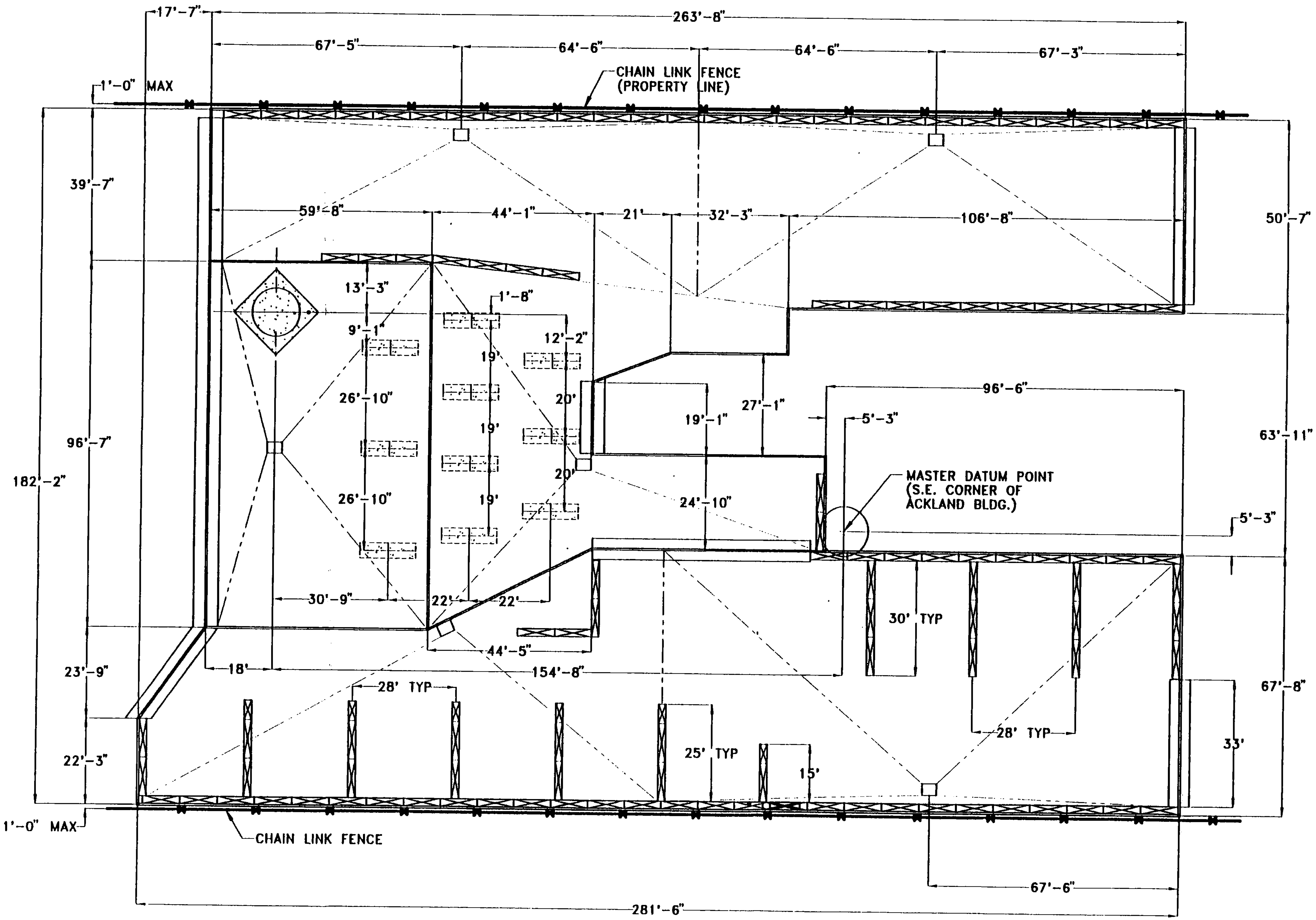
Oversized material and debris, such as cobbles, plastic covers, and personal protective equipment (PPE), will be as per Section 3.5.1.

SEE DWG. 4WODPAD1 FOR NOTES & SECTION CUTS: A

SEE DWG. 4WODPAD3 FOR SECTION VIEWS

NOTE: ALL DIMENSIONS ARE TO CENTERLINE, UNLESS OTHERWISE NOTED

GRAPHIC SCALE



Williams Environmental Services

WILLIAMS

2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

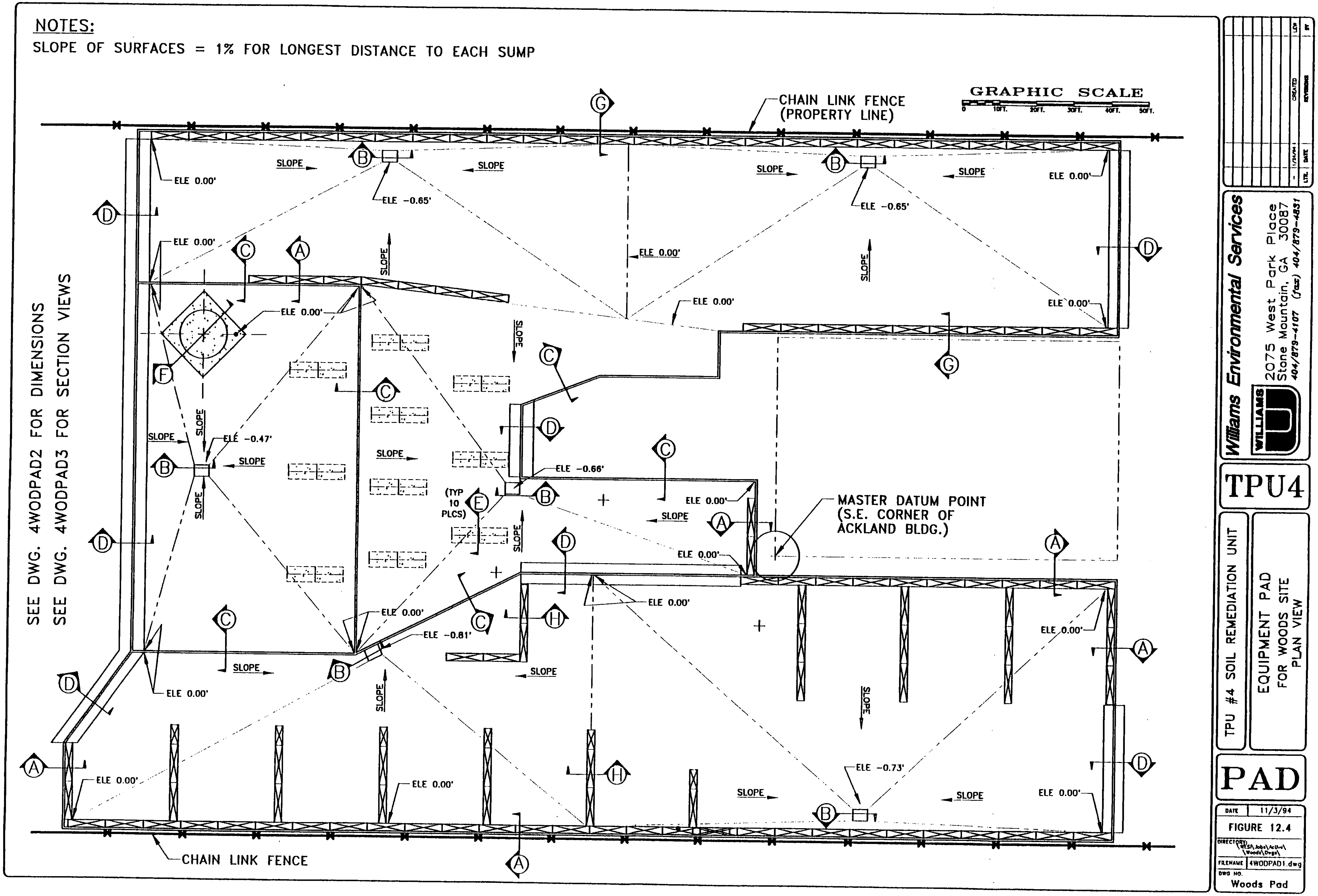
TPU4

TPU #4 SOIL REMEDIATION UNIT

EQUIPMENT PAD
FOR WOODS SITE
DIMENSIONS

PAD

DATE	11/2/94
FIGURE 12.3	
DIRECTORY:	\WES\Jobs\Active\Woods\Dwgs\
FILENAME	4WODPAD2.dwg
DWG NO.	PAD DIMS.

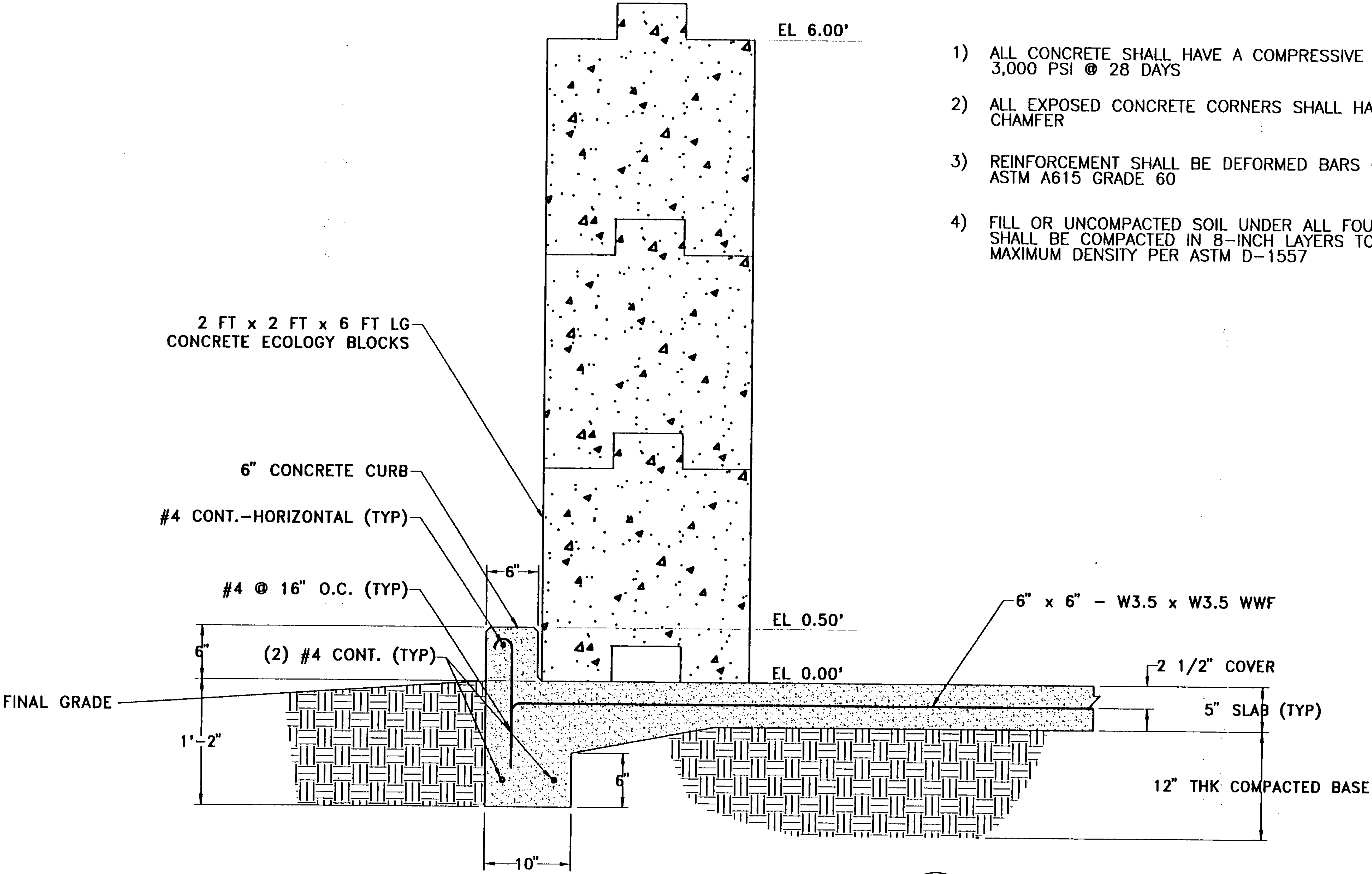

NOTES:
SLOPE OF SURFACES = 1% FOR LONGEST DISTANCE TO EACH SUMP
SEE DWG. 4WODPAD2 FOR DIMENSIONS
SEE DWG. 4WODPAD3 FOR SECTION VIEWS
GRAPHIC SCALE
0
10FT.
20FT.
30FT.
40FT.
50FT.
CHAIN LINK FENCE (PROPERTY LINE)
CHAIN LINK FENCE
MASTER DATUM POINT (S.E. CORNER OF ACKLAND BLDG.)
SLOPE
ELE 0.00'
ELE -0.65'
ELE -0.47'
ELE -0.66'
ELE -0.81'
ELE -0.73'
(TYP 10 PLCS)
A
B
C
D
E
F
G
H
Williams Environmental Services
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831
WILLIAMS
TPU4
TPU #4 SOIL REMEDIATION UNIT
EQUIPMENT PAD FOR WOODS SITE PLAN VIEW
PAD
DATE 11/3/94
FIGURE 12.4
DIRECTORY: WES\Jobs\Active\Woods\Dwgs\
FILENAME 4WODPAD1.dwg
DWG NO. Woods Pad
CREATED
REVISIONS
LTR.
DATE
LGW
BY

1) ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS

2) ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER

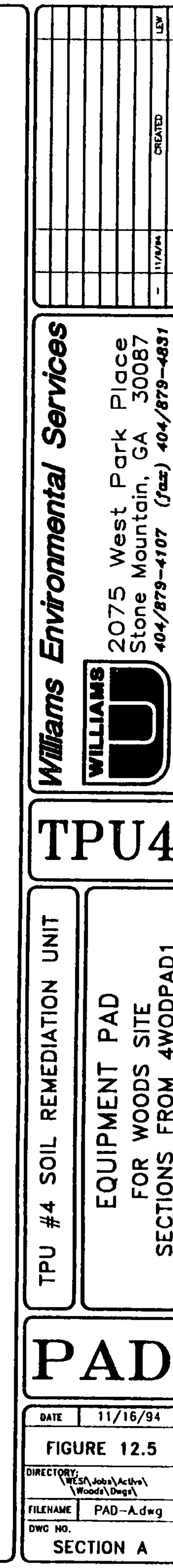
3) REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60

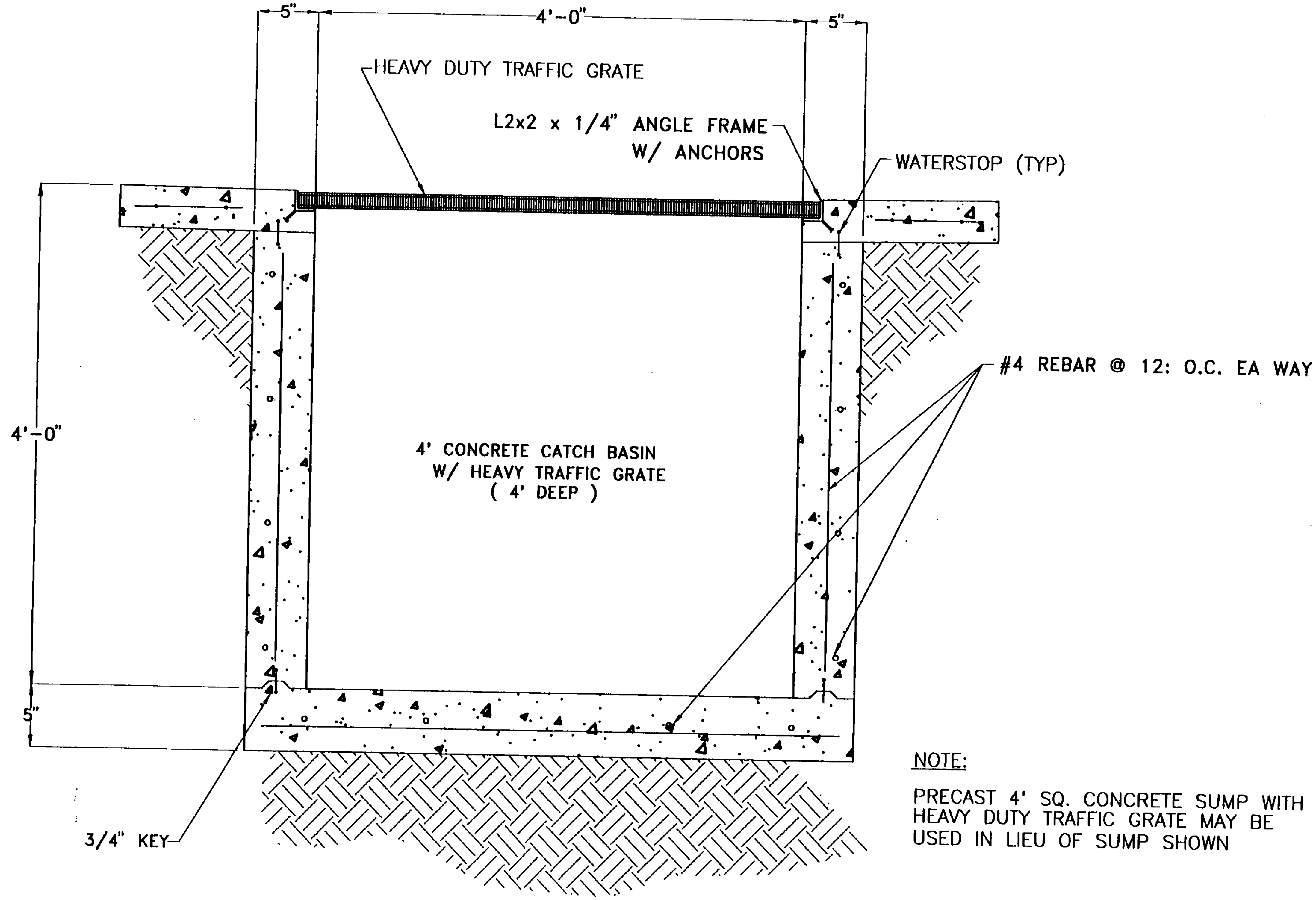
4) FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



SECTION A

TYPICAL CURBING DETAILS
WITH 6 FT CONCRETE BLOCK DIRT BARRIER





NOTE:

PRECAST 4' SQ. CONCRETE SUMP WITH HEAVY DUTY TRAFFIC GRATE MAY BE USED IN LIEU OF SUMP SHOWN

SECTION B

TYPICAL SUMP DETAIL

Williams Environmental Services
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

TPU #4 SOIL REMEDIATION UNIT

EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

PAD

DATE 11/16/94

FIGURE 12.6

DIRECTORY: \WES\Jobs\Active\Woods\Dwgs\

FILENAME PAD-B.dwg

DWG NO. SECTION B

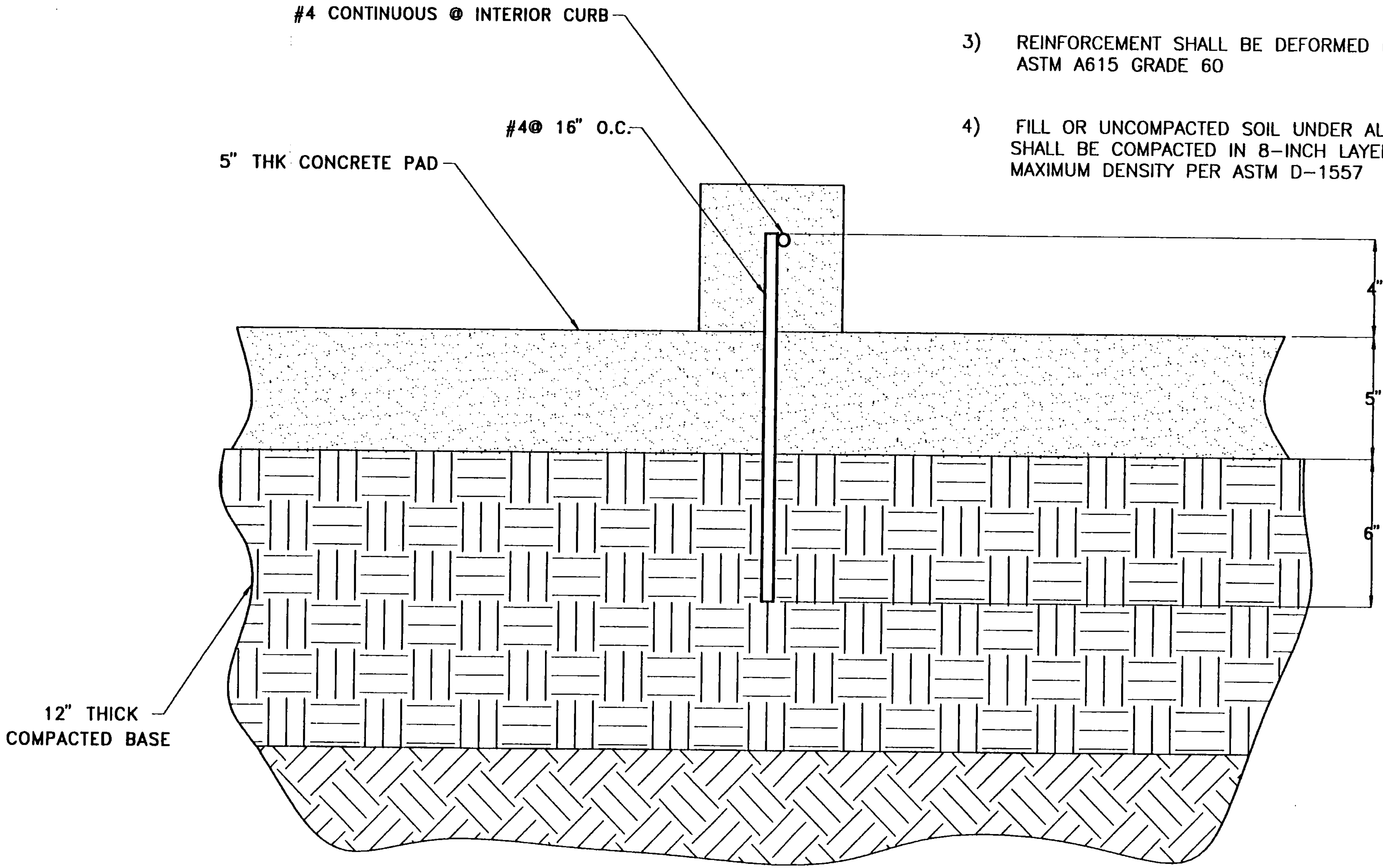
NOTES:

1) ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS

2) ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER

3) REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60

4) FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



SECTION C

TYPICAL CURBING DETAILS

Williams Environmental Services
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

TPU #4 SOIL REMEDIATION UNIT

EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

PAD

DATE 11/16/94

FIGURE 12.7

DIRECTORY: \WES\Jobs\Active\Woods\Dwgs\

FILENAME PAD-C.dwg

DWG NO. SECTION C

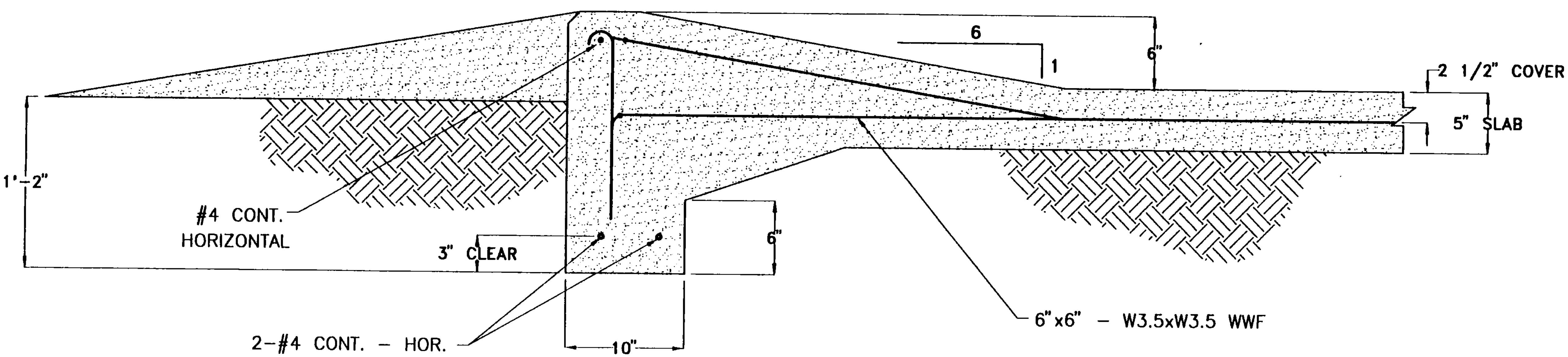
NOTES:

1) ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS

2) ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER

3) REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60

4) FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



SECTION D

TYPICAL ACCESS RAMP DETAIL

LTR.	DATE	REVISIONS	BY
-	11/16/94	CREATED	LEW

Williams Environmental Services
WILLIAMS
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

TPU #4 SOIL REMEDIATION UNIT

EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

PAD

DATE 11/16/94

FIGURE 12.8

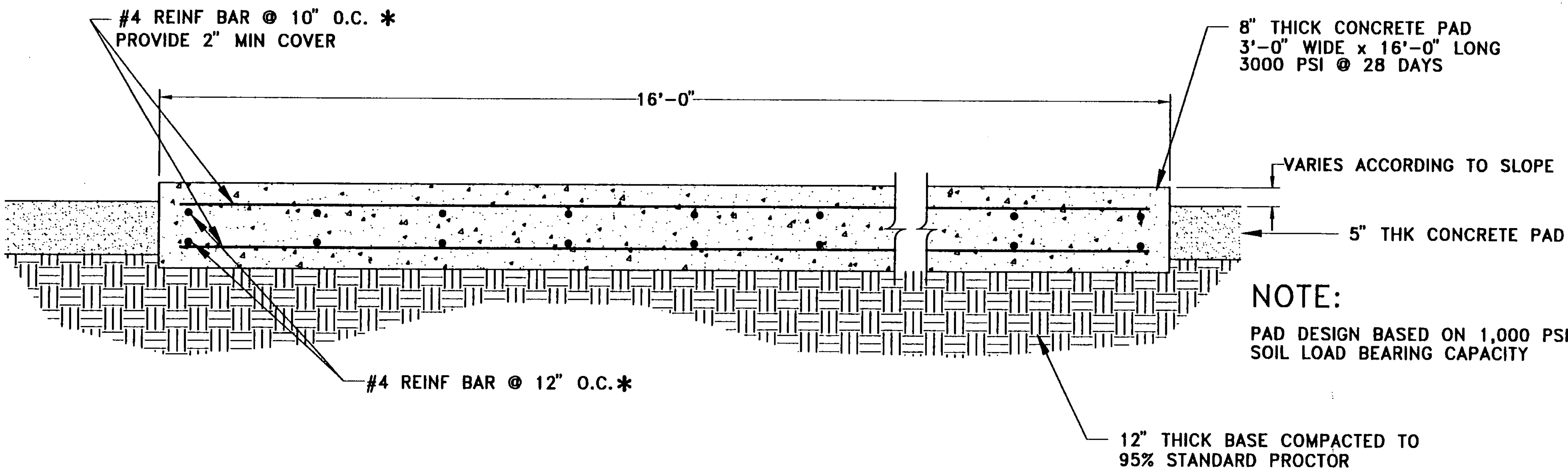
DIRECTORY: \WESI\Jobs\Active\Woods\Dwgs\

FILENAME PAD-D.dwg

DWG NO. SECTION D

NOTES:

1. ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS.
2. REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60.
3. ANCHOR BOLTS SHALL BE ASTM A307 GRADE A UNLESS OTHERWISE SPECIFIED OR REQUIRED.
4. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER.
5. FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



NOTE:

PAD DESIGN BASED ON 1,000 PSF SOIL LOAD BEARING CAPACITY

* REBAR IN CONCRETE TO BE DESIGNED BY PROFSIONAL ENGINEER

SECTION E

TYPICAL EQUIPMENT FOOTING DETAIL

Williams Environmental Services
WILLIAMS
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

TPU #4 SOIL REMEDIATION UNIT

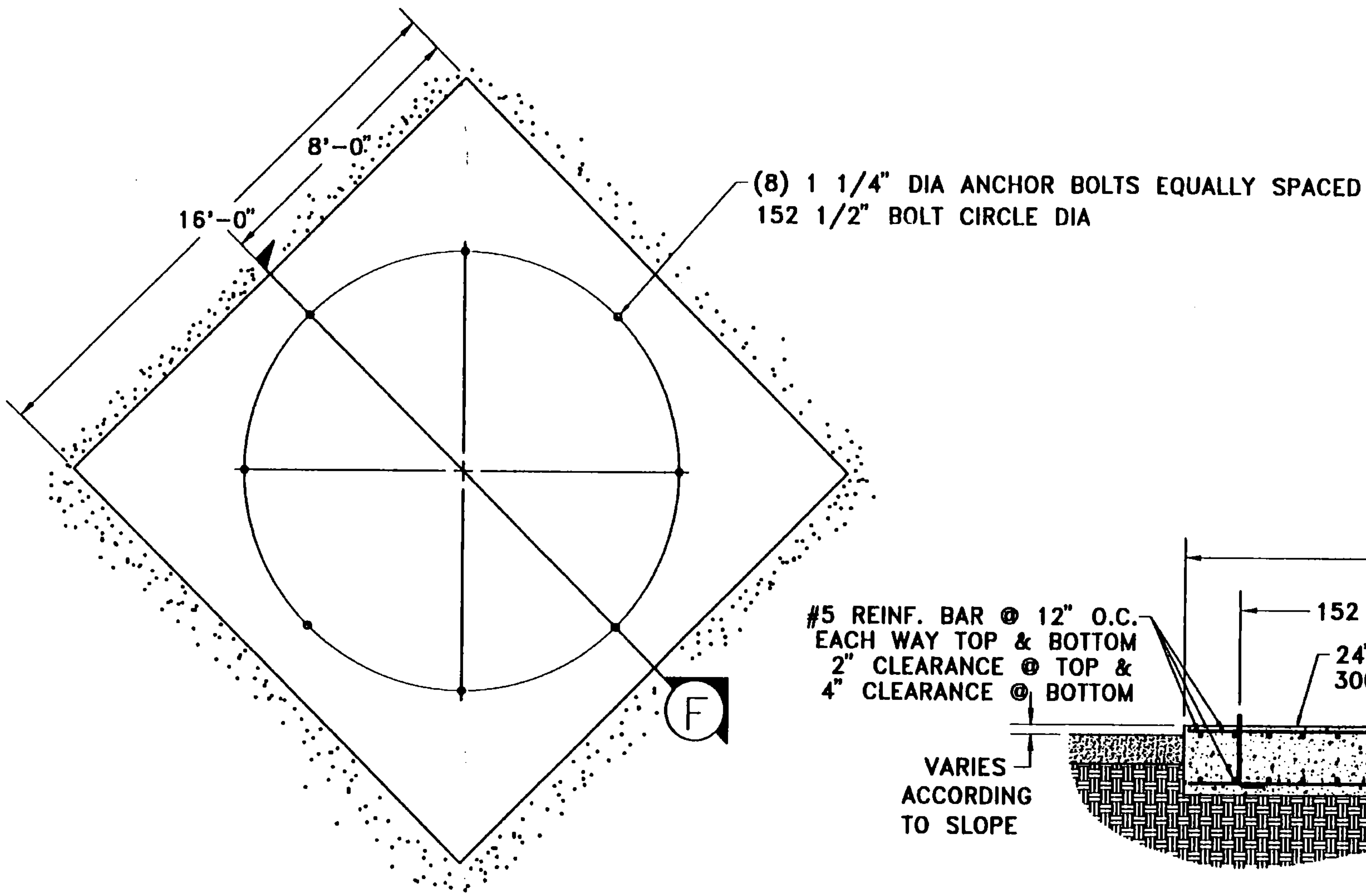
EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

PAD

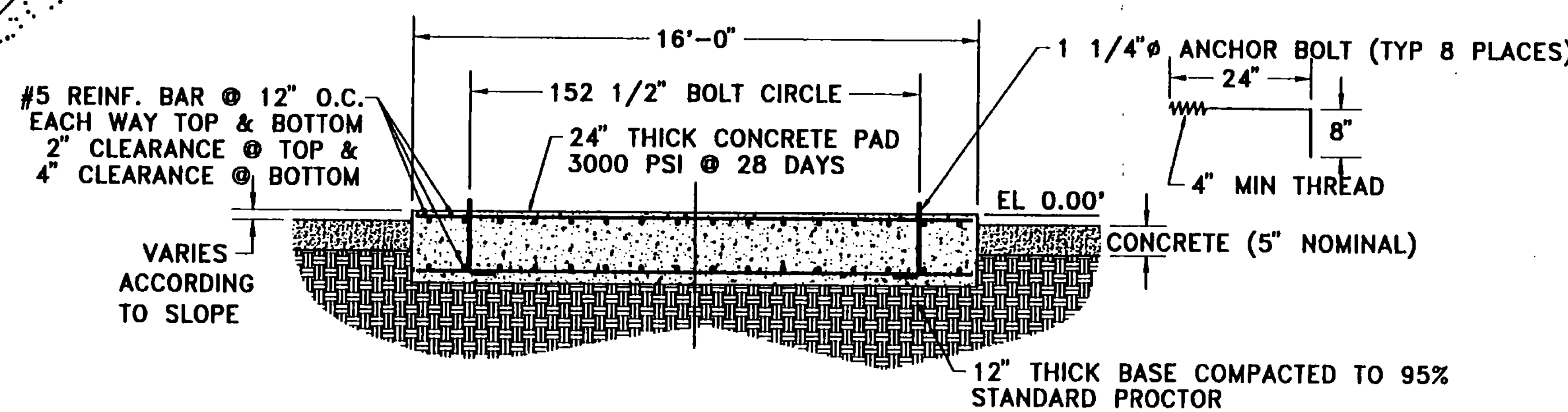
DATE	11/16/94
FIGURE 12.9	
FILENAME	PAD-E.dwg
DWG NO.	SECTION E

NOTES:

1. ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS.
2. REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60.
3. ANCHOR BOLTS SHALL BE ASTM A307 GRADE A UNLESS OTHERWISE SPECIFIED OR REQUIRED.
4. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER.
5. FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



SCRUBBER FOUNDATION DETAIL



SECTION F

Williams Environmental Services
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

WESI*TPU4 for WOODS Job

EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

SITE

DATE 11/16/94

FIGURE 12.10

DIRECTORY \WESA\Jobs\Active\ \Dwgs\

FILENAME PAD-F.dwg

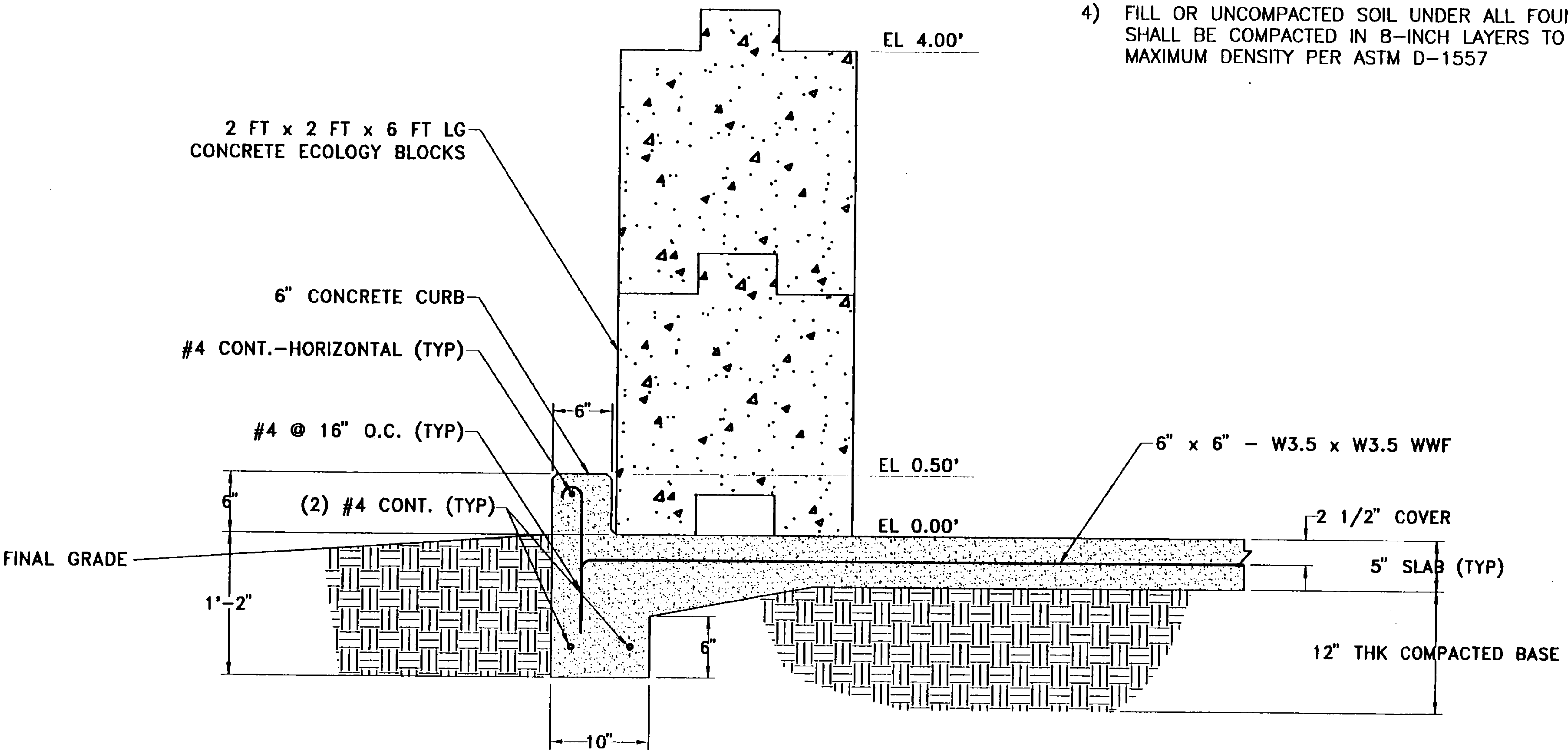
DWG NO. DETAIL F

1) ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS

2) ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER

3) REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60

4) FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



SECTION G

TYPICAL CURBING DETAILS
WITH 6 FT CONCRETE BLOCK DIRT BARRIER

Williams Environmental Services

2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

TPU #4 SOIL REMEDIATION UNIT

EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

PAD

DATE 11/16/94

FIGURE 12.11

DIRECTORY: \WESA\Jobs\Active\Woods\Dwgs\

FILENAME PAD-G.dwg

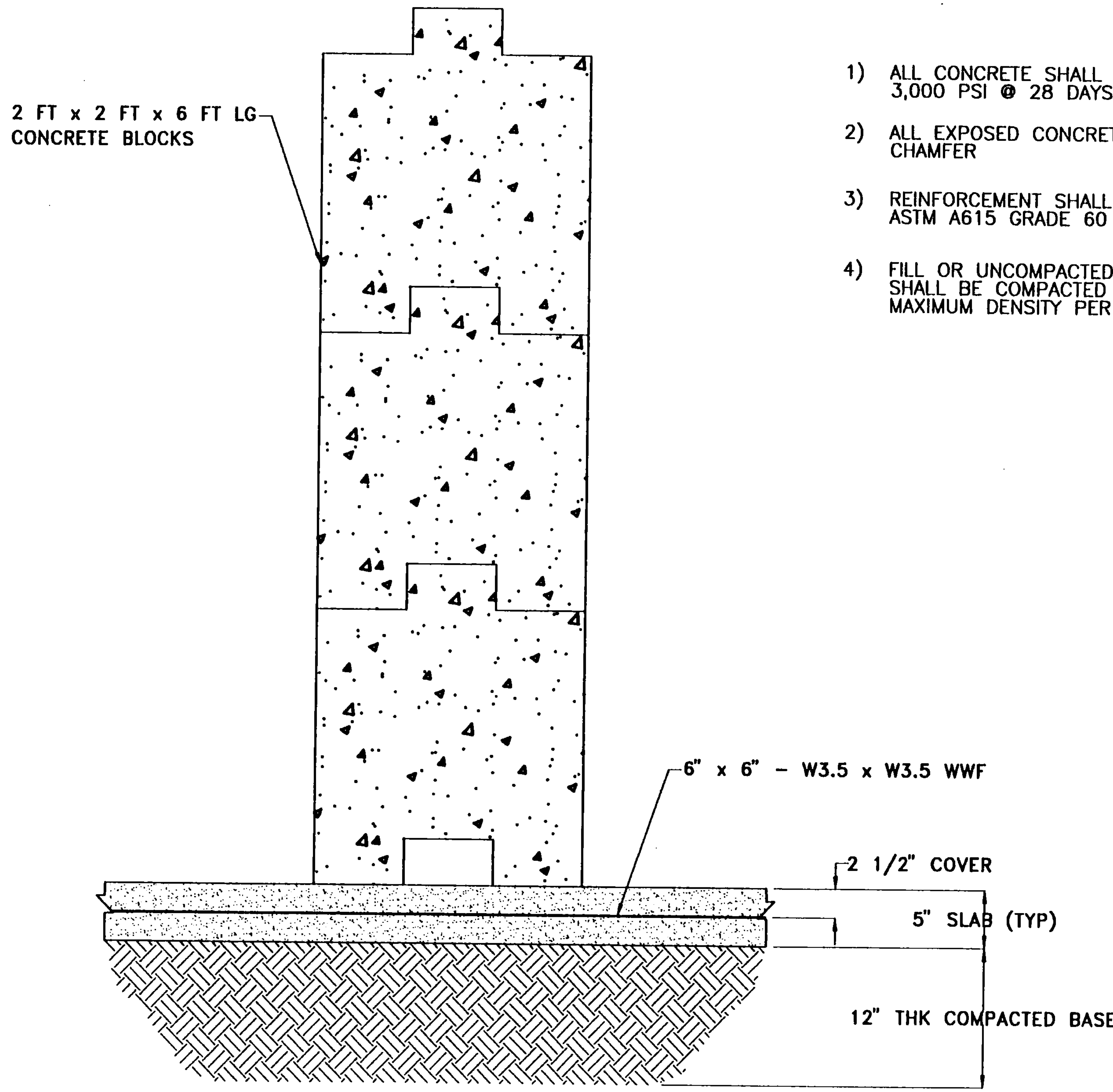
DWG NO. SECTION G

1) ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI @ 28 DAYS

2) ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 1/2" CHAMFER

3) REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615 GRADE 60

4) FILL OR UNCOMPACTED SOIL UNDER ALL FOUNDATIONS SHALL BE COMPACTED IN 8-INCH LAYERS TO 95% OF MAXIMUM DENSITY PER ASTM D-1557



SECTION H

TYPICAL CURBING DETAILS
WITH 6 FT CONCRETE BLOCK DIRT BARRIER

Williams Environmental Services
2075 West Park Place
Stone Mountain, GA 30087
404/879-4107 (fax) 404/879-4831

TPU4

TPU #4 SOIL REMEDIATION UNIT

EQUIPMENT PAD
FOR WOODS SITE
SECTIONS FROM 4WODPAD1

PAD

DATE	11/16/94
FIGURE 12.12	
DIRECTORY:	\WES\Jobs\Active\Woods\Dwgs\
FILENAME	PAD-H.dwg
DWG NO.	SECTION H

13

SECTION 13

DUST CONTROL

Dust shall be minimized at all times, including non-working hours, weekends and holidays. Water spray will be applied from a water truck or other means as needed to control dust during soil handling and stockpiling operations. Additionally, material stockpiles will remain covered with polyethylene plastic sheeting when not directly involved in processing.

Soils disturbed during operations will be sprayed with water as necessary to control dust. A sprinkler system will be used to mitigate wind erosion of existing soils on site. Again, plastic sheeting will be used to cover any soil piles not directly involved in processing. The goals of the Dust Control Program are no visible dust, as well as prevention of air levels that raise risk concerns for the chemicals of concern at the site. Further details regarding dust control and its measurement are discussed in the Ambient Air Monitoring Plan submitted by Burlington Environmental.

14

SECTION 14

HEALTH AND SAFETY

14.1 GENERAL

This section of the Thermal Desorption Work Plan details Health and Safety requirements for Williams thermal desorption activities on the site.

Williams personnel must also abide by the practices and policies specified in this section which address special HASP concerns during thermal desorption activities. The Williams Health and Safety Plan can be found in Appendix E.

14.2 SAFETY ADMINISTRATION

Principal in Charge

Williams will have corporate authority for HASP matters for work performed in the thermal desorption work area which includes the exclusion, contaminant reduction, and support zones described in Section 12.2 of the Thermal Desorption Work Plan. The HAS Officer is responsible for the day to day safety operation, with the Principal in Charge ultimately responsible for safety issues. The Principal in Charge and HASP Officer are identified in Section 2.0 of the Thermal Desorption Work Plan, Project Overview and Organization.

Health and Safety Officer

The Health and Safety (HAS) Officer will be responsible for implementation of and compliance with the HASP. Each Shift Supervisor and the Site Manager will be responsible for ensuring that personnel under their management are informed of HASP hazards and properly instructed in procedures for protecting human health and the environment.

The HAS Officer has the authority to stop any operation that he perceives to be immediately hazardous to personnel. After stopping the operation, the Site Manager will be informed and an Unsafe Work Practice Report will be completed.

The HAS Officer is responsible for preparing all safety response actions and coordinating training programs. In the event of an emergency, he is responsible for managing response activities.

The HAS Officer is responsible for conducting inspections of equipment and operating procedures to ensure compliance with the HASP Plan. A formal report is required from inspections which become part of the formal record and report to management. All problems found during an inspection and action taken to resolve the problem are placed into the record.

14.3 INSPECTIONS

During inspection, the inspector looks for malfunctions, deterioration, operator errors, or equipment failure which may cause or lead to the release of hazardous constituents to the environment or may represent a threat to human health. In addition to visual inspections, the data provided by instrumentation (e.g., changes in temperature or flow, pressure drop, position of limit switches, etc.) will aid the operators in detecting leaks and unsafe conditions requiring further investigation. Table 14-1 summarizes the potential problem areas for each of the categories of equipment to be inspected.

The records of inspections performed, observations noted and actions taken will include the information specified in Table 14-1, as a minimum.

A system for scheduling inspections will be established to provide for conducting periodic inspections at the required intervals. The system will enable management to determine whether inspections are being conducted as scheduled and when action may be required to insure compliance with the inspection frequency. Completed checklists will be signed and dated by the inspector before they are filed for future reference.

Housekeeping inspections will also be conducted by Williams' site supervisory personnel at regular intervals.

14.4 PERSONAL PROTECTIVE EQUIPMENT

PPE will be required while working in the exclusion zone. The minimum level of protection will be modified Level D as described in the Health and Safety Plan (HASP), Appendix E. The decision to upgrade to Level C protection will be based on the presence of visible dust and results of air monitoring as also described in the HASP.

14.5 PERIMETER AIR MONITORING

During periods of active site work, including soil pretreatment and thermal desorption treatment of soil, air samples may be collected from four locations along the fence line surrounding the BNRR property. For further details, regarding all perimeter air monitoring activities, reference the HASP.

15

SECTION 15

PROJECT QUALITY ASSURANCE/QUALITY CONTROL

15.1 ORGANIZATION

All personnel will be responsible for continuous adherence to the procedures set forth by the Thermal Desorption Work Plan during performance of on-site work activities. In no case may work be performed in a manner that conflicts with the intent of, or the inherent safety and environmental cautions expressed in these procedures. After due warning, contractor personnel violating health and safety procedures will be dismissed from the site. The general site organizational structure is provided in Figure 2-1.

15.2 PROJECT QUALITY ASSURANCE/QUALITY CONTROL PLAN

QA/QC procedures are intended to meet the following construction objectives:

- Assure that the proposed work is accomplished according to the requirement of all applicable Work Plans.
- Specify inspection and record keeping requirements for compliance with applicable Work Plans.

Williams' QA/QC Manager will be responsible for:

- Implementation of QA/QC Plan.
- Scheduling and coordination of QA/QC inspection activities.
- Directing and supporting QA/QC inspection personnel in performance of observations and tasks.
- Instructing QA/QC inspection personnel and record keepers on requirements and procedures.
- Verifying that test data are adequately recorded and maintained and that raw data are properly recorded, validated and interpreted.
- Verifying that the QA/QC Plan conforms with the requirements of the applicable Work Plans.

The QA/QC Manager will serve as the primary contact between BNRR, Burlington Environmental and Williams for quality control issues. The QA/QC Manager will answer directly to Williams' Principle in Charge regarding compliance with quality control requirements.

The QA/QC Manager will employ supporting personnel as required for execution of the Contractor's Quality Control Plan. These personnel will be Williams' personnel familiar with construction techniques for LTTD operations and inspection and observation procedures. Supporting personnel shall be thoroughly familiar with testing equipment which may be required as part of their inspection activities. Equipment supplied shall be accurately calibrated and properly employed. The supporting personnel shall answer directly to and be responsible to the QA/QC Manager. Support personnel shall provide all data and documentation required for completion of the Daily QC reports.

Williams' employees or their subcontractor personnel will perform all laboratory testing that may be required.

The QA/QC Manager will be responsible for holding weekly quality control meetings. As part of this meeting, QA/QC work accomplished, progress, and deficiencies (if any) will be discussed.

The Daily Production Report (Figure 15-1) and LTTD Roundsheet (Figure 15-2) will be used to record daily activities. Readings for the LTTD Roundsheet will be collected at 60 minute intervals from the Kaye data logger. These reports, supplemented with applicable testing data and subcontracted testing reports, will be compiled to make up the Daily QA/QC Report. These reports will be maintained at the job site. Additionally, Figure 15-3 shows an example of the log maintained for documenting AWFSOs.

At the completion of any work activity, the QA/QC Manager will perform a completion inspection and develop a punchlist of items which do not conform to the Scope of Work and provide the list to the Site Manager for corrective or follow-up actions. Once these items have been corrected, a follow-up inspection will be made to confirm that these items have been corrected. The completion punchlist will be incorporated into the Daily QA/QC Report along with the records of re-inspections and completion of activities.

The Sampling and Analysis Plan presented in Section 9.0 further discusses the specific plans, procedures and quality control work to be executed as part of the Production Operations phase of the project. Implementation and management of the Sampling and Analysis Plan shall be the responsibility of the QA/QC Manager.

FIGURE 15-1

Williams Environmental Services, Inc.

Daily Production Report

Client ____________________ WES Project No. ____________

Tons Processed This Date ____________________ Date ____________

Hours of Operation

	Start	Stop	Hours		Start	Stop	Hours
1				11			
2				12			
3				13			
4				14			
5				15			
6				16			
7				17			
8				18			
9				19			
10				20			

Total Hours of Operation ____________

Average Tons/Hour ____________

Total Tons to Date ____________

Fuel Usage: Start ____________

Finish ____________

Moisture Content ____________

Time and Reasons for Downtime

1 ____________________
2 ____________________
3 ____________________
4 ____________________
5 ____________________
6 ____________________
7 ____________________
8 ____________________
9 ____________________
10 ____________________
11 ____________________
12 ____________________
13 ____________________
14 ____________________
15 ____________________
16 ____________________
17 ____________________
18 ____________________
19 ____________________
20 ____________________

WES Verification By ____________________

Figure 15-2

WILLIAMS ENVIRONMENTAL SERVICES, INC. -- TPU ROUNDSHEET

CLIENT: DATE:
LOCATION: WILLIAMS PROJECT NUMBER:

PARAMETER	TIME											
KILN TEMPERATURE (F)												
TRANSITION DUCT TEMP. (F)												
SOIL TEMPERATURE (F) INSTANTANEOUS/ROLLING												
BAGHOUSE TEMPERATURE (F)												
SCC TEMPERATURE (F)												
SCRUBBER SUMP TEMP. (F)												
SCRUBBER INLET TEMP. (F)												
BAGHOUSE DELTA P (In. H2O)												
I. D. FAN (AMPS)												
KILN DELTA P (In. H2O)												
DRUM R.P.M.												
CUMULATIVE SCALE READING												
SOIL FEED RATE (TPH) INSTANTANEOUS/ROLLING												
BAGHOUSE DUST RATE (TPH) INSTANTANEOUS/ROLLING												
PRIMARY FUEL METER (In. H2O)												
BURNER SETTING (%V.O.)												
SECONDARY FUEL METER												
BURNER SETTING (%V.O.)												
pH, INSTANTANEOUS/ROLLING												
SCC OXYGEN (%)												
CO (ppm)												
SCRUBBER FLOWRATE (GPM)												
APC PURGE RATE (GPM)												
APC RECYCLE FLOWRATE (GPM)												

FIGURE 15-3

WILLIAMS ENVIRONMENTAL SERVICES, INC.
AWFSO EXCURSION LOG

CLIENT:
LOCATION:

DATE:
WILLIAMS PROJECT NUMBER:

PARAMETER	INSTRUMENT NUMBER	TIME	ACTUAL VALUE	AWFSO VALUE	WASTE FEED (ON/OFF)	DOWN TIME	CAUSE OF EVENT	CORRECTIVE ACTION	RECORD OF REPORT (YES/NO)	TIME OF APPROVAL TO RESTART

SECTION 16

REMEDIAL ACTION CONTINGENCY PLAN

16.1 GENERAL

The Remedial Action Contingency Plan presented in this section sets forth the requirements for responding to emergencies that could occur during implementation of the Woods Industries Site remedies.

This Plan presents a discussion of emergency recognition and prevention, emergency response procedures, lines of authority, and evacuation procedures which would be implemented in the event of an emergency. All on-site personnel involved with implementation of the remedial activities must be familiar with the Remedial Action Contingency Plan described herein, and the specific Health and Safety Plan. A detailed emergency response/contingency plan is outlined in Section 13 of the HASP.

16.2 GENERAL RESPONSE CONSIDERATIONS

The Operations Manager for the remedial contractor shall be responsible for directing emergency response operations discussed in this Remedial Action Contingency Plan.

Due to the nature of the site remedy for soil, the emergencies that may arise include fires involving the LTTD, and water-related incidents such as spills of wastewater, flooding, etc. The following procedures would be implemented in the event of an emergency.

<u>Spill Containment Team</u>

A Spill Containment Team shall be designated and will consist of on-site personnel who respond to soil treatment spills. The Spill Containment Team will be comprised of trained and qualified employees.

Off-Site Personnel

Off-site personnel who may become involved in an emergency at the site include representatives of local, state, or federal organizations offering response or support to the emergency. Prior to initiating site remedial activities, Williams will make arrangements with the appropriate agencies (fire department, police, spill contractor, etc.) for support and shall advise these authorities of the types of emergencies that may arise. Prior to implementation of the site remedy, a contact person at each agency will be established and the following information will be provided to each:

- Site-specific hazards;
- Site emergency procedures; and
- Decontamination procedures.

Federal Response Organizations

Site emergencies involving significant chemical releases will be coordinated with the appropriate federal response organizations. The National Response Center (NRC) in Washington, D.C., has been established under the National Contingency Plan (NCP) to activate federal response by a National Response Team(s) (for USEPA Region X). The OSC is responsible for ensuring that necessary response actions are taken to protect the public and environment from the effects of a chemical release. Many federal agencies with specific technical expertise are available to the OSC.

To aid the Operations Manager, site personnel, and the OSC in taking action in response to an emergency, a Remedial Action Contingency Plan decision list has been developed and is presented below:

REMEDIAL ACTION CONTINGENCY PLAN
WOODS INDUSTRIES SITE

Whenever there is an imminent or actual emergency situation at the Woods Industries Site, the following steps will be taken:

1. The emergency will be immediately reported to the Operations Manager.

2. The Operations Manager will assess the emergency and identify:

   - The name, location, and telephone number of the appropriate external emergency agency(ies);
   - The nature of the emergency;
   - The existence of hazardous conditions - fire, explosion, spill, etc.;
   - The amount of material involved or released; and
   - The extent to which evacuation should occur.

3. The Operations Manager will notify all personnel on-site and activate appropriate response (e.g., spill containment/fire fighting team). The site roster will be verified.

4. All work may be stopped and evacuation initiated if appropriate.

5. The Operations Manager (or designated alternate) will notify the following parties:

	Phone #'s
Williams' Health and Safety Officer	800/247-4030
Williams' Project Manager, Mark Fleri	800/247-4030
BNRR Project Manager, Bruce Sheppard	206/467-3382
Burlington Environmental Project Manager, David Eagleton	618/281-7173

6. The Operations Manager will call the external emergency agencies as may be necessary.

City :	
Fire Department	911, 509/248-2100
Police Department	911, 509/248-1010
County Health Department	509/575-4040
Washington State Police	509/575-2320
Washington State Spill Hotline	509/575-2491
Lynda Priddy (On-Site Coordinator and Project Coordinator Region X)	206/553-1987
Cathy Massimino (EPA Tech. Adv.)	206/553-4153
National Response Center	800/424-8802
Chemtrec	800/424-9300
Poison Control Center of Washington	800/732-6985

16.3 EMERGENCY RECOGNITION AND PREVENTION

During implementation of the site remedies, individual on-site personnel should be constantly alert for indication of potentially hazardous or unsafe situations or conditions. In addition, personnel must be aware of signs or symptoms in themselves or others that may indicate hazardous conditions or exposure. Timely recognition of potentially hazardous conditions can avert an emergency. Daily safety meetings will be held prior to initiation of work to discuss the potential hazards associated with the week's work tasks. Emergency procedures and rest/work cycles will be reviewed at the weekly safety meetings. In addition, problems observed during the previous week's work should be discussed and corrected, if possible.

16.4 EMERGENCY RESPONSE PROCEDURES

The response to an emergency starts with the notification of trouble and continued after the emergency through the preparation of equipment and personnel for the next potential emergency. The stages of emergency response consist of notification, emergency evaluation, response action, follow-up, and documentation. The stages of emergency response are presented and discussed below in logical order.

<u>Notification</u>

Upon discovering the emergency, the Operations Manager will be responsible for notifying other on-site personnel of the emergency. A predetermined internal audio communications device (siren, whistle) will be activated to notify personnel to stop work activities, to lower background noise (if possible), and to initiate emergency procedures.

The on-site emergency response personnel (e.g. Spill Containment Team) will be notified and informed by the Operations Manager of the following information.

- Equipment and personnel resources required for hazard mitigation;

- Where and when did it happen and to whom;

- What is the extent of the damage; and

- What form of aid or response is required.

Response

At this stage of emergency response, the Operations Manager will decide the type of action required based on the available information. The response action(s) is then implemented. The Operations Manager will also designate on-site personnel responsibilities in order to accomplish the response actions. Response actions may include the following:

1) Enforcement of the Buddy System

No one will enter the exclusion zone or hazardous area without a partner. Line-of-sight contact between rescue/response personnel and support will be maintained.

2) Allocate Resources

Along with the designation of on-site personnel to aid in the rescue/response operations, the Operations Manager will also allocate on-site equipment to be used in the rescue/response operation.

3) Request Aid

The Operations Manager will contact off-site personnel and/or agencies as required to aid in the rescue/response operation.

4) Control

The Spill Containment Team will bring the hazardous situation under complete or temporary control. The intent of control is to prevent the spread and impact of the emergency. In the event of a fire, the Operations Manager will immediately call the City of Yakima Fire Department and decide if attempts should be made by on-site personnel to control the fire depending upon the degree of the fire. In the event of a spill or chemical release, the Spill Containment Team will contain the spill and prevent further migration by absorbent pads.

5) Stabilize

The Operations Manager or designated alternate(s) will administer medical procedures as required to injured personnel (see Health and Safety Plan) and the cause of the emergency will be attended to, if possible (i.e., turn off leaking valve, shut-down treatment system).

6) Evacuate

On-site personnel will be moved a safe distance upwind of the hazardous area. The emergency incident will be monitored for significant changes. The designated public safety personnel (city and state police, fire department) will be contacted when there is a potential or actual need to evacuate the off-site population. Evacuation of off-site personnel is the responsibility of government authorities.

7) Follow-Up Review

Prior to resuming normal site activities, on-site personnel must review the cause of the emergency and aid in the revision of this Remedial Action Contingency Plan and/or the Contractor's Remedial Action Contingency Plan according to new site conditions and events that took place during emergency response. Emergencies or accidents that result in any fatalities or five or more hospitalizations must be reported to OSHA.

8) Equipment

In response to an emergency, equipment will be necessary to rescue victims, protect response personnel, and to mitigate hazardous conditions (e.g., contain spills). Table 16.1, provided at the end of this section, presents a list of basic on-site equipment and supplies for emergency response. This list will be updated during the Remedial Design to include special equipment that should be obtained depending upon specific conditions or emergencies that may arise during implementation of the site remedies. After an emergency, site equipment and supplies must be restocked, repaired, or replaced as necessary.

9) Documentation

The Operations Manager will be responsible for documenting the events of the emergency. Documentation of the emergency may be used to prevent reoccurrence of the emergency and as evidence for potential legal actions. Documentation may be accomplished by the use of bound field notebook and written transcripts of tape recordings made during the emergency.

Documentation of an emergency should include the following:

- Chronological history of the emergency;
- Facts pertaining to the incident when they become available;
- Names and titles of personnel involved;
- Actions taken, orders and instructions given and received, and decisions made by the Operations Manager and other on-site and off-site personnel; and
- Potential exposures of on-site personnel.

16.5 EVACUATION ROUTES

In the event of severe emergency (e.g., fire or explosion), normal site exit routes may become blocked. Consideration will be given to the following factors when developing alternate evacuation routes:

- Upwind locations;
- Accessibility of potential routes;
- The development of two or more routes;
- Equipment necessary to mark-out routes; and
- The mobility of site personnel wearing protective equipment.

16.6 REMEDIAL ACTION CONTINGENCY PLAN FOR THERMAL TREATMENT

The Contingency Plan will be activated whenever there is an imminent or actual threat to human health or the environment from fire, explosion, or release of hazardous waste or constituents. The decision to implement the contingency plan rests with the emergency coordinator, but all other members of the site remediation team will also be familiarized with what constitutes "imminent or actual danger" in case they ever have to decide whether or not to contact the emergency coordinator. The following list is representative of emergency situations which could arise. It is not intended to be comprehensive or indicative of every emergency which could arise.

POSSIBLE EMERGENCY SITUATIONS

1. Fire or Explosion

   a. Fire damages thermal treatment unit;
   b. Fire spreads to waste stockpile;
   c. Fire spreads to control room;
   d. Use of water could result in contaminated run-off; and
   e. An explosion occurs, damaging equipment and causing a a material release.

2. Spill or Material Release

   a. Spill can be contained on-site, but potential exists for soil contamination;
   b. Material release was dispersive; potential soil contamination beyond "hot zone" or off-site, risk of inhalation or ingestion of contaminated soil; and
   c. Material release reached surface water; risk of soil and water traveling off-site.

EMERGENCY RESPONSE PROCEDURES

1) Notification

The person discovering the emergency situation will notify the emergency coordinator (either the Operations Manager or the Chief Operator). The emergency coordinator for the fire and police departments, local ambulance squads, hospital, and federal, state, and local agencies which would require notification will be posted in the field office and in the control room. Site personnel will be notified by voice instructions or two way radio. The emergency coordinator will designate an employee to wait by the facility entrance to direct outside emergency response teams to the proper area.

2) Assessment of Hazards

The emergency coordinator will be initially responsible for determining the direct and indirect hazards to human health and the environment. He will consider the nature of the release (to air, water, or soil), the quantity of material released, the approximate affected area, the potential for off-site exposure, and the potential for additional releases in the immediate future. This information will be transmitted to site personnel involved in the emergency response effort, management, and local emergency response agencies.

If the emergency coordinator determines that evacuation of local areas may be advisable, the appropriate local authorities will be notified, giving the name and telephone number of the reporter, name and address of the facility, time and type of incident, name and quantity of materials involved (to the extent known), the extent of any injuries, and the possible hazards to human health or the environment outside the facility.

3) Control Procedures

Potential emergencies include: fire or explosion, spills or material releases, or floods. Natural disasters such as hurricanes or tornadoes could fall into one of these categories depending upon the severity of the incident. During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste storage areas to the facility. The emergency coordinator will have the authority to stop processes and operations, collect and contain released waste, and remove or isolate waste.

4) Fire or Explosion

Fire fighting efforts will be concentrated on containing a fire in the "exclusion zone" or preventing a fire at another part of the facility from reaching the equipment and material located in the "exclusion zone".

The following procedures will be followed in responding to a fire or explosion in the "exclusion zone" at the site remediation project:

- waste transfer operations will immediately cease.
- if the fire involves the thermal treatment equipment, emergency shutdown procedures will be initiated immediately.
- all Williams personnel not actively involved in fighting the fire will report to the office to be accounted for. Visitors will also report to the office.
- injured persons will be removed and emergency medical treatment will be secured.
- if the Operations Manager determines that outside assistance is needed, the coordinator or his designee will call the fire department.

Site evacuation may be necessary in the event of a major fire or explosion. All personnel will receive training in evacuation procedures and exit routes from their usual work areas.

5) Spills or Material Release

Given the nature and physical characteristics of the material being treated, there is virtually no potential for a catastrophic material release (as in an explosion which would disperse material over a wide area). Instead, any releases would be more likely to occur during material handling and would not ordinarily require activation of the Contingency Plan because they would involve limited quantities of material that would not pose a threat to human health or the environment. For completeness, the recommended procedures for responding to material releases are included in this section.

The most likely scenario for a release of the contaminated soil would occur during transport from the excavation to the staging area. Spilled material will be collected using the front-end loader and shovels (as needed) and will be returned to the contaminated soil stock pile for future processing.

Another possibility for a material release prior to treatment would occur in transferring soil from the staging area to the feed hopper. Again, the spilled soil would be collected with a front-end loader or shovels, as appropriate, and would be put into the feed hopper for thermal treatment.

The soil leaving the treatment unit is expected to be non-hazardous and will be stored in the verification holding area until chemical analyses confirm this assumption. If a batch of treated soil does not meet specifications, it will immediately be recycled through the treatment system. In transferring the material from the storage area back to the feed hopper, the potential exists for a material release. As with the untreated material, spills would be collected and placed in the feed hopper.

6) Flood

It is unlikely that the thermal treatment equipment, contaminated soil stockpile, or the clean soil storage pile would be subject to flooding. If the working areas were threatened by floodwaters during the site remediation, operations would be suspended, the contaminated stockpile would be compacted (if necessary), and portable equipment and vehicles would be moved to higher ground. The clean soil storage pile is not of concern as it contains only uncontaminated material.

7) Emergency Equipment

Table 16.1 lists the emergency equipment that will be maintained at the site. Emergency equipment will be inspected on a weekly basis. First aid supplies will be available at the office and will include the following items:

- bandage materials (adhesive strips, gauze pads and rolls, adhesive tape, butterfly bandages);

- antibacterial ointments;

- small splints; and

- aspirin.

Half face respirators with organic vapor canisters will be maintained in the control room. One will be provided for each employee; additional respirators will be maintained for visitors and emergency response personnel. Full face respirators will also be kept in the control room. Gloves and Tyvek™ suits will be provided for emergency use by visitors or emergency response agencies. Cotton flame-resistant clothing will be provided for work near hot surfaces.

TABLE 16.1
ON-SITE EMERGENCY EQUIPMENT

Item	Quantity	Physical Description	Location	Capabilities
Fire Extinguishing System	8	Portable general purpose fire extinguisher	Control room, office, decontamination trailer	First response to small fires
	1	35 gpm water system	Contaminant reduction zone	Supplemental water for fire fighting
Spill Control Equipment	2	Hand shovel	Control room	Dedicated solely to handling contaminated soil and treated residues
	1	Front-end loader	Contaminant reduction zone	Transferring large quantities of spilled soil or ash
Internal Communications Equipment				
Two Way Radio	3 sets	Hand-held, battery operated	Control room	Local, communication beyond voice range up to 500 ft.
External Communications Equipment				
Telephone	2	Standard rotary dial or push-button telephone	Control room, office	Summon local emergency response agencies

Item	Quantity	Physical Description	Location	Capabilities
	1	Mobile phone		Summon local emergency response agencies
Decontamination Equipment	12 minimum	Plastic drop cloths	Decontamination trailer	Protect surfaces from contaminated materials
	2	Wash tubs	Decontamination trailer	To hold disposed items
First Aid Equipment	1	First aid kit	Control room	Contains bandages, antibacterial ointments, small splints, aspirin, syrup of ipecac; for first response to injury
Protective Clothing and Equipment	1 per employee plus spares	Half-face respirators with canisters for organic vapors	Control room	Personal protection from low to moderate levels of organic vapors
	6	Full-face respirators with canisters for organic vapors	Control room	Personal protection from moderate to high levels of organic vapors
	6 suits*	Tyvek suits	Control room	To cover clothing, protection from dermal exposure to chemicals

Item	Quantity	Physical Description	Location	Capabilities
	2 sets	Cotton flame-proof clothing	Control room	To cover clothing, protection from hot surfaces
	12 pair minimum*	Outer gloves	Control room	To cover hands, protection from dermal exposure to chemicals
*Employee suits and gloves maintained separately				

A

APPENDIX A
PERFORMANCE TEST PLAN
WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON

SUBMITTED TO:

BURLINGTON NORTHERN RAILROAD
2000 FIRST INTERSTATE CENTER
999 THIRD AVENUE
YAKIMA, WASHINGTON 98104-1105

PREPARED FOR:

WILLIAMS ENVIRONMENTAL SERVICES, INC.
2075 WEST PARK PLACE
STONE MOUNTAIN, GEORGIA 30087

January 27, 1995
FOCUS PROJECT NO. 059312

PREPARED BY:

FOCUS ENVIRONMENTAL, INC.
9050 EXECUTIVE PARK DRIVE
SUITE A-202
KNOXVILLE, TENNESSEE 37923

PERFORMANCE TEST PLAN

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1. QUALITY ASSURANCE PROJECT PLAN

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ACRONYMS AND ABBREVIATIONS

acfm .... actual cubic feet per minute
APC .... air pollution control
ASTM .... American Society for Testing and Materials
AWFSO .... Automatic Waste Feed Shutoff
BEI .... Burlington Environmental, Inc.
BIF .... Boilers and Industrial Furnaces
Btu .... British thermal unit
CEM .... continuous emissions monitor
CEMS .... continuous emissions monitoring system
CERCLA .... Comprehensive Environmental Response, Compensation, and Liability Act
CFR .... Code of Federal Regulations
CO .... carbon monoxide
DRE .... destruction and removal efficiency
EPA .... Environmental Protection Agency
Focus .... Focus Environmental, Inc.
gpm .... gallons per minute
gr/dscf .... grains per dry standard cubic foot
HCl .... hydrogen chloride
hp .... horsepower
ID .... induced draft
lbs/hr .... pounds per hour
LTTD .... low temperature thermal desorption
mg/kg .... milligrams per kilogram
M5 .... EPA Method 5
M23 .... EPA Method 23
MMT .... EPA Multi-Metals Train
OCL .... organochlorine
PCDDs .... polychlorinated dibenzo-p-dioxins
PCDFs .... polychlorinated dibenzofurans
POHC .... principle organic hazardous constituent
p,p'-DDT .... 1,1'-(2,2,2-Trichloroethylidene)bis[4-chlorobenzene]
ppm_V .... parts per million by volume
psig .... pounds per square inch, gauge
QA/QC .... quality assurance/quality control
QAPP .... Quality Assurance Project Plan
TEQ .... Total Equivalent 2,3,7,8-TCDD
TCDD .... tetrachlorinated dibenzo-p-dioxins
USEPA .... United States Environmental Protection Agency
WAC .... Washington Administrative Code
w.c .... water column
Williams .... Williams Environmental Services, Inc.

1.0 INTRODUCTION

As part of a Removal Action being performed by Burlington Northern Railroad, pursuant to a Removal Action Order issued by the U.S. Environmental Protection Agency (USEPA) in March, 1993, on-site treatment of approximately 19,000 tons of soil will be conducted at the Woods Industries site in Yakima, Washington. The project will be conducted using the Williams Environmental Services, Inc. (Williams) low temperature thermal desorption (LTTD) system.

A Thermal Desorption Work Plan (revised, March 14, 1994) has been prepared by Williams that describes the proposed plan for executing the entire project. This performance test plan has been prepared by Focus Environmental, Inc. to describe the test objectives, process equipment design features, process operating parameters, sampling procedures, analysis procedures, and monitoring procedures that will be used during the performance test program. Attachment 1 is a Quality Assurance Project Plan (QAPP) that describes quality assurance procedures that will be used during the performance test.

The soils are primarily contaminated with organochlorine (OCL) pesticides (hexachlorobenzene, p,p'-DDT, and dieldrin). Initial removal action activities conducted on-site included the demolition of buildings in January and February, 1993. From April to September, 1993, some contaminated soils were excavated and placed in temporary storage areas. Soils with high concentrations of OCL pesticides were stored in rolloff boxes.

The major mechanical components of the LTTD system consist of a soil pretreatment system (optional), soil feed system, a thermal desorber (rotary dryer-type), treated soil handling system, baghouse, induced draft (ID) fan, thermal oxidizer, quench, packed bed scrubber, stack, liquid-phase activated carbon units, auxiliary fuel supply system, and a process control, monitoring, and interlock system.

Following mobilization and erection of the LTTD system, the unit will undergo a shakedown period to confirm the proper operation of all mechanical, electrical, and instrument systems and to establish appropriate operating parameters. The system will initially be started up using clean soils until the proper operation of all system components are confirmed.

After proper mechanical, electrical, instrument, and process operations are confirmed, the system will initiate processing of contaminated materials. The objective of this phase of the startup will be to establish the optimum process conditions for treating the contaminated materials. A pretest consisting of one run will be conducted during this period to prepare for the performance test. The process operating conditions and sampling and analysis procedures for conducting the pretest run will be the same as the procedures that will be used during the performance test. The shakedown period will be limited to 360 hours unless additional hours are approved by USEPA Region X. The 360 hours includes only that time when contaminated soil is being fed to the system. A breakdown of the hours includes approximately 168 hours for certification of the CEM system, with the remaining 192 hours for shakedown and pretest of the unit. The system will be limited to treating no more than one third of the contaminated soils during the shakedown and performance test period.

Following the receipt of the pretest results, a performance test will be conducted which will consist of three replicate sampling runs. The goals of the performance test will be to demonstrate the ability of the LTTD system to reduce the concentrations of OCL pesticides in the soil and to meet applicable air emission control requirements. The performance test will be deemed successful if the requirements outlined below are met:

- The concentrations of organochlorine (OCL) pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene) and metals (As, Hg, and Pb) in the treated soil meets those specified in Washington State Model Toxic Control Act, Residential Method B. The cleanup goals are listed in Table 1-1.

- The concentration of 2,3,7,8-TCDD (TEQ) in the treated soil meets the agreed upon limits listed in Table 1-1.

- The ambient concentrations of OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene) resulting from stack gas emissions must meet WAC maximum Acceptable Source Impact Levels (ASIL). Ground-level concentrations are calculated based on a dispersion factor resulting from stack height, stack gas velocity, and stack gas temperature. The allowable stack gas concentrations listed in Table 1-2 are based on the EPA SCREEN model and estimated stack gas data. More accurate allowable concentrations will be calculated when stack gas data from the performance test are available. If necessary, evaluation of stack gas emissions would be based upon site-specific modeling and/or 24-hour WAC Maximum Allowable Ground-Level Concentrations.

- The ambient concentrations of indicator metals (As, Hg, and Pb) resulting from stack gas emissions must meet WAC Maximum Allowable Annual Ground-Level Concentrations. In addition, ambient concentrations of any remaining metal of concern (Be, Cd, Cr, Ni, Sb, Ba, Se, Ag, Tl) must meet appropriate risk specific dose (RSD)(for carcinogens) or reference air concentrations (RAC)(for noncarcinogens) as specified by 40 CFR 266, Appendix IV and V. The estimated allowable stack gas concentrations are listed in Table 1-2.

- A 99.99 percent destruction and removal efficiency (DRE) of a principal organic hazardous constituent (POHC) is achieved per 40 CFR 264.343. A 99.99% DRE will be demonstrated by measuring the concentration of hexachlorobenzene in the feed soil and stack gas.

- The concentration of particulates in the stack gas is less than 0.03 grains per dry standard cubic feet (gr/dscf), corrected to 7 percent oxygen.

- The emission rates of hydrogen chloride (HCl) and chlorine (Cl_2) in the stack gas are controlled to meet the ambient air impact guidelines described in the Boilers and Industrial Furnaces (BIF) guidelines described in 40 CFR 266.107. In addition, if the feed rate of total chlorine would result in an emission rate of greater than 4 lbs/hr of hydrogen chloride (HCl) in the stack gas, 99% removal of HCl will be demonstrated.

- The concentration of carbon monoxide (CO) in the stack exhaust gas is less than 100 ppm_v, based on a 60 minutes rolling average.

- Risk evaluation results related to stack gas emissions including products of incomplete combustion (PICs) performed according to the methodology provided in the Ambient Air Quality Impact Report shows risk within or below the range of acceptable risk.

In addition to the above requirements, the stack gas will be sampled and analyzed for total polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs), volatile organic compounds and semi-volatile organic compounds that are potential products of incomplete combustion (PICs). Total PCDDs/PCDFs will be calculated by adding all congeners from the tetra- through the octa- PCDD/PCDF groups. In addition, total equivalent (TEQ) 2,3,7,8 TCDD based on the relative potency of the isomers in accordance with USEPA guidelines will be calculated for use in risk evaluation. Risk evaluation will be made consistent with the methodology used in the Ambient Air Quality Impact Report (AAQIR) for the Woods Industries Site prepared by Burlington Environmental, Inc.

The performance test will consist of three replicate sampling runs. In the test, soil feed and operating conditions are designed to achieve the following goals:

- Establish maximum soil mass feed rate (target 30 tons/hr)
- Demonstrate minimum thermal desorber exit soil temperature (target 700 °F)
- Demonstrate minimum thermal oxidizer exit gas temperature (target 1700 °F)
- Demonstrate minimum Air Pollution Control (APC) system recycle water flow rate
- Demonstrate minimum APC system purge rate (target 12 gpm)
- Demonstrate minimum packed bed scrubber recycled water pH (target 4)
- Establish control limits for the LTTD and Air Pollution Control (APC) system operating parameters
- Establish maximum stack gas velocity by correlating the velocity to ID fan amperage
- Establish minimum oxygen concentration in the stack gas.

Stack sampling protocols for the performance test are summarized as follows:

- Particulates and HCl by EPA Method 5 (BIF Method 0050)
- OCL Pesticides and Semi-Volatile organics by EPA Modified Method 5 (SW-846 Method 0010).
- Volatile organics by EPA Volatile Organics Sampling Train (VOST SW-846 Method 0030)
- Metals by EPA Multiple Metals Train (EPA Draft Method 29)
- PCDDs/PCDFs by EPA Method 23 (EPA Method 23)
- Continuous emissions monitoring (CEM) for CO (EPA Method 10) and O2 (EPA Method 3A).

Specific references used in preparing the performance test plan include:

- Washington Administrative Codes 173-30-740(1)(c).
- Williams Environmental Services, Inc., "Thermal Desorption Work Plan", Woods Industries Site, Yakima, Washington.
- Burlington Environmental, Inc, "Ambient Air Quality Impact Report", Woods Industries Site, Yakima, Washington.
- USEPA, "Methods Manual for Compliance with the BIF Regulations", EPA/530-SW-91-010, December, 1990.
- USEPA, "Standards for Miscellaneous Treatment Units", Subpart X, 40 CFR 264.
- USEPA, "New Source Performance Standards, Test Methods and Procedures", Appendix A, 40 CFR 60.
- USEPA, "Test Methods for Evaluating Solid Waste", Third Edition, 1986, revised 1990.
- American Society for Testing and Materials, "Annual Book of ASTM Standards", latest annual edition.

Attachment 1 presents the Performance Test Quality Assurance Project Plan.

Table 1-1. Soil Cleanup Goals

Sampling Parameters	Soil Cleanup Goal[a] (mg/kg)
Pesticides	
Aldrin	0.0588
alpha-BHC	0.159
beta-BHC	0.556
gamma-BHC (lindane)	0.769
Chlordane	0.769
p'p'-DDD	4.17
p'p'-DDE	2.94
p'p'-DDT	2.94
Dieldrin	0.0625
Endrin	24
Heptachlor	0.222
Heptachlor epoxide	0.11
Hexachlorobenzene	0.625
Methoxychlor	400
Toxaphene	0.909
Dioxins/Furans (2,3,7,8-TCDD TEQ) [b]	0.001
Metals	
Arsenic	20
Lead	250
Mercury	1

a WAC 173-30-740 (1)(c)(iii), based on total metals concentrations

b BNRR/USEPA agreement

Table 1-2. Allowable Air Emission Limits

Sampling Parameters	Acceptable Source Impact Level (ASIL)[a] [Annual Average] (μg/m3)	Allowable Stack Gas Emission[b] [Annual Average] (μg/m3)
Pesticides		
Aldrin	0.0002	0.77
alpha-BHC[c]	0.64	2473.60
beta-BHC[c]	0.64	2473.60
gamma-BHC (lindane)[c]	0.64	2473.60
Chlordane	0.0027	10.44
p'p'-DDD	0.1	386.50
p'p'-DDE	(d)	–
p'p'-DDT	0.01	38.65
Dieldrin	0.0002	0.77
Endrin[c]	0.12	463.80
Heptachlor	0.00077	2.98
Heptachlor epoxide	0.000384	1.48
Hexachlorobenzene	0.002	7.73
Methoxychlor[c]	13.32	51481.80
Toxaphene	0.003	11.60
PCDDs/PCDFs		
2,3,7,8-TCDD (TEQ)	0.00000003	0.000116
Metals[e]		
Arsenic	0.00023	0.89
Beryllium	0.00042	1.62
Cadmium	0.00056	2.16
Chromium	0.000083	0.32
Silver[c]	0.12	463.80
Selenium[c]	0.28	1082.20
Nickel[c]	1.32	5101.80
Mercury[f]	0.3	1159.50
Lead[f]	0.09	347.85
Thallium[f]	0.5	1932.50
Barium[f]	50	193250.00
Antimony[f]	0.3	1159.50

Notes:

[a] (WAC) Chapter 173-460, Controls for New Sources of Toxic Air Pollutants

[b] Based on a dispersion factor [SCREEN Model] of 3,865

[c] Converted from a 24-hour average to an annual average by multiplying with a factor of 0.4

[d] By-product of DDT; unit risk factors needed to calculate regulatory limits were not available

[e] The more restrictive metals from either the Washington ASIL or the Reference Air Concentrations from 40 CFR 266, Appendix IV are listed

[f] Reference Air Concentrations from 40 CFR 266, Appendix IV

2.0 LTTD STARTUP/SHAKEDOWN

2.1 LTTD STARTUP

The LTTD will undergo a comprehensive startup and shakedown period prior to the performance test. During this period, the LTTD subsystem will be thoroughly tested to verify that all design criteria are met and that each subsystem, and the unit as a whole, will perform in a consistent and predictable manner. Also, during this period, the LTTD will be tested to determine various performance parameters in preparation for conducting the performance test.

2.2 LTTD SHAKEDOWN

Following the startup phase, a two-phase shakedown of the LTTD operation will be conducted. In the first phase, uncontaminated soils will be fed into the LTTD to evaluate system performance. When performance is deemed acceptable by Williams and Burlington Environmental, Inc. (BEI), the second phase of the shakedown will commence. Contaminated soils will be fed to bring the LTTD to a point of readiness for the pretest. A maximum of 360 hours of operating time on contaminated soil will be allowed during the Shakedown including the Pre-performance test run.

2.3 SHAKEDOWN CONDITIONS

The anticipated LTTD shakedown operating conditions are listed in Table 2-1. The range in shakedown operating conditions is intentionally broad to account for the expected operating envelope during this period. Minimum and maximum conditions are not outside of the range expected to be established by the performance test. Performance test operating conditions are targeted in a narrower range (See Table 3-25) to demonstrate minimum and maximum conditions. Treated soil will be sampled and analyzed to meet the cleanup goals as described in Table 1-1. One pre-performance test (pretest) run will be performed following the shakedown period. The pretest run conditions will be identical to the test runs during the performance test, and samples for the run will be collected and analyzed according to the methods described in Section 3.3. When analytical data from the pretest indicate that the LTTD will perform as planned, the performance test will be initiated. The anticipated time between the pretest and performance test as shown in Figure 3-11 is approximately 1 1/2 weeks.

Table 2–1. Planned Shakedown Operating Conditions [a]

Parameter	Test Conditions [b]
Thermal desorber soils feed rate (tons/hr)	20 – 30
Thermal desorber gas outlet temperature (°F)	250 – 450
Thermal desorber treated soil exit temperature (°F)	700 – 1,100
Thermal desorber pressure (inches w.c.)	–0.01 – –0.05
Propane feed rate (scf/hr)	As required
Thermal desorber combustion air flow rate (acfm)	9,000 – 13,000
Thermal oxidizer combustion air flow rate (acfm)	10,000 – 15,000
Thermal oxidizer gas outlet temperature (°F)	1,700 – 2,100
Quench outlet temperature (°F)	160 – 200
Packed bed scrubber recycle water pH	4 – 10
Baghouse differential pressure (inches w.c.)	1 – 10
ID fan current (amps)	(c)
APC recycle water flow rate (gpm)	(c)
APC purge rate (gpm)	4 – 16
CEMs carbon monoxide (ppm_v)	< 100

[a] All values are estimated ranges.

b See Table 3–26 for proposed data reduction method (instantaneous, rolling averages)

[c] Determined during clean soil shakedown, approved by Agency

3.0 PERFORMANCE TEST PLAN

3.1 OVERVIEW

The performance test plan includes the following components:

- Performance test objectives
- Detailed engineering description
- Sampling procedures
- Analytical procedures
- Monitoring procedures
- Performance test schedule
- Detailed performance test protocol
- Operating conditions for the emissions control equipment
- Allowable operating limits objectives
- Quality assurance/quality control procedures
- Performance test reports.

3.2 LTTD PERFORMANCE

Based upon the results of engineering analyses and experience in operating the LTTD, Williams believes that the conditions specified in this performance test plan will be adequate to ensure compliance with specified soil cleanup levels and all applicable guidance and regulation of process emissions.

A performance test of the LTTD system will be conducted to demonstrate the ability of the LTTD to effectively remove contaminants from the soil and meet stack gas emission limits. The LTTD system will be operated for 1 to 4 hours prior to the performance test on contaminated materials in order to establish equilibrium conditions within the system. Highly-contaminated soils, representing "worse-case" feed properties that are stored in rolloff boxes will be blended with other contaminated soils and used during the performance test. This combination of soils will therefore represent a worse-case, representative mixture of soils to be treated in the post-performance-test period.

3.3 DETAILED ENGINEERING DESCRIPTION

The LTTD will be used to thermally treat pesticides-contaminated soil. The LTTD process will treat soils at temperatures in the range of 700°F to 1100°F in order to volatilize pesticides in the soil. A detailed engineering description of the major equipment is presented in this section.

The primary thermal treatment component of the LTTD system is a natural gas or propane fired, countercurrent rotary dryer (thermal desorber) with internal flights. Soil is fed into the thermal desorber where the internal flights lift and spill the soil through the hot gas stream. Treated soil from the thermal desorber exits into a pugmill where it is water-cooled. The cooled soil drops onto a stacking conveyor and is conveyed to a temporary stockpile. Periodic grab samples of the treated soil are collected from the stacking conveyor. The grab samples are composited and analyzed.

The APC system consist of a baghouse, thermal oxidizer, quench, and packed bed scrubber. Entrained particulates in the thermal desorber offgas are removed by the baghouse. Volatilized pesticides from the thermal desorber offgas are destroyed in the thermal oxidizer. Following the oxidizer, a wet APC system is used to remove HCl and Cl_2 present in the off-gases. A block flow diagram of the LTTD system is shown in Figure 3-1. The block flow diagram begins where soil feed and auxiliary fuel are introduced into the thermal desorber and then traces the off-gases through the APC system.

Fugitive emissions from the thermal desorber and baghouse are controlled by maintaining negative pressure in this portion of the LTTD system. Following the ID Fan, in the positive pressure portion of the system, the system is designed to be leak-tight. Visual observation by the operator is made as part of the system inspection to assure that no fugitive emissions occur.

3.3.1 Manufacturer's Name and Model Number

The LTTD system was designed by Williams and is designated with the model number TPU #4. The thermal desorber, baghouse, quench, and packed bed scrubber components were manufactured according to Williams' specifications and do not have model numbers. The ID fan is manufactured by Northern Blower Exhaust Fan. The thermal desorber burner and thermal oxidizer burner systems were manufactured by Hauck.

3.3.2 Type of Thermal Desorber

The LTTD system consists of a soil pretreatment and feed system, countercurrent thermal desorber, treated soil cooling system, a baghouse, ID fan, thermal oxidizer, an adiabatic saturating water quench system, packed bed scrubber, and stack. Auxiliary systems include the fuel system, cooling water recirculation and treatment systems, and the process control, monitoring, and interlock system.

3.3.3 Linear Dimension and Cross-Sectional Areas of Thermal Desorber and Thermal Oxidizer

The internal dimensions of the thermal desorber are 8.5 feet in diameter by 40 feet long. Internal dimensions of the thermal oxidizer are 11 feet in diameter by 63 feet long, with a total volume of 5889 cubic feet.

3.3.4 Description of Soil Feed Systems

Feed soil is passed through a bar grate to the feed hopper of the apron feeder by a front end loader. The sized material is fed onto a belt conveyor by the apron feeder. The belt conveyor discharges the metered soil to a constant velocity belt conveyor equipped with a weigh cell for feed rate monitoring. The weigh belt conveyor discharges to the thermal desorber via the inlet breeching.

3.3.5 Description of the Auxiliary Fuel Systems

Propane will be used as the auxiliary fuel for maintaining the temperature requirements of both the thermal desorber and the thermal oxidizer. Liquid propane will be stored in a portable tank for use in the thermal desorber and thermal oxidizer burners.

3.3.6 Capacity of the Prime Mover

The LTTD system prime mover is an industrial radial blade centrifugal fan which produces a negative pressure in the thermal desorber and baghouse and a positive pressure in the thermal oxidizer, quench, packed bed scrubber, and stack. The fan, a Northern Blower Exhaust Fan, is rated at 250 horsepower (hp) and has a nominal flow rate of 35,000 acfm.

3.3.7 Burner Design

Both the thermal desorber and thermal oxidizer burner systems are manufactured by Hauck and are equipped with centrifugal blowers to supply ambient air to the burner for combustion of propane to maintain the temperature requirements of the thermal desorber and the thermal oxidizer.

Thermal Desorber Burner

The thermal desorber burner is equipped with a 50 hp Hauck combustion air blower and has a thermal output rating of 49 MM Btu/hr.

Thermal Oxidizer Burner

The thermal oxidizer burner is equipped with a 100 hp Hauck combustion air blower and has a thermal output rating of 97 MM Btu/hr.

3.3.8 Construction Materials

Materials of construction for major equipment are listed in Table 3-1.

3.3.9 Controls, Monitoring, and Interlock System

Controls System

The control room for the LTTD is dedicated to a mobile trailer. The control room contains controllers, indicators, and recorders for the control, monitoring, and recording of the key process variables including flow, temperature, pressure, and level for the entire LTTD and auxiliary systems. Three sides of the control room are glass paneled so that process parameters can be monitored and field operations can be viewed simultaneously. Motors and pumps are started and stopped via start-stop pull buttons located on the panel of the control room trailer.

Monitoring System

Critical operating parameters are monitored to ensure that the LTTD is operated in compliance with allowable operating limits. Key operating parameters are interlocked with the soil feed system to automatically shut off soil feed if parameters deviate from the established operating limits. This interlock system prevents restart of the system until operating parameters are restored within the acceptable range and process alarms have been cleared.

In addition to the interlocks related to environmental controls, a combustion interlock system is provided to assure safe operation of the burners in the thermal desorber and thermal oxidizer. This system is described in Section 6.3 of the Workplan prepared by Williams Environmental, Inc.

A Kaye Digistrip 4 Plus Validator continuously logs soil feed rate; baghouse dust feed rate; treated soil discharge temperature; thermal desorber, thermal oxidizer, quench, and packed bed scrubber exit gas temperatures; baghouse differential pressure; APC recycle water flow rate and purge rate; packed bed scrubber recycle water pH; thermal desorber soil discharge end hood pressure; ID fan current; and stack gas carbon monoxide and oxygen concentrations. Descriptions and specifications for this recorder are included in the Appendix I of the thermal desorption work plan.

The Continuous Emission Monitoring (CEM) system is discussed separately later in this section.

Interlock System

Interlocks are initiated based on an instantaneous process value or on a combination of instantaneous and rolling averages generated by the control system. Where rolling averages are used, the control center accumulates the most recent data for the accumulation period for the desired process parameter and computes the arithmetic average of those values. As each additional one-minute data point for the process parameter is collected, the least recent one-minute of data in the accumulation period is discarded, and a new average is computed. Thus, a new rolling average data point is computed each minute.

Table 3-2 summarizes Automatic Waste Feed Shut off (AWFSO) conditions. A discussion of the AWFSO conditions is presented below:

Thermal Desorber Soil Feed Rate High: The instantaneous soil feed rate is continuously monitored each minute and the 60 minute rolling average is continuously calculated and recorded. The soil feed will be shut off if the rolling average allowable feed rate is exceeded or if the instantaneous maximum feed rate is exceeded.

Baghouse Dust Feed Rate High: The baghouse dust feed rate is continuously monitored each minute and the 60 minute rolling average is continuously calculated and recorded. The soil feed will be shut off if the rolling average allowable baghouse dust feed rate is exceeded or if the instantaneous maximum dust feed rate is exceeded.

Thermal Desorber Pressure High: The pressure in the thermal desorber is continuously monitored and maintained at a negative value to minimize fugitive emissions. Soil feed to the desorber will be instantaneously shut off if the pressure exceeds the high set point.

Thermal Desorber Exit Soil Temperature Low: Removal of organics from the soil is controlled by the temperature and residence time of the soil in the thermal desorber. The thermal desorber exit soil temperature is monitored continuously each minute. The soil feed rate will be automatically shut off if the 20-minute rolling average soil temperature falls below its minimum allowable value or if the temperature falls below its instantaneous minimum allowable value. Neither the 20-minute rolling average nor the instantaneous limitations will be in effect in the first 20 minutes of operation after startup.

Thermal Desorber Exit Gas Temperature High: The thermal desorber exit gas temperature is continuously monitored each minute and maintained in an operating range which ensures organics removal efficiency as well as protection of the downstream baghouse and ID Fan. If the exit gas temperature exceeds the high set point an instantaneous shut off of soil feed will occur automatically at 450° F.

Thermal Desorber Exit Gas Temperature Low: The thermal desorber exit gas temperature is continuously monitored each minute and maintained in an operating range which ensures organics removal efficiency as well as protection of the downstream baghouse and ID Fan. If the exit gas temperature falls below the low set point an instantaneous shut off of soil feed will occur automatically at 250°F.

Thermal Oxidizer Exit Gas Temperature Low: The thermal oxidizer exit gas temperature is continuously monitored each minute and maintained in an operating range which ensures high organics destruction efficiency as well as protection of downstream equipment. If the exit gas temperature falls below its instantaneous minimum allowed value, soil feed to the thermal desorber will be automatically shut off.

Thermal Oxidizer Exit Gas Temperature High: The thermal oxidizer exit gas temperature is continuously monitored each minute and maintained in an operating range which ensures high organics destruction efficiency as well as protection of downstream equipment. If the exit gas temperature exceeds the high set point, soil feed to the thermal desorber and all auxiliary fuel to the LTTD will be instantaneously shut off.

Quench Exit Gas Temperature High: The temperature of the gas exiting the quench is continuously monitored each minute and maintained below a safe limit to ensure proper quench operation and to provide thermal protection for the quench and downstream equipment. If the quench exit gas temperature exceeds the high set point, soil feed and all auxiliary fuel to the LTTD will be instantaneously shut off.

Stack Gas Carbon Monoxide High: The concentration of carbon monoxide (CO) in the stack gas is continuously monitored each minute, corrected to 7% Oxygen and the 60-minute rolling average of the corrected value is continuously monitored and recorded. If the 60-minute rolling average exceeds the high set point for CO concentration, soil feed will be automatically shut off.

Stack Gas Oxygen Low: The concentration of oxygen (O2) in the stack gas is continuously monitored each minute. If the O2 concentration falls below the minimum allowable limit, soil feed will be automatically shut off.

ID Fan Current High: The ID fan current is continuously monitored to ensure that the fan is operating properly and has the necessary headroom to respond to fluctuations in the system pressure profile. ID fan current will be correlated to combustion gas exit velocity during the shakedown period and the performance test. The operating limit will initially be established during the shakedown on clean soil and approved by the agency prior to start-up with contaminated soil. The final limit will be based upon the performance test. The ID fan setpoint for post performance test operation will be set at the highest run-average amperage demonstrated for the 3 performance test runs. If the ID fan current exceeds the allowable maximum value, soil feed to the thermal desorber will be automatically shut off.

APC Recycle Water Flow Rate Low: The APC system recycle water flow rate is continuously monitored each minute to ensure performance of the packed bed scrubber. The operating limit will initially be established during the shakedown on clean soil and approved by the agency prior to start-up with contaminated soil. The final limit will be based upon the performance test. If the APC recycle water flow rate falls below the allowable minimum limit, soil feed will be automatically shut off.

APC Purge Rate Low: The APC system purge rate is continuously monitored each minute to ensure continuous removal of dissolved solids. If the APC purge rate falls below the allowable minimum flow rate, soil feed will be automatically shut off.

Baghouse Differential Pressure Low: Differential pressure is the key indicator of a properly operating baghouse. Fabric rupture in the baghouse will be indicated by a low differential pressure across the baghouse. Soil feed will be instantaneously shut off if the differential pressure falls below the set point.

Packed Bed Scrubber Recycled Water pH Low: pH of the recycled water from the scrubber system is continuously monitored each minute and adjusted to ensure adequate acid gas absorption. In addition, the 20-minute rolling average will be calculated and recorded. If either the rolling average or instantaneous pH of the recycled water falls below the allowable minimum value, soil feed to the thermal desorber will be automatically shut off.

3.3.10 Stack Gas Monitoring

The continuous emission monitoring (CEM) system consists of sample probes, sample delivery and conditioning apparatus, and a gas analyzer to provide real time stack gas monitoring. Continuous monitoring of stack gas emissions will be conducted for CO and O2. CO concentration will be measured by a non-dispersive infrared analyzer. O2 will be measured using paramagnetic technology. The CEM system will report data to various control room instruments and the process variable recorder and will activate elements of the LTTD interlock/AWFSO system.

3.3.11 Offgas Treatment Equipment

The LTTD gas conditioning and treatment equipment is shown in Figure 3-1 and includes the following equipment:

- Baghouse
- ID fan
- Thermal oxidizer
- Quench
- Packed bed scrubber
- Stack.

Particulates that are entrained in the thermal desorber exit gas are captured in the baghouse. The baghouse utilizes a pulse jet cleaning system to dislodge captured particulate from the fabric bag surfaces. Dislodged particulates fall by gravity to a hopper which utilizes a screw conveyor to transfer the solids to the hot zone of the thermal desorber. The baghouse solids will be heated to approximately 800 °F by mixing with soil discharged from the thermal desorber.

Baghouse exit gases flow through the ID fan to the thermal oxidizer which combusts the organics present in the gas stream. The thermal oxidizer is designed to provide a high temperature oxidative environment with sufficient gas turbulence and residence time (approximately 2 seconds at 1800 °F) to achieve high organic destruction efficiencies.

The thermal oxidizer exit gas is cooled to approximately 175 °F and humidified to its saturation point by direct contact with recycled and fresh water sprays in the quench. The purpose of the quench process is to cool and condition the gas stream to make it amenable to acid gas absorption in the downstream packed bed scrubber.

The packed bed scrubber removes acid gases from the gas stream exiting the quench. The packed bed scrubber utilizes packing material and water sprays to provide a large liquid surface area for absorption of acid gases into the liquid phase. The pH of the recycled liquid stream is continuously monitored and adjusted with an alkaline (sodium hydroxide) solution. Dissolved solids are continuously purged from the system to minimize any carryover of particulate generating materials.

Scrubber exit gases are discharged to a stack measuring 60 inches in diameter and 70 feet tall. The stack is equipped with one CEM port, two sets of sampling ports, two sampling platforms, and a ladder to facilitate emission testing.

3.3.12 Location of Temperature, Pressure, and Flow Indicating and Control Devices

The LTTD control room contains controllers, indicators, and recorders for the control, monitoring, and recording of the key process variables including flow, temperature, pressure, and level for the entire LTTD and auxiliary systems. Three sides of the control room are glass paneled so that process parameters can be monitored and field operations can be viewed simultaneously. Motors and pumps are started and stopped via start-stop pull buttons located on the panel of the control room trailer. The control room is insulated and can be heated or cooled as necessary. A positive pressure is maintained inside the control room to minimize dust infiltration.

Table 3-3 summarizes the key instrumentation on the LTTD system including pressure, temperature, and flow monitoring devices. Figure 3-2 shows the approximate location of the major process instruments and monitoring devices. Instrument tag references refer to Table 3-2.

Soil Feed Rate (WE-170)

The soil feed rate to the thermal desorber is measured by a weigh cell located on the soil feed belt conveyor. Instantaneous one-minute values and the 60-minute rolling average feed rate are continuously recorded.

Baghouse Dust Feed Rate (TBD)

The baghouse dust feed rate to the thermal desorber will be measured by a mass flow meter located in the baghouse dust feed conveyor. Instantaneous one-minute values and the 60-minute rolling average feed rate are continuously recorded.

Thermal Desorber Exit Gas Temperature (TIC-310)

The thermal desorber exit gas temperature is continuously monitored by a thermocouple element. Instantaneous values of exit gas temperature are continuously recorded.

Thermal Desorber Pressure (PI-330)

A pressure sensor located in the thermal desorber constantly monitors gas pressure. The thermal desorber gas pressure is continuously recorded in the control room.

Thermal Desorber Exit Soil Temperature (TE-112)

The thermal desorber exit soil temperature is continuously monitored by a thermocouple element. Instantaneous one-minute values and the 20-minute rolling average temperature are continuously recorded.

Thermal Oxidizer Exit Gas Temperature (TIC-518)

The thermal oxidizer exit gas temperature is continuously monitored by a thermocouple element. The instantaneous one-minute temperature is continuously recorded.

Quench Outlet Gas Temperature (TI-819)

The quench outlet gas temperature is continuously monitored by a thermocouple element.

Baghouse Inlet Gas Temperature (TI-313)

A thermocouple in the baghouse outlet ducting continuously monitors the baghouse outlet temperature.

Baghouse Differential Pressure (PDI-633)

The differential pressure across the baghouse is continuously monitored by a pressure sensor. If a low differential pressure event occurs, the AWFSO system is activated and the event is recorded.

APC System Water Supply Pressure (PE-739)

Fresh water supply pressure is continuously monitored by a pressure sensor to ensure the flow of water for gas cooling and scrubbing.

APC System Recycle Water Flow Rate (FT-700, FT-701, FT-706, FT-707)

The APC system recycle flow rate is continuously monitored with a flow meter and recorded. If the scrubber water flow rate falls below the minimum allowable limit, the AWFSO system is activated and the event is recorded.

APC Purge Rate (FI-704)

The APC system purge rate is continuously monitored with a flow meter and recorded. If the system purge rate falls below the minimum allowable limit, the AWFSO system is activated and the event is recorded.

ID Fan Current (II-6622, II-6623)

Amperage to the ID fan is continuously monitored with an ammeter and recorded. If the ID fan amperage exceeds the maximum allowable limit, the AWFSO system is activated and the event is recorded.

Packed Bed Scrubber Recycle pH (AIC-753)

A pH meter continuously measures the pH of the packed bed scrubber water. Instantaneous and 20-minute rolling average values are continously recorded. If the pH fall below the minimum allowable limit, the AWFSO system is activated and the event is recorded.

Oxygen Concentration (AIC-851C)

A stack gas sample is continuously withdrawn through a sample extraction and conditioning system and transported to an oxygen analyzer utilizing paramagnetic technology. O2 concentrations are monitored continuously each minute and recorded. If the instantaneous O2 concentration falls below the established minimum allowable limit, the AWFSO system is activated and the event is recorded.

Carbon Monoxide Concentration (AIC-851A)

A stack gas sample is continuously withdrawn through a sample extraction and conditioning system and transported to a non-dispersive infrared analyzer for analysis. CO concentrations are monitored continuously each minute, corrected to 7% O2 and the 60-minute rolling average corrected CO concentration is recorded. The CO analyzer and process variable recorder are located in the control room. If the 60-minute rolling average exceeds the maximum allowable limit, the AWFSO system is activated and the event is recorded.

3.4 SAMPLING, ANALYSIS, AND MONITORING PROCEDURES

3.4.1 Sampling Locations and Procedures

The locations where performance test samples are collected from the LTTD system are shown schematically in Figure 3-3.

The sampling equipment and the procedures for collecting samples at each location are summarized in Table 3-4. Sampling frequency and reference methods are also included. Additional details regarding each sampling location are discussed below. The numbers following each heading refer to the sampling locations shown in Figure 3-3 and in Table 3-4.

Feed soil (1)

The feed soil sample will be collected from the conveyor belt entering the thermal desorber. Feed soil sampling procedures are described in Table 3-5.

Treated Soil (2)

Treated soil samples will be collected from the stacking conveyor after the point of addition of blowdown water. Treated soil sampling procedures are described in Table 3-6.

Stack Gases (3)

Stack sampling will be conducted at the stack during each performance test run. The exhaust stack is designed for isokinetic sampling. Figures 3-4 and 3-5 show the planned stack configuration and sampling point locations. The following sampling systems will be used during the performance test:

- An EPA Method 5 (BIF Method 0050, Figure 3-6) sampling train will be used to collect particulates, HCl, and Cl_2. Details of the sampling method are presented in Table 3-7.
- An EPA Method 23 (EPA Method 23, Figure 3-7) sampling train will be used to collect PCDDs/PCDFs. Details of the sampling method are presented in Table 3-8.
- An EPA Multiple metals (EPA Draft Method 29, Figure 3-8) sampling train will be used to collect metals (As, Be, Cd, total Cr, Ni, Sb, Ba, Pb, Hg, Se, Ag. amd Tl). Details of the sampling method are presented in Table 3-9.
- An EPA Modified Method 5 (SW-846 Method 0010, Figure 3-9) sampling train will be used to collect OCL pesticides and semi-volatile organic compounds. Details of the sampling method are presented in Table 3-10.
- An EPA Volatile Organic Sampling Train (VOST SW-846 Method 0030, Figure 3-10) will be used to collect volatile organic compounds. Details of the sampling method are presented in Table 3-11.

All stack sampling activities will be performed simultaneously during each test run.

Continuous Emissions Monitor (4)

Continuous monitoring of the stack gases will be conducted during the performance test for CO and O2. Table 3-12 briefly discusses the stack gas continuous emissions monitoring procedures.

Scrubber Water Blowdown (5)

Scrubber water blowdown samples will be collected from a sample tap in the scrubber water blowdown line. Scrubber water blowdown sampling procedures are described in Table 3-12A.

3.4.2 Analytical Procedures

The analyses planned for each performance test sample are listed in Table 3-13. The analytical procedures and reference methods for these analyses are summarized in Table 3-14. Detailed procedures for preparing and analyzing the collected samples are presented in Tables 3-15 through 3-24.

3.5 PERFORMANCE TEST SCHEDULE

3.5.1 Schedule

A general schedule for the test is shown in Figure 3-11. As the time approaches to conduct the actual performance test, a more detailed schedule will be developed. Williams will notify EPA Region X at least 2 weeks prior to commencement of the performance test.

3.5.2 Duration of Each Performance Test

One performance test is planned, consisting of three replicate sampling runs. Each sampling run is expected to last about 3 to 4 hours. Prior to the actual sampling time, the thermal desorber will be fed soil for a period of 1 to 4 hours before each sampling run is initiated. This will establish steady operation at process test conditions. For planning purposes, a twelve hour period has been assumed for operations at performance test conditions during each test day. This schedule includes contingencies for unanticipated delays during test execution. According to the present schedule, it is planned to conduct testing over a three day period. However, unanticipated mechanical problems with the LTTD or sampling equipment could extend this period.

3.5.3 Quantity of Soil to be Treated

The amount of soil treated during the shakedown pretest and performance test will be limited to a maximum of one-third of the contaminated site soils. Up to 360 tons of pesticides-contaminated soils will be treated during each test run (total of 12 hours/run), for a maximum of 1080 tons for the entire performance test. The LTTD will be operating approximately 12 hours per day during the performance test.

3.6 DETAILED PERFORMANCE TEST PROTOCOL

3.6.1 Soil Characterization

The soil to be treated is contaminated with OCL pesticides, primarily with p,p'-DDT, hexachlorobenzene, and dieldrin. The soils with the highest concentrations are stored in five roll-off boxes. These soils representing approximately 10% of the total feed planned during the performance test will be blended (1/10) with other contaminated soil to form about 1080 tons of material to be used during the performance test. Further detail regarding soil characterization is provided in the Work Plan prepared by Williams Environmental, Inc.

3.6.2 POHC Selection Rationale

Hexachlorobenzene has been selected as the POHC to demonstrate 99.99% DRE during the performance test. Hexachlorobenzene and p,p'-DDT are the most prevalent contaminants on site. At the level of hexachlorobenzene that is anticipated to be present in the performance test feed soil mixture, no spiking of POHC will be required to demonstrate 99.99% DRE. An example calculation is provided in Appendix S of the Work Plan.

Hexachlorobenzene has been selected as the POHC because it is the most difficult contaminant to treat. It is also the highest ranking (No. 31 - 33) POHC, according to the University of Dayton's Thermal Stability Index, among all the contaminants on site. p,p'-DDT is ranked 175 - 178 in the Thermal Stability Index. The University of Dayton's Thermal Stability Ranking is described in the "EPA Guidance on Setting Permit Conditions and Reporting Trial Burn Results", EPA/625/6-89/019, January 1989.

3.6.3 Performance Test Protocol and Operating Conditions

The performance test will be conducted to demonstrate the LTTD system's treatment capabilities. All testing will follow EPA Methods. The performance test protocol has been developed to optimize the testing such that the test will demonstrate all critical parameters anticipated as the allowable operating limits.

The performance test will demonstrate the following capabilities of the LTTD system:

- Demonstrating 99.99% DRE for hexachlorobenzene
- Maximum soil feed rate
- Compliance with soil cleanup criteria established for the site
- Compliance with particulates, HCl, and Cl_2 emission standards
- Compliance with WAC guidelines for the contaminants of concern
- Compliance with CO emissions concentration standards.
- Compliance with acceptable health based limits for emissions based on the risk assessment/air quality document.

Table 3-25 summarizes the planned operating conditions (temperatures, flow rates, pressures, etc.) for the performance test. The table presents anticipated ranges, maximum, or low conditions planned for the testing. It is anticipated that some degree of fluctuation will occur during the performance test just as in normal operation.

3.6.4 Thermal Desorption Temperature Ranges

The planned normal operating temperatures for the thermal desorber and thermal oxidizer are listed in Table 3-25. Since some degree of fluctuation will occur during operations, it is anticipated that a temperature range will be established as an allowable operating condition. Table 3-26 lists the anticipated operating conditions for the LTTD, with the minimum and maximum operating temperatures for the thermal desorber.

3.6.5 Soil Feed Rates

A contaminated soil feed rate of 20 to 30 tons/hr is planned for the LTTD. The feed rate is dependent on the moisture concentration, handling characteristics, and pre-treatment requirements of the contaminated soil. The maximum feed rate will be established during shakedown and confirmed during the performance test.

3.6.6 Stack Gas Velocity Indicator

A maximum stack gas velocity will be established during the shakedown period and confirmed during the performance test. The stack gas velocity will be measured with a pitot tube according to EPA Method 5. The corresponding amperage on the ID Fan will be used as an indication of stack gas velocity.

3.6.7 Organic Chlorine Content

Assuming an average pesticide concentration of 3,150 ppm in the contaminated soil, and 60% chlorine concentration in the pesticide, at 30 tons/hr of waste feed, the maximum anticipated chlorine feed rate will be 116.6 lbs/hr.. Stack gases will be sampled according to EPA Method 5 and analyzed using ion chromatography. Compliance with ambient air impact guidelines described in the BIF regulations (40 CFR 266.107) will be demonstrated. The total organic chlorine content of the feed soil will be measured during the performance test and the % removal of hydrogen chloride will be measured to show compliance with the required 99%. The organic chlorine content of the soil during normal operations is anticipated to be about one-half the content demonstrated during performance testing.

3.7 DESCRIPTION AND PLANNED OPERATING CONDITIONS FOR THE EMISSIONS CONTROL EQUIPMENT

The components of the emission control equipment are described in Section 3.3.11. The operating condition ranges for normal operation and the performance test are shown in Table 3-25.

During normal operation, the system temperatures, flow rates and pressure drops will typically fluctuate. These fluctuations are also expected to occur during the performance test.

3.8 PERFORMANCE TEST OBJECTIVES

The objective of this section is to propose those parameters for which Williams requests operating limits to be established. During the performance test, each of these parameters will be monitored and recorded. If the required stack emissions and soil treatment performance standards are achieved, Williams requests that operating parameter limits be established within the range of conditions that are demonstrated during the performance test.

Table 3-26 summarizes the expected allowable operating condition limits. The following sections present a discussion of each anticipated allowable operating parameter limit.

3.8.1 Control Parameter Categories

Williams anticipates that allowable operating limits will be established for a number of process control parameters based on the process conditions demonstrated during the performance test. Control parameters are grouped into three categories:

- Group A parameters are continuously monitored and are interlocked with the automatic soil feed shut off system. Interruption of soil feed will be automatic if Group A limits are exceeded. Because these parameters may fluctuate during normal operation, rolling averages may be used in triggering the soil feed shut off interlocks. The rolling averages are used to prevent unnecessary interruption of system operations and minimize short-term fluctuations in system performance.

  Most Group A parameter limits will be established from the performance test operating data, and will be used to ensure that the LTTD system operating conditions are not significantly less rigorous than those demonstrated during the performance test. These parameters are called Group A-1 parameters. During the testing periods, interlocks for Group A-1 parameters will be set at lower or higher values than those listed in Table 3-25 to allow for a sufficient operating range during the performance test.

  For the other Group A parameters, allowable operating limits are established based on operational safety and good operating practice considerations rather than on the performance test operating conditions. These parameters are referred to as Group A-2 parameters. An example of a Group A-2 parameter is the maximum quench exit gas temperature.

- Group B parameters do not require continuous monitoring and are not interlocked with the automatic soil feed shut off system. Operating records are required to ensure that these parameters are not exceeded. No Group B parameter limits wil be established for this project. All parameters will either be Group A or C.

- The Group C parameter limits are set independently of performance test conditions. These limits are based on equipment manufacturers' design and operating specifications and are thus considered good operating practice. Group C parameters do not require continuous monitoring and are not interlocked with the automatic soil feed shut off system.

In the discussion of each allowable operating limit parameter below, an indication is given of the appropriate control parameter category. The discussion also defines how the limit for each parameter will be established.

3.8.2 Group A-1 Parameters

Maximum Soil Feed Rate

The feed rate of soil will be approximately equal during each replicate test run. The maximum allowable rolling-average soil mass feed rate will be determined based on the average over all test runs of the highest 60-minute average value for each test run. The instantaneous feed rate data (one-minute values) will be evaluated and a maximum instantaneous feed rate limit will be set for the soil based upon averaging the maximum hourly value from each hour of the test run and then averaging these three test run averages. The soil feed will be shut off if the maximum soil feed rate value is exceeded, based on a 60-minute rolling average or if the instantaneous maximum level is exceeded.

Maximum Dust Feed Rate

Baghouse dust is returned to the thermal desorber on an intermittent basis. The rate of return will be measured continuously during the performance test. The maximum allowable rolling-average baghouse dust feed rate will be determined based on the average over all test runs of the highest 60-minute average value for each test run. The instantaneous baghouse dust feed rate data (one-minute values) will be evaluated and the maximum instantanous feed rate will be set for the baghouse dust based upon averaging the maximum hourly value from each hour of the test run and then averaging these three test run averages. The baghouse dust feed feed will be shut off if the maximum baghouse dust feed rate value is exceeded, based on a 60-minute rolling average or if the instantaneous maximum level is exceeded.

Minimum Thermal Desorber Exit Soil Temperature

One performance test consisting of three replicate runs will be conducted at approximately the same thermal desorber exit soil temperature. Based on successful completion of the testing, the allowable operating limits should specify a minimum thermal desorber rolling-average exit soil temperature based on the average over all test runs of the lowest 20-minute average value for each test run. Soil feed will be automatically shut off if the thermal desorber exit soil temperature falls below the minimum allowable value based on a 20-minute rolling average limit. The instantaneous exit soil temperature data (one-minute values) will be evaluated and a minimum instantaneous exit soil temperature limit will be set based on averaging the minimum hourly value from each hour of the test run and then averaging these three test run averages. Neither the 20-minute rolling average nor the instantaneous limits will be activated during the first 20 minutes of operation after startup. Desorber off-gas temperature will be used as an alternative A-1 parameter during this first 20 minutes of operation after startup. Initially this alternate temperature limit will be set at 250°F. The final alternate limit will be based upon the performance test.

Minimum Thermal Oxidizer Exit Gas Temperature

The destruction efficiency of pesticides in the stack gas is a function of the temperature of the combustion gases in the thermal oxidizer. Therefore, Williams expects a minimum thermal oxidizer temperature to be set based on the time-weighted average during all test runs of the performance test. The soil feed will automatically be shutoff based upon an instantaneous minimum allowable temperature.

Maximum Stack Gas Carbon Monoxide Concentration

The concentration of CO in the stack gas is an indication of the combustion efficiency of the thermal oxidizer. A high CO concentration may result in poor DRE. Therefore, a maximum CO concentration of 100 ppm_v corrected to 7% O_2 in the stack gas is proposed, based on a 60-minute rolling average.

Minimum APC Recycle Water Flow Rate

A minimum APC recycle water flow rate will be established based upon the time-weighted average of the test data. An automatic shut off of the soil feed will be activated based upon an instantaneous minimum allowable recycle water flow.

Packed Bed Scrubber Recycle Water pH

The pH of the packed bed scrubber water will be normally be maintained between 4 and 10. High pH will result in excessive use of caustic and low pH may result in equipment corrosion. The minimum 20-minute rolling average and instantaneous pH will be established during the performance test. The minimum 20-minute rolling average limit will be set based upon the average over all test runs of the lowest 20-minute average value for each test run. The instantaneous pH data (one-minute values) will be evaluated and a minimum pH limit will be set based on averaging the minimum hourly value from each hour of the test run and then averaging these three test run averages. An AWFSO will be activated if the pH falls below either the 20-minute rolling average limit or the instantaneous minimum allowable limit.

Minimum APC Purge Rate

The optimum APC purge rate will be evaluated during the LTTD shakedown. The minimum APC purge rate will be established during the performance test based upon the time-weighted average during all the runs of the performance test.

Maximum ID Fan Current

A maximum stack gas velocity will be established during the performance test. The stack gas velocity will be measured with a pitot tube according to EPA Method 5. The corresponding amperage on the ID Fan will be used as an indication of stack gas velocity. The maximum ID Fan amperage will be established during the performance test based upon the time-weighted average of the three test runs.

3.8.3 Group A-2 Parameters

Thermal Desorber Pressure High

The thermal desorber will be maintained below atmospheric pressure at any time soil is being fed into the system in order to control fugitive emissions. Williams anticipates a maximum allowable limit on the thermal desorber pressure of -0.01 inches of water column. This condition will not necessarily be demonstrated during the performance test, but should be set based on good operating practice. Soil feed will be automatically shut off if the thermal desorber pressure exceeds -0.01 inches of water column.

Maximum Thermal Desorber Exit Gas Temperature

The temperature of the thermal desorber exit gas will not exceed 450 °F during the performance test. An instantaneous (AWFSO) will be set at a temperature of 450 °F. This condition will not be demonstrated during the performance test.

Thermal Desorber Exit Gas Temperature Low

The pesticide removal efficiency of the LTTD is a function of the soil temperature, not the exit gas temperature. However, a low thermal desorber exit gas temperature may be an indication of a problem within the burner management system. Under normal operation soil feed to the LTTD will be shut off instantaneously if the exit gas temperature falls below the low set point of 250 °F.

Thermal Oxidizer Exit Gas Temperature High

In order to protect downstream APC system, a high thermal oxidizer exit gas temperature will instantly cut-off the soil feed and auxiliary fuel to the LTTD system. This high temperature is based on manufacturer's specification and will not be demonstrated during the performance testing. An instantaneous AWFSO will be set at a temperature of 2100°F.

Baghouse Differential Pressure Low

A low baghouse differential pressure during normal operations may be an indication of bag failure. If bag failure is not detected, there is potential of fouling downstream equipment with entrained particulates. In order to protect downstream equipment, a low baghouse differential pressure will instantly shut off the soil feed and all auxiliary fuel to the LTTD. It is anticipated that the minimum limit will be established at 1 inch w.c. It is expected that the test will be run near this limit but not actually demonstrated. If the baghouse differential pressure exceeds 2 inches w.c. during the performance these the limit will be established based upon the time-weighted average during all test runs.

Quench Exit Gas Temperature High

A maximum quench exit gas temperature allowable limit of 250 °F is anticipated based on equipment protection considerations and good operating practice for the quench. This value will not be demonstrated during the performance test, for equipment protection reasons. The soil feed and all auxiliary fuel to the LTTD will be immediately shut off if the quench exit gas temperature exceeds 250°F.

Minimum Stack Gas Oxygen Concentration

A minimum oxygen concentration will be established at 3%. An automatic shut off of the soil feed will be activated during normal operation based upon an instantaneous minimum allowable oxygen concentration. Based on the rusults of the testing, this parameter may be re-evaluated.

Burner System Failure

The burner system is continuously monitored during normal operations. A burner system failure indicated at the burner management system will automatically shut off the soil feed system.

ID Fan Failure

ID Fan failure is indicated by a low amperage and will automatically shut off the soil feed and all auxiliary fuel to the LTTD instantly.

Power Failure

In the unlikely event of a total power failure, the soil feed system will automatically be shut off. All auxiliary fuel to the LTTD will be shut off instantly.

3.8.4 Group B Parameters

There are no group B parameters to be established.

3.8.5 Group C Parameters

APC System Water Supply Pressure

The APC system water supply pressure will be maintained above 20 psig to ensure that water will be available for cooling and/or scrubbing purposes.

3.9 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

The Performance Test Quality Assurance Project Plan is presented in Attachment 1 to the Performance Test Plan.

3.10 PERFORMANCE TEST RESULTS

A draft performance test report will be submitted to EPA Region X within 18 days after completion of the performance test, subject to timely receipt of laboratory analysis. A final performance test report containing the results of the performance test will be submitted to EPA Region X within 60 days after completion of the performance test, subject to the timely receipt of the complete laboratory analysis package. Operation during the post performance test period is discussed in Section 4.0.

The performance test report will contain the following information:

- Concentration of OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene) in the feed and treated soils.
- Concentration and mass of the 18 parameters listed in Table 1-1, (excluding PCDD/PCDF), in the scrubber water.
- Concentration of OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene) in the stack gas.
- Computation of DRE of hexachlorobenzene.
- Concentration of total PCDDs/PCDFs (tetra through octa congeners) in the stack gas and associated calculated total equivalent concentration of 2,3,7,8 - TCDD.
- Concentration of total metals (As, Be, Cd, Cr. Ni, Sb, Ba, Pb, Hg, Se, Ag and Tl) in the feed and treated soil.
- Mass emission of metals (As, Be, Cd, Cr. Ni, Sb, Ba, Pb, Hg, Se, Ag and Tl) in the stack gas.
- Computation of particulate, HCl, and Cl_2 emissions.
- Concentration of volatile and semi-volatile organic compounds detected in the stack gas.
- All operating records related to A1 and A2 operating conditions summarized to justify suggested operating limits.
- Other information specified in the performance test plan.
- All associated QA data as described by the QAPP (Attachment 1).
- A risk assessment addendum reflecting the results of the performance test.

Table 3-1. Materials of Construction of Major Equipment

Component	Construction Materials
Thermal Desorber	Carbon steel Stainless steel
Thermal Oxidizer Refractory	Ceramic fiber modules
Quench	Stainless Steel
Baghouse	P-84 fabric bags Carbon steel shell
Packed Bed Scrubber	FRP/PPE
ID fan	Carbon steel
Stack	Carbon steel

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Table 3-2. Automatic Waste Feed Shutoff Conditions To Be Complied With During All Phases of Contaminated Soil Processing

Control Parameters[a]	Instrument[a] Number	Cutoff Condition	Value	Comments
Soil feed rate (ton/hr)	WQI-170	High	> 30	60-minute rolling average AWFSO
Soil feed rate (ton/hr)	WQI-170	High	(d)	Instantaneous AWFSO
Baghouse dust feed rate (tons/hr)	TBD	High	> 3	60-minute rolling average AWFSO
Baghouse dust feed rate (tons/hr)	TBD	High	(d)	Instantaneous AWFSO
Thermal desorber pressure (inches w.c.)	PI-330	High	> -0.01	Instantaneous AWFSO
Thermal desorber exit soil temperature (°F)[c]	TI-112	Low	< 700	20-minute rolling average AWFSO
Thermal desorber exit soil temperature (°F)[c]	TI-112	Low	(b)	Instantaneous AWFSO
Thermal desorber exit gas temperature (°F) as Alternative measure of performance initial 20 minutes	TIC-310	Low	< 250	Instantaneous AWFSO
Thermal desorber exit gas temperature (°F)	TIC-310	High	> 450	Instantaneous AWFSO
Thermal desorber exit gas temperature (°F)	TIC-310	High-high	> 500	Instantaneous VO
Thermal desorber exit gas temperature (°F)	TIC-310	Low	< 250	Instantaneous AWFSO
Thermal oxidizer exit gas temperature (°F)	TIC-518	Low	< 1,700	Instantaneous AWFSO
Thermal oxidizer exit gas temperature (°F)	TIC-518	High	> 2,100	Instantaneous AWFSO
Quench exit gas temperature (°F)	TI-519	High	> 250	Instantaneous AWFSO
Stack gas carbon monoxide (ppm_v)	AIC-851A	High	> 100 (e)	60-minute rolling average AWFSO
Stack gas oxygen (%)	AIC-851C	Low	< 3	Instantaneous AWFSO
ID Fan current (amp)	II-6622,6623	High	(d)	Instantaneous AWFSO
APC recycle water flow rate	FT-700,701 FT-706,707	Low	(d)	Instantaneous AWFSO
APC purge rate (gpm)	FI-704	Low	(d)	Instantaneous AWFSO
Baghouse differential pressure (inches w.c.)	PDI-639	Low	< 1	Instantaneous AWFSO
Packed bed scrubber recycled water pH	AIC-753	Low	(b)	20-minute rolling average AWFSO
Packed bed scrubber recycled water pH	AIC-753	Low	< 4	Instantaneous AWFSO
ID Fan failure	II-6622,6623	-	-	Instantaneous AWFSO
Burner system failure	NA	(f)	-	Instantaneous AWFSO
Power failure	NA	(g)	-	Instantaneous AWFSO

Notes:

a See Figure 6-1 of the Thermal Desorption Work Plan for locations of major process instruments

b Determined during performance test

c Limits not in effect during first 20 minutes of operation

d Determined during clean soil shakedown, approved by agency, verified during performance test

e Corrected to 7% oxygen

f Burner management system flame out indication

g Programmable logic controller power failure indication

Table 3-3. Major Process Instruments

Monitored Parameter (Location)	Instrument a Number	Measuring b Device	Measurement c Frequency	Recording c Frequency	Calibration Frequency	Testing d Frequency
Thermal Desorber						
Soil feed rate	WE-170	Weigh cell	Continuous	Continuous *	Monthly	Weekly
Baghouse dust rate	TBD	Flowmeter	Continuous	Continuous *	Monthly	Weekly
Thermal desorber exit gas temperature	TIC-310	Thermocouple	Continuous	Continuous *	Annual	Weekly
Thermal desorber pressure	PI-330	Pressure sensor	Continuous	Continuous *	Quarterly	Weekly
Thermal desorber exit soil temperature	TE-112	Thermocouple	Continuous	Continuous *	Annual	Weekly
Thermal oxidizer						
Thermal oxidizer exit gas temperature	TIC-518	Thermocouple	Continuous	Continuous *	Annual	Weekly
APC System						
Quench exit gas temperature	TI-819	Thermocouple	Continuous	Continuous *	Annual	Weekly
Baghouse inlet gas temperature	TI-313	Thermocouple	Continuous	Continuous*	Quarterly	Weekly
Baghouse differential pressure	PDI-633	Pressure sensor	Continuous	Continuous*	Quarterly	Weekly
APC system water supply pressure	PE-739	Pressure sensor	Continuous		Quarterly	Weekly
APC recycle water flow rate	FI-700/701 FI-706/707	Flowmeter	Continuous	Continuous*	Annual	Weekly
APC purge rate	FI-704	Flowmeter	Continuous	Continuous *	Annual	Weekly
ID fan current	II-6622/6623	Ammeter	Continuous	Continuous *	Annual	Weekly
Packed bed scrubber recycle pH	AIC-753	pH meter	Continuous	Continuous*	Monthly	Weekly
Stack gas CEM						
Oxygen	AIC-851C	Paramagnetic Technology	Continuous	Continuous*	Daily/Quarterly	Weekly
Carbon Monoxide	AIC-851A	Non-Dispersive Infrared Analyzer	Continuous	Continuous *	Daily/Quarterly	Weekly

* - Recorded via strip charts

a See Figure 3-2 for locations of major process instruments

b Type of actual sensing device used to generate signal

c Monitoring and recording funtions are integrated with the control system

d Testing of related waste feed cutoff system and/or alarms. See Section 7.0 for details of alarm and waste feed cutoff system testing.

Table 3-4. Performance Test Sample Collection Locations, Equipment, and Methods

Location	Sample Name	Sampling Location	Sampling Equipment	Sample Size	General Procedure/Frequency	Reference a Method
1	Feed soil (metals, OCL pesticides, heating value, moisture, ash, total choride)	Feed Conveyor	4-ounce scoops, 8-ounce glass jars 2-gallon bucket, ceramic pestle	8-ounce (4)	Grab sample every 15 minutes and place in 2-gallon bucket; fill four 8-ounce glass jars from well mixed composite in 2-gallon bucket at the end of each run.	SW-846, Chapter 9
2	Treated soil (metals, OCL pesticides, dioxins/furans)	Stacking Conveyor	4-ounce scoops, 8-ounce glass jars 2-gallon bucket, ceramic pestle	8-ounce (4)	Grab sample every 15 minutes and place in 2-gallon bucket; fill four 8-ounce glass jars from well mixed composite in 2-gallon bucket at the end of each run.	SW-846, Chapter 9, Method 8290 for dioxins/furans
3A	Stack gas M5	Stack Port	EPA M5 sampling train modified for collection of HCl/Cl2	Two-hour sample	Collect integrated sample for particulates, HCl/Cl2, and moisture; measure stack gas velocity, pressure and temperature, collect bag samples for oxygen and carbon dioxide.	EPA Methods 1 through 5; SW-846 Method 0050
3B	Stack gas M23	Stack Port	EPA M23 sampling train	Minimum 3 dry standard cubic meters	Collect integrated sample for PCDDs/PCDFs, and moisture; measure stack gas velocity, pressure and temperature; collect bag samples for oxygen and carbon dioxide.	EPA Methods 1 through 5 and Method 23
3C	Stack gas MM5	Stack Port	EPA MM5 sampling train	Minimum 3 dry standard cubic meters	Collect integrated sample for OCL pesticides, semivolatile organics, and moisture; measure stack gas velocity, pressure and temperature; collect bag samples for oxygen and carbon dioxide.	EPA Methods 1 through 5; SW-846 Method 0010
3D	Stack gas MMT	Stack Port	EPA multi-metals sampling train	Minimum 1.25 dry standard cubic meters	Collect integrated sample for metals and moisture; measure stack gas velocity, pressure and temperature; collect bag samples for oxygen and carbon dioxide.	EPA Methods 1 through 5; BIF Guidance Draft Method 29

Table 3-4. Performance Test Sample Collection Locations, Equipment, and Methods

Location	Sample Name	Sampling Location	Sampling Equipment	Sample Size	General Procedure/Frequency	Reference a Method
3E	Stack gas VOST	Stack Port	EPA VOST sampling train	At least 20 minutes per tube pair at selected sampling rate	Collect four pairs of sorbent tubes for volatile organics during each run.	SW-846 Method 0030
4	Stack gas CEMS	Stack Port	Continuous emissions monitoring system	Continuous	Continuously monitor stack gas for carbon monoxide and oxygen	EPA Methods 10 & 3A, BIF Guidance
5	Scrubber Blowdown	Tap in Pipeline	4 liter glass bottle 1 liter glass bottles (Teflon-lined lids)	1 liter (3) (Each run)	Collect a 500 ml grab sample every 30 minutes and transfer to the 4 liter glass bottle Fill the 1 liter sample bottles from the 4 liter bottle at the end of each run	ASTM E 300-86, Sections 23 & 24

a "EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"SW-846" refers to Test Methods for Evaluating Solid Waste, Third Edition, 1986, Revised 1990.
ASTM" refers to American Society for Testing and Materials, Annual Book of ASTM Standards, Annual Series
"BIF Guidance" refers to Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91-010, December 1990.

Table 3-5. Feed Soil Sampling Procedure

Sample name:	Feed soil
Sampler:	Process sampling team
Locations:	Feed conveyor belt (BC-1-P)
Equipment:	4-ounce scoops Ceramic pestle Large spoon 2 gallon bucket 8 ounce glass jars with lids (4) Gloves, eye protection, hard hat
Frequency:	15-minute intervals
Procedures:	Collect an equal quantity of soil from the feed conveyor belt at each time interval with a 4-ounce scoop and transfer the grab sample to the 2-gallon bucket. Each time a grab sample is taken, record the sampling time and approximate weight of the grab sample on a sample collection sheet. At the end of the performance test run, crush the soil in the bucket using the ceramic pestle. Mix the soil by hand using the large spoon. Use a 4-ounce scoop to transfer the sample from the 2-gallon bucket to the four 8-ounce jars. After each sampling run, decontaminate all sampling equipment by rinsing with clean water. At the end of the test, following final decontamination of the sampling equipment, rinse the equipment again with clean water and collect the equipment rinse in a sample jar. Attach sample numbers to jars and label with date, sample name and test-run number. Process Sampling Coordinator accepts custody of samples and records sample numbers and collection data in field log book. Samples are placed on ice in a shipping container which is stored in the sample holding area separate from the container supply area.
References:	Test Methods for Evaluating Solid Waste, SW846, Third Edition, 1986 revised 1990.

Table 3-6. Treated Soil Sampling Procedure

Sample name:	Treated soil
Sampler:	Process sampling team
Locations:	Stacking conveyor (BC-2-P)
Equipment:	4-ounce scoops 2-gallon bucket Ceramic pestle Large spoon Ladle 3 foot long, 1-inch diameter dowel rod 8 ounce glass jars with lids (3) Gloves, eye protection, hard hat
Frequency:	15-minute intervals
Procedures:	Soil on the stacking conveyor is hot and emits steam and should be sampled with caution. Use duct tape to tape the ladle to the dowel rod to make a long handled sample collection device. Collect an equal quantity of soil from the stacking conveyor belt (at a location after the treated water has been added to the soil for conditioning) at each time interval with the ladle at a location after the addition of the treated water. Use a 4-ounce scoop and transfer a portion of the grab sample from the ladle to the 2-gallon bucket. Each time a grab sample is taken, record the sampling time and approximate weight of the grab sample on a sample collection sheet. At the end of the performance test run, crush the soil in the bucket using the ceramic pestle. Mix the soil by hand using the large spoon. Use a 4-ounce scoop to transfer the sample from the 2-gallon bucket to the four 8-ounce jars. After each sampling run, decontaminate all sampling equipment by rinsing with clean water. At the end of the test, following final decontamination of the sampling equipment, rinse the equipment again with clean water and collect the equipment rinse in a sample jar. Attach sample numbers to jars and label with date, sample name and test-run number. Process Sampling Coordinator accepts custody of samples and records sample numbers and collection data in field log book. Samples are placed on ice in a shipping container which is stored in the sample holding area separate from the container supply area.
References:	Test Methods for Evaluating Solid Waste, SW846, Third Edition, 1986 revised 1990.

Table 3-7. Stack Gas Particulate, Hydrogen Chloride, and Chlorine Sampling Procedure

Sample name: Stack gas M5

Sampler: Stack sampling team

Locations: Stack

Equipment: EPA Method 5 sampling train modified for the collection of acid gases; petri dish with tared particulate filter; polyethylene sample jars with lids, graduated cylinder, balance.

Frequency: Continuous during a test run; three runs to complete test. A minimum of 2 hours sampling time will be completed during each run.

Procedures: Stack gases will be isokinetically sampled to collect particulate matter on a filter, and to collect hydrogen chloride and chlorine in absorbing solutions. The particulate weight will be determined gravimetrically, and the chloride content of the absorbing solutions will be quantitatively determined by ion chromatography.

Sample point locations are determined in accordance with EPA Method 1. An initial traverse is made with a pitot tube at each sample point following EPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow will be checked only on the first day of testing). EPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide, and dry molecular weight. EPA Method 4 will be followed to determine the stack gas moisture content. EPA Method 5 procedures are followed for pretest and post-test leak checks, isokinetic sampling rate, filter changeouts (if needed), and data recording.

The sampling train utilizes a heated particulate filter and a series of seven chilled impingers. Impinger 1 is used as a condensate collector and contains 50 ml of 0.1N sulfuric acid solution; impingers 2 and 3 will each contain 100 ml of a 0.1N sulfuric acid solution; impinger 4 will be empty; impingers 5 and 6 will each contain 100 ml of a 0.1 N sodium hydroxide solution; impinger 7 will contain 200 to 300 g of indicating silica gel, weighed to within 0.5 g.

After sampling, the probe will be removed from the stack and the nozzle will be covered. External particulate matter will be wiped off the probe. It will then be disconnected from the train and both ends capped. The probe and the filter and impinger assembly are transported to the sample recovery area. The samples are recovered as follows:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container No. 1) which is sealed with tape and placed in a plastic bag.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, and front half of the filter holder are cleaned by rinsing, brushing, and final rinsing with acetone into a separate sample jar (Container No. 2).
- Acid Impinger Liquid -- The liquid contents of impingers 1, 2, 3, and 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container No. 3). Each acid impinger and all connecting glassware, including the back half of the filter holder, is rinsed with deionized water, and the rinse is added to Container No. 3.

Table 3-7. (Continued)

- Alkaline Impinger Liquid -- The liquid contents of impingers 5 and 6 are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container No. 4). Each impinger and all connecting glassware is rinsed with deionized water, and the rinse is added to Container No. 4.

- Silica Gel -- The silica gel contents of impinger 7 are weighed to the nearest 0.5 g.

- Samples of the deionized water, acetone, sulfuric acid solution, and sodium hydroxide solution are taken for reagent blanks once during the test.

All of the sample containers will be assigned numbers and labeled with date and test-run number. The samples will be turned over to the sample coordinator who will record the appropriate data in the field logbook and pack the samples in shipping containers. Samples will be stored in the sample holding area separate from the container supply area.

References: EPA Methods 1, 2, 3, 4, and 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Methods Manual for Complying with the BIF Regulations, USEPA/530-SW-91-010, Method 0050, December, 1990.

Table 3-8. Stack Gas PCDDs/PCDFs Sampling Procedure

Sample name:	Stack Gas Method 23
Sampler:	Stack sampling team
Locations:	Exhaust stack
Equipment:	EPA Method 23 sampling train, five impingers; one XAD-2 adsorbent resin trap; aluminum foil; glass jars with Teflon-lined lids; petri dish with tared particulate filter; balance; glass graduated cylinder.
Frequency:	Continuous during a test run; three runs to complete test. A minimum of 3 dry standard cubic meters of sample will be collected during each run.
Procedures:	A stack gas sample will be collected on a particulate filter and the XAD-2 adsorbent resin trap. The sample will be extracted from the filter and resin, separated by gas chromatography, and quantitatively analyzed by mass spectrometry for PCDDs and PCDFs.

Stack sampling point locations are determined in accordance with EPA Method 1. An initial traverse is made with a pitot tube at each sample point following EPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow will be checked only on the first day of testing). EPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide, and dry molecular weight. EPA Method 4 will be followed to determine the stack gas moisture content. EPA Method 5 procedures are followed for pretest and post-test leak checks, isokinetic sampling rate, filter changeouts (if needed), and data recording. During leak checks, an activated charcoal filter will be placed on the end of the sample probe to ensure that no ambient contaminants are allowed to enter the train.

The Method 23 train utilizes a heated particulate filter, a condenser, an XAD-2 adsorbent resin trap, a condensate impinger, two deionized water impingers, an empty impinger, and a silica gel impinger. The condenser is cooled by a recirculating water system that controls the temperature of the gas entering the XAD-2 adsorbent resin trap and the impingers. All five impingers are placed in an ice bath.

All train components, reagents, and cleaning solutions will be specially prepared, according to the procedures specified in the methods referenced below, to prevent contamination and ensure that representative samples are obtained. The following is a brief description of the preparation of the adsorbent resin:

> XAD-2 resin will be cleaned by water rinses followed by soxhlet extractions with water, methanol, and methylene chloride. Next, the XAD-2 resin will be dried using a flow of inert gas. An extract from a portion of the prepared XAD-2 resin will be analyzed to confirm that it is free of significant background contamination. The adsorbent traps will then be loaded with approximately 35 g of the XAD-2 resin, packed with glass wool, and charged with 100 μl of an isotopically labeled PCDD/PCDF surrogate standard solution to ensure accurate quantitative measurements. The ends of the adsorbent trap will be capped, wrapped in aluminum foil, sealed in a zip lock bag, and packed in an insulated cold chest.

Table 3-8. (Continued)

Field assembly of the sampling train will take place in an area free from organic contaminants. Train components will be handled so that exposure to ambient conditions will be minimized. No sealant grease will be used in assembling the train.

A clean and inspected filter will be placed in the filter holder. Impinger 1 will be empty; impingers 2 and 3 will each contain 100 ml of deionized water; impinger 4 will be empty; and impinger 5 will be loaded with 200 to 300 g of pre-weighed silica gel. Before each sampling run, the Stack Sampling Coordinator will supply the XAD-2 adsorbent resin trap to the stack sampling team for installation into the train. The condenser recirculation pump will be turned on and proper XAD-2 adsorbent resin trap gas entry temperature (maximum 68 °F) will be assured before sampling begins.

After sampling, the probe will be removed from the stack and the nozzle will be sealed with aluminum foil. External particulate matter will be wiped off the probe. It will then be disconnected from the train and both ends capped. The probe and impinger assembly will be transported to the sample recovery area. The samples will be recovered as follows:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container No. 1) which is sealed with tape and placed in a plastic bag.
- XAD-2 Adsorbent Resin Trap -- The XAD-2 adsorbent resin trap is removed from the train, and both ends of the trap are capped. The trap is then labeled, covered with aluminum foil, sealed in a plastic bag and stored in an insulated cold chest.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware is brushed and rinsed three times with acetone, and then rinsed three more times methylene chloride. As an alternate, triple rinsing with a 50/50 acetone/methylene chloride solution may be substituted for the separate rinses. All rinses are placed into a glass sample bottle (Container No. 2).
- Back Half Rinse -- The back half of the filter holder and the connecting line between the holder and the condenser are rinsed three times with acetone. The connecting line is soaked in three separate portions of methylene chloride for 5 minutes each. If a separate condenser and adsorbent trap are used, the condenser will be rinsed and soaked in the same manner as the connecting line. All rinses and soaking liquid will be transferred to container No. 2.
- Toluene rinse -- The methylene chloride soaking procedures for the Front Half and Back Half Rinses will be repeated substituting toluene as the solvent. The toluene soaking solution will be collected in a separate glass sample bottle (Container No. 3).
- Impinger water -- The liquid contents of impingers 1 through 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and discarded.
- Silica Gel -- The silica gel contents of impinger 5 are weighed to the nearest 0.5 g.

Table 3-8. (Continued)

- Samples of the acetone, methylene chloride, and toluene are collected as reagent blanks once during the test.

Once during the test program, a blank train will be prepared, set up at the sampling location, and leak tested at the beginning and end of one of the runs. The particulate filter holder and probe will be heated for the duration of the sampling period, but no gas will pass through the train. The nozzle will be capped with aluminum foil and the exit end of the last impinger will be sealed with a ground glass cap. The train will remain assembled at the sampling location for a period equivalent to one test run. The blank train samples will be recovered using the procedures described above.

All of the sample containers will be assigned numbers and labeled with the date and test-run number. The samples will be turned over to the Stack Sampling Coordinator who will record the appropriate data in the field logbook and pack the samples in insulated cold chests. Samples will be stored in the sample holding area separate from the container supply area.

References: EPA Methods 1, 2, 3, 4, 5 and 23, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Table 3-9. Stack Gas Metals Sampling Procedure

Sample name:	Stack gas MMT
Sampler:	Stack sampling team
Locations:	Stack
Equipment:	EPA Multiple Metals sampling train; petri dish with particulate filter; glass and polyethylene sample jars with Teflon-lined lids, graduated cylinder, balance.
Frequency:	Continuous during a test run; three runs to complete test. A minimum of 1.25 dry standard cubic meters of sample will be collected.
Procedures:	Stack gases will be isokinetically sampled to collect the metals As, Be, Cd, total Cr, Ni, Sb, Ba, Pb, Hg, Se, Ag, and Tl on a filter and in absorbing solutions.

Sample point locations are determined in accordance with EPA Method 1. An initial traverse is made with a pitot tube at each sample point following EPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow will be checked only on the first day of testing). EPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide, and dry molecular weight. EPA Method 4 will be followed to determine the stack gas moisture content. EPA Method 5 procedures are followed for pretest and post-test leak checks, isokinetic sampling rate, filter changeouts (if needed), and data recording.

The sampling train utilizes a heated, low metals content filter and a series of chilled impingers. The first impinger is an optional condensate trap. If the condensate trap is used, it will initially be empty. Impingers 2 and 3 will each contain 100 ml of a 5% nitric acid/10% hydrogen peroxide (5% HNO_3/10% H_2O_2) solution; impinger 4 will be empty; impingers 5 and 6 will each contain 100 ml of a 4% potassium permanganate/10% sulfuric acid (4% $KMnO_4$/10% H_2SO_4) solution; and impinger 7 will contain 200 to 300 g of indicating silica gel weighed to the nearest 0.5 g.

After sampling, the probe will be removed from the stack and the nozzle will be covered. External particulate matter will be wiped off the probe. It will then be disconnected from the train and both ends capped. The probe and the filter and impinger assembly are transported to the sample recovery area. The samples are recovered as follows:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish which is sealed with tape and placed in a plastic bag (Container No. 1).
- Probe Rinse -- The internal surfaces of the nozzle, probe, and front half of the filter holder are cleaned by rinsing, brushing, and final rinsing with exactly 100 ml of 0.1N nitric acid into a separate sample jar (Container No. 2).
- Impingers 1, 2, and 3 -- The liquid contents of impingers 1, 2, and 3 are volumetrically measured to the nearest 0.5 ml or weighed to the nearest 0.5 g and placed into a separate sample bottle (Container No. 3). The impingers, the filter support, the back half of the filter housing, and connecting glassware are then rinsed with exactly 100 ml of 0.1N nitric acid solution and the rinse is added to the sample bottle.
- Impingers 4, 5, and 6 -- The liquid contents of impinger 4 are measured to the nearest 0.5 ml and placed into a separate container (Container No. 4a). Impinger No. 4 is then rinsed with exactly 100 ml of 0.1N nitric acid solution and the rinse is added to Container No. 4a. The liquid contents of impingers 5 and 6 are measured to the nearest 0.5 ml and placed into a

separate container (Container No. 4b). Impingers 5 and 6 and any connecting glassware are then rinsed a minimum of three times using a total of exactly 100 ml of fresh acidified potassium permanganate solution, and the rinses are added to Container No. 4b, being careful to also transfer any loose precipitated materials into the container. Tripple rinsing of impingers 5 and 6 is then repeated using a total of exactly 100 ml of water. The water rinses are also placed into Container No. 4b. If visible deposits remain in impingers 5 or 6 following the water rinses, they are rinsed with 25 ml of 8 N hydrochloric acid, and the rinse is placed into a separate container (Container No. 4c) which contains 200 ml of water.

- Silica Gel -- The silica gel contents of the fourth impinger are weighed to the nearest 0.5 g.
- The following reagent blank samples will be collected once during the test program: 300 ml of the 0.1N nitric acid solution; 100 ml of the water used in sample recovery; 200 ml of the nitric acid/hydrogen peroxide reagent solution; 100 ml of the acidified potassium permanganate solution; and three unused particulate filters. If impingers 5 and 6 are rinsed with HCl, then a 25 ml blank sample of the 8 N HCl solution is also collected and added to 200 ml of water in a separate container.
- Once during the test program, a blank train (without a filter) will be set up in a clean area and then recovered using the procedures described above. This blank train, along with two of the three filter blanks collected with the reagents, will be used for a matrix spike and matrix spike duplicate for QA/QC purposes.

All of the sample containers will be assigned numbers and labeled with date and test-run number. The samples will be turned over to the Sample Coordinator who will record the appropriate data in the field log book and pack the samples in shipping containers. Samples will be stored in the sample holding area separate from the container supply area.

References:

USEPA Methods 1, 2, 3, 4, 5, and Draft Method 29 Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

"Methodology for the Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes." EPA Methods Manual for Compliance with the BIF Regulations, USEPA/530-SW-91-010, December 1990.

Table 3-10. Stack Gas OCL Pesticides and Semivolatile Organics Sampling Procedure

Sample name:	Stack Gas MM5
Sampler:	Stack sampling team
Locations:	Exhaust stack
Equipment:	USEPA Modified Method 5 (MM5) sampling train, five impingers; one XAD-2 adsorbent resin trap; aluminum foil; glass jars with Teflon-lined lids; petri dish with tared particulate filter; balance; glass graduated cylinder.
Frequency:	Continuous during a test run; three runs to complete test. A minimum of 3 dry standard cubic meters of sample will be collected during each run.
Procedures:	A stack gas sample will be isokinetically collected on a particulate filter, in the impinger solutions, and on the XAD-2 adsorbent resin trap.

Stack sampling point locations are determined in accordance with USEPA Method 1. An initial traverse is made with a pitot tube at each sample point following USEPA Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow will be checked only on the first day of testing). USEPA Method 3, employing an Orsat analyzer, will be used to determine stack gas oxygen, carbon dioxide, and dry molecular weight. USEPA Method 4 will be followed to determine the stack gas moisture content. USEPA Method 5 procedures are followed for pretest and post-test leak checks, isokinetic sampling rate, filter changeouts (if needed), and data recording. During leak checks, an activated charcoal filter will be placed on the end of the sample probe to ensure that no ambient contaminants are allowed to enter the train.

The MM5 train utilizes a heated particulate filter, a condenser, an XAD-2 adsorbent resin trap, a condensate impinger, two deionized water impingers, an empty impinger, and a silica gel impinger. The condenser is cooled by a recirculating water system that controls the temperature of the gas entering the XAD-2 adsorbent resin trap and the impingers. All five impingers are placed in an ice bath.

All train components, reagents, and cleaning solutions will be specially prepared, according to the procedures specified in the methods referenced below, to prevent contamination and ensure that representative samples are obtained. The following is a brief description of the preparation of the adsorbent resin:

> XAD-2 resin will be cleaned by water rinses followed by soxhlet extractions with water, methanol, and methylene chloride. Next, the XAD-2 resin will be dried using a flow of inert gas. An extract from a portion of the prepared XAD-2 resin will be analyzed to confirm that it is free of significant background contamination. The adsorbent traps will then be loaded with approximately 35 g of the XAD-2 resin and packed with glass wool. The ends of the adsorbent trap will be capped, wrapped in aluminum foil, sealed in a zip lock bag, and packed in an insulated cold chest.

Field assembly of the sampling train will take place in an area free from organic contaminants. Train components will be handled so that exposure to ambient conditions will be minimized. No sealant grease will be used in assembling the train.

Table 3-10. Stack Gas OCL Pesticides and Semivolatile Organics Sampling Procedure (Continued)

A clean and inspected filter will be placed in the filter holder. Impingers 1 and 4 will be empty; impingers 2 and 3 will each contain 100 ml of organic free deionized water; and impinger 5 will be loaded with 200 to 300 g of pre-weighed silica gel. Before each sampling run, the Stack Sampling Coordinator will supply the XAD-2 adsorbent resin trap to the stack sampling team for installation into the train. The condenser recirculation pump will be turned on and proper XAD-2 adsorbent resin trap gas entry temperature (maximum 68°F) will be assured before sampling begins.

After sampling, the probe will be removed from the stack and the nozzle will be sealed with aluminum foil. External particulate matter will be wiped off the probe. It will then be disconnected from the train and both ends capped. The probe and impinger assembly will be transported to the sample recovery area. The samples will be recovered as follows:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container No. 1) which is sealed with tape and placed in a plastic bag.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware is brushed and rinsed three times with a solution of methanol/methylene chloride (1:1;v/v). All rinses are placed into a glass sample bottle (Container No. 2).
- Back Half Rinse -- Sample train components from the back half of the particulated filter to the XAD-2 resin adsorbent trap are rinsed thoroughly with methanol/methylene chloride (1:1;v/v). All rinses and soaking liquid will be transferred to Container No. 2.
- XAD-2 Adsorbent Resin Trap -- The XAD-2 adsorbent resin trap is removed from the train, and both ends of the trap are capped. The trap is then labeled, covered with aluminum foil, sealed in a plastic bag and stored in an insulated cold chest (Container No. 3).
- Condensate Impinger -- Measure the condensate collected in impinger 1 to the nearest milliliter or to the nearest 0.5 g. Transfer this liquid into a glass sample bottle (Container 4). Also, inspect the back half of the particulate filter holder for condensate (filter condensate). If condensate is observed, transfer the condensate from the filter holder and measure the volume and/or weight as described above. Add this liquid to the glass sample bottle containing the knockout trap condensate (Container No. 4).
- Impinger water -- The liquid contents of impingers 2 through 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and transferred to Container No. 4.
- Silica Gel -- The silica gel contents of impinger 5 are weighed to the nearest 0.5 g.
- Samples of the methanol, methylene chloride, and water are collected as reagent blanks once during the test.

Table 3-10. Stack Gas OCL Pesticides and Semivolatile Organics Sampling Procedure (Continued)

	Once during the test program, a blank train will be prepared, set up at the sampling location, and leak tested at the beginning and end of one of the runs. The particulate filter holder and probe will be heated for the duration of the sampling period, but no gas will pass through the train. The nozzle will be capped with aluminum foil and the exit end of the last impinger will be sealed with a ground glass cap. The train will remain assembled at the sampling location for a period equivalent to one test run. The blank train samples will be recovered using the procedures described above.
	All of the sample containers will be assigned numbers and labeled with the date and test-run number. The samples will be turned over to the Stack Sampling Coordinator who will record the appropriate data in the field logbook and pack the samples in insulated cold chests. Samples will be stored in the sample holding area separate from the container supply area.
References:	USEPA Methods 1, 2, 3, 4, and 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
	Test Methods for Evaluating Solid Wastes, Method 0010, SW-846, Third Edition, November 1986, and updates.

Table 3-11. Stack Gas Volatile Organics Sampling Procedure

Sample name:	Stack gas VOST
Sampler:	Stack sampling team
Locations:	Exhaust stack
Equipment:	Volatile organic sampling train (VOST): sorbent tubes, glass culture tubes with Teflon lined screw caps, aluminum foil, glass VOA vials (40 ml) with plastic screw caps, screw capped glass container.
Frequency:	Continuous with replacement of sorbent tube pairs every 20 to 40 minutes depending on selected sample flow rate.
Procedures:	Stack gases will be sampled at a controlled rate to collect volatile organic compounds on adsorbent resin.

The sampling train utilizes a glass-lined probe followed by an isolation valve, a water-cooled glass condenser, a sorbent tube containing Tenax resin, an empty impinger for condensate collection, a second water-cooled glass condenser, a second sorbent tube containing Tenax resin and petroleum-based charcoal, a silica drying tube, a rotameter, sampling pump, and dry gas meter.

Sorbent Tube Preparation -- The procedures for preparing, storing, and analyzing the tubes will be those described in Method 0030 referenced below. As described in the method, sorbent material (Tenax resin and charcoal) will be soxhlet extracted, vacuum dried, thermally conditioned with organic-free nitrogen, and loaded into tubes. Each sorbent tube will be labeled with an identification number.

The sorbent tubes will be protected from contamination by placing them in culture tubes that contain clean charcoal. The tubes will be stored in a cooler at 4°C in an area free from sources of organic contamination. The tubes will be packed separately and kept cold in insulated containers during transfer to the test site.

At the test site, the tubes are stored cold until needed for a test.

Before each replicate sampling run, the sample coordinator will supply the resin tubes, including a field blank, to a stack sampling team member conducting the VOST sampling. At the end of each run, the sample coordinator will recover the tubes along with the sample collection sheet. The samples will be replaced in cold storage for return shipment and the sample coordinator will make the appropriate notations in the field log book.

VOST Operation -- The sample collection procedures will be as described in the EPA protocol referenced below. As described in the protocol, the dry gas meter will be calibrated before arriving at the test site, and the sample train will be cleaned and assembled before installing the resin tubes. The caps to the tubes will be stored in a clean glass jar while the tubes are in the train. The train will then be leak tested at 10 in. Hg in such a manner as to prevent exposure of the train components to the ambient air.

Before sampling, ice water will be circulated through the condensers and the probe will be purged of ambient air and inserted into the stack. The probe will be heated to 130 to 150°C (266 to 302°F). Four pairs of tubes will be collected during each test run.

After collecting the samples, the tube pair will be removed from the VOST; end caps replaced; labeled, returned to the culture tubes, and returned to cold storage. Samples of the condensate water will be collected in VOA vials with no headspace. If there is not

Table 3-11. Stack Gas Volatile Organics Sampling Procedure (Continued)

enough condensate to fill a VOA vial, enough organic-free water will be added to fill the container.

Quality control samples for the VOST are collected as follows:

- One tube pair will be collected during each sampling run as a field blank
- One tube pair will be collected with each shipment of tubes to the laboratory as a trip blank
- One tube pair will remain in the laboratory as a laboratory blank.

During the sampling run, the end caps from the field blank tubes will be removed to simulate the handling of the test tubes. The ends will remain open for approximately 10 minutes.

Samples will be stored at or below 4 °C in shipping packages which will be kept in an area away from other high concentration samples. If shipped by truck, the samples will be stored away from other chemicals or from where automotive exhaust fumes could become concentrated.

The sample collection data shown in the reference method will be recorded for each tube pair.

References: Test Methods for Evaluating Solid Wastes, Method 0030, SW-846, Third Edition, November 1986, and updates.

Table 3-12. Stack Gas Continuous Emissions Monitoring Procedure

Sample name:	Stack gas CEMS
Sampler:	Monitoring system operator
Components:	Probe, sample conditioning system, analyzer
Location:	Stack
Frequency:	Continuous during each sampling run; three runs to complete each test.
Procedures:	Continuously monitor the following stack gas constituents: • Carbon monoxide by non-dispersive infrared (NDIR) analyzer (USEPA Method 10 and BIF Guidance) • Oxygen by paramagnetic technology (USEPA Method 3A, and BIF Guidance)
References:	USEPA Performance Specifications 2, 3, and 4, Appendix B, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60. USEPA Methods 3A and 10, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60. "Performance Specifications for Continuous Monitoring of Carbon Monoxide and Oxygen for Incinerators, Boilers, and Industrial Furnaces Burning Hazardous Waste", 40 CFR 266, Appendix IX.

Table 3-12A. Scrubber Blowdown Sampling Procedure

Sample name:	Scrubber blowdown
Sampler:	Process sampling team
Locations:	Sample tap on pipe line
Equipment:	Glass graduated cylinder 4 liter glass bottle 1 liter glass bottles with Teflon-lined lids Gloves, eye protection
Frequency:	30-minute intervals during each run.
Procedures:	Purge tap by allowing a small amount of liquid to flow into a waste container, rinse graduated cylinder with liquid and discard to container; collect approximately 500 ml of sample in graduated cylinder and transfer to 4 liter glass bottle at each time interval. At the end of the run, mix the sample in the 4 liter bottle and fill 1 liter bottles from the 4 liter bottle as follows: 1 - Total metals 1 - OCL Pesticides 1 - Archive Attach sample numbers to bottles and label with date, sample name and test-run number. The Sample Custodian accepts custody of samples and records numbers and collection data in a field log book. Samples are placed on ice in a shipping container which is stored in the sample holding area separate from the container supply area.
References:	ASTM E 300-86, Section 23 and 24, American Society for Testing and Materials, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series.

Table 3-13. Analyses Planned for Performance Test Samples

Sample Name	Analyses
Feed soil	OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,4'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene), total metals (As, Be, Cd, Cr, Ni, Sb, Ba, Pb, Hg, Se, Ag, Tl), moisture, chloride, ash, heating value
Treated soil	OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,4'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene), total metals (As, Be, Cd, Cr, Ni, Sb, Ba, Pb, Hg, Se, Ag, Tl), PCDDs/PCDFs
Scubber Blowdown	OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,4'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene), total metals (As, Pb, and Hg)
Stack gas M5	Particulate, HCl, Cl_2, moisture, oxygen, carbon dioxide, temperature, flow rate
Stack gas M23	PCDDs/PCDFs, moisture, oxygen, carbon dioxide, temperature, flow rate
Stack gas MM5	OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,4'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene), semi-volatile organics, moisture, oxygen, carbon dioxide, temperature, flow rate
Stack gas VOST	Volatile organics
Stack gas MMT	Metals (As, Be, Cd, Cr, Ni, Sb, Ba, Pb, Hg, Se, Ag, Tl)
Stack gas CEMS [a]	Carbon monoxide, oxygen

[a] Continuous monitors used during the performance test are permanently installed monitors that will be used throughout normal operation.

Table 3-14. Summary of Analytical Procedures and Methods

Sample Name	Analysis	Total Field Samples for Analysis	Preparation Method a	Analytical Method a	Analytical b Responsibility
Feed soil	OCL Pesticidesc	3	Solvent extraction (SW846-3500 series)	GC/ECD (SW846-8080)	ACL
	Total Metals	3	Acid Digestion (SW846-3050 or 3051)	ICP (SW846-6010) CVAAS (SW846-7471)	ACL
	Moisture	3	N/A	Evaporation (ASTM D 3173)	ACL
	Chloride	3	Bomb Combustion (SW846-5050)	Ion chromatography (SW846-9056)	ACL
	Ash	3	N/A	Ignition (ASTM D 3174)	ACL
	Heating value	3	N/A	ASTM Method D 2015	ACL
Treated soil	OCL Pesticides	3	Solvent extraction (SW846-3500 series)	GC/ECD (SW846-8080)	ACL
	Total Metals	3	Acid Digestion (SW846-3050 or 3051)	ICP (SW846-6010) CVASS (SW846-7471)	ACL
	PCDD/PCDF	3	Solvent extraction (SW846-8290)	HRGC/HRMS (SW846-8290)	ACL
Scrubber Blowdown	OCL Pesticides	3	Solvent extraction (SW846-3500 series)	GC/ECD (SW846-8080)	ACL
	Total Metals	3	Acid Digestion (SW846 3010)	ICP (SW846-6010) CVASS (SW846-7471)	ACL
Stack gas M5	Particulate	3	Evaporate/Dessicate	Gravimetric (EPA Method 5)	SSC
	HCl/Cl2	3	NA	Ion Chromatography (BIF Method 9057)	ACL
	Moisture	3	NA	Gravimetric (EPA Method 5)	SSC
	Temperature	NA	NA	Thermocouple (EPA Method 5)	SSC
	Velocity	NA	NA	Pitot tube (EPA Method 5)	SSC
	Oxygen, carbon dioxide	(d)	NA	Orsat (EPA Method 3)	SSC
Stack gas M23	PCDDs and PCDFs (filter, XAD-2, acetone/ methylene chloride/ toluene rinse)	3	Solvent extraction (EPA Method 23)	GC/MS (EPA Method 23)	ACL
	Moisture	3	NA	Gravimetric (EPA Method 5)	SSC
	Temperature	NA	NA	Thermocouple (EPA Method 5)	SSC
	Velocity	NA	NA	Pitot tube (EPA Method 5)	SSC
	Oxygen, carbon dioxide	(d)	NA	Orsat (EPA Method 3)	SSC

(Continued)

Table 3-14. Summary of Analytical Procedures and Methods

Sample Name	Analysis	Total Field Samples for Analysis	Preparation Method a	Analytical Method a	Analytical b Responsibility
Stack gas MMT	Metals	3	Acid Digestion (BIF Guidance)	ICP (SW846-6010) or GFAAS (SW846-7000 series) CVAAS (SW846-7471)	ACL
	Moisture	3	NA	Gravimetric (EPA Method 5)	SSC
	Temperature	NA	NA	Thermocouple (EPA Method 5)	SSC
	Velocity	NA	NA	Pitot tube (EPA Method 5)	SSC
	Oxygen, carbon dioxide	(d)	NA	Orsat (EPA Method 3)	SSC
Stack gas VOST	Volatile Organics	18	Thermal desorption, trap (SW846-5040)	GC/MS (SW846-5040)	ACL
Stack gas MM5	OCL Pesticides (filter, XAD-2, methanol/ methylene chloride rinse, condensate/imp. water)	3	Solvent extraction (SW846-3500 series)	GC/ECD (SW846-8080)	ACL
	Semivolatile Organics	3	Solvent extraction (SW846-3500 series)	GC/MS (SW846-8270) Full scan + 10 highest peaks	ACL
	Moisture	3	NA	Gravimetric (EPA Method 5)	SSC
	Temperature	NA	NA	Thermocouple (EPA Method 5)	SSC
	Velocity	NA	NA	Pitot tube (EPA Method 5)	SSC
	Oxygen, carbon dioxide	(d)	NA	Orsat (EPA Method 3)	SSC
Stack Gas CEMs	Carbon Monoxide	(e)	NA	Continuous NDIR (EPA Method 10, BIF Guidance)	Williams
	Oxygen	(e)	NA	Paramagnetic technology (EPA Method 3A, BIF Guidance)	Williams

a "SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, 1986 revised 1990.
"EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"BIF Method" refers to Methods Manual for Compliance with the BIF Regulations - Burning Hazardous Waste in Boilers and Industrial Furnaces, EPA/530-SW-91-010.

b ACL = Analytical contract laboratory SSC = Stack sampling contractor Williams = Williams Environmental Services, Inc.

c OCL Pesticides = Hexachlorobenzene, aldrin, alpha-BHC, beta-BHC, Lindane, alpha-chlordane, p'p'-DDE, heptachlor p'p'-DDD, p'p'-DDT, dieldrin, heptachlor epoxide, endrin, toxaphene.

d Gas bag samples collected during each stack traverse for Orsat analysis.

e CEMS sampling and analysis is continuous during each run.

Table 3-15. Analysis of OCL Pesticides in Soil

Matrices:	Feed Soil Treated Soil
Holding Time:	Collection to extraction = 14 days Extraction to analysis = 40 days
Procedures:	Extract sample using SW-846 3540 or 3550 as appropriate. Add surrogate (dibutylchlorendate), process through cleanup as necessary, and proceed with GC/ECD analysis per SW-846 Method 8080 for feed soil and treated soil for the following pesticides: aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene.
References:	Method 8080, GC Method for Organochlorine Pesticides and PCBs; SW-846, 3rd ed., 1986 revised 1990. Method 3540 and 3550, Test Methods for Evaluating Solid Waste, SW-846, 3rd ed., November 1986 and updates.

Table 3-15A. Analysis of PCDD/PCDF in Soil

Matrices:	Treated Soil
Holding Time:	Collection to extraction = 14 days Extraction to analysis = 40 days
Procedures:	Extract sample using matrix specific procedure per SW-846 8290. Add the specified amounts of each of the nine isotopically labeled PCDDs/PCDFs, process through cleanup as necessary, and proceed with HRGC/HRMS analysis per SW-846 Method 8290. The extract will be anlayzed for the quantification of dioxin/furans and results will be reported for the 17 congeners required to caluculate a dioxin/furan toxicity equivalency value.
References:	Method 8290, HRGC/HRMS Method for Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs); SW-846, 3rd ed., 1986 revised 1992.

Table 3-16. Analysis of Metals in Soil

Matrices:	Feed soil Treated soil
Holding Time:	40 days
Procedures:	Feed and treated soil samples will be acid digested according to SW-846 method 3050 or method 3051. The digestion solutions will be analyzed for As, Be, Cd, Cr, Ni, Sb, Ba, Pb, Se, Ag, and Tl by inductively coupled plasma emission spectroscopy (ICP) using SW-846 method 6010. Feed soil and treated soil will be analyzed for Hg by manual cold vapor atomic absorption Spectroscopy (CVAAS) according to SW-846 Method 7471.
References:	Methods 3050, 3051, 6010, and 7471, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Table 3-17. Analysis of Soil Characteristics

Matrices: Feed Soil

Moisture Determination: Moisture is determined by establishing the loss in weight of the sample when heated under rigidly controlled conditions of temperature, time, atmosphere, sample weight, and equipment specifications. A portion of sample is placed into an oven at 104 - 110 °C for one hour, then cooled in a desiccator and weighed again. ASTM Method D 3173 procedures are used.

Ash Content: Ash content is determined by weighing the residue remaining after burning the sample under rigidly controlled conditions of temperature, time, atmosphere, sample weight, and equipment specifications. The sample is pulverized and a weighed portion is placed into a weighed capsule. The capsule is placed into a cold muffle furnace and heated to 450 - 500 °C in one hour. Heating is continued such that the temperature reaches 700 - 750 °C by the end of the second hour. The sample is then held at 700 - 750 °C for two additional hours, or until a constant weight is reached. ASTM Method D 3174 procedures are used.

Chlorine Content: The sample is combusted in an oxygen bomb according to SW-846 Method 5050, and the rinse solution is analyzed for chloride using ion chromatography according to SW-846 Method 9056.

Heating Value: The sample will be thoroughly mixed, and a portion will be combusted in an adiabatic bomb calorimeter according to ASTM Method D 2015.

References:

Method D 3173, D 3174, and D 2015, American Society of Testing and Materials, Annual Book of ASTM, Philadelphia, PA.

Method 5050 and 9056, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and updates.

Table 3-17A Analysis of Pesticides in Scrubber Blowdown

Matrices:	Scrubber blowdown
Procedure:	Extract liquid samples using SW-846 Method 3510 or 3520 as appropriate. Process through cleanup as necessary, and proceed with GC/ECD analysis per SW-846 Method 8080.
References:	Method 8080, GC Method for Organochlorine Pesticides and PCBs; SW-846, 3rd ed., 1986 revised 1990. Method 3510, Separatory Funnel Liquid-Liquid Extraction, SW-846, 3rd ed., 1986 and updates. Method 3520, Continous Liquid Extraction, SW-846, 3rd ed., 1986 and updates.

Table 3-17B. Analysis of Metals in Scrubber Blowdown

Matrices	Scrubber blowdown
Procedures:	Aqueous samples will be acid digested according to SW-846 Method 3010. The digestion solution will be analyzed for As and Pb inductively coupled plasma emission spectroscopy (ICP) using SW-846 Method 6010. If needed, the samples will be analyzed using graphite furnace atomic absorption spectroscopy (GFAAS) using SW-846 7000-series methods. For determination of Hg content, the digestion solution will be analyzed by cold vapor atomic absorption spectroscopy (CVAAS) using SW-846 Method 7470.
References:	Methods 3010, 6010 and 7000-series, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986 and Updates.

Table 3-18. Analysis of Particulates in M5 Samples

Matrices:	Particulate filter (quartz or teflon)
	Front Half Rinse (acetone)
Holding Time:	40 days
Procedures:	The M5 train front half rinse will be evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours, and the residue weight determined to the nearest 0.1 mg.
	The particulate filter will be oven dried at 105°C (220°F) for 2 to 3 hours and the weight determined to the nearest 0.1 mg.
References:	EPA Method 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Table 3-19. Analysis of Hydrogen Chloride and Chlorine in M5 Samples

Matrices:	Acid Impinger Liquid - Sulfuric acid solution (Container No. 3) for HCl analysis Alkaline Impinger Liquid - Sodium hydroxide solution (Container No. 4) for Cl_2 analysis
Holding Time:	28 days
Procedure:	M5 Impinger samples will be analyzed for hydrogen chloride and chlorine using ion chromatography.
Reference:	Method 300.0, The Determination of Inorganic Anions in Water by Ion Chromatography, EPA-600/4-84, 017, March 1984. Protocol for Analysis of Samples from HCl/Cl_2 Emission Sampling Trains (Method 9057), Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91-010, December 1990.

Table 3-20. Determination of Stack Gas Moisture Content

Matrices:	Impinger water
	Silica gel trap
Holding Time:	None, perform upon collection
Procedures:	Increase in volume of impinger water will be measured by weighing to the nearest 0.5 g.
	Increase in weight of silica gel will be measured to the nearest 0.5 g.
	Stack gas moisture content will be calculated using equations provided in method referenced below.
References:	EPA Methods 4 and 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Table 3-21. Analysis of PCDDs/PCDFs in M23 Samples

Matrices: Filter (glass fiber) - Container No. 1
Front and back half rinses (acetone/methylene chloride) - Container No. 2
Toluene rinse of Back Half - Container No. 3
Adsorbent resin (XAD-2 resin)/glass wool

Holding Time: 7 days to extraction, 40 days to analysis.

Procedures: Liquid and solid samples will be prepared for extraction, extracted, and analyzed using appropriate methods as referenced below.

The M23 train front and back half acetone/methylene chloride rinses (Container No. 2) are concentrated in a rotary evaporator apparatus and the residue is added to the particulate filter (Container No. 1) and the XAD-2 resin/glass wool. The evaporator residue, particulate filter, and adsorbent resin/glass wool are spiked with internal standards, and soxhlet extracted.

The extract is split for the following analyses:

- Extract 1: PCDDs/PCDFs
- Extract 2: Archive.

The extracts are analyzed as follows:

Extract 1: Dioxin/furan Quantification
Extract 1 will be processed through cleanup as necessary and analyzed according to USEPA Method 23 for quantitation of dioxins and furans. Analytical results will be reported for the 17 congeners required to calculate a dioxin/furan toxicity equivalence value. Results will also be reported for all tetra through octa congeners.

Extract 2: Archive
Extract 2 will be archived and used if necessary.

Following addition of the internal standard solution, the back half toluene rinse (Container No. 3) is concentrated using the rotary evaporator apparatus. The evaporator residue is soxlet extracted. The extract is then analyzed separately as described for Extract 1 above.

References: Methods 3540 and 8290, Test Methods for Evaluating Solid Waste, SW-846, 3rd ed., 1986 revised 1990.

EPA Method 23, New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.

Table 3-21A. Comparison of Allowable Stack Gas PCDD/PCDF Concentrations with Stack Gas PCDD/PCDF Concentrations Calculated Using Detection Limits

Isomer No.	PCDD/PCDF Compound	Detection Limit (pg/sample)	Estimated Stack (a,b,c) Concentration (ug/dscm)	2,3,7,8-TCDD Toxicity Equivalence Factor	Estimated Stack Concentration Toxic Equivalents (ug/dscm)	Estimated Emission Rate as 2,3,7,8-TCDD (g/s)
			PCDDs			
1	2,3,7,8-TCDD	8.3	2.76E-06	1	2.76E-06	2.72E-14
	Other TCDD	0	0.00E+00			
	Total TCDD	8.3	2.76E-06			
2	1,2,3,7,8-PeCDD	4.8	1.60E-06	0.5	7.99E-07	7.87E-15
	Other PeCDD	4.1	1.37E-06			
	Total PeCDD	8.9	2.96E-06			
3	1,2,3,4,7,8-HxCDD	5.4	1.80E-06	0.10	1.80E-07	1.77E-15
4	1,2,3,6,7,8-HxCDD	4.9	1.63E-06	0.10	1.63E-07	1.61E-15
5	1,2,3,7,8,9-HxCDD	4.6	1.53E-06	0.10	1.53E-07	1.51E-15
	Other HxCDD	0	0.00E+00			
	Total HxCDD	14.9	4.96E-06			
6	1,2,3,4,6,7,8-HpCDD	8.5	2.83E-06	0.01	2.83E-08	2.79E-16
	Other HpCDD	8.5	2.83E-06			
	Total HpCDD	8.5.	2.83E-06			
7	OCDD	28	9.33E-06	0.001	9.33E-09	9.18E-17
Total PCDDs(d)		68.6	2.29E-05		4.10E-06	4.04E-14
			PCDFs			
8	2,3,7,8-TCDF	5	1.67E-06	0.1	1.67E-07	1.64E-15
	Other TCDF	0	0.00E+00			
	Total TCDF	5	1.67E-06			
9	1,2,3,7,8-PeCDF	8.1	2.70E-06	0.05	1.35E-07	1.33E-15
10	2,3,4,7,8-PeCDF	8.1	2.70E-06	0.5	1.35E-06	1.33E-14
	Other PeCDF	0	0.00E+00			
	Total PeCDF	8.1	2.70E-06			
11	1,2,3,4,7,8-HxCDF	4.1	1.37E-06	0.1	1.37E-07	1.34E-15
12	1,2,3,6,7,8-HxCDF	1.3	4.33E-07	0.1	4.33E-08	4.26E-16
13	2,3,4,6,7,8-HxCDF	1.9	6.33E-07	0.1	6.33E-08	6.23E-16
14	1,2,3,7,8,9-HxCDF	1.7	5.66E-07	0.1	5.66E-08	5.58E-16
	Other HxCDF	0	0.00E+00			
	Total HxCDF	4.1	1.37E-06			
15	1,2,3,4,6,7,8-HpCDF	6.4	2.13E-06	0.001	2.13E-09	2.10E-17
16	1,2,3,4,7,8,9-HpCDF	6.7	2.23E-06	0.001	2.23E-09	2.20E-17
	Other HpCDF	0	0.00E+00			
	Total HpCDF	6.7	2.23E-06			
17	OCDF	13	4.33E-06	0.001	4.33E-09	4.26E-17
Total PCDFs(e)		36.9	1.23E-05		1.96E-06	1.93E-14
Total PCDD/PCDF		105.5	3.51E-05		6.06E-06	5.96E-14
Allowable stack gas concentration					1.16E-04	
Allowable minus estimated actual stack gas concentration					1.16E-04	

(a) Stack gas sample volume 106.00 dry standard cubic feet
3.00 dry standard cubic meters

(b) Stack gas flow rate 20,860 dry standard cubic feet per minute
9.85 dry standard cubic meters per second

(c) If the sum of the detection limits of the individual isomers for a given dioxin or furan exceeded the detection limit of the total it was assumed that these individual isomers, when added, constituted the entire total so that any contribution to the total by "other" isomers would be zero.

(d) Total PCDDs = Total TCDD + Total PeCDD + Total HxCDD + Total HpCDD + OCDD

(e) Total PCDFs = Total TCDF + Total PeCDF + Total HxCDF + Total HpCDF + OCDF

Table 3-22. Analysis of Stack Gas Metal Samples

Matrices:	Particulate filter - Container No. 1 Probe rinse (nitric acid) - Container No. 2 Nitric acid/hydrogen peroxide impinger solution - Container No. 3 Pottasium permaganate/sulfuric acid solution - Containers No. 4a, 4b, and 4c
Holding Time:	40 days
Procedures:	The sampling train probe rinse, particulate filter, nitric acid/hydrogen peroxide impinger solution, and their rinses will be digested separately according to methods referenced below. The probe rinse digestion solution, filter digestion solution, and nitric acid/hydrogen peroxide digestion solution will be analyzed for As, Be, Cd, Cr, Ni, Sb, Ba, Pb, Se, Ag, and Tl by inductively coupled argon plasma emission spectroscopy (ICAP) according to SW-846 Method 6010. If individual metals are found at concentrations below approximately 2 ug/ml, the digestion solutions may be analyzed by graphite furnace atomic absorption (GFAA) spectroscopy according to the SW-846 7000-series methods referenced below. An aliquot of the nitric acid/hydrogen peroxide impinger solution and the pottasium permaganate/sulfuric acid solution will be analyzed separately for Hg by manual cold vapor atomic absorption (CVAA) according to SW-846 Method 7471. The results of the component analyses will be summed to give the metals content in the gas sample.
References:	Methods 3010, 6010, and 7000-series, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates. "Methodology for the Determination of Metal Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes." EPA Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91-010, December 1990.

Table 3-22A. Comparison of Allowable Stack Gas Metals Concentrations with Stack Gas Metals Concentrations Calculated Using Detection Limits

Metal	Analytical Method	Detection Limit (ug per sample)	Estimated Stack Gas Conc. (a) (ug/dscm)	Estimated Mass Emission Rate (g/s)	Allowable Stack Gas Concentration (ug/m3)	Allowable Stack Gas Concentration Minus the Estimated Actual Conc. (ug/m3)
Antimony	ICP	34.5	11.50	1.13E-04	1160	1148
Arsenic	GFAA	1.2	0.4	3.94E-06	0.890	0.49
Barium	ICP	2.4	0.8	7.88E-06	193250	193249
Beryllium	ICP	0.3	0.11	1.08E-06	1.62	1.51
Cadmium	ICP	4.5	1.5	1.48E-05	2.16	0.66
Chromium	GFAA	0.9	0.3	2.95E-06	0.320	0.020
Lead	ICP	45.3	15.10	1.49E-04	347.85	333
Mercury	CVAA	16.8	5.60	5.51E-05	1160	1154
Nickel	ICP	16.2	5.40	5.32E-05	5102	5096
Silver	ICP	7.8	2.60	2.56E-05	464	461
Thallium	ICP	43.2	14.40	1.42E-04	1932.5	1918
Zinc	ICP	2.4	0.80	7.88E-06	NA	NA
Total Metals		132.4	< 106.27	< 1.05E-03		
Total Detected Metals		175.6	141.0	1.39E-03		

MMT Stack Sampling Parameters	
Stack gas flow, dscfm	20,860
,acfm	65,000
,dscm/sec	9.85
Stack gas temp, deg F	185
Sampling vol, dscf	44.00
, dscm	1.25
Stack gas moisture, vol%	55.0

(a) In-stack method detection limits from Part 266 Appendix IX, Method 29.
NA = Not Available
ICP = Inductively Coupled Plasma
GFAA = Graphite Furnace Atomic Absorption
CVAA = Cold Vapor Atomic Absorption

Table 3-23. Analysis of OCL Pesticides and Semi-volatile Organics in MM5 Samples

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Matrices: Particulate filter - Container No. 1.

Combined front half and back half rinse (methanol/methylene chloride) - Container No. 2.

XAD-2 resin trap - Container No. 3

Condensate and impinger water - Container No. 4

Holding Time: Extract within 7 days; Analyze within 40 days of extraction.

Procedures: Liquid and solid samples will be prepared for extraction, extracted, and analyzed using appropriate methods as referenced below. All samples are to be spiked with surrogate standards as received from the field prior to any sample manupulations.

The MM5 train combined front half and back half rinse, and the extract from the impinger water are concentrated in a rotary evaporator apparatus and the residue is added to the particulate filter and the XAD-2 resin/glass wool. The combined evaporator residue, particulate filter, and adsorbent resin/glass wool are spiked with surrogate standards, and soxhlet extracted. The extract is processed through cleanup as necessary and split into three portions.

The extract is analyzed as follows:

Extract 1: OCL Pesticides
One of the portions will be analyzed according to SW-846 Method 8080 for OCL Pesticides analysis (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene).

Extract 2: Semi-volatile organics
The second portion from of the extract will be used for analysis of semi-volatile organics according to SW846 Method 8270 by placing the analytical system in full scan mode (full scan plus 10 highest peaks will be identified) and comparing the mass spectra obtained to the NBS library of mass spectral data for organic compounds.

Extract 3: Archive
Extract 3 will be archived and used if necessary.

References: Methods 3540, 8080 and 8270, Test Methods for Evaluating Solid Waste, SW-846, 3rd ed., 1986 revised 1990.

Table 3-23A. Comparison of Allowable Stack Gas OCL Concentrations with Stack Gas OCL Concentrations Calculated Using Detection Limits

Pesticide	Detection Limit (ug per sample)	Estimated Stack Concentration (ug/dscm) (a)	Estimated Mass Emission Rate (g/s) (b)	Allowable Stack Gas Concentration (ug/m3)	Allowable Stack Gas Concentration Minus the Estimated Actual Conc. (ug/m3)
Aldrin	0.20	0.07	6.56E-07	0.77	0.703
alpha-BHC	0.094	0.03	3.08E-07	2473.6	2474
beta-BHC	0.32	0.11	1.05E-06	2473.6	2473
gamma-BHC	0.20	0.07	6.56E-07	2473.6	2474
Chlordane	0.20	0.07	6.56E-07	10.44	10
4,4'-DDD	0.40	0.13	1.31E-06	386.5	386
4,4'-DDE	0.40	0.13	1.31E-06	NA	NA
4,4'-DDT	0.40	0.13	1.31E-06	38.65	39
Dieldrin	0.40	0.13	1.31E-06	0.77	0.637
Endosulfan I	0.20	0.07	6.56E-07	NA	NA
Endosulfan II	0.40	0.13	1.31E-06	NA	NA
Endrin	0.40	0.13	1.31E-06	463.8	464
Endrin ketone	0.40	0.13	1.31E-06	NA	NA
Heptachlor	0.20	0.07	6.56E-07	2.98	2.9
Heptachlor epoxide	0.20	0.07	6.56E-07	1.48	1.4
Methoxychlor	2.0	0.67	6.56E-06	51481.8	51481
Toxaphene	4.0	1.33	1.31E-05	11.6	10.3
Hexachlorobenzene	1	0.33	3.28E-06	7.73	7.4

NA = Not available

(a) Stack gas required sample volume — 106.00 dry standard cubic feet
3.00 dry standard cubic meters

(b) Stack gas estimated flow rate — 65,000 actual cubic feet per minute
185 deg F,. stack gas temperature
0.55 volume fraction moisture
29,250 dry acfm
20,860 dry scfm
9.85 dry standard cubic meters per second

Table 3-24. Analysis of Volatile Organics in VOST Samples

Matrices:	VOST sorbent resins (charcoal/Tenax) VOST condensate (water)
Holding Time:	14 days
Quantitation:	10 ng/sample
Procedures:	VOST tube contents will be spiked with the appropriate surrogates and internal standards, thermally desorbed, bubbled through organic-free water, and trapped on an analytical absorbent trap. VOST tubes will be analyzed separately for breakthrough determination. Analysis will be conducted by GC/MS according to SW-846 Method 5040 for volatile organics. Condensate samples will be analyzed directly using a purge-and-trap device and GC/MS according to SW-846 method 8240. Analysis will be for the complete method list of volatile organic compounds plus the 10 highest peaks.
References:	Method 5040, Protocol for Analysis of Sorbent Cartridges from Volatile Organic Sampling Train, SW-846, Third Edition, November 1986, and Updates. Method 8240, Volatile Organics by GC/MS, SW-846, Third Edition, November 1986, and Updates.

Table 3–25. Planned Performance Test Operating Ranges

Parameter	Test Conditions [a]
Soils feed rate (ton/hr)	20–30
Baghouse dust feed rate (tons/hr)	2–3
Propane feed rate (scf/hr)	As required
Thermal desorber combustion air flow rate (acfm)	9000 – 13000
Thermal oxidizer combustion air flow rate (acfm)	10000 – 15000
Thermal desorber gas outlet temperature (°F)	425
Thermal desorber treated soil exit temperature (°F)	800
Thermal oxidizer gas outlet temperature (°F)	1800
Quench outlet temperature (°F)	160 – 200
Packed bed scrubber recycle water pH	4 – 10
Thermal desorber pressure (inches w.c.)	< –0.01
Baghouse differential pressure (inches w.c.)	2
ID fan current (amps)	(b)
APC recycle water flow rate (gpm)	(b)
APC purge rate (gpm)	4 – 16
CEMs oxygen (%)	3 – 8
CEMs carbon monoxide (ppm_v)	< 100

a All values are estimated ranges. Final values will be determined from the performance test results.

b To be determined during clean soil shakedown, approved by agency, verified during performance test

Table 3–26. Anticipated Allowable Operating Conditions

Control Parameters[a]	Value	Comments[b]
GROUP A1 PARAMETERS		
Maximum thermal desorber soil feed rate (ton/hr)	30	60–minute rolling average AWFSO
Maximum thermal desorber soil feed rate (ton/hr)	(e)	Instantaneous AWFSO
Maximum baghouse dust feed rate (ton/hr)	3	60–minute rolling average AWFSO
Maximum baghouse dust feed rate (ton/hr)	(e)	Instantaneous AWFSO
Minimum thermal desorber exit soil temperature (°F)[d]	700	20–minute rolling average AWFSO
Minimum thermal desorber exit soil temperature (°F)[d]	(c)	Instantaneous AWFSO
Minimum thermal desorber exit gas temperature (°F)	250	Instantaneous AWFSO
As Alternative measure initial 20 minutes	(e)	
Minimum thermal oxidizer exit gas temperature (°F)	1,700	Instantaneous AWFSO
Maximum stack gas carbon monoxide (ppm_v)	100	60–minute rolling average AWFSO
Minimum packed bed scrubber recycle water pH	(c)	20–minute rolling average AWFSO
Minimum packed bed scrubber recycle water pH	4	Instantaneous AWFSO
Minimum APC recycle water flow rate	(e)	Instantaneous AWFSO
Minimum APC purge (gpm)	(e)	Instantaneous AWFSO
Maximum ID Fan current (amp)	(e)	Instantaneous AWFSO
GROUP A2 PARAMETERS		
Maximum thermal desorber pressure (inches w.c.)	–0.01	Instantaneous AWFSO
Minimum thermal desorber exit gas temperature (°F)	250	Instantaneous AWFSO
Maximum thermal desorber exit gas temperature (°F)	450	Instantaneous AWFSO
Maximum thermal desorber exit gas temperature (°F)	500	Instantaneous VO
Maximum thermal oxidizer exit gas temperature (°F)	2100	Instantaneous AWFSO
Minimum baghouse differential pressure (inches w.c.)	1	Instantaneous AWFSO
Maximum quench exit gas temperature (°F)	250	Instantaneous AWFSO
I.D. Fan failure	–	Instantaneous AWFSO
Burner system failure	–	Instantaneous AWFCO
Power failure	–	Instantaneous AWFSO
Minimum stack gas oxygen (%)	3	Instantaneous AWFSO
GROUP C PARAMETERS		
Minimum APC system water supply pressure (psig)	20	

a Group A parameters are continuously monitored and are interlocked with the automatic waste feed cutoff system.
Group A1 parameters are established from the performance test results.
Group A2 parameters are based on safety and/or good operating practice considerations.

Group C parameters do not require continuous monitoring and are not interlocked with the automatic waste feed cutoff system. Values are established independently of performance test conditions.

b AWFSO = Automatic waste feed shutoff

c To be determined during performance test

d Limits not in effect during first 20 minutes of operation

e To be verified during clean soil shakedown, approved by agency, with final determination during performance test

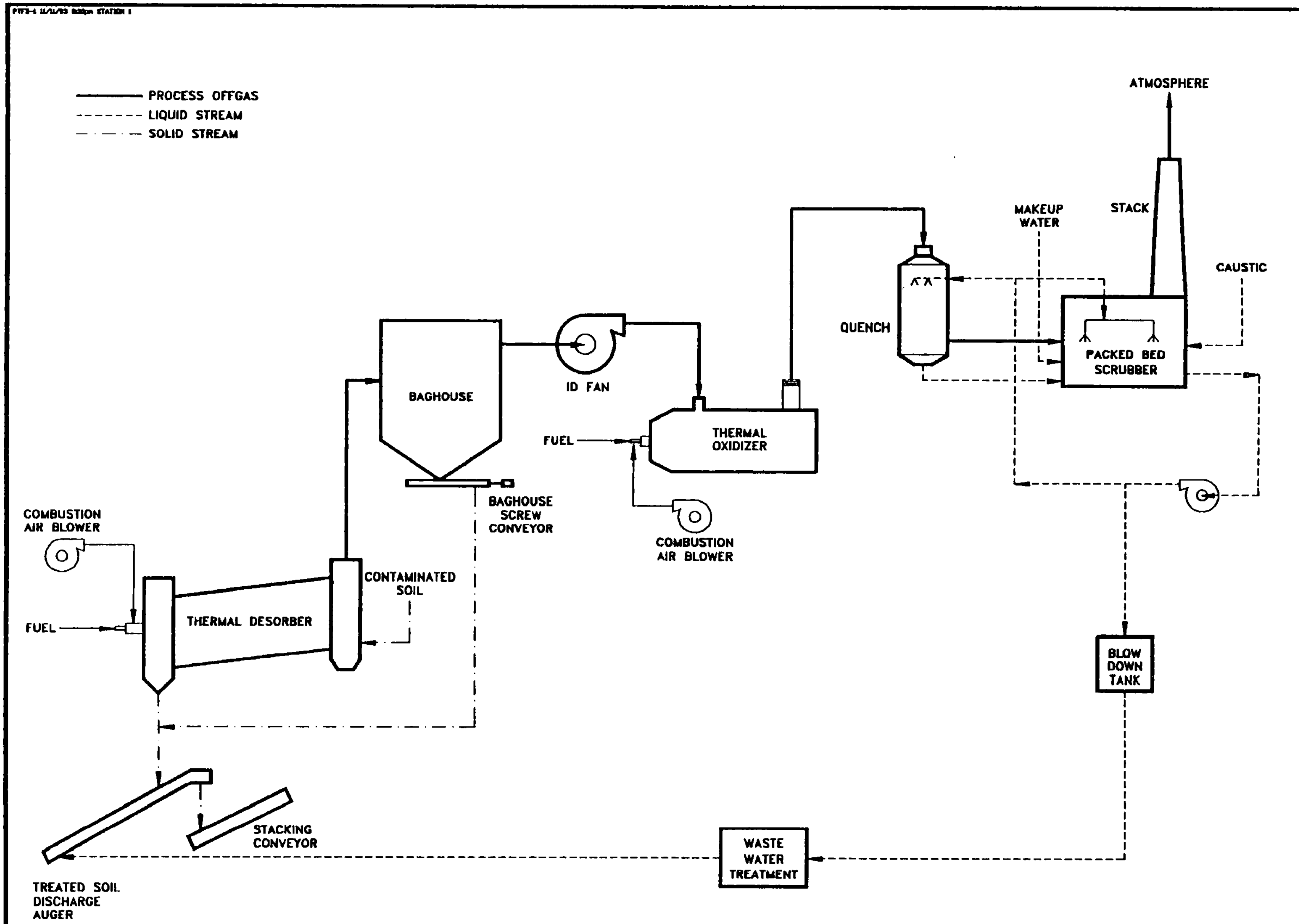


Figure 3-1. LTTD Block Flow Diagram

REV. 0	11/11/93	PTF3-1	059312

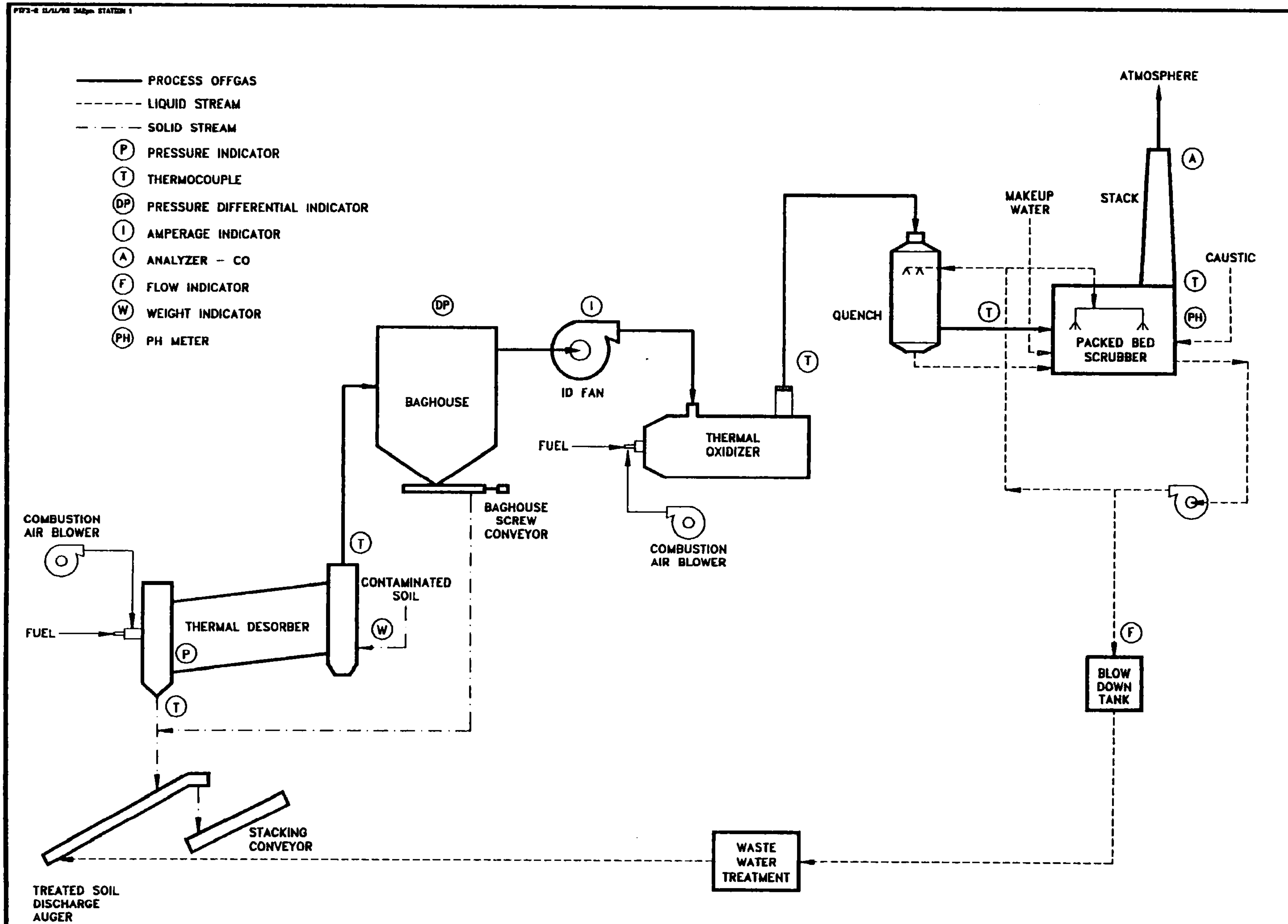


Figure 3–2. Locations of Major Process Instruments

REV. 0	11/11/93	PTF3-2	059312

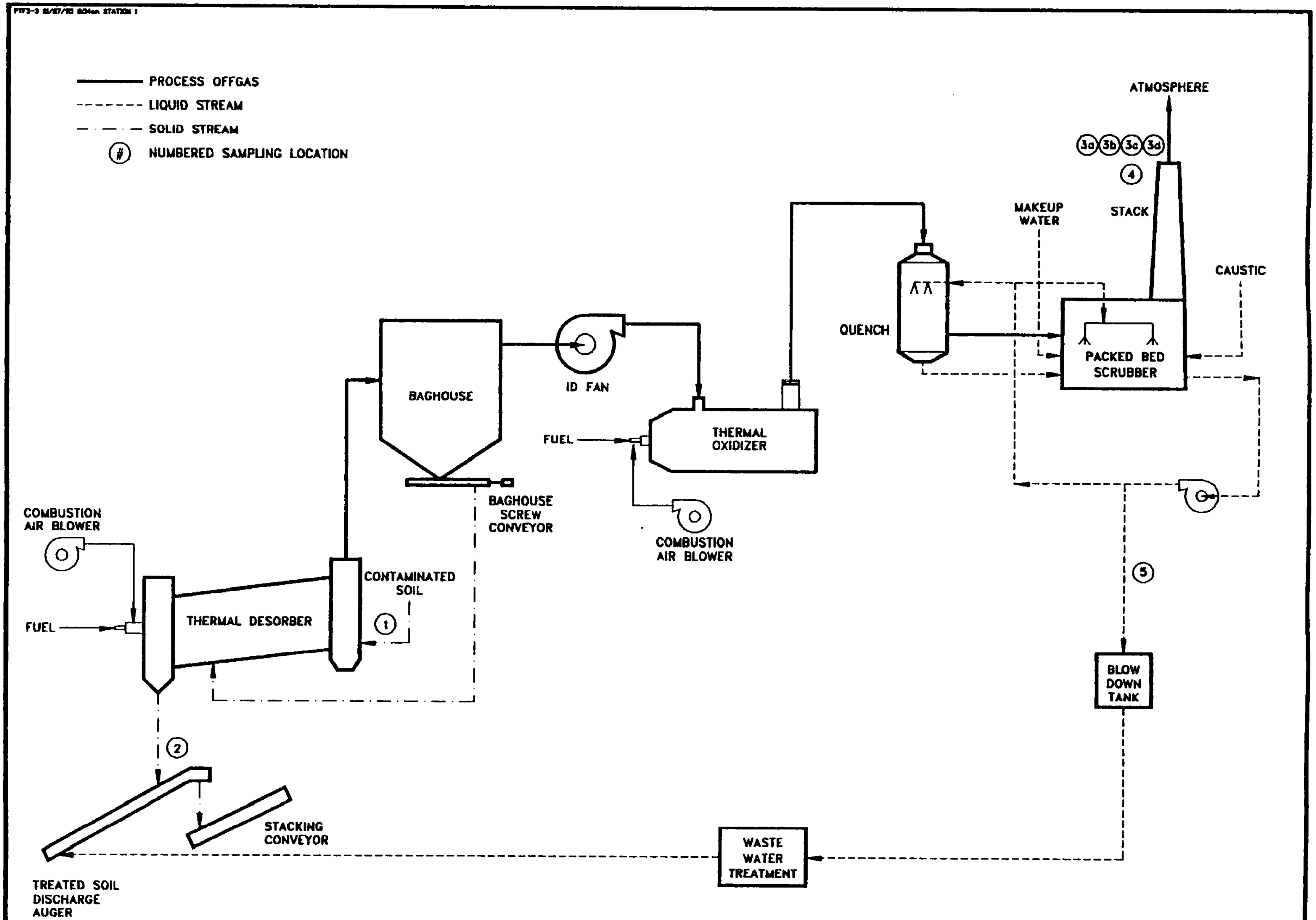


Figure 3-3. Performance Test Sampling Locations

REV. 0	01/27/95	PTF3-3	059312

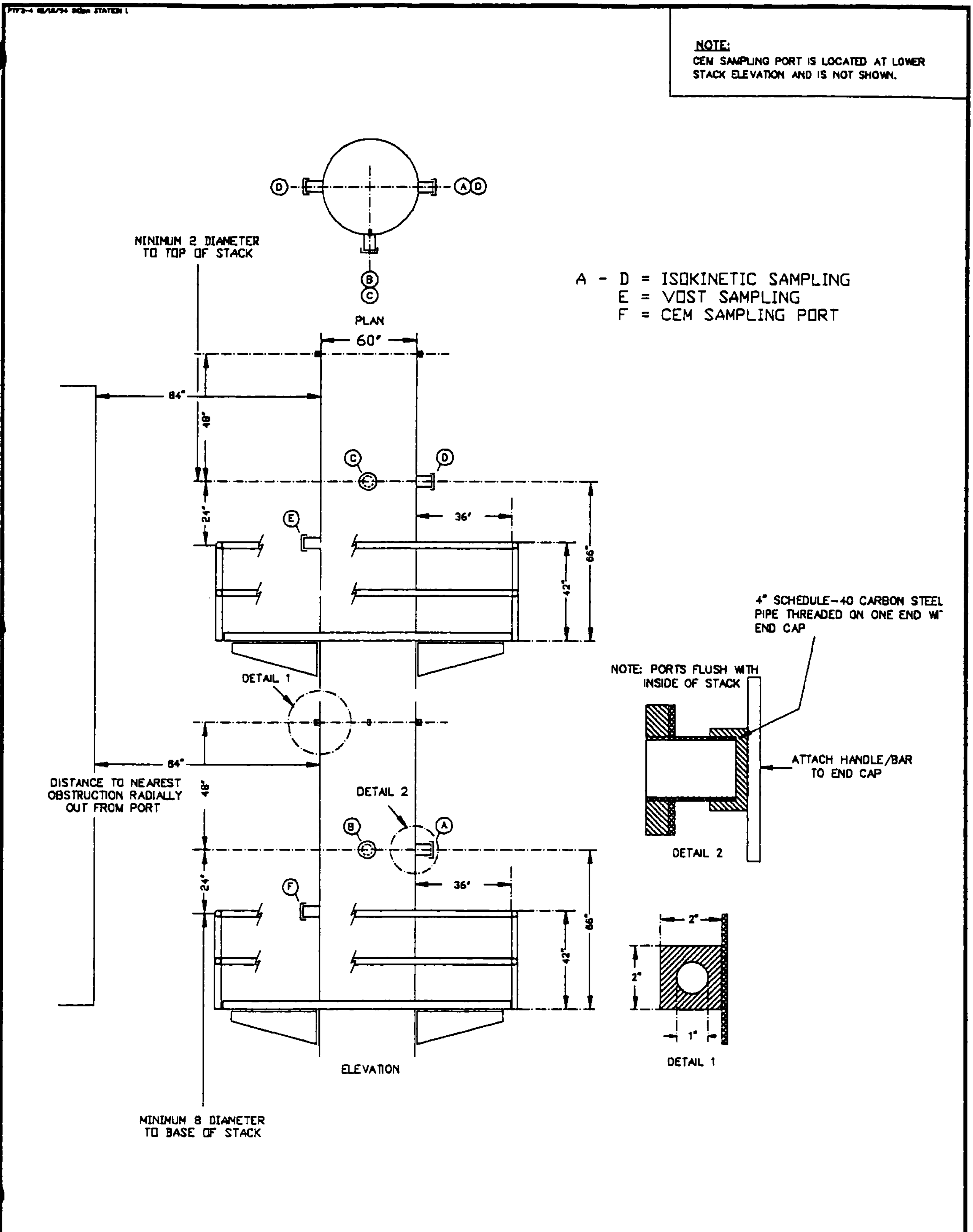
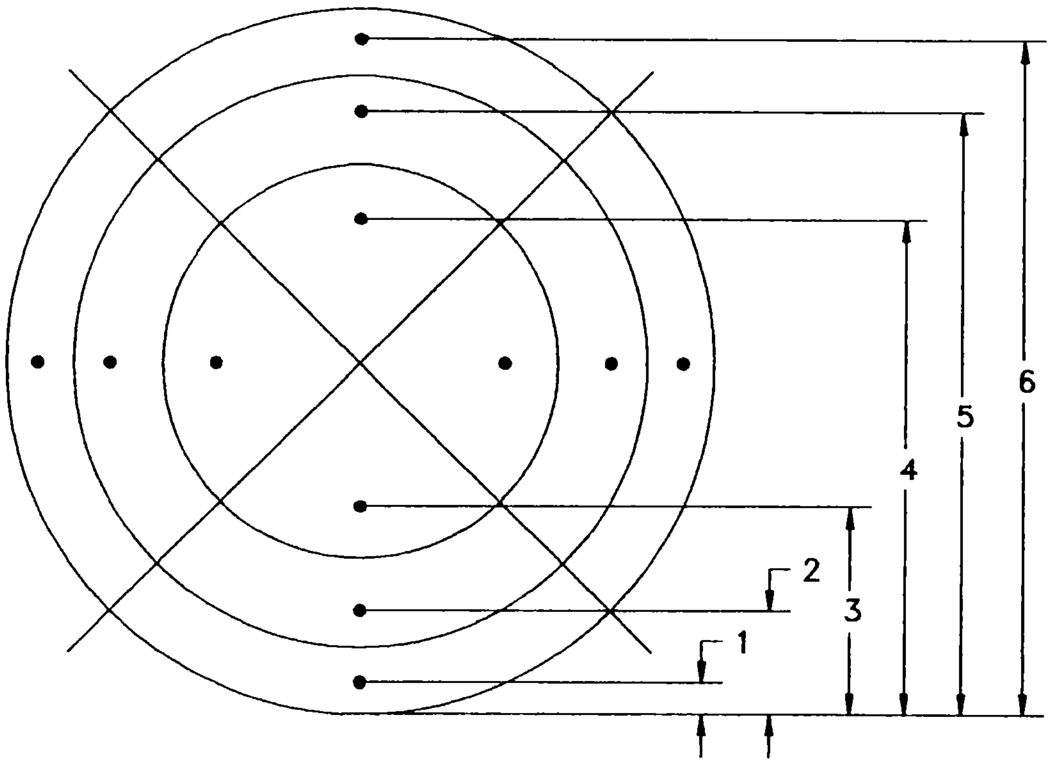


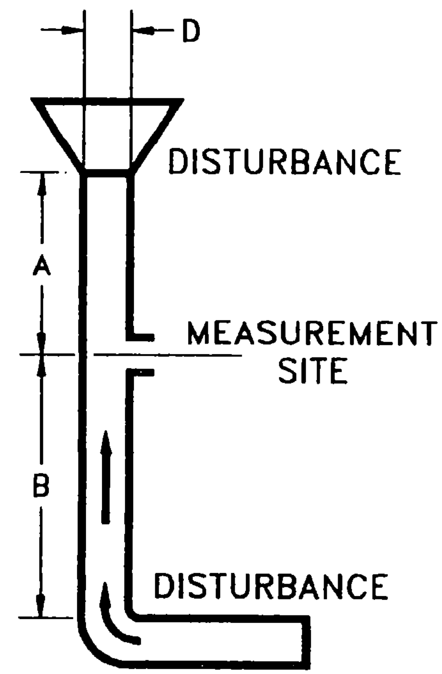
Figure 3-4. Stack Sampling Location Details

REV. 0	02/18/94	PTF3-4	059312

TRAVERSE POINT	DISTANCE % of diameter	DISTANCE (inches)
1	4.4	2 5/8"
2	14.6	8 3/4"
3	29.6	17 3/4"
4	70.4	42 1/4"
5	85.4	51 1/4"
6	95.6	57 3/8"

	LINEAR DIMENSION (a)		DUCT DIAMETERS	
PORTS	A, B	C, D	A, B	C, D
A	20	10	4	2
B	40	50	8	10
D	5	5		





NOTE (a) - SEE FIGURE 3-4.

Figure 3-5. Isokinetic Sampling Locations

02/18/94	PTF3-5	059312

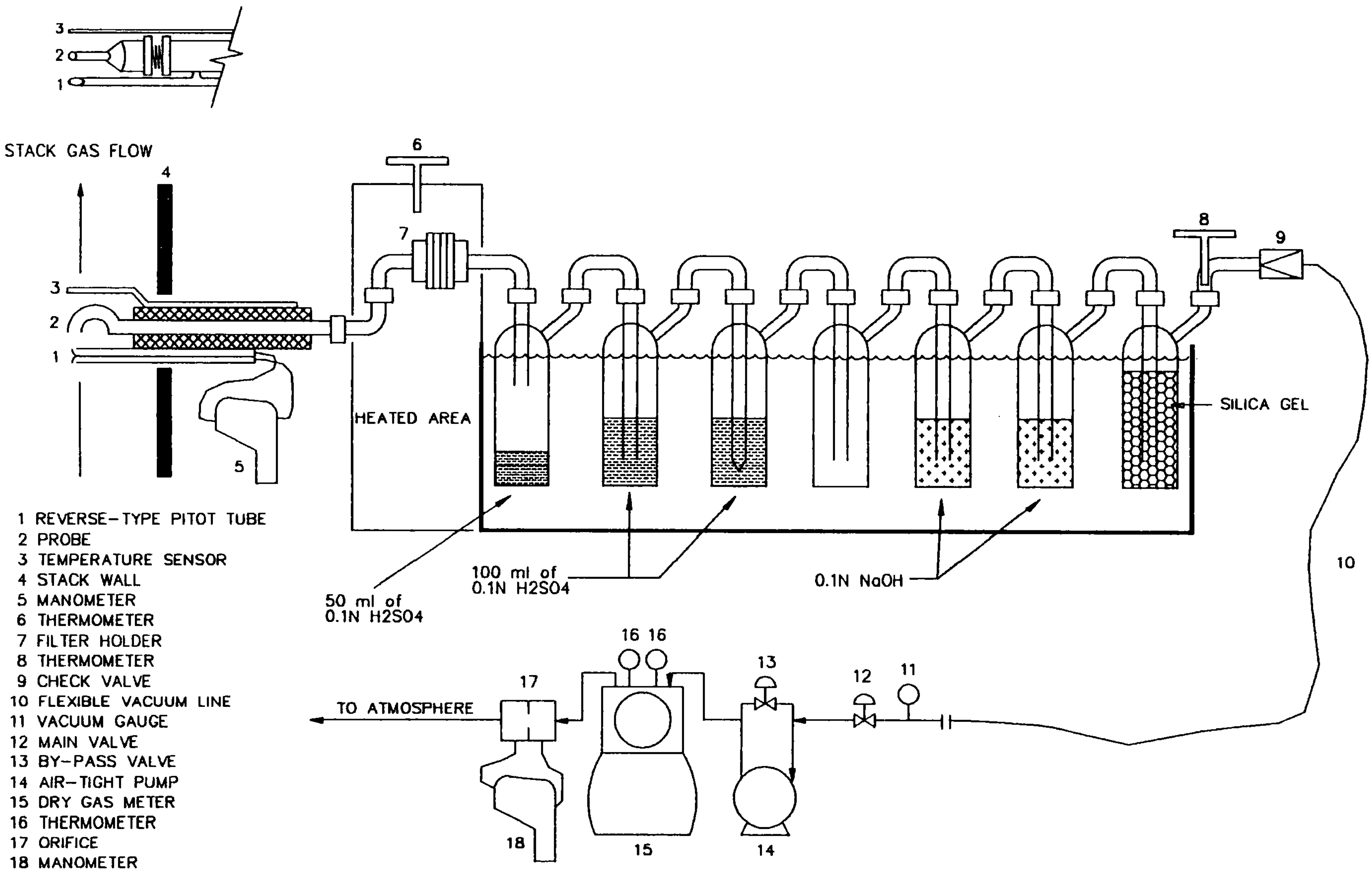
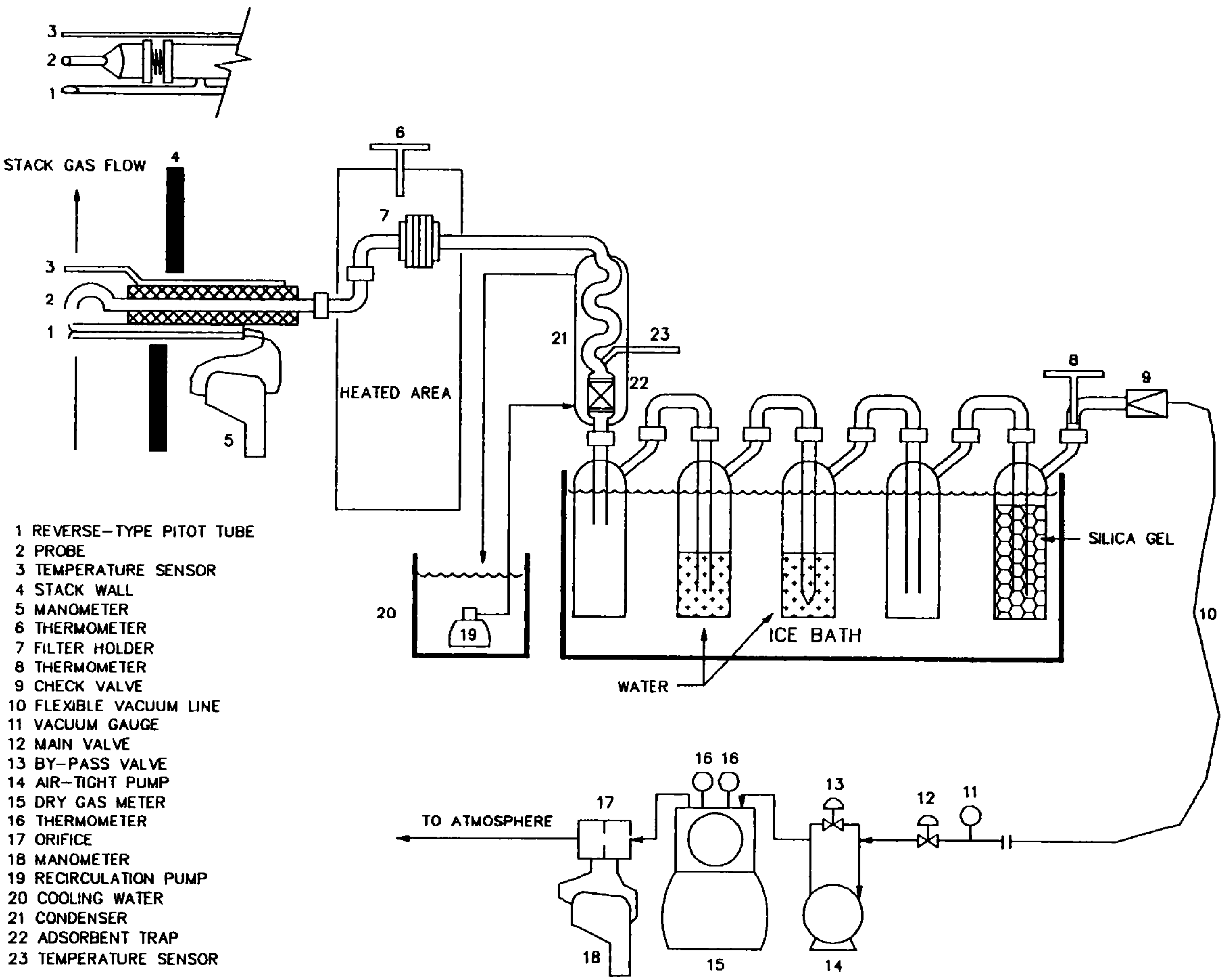


Figure 3-6. EPA Method 5 Sampling Train (M5)

REV. 0	02/18/94	PTF3-6	059312



1 REVERSE-TYPE PITOT TUBE
2 PROBE
3 TEMPERATURE SENSOR
4 STACK WALL
5 MANOMETER
6 THERMOMETER
7 FILTER HOLDER
8 THERMOMETER
9 CHECK VALVE
10 FLEXIBLE VACUUM LINE
11 VACUUM GAUGE
12 MAIN VALVE
13 BY-PASS VALVE
14 AIR-TIGHT PUMP
15 DRY GAS METER
16 THERMOMETER
17 ORIFICE
18 MANOMETER
19 RECIRCULATION PUMP
20 COOLING WATER
21 CONDENSER
22 ADSORBENT TRAP
23 TEMPERATURE SENSOR

Figure 3-7. EPA Method 23 Sampling Train

REV. 0	04/27/94	PTF3-7	059312

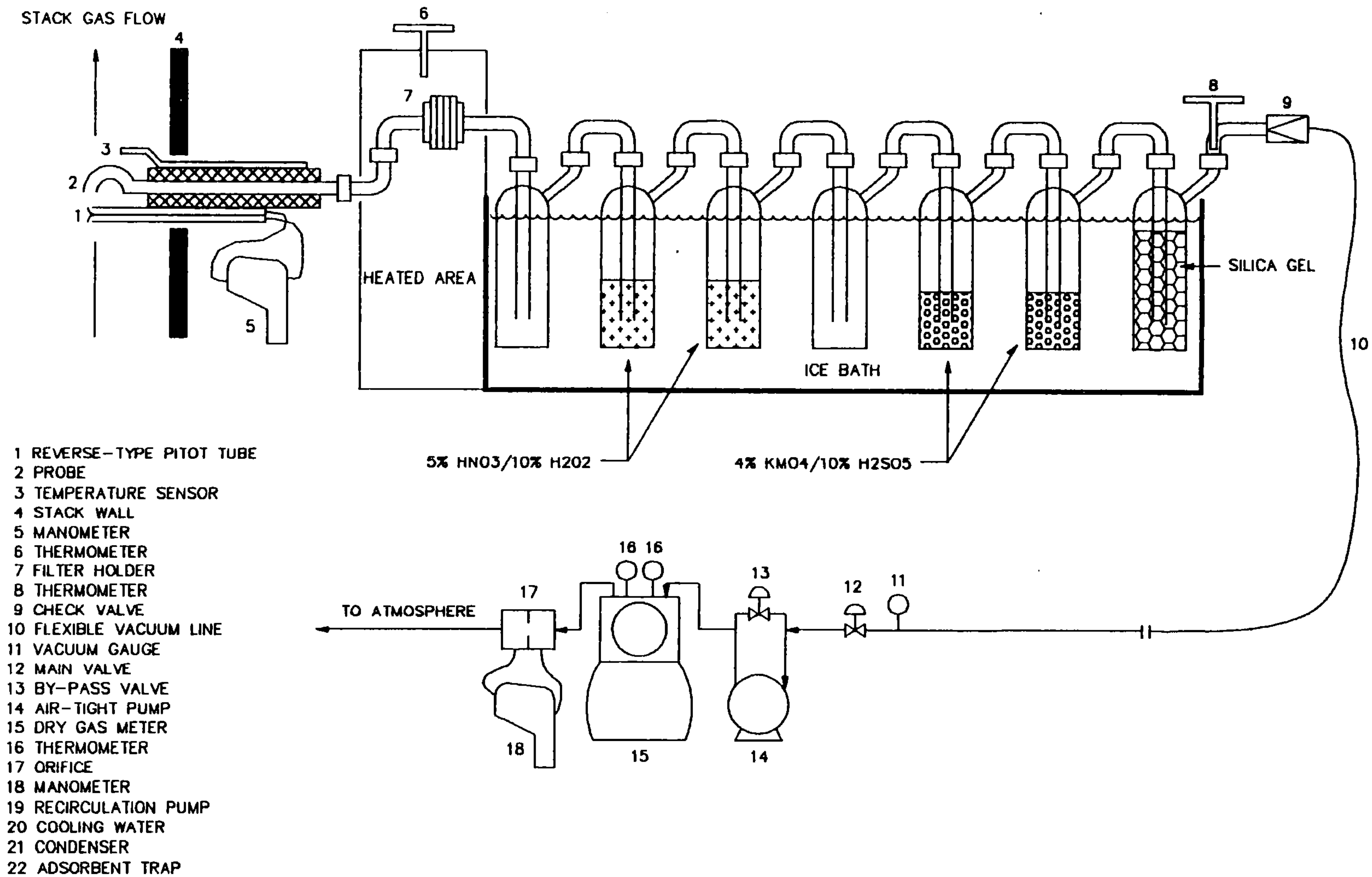
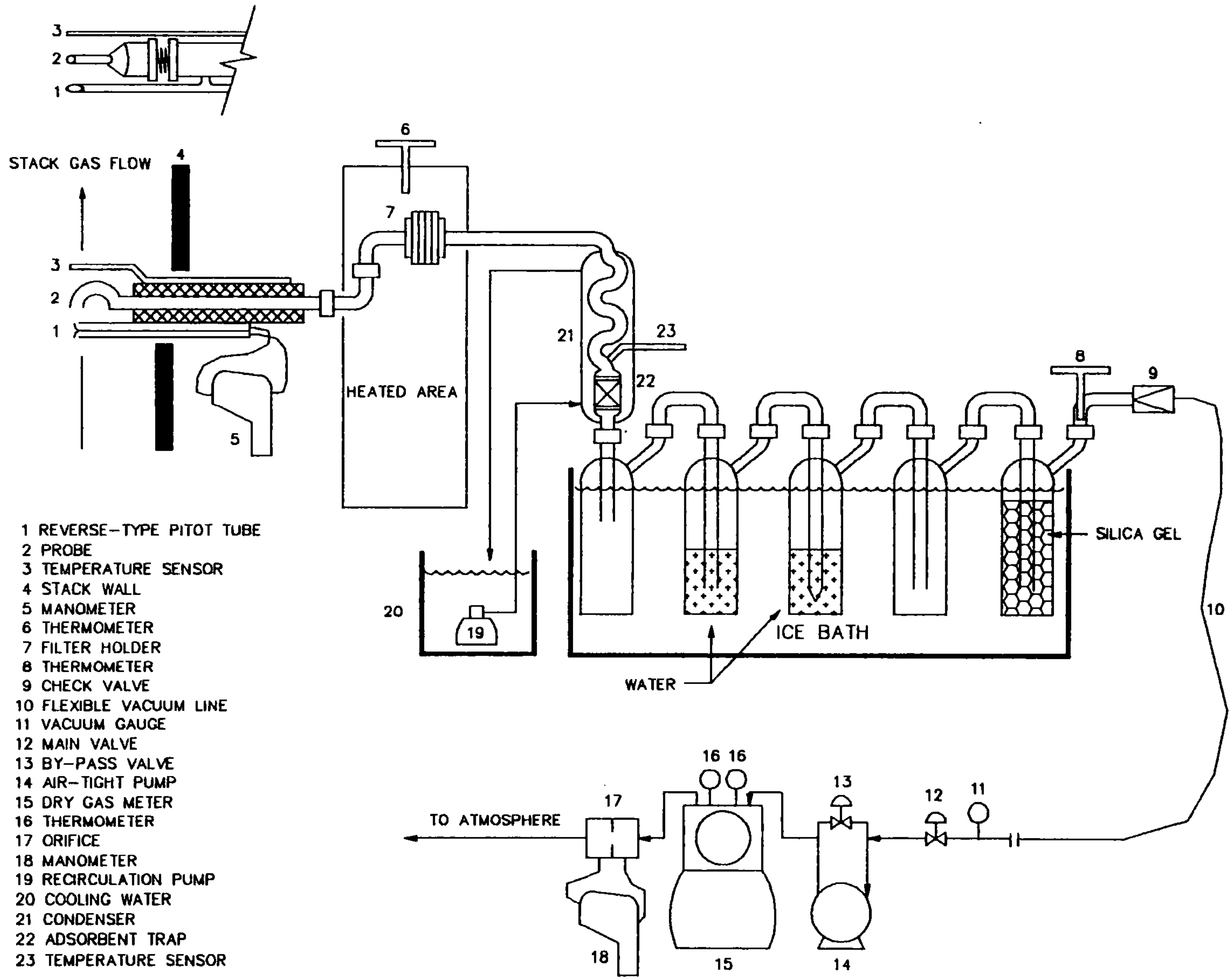


Figure 3-8. EPA Multi-Metals (MMT) Sampling Train

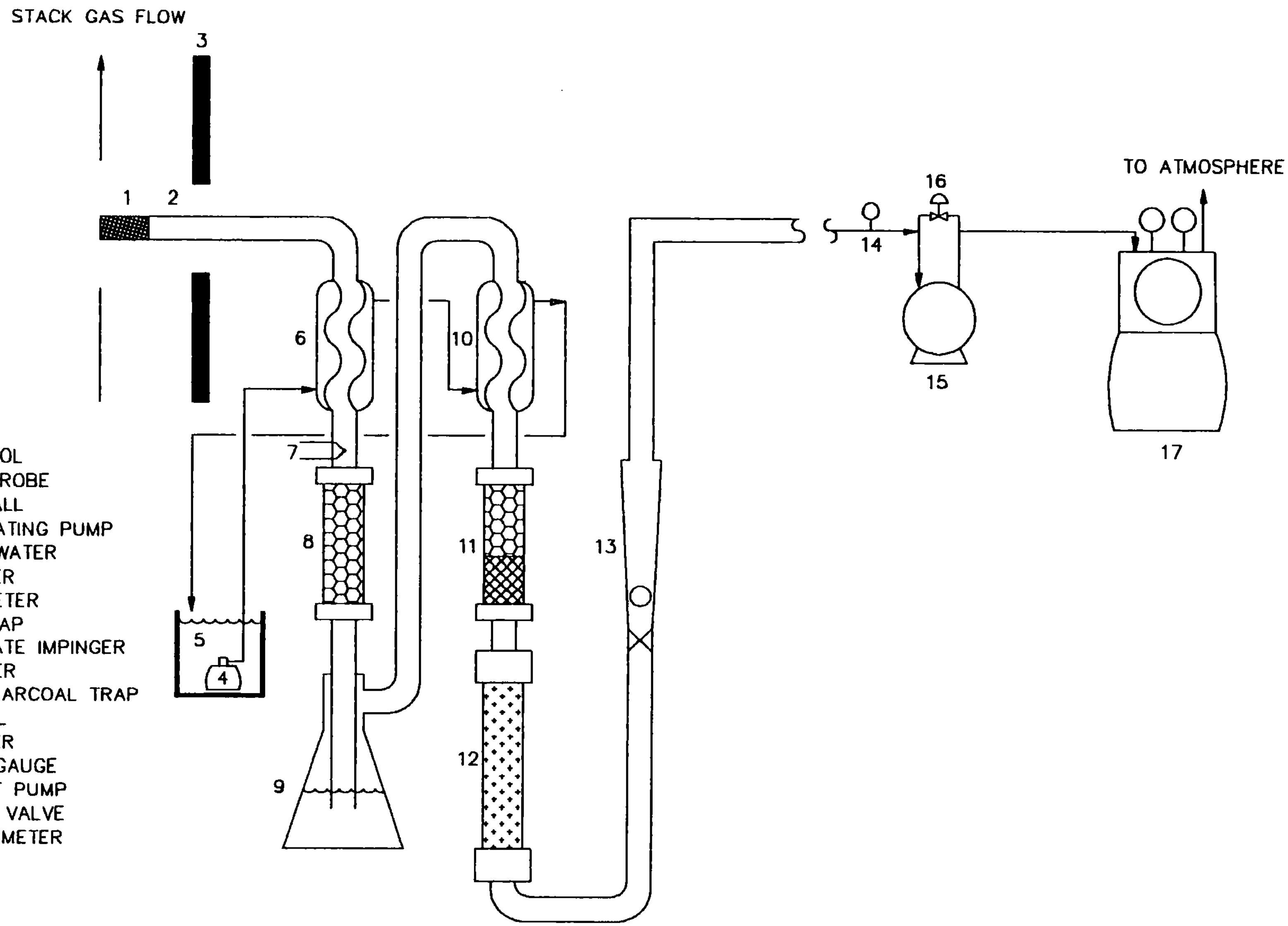
REV. 0	02/18/94	PTF3-8	059312



1 REVERSE-TYPE PITOT TUBE
2 PROBE
3 TEMPERATURE SENSOR
4 STACK WALL
5 MANOMETER
6 THERMOMETER
7 FILTER HOLDER
8 THERMOMETER
9 CHECK VALVE
10 FLEXIBLE VACUUM LINE
11 VACUUM GAUGE
12 MAIN VALVE
13 BY-PASS VALVE
14 AIR-TIGHT PUMP
15 DRY GAS METER
16 THERMOMETER
17 ORIFICE
18 MANOMETER
19 RECIRCULATION PUMP
20 COOLING WATER
21 CONDENSER
22 ADSORBENT TRAP
23 TEMPERATURE SENSOR

Figure 3-9. EPA Modified Method 5 Sampling Train

REV. 0	02/18/94	PTF3-9	059312

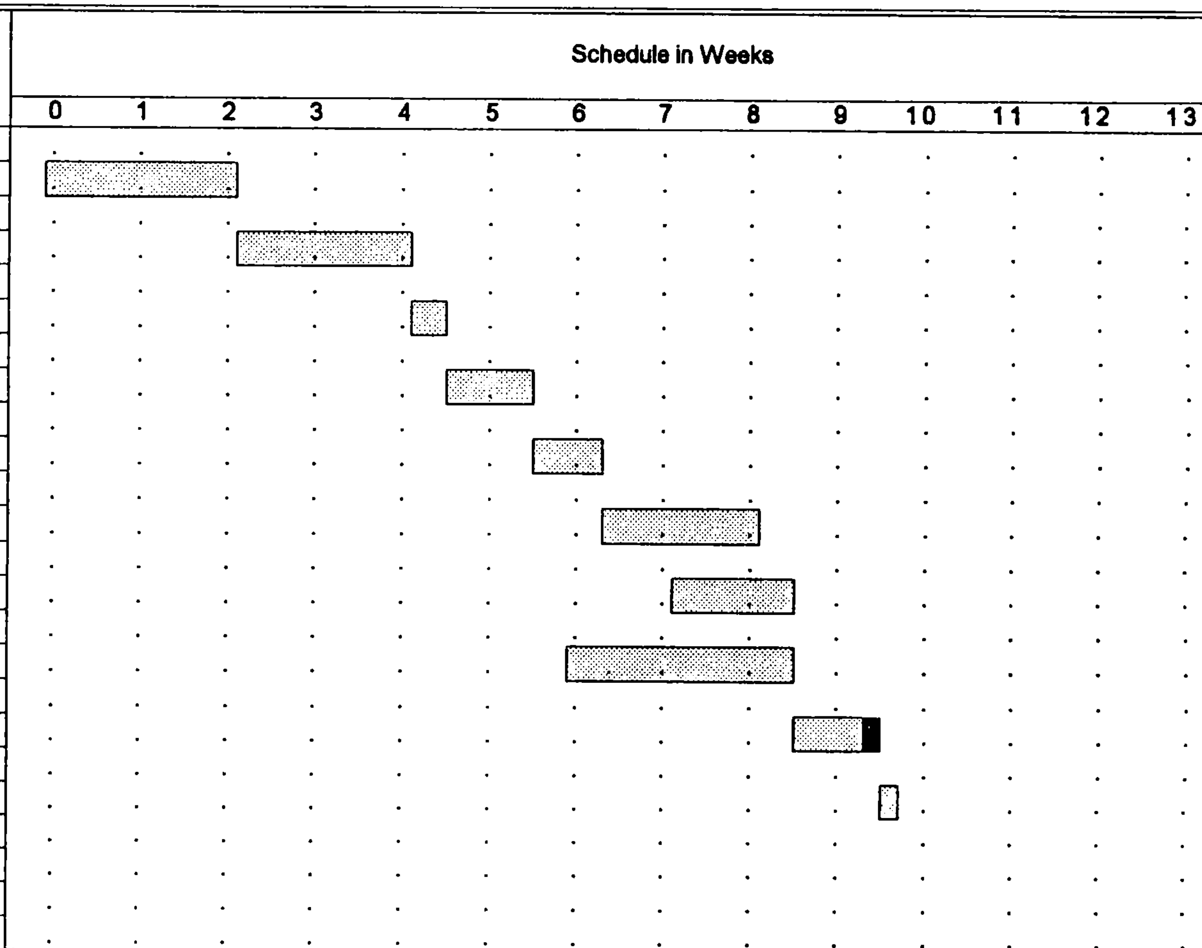


1 GLASS WOOL
2 HEATED PROBE
3 STACK WALL
4 RECIRCULATING PUMP
5 COOLING WATER
6 CONDENSER
7 THERMOMETER
8 TENAX TRAP
9 CONDENSATE IMPINGER
10 CONDENSER
11 TENAX/CHARCOAL TRAP
12 SILICA GEL
13 ROTAMETER
14 VACUUM GAUGE
15 AIR-TIGHT PUMP
16 BY-PASS VALVE
17 DRY GAS METER

Figure 3-10. EPA Volatile Organic Sampling Train (VOST)

02/18/94	PTF3-10	059312

Task No.	Task
1	Equipment Mobilization/Erection
2	Equipment Shakedown
3	Pretest Execution
4	Pretest Sample Analysis/Reporting
5	Performance Test (3 Runs)
6	Performance Test Sample Analysis
7	Data Validation (by EPA Oversight Contractor)
8	Interim Performance Test Report Preparation
9	Interim Performance Test Report Review by Agencies
10	Approval to Begin Production Operations



Client: Williams Environmental Services, Inc.
Location: Stone Mountain, GA

Submitted By: Focus Environmental, Inc.

Thermal Desorption System Perform
Woods Industries Site
Yakima, Washington

Figure 3-11. Project Schedule - Pretest an

File: PTF3-11.WK1	
Project No. 059312	
Engr: SKG	
Date: 02/18/94	
Activity	
Review Meeting	

4.0 POST PERFORMANCE TEST OPERATION

Following completion of the performance test, the LTTD system will operate at 50% of the contaminated soil feed rate demonstrated during the performance test, based on the maximum run average of the three runs. This is contingent on submittal within one week of the operating data collected during the performance test. The data will be submitted in a form that is manipulatable and easily summarized to establish and justify the interim operating conditions. Operation will be increased to 60% following submittal of preliminary stack gas particulate, HCl and free chlorine data showing acceptable levels of emission. Operation will be increased to 75% following submittal of final stack gas particulate, HCl, free chlorine, carbon monoxide, carbon dioxide, oxygen and moisture data in the stack gas; and POHC fate data. Full production operations will resume following submittal to and approval by Region X of the final Performance Test Report, which includes a complete laboratory data package and the risk assessment addendum.

5.0 MONITORING

During the treatment of contaminated soil, monitoring of several parameters will be conducted. The monitored parameters and the monitoring frequency are discussed in Section 3.3.12 of the performance test plan.

6.0 LTTD INSPECTION

The LTTD and associated equipment will be visually inspected daily during operation for fugitive emissions, leaks, spills, and signs of tampering. Additional details concerning inspections are included in Section 14.3 of the Thermal Desorption Work Plan.

7.0 WASTE FEED SHUT OFF

During normal operation, the soil feed shut off system as described in Section 3.3.9 will be functioning any time soil is being introduced into the thermal desorber.

Williams will perform weekly testing of all alarms associated with soil feed shut offs. Weekly testing will be conducted for all contact points and final outputs to the soil feed shut offs. Manual logs will be kept to document the alarm and automatic soil feed shut off system testing.

If the LTTD is not routinely operating, the alarm and soil feed shut off system will be functionally tested just prior to start-up of the LTTD, and then on the weekly functional testing schedule, as described above, during the operating period.

ATTACHMENT 1
QUALITY ASSURANCE PROJECT PLAN
WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON

SUBMITTED TO:

BURLINGTON NORTHERN RAILROAD
2000 FIRST INTERSTATE CENTER
999 THIRD AVENUE
YAKIMA, WASHINGTON 98104-1105

PREPARED FOR:

WILLIAMS ENVIRONMENTAL SERVICES, INC.
2075 WEST PARK PLACE
STONE MOUNTAIN, GEORGIA 30087

January 27, 1995
FOCUS PROJECT NO. 059312

PREPARED BY:

FOCUS ENVIRONMENTAL, INC.
9050 EXECUTIVE PARK DRIVE
SUITE A-202
KNOXVILLE, TENNESSEE 37923

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ATTACHMENTS

1. STACK GAS SAMPLING FIELD DATA COLLECTION FORMS
2. CHAIN OF CUSTODY FORMS
3. LABORATORY REQUEST FOR ANALYSIS FORMS

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

A........................ percent accuracy
APC.................. air pollution control
As...................... arsenic
ASTM .... American Society for Testing and Materials
AWFSO............. Automatic Waste Feed Shutoff
BEI .... Burlington Environmental, Inc.
BIF..................... boilers and industrial furnaces
C........................ percent completeness
CEM .... continuous emissions monitor
CEMS................ continuous emissions monitoring system
CFR................... Code of Federal Regulations
Cl_2..................... chlorine
CO..................... carbon monoxide
DRE................... destruction and removal efficiency
GC/ECD .... gas chromatography/electron capture detector
GC/MS .... gas chromatograph/mass spectrometer
gr/dscf............. grains per dry standard cubic feet
HCl .... hydrogen chloride
Hg .... mercury
LAC .... Laboratory Analysis Coordinator
LTTD .... low temperature thermal desorption
M23 .... EPA Method 23
M5 .... EPA Method 5
MMT .... EPA Multiple Metals Train
N........................ amount of native material
OCL.................. organochlorine
Pb...................... lead
PCDD .... polychlorinated dibenzo-p-dioxins
PCDF .... polychlorinated dibenzofurans
POHC................ principal organic hazardous constituent
ppm_v................. parts per million, by volume
PSC................... Process Sampling Coordinator
PTM................... Performance Test Manager
QA..................... quality assurance
QAO .... quality assurance officer
QAPP .... Quality Assurance Project Plan
QC..................... quality control
R........................ percent recovery
RP .... range percent
RPM .... EPA Remedial Project Manager
RSD................... relative standard deviation
S........................ amount of spiked material
SSC................... Stack Sampling Coordinator
USEPA.............. United States Environmental Protection Agency
WAC.................. Washington Administrative Code
Williams............ Williams Environmental Services, Inc.
X........................ experimentally determined value

1.0 PROJECT TITLE AND PLAN APPROVALS

1.1 PROJECT TITLE: WOODS INDUSTRIES PERFORMANCE TEST

1.2 APPROVALS

EPA Remedial Project Manager	Date
Williams Project Manager	Date
Quality Assurance Officer	Date
Performance Test Manager	Date
Process Sampling Coordinator	Date
Stack Sampling Coordinator	Date
Laboratory Analysis Coordinator	Date
Laboratory Analysis Coordinator	Date

2.0 PROJECT DESCRIPTION

Williams Environmental Services (Williams) has proposed the use of an innovative technology, low temperature thermal desorption (LTTD), to treat pesticides-contaminated soils at the Woods Industries site (Woods). The goals of the performance test will be to demonstrate the ability of the LTTD system to reduce the concentrations of OCL pesticides in the soil and to meet applicable air emission control requirements. The performance test will be deemed successful if the requirements outlined below are met:

- The concentrations of organochlorine (OCL) pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene) and metals (As, Hg, and Pb) in the treated soil meets those specified in Washington State Model Toxic Control Act, Residential Method B. The cleanup goals are listed in Table 1-1.

- The ambient concentrations of OCL pesticides (aldrin, alpha-BHC, beta-BHC, gamma-BHC, chlordane, p,p'-DDE, p,p'-DDD, p,p'-DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxyclor, and toxaphene) resulting from stack gas emissions must meet WAC maximum Acceptable Source Impact Levels (ASIL). Ground-level concentrations are calculated based on a dispersion factor resulting from stack height, stack gas velocity, and stack gas temperature. The allowable stack gas concentrations listed in Table 1-2 are based on the EPA SCREEN model and estimated stack gas data. More accurate allowable concentrations will be calculated when stack gas data from the performance test are available.

- The ambient concentrations of indicator metals (As, Hg, and Pb) resulting from stack gas emissions must meet WAC Maximum Allowable Annual Ground-Level Concentrations. In addition, ambient concentrations of any remaining metal of concern (Be, Cd, Cr, Ni, Sb, Ba, Se, Ag, Tl) must meet appropriate risk specific dose (RSD)(for carcinogens) or reference air concentrations (RAC)(for noncarcinogens) as specified by 40 CFR 266, Appendix IV and V. The estimated allowable stack gas concentrations are listed in Table 1-2.

- The concentration of 2,3,7,8-TCDD (TEQ) in the treated soil meets the agreed upon limits listed in Table 1-1.

- A 99.99 percent destruction and removal efficiency (DRE) of a principal organic hazardous constituent (POHC) is achieved per 40 CFR 264.343. A 99.99% DRE will be demonstrated by measuring the concentration of hexachlorobenzene in the feed soil and stack gas.

- The concentration of particulates in the stack gas is less than 0.03 grains per dry standard cubic feet (gr/dscf), corrected to 7 percent oxygen.

- The emission rates of hydrogen chloride (HCl) and chlorine (Cl_2) in the stack gas are controlled to meet the ambient air impact guidelines described in the Boilers and Industrial Furnaces (BIF) guidelines described in 40 CFR 266.107. In addition, if the feed rate of total chlorine would result in an emission rate of greater than 4 lbs/hr of hydrogen chloride (HCl) in the stack gas, 99% removal of HCl will be demonstrated.

- The concentration of carbon monoxide (CO) in the stack exhaust gas is less than 100 ppm_v, based on a 60 minutes rolling average.
- Risk evaluation results related to stack gas emissions including products of incomplete combustion (PICs) performed according to the methodology provided in the Ambient Air Quality Impact Report shows risk within or below the range of acceptable risk.

In addition to the above requirements, the stack gas will be sampled and analyzed for total polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs), volatile organic compounds and semi-volatile organic compounds that are potential products of incomplete combustion (PICs). Total PCDDs/PCDFs will be calculated by adding all congeners from the tetra- through the octa- PCDD/PCDF groups. In addition, total equivalent 2,3,7,8 TCDD based on the relative potency of the isomers in accordance with USEPA guidelines will be calculated for use in risk evaluation. Risk evaluation will be made consistent with the methodology used in the Ambient Air Quality Impact Report (AAQIR) for the Woods Industries Site prepared by Burlington Environmental, Inc.

The performance test will consist of three replicate sampling runs. In the test, soil feed and operating conditions are designed to achieve the following goals:

- Establish maximum soil mass feed rate (target 20-30 tons/hr)
- Demonstrate minimum thermal desorber exit soil temperature (target 700 °F)
- Demonstrate minimum thermal oxidizer exit gas temperature (target 1700 °F)
- Demonstrate minimum Air Pollution Control (APC) system recycle water flow rate
- Demonstrate minimum APC system purge rate (target 12 gpm)
- Demonstrate minimum packed bed scrubber recycled water pH (target 4)
- Establish control limits for the LTTD and Air Pollution Control (APC) system operating parameters
- Establish maximum stack gas velocity by correlating the velocity to ID fan amperage
- Establish minimum oxygen concentration in the stack gas.

Stack sampling protocols for the performance test are summarized as follows:

- Particulates and HCl by EPA Method 5 (BIF Method 0050)
- OCL Pesticides and semi-Volatile organics by EPA Modified Method 5 (SW-846 Method 0010).

- Volatile organics by EPA Volatile Organics Sampling Train (VOST SW-846 Method 0030)
- Metals by EPA Multiple Metals Train (EPA Draft Method 29)
- PCDDs/PCDFs by EPA Method 23 (EPA Method 23)
- Continuous emissions monitoring (CEM) for CO (EPA Method 10) and O2 (EPA Method 3A).

The Quality Assurance Project Plan (QAPP) describes the procedures that will be implemented to ensure that quality data are acquired during the performance test. The QAPP is based on the guidelines described in Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans EPA-600/4-83-004, Feb 1983. The QA/QC procedures specific to the stack gas sampling and analytical contractor(s) will be incorporated into this plan, as needed.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The remedial activities at the Woods Industries site are being performed under the oversight of EPA Region X. The EPA Remedial Project Manager (RPM) will be onsite during the performance test. Other regulatory observers from EPA Region X, EPA technical assistance groups, EPA oversight contractors, and state and local agencies may also be at the site during the performance test.

The performance test program will be performed by a project team consisting of representatives of Burlington Environmental, Inc. (BEI), Williams, and a group of subcontractors. The stack testing for this project will be conducted by a subcontractor who is experienced in the testing of thermal treatment systems. Analytical services will be provided by one or more analytical laboratory subcontractors. A performance testing consultant will serve as the Performance Test Manager (PTM). The overall project organization and lines of responsibility are shown in Figure 3-1. Names of personnel who have been already been selected for the project team are included on this Figure. Since all contractors have not been selected at this time, some individuals will be added at the time of contractor selection.

The BEI Project Manager has overall responsibility for coordinating site activities. He will have oversight responsibilities for Williams' operations during the LTTD system testing.

The Williams Principal in Charge is the corporate officer with overall responsibility for the financial, operational, and health and safety aspects of the project. The Principal in Charge interacts with the client, regulatory agencies, and the Williams Project Manager as required.

The Williams Project Manager is responsible for coordinating LTTD operations with the test team and providing liaison with the EPA Remedial Project Manager (RPM) during testing. Some of his responsibilities include:

- Working with the PTM in planning and implementing the Performance Test Plan
- Preparing the LTTD system for testing
- Calibrating instruments prior to the test
- Testing automatic waste feed shut offs (AWFSOs) prior to the test
- Operating the LTTD system at planned test conditions

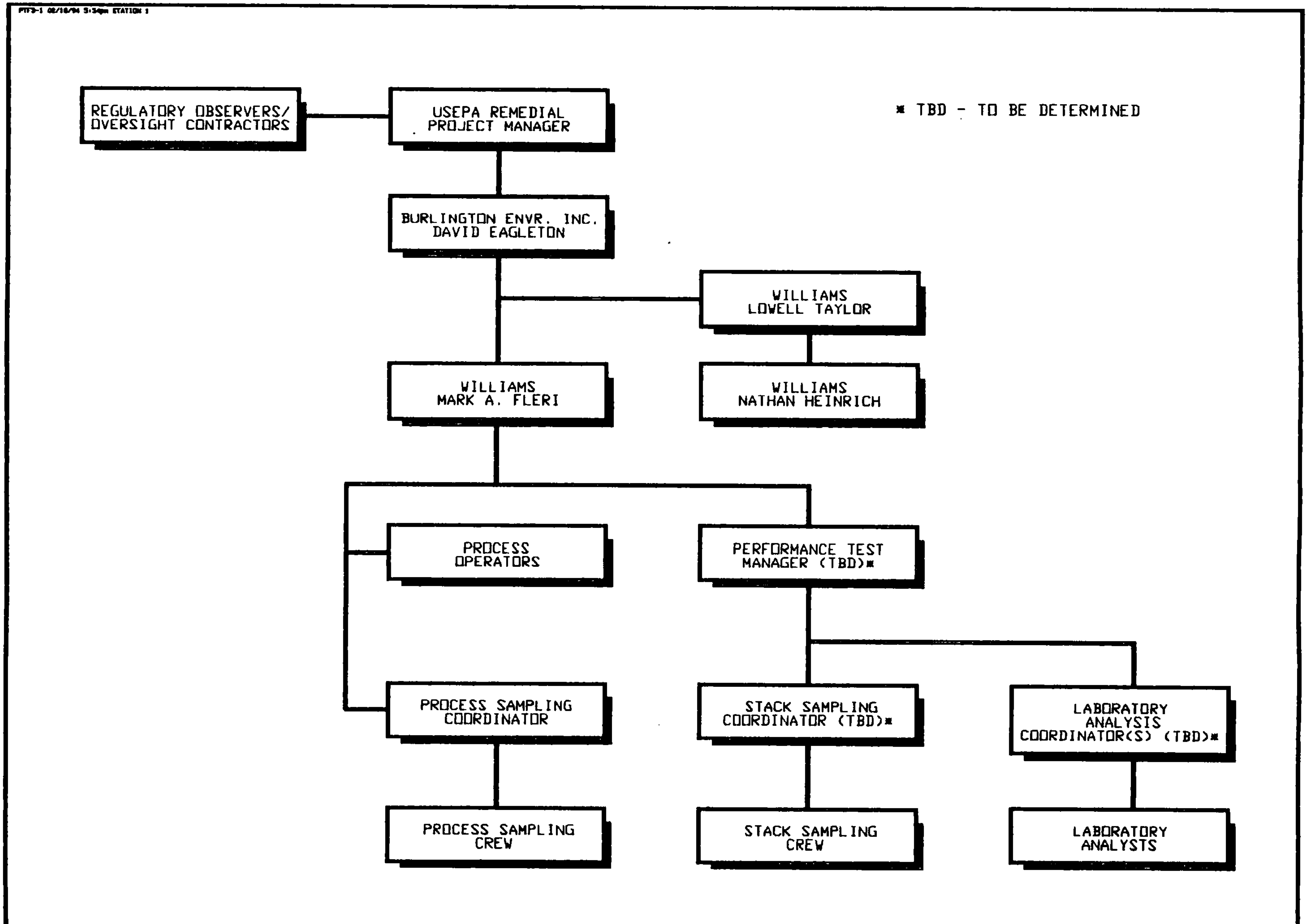

Figure 3-1. Performance Test Project Organization and Responsibility

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- Recording LTTD process data required by the test plans
- Coordinating LTTD operational activities with the Stack Testing Manager through communication with the PTM
- Certifying sections of the performance test report that document the process operations.

The PTM will be responsible for the development of the performance test plan and performance test report and for coordinating activities among various project team members. Specific responsibilities will include:

- Developing the Performance Test Plan
- Coordinating reviews of the Performance Test Plan and QAPP by all performance test participants prior to the performance test
- Ensuring compliance with the Performance Test Plan and the QAPP by all project team members during the performance test
- Assisting the Williams Project Manager in interfacing with the EPA RPM and other regulatory observers/oversight contractors during the performance test
- Providing coordination between the Williams Project Manager and the Stack Sampling Coordinator during the performance test
- Providing field review of process operating logs, Performance Test Sample Collection Sheets, stack sampling logs, chain of custody forms, and request for analysis forms
- Interfacing with the Laboratory Analysis Coordinators while samples are being analyzed
- Interfacing with the Stack Sampling Coordinator while the performance test stack sampling data is being reduced
- Supervising production of the Performance Test Report
- Certifying the overall performance test results and Performance Test Report
- Coordinating review of the Performance Test Report with regulatory agency personnel

A Quality Assurance Officer (QAO) who reports to the Williams Principal in Charge will also be appointed whose responsibilities will include:

- Reviewing QA/QC activities and communicating the results of those activities to the appropriate personnel
- Making recommendations to the Williams Principal in Charge if problems are detected
- Ensuring that appropriate corrective actions are taken if problems are detected
- Conducting or coordinating any required audits of field or laboratory procedures to ensure compliance with the Performance Test Plan and QAPP
- Verifying that test data are adequately recorded and maintained and that raw data are properly recorded, validated, and interpreted.

A Process Sampling Coordinator (PSC) will be appointed who will have the following responsibilities:

- Preparing and shipping soil sampling equipment, soil sample containers, and shipping containers to the test site
- Assigning and recording soil sample numbers
- Reviewing and approving Performance Test Sample Collection Sheets
- Documenting stack sampling activities in a field logbook
- Directing and/or participating in soil sampling activities
- Overseeing preservation of soil samples in the field
- Preparing soil samples and packaging them for shipment to the laboratory
- Preparing chain of custody and request for analysis forms for soil samples
- Shipping soil samples to the laboratory.

A Stack Sampling Coordinator (SSC) will be appointed who will have the following responsibilities:

- Preparing and shipping stack sampling equipment and stack sample containers, and stack sample shipping container to the test site
- Assigning and recording stack sample numbers
- Preparing and calibrating stack sampling equipment
- Directing stack sampling activities
- Recording field test data required by the Performance Test Plan or stack sampling methods
- Reviewing and approving all field data sheets
- Completing chain-of-custody forms and request for analysis forms for stack samples
- Overseeing preservation of stack samples in the field
- Labeling stack samples and preparing them for shipment to the laboratory
- Shipping stack samples to the analytical laboratory
- Reducing stack sampling data and performing all calculations and QA activities required by the sampling methods
- Preparing a draft and final report of stack sampling activities.

One Laboratory Analysis Coordinator (LAC) will be appointed for each laboratory that provides analytical services for the project. His/her responsibilities will include:

- Receiving, verifying, and documenting that incoming field samples correspond to the chain-of-custody information
- Maintaining records of incoming samples
- Tracking samples through processing, analysis, and disposal
- Preparing QC samples for analysis during the project

- Verifying that personnel are trained and qualified in specified laboratory QC and analytical procedures
- Verifying that laboratory QC and analytical procedures are being followed as specified in the QA/QC Plan
- Reviewing QC and sample data during analysis and determining if repeat samples or analyses are needed
- Submitting certified QC and sample analysis results and data packages to the PTM
- Archiving analytical data.

4.0 QUALITY ASSURANCE OBJECTIVES

QA objectives for precision, accuracy, and completeness are addressed in this section. Procedures and formulas for determining accuracy and precision are discussed in Section 13.0 of this document. The following definitions briefly describe the QA objectives of precision, accuracy, and completeness:

Accuracy: The degree of agreement of a measurement (or an average of measurements of the same parameter) X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X - T, or the difference as a percentage of the reference or true value, 100 (X - T)/T, and sometimes expressed as a ratio, X/T. In some cases, accuracy is described as the percentage recovery of a known quantity of material added to a sample prior to analysis. Accuracy is a measure of the bias in a system.

Precision: A measure of mutual agreement among individual measurements of the same property, usually under "prescribed similar conditions." Various measures of precision exist depending on the prescribed similar conditions. If the number of samples is less than 4, the precision is described as range percent from the average of replicate measured values for analysis of the same parameter. If the number of samples is four or greater, precision is best described in terms of relative standard deviation.

Completeness: A measure of the amount of valid data obtained compared to the amount expected to be collected under normal conditions. Completeness is usually expressed as a percentage.

When experience, established methods of analysis, and homogeneous sample matrices are all present in a project, QA objectives can be stated with some degree of confidence that they can be achieved. Predetermined tolerance limits for the overall precision and accuracy of sampling and analysis cannot be established before the collection of field samples. Therefore, the establishment of QA objectives for a particular performance test project must rely heavily on spike recovery and results of duplicate analyses or samples analyzed before the collection of actual performance test samples.

Data quality objectives for the measurement parameters associated with this project are presented in Table 4-1. Precision estimates presented in the table represent variability for replicate measurements of the same parameters, expressed in terms of range percent or relative standard deviation, as appropriate. Accuracy values include components of both random error and bias, expressed as a percentage of the true value (for reference materials) or percent analyte recovery (for spiked samples).

Table 4-1. Specific Objectives for Data Quality

Test Parameter(s)	Matrix/ Test Series	Method of Determination	Frequency	Accuracy	Precision
OCL Pesticides (SW846-8080)	Feed soil Treated soil Scrubber Blowdown	Duplicate analysis	One sample per matrix	NA	< 35 RP if concentration > 5 times the detection limit, otherwise < 50 RP
		Surrogate (dibutylchlorendate) spiked before sample preparation	One matrix spike and matrix spike duplicate per each matrix	50 - 130% (recovery)	< 35 RP of surrogate recovery
	Blanks	Method blank carried through all sample prep. and analysis steps	Once per sample batch	<5% of analyte concentrations or < 2 times detection limit	
Metals (total) (SW846-6010 and 7471)	Feed soil Treated soil Scrubber Blowdown	Duplicate analysis	One sample per matrix	NA	< 35 RP for results > lowest calibration standard
		One sample from a run spiked at 10 times the detection limit	One sample per matrix	70 - 130% recovery	NA
	Blanks	Method blank carried through all sample prep. and analysis steps	Once per sample batch	<5% of analyte concentrations or < 2 times detection limit	
Heating Value Ash Content Moisture Chlorine Content	Feed soil	Duplicate analysis	One sample per matrix	NA	<10 RP
		Known material	Once per sample batch	90 - 110% of reference value of known material	NA
HCl/Cl2 (SW846-9057)	Stack gas M5 impinger samples	H_2SO_4 and NaOH impinger solutions post spiked at < 3 times native level	Once per performance test	85 - 115% (recovery)	NA
		Duplicate analysis on H_2SO_4 and NaOH impinger solutions	Once per performance test	NA	< 25 RP if concentration > 5 times DL, otherwise < 50
	Blank	Method blank carried through all sample preparation	Once per performance test	<5% of analyte concentrations or < 2 times detection limit	
Oxygen and Carbon Dioxide	Stack gas M5, M23 bag samples	Single analysis of ambient air	Prior to sample analysis	98 -102% (assuming air at 20.8% oxygen)	NA
		Triplicate analysis of test samples	Each sample	NA	< 2 RP

Table 4-1. Specific Objectives for Data Quality

Test Parameter(s)	Matrix/ Test Series	Method of Determination	Frequency	Accuracy	Precision
PCDD's/PCDFs EPA Method 23 (SW846-8290)	Stack gas M23 train samples and blank M23 train	Sorbent resin is spiked with surrogates prior to sample collection	Every sorbent cartridge	70 - 130 % (recovery)	< 30% RSD of surrogate recoveries
		Train components are spiked with internal standards prior to analysis	Every train component	40 - 130% (recovery) for tetra- through hexa-chlorinated homologues, 25 - 130% recovery for hepta and octa homologues	< 60% RSD of surrogate recoveries
	Blank M23 train sample	Method blank for each train component	Once per performance test	<5% of analyte concentrations or < 2 times detection limit	
	Audit	Audit provided by regulatory agency	Once per test	80 - 120% of true value	NA
PCDDs/PCDFs (SW846 8290)	Treated soil	Duplicate analysis	Once per test run	NA	<25 RP
		Surrogates spiked before sample preparation	Every sample	40 - 135%(recovery)	NA
	Blank	Method blank carried through all sample preparation	Once per test	<5% of analyte concentrations or < 2 times detection limit	
		Surrogates spiked before sample preparation	Once per test	40 - 135%(recovery)	NA
	Rinsate	Surrogates spiked before sample preparation	Once per test	40 - 135%(recovery)	NA
OCL Pesticides (SW846-8080)	Stack gas MM5 train samples	Duplicate analysis of all train components from the run with the highest pesticide concentration	Once per performance test	NA	< 50 RP if pesticide concentration is above lowest calibration standard; < 100 RP in all other cases
		Surrogate (dibutyl chlorendate) spiked before sample preparation	Every sample	50 - 150% (recovery)	< 40 RP of surrrogate recovery
	Blank MM5 train sample	Method blank for each train component	Once per performance test	<5% of analyte concentrations or < 2 times detection limit	

Table 4-1. Specific Objectives for Data Quality

Test Parameter(s)	Matrix/ Test Series	Method of Determination	Frequency	Accuracy	Precision
Semivolatile Organic (SW846-8270)	Stack gas MM5 train samples	Duplicate analysis of all train components from one run	Once per performance test	NA	< 50 RP if target compound concentration is above lowest calibration standard; <100RP in all other cases
		Spiked with isotopical labeled surrogates before sample analysis	Every sample	50 - 150% (recovery)	< 40 RP of surrogate recovery
	Blank MM5 train sample	Method blank for each train component	Once per performance test	Verify noncontamination of field samples	
Metals (SW 846-6010, 7000-series)	Stack gas MMT samples	One sample preparation from each train component is analyzed and then spiked at 10 times the detection limit	Once per performance test per component	70 - 130% recovery	NA
	Standards	Duplicate preparation and analysis of NIST standard reference filters	Once per performance test	75 - 125% of true value	< 35 RP
	Blanks	Duplicate preparation and analysis of complete blank sampling trains spiked at 10 times the DL	Once per performance test except mercury For mercury, once per sample matrix	70 - 130% recovery	< 35 RP except mercury For mercury <25 RP
		Analysis of method blanks	Once per performance test	Evaluated on a case-by-case basis	
Volatile Organics (SW846-8240)	Pre-analysis VOST tube demonstration	Analysis of 4 tubes spiked with standard independent of calibration standards @ 100 ng	Demonstrate prior to sample analysis	75-125% recovery	< 25% RSD between spike recoveries
	VOST Samples	Spike each VOST tube sample with surrogates	Every VOST tube sample	50-150% recovery	<35% RSD of sample recovery
		Condensate spiked with surrogates	Every condensate sample	50-150% recovery	<35% RSD of sample recovery
	Blanks	Field blanks to verify lack of field contamination	1 pair for 6 samples	< lowest standard	NA

Table 4-1. Specific Objectives for Data Quality

Test Parameter(s)	Matrix/ Test Series	Method of Determination	Frequency	Accuracy	Precision
Volatile Organics (SW846-8240) (Continued)	Blanks (Continued)	Trip blanks to verify no cross-combination in shipping or storage	1 pair with each shipment; analyzed only if field only if field blanks contaminated	< lowest standard	
		Lab blanks (prepared in same batch as field tubes and archived)	1 pair per day; analyzed only if trip blanks are contaminated	< lowest standard	
		System blanks to verify no laboratory contamination	Daily, before analysis of samples and between high-level samples	< lowest standard	
	Audit	Analysis of sample from EPA audit cylinder	Once per performance test	50-150% of true value	NA
Carbon monoxide	Stack gas CEMS	Calibration error, 3 points (Low and High Range)	Once prior to performance test	± 5% of span	NA
		Calibration checks, high and low range	Daily during perfromance test	Within 3% of span	NA
		Relative accuracy test	Once prior to performance test	Within the greater of 10ppm or 10% of reference method	NA
		Calibration drift test, high and low range, 7-day period, 24 hour test	Once prior to performance test	NA	Within 3% of span
Oxygen	Stack gas CEMS	Calibration error, 3 points	Once prior to performance test	< 0.5% Oxygen	Within 0.5% Oxygen
		Calibration checks, high and low range	Daily during perfromance test	Within 0.5% Oxygen	NA
		Relative accuracy test	Once prior to performance test	Incorporated into CO relative accuracy test	
		Calibration drift test, 7-day period, 24 hour test	Once prior to performance test	Within 0.5% Oxygen	NA

Explanation of abbreviations:
NA - Not Applicable; RSD - Relative Standard Deviation; RP - Range Percent

Data completeness represents the percentage of valid data collected from the total number of valid tests conducted. As it applies to a performance test program, data must be essentially 100 percent complete, in that three valid test runs are needed for each test condition. Because the possibility exists that a sample may be lost or broken, the data from each individual analytical parameter may not be 100 percent complete for all test runs. This may not, however, necessarily invalidate a run. With this in mind, it is difficult, if not impossible to establish numeric values for data completeness for each parameter. The completeness objective of this performance test program is to generate sufficient data for the regulatory agencies to judge the performance of the LTTD system.

A number of procedures will be used to meet the precision and accuracy objectives of the analytical program. All sampling and analytical activities will be conducted following referenced procedures. All reference materials used as calibration standards, surrogate compounds, or laboratory control samples will be of the highest purity commercially available, usually greater than 98 percent. The instruments used in the analysis will be verified each day that samples are analyzed as described in Sections 8.0 and 11.0 of this QA document. Assessment of data precision and accuracy will be accomplished by evaluating the results from analysis of standards, reagent or method blanks, field and trip blanks, duplicate samples, and matrix or surrogate spiked samples.

The QA/QC program will focus upon controlling measurement error within these estimated limits of measurement uncertainty. It should be noted that these limits are estimates which are, in most cases, described in the referenced analytical methods. They represent the range of results which can be expected from these methods based on actual field sampling results and laboratory-based QA/QC studies. Therefore, it is reasonable to expect that the measurement errors associated with this project will be within the objectives shown in Table 4-1.

If ongoing QA/QC procedures reveal that a measurement's error has exceeded the estimated data quality limits, the source of the excessive error will be identified and corrective action will be taken, as described in Section 14.0. If data fall outside the acceptable range of precision and accuracy, even after corrective action has been taken, those data points will be flagged in the final report. The precision and accuracy for those measurements will be reported as determined using the actual data. Also, alternative procedures (either sampling or analytical) may be considered and recommended if possible. Any changes or additions would necessarily be agreed to by all parties before implementation.

The analytical laboratory conducting the analysis of the performance test samples will be required to have standard procedures for preparing, reviewing, and controlling distribution of analytical procedures.

5.0 SAMPLING PROCEDURES

The stack sampling procedures will be implemented by a subcontractor with demonstrated experience in successfully conducting performance stack tests for compliance with applicable regulations. The contractor will be responsible for implementing the detailed stack sampling and analytical procedures which are defined in the Performance Test Plan, as they are approved by the regulatory agency.

Process sampling will be coordinated and conducted by Williams personnel. Williams will be responsible for implementing the detailed sampling procedures which are defined in the Performance Test Plan, as they are approved by the regulatory agency.

Performance test samples will be taken for the following process streams:

- Soil feed
- Treated soil
- Scrubber blowdown
- Stack gas.

Sampling point locations are shown in Figure 3-3 of the Performance Test Plan

The sample collection equipment, procedures, frequency, and methods for the performance test are summarized in Table 3-4 of the Performance Test Plan. Detailed descriptions of these procedures are presented in the Performance Test Plan, Section 3.4.1, which are incorporated here by reference. Table 5-1 summarizes all samples to be collected during the performance test including those related to the QA/QC (duplicates, replicates, spikes, audits and blanks).

Table 5-1 Summary of QA/QC Samples

Sample Matrix	Routine Samples or Field Splits (a) (No. per Run)	Field Duplicates (a) (No. per Run)	Number of Runs	Total Samples Collected During Test
Feed soil				
Physical properties	1	0	3	3
OCL pesticides	1	0	3	3
Total metals	1	0	3	3
Archive	1	0	3	3
Sampling equipment rinse blank	NA	NA	NA	1
Subtotal	4	0	3	13
Treated soil				
Physical properties	1	0	3	3
OCL pesticides	1	0	3	3
Total metals	1	0	3	3
Dioxins and furans	1	1	3	6
Archive	1	0	3	3
Sampling equipment rinse blank	NA	NA	NA	1
Subtotal	5	1	3	19
Scrubber Blowdown				
OCL pesticides	1	0	3	3
Total metals	1	0	3	3
Archive	1	1	3	6
Sampling equipment rinse blank	NA	NA	NA	1
Subtotal	3	1	3	13
Stack Gas M5				
Filter	1	0	3	3
Front half rinse	1	0	3	3
Acid impinger liquid	1	0	3	3
Alkaline impinger liquid	1	0	3	3
Deionized water reagent blank	NA	NA	NA	1
Acetone reagent blank	NA	NA	NA	1
Sulfuric acid solution reagent blank	NA	NA	NA	1
Sodium hydroxide solution reagent blank	NA	NA	NA	1
Subtotal	4	0	3	16
Stack Gas M23				
Filter	1	0	3	3
Resin trap	1	0	3	3
Acetone/methylene chloride rinses	1	0	3	3
Toluene rinses	1	0	3	3
Filter (blank train)	NA	NA	NA	1
Resin trap (blank train)	NA	NA	NA	1
Acetone/methylene chloride rinses (blank train)	NA	NA	NA	1
Toluene rinses (blank train)	NA	NA	NA	1
Filter blank	NA	NA	NA	1
Resin trap blank	NA	NA	NA	1
Acetone/methylene chloride reagent blank	NA	NA	NA	1
Toluene reagent blank	NA	NA	NA	1
Subtotal	4	0	3	19

Table 5-1 Summary of QA/QC Samples

Sample Matrix	Routine Samples or Field Splits (a) (No. per Run)	Field Duplicates (a) (No. per Run)	Number of Runs	Total Samples Collected During Test
Stack Gas MM5				
Filter	1	0	3	3
Resin trap	1	0	3	3
Acetone/methylene chloride rinses	1	0	3	3
Impinger liquid	1	0	3	3
Filter (blank train)	NA	NA	NA	1
Resin trap (blank train)	NA	NA	NA	1
Acetone/methylene chloride rinses (blank train)	NA	NA	NA	1
Impinger liquid (blank train)	NA	NA	NA	1
Filter blank	NA	NA	NA	1
Resin trap blank	NA	NA	NA	1
Acetone/methylene chloride reagent blank	NA	NA	NA	1
Water reagent blank	NA	NA	NA	1
Subtotal	4	0	3	19
Stack Gas MMT				
Filter	1	0	3	3
Nitric acid probe rinse	1	0	3	3
Impinger 1, 2, & 3 solution and rinses	1	0	3	3
Impinger 4 solution and rinse	1	0	3	3
Impinger 5 & 6 solution and rinse	1	0	3	3
Impinger 5 & 6 HCl rinse (if used)	1	0	3	3
Filter blank	NA	NA	NA	3
Nitric acid probe rinse (blank train)	NA	NA	NA	1
Impinger 1, 2, & 3 solution and rinse (blank train)	NA	NA	NA	1
Impinger 4 solution and rinse (blank train)	NA	NA	NA	1
Impinger 5 & 6 solution and rinse (blank train)	NA	NA	NA	1
Impinger 5 & 6 HCl rinse (if used) (blank train)	NA	NA	NA	1
Nitric acid solution reagent blank	NA	NA	NA	1
Water reagent blank	NA	NA	NA	1
Nitric acid/hydrogen peroxide solution reagent blank	NA	NA	NA	1
Acidified potassium permanganate solution reagent b	NA	NA	NA	1
HCl solution reagent blank (if used)	NA	NA	NA	1
Subtotal	6	0	3	31
Stack Gas VOST				
Tenax resin tube	4	0	3	12
Tenax resin/charcoal tube	4	0	3	12
Condensate	1	0	3	3
Tenax resin tube field blank	1	0	3	3
Tenax resin/charcoal tube field baink	1	0	3	3
Tenax resin tube trip blank	NA	NA	NA	1
Tenax resin/charcoal tube trip blank	NA	NA	NA	1
Tenax resin tube laboratory blank	NA	NA	NA	1
Tenax resin/charcoal tube laboratory blank	NA	NA	NA	1
Tenax resin tube audit samples	NA	NA	NA	3
Tenax resin/charcoal tube audit samples	NA	NA	NA	3
Subtotal	11	0	3	43
TOTAL	37	2	3	154

(a) "Field Splits" are separate portions of the same sample, placed into individual containers.
"Filed Duplicates" are separate samples collected from the same sampling point.

6.0 SAMPLE CUSTODY

Stack sample custody will be the responsibility of the SSC from the time of sample collection until the samples are shipped to the analytical laboratory. Process sample (soils) will be the responsibility of the PSC from the time of sample collection until the samples are shipped to the analytical laboratory. After samples are received at the laboratories, custody will be maintained by the LAC(s).

Samples will be kept in appropriate containers labeled to uniquely identify each sample. An example sample collection sheet, shown in Figure 6-1, will provide an inventory and field sampling record of each process sample collected during field operations. A set of sample collection forms for stack sampling activities will be provided by the stack sampling coordinator once the stack sampling contractor is chosen. These forms will be amended to this QAPP as Attachment 1.

Chain of custody record forms will provide the formal custody record. A "Request for Analysis" form, describing the analyses to be performed on each sample, will accompany samples to the laboratory. Both Chain of Custody and Request for Analysis forms will be provided by the LAC(s) once the analytical contractor is chosen. These forms will be amended to this QAPP as Attachments 2 and 3 respectively.

Samples will be kept on ice as appropriate in an ice chest and will be shipped to the analytical laboratory in a secured chest. Chain of custody forms will be executed and retained as follows:

- One copy retained by the PTM
- One copy retained by the sampling team collecting the data
- One copy sent separately to the analytical laboratory.

The LAC(s) will inventory each shipment of samples and sign and date the original chain of custody form. He will then make a note on the custody form of any discrepancy in the number of samples or breakage of samples. The PTM and the QAO will be notified immediately of any problems identified with shipped samples. All samples will be logged into the contractor's laboratory information management system to track sample information. The laboratory will maintain custody of the samples for a minimum of 60 days after reporting or until notification for release is received from the PTM. A final copy of the completed chain of custody forms will be forwarded to the PTM for inclusion in the final report.

Figure 6-1. Performance Test Sample Collection Sheet

A. Sample Information:	Comments
Sample Type/Name: ______	______
Sample No(s): ______	______
Run No.: ______	______
Sample Amount(s): ______	______
Number of Samples: ______	______
Collection Date/Time: ______	______
B. Sampling Location:	**Comments**
Process Area: ______	______
Location Description: ______	______
Sample Description: ______	______
Hazard Category: ______	______
C. Sampling Equipment:	**Comments**
Type: ______	______
D. Sample Form (circle one):	**Comments**
Liquid Solid Semi-Solid	______
E. Sample Container (check one):	**Comments**
______ 4 ounce glass jar ______ 16 ounce glass jar	______
______ 8 ounce glass jar ______ 32 ounce glass jar	______
______ Other ______	______
F. Preservative (circle one):	**Comments**
Yes No If so, what type: ______	______
G. Sample Composited?:	**Comments**
Yes No	
Composite No. 1: Time: ______ Amount: ______	______
Composite No. 2: Time: ______ Amount: ______	______
Composite No. 3: Time: ______ Amount: ______	______
Composite No. 4: Time: ______ Amount: ______	______
Composite No. 5: Time: ______ Amount: ______	______
Composite No. 6: Time: ______ Amount: ______	______
Composite No. 7: Time: ______ Amount: ______	______
Composite No. 8: Time: ______ Amount: ______	______
Composite No. 9: Time: ______ Amount: ______	______
Composite No. 10: Time: ______ Amount: ______	______
Composite No. 11: Time: ______ Amount: ______	______
Composite No. 12: Time: ______ Amount: ______	______
Composite No. 13: Time: ______ Amount: ______	______
Composite No. 14: Time: ______ Amount: ______	______
Composite No. 15: Time: ______ Amount: ______	______
Composite No. 16: Time: ______ Amount: ______	______

H. Approval:

Sampler's Signature: ______ Date: ______

Sampling Coordinator's Signature: ______ Date: ______

7.0 CALIBRATION PROCEDURES AND FREQUENCY

The objective of this section is to assure that LTTD process instruments, gas sampling equipment, and analytical instruments are performing properly before conducting the performance test and analyzing performance test samples. Equipment and instruments used to generate data for determining compliance with performance requirements or to establish quantitative allowable operating limits will be calibrated prior to and/or during the performance test as necessary.

The calibration procedures are separated into three groups according to the personnel who will perform them. The process instruments will be calibrated by Williams operational personnel, stack sampling equipment by the stack testing subcontractor, and analytical instruments by laboratory personnel. The calibration procedures for each of these groups are described in the following subsections.

7.1 LTTD PROCESS INSTRUMENTS

The following LTTD process instruments will be checked, tested and/or calibrated before the performance test.

- Feed conveyor feed weigh cell
- Baghouse dust flow meter
- Thermal desorber exit gas temperature monitor
- Thermal desorber exit soil temperature monitor
- Thermal desorber pressure monitor
- Thermal oxidizer exit gas temperature
- Baghouse differential pressure gauge
- Quench exit gas temperature thermocouple
- APC system recycle water flowmeter
- Quench/packed bed scrubber liquid pH probe
- APC system water supply pressure gauge
- APC system purge rate flow meter
- ID Fan ammeter
- Stack gas CO monitor
- Stack gas O2 monitor.

The calibration procedures for each specific instrument are summarized in Table 7-1. The procedures will be performed within the time periods (frequencies) shown in the table.

Table 7-1. Summary of Process Instrument Calibration Procedures, Acceptance Criteria, and Frequency

Instrument	Type	Calibration Procedure	Acceptance Criteria	Frequency
FLOW				
Feed soil Baghouse Dust APC Purge APC Recycle water	Weigh cell Flow meter Flow meter Flow meter	Perform calibration procedures based on manufacturer's recommendation	± 1.0% Span	Within 1 month of performance test
TEMPERATURE				
Thermal desorber exit gas Thermal desorber exit soil Thermal oxid. temperature Baghouse exit gas Quench exit gas Packed scrubber exit gas	Thermocouple	Check thermocouple type and condition; use standard thermocouple simulator to generate a millivolt signal from the ANSI standard thermocouple tables corresponding to a given temperature; adjust output signal to generate the proper temperature readout.	± 2.5% span	Within 1 month of performance test
PRESSURE GAUGES				
Thermal desorber Quench recycle flow APC water supply Baghouse DP ID Fan DP	Pressure Transmitter Pressure switch	Use standard pressure calibrator or manometer to generate a signal corresponding to pressure signaldata given by the manufacturer.	± 2% of span	Within 1 month of performance test
CEM SYSTEM				
General	NA	System Audit	Review calibration, check data, inspect recording system, panel lights, sample transport and interface system	Daily during performance test
		Calibration check (High and Low Range)	Average deviation from mean within 3% of span	Daily during performance test

Table 7–2. Sampling Equipment Calibration Requirements

Equipment	Acceptance Limits	Measurement Frequency/Method	Corrective Actions	References
Wet Test Meter	Capacity > 3.4 m^3/hr (120 ft^3/hr) accuracy within ±1%	Calibrate initially, and then yearly by liquid dis–placement.	Adjust until specifications are met, or return to manufacturer.	Section 5.3.1, Method 5 (a)
Dry Gas Meter EPA Methods (a)	Yi = Y ± 0.02(Y)	Calibrate vs wet test meter initially, and when post–test check exceeds Y ± 0.05.	Repair or Replace and then recalibrate.	Section 5.3.1 – 5.3.3, Method 5(a)
Thermometers	Impinger thermometer ±1°C (2°F); Dry gas meter thermometer, ±3°C (5.4°F) over range; Stack temperature sensor, ±1.5% of absolute temperature.	Calibrate each initially as a separate component against a mercury–in–glass thermometer.	Adjust; determine a constant correction factor or reject.	Section 4.3, Method 2 (a)
Barometer	± 2.5 mm (0.1 inches) Hg of mercury–in–glass barometer	Calibrate vs mercury–in–glass barometer initially; check before and after each field test.	Adjust to agree with a certified barometer.	Section 5.7, Method 5 (a)
Probe Heating System	Capable of maintaining 120°C ± 14°C (248° ± 25°F) at a flow rate of 21 l/min (0.71 ft^3/min)	Calibrate component by APTD–0576(11) initially, if constructed by APTD–0581 (0) or use published calibration curves	Repair or replace and verify the calibration.	Section 5.4, Method 5 (a)
Probe Nozzle	Average of 3 ID measurements of nozzle; difference between high and low < 0.1 mm (0.004 inches)	Use a micrometer to measure to nearest 0.025 mm (0.001 inches)	Recalibrate, reshape and sharpen when nozzle becomes nicked, dented or corroded.	Section 5.1, Method 5 (a)
Analytical Balance	± 1 mg of Class–S weights	Check with Class–S weights upon receipt and daily before each use	Adjust or repair.	Section 2.3.3, Method 5 (a)

Table 7-2. (Continued)

Equipment	Acceptance Limits	Measurement Frequency/Method	Corrective Actions	References
Type S pitot tube and/or probe	All dimension specifications met	Calibrate initially and visually inspect test	Use pitot tubes that meet factory opening specifications; repair or replace as required.	Section 4.1, Method 2 (a)
Stack gas temperature measurement system	Capable of measuring within 1.5% of minimum stack gas temperature	Calibrate initially and after each field test	Adjust to agree with Hg bulb thermometer, or construct a calibration curve to correct the readings.	Section 4.3, Method 2 (a)
Differential pressure gauge (does not include manometers)	Agree within ± 5% of inclined manometers	Calibrate initially and after each field test	Adjust differential pressure using correction factor; repair or replace with inclined manometer.	Section 2.2, Method 2 (a)

Note:

a) New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60

The CEM system is included in the process equipment group because the calibration and operation of this instrument are under the direction of Williams personnel. The process CEM system is a continuous analyzer that will be tested before the performance test to allow time for adjustments and a repeat test if necessary. The performance acceptance criteria are listed in Table 7-1 for the CEM. The performance acceptance test will be conducted when the process is operating under normal conditions.

7.2 STACK GAS SAMPLING EQUIPMENT

The stack testing personnel will check, test and/or calibrate the following sampling equipment:

- Dry gas meters
- Probe and filter heating systems
- Temperature measurement systems
- Pitot tubes
- Probe nozzles
- Analytical balances.

The sampling equipment calibration requirements are summarized in Table 7-2. The requirements are detailed in the referenced methods.

The calibration procedures performed and the results will be documented in logbooks and on special forms. Copies of the required information will be included in the performance test report.

7.3 LABORATORY ANALYTICAL EQUIPMENT

The laboratory instruments will be calibrated as specified by the appropriate method before analyzing the performance test samples. The calibration procedures are based on instructions in the referenced analytical methods. For practical reasons, the analytical instrument calibration procedures are summarized with the internal quality control checks in Table 10-1 of Section 10.0. The calibrations performed and the results will be reported as appropriate to assure the quality of data in the performance test sample analysis report.

8.0 ANALYTICAL PROCEDURES

The analytical procedures will be implemented by a contract laboratory, selected at Williams' and/or the client's discretion, which has demonstrated experience in analyzing samples for the parameters identified in the Performance Test Plan. The analysis parameters, sample matrices, number of samples, and analytical reference methods are summarized in Table 3-11 and 3-12 of the Performance Test Plan.

Standard methods will be employed for the analyses of all collected samples, whenever possible. The analytical methods referenced in Table 3-12 of the Performance Test Plan are described in the following documents:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, US EPA Publication No. SW-846, 3rd edition, 1986 revised 1990.
- *New Source Performance Standards*, Test Methods and Procedures, Appendix A, 40 CFR 60.
- *Methods Manual for Complying with the BIF Regulations*, EPA/530-SW-91-010, December, 1990.
- *Annual Book of ASTM Standards*, American Society for Testing and Materials, latest annual edition.

Additional details on the analytical procedures are presented in the Performance Test Plan, Section 3.4, which are incorporated here by reference.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

The overall data reduction, validation, and reporting flow scheme for the performance test is presented in Figure 9-1. Reduction of data obtained from this performance test will involve using the sampling and analysis results to calculate the values for various process and performance parameters, such as feed rates and emission rates.

The results of sample analysis will be reported in terms of mass per unit volume and converted to total mass per sample and emission rates in mass per unit time.

The initial step in the data validation will consist of verification of all calculations involved in reduction of sampling and analytical data. The analytical data will be reviewed using EPA Functional Guidelines when applicable, or using the specific method's QC requirements. Next, the data will be investigated for consistency of the results within and between tests. For example, comparisons will be made of stack gas flow rates, stack gas temperatures, and sampling system operating conditions. Analytical data will be reviewed to identify variations in composition from sample to sample among replicate runs. Where unexplainable variations appear, calculations will again be checked for errors, and the sample collection and analytical procedures will be reviewed to identify any causes for the inconsistencies. Any calculation errors will be corrected and anomalies in the sampling or analytical procedures will be documented and reported in the final performance test report.

Automatic data processing procedures will be used to calculate emission rates. These procedures will be checked manually at least once for each set of equations by the SSC. Manual checks of procedures will be documented and retained in the project files.

9.1 TREATMENT OF OUTLYING DATA AND MEASUREMENTS BELOW DETECTION LIMITS

All data collected in the study will be considered valid, with the following qualifications, and will be reported. If anomalous results are obtained, every effort will be made to identify any problems in the sample collection, sample preparation, and/or analysis which could have contributed to the anomaly. If any problems have occurred, they will be reported with the results in question, and may serve to qualify the significance of the result(s).

In instances where the analyte concentration in the analyzed sample is below the limit of quantitation, a "less than" value will be reported for the sample. One half of this quantitation limit will be used to calculate

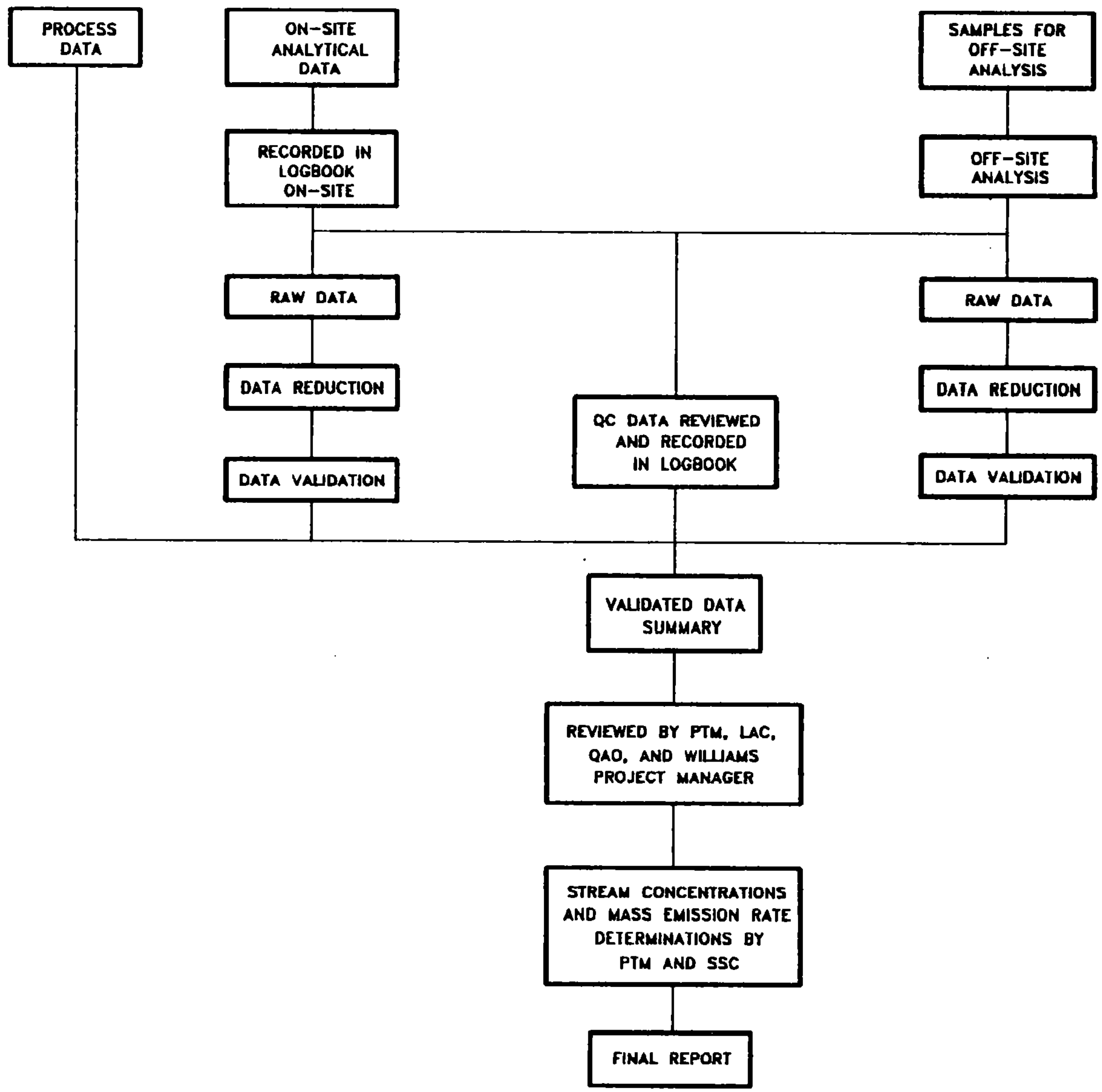

Figure 9-1. Overall Data Reduction, Validation, and Reporting Flow Scheme

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an emission level. This computed emission level will be reported as a "less than" value. Quantitation limits will vary with sample type and the level of interference in the sample.

The performance test report will include, as a minimum, the following information:

- Executive summary
- Introduction
- Performance test objectives
- Sampling plan overview
- Performance test results
- QA/QC summary
- Recommended operating conditions.

The performance test report will also include a series of appendices that will contain the following information:

- Process sampling data logs
- Stack sampling field data and results
- Stack sampling instrument calibration results
- Process operating/monitoring data summaries
- Continuous emissions monitoring records
- Continuous monitoring instrument strip charts
- Analytical certificates
- Process instrument calibration records
- Example calculations
- QA program results summary.

All original and supporting information will be retained in Williams' project files for a period of 3 years from the performance test. The project files will include field logbooks, original records of LTTD process conditions, performance calculation work sheets, sample traceability records, analytical instrument output documents, analytical results calculations, and QA program documentation. Copies of all records will be maintained by the organization that generated the original record and one copy will be provided to Williams for archiving.

10.0 INTERNAL QUALITY CONTROL CHECKS

Blanks of all reagents and solvents used in the field for sample recovery will be taken, as well as method blanks to assess possible field or laboratory contamination. Field blanks and trip blanks will be collected for the M23. Samples of an extract taken from the adsorbent resins used in M23 trains will be analyzed to ensure that the resins are free from significant background contamination. Alternately, prepared resins will be purchased from a supplier who will certify the lack of contamination. Process parameter measurements (temperatures, flows, etc.) will consist of reading the appropriate instrument (thermocouple readout, flowmeter, etc.), which will be calibrated before the test.

Internal QC determinations will be performed by analysis of various blanks, standards, spikes, and duplicates. Table 4-1 in Section 4.0 summarizes the QC samples planned for verifying analytical results. The analytical equipment QC control checks, frequencies, acceptance criteria, and corrective actions are summarized in Table 10-1. The QC information in Tables 4-1 and 10-1 will be reviewed before the performance test and revised at that time if needed to ensure the quality of the performance test data.

Table 10-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Action

Parameter/ Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
OCL Pesticides (GC/ECD Analysis)	Linearity check (multi-point cal.)	Once before sample analysis and once every 72 hours	Refer to SW846 Methods 8080 and 8000A	(1) Repeat linearity check (2) If still unacceptable, make necessary adjustments (3) Repeat linearity check
	Single point check	once every 12 hours (middle concentration standard after each group of 10 samples)	Refer to SW846 Methods 8080 and 8000A	(1) Repeat single point check (2) If still unacceptable, perform new multipoint calibration
	Retention time window	Daily	Refer to SW846 Methods 8080 and 8000A	Flag data
	Surrogate spike analysis	Every sample	Refer to SW846 Methods 8080 and 8000A	(1) Check calibration and standards. (2) Check instrument (3) Repeat analysis (4) Flag data
	Internal standard	Every sample	Refer to SW846 Methods 8080 and 8000A	Flag data
	Extraction blanks	Once per extraction lot (□ 20 samples)	Refer to SW846 Methods 8080 and 8000A	Used to assess memory effects
	Injection blanks	Once every 12 hours	Refer to SW846 Methods 8080 and 8000A	Follow laboratory standard procedures
	Matrix spike duplicate samples	5% or < 20 per batch	Refer to SW846 Methods 8080 and 8000A	(1) Run check standard (2) Correct problem (3) Flag data
Chloride (Ion Chromato-graph)	Multi-point calibration	Initially and as required	r>=0.995	(1) Check calculations (2) Recalibrate
	Initial calibration verification	Prior to sample analysis	+/-10% from expected concentration	(1) Check calculations (2) Rerun ICV (3) Recalculate as necessary
	Single-point calibration	After every 10 samples and end of run	+/- 10% from expected concentration	(1) Check calculations (2) Rerun ICV (3) Recalculate as necessary

Table 10-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Action

Parameter/ Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Chloride (Ion Chromato-graph)	Calibration blank	Daily and after each ICV and CCV	<detection limit	(1) Rerun (2) Clean system (3) Rerun sample back to last blank
	Reference standard	Prior to sample analysis	+/- 10% from expected concentration	(1) Check calculations (2) Rerun reference standard (3) Rerun ICV
Volatile Organics, Semivolatile Organics, PCDDs/PCDFs, (GC/MS Analysis)	Mass scale calibration using PFTBA	As needed	Manufacturer specifications	Repeat calibration
	Ion abundance/intensity check	Beginning of each 12-hour shift	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	Repeat calibration
	Linearity check (multi-point cal.)	Once before sample analysis	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	(1) Repeat linearity check (2) If still unacceptable, make necessary adjustments (3) Repeat linearity check
	Single point check	Daily (beginning of each 12-hr shift)	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	(1) Repeat single point check (2) If still unacceptable, perform new multipoint calibration
	Retention time window	Daily	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	Flag data
	Surrogate spike analysis	Every sample	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	(1) Check calibration and standards (2) Check instrument (3) Repeat analysis (4) Flag data
	Internal standard	Every sample	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	Flag data
	Extraction blanks	Once per extraction lot (□ 20 samples)	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	Used to assess memory effects
	Matrix spike duplicate samples	5% or < 20 per batch	Refer to SW846 Methods 8240, 8270, 8290, & 8000A	(1) Run check standard (2) Correct problem (3) Flag data

Table 10-1. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Action

Parameter/ Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Metals (ICP)	Calibration (1-point for each mixed standard solution)	Before analytical run	Manufacturers specifications	Repeat calibration
	Check standard	1 out of 10 samples and at end of run	± 10% of standard	(1) Repeat check (2) Repeat calibration
	Matrix spike	1 per batch	± 25% of actual	Flag data
	Matrix spike duplicate	1 per batch	± 25% of actual	Flag data
	Calibration blank	1 out of 10 samples and at end of run	Refer to method SW846 Method 6010	(1) Terminate analysis (2) Correct problem (3) Recalibrate
	Reagent blank	1 at beginning of analysis	Refer to method SW846 Method 6010	Use to correct data
Metals (GFAAS)	Calibration (blank, 3 standards)	Daily	Manufacturers specifications	Repeat calibration
	Check standard	1 per 10 samples	± 20% of standard	(1) Repeat check (2) Repeat calibration
	Matrix spike	1 per batch	± 25% recovery	Analyze by standard additions
	Matrix spike duplicate	1 per batch	± 25% recovery	Analyze by standard additions
	Blank	1 per sample batch	None	Use to correct data
Particulate Matter, Moisture	Balance calibration with Class-S wts	Before each use	± 1 mg	Adjust or repair

11.0 PERFORMANCE AND SYSTEM AUDITS

Field sampling performance audits will be accomplished through observation of the sampling operations by the regulatory agency representatives and the PTM.

Analytical performance audits will consist primarily of replicate analyses of field samples and the scheduled analysis of blanks, spikes, and standards using the analytical methods identified in Section 9.0 of this document. If deemed necessary by the PTM and QAO, standard reference materials or performance evaluation samples will be submitted for analysis as unknowns.

A system audit will be performed before any new laboratory experimental procedures are implemented that are not described in standard analytical protocols. This audit may be performed by the PTM, Laboratory Analysis Coordinator, QAO, or another designee of the Williams Project Manager. The audit may include an on-site inspection and review of the analytical operations and the associated QA activities being employed, review of results of Method Detection Limit studies, review of analytical results from audit samples, or other QA procedures. Additionally, the PTM, Laboratory Analysis Coordinator(s), and QAO will frequently review data to ensure that all required QC checks are being made and that evaluation criteria are being followed.

12.0 PREVENTIVE MAINTENANCE

Preventive maintenance of sampling and analytical equipment used during the project will be performed according to the procedures and schedules set forth in manufacturers' maintenance manuals and as described in appropriate parts of standard methods.

All preventive maintenance performed will be recorded in a service record log for each instrument. The log shall include a signature and date. If the performance of the instrument could have been affected by the maintenance procedure, calibration check samples (where appropriate) will be analyzed and the results recorded in the record notebook before any samples are analyzed. Whenever parts are replaced, the serial number of the new part (if available) or an assigned serial number will be logged into the maintenance record notebook. When parts are replaced, audit samples shall be analyzed to demonstrate correct operation of the system.

13.0 PROCEDURES FOR ASSESSING DATA ACCURACY AND PRECISION

The QA activities implemented in this study will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 4.0 discusses the QA activities that will generate the accuracy and precision data for each sample type. The generalized forms of the equations that will be used to calculate accuracy and precision are presented below.

13.1 ACCURACY

When a reference standard material is used in the analysis, percent Accuracy (A) will be calculated as follows:

$$A = \frac{\text{Found concentration}}{\text{True concentration}} \times 100 \qquad \text{Equation 13-1}$$

Percent analyte Recovery (R) will be calculated as follows:

$$R = \frac{(X-N)}{S} \times 100 \qquad \text{Equation 13-2}$$

where X is the experimentally determined value, N is the amount of native material in the sample, and S is the amount of spiked material of the species being measured. Recoveries are used to determine accuracy when standards are not available.

13.2 PRECISION

When less than four analyses of the same parameter are available, precision will be calculated as a Range Percent (RP) from the average of replicate measurements according to:

$$RP = \frac{(X1 - X2)}{\text{Average X}} \times 100 \qquad \text{Equation 13-3}$$

Where X1 and X2 are the highest and lowest results of replicate measurements.

Where 4 or more analyses of the same parameter are available, the precision will be determined as the Relative Standard Deviation (RSD) according to:

$$RSD = \frac{\text{Standard deviation}}{\text{Average X}} \times 100 \qquad \text{Equation 13-4}$$

13.3 COMPLETENESS

Percent Completeness (C) is calculated as:

$$C = \frac{\text{Number of Valid Results}}{\text{Total Number of Samples}} \times 100 \qquad \text{Equation 13-5}$$

14.0 CORRECTIVE ACTION

The need for corrective action occurs when a circumstance arises that threatens the quality of the data output. For corrective action to be initiated, awareness of a problem must exist. In most instances, the personnel conducting the field work and the laboratory analyses are in the best position to recognize a problem or nonconformance that will affect data quality. Keen awareness on their part can frequently detect minor instrument changes, drifts, or malfunctions which can be corrected. If major problems arise, sampling and laboratory personnel are in the best position to decide upon the proper corrective action and initiate it immediately, thus minimizing data loss. Therefore, the field sampling and laboratory analysis personnel will have prime responsibility for recognizing a nonconformance. Each nonconformance shall be documented by the personnel identifying it or originating the corrective action. For this purpose, a variance log, testing procedure record, notice of equipment calibration failure, results of laboratory analysis QC tests, audit report, internal memorandum, or letter shall be used as appropriate. Documentation shall include:

- Identification of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Any required approval signatures
- Method(s) for correcting the nonconformance (corrective action) or description of the variance granted
- Schedule for completing corrective action.

Documentation in the form of a nonconformance report shall be made available to project and laboratory management and the QAO. It is the responsibility of the PTM, LAC(s), and/or QAO to notify appropriate personnel of the nonconformance. Samples affected will be listed on the nonconformance report.

Decisions on whether to take corrective action and what action(s) to take will be made by the PTM, LAC(s), and/or QAO. When a corrective action is taken by any of the operations or analytical laboratory personnel, they will be responsible for notifying the QAO so that, if deemed necessary, QA surveillance of the affected sampling or analysis system can be intensified. Nonconformance and corrective action reports will become part of the performance test report or the supporting data files that are submitted to the regulatory agencies.

A second recognition level of the need for corrective action will be determined by the QAO. The QAO is responsible for determining the need for corrective action based on the results of the audits described in Section 11.0 and from review of the QA data generated during the study. The QAO will be responsible for initiating corrective action by immediately notifying the PTM during the sample analysis phase. The appropriate manager will then be responsible for instituting corrective action and ensuring that the corrective actions produce the desired results.

Ultimately, the personnel performing and checking the sampling and analysis procedures and results must participate in decisions to take correct actions. To reach the proper decision, each individual must understand the program objectives and data quality required to meet these objectives. Data quality objectives for this program are presented in Section 4.0. All personnel involved in the analytical components of this project will receive an approved copy of this QA Plan and will be informed of these objectives. Each individual will have a responsibility to notify the respective PSC, SSC, LAC whenever a measurement system is not yielding data within these objectives.

If a situation arises requiring corrective action, the following closed-loop corrective action system will be used:

- Define the problem
- Assign responsibility for investigating the problem
- Investigate and determine the cause of the problem
- Determine corrective action course to eliminate the problem
- Assign responsibility for implementing the corrective action
- Determine the effectiveness of the corrective action and implement the correction
- Verify that the corrective action has eliminated the problem
- If not completely successful, loop back to first step.

15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The key staff responsible for sampling, analysis, and data management will review the QAPP periodically while data are being generated. The PTM will immediately notify the Williams Project Manager of any event or occurrence which could have a significant effect on the validity of the performance test results. Notification will be verbal followed by a written memorandum which includes the proposed corrective action. The results of the periodic QA review will be summarized in a memorandum which will specifically identify any areas that may require corrective action and present the proposed corrective action. In addition, the memorandum will present the results of previous corrective actions. All QA reports will be submitted with the performance test sampling and analysis results.

ATTACHMENT 1

STACK GAS SAMPLING FIELD DATA COLLECTION FORMS

(To Be Provided by Stack Sampling Contractor)

ATTACHMENT 2

CHAIN OF CUSTODY FORMS

(To Be Provided by Analytical Laboratory)

ATTACHMENT 3

LABORATORY REQUEST FOR ANALYSIS FORMS

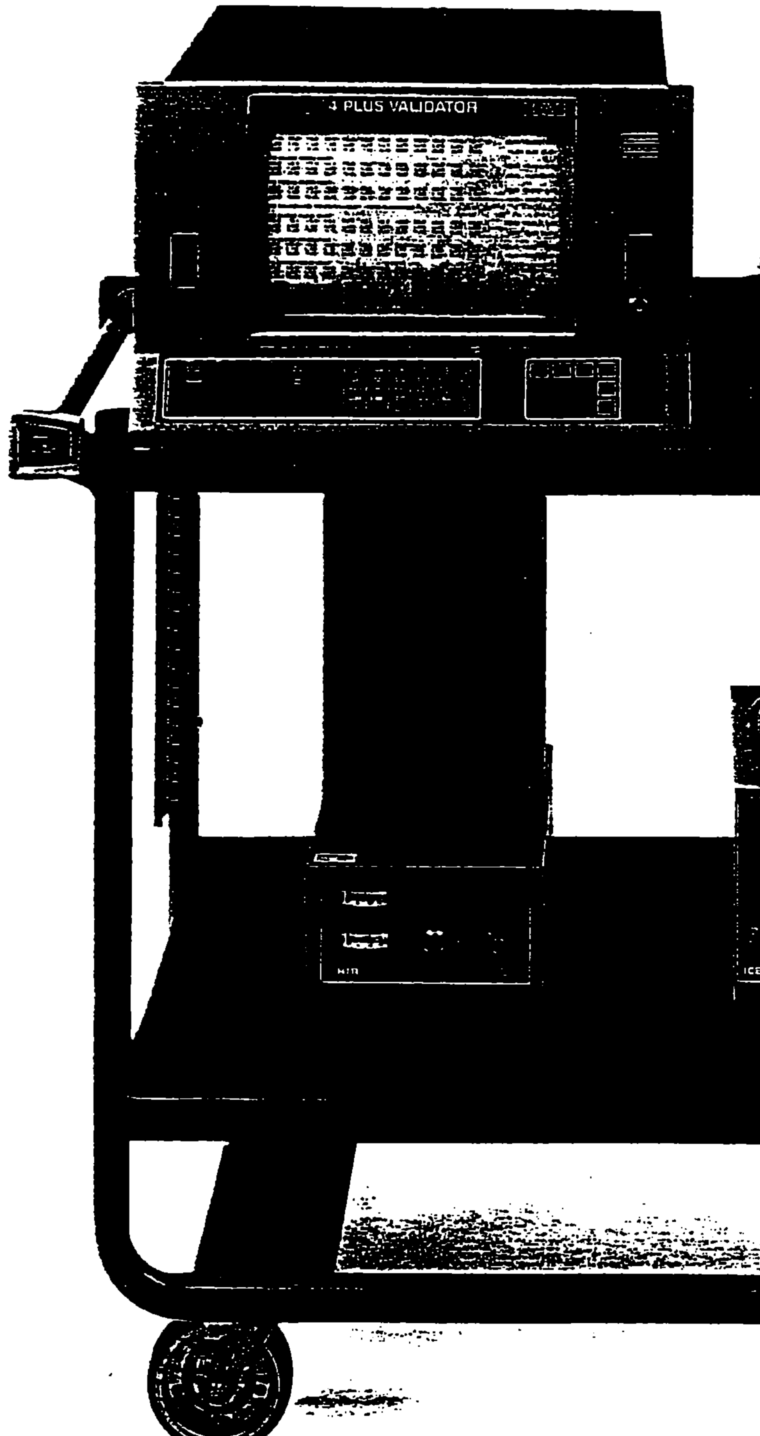
(To Be Provided by Analytical Laboratory)

B

APPENDIX B

EQUIPMENT SPECIFICATIONS

Validation Systems

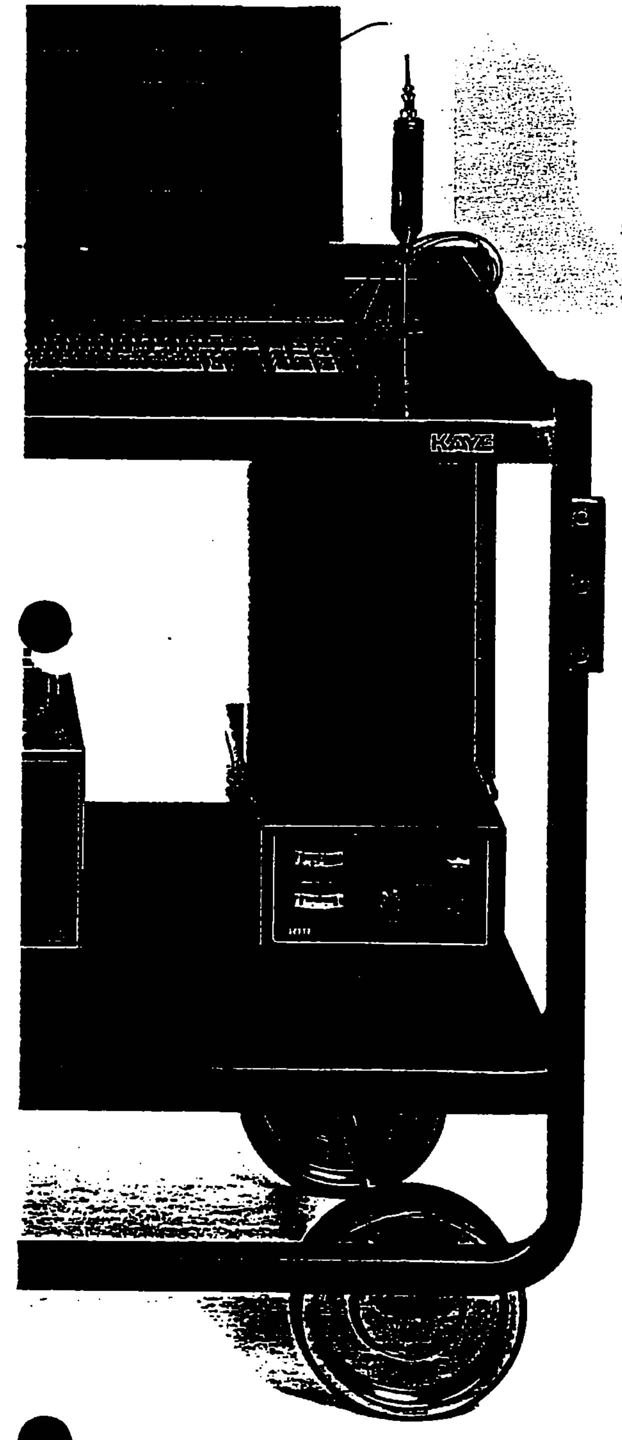


Kaye, the industry standard, introduces a new generation of validation systems to improve your productivity.

HILE CONTROLS OF GEORGIA, INC.
4151 MEMORIAL DR., SUITE 203B
DECATUR, GA 30032
TEL: (404) 294-0224
FAX: (404) 294-0655

KAYE

From high-accuracy measurements to final reports.



Setting the Standard in Validation for Over Twenty Years

Since the early 1970s when validation methodology became an industry focus, Kaye has been there. Our close ties with industry leaders permit us to respond quickly with solutions to improve validation productivity. From the System 8000 high-accuracy datalogger and patents on secondary calibration standards to the first automatic F_o calculator and the 8½×11″ report format, Kaye has continued to be the industry leader.

Today, Kaye continues to respond. Kaye introduces a complete validation system that takes advantage of the growing acceptance of PCs as a productivity tool for validation.

To date, over 700 pharmaceutical and biotechnical manufacturers have selected Kaye equipment for their process validation needs. Kaye's broad experience and knowledge of regulatory guidelines means that we understand your validation requirements. Consequently, our customers obtain solutions that inherently address system validation issues—in hardware and software.

Here are the Highlights

Read about these new products on the following pages:

- The Digistrip® 4 Plus Validator™ using the PC to set up tests, automate calibrations and collect data.
- An automatic calibration software utility to calibrate up to 48 thermocouples or RTDs at a time. (Compatible with Digi 4M, 4C and all 4 Plus models.)
- An ultra high-accuracy Intelligent RTD Reference Probe that reads temperature and communicates directly to a PC.
- Digi Collect™ software to automatically capture validation report data onto a PC. (Compatible with all Digi 4 and 4 Plus models.)

Contents

All the Tools for Validation

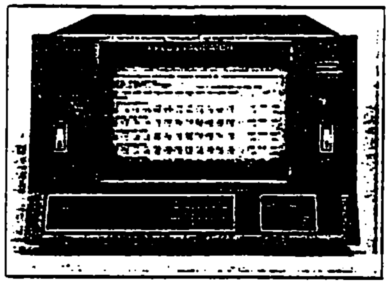
Kaye provides a complete range of equipment to meet your exact calibration and validation requirements.

Validation equipment includes:

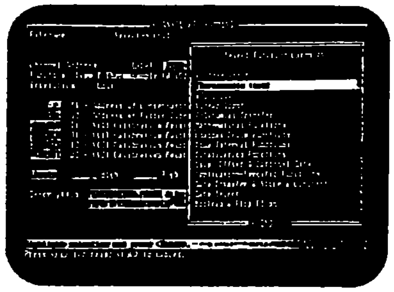
- Digistrip 4 Plus Validator with PC software support
  - — Menu-driven programming
  - — Automatic calibration
  - — Automatic data collection
- Sample Validation Programs
  - — Penetration program
  - — Distribution program
- Calibration References
  - — Ice point
  - — High temperature
  - — Intelligent RTD probe
- Thermocouple Wire and Probes
  - — Premium grade wire
  - — Probes for steam sterilization
  - — Probes for dry heat sterilization
  - — Custom probes
- Accessories
  - — Validation workstation
  - — Validation cart
  - — Portable shipping cases

In addition to an extensive product offering, Kaye provides support programs for virtually every aspect of your validation system, including applications assistance, warranty service, equipment and software maintenance, hands-on training at your facility or ours and recertification service. And, you can count on assistance from over 60 representative organizations, worldwide. We make it easy for you to do business with Kaye.

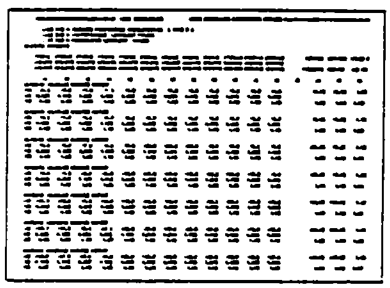
While this document describes Kaye's capability in validation, we also provide systems for comprehensive continuous monitoring of facilities and dial-up alarm/notification systems for unattended operations.



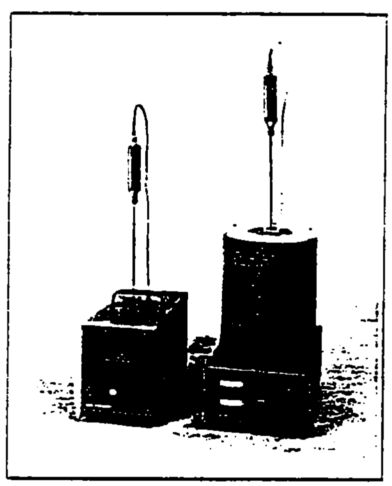
Recognized worldwide as the validation recorder of choice, Digi provides the high-accuracy temperature measurement, built-in lethality calculations and reporting you require.



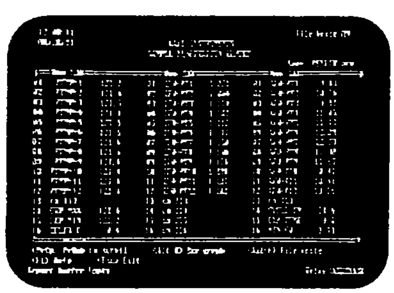
Turning to the PC for programming, you save time to set up tests, obtain the best documentation and reduce training of validation personnel.



Reporting flexibility in the Digi lets you generate validation data as digital text, trends or a combination of both on convenient standard-size pages.

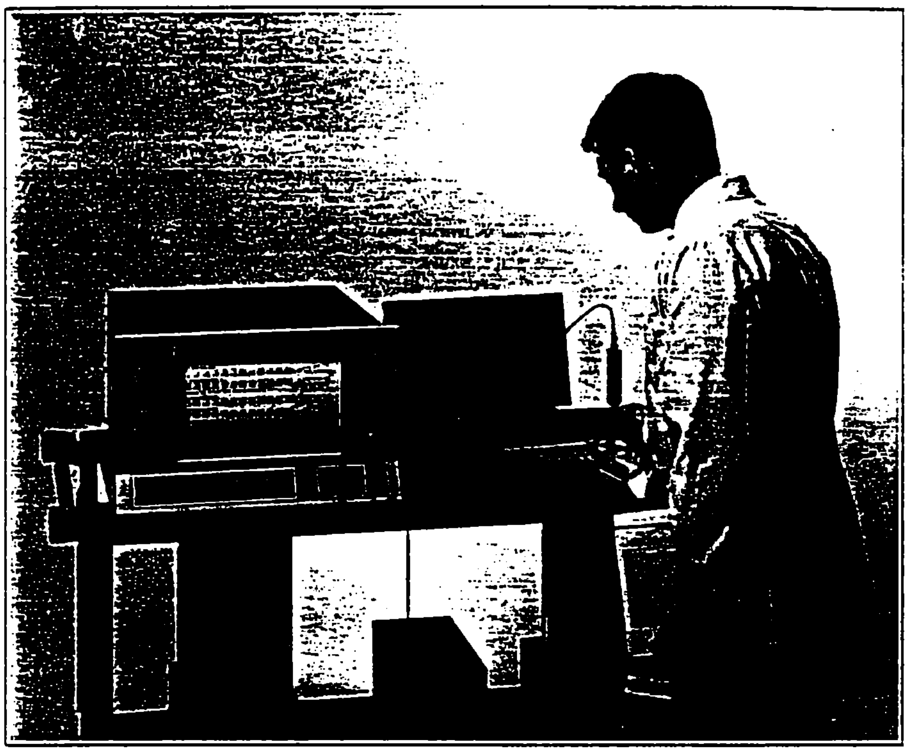


Using the Intelligent RTD Probe and Kaye references, you can automate sensor calibration to reduce the time and cost to perform calibration procedures.



With Kaye's Digi Collect software, you can collect validation data automatically to a PC, eliminating the manual entry previously required for post analysis.

The Digi Family—Setting the Standard for Validation



Validation Overview

Over 10,000 Digi systems have been delivered since the early 1970s when Kaye introduced its first validation system. Today, the standard continues with the two most current models used for validation—the Digistrip 4S Plus and the Digistrip 4 Plus Validator.

The difference between the two models is the front panel. The Validator meets the objective of simplifying the Digi interface by completely eliminating programming at the front panel. Using menu-driven software, operators do not need previous experience with the Digistrip to download programs, calibrate sensors and collect data. Operators select menu items, rather than function codes.

Both models offer PC-based software to improve operator productivity and reduce training requirements.

As a system support tool, the PC cuts the time and knowledge required for operators to load programs, calibrate sensors, run tests and offload data. It automates many of the tasks that were previously performed manually and required extensive training.

This document describes the Digistrip 4 Plus Validator since it provides the maximum productivity for performing validation tests. For details on the Digistrip 4S Plus, refer to Product Data Sheet #500.

The Complete Validation System

The Validator system includes five basic elements:

1. Digistrip 4 Plus Validator
2. Validator Programmer—PC-based programming with utilities, including automatic sensor calibration
3. Sample Validation programs for Penetration and Distribution studies
4. Digi Collect software for on-line viewing and automatic storage of validation data in Lotus® 1-2-3 compatible "PRN" files
5. Validator User's Guide

The Validator Programmer is a Kaye menu-driven utility for on- and off-line programming of the Validator. It permits automatic calibration of thermocouples and RTDs using Kaye reference systems (see page 14 & 15).

No front panel programming! Pop-up menus, designed for validation, make it easy to set up a test, reducing your time from hours to minutes.

No codes to decipher! It's easy to train other staff members. Viewing single channels or the entire program at a glance and comment fields for easily understood descriptions, a new person can pick up where someone else left off.

You can prepare test sequences in advance by programming the Validator off-line, at the most convenient location and time. Create a library of programs for each of your vessels. Operators simply download the appropriate test program for the chamber you want to test.

With the auto-calibration feature of the Validator Programmer, you can perform one- or two-point calibrations for up to 48 thermocouple or RTD probes automatically. The software calibrates each probe to a fixed reference temperature. And, you get a one-page calibration report before and after the test run.

Digi Collect permits validation test data to be sent automatically to a computer and stored in spreadsheet-compatible files—*No more manual entry of data for post-analysis.* Digi Collect displays data on-line in tabular or bar graph form, and saves data as "PRN" files.

Validator Inputs

The Validator accepts analog and digital inputs from your process. You connect the inputs directly to the system scanners (multiplexers).

The Validator accepts data from:

- thermocouples, RTDs, pressure transducers
- 4-20 mA current transmitters
- voltage transducers
- dry contacts (switches or pushbuttons)

Input Scanners

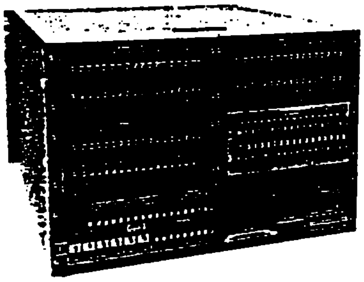
The Validator uses multiple plug-in scanners to accept analog, RTD and discrete status inputs. The standard chassis accommodates 4 scanners, up to 16 inputs each, for a total of 64 inputs. You can use an expansion chassis for up to 8 scanners for a total of 128 inputs. Of these total inputs, up to 32 can be status inputs.

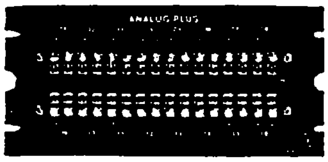
Analog Scanners accept inputs from thermocouples, current inputs and direct input voltages (0 to 12V DC) from transducers. Each analog scanner has a scanner board and a Uniform Temperature Reference (UTR) block providing cold-junction compensation—resulting in the highest accuracy thermocouple measurements available. A single analog scanner can accept mixed inputs from different thermocouple types, voltage transducers and current transmitters.

RTD Scanners accept inputs from 3- and 4-wire 100-Ohm platinum RTDs, and provide the required excitation voltage and bridge completion.

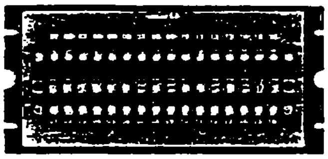
Status Input Scanners accept discrete inputs from external devices (switches or operator pushbuttons). All status inputs are optically isolated.

Analog/Status Input Scanners accept 8 analog and 8 dry contact discrete inputs.

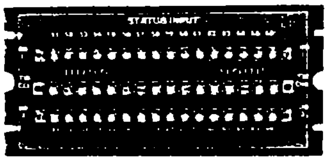




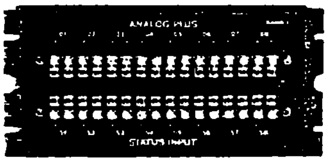
Analog Input Scanner for Thermocouples



RTD Input Scanner



Status Input Scanner



Combined Analog & Status Input Scanner

Analog Input Scanner

RTD Input Scanner

The Validator Input Scanner —Specifications

	ANALOG SCANNER	RTD SCANNER	ANALOG/STATUS*	STATUS
Inputs	16	16	8/8	16
Scan speed	40 channels/second at 60 Hz; 33.3 ch/sec at 50 Hz			Once/math scan
Relay type	Solid state photovoltaic			NA
Direct input range	30.000mV,** 60.000mV, 600.00mV, 12.000V			NA
Sensor types	J, K, T: 0.1°C or 0.1°F resolution; T limited range resolution: 0.01°C	100Ω Pt, 3- & 4-wire bridge: 0.01°C resol. (model V2236A); 0.1°C resol. (model V2236B)	J, K, T: 0.1°C or 0.1°F resolution; T limited range resolution: 0.01°C	NA
Current input	0 to 16mA/4 to 20mA (with precision resistor)	NA	0 to 16mA/4 to 20mA (with precision shunt resistor)	Current voltage: 24 to 48V AC/DC
Maximum common mode voltage	100V peak channel to channel within each scanner; 350V peak channel to channel between scanners or channel to frame ground			600V peak contact to frame ground
Compensator temperature coefficient	±0.01°C per °C			NA
Input terminal temperature non-uniformity	±0.10°C			NA

*Dry contacts for Analog/Status Scanner use same specifications as Status Scanner. **30mV range used for Type T thermocouple only.

Validator Performs the Calculations

At the heart of the Validator is an extensive built-in library of validation-specific calculations, such as lethality, cycle times, group minimum and group maximum.

You can combine these calculations to design specific programs for penetration and distribution tests. A distribution study, for example, includes measuring numerous thermocouple inputs and calculating the min and max temperature of the group. Using the Subtract calculation, the Validator determines the delta temperature. The Validator also calculates the location of min and max temperature for all sensors to identify hot and cold spots in your vessel.

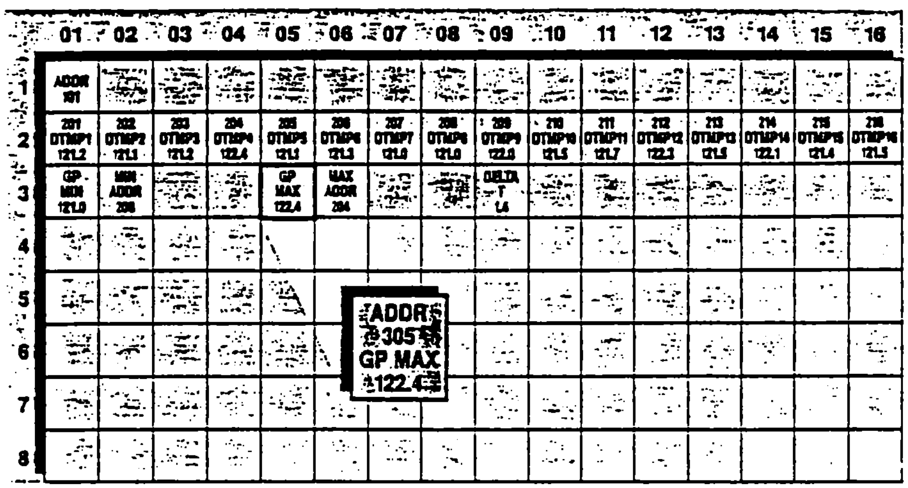
How the Validator Works

Configuring the Validator is very similar to building a spreadsheet matrix. The cells of a spreadsheet are the same as channels in the Validator.

The Validator's matrix (see figure) contains 128 channels, arranged in 8 rows of 16 columns. Each channel is assigned a unique address numbered 101 to 816. The first digit refers to the row and the second two digits refer to the column. You can assign any calculation from the library (see table) to a channel—live input, numeric or logic calculation. In addition, there are 99 channels simply for calculations.

Several important calculations provided by the Validator include:

- Lethality, F_o—calculates instantaneous equivalent sterilization time based on probe temperature.
- Accumulation—integrates instantaneous lethality rate for a fixed duration (cycle or exposure time).
- Elapsed Timer—calculates cycle times such as exposure time, cool-down and heating times.
- Group Min and Group Max—calculates the highest and lowest temperature of the group.
- Subtract—can be used to calculate delta T of the min and max temperature.
- Interval—can be used to calculate minimum and maximum temperature of a single input over a fixed period of time, e.g. calculating maximum temperature achieved during exposure for a particular probe.



Validator Calculation Library

- **Voltage Input**
  - 60mV
  - 600mV
  - 6V
  - 12V
  - 30mV
- **Linear Scale Input** (For pressure, humidity and linear transducers)
  - 60mV unbounded
  - 600mV unbounded
  - 6V unbounded
  - 12V unbounded
  - 60mV bounded
  - 600mV bounded
  - 6V bounded
  - 12V bounded
- **Thermocouple**
  - J (0.1°F)
  - J (0.1°C)
  - J (0.1°C) DIN
  - K (0.1°F)
  - K (0.1°C)
  - T (0.1°F)
  - T (0.1°C)
  - T (0.01°C)
  - T (0.1°C) DIN
- **Accumulation**
  - Totalization
- **RTD Input**
  - 100Ω Pt 3-wire (0.1°F)
  - 100Ω Pt 3-wire (0.1°C)
  - 100Ω Pt 3-wire (0.01°C)
  - 100Ω Pt 4-wire (0.1°F)
  - 100Ω Pt 4-wire 1mA (0.1°C)
  - 100Ω Pt 4-wire 1mA (0.01°C)
- **Counter**
  - Counts events
- **Interval**
  - Average
  - Maximum
  - Minimum
  - Time of min/max interval
  - Rate of change
- **Elapsed Timer**
  - (Cycle and exposure times)
  - Run = 1 Reset = 0/1
  - Run = 0 Reset = 0/1
- **Channel Group**
  - Average
  - Maximum
  - Minimum
  - Address of min/max channel group
  - Standard deviation
- **Math**
  - Add
  - Subtract
  - Multiply
  - Divide
  - Polynomial
- **Boolean Logic**
  - AND
  - MIXED AND
  - NOR
  - OR
  - MIXED OR
  - NAND
  - XOR
- **Flip/Flop**
  - Set = 1 Reset = 1
  - Set = 1 Reset = 0
  - Set = 0 Reset = 1
  - Set = 0 Reset = 0
- **Controller Transfer**
  - Transfer on true
  - Transfer on false
- **Select**
  - Select 1 of 2
- **Application Specific**
  - Relative humidity
  - Lethality rate

Multiple Validation Reports

You can define up to 4 separate data reports, such as penetration, distribution, summary and trend. Each report can be independently triggered—automatically on time, event or a combination, or manually.

You can also define each report for contents and format. For contents, simply select rows from the matrix you want in the report. To format your reports, specify the channels per row and if you want channel addresses or labels to determine how the data is printed and where it will appear on the page. You can also indicate header information by the number of lines and length you need.

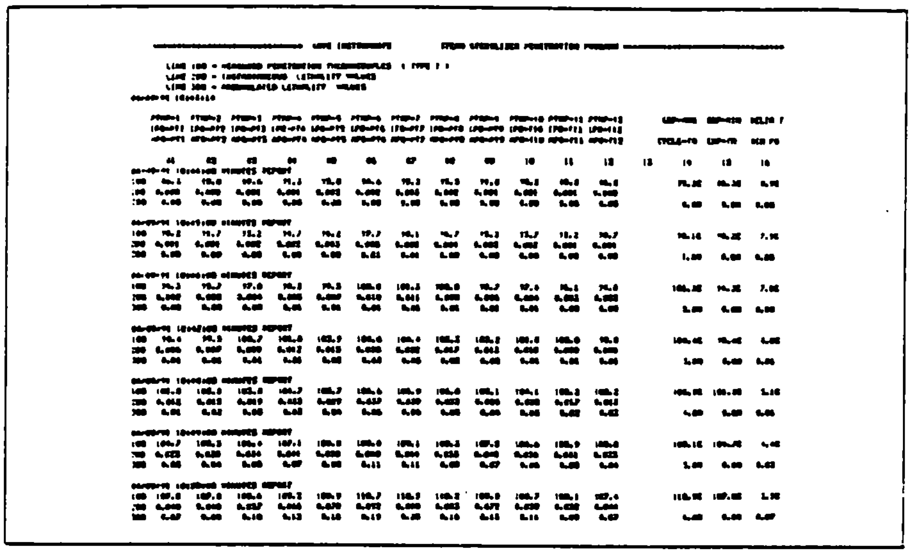
Report Destination

You can send report data automatically to the Validator's internal printer and to its communication's port. Reports can also be stored temporarily in the text output buffer and released later. The buffer is a convenient way to back up your printed reports in case your paper runs out in the middle of a test. You can also specify the number of reports to be stored in the buffer.

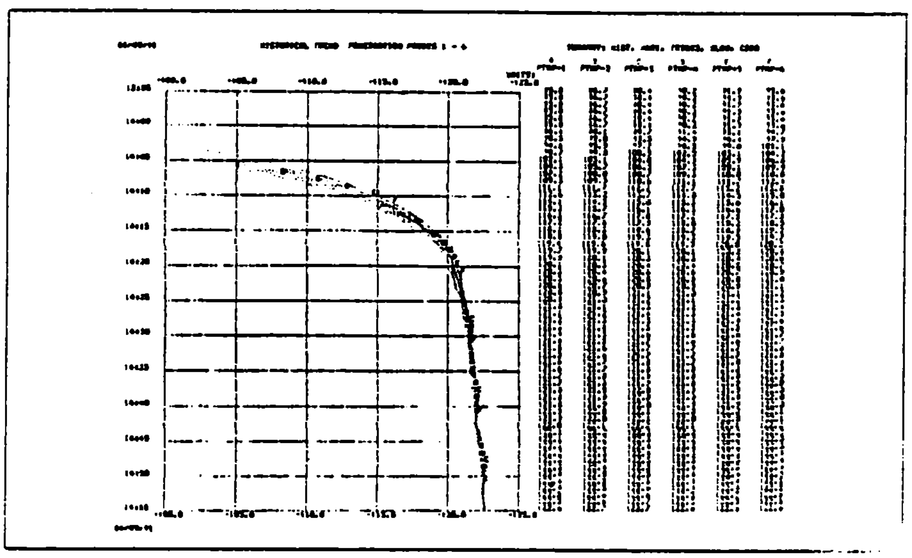
By performing calculations and generating reports on-line, the Validator saves you time in analysis and provides the finished documents to meet your regulatory requirements.

Configure reports easily from Validator Programmer's menus:

- Characters per line
- Number of lines in the header and actual header message
- Number of channels in a line
- Inclusion of labels and channel addresses
- Location of labels and channel addresses
- Number of lines in the report



Independent reports let you configure the data output to meet your documentation needs—cycle, summary and trend reports.



With the built-in Auto-Trend feature, the Validator lets you set up trend reports of live or historical data from up to 32 different channels.

Messages

There are 100 messages available to describe events, such as start and end of cycles. Messages can also be used for report and trend headers. You can print single line messages for alarms, as well.

Trending

You can configure one of the Validator's 4 reports to provide live or historical trends of acquired data. This report can generate up to 9 separate trend reports from a total of 32 channels. At the end of a distribution test, for example, the Validator can print a trend of thermocouples 1-6, another for thermocouples 7-12 and a third trend showing min, max and delta temperatures.

With powerful calculations and flexible reporting, the Validator provides the final documentation you need for post analysis.

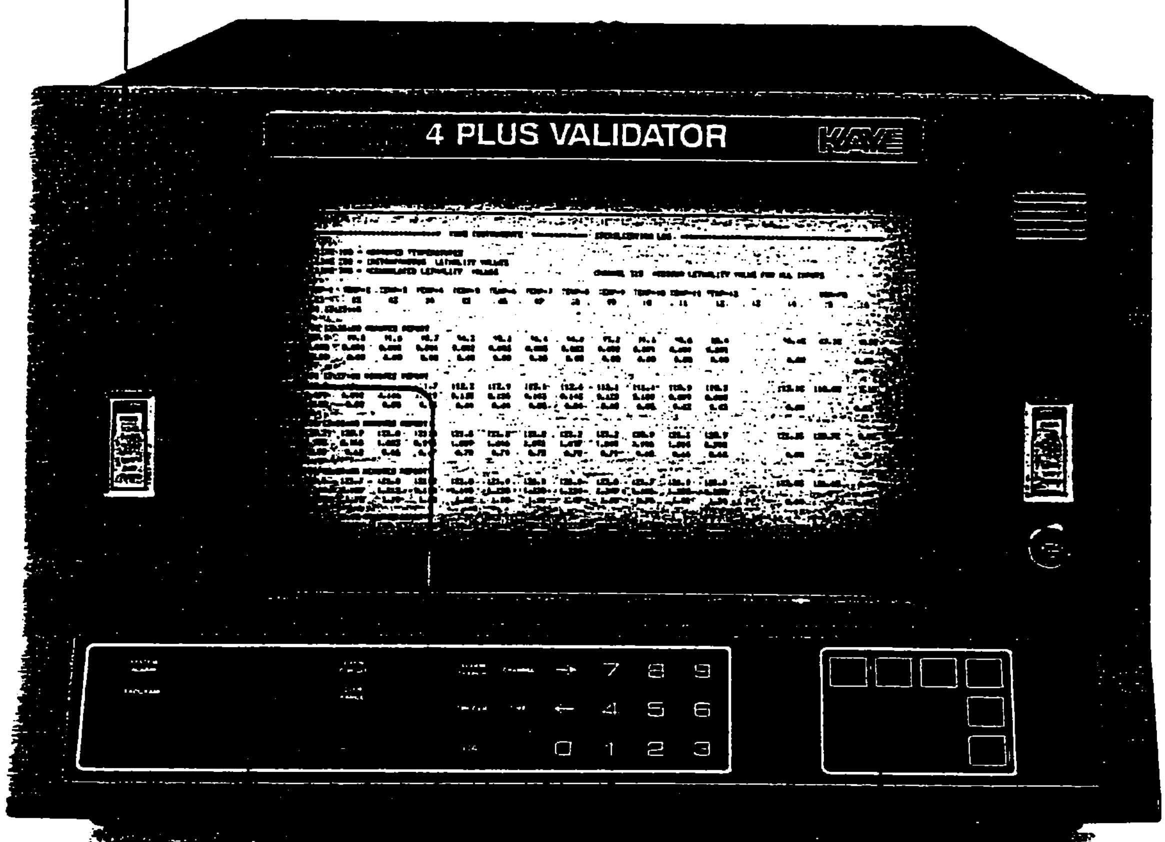
Validator's Operator Panel

Operator Convenience

Because the Validator uses a PC to set up and download validation tests and calibrate sensors, there's no need to deal with codes or functions. The operator interface is straightforward and requires little training to use. The front panel provides convenient access to monitor channels, generate program listings and, if you choose, initiate your test. The operator interface at the Validator is greatly simplified.

Status Indicators

- SYSTEM ALARM light indicates an alarm at one or more channels.
- PROGRAM light flashes when Validator is in program mode by Validator Programmer or during program loading.
- OPEN CIRCUIT light alerts you to an open thermocouple on the accessed channel.
- OVER RANGE light indicates channel data exceeds display capacity.
- AUTO SEARCH light indicates that system is searching for and displaying channels in alarm at one-second intervals.
- AUTO LOG light indicates AUTO LOG is enabled to automatically generate reports.



LED Displays

- Show channel address (see page 6) and value.

Operator Keys

- ALARM SEARCH generates automatic search for alarmed channels.
- TRIGGER and LOG can be used to start tests, generate reports and reset totals or intervals.
- TIME displays current date and time
- CHANNEL accesses a channel address
- ← accesses next higher channel address
- → accesses next lower channel address

Program Listing Keys

- Can generate a listing for all channels in system or a selected group. These listings document the applications code required for validation of the system.

Validator Programmer

Setting Up Your Validation Tests

Programming your validation tests, on-line or off-line, is easy using the menu-driven PC-based Validator Programmer.

The Validator Programmer includes many time-saving features to:

1. Back up or load a program file, compare a program file with an active program, list a program and initialize the Validator.
2. Automate calibration of sensors
3. Program the Validator

Off-line programming lets you create different programs in advance for the different vessels you need to validate. This permits operators to select the appropriate test program, download it to the Validator, calibrate multiple sensors via the menu-driven software and initiate the test. There's no need for operators to be involved with the initial configuration. Your Validator is not idle and you don't have to move your equipment around—saving you time and convenience.

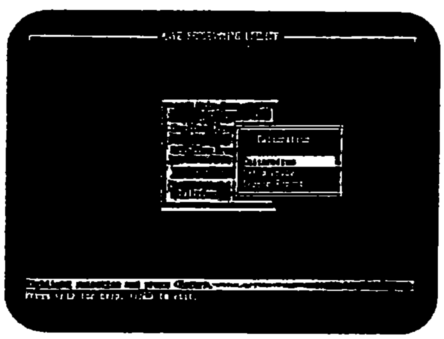
As for configuring programs, pop-up menus contain only validation-specific parameters. English-language prompts help you quickly select parameters—thermocouples or RTDs, type, resolution and units. In addition, when you want more explanation about a selection, comprehensive help screens are displayed with a keystroke.

When you want to apply a calculation to more than one channel location, you can use the Validator Programmer to copy the channel data to a range of channels that you specify. You don't have to rely on memory or handwritten notes; relevant data is right in front of you, eliminating chances of error.

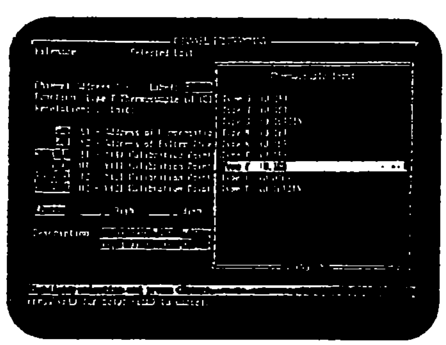
The Copy feature also lets you copy portions of a program and save it—no duplication of effort when you set up the next program. For example, many programs use the calculations of group min and max, address min and delta temperature. With a few keystrokes, you can apply that portion of the program to other programs using the same calculations.

Reduce Training Requirements

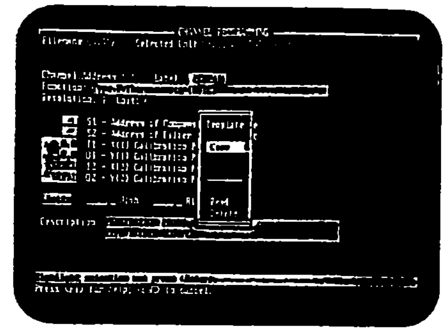
Menus not only make operation easy but also cut training needs and costs to an absolute minimum. Use personnel more efficiently because you don't need experts to develop programs or run validation tests.



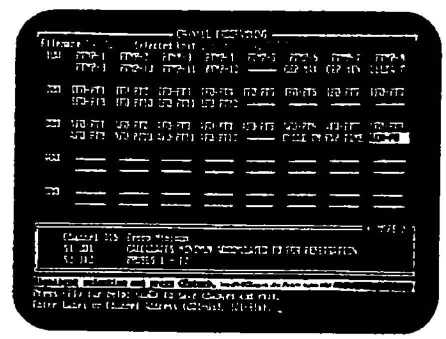
The Validator Programmer's menu-driven, English prompts makes program set up easy. It eliminates the need for previous experience with computers or the Digistrip.



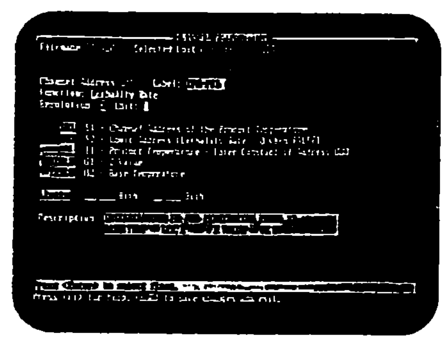
Pop-up menus designed specifically for validation let you select test parameters with a single keystroke.



When multiple channels have the same specifications, you need only configure one channel and copy data to the number of channels you specify.



Information on all the channels used for validation is displayed on one screen, providing a wide view of the entire program specifications.



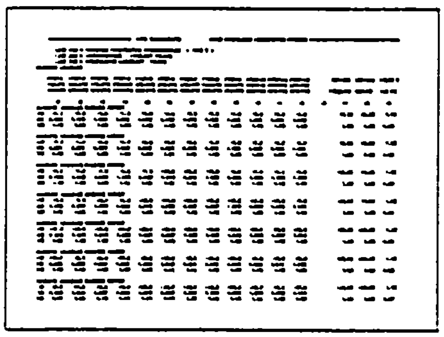
The lethality calculations are built-in; you simply enter parameters such as temperature sensor location, base temperature and Z value.

Ready-Made Validation Programs

Included with the Validator Programmer are Sample Validation Programs for penetration and distribution tests. Both programs are preconfigured to measure 12 type-T thermocouples in °C. Based on the program you select, temperature is displayed for the product or chamber.

Penetration Studies

The Validator Penetration program calculates the instantaneous and accumulated F_o values for all the measured temperatures



during a cycle. Since the penetration program is designed for steam sterilization, the lethality calculations are configured for a base temperature of 121.1°C with a Z-value of 10.

Other calculations include group min, group max and delta T of the penetration temperatures, minimum accumulated F_o for all penetration probes and cycle and exposure times.

The program automatically generates a text report every minute and includes all the above parameters. When the test reaches the minimum F_o and exposure setpoint time, the report ends. The Validator also creates historical trend reports of penetration temperatures and F_o values during the cycle.

Distribution Studies

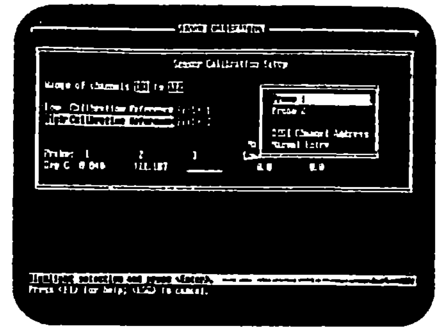
The Validator Distribution program automatically calculates group min and group max for all thermocouple probes, locations for min and max probes, delta T and cycle and exposure times. These reports continue until manually stopped. The report also generates a trend of temperature profiles during the test.

Calibrate Sensors Automatically

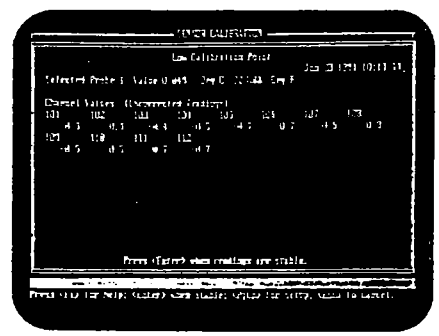
With the auto-calibration feature of the Validator Programmer, you can perform 1- or 2-point calibrations for up to 48 thermocouple or RTD probes at one time, automatically. Without any previous programming experience, operators can use the menu-driven calibration utility to perform automatic sensor calibrations and generate reports.

Insert probes and Intelligent RTDs into your reference baths, view temperature data from all sensors and the Intelligent RTDs on one screen and press a key. Software does the rest—displays temperature readings and downloads calibration constants. The Validator performs the actual sensor calibration, correcting each thermocouple or RTD to a fixed-point temperature referenced to a NIST-traceable calibration standard.

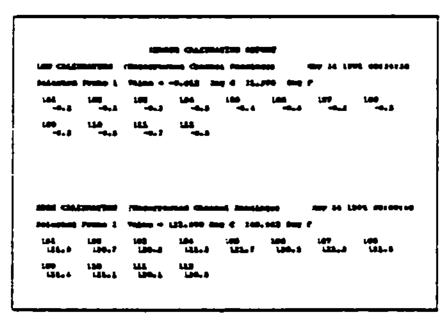
At the time of calibration, the Validator Programmer produces a one-page printed calibration report—including reference temperature and the uncorrected values for all sensors at low and high reference points. You can also save the calibration data to print the report later on. When the test is complete, you can perform a sensor calibration check and obtain a post-calibration report to compare sensor readings before and after the validation test.



The auto-calibration feature lets you define the range of channels to be calibrated. Low and high calibration reference temperatures can be automatically input from the Intelligent RTD Probe or entered manually.



Auto-calibration screens for low (shown) and/or high calibration points display the uncorrected values of the channels being calibrated.



A typical pre- or post-calibration report shows the uncorrected values for all probes used in the test and the temperature of the reference. Generated by a single keystroke, this report can be output to a printer or saved as a file for later output.

Digi Collect Software

Collect Data to a PC Automatically

The Digi Collect software permits you to automatically acquire validation data on-line from Digistrip 4, Digistrip 4 Plus and Validator systems.

Using a standard PC or laptop computer, you can display data on-line in column or bar graph form, as well as save the data as "PRN" files for analysis. And with Kaye's extensive error checking communications protocol, Digi Collect provides secure and consistent data from your Digi.

Once installed, Digi Collect is displayed as an additional menu item with the Validator Programmer, eliminating the need to exit from one program to access another.

Easy, Error-Free Setup

Simply connect the supplied cable from the serial port of your PC to the Digi and load the program. Digi Collect automatically searches for all configurations of Digi baud rate and ID. It automatically programs Digi to transmit all rows every 10 seconds. *No keystrokes—no errors!*

Automatic Data Storage

Digi Collect provides storage for validation data in up to 4 separate report files. Each report can contain up to 48 channels, or 3 rows, of data. This feature lets you store Distribution, Penetration and Summary information into separate files—*no need to sort in Lotus 1-2-3.* In addition, you can assign an independent trigger for each file based on time interval and events. Your computer collects files automatically and writes them in "PRN" format, easily imported to standard spreadsheet programs, e.g. Lotus.

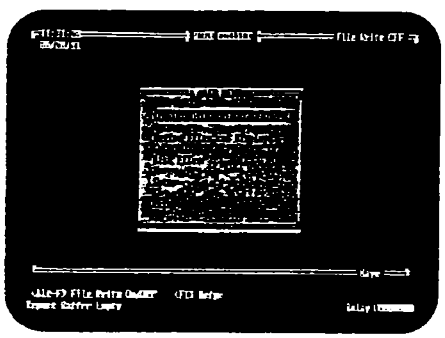
On-Line Display

The files created by Digi Collect are also available as real-time displays. With a keystroke, you can view any display as it updates.

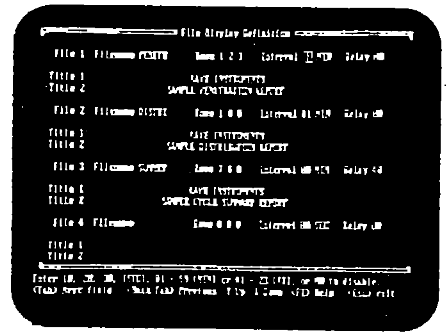
Digi Collect also displays a summary report of all 8 rows of Digi data. A Bar Graph report lets you view a single 16-channel row of validation data. You select the particular row and scaling of the report.

Important Features of Digi Collect

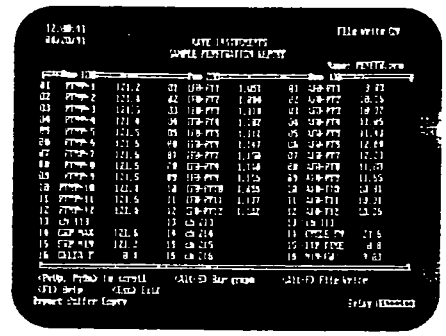
- Works with any Digi 4 model (Digi 4, Digi 4 Plus, Validator)
- Easy to use menu-driven software
- Configures Digi 4 automatically —no keystrokes, no errors
- Provides secure and consistent data with Digi 4
- Stores data in Lotus-compatible "PRN" files automatically
- On-line displays—4 file displays, summary and bar graph displays



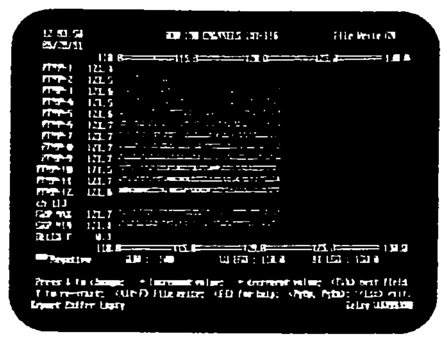
***Main Menu:** Easy-to-read menu provides immediate access to Digi Collect, eliminating the need for previous experience with computers.*



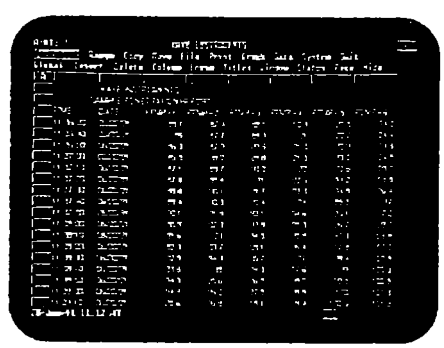
***File Definition:** Store validation data in up to 4 separate files. Simply specify the file name, rows to collect, a two-line title and the trigger for storage.*



***File Display:** On-line displays let the operator view each file during the test. File displays update automatically every 10 seconds. One of the 4 file displays is shown.*



***Bar Graph:** The operator can display a bar graph containing up to 1 row, 16 channels, of data. The operator can select the row number and scale.*



***Lotus 1-2-3 Spreadsheet:** Digi Collect converts Digi ASCII data to "PRN" files automatically. The operator can easily import data to Lotus with just a few keystrokes.* ▶

The Digistrip 4 Plus Validator Specifications

The Validator has a built-in line printer for both standard reports and graphic trend reports. The printer uses upper case alpha and numeric characters, and prints one line per second.

With fewer moving parts and a patented printing technique, the Validator's printer is extremely reliable. You can access the printer as well as most other system components via the front door. This accessibility simplifies paper loading and maintenance. Keylock entry protects printed records.

Validator holds a 250-sheet stack of 8½×11" fanfold impact printing paper, eliminating the need for changing ribbons or pens. The sheets easily separate into report-quality forms for storing or copying. A fully enclosed paper path seals out airborne contaminants. An optical sensor can sense out of paper condition and automatically trigger the buffering of report data.

The Validator accommodates up to 4 scanners; with an expansion chassis, you can increase the number of scanners to 8. Each scanner provides up to 16 inputs.

General Features

- Up to 128 analog channels with 17-bit resolution, achieving unsurpassed measurement accuracy—thermocouple and RTD measurement accuracy to 0.1° C
- Up to 32 isolated status inputs
- Math, group, logic, and timing functions
- Application functions for lethality
- User-definable digital and trend reports
- Reliable communication protocol with error detection and recovery
- Data retention during power failure
- Watchdog timer

Specifications apply to the Validator. For details on the Digistrip 4S Plus, see Product Data Sheet 500.

The Validator General Specifications			
System Input Capacity	[illegible]	[illegible]	[illegible]
Scanning Speed	[illegible]	[illegible]	[illegible]
Input Impedance	[illegible]	[illegible]	[illegible]
Common Mode Rejection	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Thermocouple/RTD Range and Accuracy Specifications			
INPUT SENSOR TYPE	TEMPERATURE TYPES RANGE	NIST SYSTEM CONFORMITY	SYSTEM ACCURACY
J (Iron-Constantan)	-112°C to 1130°C (-170°F to 2066°F)	0.05°C	±0.002% reading + 0.25°C
J (DIN Iron-Constantan)	-201°C to 901°C (-330°F to 1654°F)	0.1°C	±0.003% reading + 0.29°C
K (Chromel-Alumel)	-137°C to 1392°C (-215°F to 2537°F)	0.06°C	±0.003% reading + 1.25°C
T (Copper-Constantan)	-220°C to 402°C (-364°F to 755°F)	0.05°C	±0.003% reading + 0.25°C
T (Copper-Constantan limited range 0.01°C resolution)	-112°C to 341°C	0.02°C	±0.003% reading + 0.21°C
U (DIN 43710 Cu/CuNi)	-211°C to 599°C	0.1°C (non-NIST std)	±0.003% reading + 0.30°C
RTD: 100 ohm Pt bridge	-225°C to 1455°C (-257°F to 2651°F)	0.1°C*	±0.003% reading + 0.12°C
RTD: 100 ohm Pt bridge (limited range 0.01°C resolution)	-128°C to 340°C	0.01°C*	±0.003% reading + 0.015°C
RTD: 100 ohm Pt at 1 mA	-230°C to 1539°C (-382°F to 2802°F)	0.1°C*	±0.003% reading + 0.12°C
RTD: 100 ohm Pt at 1 mA (limited range 0.01°C resolution)	-127°C to 441°C (-196°F to 826°F)	0.01°C*	±0.003% reading + 0.015°C

*Conformity to DIN 43760 (alpha = 0.00385 Ohms/Ohm/°C)

System accuracy includes all instrument errors (e.g., maximum conformity deviations, reference junction compensation with worst case thermal scatter of input terminals, long term drift, temperature coefficients, A/D conversion errors, and scanner errors). System accuracy, 30 days 20°C to 30°C ambient.

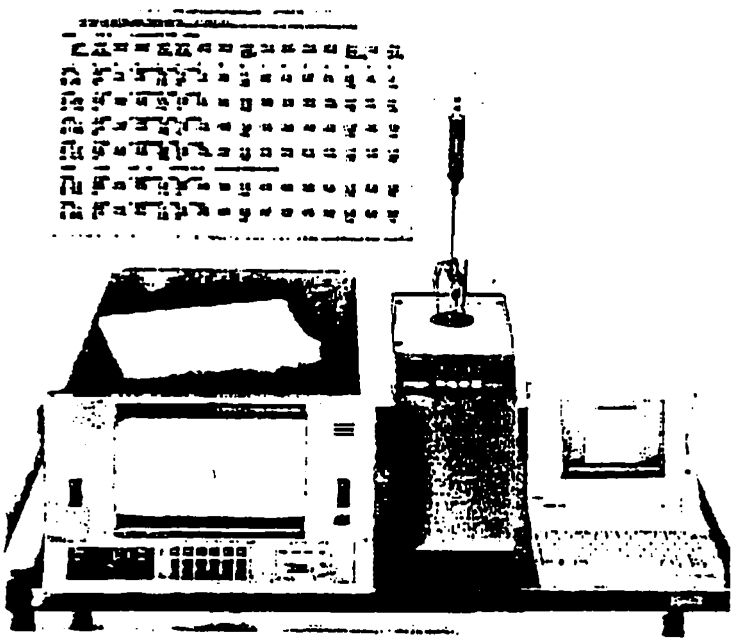
Minimum Computer Requirements for Validator Programmer and Digi Collect

The Validator software runs on the IBM® PC/AT and PS/2s or compatibles, with 80286 or 80386 processors that meet the minimum requirements listed below:

- 20MB hard disk drive
- One floppy drive (3½" or 5¼")
- 640KB RAM
- Two serial and one parallel I/O communications port
- CGA, EGA or VGA graphics
- Operating system: MS-DOS® IBM DOS 3.2 or greater

Digistrip 4 Plus Validator

The most advanced validation system designed to meet all your validation needs, including improved productivity and reduced costs.



For details on the system's menu-driven programming software, sensor calibration and data collection utilities, and report formats, see Publication #525 on the Portable Validator.

The Digistrip 4 Plus Validator,® is the world's most complete validation package. It features PC-based software, new temperature reference technology, and automated procedures for time-saving operation. *It's the only integrated validated solution designed specifically for pharmaceutical and biotech validation.*

Superior Measurement Accuracy In a Labor-Saving Solution—The Validator not only provides the highest measurement accuracy available —better than twice CGMP requirements—but also automates many of the day-to-day operator tasks.

Whether you're calibrating lots of sensors, running tests or collecting data for analysis, the Validator will save you time.

Accepts a Wide Variety of Inputs
Wired directly to its scanner screw terminals, the Validator accepts signals from:

- thermocouples, RTD's, pressure transducers
- 4-20 mA current transmitters
- voltage transducers
- dry contacts (switches or pushbuttons).

Validation-Specific Calculations
At the heart of the Validator is an extensive built-in library of validation-specific calculations for saturated steam, lethality, cycle times, group minimum and group maximum and many more.

You can combine these calculations to design specific programs for penetration and distribution tests.

A distribution study, for example, measures numerous thermocouple inputs and calculates the min and max temperature of the group. Using the Subtract calculation, the Validator determines the delta temperature. It also calculates the location of min and max temperature for all sensors to identify hot and cold spots in your vessel.

Plus, Kaye supplies sample programs ready-made for distribution and penetration studies, saving lots of set-up time.

Easy Wiring with Plug-In Scanners
Each scanner accepts 16 inputs, for a total of 64 in the main unit—up to 128 with expansion chassis.

Analog Scanners accept up to 16 thermocouples, as well as pressure and humidity transducers. Each scanner has a Uniform Temperature Reference (UTR) block providing cold-junction compensation—resulting in superior thermocouple measurement accuracy.

RTD Scanners accept 3- and 4-wire 100-Ohm platinum RTD's and provide the required excitation voltage and bridge completion.

Status Input Scanners accept discrete inputs from external devices (switches or operator pushbuttons). Status inputs are optically isolated.

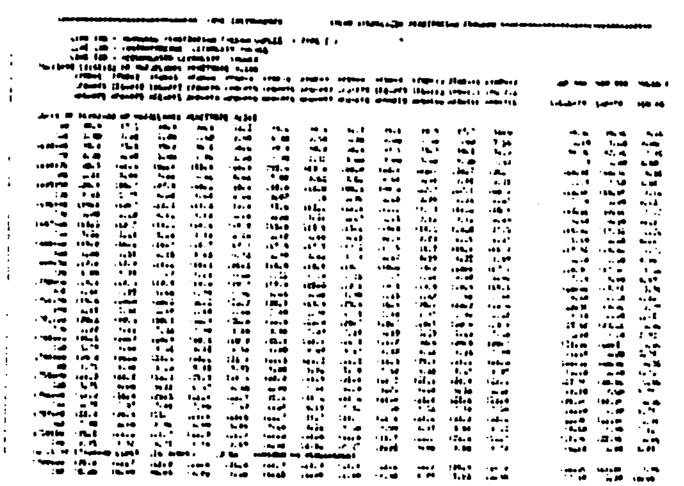
Larry
Mr Yancy
Knock out Size 17.53" W
12.31 H

Validated solution—from high-accuracy measurements to final reports.

Convenient, Reliable Reporting of Validation Data
The Validator has a high-speed built-in line printer (one line per second) for both standard reports and graphic trend reports.

Keylock entry protects printed records and provides convenient access to the printer and most other system components. This accessibility simplifies paper loading and maintenance.

The Validator holds a 250-sheet stack of 8.5 x 11" fanfold impact printing paper, eliminating the need for changing ribbons or pens. A fully enclosed paper path seals out airborne contaminants. An optical sensor can sense out-of-paper condition and automatically trigger the buffering of report data.



Select the report format you need to prove your validation cycles, including the new condensed format (shown) which saves paper.

Brief Comparison Chart of Kaye Systems Used for Validation

	Portable Validator	Digi 4 Plus Validator
Max. no. inputs	32	128
Type of inputs	Analog, T/C, RTD	Analog, T/C, RTD, Discrete
Operator display	Validator software	On board or Validator software
Printed reports	Via external serial or parallel printer	Via local printer
Portability	Hand Carry	Validation Cart
Weight	9 kg (19.3 lbs.)	33.6 kg (74 lbs.)
Power	90-250 VAC	90-135 VAC; 180-270 VAC

SPECIFICATIONS	
Analog Input Capacity	Up to 64 on board; 128 with expansion chassis; Discrete: Up to 32
Scanning Speed	Analog: 40 channels/second at 60Hz; 33.3 channels/second at 50Hz
Thermocouple Types	J, K, T: 0.1°F or 0.1°C resolution; T: 0.01°C resolution (limited range)
RTD Types	100Ω Pt, 3-wire bridge: 0.1°F, 0.1°C, or 0.01°C resolution (limited range)
System Accuracy	Type T: ±(0.003% reading + 0.25°C) RTD 100Ω Pt bridge: ±(0.003% reading + 0.12°C)
Input Impedance	>1GΩ. Source greater than 10KΩ produces open circuit indication
Common Mode Rejection	>160db @ line frequency; 140db @ DC
Max. Common Mode Voltage	100V pk ch-to-ch within each scanner; 350V pk ch-to-ch between scanners or channel to frame ground
Normal Mode Rejection	60db @ 50 or 60Hz
Voltage Input Accuracy	30 days: ±(0.003% of reading + 2 count + 4 microvolts); 1 year: ±(0.006% of reading + 2 count + 4 microvolts)
Resolution	1:60,000
Sensitivity	0.5 microvolts (on most sensitive range)
Voltage Temperature Coefficient	±(0.1 microvolts + 0.001% reading)/°C
Compensator Temp. Coefficient	±0.01°C per °C
Input Terminal Temperature Non-uniformity	±0.10°C
Direct Input Ranges	30.000mV (Type T only), 60.000mV, 600.00mV, 6.0000V, 12.000V
Power	90 to 135V AC, 50/60Hz (115V AC) 180 to 270V AC, 50/60Hz (230V AC) Idle: 42W; Print: 76W (avg), 200W (pk)
Fuse Rating	1.5A Slow-Blow (115V AC) 1.0A Slow Blow (230V AC)
Environmental	Temperature: 0 to 50°C (32 to 125°F) Relative Humidity: 95% (non-condensing)
Physical	Size: 311mm H x 483mm W x 601mm D (12.25" H x 19" W x 23.7" D) Weight: 33.6 kg (74 lbs).

KAYE

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Kaye–Europe • 106, rue des Frères Farman • 78530 BUC • France
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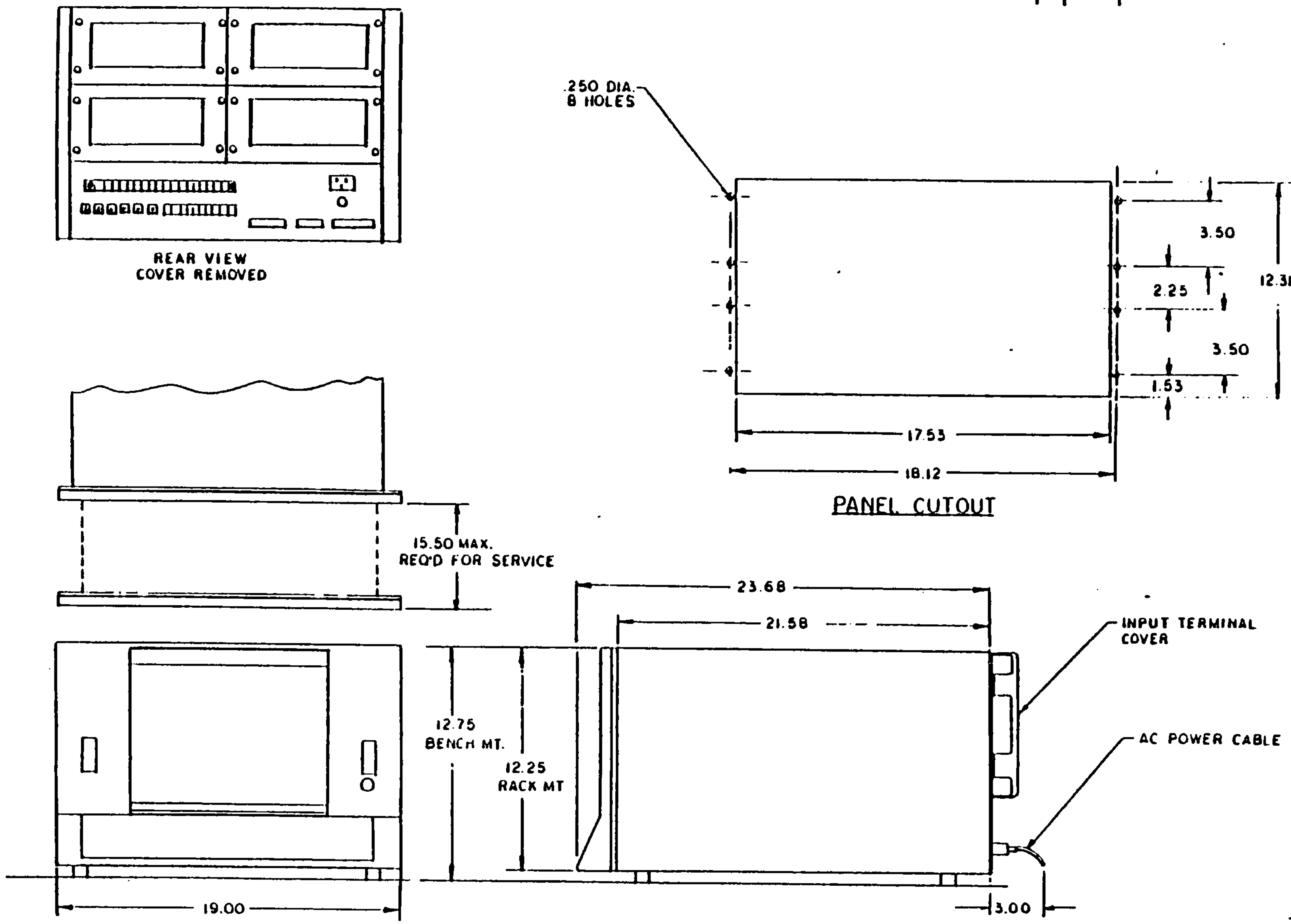
SYSTEM SPECIFICATIONS: DIGI 4 PLUS

DIGISTRIP 4 PLUS		DIGI-LINK 4 PLUS	
Power:	90 - 135 VAC, 50/60 Hz (115 VAC) 180 - 270 VAC, 50/60 Hz (230 VAC) Idling: 42 W Printing: 76 W (average) 200 W (peak)	**Power:**	90 - 135 VAC, 50/60 Hz (115 VAC) or 180 - 270 VAC, 50/60 Hz (230 VAC) 35 W
Fuse Rating:	1.5A Slo-Blo (115 VAC) 1.0A Slo-Blo (230 VAC)	**Circuit Breaker Rating:**	1.0A (115 VAC) 0.5A (230 VAC)

Environmental:	Temperature: 0 - 50°C (32 - 125°F) Relative Humidity: 95% (non-condensing)
System Input Capacity:	Analog: Digistrip 4 Plus, up to 64 on board; 128 with expansion chassis Digi-Link 4 Plus, up to 128 on board Status: Up to 32
Scanning speed:	Analog: 40 channels/second at 60 Hz; 33.3 channels/second at 50 Hz Status Inputs: once/math scan* Calculations: once/math scan*
Input Impedance:	>1 GΩ. Source greater than 10KΩ produces open circuit indication.
Common Mode Rejection:	Greater than 160 db @ line frequency; 140 db @ DC
Maximum Common Mode Voltage:	100V peak channel to channel within each scanner 350V peak channel to channel between scanners or channel to frame ground
Normal Mode Rejection:	60 db @ 50 or 60 Hz
Voltage Input Accuracy:	30 days: ±(0.003% of reading + 2 count + 4 microvolts) 1 year: ±(0.006% of reading + 2 count + 4 microvolts)
Resolution:	1:60,000
Sensitivity:	0.5 microvolts (on most sensitive range)
Voltage Temperature Coefficient:	±(0.1 microvolts + 0.001% reading)/°C
Compensator Temperature Coefficient:	±0.01°C per °C
Input Terminal Temperature Non-uniformity:	±0.05°C Digi-Link 4 Plus ±0.10°C Digistrip 4 Plus
Direct Input Ranges:	30.000 mV**, 60.000 mV, 600.00 mV, 8.0000 V, 12.000 V
Thermocouple Types:	B, C, E, J, K, N, R, S, T: 0.1°F or 0.1°C resolution T: 0.01°C resolution (limited range)
RTD Types:	100Ω Pt, 3-wire bridge: 0.1°F, 0.1°C, or 0.01°C resolution 10Ω Cu, 3-wire bridge: 0.1°F or 0.1°C resolution

* A typical math scan ranges from .3 to 1.0 second.
**30.000mV range used for Type R, S and T only.

REVISIONS				
NO.	ECO	DESCRIPTION	CHKD	DATE



-3	-2	-1	PART NO.	DESCRIPTION	ITEM NO.
QTY REQ'D					

MATERIAL: — / / —

FINISH: / /

QTY PER ASSY

DWG SCALE 1/4

DWN B.L.J.
DATE 1-31-84
CHKD 30W
DATE 1-31-84

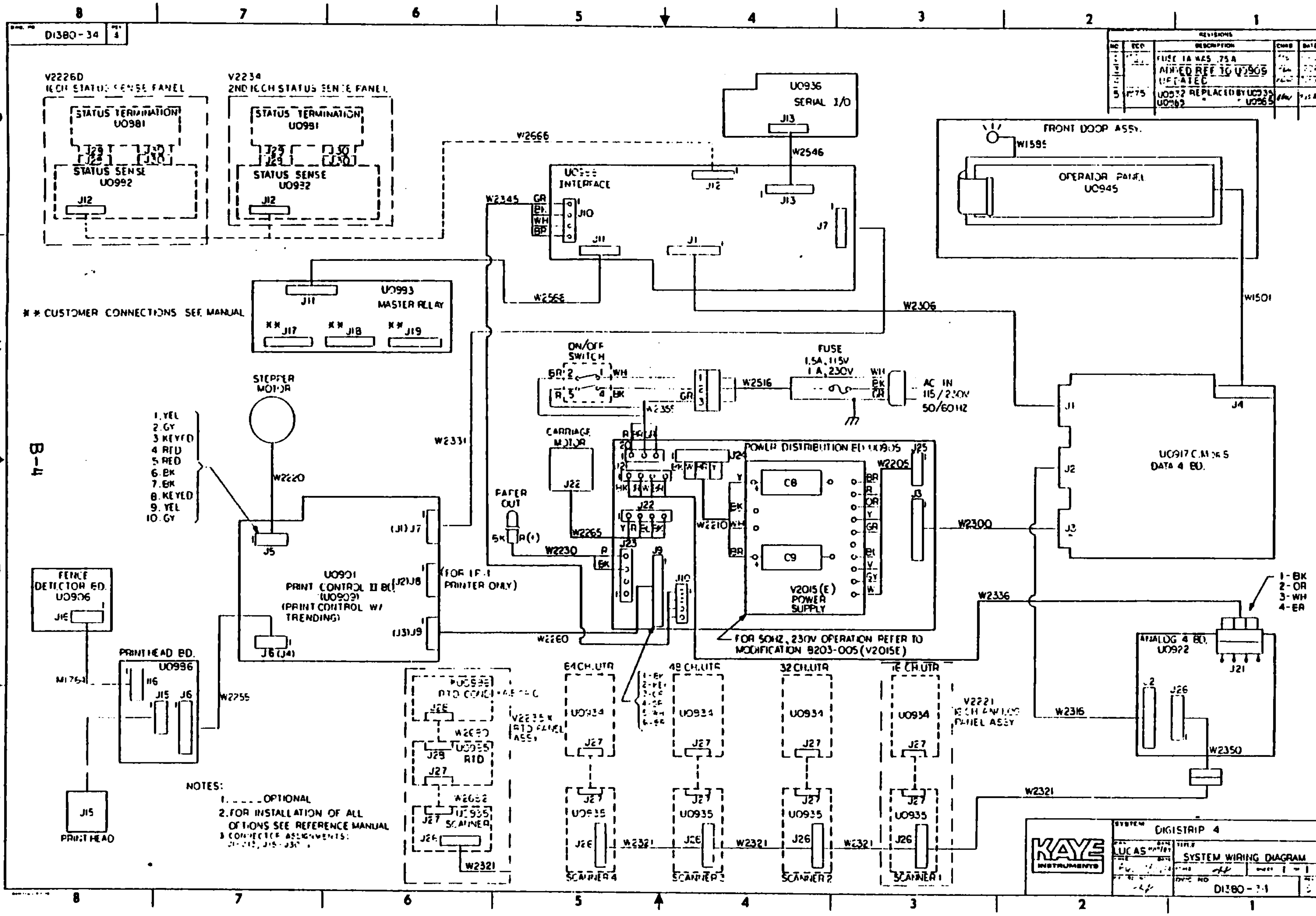
DO NOT SCALE DRAWING

SYSTEM: DIGISTRIP 4 (C.M)
TITLE: OUTLINE DRAWING

DWG NO. C1380-33 REV 0

KAYE INSTRUMENTS

/87


D1380-34
V2226D
1ECH STATUS SENSE PANEL
V2234
2ND IECH STATUS SENSE PANEL
STATUS TERMINATION
U0981
STATUS SENSE
U0992
W2666
U0936
SERIAL I/O
W2546
INTERFACE
FRONT DOOR ASSY.
W1595
OPERATOR PANEL
U0945
W2345
W2568
U0993
MASTER RELAY
** CUSTOMER CONNECTIONS SEE MANUAL
W2306
W1501
ON/OFF SWITCH
FUSE
1.5A, 115V
1 A, 230V
W2516
AC IN
115/230V
50/60 HZ
STEPPER MOTOR
CARRIAGE MOTOR
POWER DISTRIBUTION BD U0905
W2205
U0917 CMOS
DATA 4 BD.
W2331
W2220
1. YEL
2. GY
3. KEYED
4. RED
5. RED
6. BK
7. BK
8. KEYED
9. YEL
10. GY
PAPER OUT
W2265
W2230
W2210
W2300
U0901
PRINT CONTROL II BD.
(U0909)
(PRINT CONTROL W/ TRENDING)
(FOR LP-1 PRINTER ONLY)
V2015 (E)
POWER SUPPLY
W2336
1-BK
2-OR
3-WH
4-BR
FENCE DETECTOR BD.
U0906
W2260
FOR 50HZ, 230V OPERATION REFER TO MODIFICATION 8203-005 (V2015E)
ANALOG 4 BD.
U0922
PRINTHEAD BD.
U0996
W2255
64 CH. UTR
48 CH. UTR
32 CH. UTR
16 CH. UTR
U0934
U0935
V2221
16 CH ANALOG PANEL ASSY
W2316
W2350
W2321
RTD
SCANNER
V2235
RTD PANEL ASSY
SCANNER 4
SCANNER 3
SCANNER 2
SCANNER 1
PRINTHEAD
NOTES:
1. - - - - OPTIONAL
2. FOR INSTALLATION OF ALL OPTIONS SEE REFERENCE MANUAL
REVISIONS
FUSE 1A WAS .75A
ADDED REF TO U0909
U0932 REPLACED BY U0934
KAYE INSTRUMENTS
DIGISTRIP 4
SYSTEM WIRING DIAGRAM
D1380-34

B-4

C

APPENDIX C

SITE SPECIFIC AIR DISPERSION MODELING FOR ORGANOCHLORINE PESTICIDE(S) (REFER TO AQIR PREPARED BY BURLINGTON)

D

APPENDIX D

SAMPLE INSURANCE FORM

ACORD. CERTIFICATE OF INSURANCE

ISSUE DATE (MM/DD/YY) 4/21/94

PRODUCER

Rollins Hudig Hall of GA, Inc.
400 Interstate North Parkway
Suite 1400
Atlanta, GA 30339
404-951-1700

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COMPANIES AFFORDING COVERAGE

COMPANY LETTER A	Commerce & Industry
COMPANY LETTER B	
COMPANY LETTER C	
COMPANY LETTER D	
COMPANY LETTER E	

INSURED

Williams Environmental Srs,Inc
2075 West Park Place
Stone Mountain,
GA 30087

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY [X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS MADE [X] OCCUR. [ ] OWNER'S & CONTRACTOR'S PROT. [ ]	GL3405893	4/01/94	4/01/95	GENERAL AGGREGATE	$ 1000000
					PRODUCTS-COMP/OP AGG.	$ 1000000
					PERSONAL & ADV. INJURY	$ 1000000
					EACH OCCURRENCE	$ 1000000
					FIRE DAMAGE (Any one fire)	$ 50000
					MED. EXPENSE (Any one person)	$ 5000
	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [X] HIRED AUTOS [X] NON-OWNED AUTOS [ ] GARAGE LIABILITY	CA2772324	4/01/94	4/01/95	COMBINED SINGLE LIMIT	$ 1000000
					BODILY INJURY (Per person)	$
					BODILY INJURY (Per accident)	$
					PROPERTY DAMAGE	$
A	EXCESS LIABILITY [X] UMBRELLA FORM [ ] OTHER THAN UMBRELLA FORM	UL5060015	4/01/94	4/01/95	EACH OCCURRENCE	$ 4000000
					AGGREGATE	$ 4000000
A	WORKER'S COMPENSATION AND EMPLOYERS' LIABILITY	RMWC3171735	4/01/94	4/01/95	STATUTORY LIMITS	
					EACH ACCIDENT	$ 1000000
					DISEASE-POLICY LIMIT	$ 1000000
					DISEASE-EACH EMPLOYEE	$ 1000000
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

CERTIFICATE HOLDER

FOR EVIDENCE OF INSURABILITY ONLY

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 60 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

Beth Kitchens

104765013

ACORD 25-S (7/90)

E

WILLIAMS Project No. 0365-001-110
BENCHMARK Project No. 1100-101-110

SITE - SPECIFIC HEALTH & SAFETY PLAN

AT THE WOODS INDUSTRIES SITE
#2 EAST KING STREET
YAKIMA, WASHINGTON

Prepared For

WILLIAMS ENVIRONMENTAL SERVICES
2075 West Park Place - Stone Mountain, Georgia 30087
404/879-4107 - Fax 404/879-4831 - Wats 800/247-4030

Prepared By

BENCHMARK ENGINEERING
Consulting Engineers & Scientists
1550 Pumphrey Avenue
Auburn, Alabama 36830

Revised By

Ron Huggins, Ph.D., CIH
IH International, Inc.
494 W. Crogan Street
Lawrenceville, Georgia 30245

Preparation Date: **January 30, 1995**

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LIST OF APPENDICES—

SECTION 1
APPROVALS

SECTION 1
APPROVALS

By their signature, the undersigned certify that this HSP is approved and will be utilized at the Woods Industries Site.

Ron Huggins, Ph.D., CIH
Health and Safety Officer/
Corporate Health and Safety Consultant

2/21/95
Date

Z. Lowell Taylor, Ph.D., P.E.
President/CEO
Williams Environmental Services, Inc.

2/21/95
Date

Mark A. Fleri
Project Manager

2/21/95
Date

SECTION 2
GENERAL

SECTION 2
GENERAL

2.1 INTRODUCTION

The remediation of a hazardous waste site represents numerous and potentially deadly hazards. These hazards, if not adequately prepared for and properly addressed may have a serious impact on the health and well-being of employees assigned to work on such sites. A project which involves the assessment, excavation, and remediation of soils contaminated with various levels of chlorinated organic solvents must be initiated only after full consideration has been given to the various chemical and physical hazards associated with the site.

This Health and Safety Plan (HSP) has been prepared to identify the health and safety procedures, methods and requirements for remediation of the Woods Industries Site by thermal treatment. The HSP applies to all activities to be performed by **Williams Environmental Services, Inc. (WILLIAMS)** employees and subcontractors during implementation of remedial activities at the site. Contractors and vendors selected to perform support activities during remediation activities will be required to meet the minimum standards of this plan and abide by the protocols established herein. The HSP will be modified and updated as necessary to incorporate the specific safety risk analysis and mitigative measures identified by each subcontractor relative to unique activities which are not already addressed. The HSP addresses those health and safety issues related to the potential for specific chemical hazards being present during implementation of the remediation. An *Emergency Response/ Contingency Plan (Section 13)* has also been included in the HSP; this section outlines the procedures to be followed in the event of an emergency or unusual situation.

During development of this HSP, consideration was given to current health and safety standards as defined by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH), state guidelines and standards for known contaminants, and also by consulting procedures designed to account for the potential for exposure to unknown substances. Specifically, this HSP has been prepared in accordance with the documents entitled "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" jointly authored by NIOSH, OSHA, the United States Coast Guard (USCG), and the United States Environmental Protection Agency (USEPA).

This document will be periodically reviewed to ensure it is current and technically correct. Any changes in the site conditions and/or scope of work of the on-site activities will involve a review and modification of the HSP. Such changes will be completed in the form of an addendum.

All hazardous waste personnel who expect to participate in on-site activities must satisfy the training and medical requirements set forth in *Section 7, Personnel Training and Medical Requirements.*

2.2 PROPOSED SITE ACTIVITIES

Activities conducted as part of the PROJECT are divided into discrete tasks. The tasks covered in this HASP are as follows:

TASK NO.	DESCRIPTION
1	Mobilization to the site
2	Setup of thermal treatment unit
3	Shakedown and performance tests of the LTTD
4	Treatment of contaminated soil with the LTTD
5	Backfill of excavation
6	Off-site disposal of general waste
7	Demobilization and site closure

2.3 EMERGENCY TELEPHONE NUMBER

AGENCY	TELEPHONE NUMBERS
Fire Department	509/248-2100
Police	509/248-1010
Sheriff	509/248-3530
Nearby Hospital—St. Elizabeth's	509/565-5060
Ambulance Service	509/248-3610
BNRR Corporate Office	913/661-4439
National Response Center (operated by USEPA and U.S.C.G.)	800/424-8802
• CHEMTREC	800/424-9390
Local Environmental Emergency —	
• WILLIAMS HEALTH AND SAFETY OFFICER	800/325-0011
• WILLIAMS PROJECT PRINCIPAL	800/247-4030

2.4 WILLIAMS ENVIRONMENTAL SERVICES CONTACTS

CONTACT	TELEPHONE NUMBERS
Project Principal—Z. Lowell Taylor, Ph.D., P.E.	800/247-4030
Project Manager—Mark A. Fleri	800/247-4030
Health and Safety Officer— Ronald G. Huggins, Ph.D., CIH	800/325-0011
Health and Safety Specialist— Jeff Stalnaker	800/325/0011

SECTION 3
SITE ORGANIZATION AND RESPONSIBILITIES

SECTION 3
SITE ORGANIZATION AND RESPONSIBILITIES

3.1 OVERVIEW

All personnel will be responsible for continuous adherence to the procedures set forth by this HSP during the performance of on-site remedial work activities. In no case may work be performed which conflicts with the intent of or the inherent safety and environmental cautions expressed in these procedures. After due warning, WILLIAMS or contractor personnel violating safety and health procedures will be dismissed from the site.

3.2 PRINCIPAL HEALTH AND SAFETY OFFICER

WILLIAMS will provide a Principal Health and Safety Officer (PHSO) to administer and coordinate the health and safety program as outlined in this HSP. Minimum qualifications for the PHSO include certification in the comprehensive aspect of practice by the American Board of Industrial Hygiene, completion of a 40-hour training course as mandated by OSHA in 29 CFR 1910.120, and be familiar with the requirements specifically set forth for this type of work in that regulation.

The PHSO will be responsible for ensuring that:

+ Medical examination and training requirement for all WILLIAMS and subcontractor personnel on site are current and comply with 29 CFR 1910.120 and 134;
+ Pre-job briefing of all WILLIAMS personnel and subcontractors with regard to this HSP and other safety requirements including but not limited to (a) potential hazards; (b) personal hygiene principles; (c) personal protective equipment; (d) respiratory equipment usage; and (e) emergency procedures for dealing with fire and medical emergency situations;
+ Implementation of special safety considerations and the emergency response contingency plan;
+ Ensure that all WILLIAMS and subcontractor personnel are properly equipped and protected;
+ Alert appropriate emergency services before starting work and provide a copy of the emergency Response/Contingency Plan to the respective emergency services;
+ Comply with OSHA health and safety regulations; and
+ Maintain a chronological log of WILLIAMS personnel, subcontractors and visitors who enter the site during field activities.

Specifically, the PHSO or his designee will inspect operations, equipment, and procedures for adherence to this plan. Where deviations are discovered, he will take immediate steps to correct the deviation up to and including stopping the operation until the situation is adequately resolved. The PHSO is given the authority to take whatever legal steps are required to ensure adherence of operations to the adopted HSP. The PHSO will not be assigned to the site on a full-time basis.

WILLIAMS' designated PHSO for this project is Mr. Ronald G. Huggins, Ph.D., CIH

3.3 SITE HEALTH AND SAFETY OFFICER

The Site Health and Safety Officer (SHSO) will be assigned to the site on a full-time basis (i.e., will be on site at all times when work is being conducted) for the duration of the project. The SHSO will have experience in the area of safety and health, a sound working knowledge of federal and state occupational safety and health regulations, training in occupational safety and health, and demonstrable experience in air monitoring techniques and the administration of respiratory protection programs. The SHSO will also hold current certification in CPR and basic first aid.

The SHSO will have functional responsibility and authority for implementation and enforcement of the HSP. He will conduct daily employee exposure assessments for target contaminants for each functional task performed where exposure could reasonably be expected to occur. The SHSO shall also survey areas to detect vapor concentrations with the appropriate realtime monitoring equipment. The SHSO will provide respirator fit tests for employees prior to initial assignment of the respirator. The SHSO will inspect respiratory protective equipment and protective clothing for proper maintenance and use by employees who are assigned personal protective equipment

All confined space entry, hot electrical work, cutting and welding operations, and any other hazardous work will require advanced inspection (monitoring, testing, verification) by the SHSO. The SHSO will issue a work permit to perform the requested task for a specific period only upon completion of a permit application and his concurrence (inspection) that the work can be performed safely.

The SHSO shall immediately investigate all accidents/incidents which may occur. Each will be documented as to when it occurred, who was involved, and what corrective action needs to be implemented. The SHSO will maintain the OSHA 200 log of injuries and illnesses, as well as ensure that the required jobsite postings are visible at the jobsite. The SHSO will complete a **Daily Checklist** *(Appendix A)* to document his/her activities and inspections performed each day.

The SHSO will have the authority to suspend work during on-site emergencies and noncompliance with the HSP. The SHSO will report to WILLIAMS' on-site Project Manager and indirectly to the PHSO.

WILLIAMS' designated SHSO for this project is Jeff Stalnaker.

3.4 PROJECT MANAGER/GENERAL SUPERVISOR

The Project Manager is ultimately responsible for field implementation of the health and safety program. This includes communicating specific health and safety requirements to site supervision and consulting with the SHSO regarding planned activities, unforeseen conditions, and for resolving any questions with identified safety procedures or levels of protection to be used.

3.5 PROJECT SUPERVISOR

The Project Supervisor is responsible for ensuring that all employees working on his crew are complying with the requirements set forth in this HSP. Each supervisor is also responsible for communicating to the SHSO his opinion of the effectiveness of the HSP on site and any unforeseen hazards which may be discovered during operation. Each project supervisor will ensure that employees and subcontractors are conducting themselves in compliance with the health and safety requirements of the plan. The supervisor is responsible for immediately investigating injury circumstances and completing the **Supervisor's Employee Injury Report** (SEIR) *(Appendix A)* for any work-related injury, illness, or incident that could have resulted in injury/illness.

3.6 TECHNICIANS (WORKERS)

Technicians who will be working on site are responsible for understanding and complying with HSP requirements and for notifying either the SHSO, or their supervisor of any concerns they might have for their health and safety on the job. Technicians and all other support personnel are responsible for conducting themselves in a safe manner, mindful of the inherent hazards associated with working around chemically contaminated materials, heavy equipment, and extreme environmental conditions. Disregard of the HSP or standard operating procedures will be grounds for dismissal .

SECTION 4
SITE LOCATION, HISTORY, AND DESCRIPTION

SECTION 4
SITE LOCATION, HISTORY, AND DESCRIPTION

4.1 GENERAL

The Woods Industries Site is located in an industrial area within the city limits of Yakima, Washington *(see Figure 4.1)*, and consists of two areas formerly leased by Burlington Northern Railroad (BNRR) to Woods Industries, who sublet a portion of the site to Akland Irrigation. The entire area that was leased from BNRR covers approximately four acres. Land use in the immediate vicinity of the Woods Industries Site is primarily industrial. Fruit packing plants operate on the property east of the site.

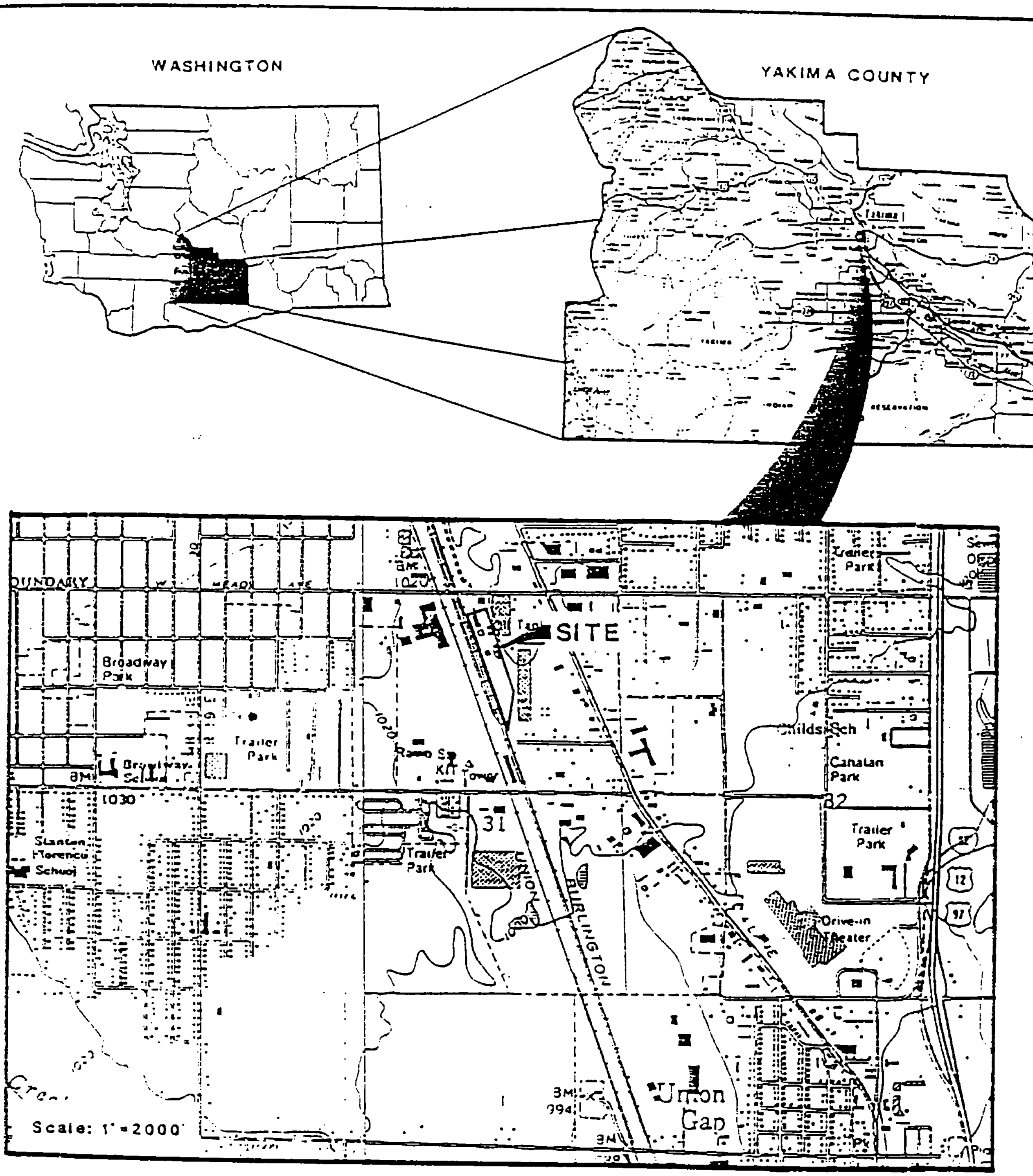
The site is relatively flat and includes the foundations of the Woods Industries buildings that were formerly used to formulate pesticides on the north part of the site and the buildings formerly used by Akland Irrigation for storage and retail sales of irrigation equipment on the south part of the site. The site has been secured by an eight-foot-high chain-link fence.

In 1990 and 1991, BNRR conducted a remedial investigation of the site. The primary soil contaminants are p,p'-DDT, hexachlorobenzene, and dieldrin. Other organochlorine pesticides and some metals (mercury, arsenic, and lead) are also above cleanup levels at some locations. In January and February of 1993, buildings on the site were demolished to grade and removed. The current site conditions are depicted in *Figures 4.2A* and *4.2B.*

4.2 SCOPE OF WORK

The work to be performed primarily consists of the treatment of soil contaminated with the compounds identified herein by Low-Temperature Thermal Dersorption (LTTD).

PROJECT MANAGER	DOCUMENT MANAGER	CHECKED BY	DRAWN BY

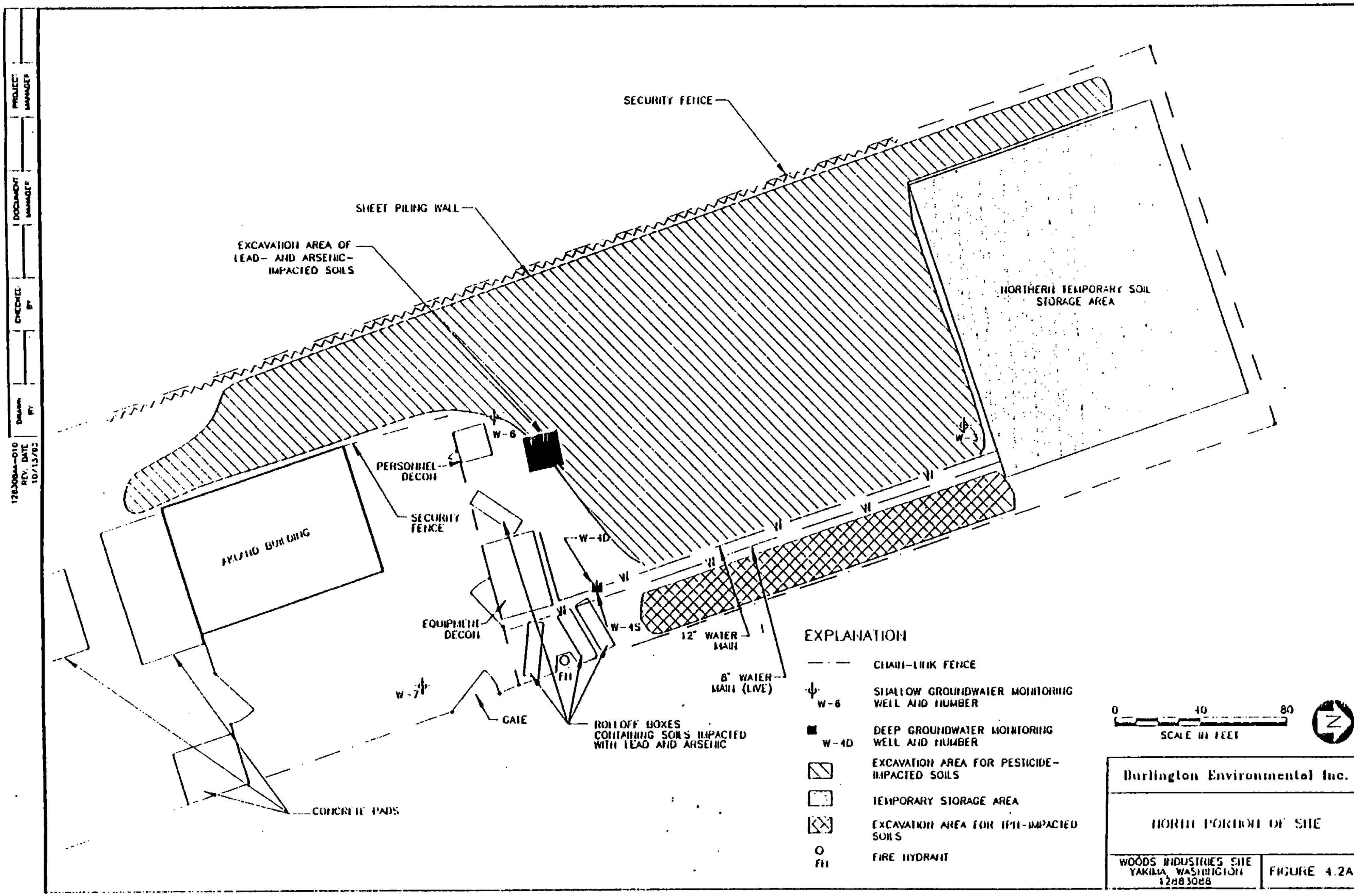


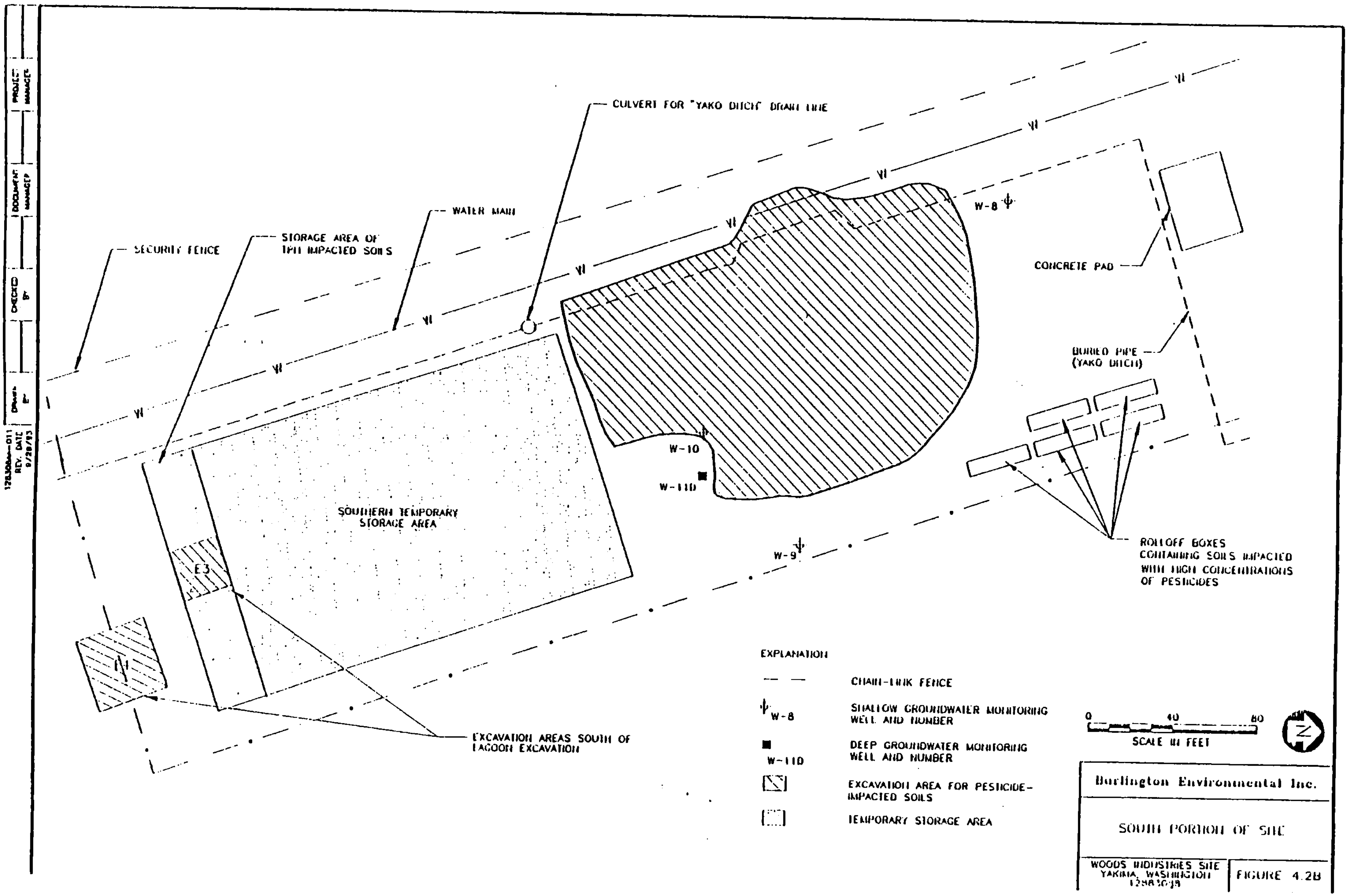
SCALE IS VARIABLE

N

Modified from U.S.Geological Survey, Yakima East quadrangle, Washington, Photo Revised 1985

Burlington Environmental Inc.	
SITE LOCATION MAP	
WOODS INDUSTRIES SITE YAKIMA, WASHINGTON 12883088	FIGURE 1.


SECURITY FENCE
SHEET PILING WALL
EXCAVATION AREA OF LEAD- AND ARSENIC-IMPACTED SOILS
NORTHERN TEMPORARY SOIL STORAGE AREA
W-6
W-3
PERSONNEL DECON
SECURITY FENCE
W-4D
W-4S
EQUIPMENT DECON
12" WATER MAIN
8" WATER MAIN (LIVE)
FH
W-7
GATE
ROLLOFF BOXES CONTAINING SOILS IMPACTED WITH LEAD AND ARSENIC
CONCRETE PADS
EXPLANATION
CHAIN-LINK FENCE
SHALLOW GROUNDWATER MONITORING WELL AND NUMBER
DEEP GROUNDWATER MONITORING WELL AND NUMBER
EXCAVATION AREA FOR PESTICIDE-IMPACTED SOILS
TEMPORARY STORAGE AREA
EXCAVATION AREA FOR TPH-IMPACTED SOILS
FIRE HYDRANT
0 40 80
SCALE IN FEET
N
Burlington Environmental Inc.
NORTH PORTION OF SITE
WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON
12883088
FIGURE 4.2A
12830844-010
REV. DATE 10/13/93
DRAWN BY
CHECKED BY
DOCUMENT MANAGER
PROJECT MANAGER


CULVERT FOR "YAKO DITCH" DRAIN LINE
WATER MAIN
STORAGE AREA OF TPH IMPACTED SOILS
SECURITY FENCE
W-8
CONCRETE PAD
BURIED PIPE (YAKO DITCH)
W-10
W-11D
SOUTHERN TEMPORARY STORAGE AREA
E3
W-9
ROLLOFF BOXES CONTAINING SOILS IMPACTED WITH HIGH CONCENTRATIONS OF PESTICIDES
EXCAVATION AREAS SOUTH OF LAGOON EXCAVATION
EXPLANATION
CHAIN-LINK FENCE
SHALLOW GROUNDWATER MONITORING WELL AND NUMBER
DEEP GROUNDWATER MONITORING WELL AND NUMBER
EXCAVATION AREA FOR PESTICIDE-IMPACTED SOILS
TEMPORARY STORAGE AREA
0
40
80
SCALE IN FEET
N
Burlington Environmental Inc.
SOUTH PORTION OF SITE
WOODS INDUSTRIES SITE
YAKIMA, WASHINGTON
FIGURE 4.2B
PROJECT MANAGER
DOCUMENT MANAGER
CHECKED BY
DRAWN BY
REV. DATE
9/28/93

SECTION 5
CHEMICAL CONTAMINANTS/
PHYSICAL HAZARDS

SECTION 5
CHEMICAL CONTAMINANTS/PHYSICAL HAZARDS

5.1 OVERVIEW

The purpose of this section is to identify the physical, chemical, and biological hazards associated with implementation of the remedial activities at the site. A detailed description project activities to be performed is included in *Section 6, Hazard Assessment.* Subsections of this section will discuss each task or operation anticipated for the project in terms of the general hazards associated with it. It will also identify the protective measures to be implemented during the performance of each specific activity. If additional activities beyond those identified are conducted on site by WILLIAMS or subcontractors, a supplemental health and safety risk analysis will be performed specific to those activities.

This section will also delineate the specific chemical contaminants of concern, as well as anticipated physical hazards which may be encountered on the site.

5.2 CHEMICAL HAZARDS

Potential chemical exposure hazards exist from organic and inorganic compounds associated with the pesticide formulation process known from site operation records. Pesticides present on site include aldrin, dieldrin, endrin, DDT, DDD, DDE, beta-BHC, lindane, methoxychlor, alpha-endosulfan, malathion, parathion, and hexachlorobenzene. Chemical substances also found on site include polychlorinated biphenyls, copper, lead, manganese, arsenic, zinc, methylene chloride, and tetrachloroethylene. *Table 5.1* lists those chemical families, formulations, or specific compounds considered to be the highest hazard material on site. Reference material for this information includes:

+ *Dangerous Properties of Industrial Materials Seventh Edition*, Sax, N. Irving; Lewis, Richard J., Van Nostrand Reinhold, 1989.
+ *A Comprehensive Guide to the Hazardous Properties of Chemical Substances*, Patnaik, Pradyot; Van Nostrand Reinhold, 1992.
+ *Pocket Guide to Chemical Hazards*, NIOSH, 1990.
+ *Threshold Limit Values for Chemical Substances and Physical Agents*, American Conference of Governmental Industrial Hygienists, 1992–1993.

TABLE 5.1
HIGHEST HAZARD MATERIALS ASSOCIATED WITH THE WOODS INDUSTRIES SITE[1]

(Sources: ACGIH, 1987; Kirk-Othmer, 1985; NIOSH, 1987; OHS, Inc., 1986–88; Olishifski, 1984; Sax, 1984; and Verschuren, 1983)

COMPOUND	EXPOSURE LIMIT CONCENTRATION				WARNING PROPERTIES	EXPOSURE SYMPTOMS
	PEL[2]	TLV[3]	IDLH[4]	UNITS[5]		
Aldrin	0.25	0.25	‡	mg/M^3	Tan to dark brown solid with mild chemical odor	Produces hyperirritability, convulsions or coma, headache, nausea, and vomiting. Chronic intoxication may result in fainting, muscle spasms, tremors, and loss of weight.
Arsenic (& soluble compounds)	0.01	0.2	Variable	mg/M^3	None	Eye, mucous membrane, and skin irritant (mutagenic, carcinogenic). Gastrointestinal upset, death from circulatory failure. Sublethal exposure-- restlessness, short and raspy breathing, skin discoloration (blue), jaundice, and decreased urine excretion.
beta-BHC	†	†	†	†	Inadequate	Nausea, vomiting, central nervous system disturbance, headache, euphoria, tremors, convulsions, eye irritation, and skin irritation.
BHC (Lindane)	0.5	0.5	1,000	mg/M^3	Colorless solid with a musty odor, pure material is odorless	Causes nausea, vomiting, central nervous system disturbance, headache, euphoria, fascination, tremors, convulsions, and skin irritation.
Copper	1.0	1.0	†	mg/M^3	Reddish-colored metal	Irritation of upper respiratory tract, metallic or sweet taste, and nausea.
DDD	†	†	†	†	None	Skin irritation, central nervous system depression, headache, nausea, muscular spasm, vomiting, abdominal cramps, weakness, drooling/frothing of mouth and nose, and visual disturbance.
DDE	--	--	--	None	None	Derivative of DDT; symptoms are similar.
DDT	1	1	‡	mg/M^3	Inadequate	Causes skin and eye irritation, central nervous system depression, tremors, burning or prickling of the skin. DDT will accumulate in fatty tissue.
Dieldrin	0.25	0.25	‡	mg/M^3	Colorless to light tan with slight chemical odor	Headache, dizziness, nausea, vomiting, sweating, convulsions, limb jerks, and coma. Dieldrin is a potential carcinogen and can cause kidney damage.

†—No value established.
‡—Should be treated as a potential human carcinogen.

[1]*This table is not a complete listing of the hazardous materials suspected to be found on site. Rather, this list presents a compilation of the most toxic and/or hazardous compounds that may be encountered during field operations, and, therefore, they pose the greatest concern for personal safety protection. These compounds were selected based on the relative toxicity and/or representativeness for average hazard potential.*

[2]*PEL—OSHA Permissible Exposure Limit.*

[3]*TLV—ACGIH Threshold Exposure Limit.*

[4]*IDLH—Immediately Dangerous to Life and Health.*

[5]*Value given in* mg/M^3 *indicates a relatively low volatility.*

TABLE 5.1
(continued)

COMPOUND	EXPOSURE LIMIT CONCENTRATION				WARNING PROPERTIES	EXPOSURE SYMPTOMS
	PEL[1]	TLV[2]	IDLH[3]	UNITS[4]		
Endosulfan	†	0.1	†	mg/M3	Tan, semiwaxy solid with possible slightly sulfur dioxide odor	Slight nausea, confusion, excitement, flushing, and dry mouth.
Endrin	0.1	0.1	200	mg/M3	Inadequate	Headache, apprehension, dizziness, excitability, weakness, nausea, vomiting, disorientation, diarrhea, stomach pain, insomnia, paresthesia tremors, muscle spasm.
Ethanol	1,000	1,000	†	ppm	Clear, colorless, fragrant liquid, burning taste	Central nervous system depressant. Doses of 5,000–10,000 ppm may result in irritation of eyes and upper respiratory tract.
Hexachlorobenzene	†	†	†	†	Inadequate	Tremors, excitability, weakness, and coughing.
Lead	50	†	†	micro-grams/M3	Gray metal	Insomnia, headache, weight loss, vomiting, and diarrhea.
Malathion	15	10	†	mg/M3	Deep brown to yellow liquid with slight skunk odor	Skin irritation, eye irritation, headache, dizziness, incoordination, anxiety, chest pain, coughing, wheezing, sweating, and tremors.
Manganese	5	5	†	mg/M3	Gray-white metal	Irritation of the respiratory tract.
Methoxychlor	15	10	†	mg/M3	Inadequate	Anxiety, excitation, dizziness, headache, confusion, weakness, vomiting, and tremors.
Mercury	0.05	0.05	28	mg/M3	Silver-white, heavy odorless liquid.	Cough, chest pain, dyspnea, bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, fatigue, weakness, stomatitis, salivation, GI disturbance, anorexia, weight loss, irritation of eyes and skin.
Methylene Chloride	†	50	†	ppm	Inadequate	Fatigue, weakness, sleepiness, lightheadedness, numbness in extremities, headache, eye irritation, skin irritation, and nausea.
Parathion	0.1	0.1	†	mg/M3	Yellow to deep brown liquid with garlic-like odor	Headache, wheezing chest, salivation, nausea, abdominal cramps, diarrhea, sweating, and weakness.
Polychlorinated Biphenyls (PCBs)	0.5	0.5	†	mg/M3	Mild hydrocarbon odor	Skin irritation, chloracne, dermatitis, nausea, vomiting, diarrhea, headache, eye irritation, visual disturbance, and respiratory disturbance.
Tetrachloroethylene	25	50	500	ppm	Colorless liquid with mild chloroform-like odor	Irritation of eyes, nose, and throat, nausea, flushed neck and face, vertigo, dizziness, incoordination, headache, somnolence, skin erythema, and liver damage.
Trichloroethylene	†	50	†	ppm	Sweet, chloroform-like odor	Skin inflammation, skin ulcers, eye irritation, upper respiratory tract irritation, and blurred vision.

†—No value established.
‡—Should be treated as a potential human carcinogen.

Contaminants at the site are known to be carcinogenic, bio-accumulative, and cause long-term health effects. Some of the pesticides are very persistent in natural environments and are toxic by absorption directly through the skin. Exposure to these chemicals could be primarily through dermal contact, and the highest potential exposure would be from visibly contaminated materials. There is also a slight potential for inhalation of organic vapors from pesticide carrier solvents. In general, inhalation of pesticide vapors, or pesticide-contaminated soil dust, may pose a hazard to site personnel due to the concentrations and potential for mobility of site contaminants. Also encounters with dry, powdery chemical material or dust would present an inhalation hazard

5.3 PHYSICAL HAZARDS

The chart below identifies the type of physical hazards which may be present on site during remedial activities:

X	Slip, Trip, Fall	X	Toxic Atmosphere	X	Unlevel Surfaces
X	Heavy Equipment	X	Falling Objects	X	Flammable Atmosphere
X	Excavations	X	Lighting Levels	X	Noise
X	Oxygen-Deficient Atmosphere	X	Heat Stress	X	Compressed Gases
X	Overhead Work	X	Cold Stress	X	Fire
		X	Electrical		

+ **Slip, Trip, Fall**—These type hazards result from unlevel surfaces, slippery surfaces, and hard to see objects located across walking paths (i.e., rope, cords) responsible for over 60 percent of work-related injuries. A real fall hazard is created as a result of the void created by removal of large underground storage tanks and excavations.

+ **Heavy Equipment**—Heavy equipment is necessary for both excavation and transport of soils. Associated hazards include poor operator visibility and his inability to be fully aware of surroundings at all times (i.e., people, mobile, stationary objects). Vehicles used to haul soil and debris will be operating on the site. Severe slopes may be present which present roll-over and fall hazards to operators and site personnel.

+ **Excavations**—Excavation of the site will create hazards to site personnel. Equipment may fall into open excavations even if fencing is provided. Workers may also fall into excavated areas. Excavations may cave in if not properly sloped or shored. Excavation may result in a hazardous environment from the accumulation of toxic vapors which are heavier than air.

+ **Oxygen-Deficient Atmosphere**—Oxygen-deficient atmospheres may occur in portions of the LTEVF, and in the excavations pit. Oxygen-deficient atmospheres are defined by OSHA as environments with less than 19.5% oxygen content, by volume. For site operations, no entry into an oxygen-deficient environment will be conducted. Where oxygen deficiency is suspected or may exist, measurements—by remote sampling—will be performed to quantify oxygen levels prior to any entry. If oxygen deficiency is determined, appropriate ventilation must be performed prior to entry. Also the requirement for confined space entry must be followed (testing, approvals, permit, etc.).

+ **Toxic Atmosphere**—Toxic atmospheres may exist over the excavation pit and in any of the locations identified in the "oxygen-deficient atmospheres" section, above. By nature of the work to be performed, varying concentrations of toxic airborne contaminants may be present. *(See "Chemical Hazards," Section 5.2).* In the disturbance of affected soils, vapors and dusts of hazardous substances may be generated. The human sense of smell is not sufficient to provide adequate warning of unsafe levels of airborne substances. Continuous monitoring will be performed where affected materials may exist by a combination of personal monitoring with analysis of samples and by direct-reading instruments. A schedule of levels of protection and restriction of operations has been developed and is listed in *Section 9, Personal Protective Equpment and Equipment Reassessment Program.*
+ **Falling Objects**—The movement of loaded vehicles access the site can generate falling objects. Operations of cranes on site can create hazards from falling objects. Hard hats, safety glasses and steeled-toed footwear will be required for personnel in all operations and areas on site with the exception of the front gate security area and the office and support trailers.
+ **Lighting Levels**—For work activities scheduled after dusk, poor lighting conditions will increase risks of injury. Low light levels exist in all confined spaces. If work is to be performed after dusk or before dawn, supplemental site and vehicle lighting will be used. No operations will be performed after these periods of the day without both supplemented lighting systems.
+ **Heat Stress**—Heavy construction work outdoors in the summer months will create heat stress conditions for employees. The use of respiratory protective equipment and protective (nonbreatheable) clothing, boots, and gloves will greatly increase the levels of heat stress *(Appendix F).*
+ **Cold Stress**—Due to the time of year the project will be conducted and its location, it is anticipated that conditions which lead to cold stress will be encountered *(Appendix E).*
+ **Electrical**—Temporary electrical wiring to site power equipment will present electrical shock hazards and sources of ignition. Overhead high voltage lines in the vicinity of the excavation will present electrocution and fire hazard from contact.

+ **Unlevel Surfaces**—Results from excavation activities and the natural terrain in some areas.

+ **Flammable Atmosphere**—Flammable atmospheres may exist in buried lines and unidentified tanks.

+ **Noise**—High noise levels (in excess of 85 dBA of extended periods) can result in temporary and permanent loss of hearing. Where noise levels exceed 85 dBA levels, hearing protection will be provided and worn. Measurements of suspected high noise operations shall be performed to determine when and where worker hearing protection is required.

+ **Compressed Gases**—Stored energy in cylinders, when released, can result in projectiles. Fire and explosion will result from the ignition of flammable gases. Toxic or oxygen-deficient atmospheres may result from the release of gases in confined spaces.

+ **Fire**—Many ignition sources exist on site which can result in fire. Fuel sources may exist in the form of flammable liquids, combustible materials and flammable gases. Accumulation of debris can contribute fuel to fires. Improper storage and use of flammable materials may result in fire.

SECTION 6
HAZARD ASSESSMENT

SECTION 6
HAZARD ASSESSMENT

6.1 TASK-BY-TASK RISK ANALYSIS

Activities conducted as part of the PROJECT are divided into discrete tasks. The tasks covered in this HSP are as follows:

TASK NO.	DESCRIPTION
1	Mobilization to the site
2	Setup of thermal treatment unit
3	Shakedown and performance tests of the LTTD
4	Treatment of contaminated soil with the LTTD
5	Backfill of excavation
6	Off-site disposal of general waste
7	Demobilization and site closure

6.2 TASKS 1 AND 2—MOBILIZATION AND SETUP OF LTTD

6.2.1 Description of Activity

Mobilization of LTTD unit and associated support equipment to the site, and installation and setup of that equipment on-site.

6.2.2 Hazard Assessment

Chemical hazards associated with this task are expected to be minimal. The primary hazard will be associated with the use of heavy equipment and construction practices. Additionally the potential for electrical hazard exists during this task. Improperly installed utilities may also lead to electrical hazards throughout the project. The fuel used for the unit for this project will be liquid propane which will be stored in a tank. This presents both a fire and compressed gas storage hazard. Other physical hazards associated with operation of the unit include burns, entanglement in mechanized moving parts, possible confined space entry, noise and temperature stress.

6.2.3 Health and Safety Mitigative Measures

Workers setting up the LTTD will be required to wear Level D protection as described in *Section 9, Personal Protective Equipment and Equipment Reassessment Program.* Safe operating practices for working with heavy equipment (as detailed in *Section 11, Safe Work Practices)* and construction safety will be stressed at the daily tailgate safety meeting. All electrical utilities will be installed in compliance the National Electrical Code and any specific code requirements of the State of Washington. Connection of liquid propane feed to the burner system will be accomplished by qualified personnel. A fire watch will be posted during this entire operation. No smoking or other open flames will be allowed within 100 feet of this area during connection operations.

All moving parts will be properly guarded, with work on any moving part being conducted after the unit is locked or blocked out and tagged out by the individual performing the work. Any required flame cutting or welding will be accomplished only after the appropriate hot work permit has been issued. Should confined space entry be required, it will be conducted in strict accordance with the confined space procedure included in *Appendix B*.

6.3 TASK 3—SHAKEDOWN AND PERFORMANCE TESTS OF LTTD

6.3.1 Description of Activity

Startup operation of the LTTD unit will be initiated once mobilization has been completed. Initial operation will be without feed material. Once unit is completely operational, noncontaminated feed material will be introduced. When material feeds through the unit properly, contaminated feed material will be introduced and appropriate testing to verify thermal destruction of compounds of concern will be conducted. This task will involve an operator, one to three systems mechanics, and one to two personnel working with the material feed system.

6.3.2 Hazard Assessment

Chemical hazards associated with the task are expected to be minimal. The primary hazard will be associated with the use of heavy equipment and construction practices. The potential for electrical hazard exists during this task; the control systems may offer a potential for electrical shock if opened for servicing or adjustment by nonqualified personnel. Other physical hazards associated with operation of the unit include burns, entanglement in mechanized moving parts, possible confined space entry, and noise and temperature stress.

6.3.3 Health and Safety Mitigative Measures

Workers conducting the shakedown run of the LTTD will be required to wear Level D protection as described in *Section 9, Personal Protective Equipment and Equipment Reassessment Program*. Safe operating practices for operation of the unit as defined in the LTTD standard operating procedures (SOPs) will be stressed at the daily tailgate safety meeting. Only trained, qualified operators will be allowed to run the LTTD unit.

All moving parts will be properly guarded, with work on any moving part being conducted on after the unit is deenergized, locked or blocked out, and tagged out by the individual performing the work. Any required flame cutting or welding will be accomplished only after the appropriate hot work permit has been issued. Should confined space entry be required, it will be conducted in strict accordance with the confined space procedure *(see Appendix B)* and only after the unit is deenergized and locked out.

6.4 TASK 4—TREATMENT OF CONTAMINATED SOIL WITH LTTD

6.4.1 Description of Activity

This task involves the treatment of excavated soils contaminated with chemicals noted on site; the primary targets of concern are the organochlorine pesticides. The process will involve transfer of contaminated soil from the staging area to the LTTD's feed preparation unit with a front-end loader. The contaminated material will be place into the feed preparation unit and transported by conveyor to the intake of the kiln. The rotary motion of the unit will transport the contaminated soil through the kiln and clean soil will exit the unit.

6.4.2 Hazard Assessment

Chemical hazards associated with this task involve potential contact with soils and water containing organochlorine and organophosphate pesticides and carrier solvents, which are listed in Section 5.2. Skin absorption, inhalation, and ingestion are identified as potential routes of exposure. Other hazards associated with the operation— troubleshooting and servicing of the unit—would include those physical hazards associated with the operation of heavy equipment, temperature stress, burns, noise, working at heights, fire hazard, electrical, confined space entry, and working around machinery with moving parts.

6.4.3 Health and Safety Mitigative Measures

Workers will initially be required to wear Modified Level D protection as described in *Section 9, Personal Protective Equipment and Equipment Reassessment Program.* The worker breathing zone will be monitored for organic vapors throughout the sampling procedure using a PID. The worker breathing zone will be monitored for particulates by use of a Real Time Aerosol Monitor (RAM). Pesticide laden dust will be monitored using the appropriate fiber glass filter cassettes. The levels of contaminants will determine whether or not the level of protection is upgraded or down graded according to tables 9.1A and 9.1B which are found in Section 9.

Polycoated Tyvek™ outer wear and chemical-resistant (nitrile + 4H) gloves will be worn while handling contaminated soils and coming into contact with potentially contaminated equipment. Workers will frequently check the integrity of their personal protective equipment by looking for any tears, rips, or holes in the clothing while they work.

Workers will receive instructions in prescribed work practices, such as minimizing direct of contact of protective clothing with water and wet soil, using work practices which avoid splashing water or generation of aerosol sprays. Instruction will also be provided regarding decontamination and personal hygiene *(see Section 12, Decontamination Protocols).*

The other physical and safety hazards associated with operation of the unit are discussed in detail in Safe Work Practices outlined in *Section 11.* Operation of heavy equipment *(Section 11.2)*, temperature stress *(Sections 11.4 and 11.5)*, fire hazards and burns *(Section*

11.8), working at heights *(Section 11.7)*, electrical *(Section 11.3)*, confined space entry *(Appendix B)*, and working around machinery with moving parts *(Section 11.2)* will be routinely discussed and emphasized at daily tailgate safety meetings.

6.5 TASK 5—PERSONNEL, EQUIPMENT, DRUM, AND DEBRIS DECONTAMINATION

6.5.1 Description of Activity

This task will involve decontamination of personnel, equipment, drums, and debris which have come into contact with soil and water contaminated with chemicals on the site. Decontamination of personnel may include removal of gross contamination prior to entry into the Contamination Reduction Zone (CRZ) and decontamination facility. Equipment and debris will be decontaminated on the decon pad constructed for this purpose. Steam cleaning will be employed in this operation.

6.5.2 Hazard Assessment

Chemical hazards associated with this task involve the potential contact with soils and water containing chemicals of concern. Skin absorption, inhalation, and ingestion are identified as potential routes of exposure.

6.5.3 Health and Safety Mitigative Measures

Workers will initially be required to wear Modified Level C protection as described in *Section 9, Personal Protective Equipment and Equipment Reassessment Program.* If decontamination of personnel by other personnel is required, those personnel conducting the decontamination procedure will wear, at a minimum, the same level of protection of those personnel they are decontaminating. The worker breathing zone will be monitored for organic vapors throughout the sampling procedure using a PID. The worker breathing zone will be monitored for particulates by use of a RAM. Pesticide laden dust will be monitored using the appropriate fiber glass filter cassettes. If the appropriate action level is exceeded, PPE will be upgraded to Level B.

Polycoated Tyvek™ outer wear and chemical-resistant (nitrile + 4H) gloves will be worn while collecting samples and while handling potentially contaminated equipment. Workers will frequently check the integrity of their personal protective equipment by looking for any tears, rips, or holes in the clothing while they work.

Workers will receive instruction in prescribed work practices, such as minimizing direct contact of protective clothing with water and wet soil, using work practices which avoid splashing water or generation of aerosol sprays. Care will also be taken to minimize the amount of water or other liquid used in the decontamination process. Instruction will also be provided regarding decontamination and personal hygiene *(see Section 12, Decontamination Protocols)*.

The other physical and safety hazards associated with this task are discussed in detail in Safe Work Practices outlined in *Section 11*. Operation of heavy equipment *(Section 11.2)*, temperature stress *(Sections 11.4 and 11.5)*, and working around machinery with moving parts *(Section 11.2)* will be routinely discussed and emphasized at daily tailgate safety meetings

6.6 TASK 6—BACKFILL OF TREATED SOIL AND SEDIMENT

6.6.1 Description of Activity

This task involves the replacement of soil and sediment which has been treated by the LTTD and tested and verified clean back into the excavated area.

6.6.2 Hazard Assessment

No chemical hazards are anticipated for this phase of the project. The primary hazards are physical and safety hazards associated with the operation of heavy equipment.

6.6.3 Health and Safety Mitigative Measures

Safe work practices for the operation of heavy equipment discussed in *Section 11* will be emphasized.

6.7 TASK 7—DEMOBILIZATION

6.7.1 Description of Activity

This task involves breakdown of the LTTD unit and demobilization of it and other equipment from the site.

6.7.2 Hazard Assessment

No chemical hazards are anticipated for this phase of the project. The primary hazards are physical and safety hazards associated with the operation of heavy equipment.

6.7.3 Health and Safety Mitigative Measures

Safe work practices for the operation of heavy equipment discussed in *Section 11.2* will be emphasized.

SECTION 7
PERSONNEL TRAINING AND MEDICAL REQUIREMENTS

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PERSONNEL TRAINING AND MEDICAL REQUIREMENTS

7.1 TRAINING REQUIREMENTS

All WILLIAMS personnel and visitors on the site will be trained commensurate with their job responsibilities. Such training will be provided prior to being allowed to engage in site activities which could expose personnel to health and safety hazards. The HSO or designated alternate has the responsibility to ensure this training is provided—reflective of site conditions—and updated as needed.

7.1.1 Site Orientation

The following is a listing of general site training required for all personnel during site orientation:

1. Acute and chronic health effects of the toxic chemicals identified or suspected at the site;
2. Physical agent, biological, and safety hazards identified at the site;
3. Personal hygiene and personnel decontamination requirements and procedures;
4. The selection, use, and limitations of available safety equipment, and procedures required for personnel protection.
5. Proper selection, use, maintenance, and fitting of respirators, including drills in using emergency escape units;
6. Work zones established at the site;
7. Prohibitions in contaminated areas;
8. Explanation of the "buddy" system;
9. Emergency preparedness procedures (emergency egress routes, emergency signals, evacuation procedures, phone numbers, personnel rescue methods, etc.);
10. First aid- and CPR-trained personnel on site;
11. Site safety requirements and Health and Safety Plan review;
12. Use of fire extinguishers;
13. Special training, as applicable, for drum opening and sampling, etc.;
14. Decontamination procedures for equipment;
15. Review of standard operating procedures;
16. Review of team member responsibilities;
17. Review of Hazard Communication and Worker's Rights ;

18. Air monitoring program purpose and procedures; and

19. Subcontractor's Safety Inspection Audit Program.

All personnel who will work on the site will be required to read the HSP. Prior to work on the site, each individual must read and sign a **Document Review and Certification Form** *(Appendix A)* indicating they have read and understand the requirements set forth in the Plan.

7.1.2 Preassigned Training

WILLIAMS personnel and visitors entering the Exclusion and/or Contamination Reduction Zones will have preassignment training in accordance with the provisions of 29 CFR 1910.120. These requirements are outlined below:

1. General site workers, such as laborers and equipment operators, engaged in activities which expose or potentially expose them to hazardous substances and health hazards are required to complete:
   + Forty hours of off-site instruction;
   + Three days of on-the-job training under the direct supervision of a trained experienced supervisor;
   + Eight hours of annual refresher training.
2. Workers on site only occasionally for a specific limited task (for example, groundwater monitoring, surveying, etc.), and who are unlikely to experience exposure in excess of the applicable limits are required to complete:
   + Twenty-four hours of off-site instruction;
   + One-day on-the-job training under the direct supervision of a trained, experienced supervisor; and
   + Eight hours of annual refresher training.
3. Workers regularly on site who work in areas which have been monitored and fully characterized, indicating that no PPE is required and that emergencies are unlikely to develop (i.e., the Site Support Zone) have the same training requirements as listed in 2. above.
4. On-site management and supervisors directly responsible for personnel engaged in on-site activities must complete:
   + The same or equivalent training as required for personnel they supervise;
   + Eight additional hours of specialized supervisory training; and
   + Eight hours of annual refresher training.

The HSO or SHSO is responsible for ensuring that personnel assigned to the Woods Industrial Site are trained in accordance with the above requirements. The SHSO will ensure that all training certificates are current and copies of these documents are filed on site with this HSP

7.1.3 First Aid/CPR Training

The SHSO will possess current certification in first aid and CPR. At least one person so certified will be present during each work shift while WILLIAMS and/or visitors or subcontractor personnel are on site.

7.1.4 Periodic Health and Safety Meetings

The SHSO or designated alternate will conduct a daily tailgate safety meeting. The meeting will review existing protocols and serve as a mechanism to update personnel on new site conditions and requirements. The meetings will also provide an opportunity for site personnel to express any health and safety concerns. Topics for discussion may include, but are not limited to:

+ Delineation of day's work activities.
+ Review of available analytical or relevant process data which may relate to the potential for worker exposure during task execution;
+ Review of the type and frequency of environmental and personal monitoring (if any) to be performed;
+ Task-specific levels of protection and anticipated potential for upgrading;
+ Review of emergency procedures;
+ Review of existing and/or new health and safety issues.

The **Tailgate Safety Meeting Log** *(Appendix A)* will be signed by each attendee.

7.1.5 Subcontractor Training Requirements

Prior to arrival on site, each subcontractor will be responsible for certifying that their employees meet the training requirements contained in this section. Each subcontractor employee will be required to provide a document certifying the dates of their training attendance and latest annual refresher. Subcontractor personnel will also be required to attend the daily tailgate safety meeting.

7.1.6 Documentation

Appendix A contains a **Health and Safety Acknowledgment of Training Form**. This form will be used to document compliance with the training requirements specified in this section. All on-site WILLIAMS personnel, visitors, and subcontractors are required to sign this form. The form, together with the training certificates, will be retained on site with the HSP.

Daily tailgate safety meetings will also be documented on the appropriate form included in *Appendix A*. The form will include topics of discussion for the day and be signed by all those in attendance at the meeting. Completed forms will be maintained on site with the HSP.

7.2 GENERAL MEDICAL PROGRAM

7.2.1 General

WILLIAMS will use the services of an Occupational Physician to oversee the medical examinations and surveillance specified herein. The name of the Occupational Physician and evidence of his/her certification of all on-site employees shall be provided to the Contractor prior to assigning these employees to the site. (See **Physician's Written Opinion of Employee Health Status** in *Appendix A*.)

All on-site employees involved on the Woods Industries project will be provided with a medical examination prior to commencing work. The examination will meet requirements of USEPA, OSHA 29 CFR 1910.120, 1910.134, and ANSI Z88.2. The medical protocol will include the following:

1. Medical and Work History;
2. General Physical Examination (including evaluation of all major organ systems);
3. Audiogram;
4. Electrocardiogram;
5. Biological Blood Profile (SMAC-21 or equivalent);
6. Complete Blood Count (CBC);
7. Chest X-ray;
8. Pulmonary Function Testing (FVC and FEVI.O);
9. Urinalysis with Microscopic Examination; and
10. Ability to wear a respirator.

Additional clinical tests may be included at the discretion of the Occupational Physician.

Periodic (annual) surveillance examinations will be performed, as described above, for all on-site employees included in the medical surveillance program.

In addition, nonscheduled medical examinations will be conducted under the following circumstances:

1. After acute exposure to any toxic or hazardous material;
2. At the discretion of the Contractor, HSO, and Occupational Physician, when an employee reports exposure to dangerous levels of toxic or hazardous materials; and

3. At the discretion of the Contractor, HSO, and Occupational Physician, and upon receipt of a request for a medical examination from an employee with demonstrated symptoms of exposure to hazardous substances.

WILLIAMS will maintain medical surveillance records for its employees and require lower-tier subcontractors to do likewise. These records will be available to the Contractor or regulatory agencies upon request by appropriate officials following all rules prescribed under 29 CFR 1910.20. These records will be maintained for the duration of employment plus 30 years.

7.2.2 Respirator Certification

Prior to authorizing the use of any air-purifying or supplied-air respirator, OSHA, under 29 CFR 1910.134 and 29 CFR 1925.58, requires that a determination be made regarding the prospective wearer's physical ability to safely use such equipment. Consequently, individuals scheduled to work in areas that require the use of respirator protection must provide the SHSO with current documentation, signed by a qualified physician, regarding the individual's physical abilities to wear a respirator. The inability to provide current or complete documentation will be sufficient grounds to preclude any individual from areas or tasks requiring such protection.

7.2.3 Exposure/Injury Medical Emergency

As a follow-up to an injury or illness or as a result of possible excessive exposure to either a chemical or physical hazard, all employees are entitled to and encouraged to seek appropriate medical attention. The SHSO or designated alternate must be apprised of the need for seeking such medical attention and assist in determining the immediacy of the situation.

During and immediately following the emergency situation, the SHSO or designated alternate have the following responsibilities:

+ Ensure that the examining medical facility is fully appraised of the site condition and/or hazard which caused the medical emergency;
+ Conduct an investigation of the site condition which caused the medical situation prior to reassigning the task;
+ Complete an **Emergency Incident Report** *(Appendix A)*;
+ Ensure that the injured or ill worker receives written medical clearance prior to return to the site;
+ Ensure a copy of the **Medical Clearance and Accident Investigation Form** *(Appendix A)* is maintained on site for the duration of the project; and

+ Provide a copy of the Medical Clearance and Accident Investigation Form for the employee's medical records.

Injury/illness and/or possible excessive exposure to either a chemical or physical hazard requiring emergency medical treatment and hospitalization must be reported within 24 hours to the Project Manager, WILLIAMS' Project Principal, and the Client. Fatalities must be reported immediately.

SECTION 8
SITE CONTROL

SECTION 8
SITE CONTROL

8.1 SITE CONTROL

Site control will minimize potential contamination of workers and observers, protect the public from potential on-site hazards, and prevent vandalism of equipment and materials. Site control measures also enhance response in emergency situations.

The site field operations will be divided into three distinct areas. The areas are delineated in diagramatically after being established on the site. Generally, these areas will include:

1. **Exclusion Zone**—The area where the highest potential for exposure by dermal or inhalation routes exists. Personal protective equipment is required and a daily log must be maintained by the SHSO of all personnel entering this zone. The Exclusion Zone must be clearly demarcated by barricades or barrier tape which will be placed a minimum of 30 feet from the edge of an active operation. Some situations may necessitate a distance less than the recommended minimum. These instances should be reviewed by the SHSO.

   Visitors are not permitted into controlled zones (Exclusion Zone and CRZ) without the approval of management. Additionally, visitors must have satisfactorily completed the required OSHA training, be properly fitted with respiratory protection, and have medical clearance, if necessary.

2. **Contamination Reduction Zone (CRZ)**—The area immediately adjacent to and surrounding the Exclusion Zone. The probability of dermal and inhalation exposure is lower than in the Exclusion Zone. The CRZ will include facilities for personnel or equipment decontamination. Personal protective equipment worn in the Exclusion Zone may not be worn outside the CRZ except during emergencies.

3. **Support Zone**—All areas outside the CRZ. The exposure potential in these zones is minimal. Support Zones provide a changing area for personnel entering the CRZ and Exclusion Zone, a lunch area, office spaces, and clean equipment and material storage. Protective clothing worn in an Exclusion Zone may not be worn in a Support Zone except in an emergency.

The final locations of these zones will be determined and modified as necessary in the field. In addition, it may be necessary to make modifications as weather and site conditions change.

Movement of personnel between the three zones will be limited through specific access control points to prevent cross-contamination from contaminated to clean areas.

8.2 SITE ACCESS CONTROL

8.2.1 General

It is the responsibility of the SHSO or designated alternate to control access to the site and to assure proper security. Any evidence of unauthorized entry should be noted in the **Daily Health and Safety Field Log** *(Appendix A)*, and the SHSO will be immediately notified. Effective site security will prevent the following:

+ Exposure of unauthorized, unprotected people to site hazards;
+ Increased hazards from vandals or persons seeking to abandon other wastes on the site;
+ Theft; and
+ Interference with safe working procedures.

Site visitors, as well as on-site workers, will be required to sign a **Daily Site Sign-In/Sign-Out Log** *(Appendix A)*.

8.2.2 Visitor Training

Prior to entry to the site, all visitors must receive a site-specific orientation briefing. The topics covered in this orientation will include those outlined in *Section 7.1.1*. Additional information will also be incorporated from the latest daily tailgate safety meeting.

Visitors who intend to enter the Exclusion Zone must also provide evidence that they have successfully completed the forty hours of general training as required in 29 CFR 1910.120.

8.3 BUDDY SYSTEM

Activities in contaminated or otherwise hazardous areas will be conducted with a "buddy" who is responsible for performing the following activities:

+ Provide his or her partner with assistance;
+ Observe his/her partner for signs of chemical or heat exposure;
+ Periodically check the integrity of his/her partner's protective clothing; and
+ Notify the command post supervisor or others if emergency help is needed.

The access control point for personnel entrance to the Exclusion Zone is a convenient location for enforcing the buddy system for two reasons: (1) enforcement is the responsibility of the Project Team Leader who is stationed in the CRZ; and (2) all personnel who enter the contaminated areas must pass through the control point.

The buddy system may not be sufficient to ensure that help will be provided in an emergency. At all times, persons in the Exclusion Zone should be in line-of-sight contact with a backup person in the Support Zone.

8.4 SITE COMMUNICATIONS

Two sets of communication systems will be established prior to initiating site activities: (1) internal communications among personnel on site; and (2) external communication between on-site and off-site personnel. Internal communication alerts team members to emergencies; passes along safety information, such as the amount of air remaining (if level B is required); time remaining until next rest period; changes in the work to be accomplished; and maintains site control. An external communication system between on-site and off-site personnel is necessary to coordinate emergency response, report to management, and maintain contact with essential off-site personnel.

On-site internal communications will be conducted through verbal communications and hand-held two-way FM radios. Nonverbal communications will be used when background noise or PPE impede verbal communications and will utilize standard hand and air-horn signals, as illustrated below:

Communication Procedures—

+ Channel .... has been designated as the radio frequency for personnel in the Exclusion Zone. All other on-site communications will use channel ....
+ Personnel in the Exclusion Zone should remain in constant radio communication or within sight of the Project Team Leader. Any failure of radio communication requires an evaluation of whether personnel should leave the Exclusion Zone.
+ **Three short blasts on the air horn** is the emergency signal to indicate all personnel should leave the Exclusion Zone. In addition, a loud hailer is available if required.
+ The following standard hand signals will be used in case of failure of radio communications:
  - Hand gripping throat ....Out of air, can't breathe.
  - Grip partner's wrist or both hands............Leave area immediately. around waist.
  - Hands on top of head ....Need assistance.
  - Thumbs up...OK, I am all right, I understand.
  - Thumbs down ....No, negative.

External communications during site activities will be accomplished by use of telephone utilities established in the site office.

SECTION 9
PERSONAL PROTECTIVE EQUIPMENT AND EQUIPMENT REASSESSMENT PROGRAM

SECTION 9
PERSONAL PROTECTIVE EQUIPMENT AND EQUIPMENT REASSESSMENT PROGRAM

9.1 OVERVIEW

This section of the HSP provides a discussion of the selection criteria, selected ensembles, and a comprehensive reassessment program providing action levels for both vapors and dust for either upgrading or downgrading the level of PPE. In addition, related information on the use of PPE is found in the following sections:

+ **Section 7—Personnel Training and Medical Requirements** specifies that all individuals on site will be forty-hour-trained. One of the purposes of that training is to cover the proper use, maintenance and limitation of PPE ensembles.
+ **Section 8.3—Buddy System** specifically states one of the specific duties incorporated into the buddy system is an integrity check of each others PPE
+ **Section 10.7—Heat Stress** discusses the use of PPE in relationship to its propensity to cause a heat stress concern.
+ **Section 12—Decontamination Protocols** is dedicated to the decontamination of PPE.

9.2 PPE SELECTION CRITERIA

PPE ensembles chosen for each individual task are specified in *Section 9.6, Levels of Protection.* Equipment selection is based on the mechanics of the task and the nature of the hazards which are anticipated. The following criteria were used in the selection of equipment ensembles:

+ Chemical hazards known or suspected to be present;
+ Routes of entry through which the chemicals could enter the body, e.g., inhalation, ingestion, skin contact; and
+ Potential for contaminant–worker contact while performing the specific task or activity.

9.3 RESPIRATORY PROTECTION

All personnel who may come in contact with hazardous airborne contaminants must be provided respiratory protection sufficient to safeguard them from exposure to unacceptable levels. It is desirable to prevent airborne contaminants from being generated through engineering controls and proper work practices. Where these methods are insufficient to control exposures to below established limits, then respiratory protection shall be used to supplement these methods.

This section will serve as the written respiratory protection program for the Woods Industries site. The following elements are required to be fully in place and operational and apply to all WILLIAMS personnel who may require PPE:

+ Written standard operating procedures governing the selection and use of respirators are established by this procedure.
+ Respirators will be half- or full-face air-purifying respirators with combination organic vapor/particulate cartridges.
+ WILLIAMS employees will be instructed and trained in the proper use of respirators and their limitations by the Site Health and Safety Officer (SHSO).
+ Respirators will be assigned to individual workers for their exclusive use, with the exception of SCBAs.
+ Respirators will be cleaned and disinfected at the conclusion of the shift. The SHSO will be responsible for enforcing these procedures.
+ Respirators shall be stored in a convenient, clean, and sanitary location.
+ Respirators used routinely will be inspected during cleaning. Worn or deteriorated parts will be replaced. Respirators for emergency use, such as self-contained breathing devices, shall be thoroughly inspected at least once a month and after each use.
+ Appropriate surveillance of work area conditions and degrees of employee exposure or stress will be maintained by the SHSO.
+ The SHSO will regularly inspect and evaluate the effectiveness of the program.
+ A physician's "written opinion" will be obtained by the SHSO to document the ability of each employee to wear a respirator.
+ NIOSH/MSHA-approved or accepted respirators will be used.

Fit testing of respirators will be conducted for employees meeting the training and medical criteria. The ***Respirator Qualitative Fit Test*** record (see example included in *Appendix A)* will be used to document fit tests.

9.4 PROTECTIVE CLOTHING

Protective clothing is used to minimize direct contact of the worker's skin with contaminated soils and sludges and to minimize contact with chemicals which will readily permeate "standard" work clothing. Clothing, gloves, and boots are not chemicalproof and only provide increased resistance to skin contact with hazardous substances. Protective clothing deteriorates and degrades over time. Factors such as environmental stresses, type and concentration of contaminant present, amount of contact, and properties of the clothing are some of the factors affecting chemical protective clothing's ability to provide protection.

Any direct contact of clothing with contaminated soils or sludges will require that the exterior garment be discarded and the worker initiate immediate decontamination procedures. On-site protective clothing will consist of poly-coated Tyvek™ coveralls and boots.

9.5 ESTABLISHED LEVELS OF PROTECTION

No entry into the Exclusion Zone (EZ) will be allowed without the proper level of protective equipment worn by the worker. Failure to properly wear the prescribed level of PPE for the specific task will be grounds for immediate dismissal.

Certain levels of protection are established for various functions on site while in the EZ. These levels may be increased or decreased based on realtime monitoring data and historical exposure assessment data. The site HSO will provide monitoring to determine the proper levels of protection.

9.6 LEVELS OF PROTECTION

Minimum initial levels of protection for anticipated tasks to be considered are specified under the sections listed below:

1	Mobilization of the LTTD	Level D
2	Operation of the LTTD	Modified Level D/C
3	Backfill of Treated Soil and Sediment	Modified Level D/Level C
4	Personal, Equipment, Debris, and Drum Decontamination	Modified Level D/C
5	Demobilization	Modified Level D/C

WILLIAMS will provide all on-site personnel with appropriate personal safety equipment and protective clothing. WILLIAMS will ensure that all safety equipment and protective clothing is properly used, kept clean, and well maintained.

Personal safety equipment and protective clothing will include, but not be limited to, the following:

1. Clothing as dictated by weather;
2. Cotton coveralls provided by WILLIAMS for all personnel entering Exclusion Zone;
3. Disposable or nondisposable outer wear, such as chemical-resistant hooded coveralls and inner and outer gloves;
4. Hardhats and liners;
5. Chemical-resistant boots that meet ANSI Z41.1;
6. Face shield and/or safety glasses that meet or exceed ANSI Z87.1; and

7. Air-purifying respirators with high-efficiency particulate air (HEPA) filters and organic vapor cartridges/pesticides; pressure-demand, self-contained breathing apparatus (SCBA), or other supplied-air system as necessary to conduct site activities in a safe manner. Two SCBAs will be maintained in a ready state for emergency use.

Level D Protection Consists of the Following:

1. Cotton coveralls;
2. Chemically resistant (rubber, neoprene, or equivalent material) boots that meet or exceed ANSI Z41.1;
3. Outdoor work clothing appropriate for climate;
4. 4H inner gloves;
5. Nitrile (Ansell-Edmont) outer gloves;
6. Hard hat as required;
7. Safety glasses (goggles) that meet or exceed ANSI Z87.1; and
8. Hearing protection as required.

Modified Level D Protection Consists of the Following:

1. Cotton coveralls;
2. Polycoated Tyvek™;
3. Chemical-resistant (rubber, neoprene, or equivalent material) boots that meet or exceed ANSI Z41.1;
4. 4H inner gloves;
5. Nitrile (Ansell-Edmont) outer gloves;
6. Hardhat as required;
7. Safety glasses (goggles) that meet or exceed ANSI Z87.1; and
8. Hearing protection as required.

Level C Protection Consists of the Following:

1. Polycoated Tyvek™;
2. Full-face air-purifying respirator with NIOSH/MSHA-certified cartridges for organic vapors and HEPA filter; and pesticides.
3. All other equipment remains the same as for Level D.

Level B Protection Consists of the Following: *(not anticipated on this site)*

1. Full-face supplied-air respirator with five-minute escape cylinder or SCBA replacing air-purifying respirator;
2. All other equipment remains the same as for Level C;

3. Full-body Saranex™ for those opening and sampling drums of unknown contents.

9.7 PPE REASSESSMENT PROGRAM

The level of protection provided by selected PPE may be upgraded or downgraded based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards will be measured. Typical indicators for reassessment would include:

+ Commencement of a new work phase, such as the start of work that begins on a different portion of the site.
+ Change in job tasks during a work phase.
+ Appearance of new contaminants other than those previously identified.
+ Changes in ambient levels of contaminants.
+ Change in work scope which affects the degree of contact with contaminants.

Upgrading or downgrading the level of protection based on changes in ambient levels of contaminants in the worker breathing zone will be determined by using portable direct-reading instruments for total organic vapor and particulate concentrations. Instrumentation will include a photoionization detector (PID) such as a HNu meter (or comparable PID) for measuring organic vapors, a Real Time Aerosol Monitor (or comparable unit) for measuring airborne particulates, glass fiber filters for pesticide laden dust, and an oxygen/combustible gas meter for confined spaces. Action Levels for such area monitoring have been established for the project and are listed in *Tables 9.1A & 9.1B.*

TABLE 9.1A
ACTION LEVELS FOR PPE UPGRADE
FROM LEVEL D TO LEVEL C

CONTAMINANT	ACTION LEVEL
Organic Vapors	10 ppm
Particulates	5 mg/M^3

TABLE 9.1B
ACTION LEVELS FOR PPE UPGRADE
FROM LEVEL C TO LEVEL B

CONTAMINANT	ACTION LEVEL
Organic Vapors	100 ppm
Particulates	10 mg/M^3

Background dust levels will be established daily at each work station as necessary. Monitoring with a PID will be conducted in worker breathing zones. Measurements of pesticide laden dust will also be evaluated to determine PPE requirements. If a release in excess of the action level is noted during perimeter or work area monitoring, any impacted workers or other persons without proper protection will be removed from the work area.

Activities conducted at the Woods Industries site may cause dust and soil particles to become airborne. It is anticipated that particulate levels and associated concentrations of volatiles will not exceed regulatory levels; however, particulate monitoring using a RAM will be conducted to ensure worker health and safety.

Background dust (particulate) levels will be established daily at each work station. Prior to initiating work and during the work, continuous monitoring with a realtime aerosol monitoring device will be conducted in the worker breathing zone. If during the perimeter or work area monitoring, the action level is exceeded, any impacted workers or other persons without proper PPE will be removed from the work area. When the action level is exceeded, the SHSO or designee will implement continuous monitoring between the active work area and the perimeter to provide input for determining the source strength and potential downwind impacts.

Confined spaces and other potentially oxygen-deficient atmospheres represent a potential threat at the Woods Industries Site. Prior to entry into any such site, the atmosphere will be checked using an oxygen/combustible gas meter. If an oxygen-deficient atmosphere is noted (less than 19.5% oxygen), the space will be ventilated and rechecked until the deficiency is corrected. Once the oxygen deficiency no longer exists, the atmosphere will be checked for the presence of combustible gases. Any reading above zero percent of the LEL will require corrective measures prior to entry into the area.

If at any time during the air monitoring sampling plan it is determined that these levels are not sufficient protection, a higher grade of protection (C, B, or A) will be used. *Table 9.2, Levels of Protection: Typical PPE Ensembles*, lists typical ensembles for Level A, B, C, and D protection and the reasons for use of each.

9.8 RECORDKEEPING

A **Daily Air Monitoring Report** *(Appendix A)* documenting all direct reading measurements will be maintained by the SHSO. This daily report form will document the task, time, meter reading, and level of protection being worn by workers involved in the activity. Actions taken in response to releases and/or recordings above preestablished action levels will also be recorded in the Daily Air Monitoring Report.

TABLE 9.2
LEVELS OF PROTECTION: TYPICAL PPE ENSEMBLES

LEVEL OF PROTECTION	RECOMMENDED	PROTECTION PROVIDED	SHOULD BE USED WHEN	LIMITING CRITERIA
A	Pressure-demand, full facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA	The highest available level of respiratory, skin, and eye protection.	The chemical substance has been identified and required the highest level of protection for skin, eyes, and the respiratory system based on either: • Measured (or potential for) high concentration of atmospheric vapors, gases, or particulates. **OR** • site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible. Operations must be conducted in confined. poorly ventilated areas until the absence of conditions requiring Level A protection is determined.	Fully encapsulating suit material must be compatible with the substances involved.

TABLE 9.2
LEVELS OF PROTECTION: TYPICAL PPE ENSEMBLES

LEVEL OF PROTECTION	RECOMMENDED	PROTECTION PROVIDED	SHOULD BE USED WHEN	LIMITING CRITERIA
B	Pressure-demand, full facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA. Chemical-resistant clothing (overalls and longsleeved jacket; hooded, one- or two-piece chemical-resistant one-piece suit). Inner and outer chemical-resistant gloves. Chemical-resistant safety boots/shoes. Hardhat. Two-way radio communications. **Optional:** Coveralls Disposable boot covers. Face shield. Long cotton underwear. Thermal insulated underclothing for cold weather.	The same level of respiratory protection but less skin protection than Level A.	The type and atmosphere concentration of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres: • with IDLH concentrations of specific substances that do not represent a severe skin hazard; **OR** • that do not meet the criteria for use of air-purifying respirators. Atmosphere contains less than 19.5% oxygen. Presence of incompletely identified vapors or gases indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemical harmful to skin or capable of being absorbed through the intact skin.	Fully encapsulating suit material must be compatible with the substances involved.

TABLE 9.2
LEVELS OF PROTECTION: TYPICAL PPE ENSEMBLES

LEVEL OF PROTECTION	RECOMMENDED	PROTECTION PROVIDED	SHOULD BE USED WHEN	LIMITING CRITERIA
C	Full-facepiece or halfface air-purifying, cartridge-equipped respirator. Chemical-resistant clothing (overalls and longsleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit). Chemical-resistant safety boots/shoes. Hardhat. Hearing protection. **Optional:** Coveralls. Disposable boot covers. Face shield. Escape mask. Long cotton underwear.	The same level of skin protection as Level B, but a lower level of respiratory protection.	The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin. The types of air contaminants have been identified, concentrations measured, and a canister is available that can remove the contaminant. All criteria for the use of air-purifying respirators are met.	Atmospheric concentration of chemicals must not exceed IDLH levels. The atmosphere must contain at least 19.5% oxygen.

TABLE 9.2
LEVELS OF PROTECTION: TYPICAL PPE ENSEMBLES

LEVEL OF PROTECTION	RECOMMENDED	PROTECTION PROVIDED	SHOULD BE USED WHEN	LIMITING CRITERIA
D	Coveralls. Safety boots/shoes. Safety glasses or chemical splash goggles. Hardhat. Hearing protection. **Optional:** Gloves. Escape mask. Face shield.	No respiratory protection. Minimal skin protection.	The atmosphere contains no known hazard, or hazard is controlled to levels below the PEL. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.	This level should not be worn in any Exclusion Zone. The atmosphere must contain at least 19.5% oxygen.

SECTION 10
ENVIRONMENTAL AND PERSONAL ON-SITE AIR MONITORING PLAN

SECTION 10
ENVIRONMENTAL AND PERSONAL ON-SITE AIR MONITORING PLAN

10.1 OVERVIEW

WILLIAMS will conduct air monitoring to determine worker exposure levels and ambient air concentrations of contaminants on the site. The purposes of air monitoring include:

+ Assessment in advance of potential for health effects prior to exposure;
+ Ensure proper selection of protective equipment to minimize exposure;
+ Delineation of areas where protection is required; and
+ Detection of any off-site migration of contaminants.

This section describes the air monitoring program for the Woods Industries site, including work areas, project boundary (perimeter), and project personnel. The air monitoring plan establishes Action Levels for initiation of dust and vapor suppression techniques or for stopping work, and for changes in personal protection, air sampling frequencies, strategies, and protocols.

While work is in progress, WILLIAMS will monitor the air quality in and around each active work location and at the project boundary. The sampling will be conducted on a regular basis as described below and additionally as required by special work conditions or at the discretion of the SHSO. All monitoring data will be recorded on **Daily Air Monitoring Report** *(Appendix A)* and transmitted to the Contractor on a daily basis. Background levels of airborne particulates, pesticide laden dust, and organic vapors will be determined with realtime monitoring instruments and active monitoring systems, before the initiation of any site activities.

10.2 ON-SITE AIR MONITORING EQUIPMENT

WILLIAMS' health and safety staff will maintain an arsenal of air monitoring equipment on site sufficient to meet the monitoring requirements for each active work site. Both realtime and laboratory media-based equipment will be used for the project. The equipment WILLIAMS maintains on site will include:

1. Organic Vapor Monitors—Photovac Microtip (or equivalent)
2. Explosimeters—Bacrach Sniffer 505
3. Wind Sock—visible from each work location
4. Aerosol Monitors—MIE Miniram PDM-3
5. Multirange Sampling Pumps—Dupont 2500B or equivalent

6. Sampling Media—Charcoal tubes for organics; PVC filter cassettes for particulates; Glass fiber filters for pesticides.
7. Sampling Pump Calibration—Gilibrator primary standard

All air monitoring equipment will be calibrated daily before use and periodically throughout the day's sampling period as recommended by the manufacturer. Maintenance on all monitoring equipment will be performed in accordance with the manufacturer's recommended maintenance schedule. Specific **Equipment Calibration Procedures** are included in *Appendix C.*

10.3 WORK AREA MONITORING

10.3.1 Monitoring Typical Work Activity

WILLIAMS will conduct realtime monitoring for particulates, pesticide laden dust, and organic vapors during all site work involving drum handling, drum opening and sampling, excavation and backfill, hazardous material handling or disposal, handling of contaminated soil, waste feed preparation, LTTD operation, decontamination of equipment, and general work in the Exclusion Zone. Monitoring will be conducted in each active work area. All air monitoring results will be recorded in the **Daily Air Monitoring Report** *(Appendix A).* The reports will also document when perimeter samples are required.

A minimum of one organic vapor monitor, one explosimeter and O_2, and one aerosol monitor will be used at the work site. Measurements will be taken in the breathing zone of employees working in the area, with monitoring efforts concentrated on the employee with the highest potential for exposure. Results of each instrument reading will be recorded by the SHSO on the *Daily Air Monitoring Report* form.

10.3.2 Monitoring Flame Cutting Operations

If flame cutting or burning are anticipated in the area, the atmosphere will be checked for the presence of organic vapors and explosive or oxygen-deficient/rich atmospheres prior to that activity. The LTTD will record the results of this monitoring on the **Daily Air Monitoring Report** *(Appendix A)* and the data will be used to complete a **Cutting, Welding, and Burning Permit** *(Appendix A)*, which must be signed by the HSO. No burning or cutting operations will be allowed if readings indicate there is more than zero percent of the of the LEL, or the concentration of oxygen is below 20 percent or above 22 percent. Monitoring will continue throughout the entire cutting or burning operation with instrument readings recorded a minimum of once every 15 minutes. Should LEL and O_2 levels fall or rise above acceptable levels, the operation will be halted until the atmosphere returns to acceptable levels.

10.4 PERSONAL SAMPLING

10.4.1 Baseline Sampling

The primary purpose of personal sampling is to assess the potential exposure to individual employees and to ensure the proper level of PPE has been selected for the task to which an employee is assigned. As each new work task is initiated in the Exclusion Zone, personal samples will be collected on 25 percent of the employees assigned to the task to assess exposure and evaluate the effectiveness of PPE selected. Samples will be collected in the employee's breathing zone using personal sampling pumps and the appropriate collection media. The SHSO will select the employee with the highest potential exposure as a monitoring subject. As discussed above, the primary organic contaminants of concern at the site are organochlorine and organophosphate pesticides, carrier organics, and particulates in the form of fugitive dust would be the other major sources of potential exposure for employees. For each major task, sampling will be conducted for a two-week period to establish a baseline. After the initial baseline is established, monitoring will be conducted once per week, except when required by elevated realtime readings as discussed below.

Organic vapor samples will be collected according to the protocol set forth in NIOSH Method 1003 using a precalibrated personal sampling pump attached to a charcoal tube via Tygon® tubing. Charcoal tubes will be capped at the end of the sampling period, wrapped in plastic, refrigerated, and shipped to the laboratory at the end of the week. Particulate samples will be collected according to protocols for total nuisance dust set forth in NIOSH Method 0500. This method involves the collection of samples by use of a precalibrated personal sampling pump attached via Tygon® tubing to a sampling cassette containing a preweighed PVC filter(glass fiber filters for pesticides). All personal samples collected above will be collected as full-shift samples and results will be reported as workshift TWAs. Collected samples will be stored on site and shipped to the laboratory .

10.5.2 Sampling Triggered by Elevated Realtime Monitoring Results

If direct reading instruments indicate levels of organic vapors exceeding the Action Level (5 ppm) or particulates (150 ug/M3)for over 15 minutes in any work area, personal sampling will be initiated immediately. Sampling will be conducted on the worker in the area with the highest expected exposure. Monitoring will continue until levels recorded by direct reading instruments return below the Action Level. Once initiated, sampling will always continue for a period long enough to collect a sufficient volume of air to allow the laboratory to achieve an analytical detection limit of no greater than one half the PEL. These samples will be collected using the methodology described in *Section 10.5.1, Baseline Sampling.*

10.5.3 Laboratory

All industrial hygiene samples collected for this project will be analyzed by EHL at either their Macon, Georgia, or Cromwell, Connecticut facilities.

10.6 NOISE MONITORING

Noise measurements will be made at the initiation of major on-site construction activities and operation of the LTTD using a sound level meter. If it is determined that a potential for noise exposure exists, noise dosimetry will be initiated in the area where the problem exists

10.7 HEAT/COLD STRESS MONITORING

10.7.1 Heat Stress Monitoring and Work Cycle Management

For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedures will be used to monitor the body's physiological response to heat, and to manage the work cycle even if workers are not wearing impervious clothing. These procedures are to be instituted when the temperature exceeds 70ºF.

10.7.2 Personnel Monitoring of Heat Stress

+ **Measure Heart Rate (HR):** Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute.
+ **Measure Body Temperature:** Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99.6ºF. If it does, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the OT exceeds 99.6ºF at the beginning of the next period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the body temperature is maintained below 99.6ºF.
+ **Measure Body Weight:** Measure body weight each day on standard bathroom scales initially at start of work prior to donning PPE. Record initial daily weight on log posted at scales. At conclusion of shift, after removal of PPE (in similar attire as initial weight) re-weigh and record weight. Replenish weight loss with additional water (or Gatorade) consumption back to initial weight. Increase daily water (Gatorade) consumption throughout shift if final weight from previous day is less than initial weight. A **Daily Weigh-In Record** *(Appendix A)* will be maintained.

10.7.3 Environmental Monitoring of Heat Stress Condition

+ Meteorological station will be operated daily with data recorded for ambient wind speeds and direction (the SHSO will record data). Daily weather conditions will be recorded on the **Daily Weather Data Sheet** *(Appendix A).*
+ Temperature measurements consisting of dry bulb, wet bulb, and globe temperatures will be recorded daily and used to determine a WBGT index for comparison to threshold limit values established by the ACGIH for safe heat exposures.

10.7.4 Cold Stress

Table 10.2 details wind chill factors as a result of wind velocity and ambient temperature.

+ At no time shall workers be exposed to extremely low temperatures without adequate protective clothing. Rest areas and changing areas will be heated to prevent exposure.
+ Workers will be educated to the signs and symptoms of cold-related injuries. If an injury does occur, proper medical attention should be sought immediately.
+ Personal monitoring for cold stress will include visual observation of areas highly susceptible to cold and taking temperature of employees at work breaks using an oral thermometer.

TABLE 10.2

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE *(UNDER CALM CONDITIONS)*

Estimated Wind Speed (in mph)	*Actual Temperature Reading (°F)*											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect)	LITTLE DANGER In chr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				

Trenchfoot and immersion foot may occur at any point on this chart.

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Maryland.

SECTION 11
SAFE WORK PRACTICES

SECTION 11
SAFE WORK PRACTICES

11.1 GENERAL

To maintain a strong safety awareness and enforce safe procedures at the site, a list of standing orders has been developed stating the practices that **must always be followed** and those that **must never occur** in the Exclusion Zone and CRZ on site. The list of standing orders is as follows:

1. No smoking, eating, or gum chewing will be permitted in the Exclusion Zone or in the CRZ;
2. Field work will only be conducted during daylight hours unless adequate artificial lighting is provided;
3. Sampling activities will be performed in at least two-person teams at all times;
4. Personnel involved in sampling activities are required to attend a daily safety meeting, read the HSP, and sign all appropriate forms prior to initiating work;
5. Personnel will be advised of the precautions to be taken against cold and heat stress; and
6. Walkways will be kept clear of equipment, sampling materials, and other obstructions.

To ensure that everyone who enters the site is aware of these orders and familiar with their content, the list will be made available in the following ways:

+ Distributed to everyone who enters the site;
+ Posted conspicuously at the site entrance and at the entrance to the CRZ and/or the Exclusion Zone; and
+ Reviewed by the SHSO or designated alternate with the field crew at the beginning of each work day, thereby informing personnel of any new standing orders resulting from a change in site conditions or work activities.

In addition to the standing orders, the site's Hazard Communication Program will include a hazardous substance information form which lists the names and properties of chemicals present on the site. In addition, Material Safety Data Sheets (MSDSs) for these chemicals will be kept on site, and all materials will be properly stored and labeled. Employees will be briefed on this information at the beginning of the project or whenever they first join the work team. Daily safety meetings will be held for all employees prior to initiating work for the day.

11.2 HEAVY EQUIPMENT OPERATION

Working with tools and heavy equipment (e.g., drill rigs, excavation equipment) is a major hazard at the site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, burns from hot objects, and damage to PPE. The following general precautions will be followed to help prevent injuries from such hazards:

+ Before any machinery or mechanized equipment is placed in use, it will be in safe operating condition Records of tests and inspections will be maintained at the site and be available on request to the designated authority.
+ The Site Manager will designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Checks will be made at the beginning of each shift during which the equipment to be used will be tested to determine that the brakes and operating systems are in proper working condition.
+ Preventative maintenance procedures recommended by the manufacturer will be followed.
+ Any machinery or equipment found to be unsafe will be deadlined and its use prohibited until safe conditions have been corrected.
+ Machinery and mechanized equipment will be operated only by designated, experienced and qualified personnel. Equipment deficiencies observed at any time that affect their safe operation will be corrected before continuing operation.
+ Getting off or on any equipment while it is in motion is prohibited.
+ Machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. (***Exemption:*** *Equipment designed to be serviced while running).*
+ Bulldozer and scraper blades, front-end loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine required otherwise.
+ All points requiring lubrication during operation will have fittings so located or guarded to be accessible without hazardous exposure.
+ When necessary, all mobile equipment and the area in which they are operated will be adequately illuminated while work is in progress.
+ Fill hatches on water haul vehicles will be secured or the opening reduced to a maximum of eight inches.

+ Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shutoff which will prevent spillage if connections are broken, may be used to fuel diesel-powered equipment left running.

+ All towing devices used on any combinations of equipment will be structurally adequate for the weight drawn and securely mounted.

+ Persons will not be permitted to get between a towed and towing piece of equipment until the towing equipment has been stopped and secured by setting brakes, placing in neutral, and chocking.

+ All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.

+ The controls of loaders, excavators, or similar equipment with folding booms or lift arms will not be operated from a ground position unless so designed.

+ All self-propelled construction equipment (except light service trucks, panels, pickups, station wagons), crawler cranes, power shovels, and draglines, whether moving alone or in combination, will be equipped with a reverse signal alarm. Alarm will be audible and sufficiently distinct to be heard above prevailing conditions. Alarm will operate automatically upon commencement of backward motion. Alarm may be continuous or intermittent (not to exceed three-second intervals) and will operate during the entire backward movement.

+ All bulldozers, tractors, or similar equipment used in clearing operations will be provided with substantial guards, shields, canopies, and grills to protect the operator from falling and flying objects as appropriate to the nature of the clearing operations.

+ While operating cranes in any work area, the equipment operator shall maintain communication with a designated signalman through voice (radio) contact and standard hand signals. In addition, all site personnel in the immediate work area shall be made aware of the equipment operations. Pedestrian travel into the Exclusion Zone operation areas will be maintained at an absolute minimum.

+ A flagman with roadwork vest, signs, cones, and high-level warning signs shall be provided when it is necessary to control normal vehicular traffic due to vehicles, such as front-end dumps, entering, or leaving the site.

+ Trucks transporting excavated soils over public highways will have tarps covering excavated materials.

+ Trucks will not trail debris or track mud outside the CRZ. Visible loose dirt will be removed. Pressure washing will be used where required to remove adhered dirt.

+ Observation areas will be established and delineated as required; these areas will be identified to operators of equipment.

11.3 ELECTRICAL SAFETY

Working with electrical systems to install necessary services to buildings and equipment may present a serious safety hazard. Lack of basic electrical safety and sound wiring practices can result in fatalities due to electric shock.

+ Three-wire (grounded) systems with ground fault circuit interrupters will be used on all temporary 110-volt electrical systems.
+ Wiring of all facilities will be in accordance with the latest edition of the NEC.
+ Wiring will be performed by a qualified (licensed) electrician.
+ No work will be performed on energized electrical systems capable of delivering current greater than 0.005 amps.
+ Any wiring required will be protected from the elements while in use.
+ High-voltage overhead lines will be identified to all equipment operators and safe clear distances will be maintained at all times.

11.4 HEAT STRESS

To minimize the likelihood of employee heat stress, all workers must observe the following:

+ Avoid prolonged periods of high heat stress;
+ Take regular breaks;
+ Consume increased amounts of fresh water (or Gatorade) to replenish body fluids; and
+ Observe coworkers (buddy system) for signs of fatigue. Take additional breaks and report any symptoms to Site Supervision.

Site Supervisors must regularly monitor the condition of the work force for signs of heat stress. Work in high ambient temperatures, coupled with protective clothing, can quickly result in worker heat stress. Heat stress monitoring and modified work-rest schedules will be instituted in accordance with ACGIH guidelines as required. Specific monitoring of heat stress is delineated in *Section 10.7, Heat/Cold Stress Monitoring.*

Alcohol consumption dehydrates the body and will increase the likelihood of incurring heat stress. Workers should curb alcohol consumption and arrive at job site each morning physically fit for work.

Any worker deemed unfit for work will be restricted from activities which may cause injury to him or coworkers. Supervisors are responsible for ensuring that unfit workers are restricted from site activities as required.

11.5 COLD STRESS

Cold-related problems are the result of low ambient temperatures and/or wind velocity. Wind chill is the term to describe the effect of moving air on human flesh.

Frostbite and hypothermia are the two cold-related problems of concern. Frostbite effects the extremities and has several degrees of severity:

+ Frost Nip—blanching or whitening of skin;
+ Superficial Frostbite—waxy or white skin which is firm to touch, but tissue underneath is supple;
+ Deep Frostbite—skin is cold, pale, and solid (could result in loss of circulation, subsequent death of tissue, and gangrene).

Hypothermia affects the entire body and is caused by exposure to freezing or rapidly dropping temperatures. The symptoms are usually progressive if not treated and begin with the following:

+ Shivering;
+ Listlessness, apathy, sleepiness, drop in body temperature (<95ºF);
+ Glassy stare, unconsciousness, slow pulse, slow respiratory rate;
+ Freezing of the extremities;
+ Death.

11.6 CONFINED SPACE ENTRY

Workplaces that are enclosed and difficult to get out of are defined as confined spaces. Limited openings hinder proper ventilation, escape, and rescue; therefore, creating a potentially life threatening situation for a worker.

Confined space entry is anticipated for site operations. No confined space entry will be undertaken without prior approval from the Site Manager, Project Manager, and Health Safety Officer. Any confined space entry will be governed by the proposed OSHA regulation, 29 CFR 2910.146, and will be conducted in accordance with the **Confined Space Entry Procedures** detailed in *Appendix B.*

11.7 SLIPS, TRIPS, FALLS

Slips, trips, and falls can easily occur at construction sites. Pedestrian traffic will be excluded from excavation sites. (Exceptions will be reviewed on a case-by-case basis, with Project Manager authorization.) Walkways to and from equipment storage (CRZ) will be established and maintained as level and free of obstructions as possible. Walking surfaces will be constructed where required and maintained free of obstacles.

11.8 FIRE HAZARDS

Smoking will not be allowed inside the EZ or CRZ. Cigarettes and lighters (or any personal effects) will also not be allowed in the Exclusion Zone.

Debris (paper, brush, scrap, wood, etc.) shall be removed from work areas on a daily basis or as needed to preclude accumulation of sources of fuel. Flammable and combustible liquids will be maintained in the smallest quantities possible. No flammable/combustible liquids will be stored inside office trailer, decon trailers, or WILLIAMS' temporary buildings.

Portable fire extinguishers shall be provided for each WILLIAMS' trailer and/or office building and for each mobile vehicle and piece of heavy equipment. Each employee will have received instruction on the operation of portable fire extinguishers.

Cutting and welding will require an inspection of the area and review of the operation by the SHSO prior to cutting or welding being performed. A request to perform cutting or welding will be submitted to trigger the inspection and testing The Supervisor will prepare the cutting and welding permit request form and sign it. The permit will be issued by the SHSO only for the specific operation for a specified period of time. A **Cutting, Welding, and Burning Permit** form is included in *Appendix A.*

11.9 VISITORS

Visitors will be permitted in the immediate area of active operations only with approval from site management. Approval for entry into the Exclusion Zones and CRZs will require physical examination and compliance with training requirements (29 CFR 1910.120). All site visitors must be briefed on appropriate sections of the HSP. A **Visitor's Log** *(Appendix A)* will be kept on site. Visitor vehicles are restricted to Support Zones. Subcontractor and vendor equipment will not be permitted in the Exclusion Zone without prior authorization and will be the subject of site decontamination procedures.

SECTION 12
DECONTAMINATION PROTOCOLS

SECTION 12
DECONTAMINATION PROTOCOLS

12.1 GENERAL

Decontamination—the process of removing or neutralizing contaminants that have accumulated on personnel and equipment—is critical to health and safety at hazardous waste sites. Decontamination protects workers from hazardous substances that may contaminate and eventually permeate the protective clothing, respiratory equipment, tools, vehicles, and other equipment used on site; it protects all site personnel by minimizing the transfer of harmful materials into clean areas; it helps prevent mixing of incompatible chemicals; and it protects the community by preventing uncontrolled transportation of contaminants from the site.

12.2 PREVENTION OF CONTAMINATION

The first step in decontamination is to establish standard operating procedures (SOPs) that minimize contact with waste and thus the potential for contamination. WILLIAMS will:

PERSONNEL—

+ Stress work practices that minimize contact with hazardous substances (e.g., do **not** walk through areas of obvious contamination, do **not** directly touch potentially hazardous substances).
+ Use remote sampling, handling, and container-opening techniques (e.g., drum grapplers, pneumatic impact wrenches).
+ Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials.
+ Wear disposable outer garments and use disposable equipment where appropriate.

HEAVY EQUIPMENT—

+ Limit the surface area of contact, i.e., on backhoes, limit contact to the arm and bucket.
+ If contaminated tools are to be placed on noncontaminated equipment for transport to the decon pad, plastic will be used on top of the noncontaminated equipment to keep it clean.
+ Spoils from excavation work will be placed so as not to be in the path of individuals.
+ Drill cuttings will be kept shoveled up and drummed and out of the way of personnel. Liquid generated during drilling will be contained out of the way to limit the amount of mud created around the drill rig.

In addition, WILLIAMS has established SOPs that maximize worker protection. For example, proper procedures for dressing prior to entering the Exclusion Zone will minimize the potential for contaminants to bypass the protective clothing and escape decontamination. In general, all fasteners should be used (i.e., zippers fully closed, all buttons used, all snaps closed, etc.). Gloves and boots should be tucked under the sleeves and legs of outer clothing, and hoods (if not attached) should be worn outside the collar. Another pair of tough outer gloves will be worn over the sleeves. All junctures will be taped to prevent contaminants from running inside the gloves, boots, and jackets (or suits, if one-piece construction).

Prior to each use, the PPE will be inspected to ensure that it contains no cuts or punctures that could expose workers to wastes. Similarly, any injuries to the skin surface, such as cuts and scratches, may enhance the potential for chemicals or infectious agents that directly contact the worker's skin to penetrate into the body. Particular care will be taken to protect these areas. Workers with large areas of damaged skin will not be allowed to work on site until skin heals.

12.3 TYPES OF CONTAMINATION

Contaminants can be located either on the surface of personal protective equipment or permeated into the PPE material. Surface contaminants may be easy to detect and remove; however, contaminants that have permeated a material are difficult or impossible to detect and remove. If contaminants that have permeated a material are not removed by decontamination, they may continue to permeate to either surface of the material where they can cause an unexpected exposure.

Five major factors affect the extent of permeation:

+ **Contact Time.** The longer a contaminant is in contact with an object, the greater the probability and extent of permeation. For this reason, minimizing contact time is one of the most important objectives of a decontamination program.
+ **Concentration.** Molecules flow from areas of high concentration to areas of low concentration. As concentrations of wastes increase, the potential for permeation of personal protective clothing increases.
+ **Temperature.** An increase in temperature generally increases the permeation rate of contaminants.
+ **Size of Contaminant Molecules and Pore Space.** Permeation increases as the contaminant molecule becomes smaller and as the pore space of the material to be permeated increases.
+ **Physical State of Wastes.** As a rule, gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids.

12.4 PERSONNEL AND PERSONAL EQUIPMENT DECONTAMINATION FACILITIES

WILLIAMS will provide and maintain a designated decon station in the CRZ. It will be equipped with soap, water, and any other solutions which may be required for effective decontamination of personnel. WILLIAMS will provide soap, towels, and wash cloths.

Except for attire worn only in the Support Zone, no work clothes or boots will be worn or carried beyond the project boundary.

A temporary storage area for disposable protective clothing will be set aside in the EZ adjacent to the CRZ. WILLIAMS will be responsible for final disposal of used disposable equipment.

12.5 PERSONAL HYGIENE AND DECONTAMINATION PROCEDURES

12.5.1 Decontamination Procedures

For those tasks of the Plan that require protective clothing and respiratory protection, a decontamination area will be provided for WILLIAMS employees who work in the area designated as the EZ. Employees will be required to don the PPE before entering and remove the PPE when leaving.

All personnel and equipment leaving the exclusion zone will be thoroughly decontaminated. The procedure for personnel decon is task- and site-dependent, however, the general elements of decon will include:

+ Gross boot and glove wash and rinse;
+ Suit wash and rinse;
+ Outer glove removal;
+ Boot removal;
+ Suit removal;
+ Respirator removal and wash;
+ Inner glove wash and rinse;
+ Inner glove removal;
+ Personnel wash (hand,face, and any exposed skin); and
+ Re-dress.

Workers should check for gross contamination on boots and clothing before leaving the EZ. Protective clothing should be removed in an inside-out fashion and disposed of properly in waste receptacles provided. Employees will be required to wash face, hands, and any exposed areas with soap and water. Boots will be cleaned using a series of tubs containing soap and water and a brush to remove contamination.

These decontamination procedures must be followed each time the employee leaves the contaminated area, with the exception of emergency egress situations. A full shower with soap and water is mandatory at the end of each shift prior to changing in to street clothing. For emergency purposes, portable eyewash bottles and portable showers will be located on site for employees to wash affected skin or flush the eyes (at least 15 minutes) if they come into contact with contaminated materials. If irritation arises, a physician will be contacted immediately.

Respirators will be removed and properly cleaned and disinfected by either the employee or a designated technician. Cartridges should be disposed of and new ones inserted in accordance with OSHA Respiratory Protection Standard 29 CFR 1910.134. The site HSO shall monitor effectiveness of the decontamination procedures and, if found ineffective, shall take appropriate steps to correct any deficiencies.

12.5.2 Equipment Decontamination

A decontamination area for tools and equipment is to be established in an area near the personal decontamination area. Water used for decontamination will be collected and properly disposed of. All tools and equipment will be decontaminated before leaving "regulated" areas.

12.5.3 Vehicle Decontamination

Trucks, excavation equipment, cranes, and loaders will become contaminated to various degrees with affected soils. Any contamination picked up in tire treads or under carriages and on other areas of vehicles or equipment will be removed at a decon station prior to the unit leaving the site. The decon facility will be designed to collect rinsewater for subsequent disposal. Soils collected at the decon station will be considered "affected" and removed daily from the decon facility and returned to either the storage area or excavation. Water collected at the decon facility will be considered "affected" and will be maintained by Project Manager for proper disposal or treatment. Means to remove dry (loose) material will be provided, as well as a means provided to remove adhered material.

At the conclusion of the work associated with affected materials, trucks, loaders, etc., will be thoroughly decontaminated and inspected by the SHSO prior to release from the site.

12.5.4 Additional Decontamination Procedures

+ Sampling equipment will be brushed clean and rinsed with distilled water or other appropriate cleaning material.
+ Sample containers will be rinsed clean with decontamination solution and dry-wiped prior to packaging.
+ Heavy equipment will be high pressure washed in the CRZ.

+ Vehicles which are used on site and are contaminated with native soil will be cleaned prior to exiting the site. The wheel wells, tires, and sides of the vehicles will be high-pressure washed in the CRZ.
+ Spent decontamination solutions may be required to be drummed and disposed of as hazardous waste. Solvent solutions will be segregated from rinsewater.
+ All decontamination will be performed in a manner so as to minimize the amount of waste generated.

SECTION 13
EMERGENCY PROCEDURES

SECTION 13
EMERGENCY RESPONSE/CONTINGENCY PLAN

13.1 GENERAL

Experience has demonstrated that actions taken during an emergency are seldom effective and may often be counterproductive unless planned and reviewed in advance. In many past instances, inadequate planning has been responsible for delayed or improper responses, resulting in increased damage and injuries. Of course, no amount of planning and preparation is adequate unless everyone involved understands their specific role. In an emergency, everyone on site—even those not responsible for directing personnel—has a role which may be as simple as congregating in a predetermined location to be accounted for and not sought after.

This Emergency Response/Contingency Plan (ERCP) has been developed to include instruction and procedures for personnel evacuation, and procedures for medical emergencies that may occur during the project. All personnel emergency conditions require concise and timely actions conducted in a manner that minimizes the health and safety risks. All on-site personnel must be familiar with the ERCP described herein. Additions to the ERCP will be incorporated into this HSP as a modification. Additionally, all aspects of the plan will be addressed as part of the site-specific health and safety training required for all personnel.

13.2 RESPONSIBILITIES

13.2.1 Health and Safety Officer

The HSO will oversee the development of, approve the ERCP and perform audits to ensure that the plans are in effect and that all preemergency requirements are met. The HSO will act as a liaison to applicable regulatory agencies and notify OSHA of reportable accidents and fatalities.

13.2.2 Site Manager

The Site Manager will be responsible for ensuring that all site work is performed in accordance with contract requirements in a safe manner. In an emergency situation, the Site Manager may serve as a focal point for the dissemination of information or as a Community Relations Manger. On the Woods Industries Site, the Site Manager will act as the Emergency Coordinator.

13.2.3 Health and Safety Specialist

The SHSO is responsible for assisting the HSO in development of the site-specific Safety Health and Emergency Response Plan (SHERP) and ensuring its provisions are abided by on site. The SHSO is responsible for the oversight of air monitoring and sampling on site and supervision of the HSMs. The SHSO is responsible for seeing that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop-work order or evacuation. The HSO will complete an **Emergency Incident Report** *(Appendix A)* which includes the following:

1. A description of the emergency (including date, time, and duration);
2. Date, time, and name of all persons/agencies notified and their response; and
3. A description of corrective actions implemented or other resolution of the incident

On the Woods Industries Site, the SHSO will also serve as an alternate Emergency Coordinator.

13.2.4 Emergency Coordinator

The Emergency Coordinator is responsible for implementing the ERCP whenever conditions warrant. The Emergency Coordinator is responsible for prior notification of emergency services (fire department, police department, hospital, ambulance, etc.) about the nature and duration of work expected on the site, types of contaminants, possible health and safety effects, and the anticipated emergency conditions. The Emergency Coordinator is also responsible for ensuring the evacuations, emergency treatment, and transport of site personnel as necessary, and notification of the appropriate management staff when the emergency plan has been implemented.

13.2.5 On-Site Personnel

All on-site personnel are responsible for knowing the ERCP and the procedures contained herein. Personnel will be expected to notify the Emergency Coordinator of occurred or impending emergencies and to cooperate fully once the plan has been enacted. All information should be communicated to the Emergency Coordinator; Personnel are to direct the media or public's inquires to the Community Relations Manager only.

13.2.6 Community Relations Manager

The Community Relations Manger will serve as the contact person for the media and the public. He/she ensures that all information made to the public is accurate, timely and in the interest of the Contractor and the public. The Community Relations Manager will also provide press releases and correct incorrect information. The EPA will provide a Community Relations Manger for the Woods Industries Site.

13.3 POTENTIAL EMERGENCIES

The activities, layout, and hazards of the Woods Industries Site have been evaluated to determine the potential emergencies to be anticipated. As a result, seven categories of emergencies have been established. This list may be revised if on-site conditions or operations warrant. In the event of a revision or addition to the list, the ERCP will be appropriately updated. The categories of anticipated emergencies are listed below.

+ Injury, Illness
+ Fire
+ Explosion
+ Spill/Environmental Release
+ Natural Hazards

Due to the nature of this site, the emergencies of extraordinary conditions that may arise are more than likely to be personnel accidents requiring first aid, exposure to soils and groundwater with chemical constituents, potential fire near mechanical equipment, and water-related incidents (e.g., on-site flooding).

13.4 PUBLIC RESPONSE AGENCIES

Contact between site personnel and local emergency services will assist in developing a good working relationship and provide an opportunity for the development of effective, overlapping emergency plans. The Emergency Coordinator will contact local fire, police, ambulance, and other emergency services before beginning work on the site. The Emergency Coordinator will inform the emergency services about the nature and duration of work expected on the site, types of contaminants and possible health or safety effects, and the anticipated emergency conditions. If possible, the Emergency Coordinator will have the emergency services' representative visit the site location and assess it in terms of their needs such as access, utilities, etc. Such contacts will be documented as part of the site records.

13.5 COMMUNICATIONS

13.5.1 Communications Systems

Two sets of communication systems will be established prior to initiating site activities: (1) internal communications among personnel on site; and (2) external communication between on-site and off-site personnel. Internal communication alerts team members to emergencies; passes along safety information, such as the amount of air remaining (if level B is required); time remaining until next rest period; changes in the work to be accomplished; and maintains site control. An external communication system between on-site and off-site personnel is necessary to coordinate emergency response, report to management, and maintain contact with essential off-site personnel.

On-site internal communications will be conducted through verbal communications and hand-held two-way FM radios. Nonverbal communications will be used when background noise or PPE impede verbal communications and will utilize standard hand and air-horn signals, as illustrated below:

13.5.2 Communication Protocols

+ Channel .... has been designated as the radio frequency for personnel in the Exclusion Zone. All other on-site communications will use channel ....
+ Personnel in the Exclusion Zone should remain in constant radio communication or within sight of the Project Team Leader. Any failure of radio communication requires an evaluation of whether personnel should leave the Exclusion Zone.
+ Three short blasts on the **air horn** is the emergency signal to indicate all personnel should leave the Exclusion Zone. A continuous 10-second blasts indicates to evacuate the site. In addition, a loud hailer is available if required.
+ The following standard **hand signals** will be used in case of failure of radio communications:
  - Hand gripping throat ....Out of air, can't breathe.
  - Grip partner's wrist or both hands around waist. ....Leave area immediately.
  - Hands on top of head ....Need assistance.
  - Thumbs up..OK, I am all right, I understand.
  - Thumbs down ....No, negative.

External communications during site activities will be accomplished by use of telephone utilities established in the site office. As a backup, at least one portable cellular telephone will also be maintained on site.

13.5.3 Postings

The following information from the ERCP will be outlined and posted at all site telephones, and entrances to the Exclusion Zone.

+ A list of public response agencies to be contacted and who may—depending on the nature of the situation—assume authority for emergency response is provided in *Table 13.1, Public Response Agency*. It includes local hospitals, the local health department, ambulance service, fire and police departments, and others.
+ Name and telephone number of the HSO.
+ Location an diagrams of fire extinguishers and emergency equipment including response procedures.
+ Location of emergency eyewash/deluge systems.
+ Procedures for potential overexposures.

TABLE 13.1
PUBLIC RESPONSE AGENCY

AGENCY	TELEPHONE NUMBERS
Fire Department	509/248-2100
Police	509/248-1010
Sheriff	509/248-3530
Nearby Hospital—St. Elizabeth's	509/565-5060
Ambulance Service	509/248-3610
BNRR Corporate Office	913/661-4439
National Response Center (operated by USEPA and U.S.C.G.)	800/424-8802
• CHEMTREC	800/424-9390
Local Environmental Emergency —	
• WILLIAMS HEALTH AND SAFETY OFFICER	800/325-0011
• WILLIAMS PROJECT PRINCIPAL	800/247-4030

13.6 EMERGENCY EQUIPMENT

13.6.1 General

On-site emergency equipment consists of equipment and supplies which are maintained on site and specifically earmarked **for emergency use only** and other equipment which may used as a part of regular site operations *(Table 13.2)*. The latter includes items such as telephones, FM two-way radios, PPE, and earth moving equipment. The following subsections describe the emergency equipment which will be on the Woods Industries Site.

TABLE 13.2
EMERGENCY AND FIRST AID EQUIPMENT

EQUIPMENT TYPE	QUANTITY REQUIRED
Fire Extinguishers • Multipurpose Dry Chemical with rating of 2-A:10-B:C	1 per floating vehicle 1 per building 1 per construction vehicle 1 per building 3 per LTTD 1 per hot work location
Radios • Fixed (Motorola) • Portable (Motorola) • Portable (Motorola) • Portable (Motorola)	1 at base 1 per work group 1 at base 1 per SHSO
Blankets, Wool	4
First Aid Equipment • Industrial First Aid Kit • Stretcher • Burn Kit • Fire Blanket	1 adjacent to CRZ 1 1 1
Eye Wash Stations	1 at LTTD 1 at decontamination area

13.6.2 First Aid Equipment

First aid equipment will be located adjacent to the CRZ where it will be most accessible to both the Exclusion Zone and support area. Equipment will include a construction site-size first aid kit, water bottle, stretcher and wool blanket. Additional first aid kits may be strategically located at other points on the site such as in the LTTD control room.

A deluge eyewash/shower will be located at the CRZ.

13.6.3 Fire Equipment

Fire equipment will include strategically located fire extinguishers of the size and type indicated in *Table 13.2*. Each fire extinguisher will be marked using readily visible signs with the word **FIRE EXTINGUISHER**. Locations will include each trailer, the CRZ, LTTD facilities, and on construction vehicles/equipment. At least one fire hose and adjustable nozzle will be located in the proximity of the LTTD.

13.6.4 Spill Response Equipment

The hazardous waste spill response equipment stored at the site consists primarily of earth moving and heavy construction-type equipment and assorted hand tools. The earth moving equipment is very effective for spills resulting from surface impoundment failures or breechings, while hand tools are primarily used for small spills. In the event of a spill, the equipment can be accessed for work areas as necessary. Additional equipment may include sorbent vermiculite and drums.

13.7 PLAN IMPLEMENTATION

13.7.1 General

All on-site personnel will be instructed to notify the support area (base station) immediately upon encountering an emergency or near emergency. The Emergency Coordinator will then institute the response measures to be taken and direct other personnel in their duties. Documentation of the incident will be accomplished as soon as possible to assure accuracy of the reporting. The Emergency Coordinator will complete an **Emergency Incident Report** (*Appendix A*) which includes the following information:

1. A description of the emergency (including date, time, and duration);
2. Date, time, and name of all persons/agencies notified and their response; and
3. A description of corrective actions implemented or other resolution of the incident.

13.7.2 Site Evacuation

In the event of an emergency situation during operations that require evacuation (such as fire, explosion, significant release of toxic gases, etc.), an air horn will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. All field personnel in both the restricted and unrestricted areas will evacuate and assemble near the CRZ trailer or other safe area identified by the Emergency Coordinator. The location will be upwind of the incident if possible. As the safety of all field personnel is being established, appropriate emergency services will be contacted by security via telephone to respond to the emergency. When making the report to Woods Industries Base, describe the complete situation including, if possible, the following:

+ Type and location of the emergency.
+ Is an explosion or fire involved?
+ Type of material involved. Contamination released?
+ Are there injuries?
+ Estimated wind speed and direction

Personnel will not reenter an evacuated area until instructed to do so by the Emergency Coordinator. In addition, if the site stops operations in response to an emergency, the Emergency Coordinator will ensure that valves, pipes, and other equipment are monitored for leaks, pressure buildup, gas generation, or ruptures.

13.8 RESTORATION AND SALVAGE

After an emergency, prompt restoration of utilities, fire protection, equipment, security equipment, medical supplies, and other equipment will reduce the possibility of further loss. Temporary systems/supplies may have to be purchased until the permanent systems are back on line. Item which may need addressing include but are not limited to:

+ Refilling fire extinguishers or water supplies;
+ Refilling medical supplies;
+ Repairing vandalism promptly so as not to invite further damage;
+ Obtaining copies of backup or hard copy data;
+ Drying water sensitive equipment or records; and
+ Obtaining temporary buildings.

13.9 PLAN EVALUATION/UPDATE

Following each practice, exercise, evacuation drill, or actual emergency, a critique shall be conducted by the Emergency Coordinator. This critique shall include a review of the Emergency Plan to identify any deficiencies and any areas where improvement is necessary, and a review of participant's performance.

At a minimum, the documentation will include:

+ A chronological history of the incident or exercise;
+ Titles and names of personnel participating; and

+ Description of actions taken; Decisions made by whom; Order given—to who, by whom, and when; Actions taken—who did what, when, where.

13.10 EMERGENCY RESPONSE PROCEDURES

13.10.1 General

Although not all of the following emergencies will be applicable to each activity, the procedures that follow will serve as the basis for decision-making and the actions to be taken during an actual emergency.

Response to an emergency—fire/explosion or spill/environmental release—starts with the identification of trouble and continues after the emergency through the preparation of equipment and personnel for the next potential emergency. The stages of emergency response consist of notification, emergency evaluation, response, follow-up review, and documentation. The stages of emergency response are presented and discussed below in logical order.

NOTIFICATION—

Upon discovering the emergency, the Emergency Coordinator will be responsible for notifying other on-site personnel to the emergency. A predetermined internal audio communications device (siren, whistle) will be activated to notify personnel to stop work activities, to lower background noise (if possible), and to initiate emergency procedures.

The on-site emergency response personnel will be notified and informed by the Emergency Coordinator of the following information:

+ What happened and how;
+ Where and when did it happen and to whom;
+ What is the extent of the damage; and
+ What form of aid or response is required?

EMERGENCY EVALUATION—

Upon review of the emergency information above, emergency response capabilities and needs will be determined. A determination will be made as to what could potentially happen as a result of the emergency. Items to consider include the types of contaminants; the potential for fire, explosion, or release of hazardous materials; the location of on-site personnel relative to the hazardous area(s); and the potential for impact on the surrounding population and environment. Next, a determination will be made as to what should be done. The Emergency Coordinator must consider the appropriate emergency response;

+ Equipment and personnel resources required for hazard mitigation;
+ Number of persons available for response;

+ Resources available on-site and off-site; and
+ Hazards involved in rescue and response.

RESPONSE—

At this stage of emergency response, the Emergency Coordinator will decide the type of action required based on the available information. The response action(s) is then implemented. The Site Supervisor will also designate on-site personnel responsibilities in order to accomplish the response actions. Response actions may include the following:

+ **Enforced Buddy System**

  No one will enter the Exclusion Zone or hazardous area without a partner. Line-of-sight contact between rescue/response personnel and support will be maintained.

+ **Allocate Resources**

  Along with the designation of on-site personnel to aid in the rescue/response operations, the Emergency Coordinator will also allocate on-site equipment to be used in the rescue/response operation.

+ **Request Aid**

  The Emergency Coordinator will contact off-site personnel and/or agencies as required to aid in the rescue-response operation.

CONTROL—

The Spill Response Team will bring the hazardous situation under complete or temporary control. The intent of control is to prevent the spread and impact of the emergency. In the event of a fire, the Emergency Coordinator will immediately call the fire department and decide if attempts should be made by on-site personnel to control the fire depending upon the degree of the fire. In the event of a spill or chemical release, the Spill Response Team will contain the spill and prevent further migration via the use of booms, adsorbent pads, or earthen berms. In the event of cave-in of excavations, the Emergency Coordinator will immediately direct the relocation of excavating equipment and personnel away from the unstable area and evaluate methods to stabilize the excavation.

STABILIZE—

The SHSO or designated alternate(s) will administer medical procedures to injured personnel as required and attend to the cause of the emergency, if possible (e.g., turn off leaking valve, shut down treatment system).

EVACUATE—

On-site personnel will be moved a safe distance upwind of the hazardous area. The emergency incident will be monitored for significant changes. The designated public safety personnel will be contacted when there is a potential or actual need to evacuate the off-site population. Evacuation of off-site personnel is the responsibility of government authorities.

FOLLOW-UP REVIEW—

Prior to resuming normal site activities, on-site personnel must review the cause of the emergency and aid in the revision of this ERCP according to new site conditions and events that took place during emergency response. Emergencies or accidents that result in any fatalities or five or more hospitalizations, must be reported to OSHA.

DOCUMENTATION—

The Emergency Coordinator will be responsible for documenting the events of the emergency. Documentation of the emergency may be used to prevent reoccurrence of the emergency and as evidence for potential legal actions. Documentation may be accomplished by the use of a bound field notebook and written transcripts of tape recordings made during the emergency.

Documentation of an emergency should include the following:

+ Chronological history of the emergency;
+ Facts pertaining to the incident when they become available;
+ Names and titles of personnel involved;
+ Actions taken. orders and instructions given and received, and decisions made by the Site Supervisor and other on-site and off-site personnel;
+ Potential exposures of on-site personnel; and
+ Signature, date, and time of individual entering data.

In response to an emergency, specialized equipment may be necessary to rescue victims, protect response personnel, and to mitigate hazardous conditions (e.g., contain spills). A list of basic on-site equipment and supplies for emergency response will be developed prior to site entry. This list will be updated as necessary to include special equipment that should be obtained depending upon special conditions or emergencies that may arise during implementation of the site remedies. After an emergency, site equipment and supplies must be restocked, repaired, or replaced as necessary.

EVACUATION ROUTES—

In the event of a severe emergency (e.g., fire, explosion), normal site exit routes may become blocked. Therefore, alternate routes for evacuating on-site personnel will be established prior to initiation of the remedial activities. Consideration will be given to the following factors when developing alternate evacuation routes:

+ Upwind locations;

+ Accessibility of potential routes;
+ The development of two or more routes;
+ Equipment necessary to mark out routes; and
+ The mobility of site personnel wearing protective equipment.

The alternate evacuation routes will be established prior to site activity and will be shown on detailed site maps. These maps will be appended to this HSP at that time.

13.10.2 On-Site Personnel Injury/Illness

13.10.2.1 General

Emergency first aid will be administered on site as deemed necessary. Emergency medical services will be contacted to respond, or the victim will be transported to the designated medical facility. The medical data sheet will accompany the injured person in each case. *Figure 13.1* shows the primary hospital route and instructions from the Woods Industries Site. These diagrams will be posted near the command trailer exit in a manner so they can be taken with the driver of the victim. The hospital will be called and notified of the impending arrival while the victim is being transported, and provided with pertinent information regarding the victim, injuries, etc.

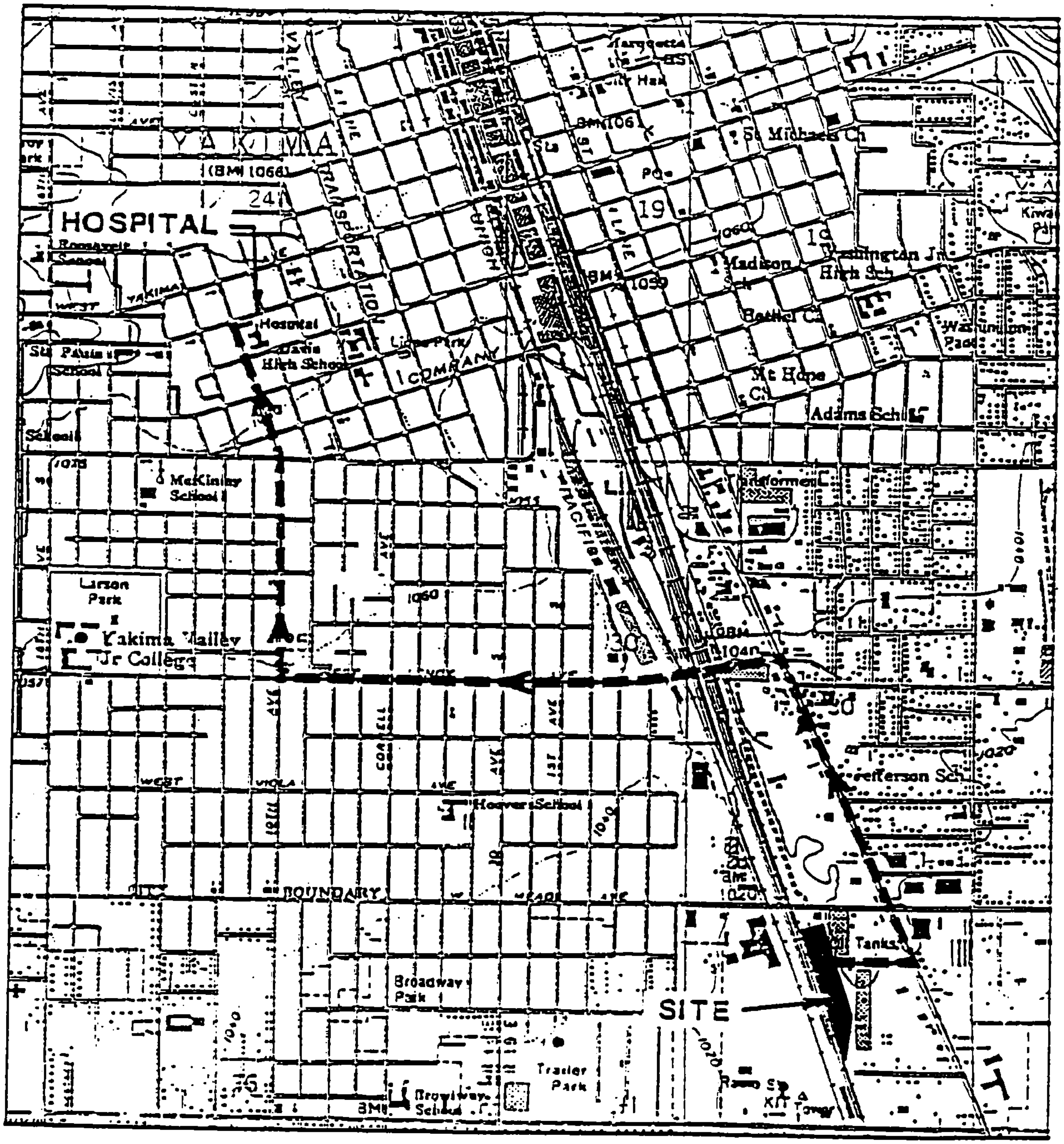
If a person working on site is physically injured, basic first aid procedures must be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, he/she will be taken to the edge of the work area where PPE will be removed and emergency first aid administered. If necessary, transportation to a local emergency medical facility will be provided as soon as possible.

If the person can only be moved by emergency medical personnel, the SHSO will decide what protective equipment (if any) is required to be worn by emergency personnel. Each work area will have extra equipment available for emergencies.

If the injury to on-site personnel involves chemical exposure, the following first aid procedures must be initiated as soon as possible:

1. **Eye Exposure**—If solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash station using water and lifting the lower and upper lids occasionally. Obtain medical attention immediately.
2. **Skin Exposure**—If solid or liquid gets on the skin, wash skin immediately at the emergency eyewash station using water. Obtain medical attention immediately.
3. **Inhalation**—If a person inhales large amounts of (organic vapor, dust, etc.), move him/her to fresh air at once. Obtain medical attention immediately. If breathing has stopped, appropriately trained personnel and/or medical personnel should perform cardiopulmonary resuscitation. Keep affected person warm and at rest.

DRAWN BY	CHECKED BY	DOCUMENT MANAGER	PROJECT MANAGER
PS 11/10/88	JAK 11/10/88	11/15/88	11/21/88



EXPLANATION

▬ ▬ ▬ PROPOSED ROUTE

Exit the site east on King Street. Turn left, north onto North First Street. Proceed approximately 0.3 miles to West Lenox Avenue. Turn left, west onto West Lenox Avenue. Continue approximately 1.2 miles to 10th Avenue. Turn right, north on 10th Avenue. Proceed approximately 0.3 miles. St. Elizabeth's Hospital is located on the right side of 10th Avenue.

0 2000 4000

SCALE IN FEET

N

John Mathes & Associates, Inc.

MEDICAL EMERGENCY ROUTE MAP

WOODS INDUSTRIES
YAKIMA, WASHINGTON
12583088

FIGURE 13.1

4. **Ingestion**—If solid or liquid is swallowed, medical attention must be obtained immediately and the Poison Control Center consulted.

The SHSO must inform the Project Manager of the injury/accident, and a written report detailing the accident, its causes, and consequences must be submitted to the Project Principal within 48 hours of the incident.

13.10.2.2 Temperature-Related Problems

Temperature-related problems are discussed in *Section 10, Environmental and Personal On-Site Air Monitoring Plan,* with respect to monitoring and mitigations.

First aid for all forms of heat stress includes cooling the body by removing PPE, moving to an area outside the Exclusion Zone and Contamination Reduction Zones, and allowing the person to rest in a cooler environment.

First aid for frostbite will include protecting the frozen area from further injury, bringing the victim indoors, warming the affected areas quickly with lukewarm water, and maintaining respiration according to first aid procedures. Medical help must be called immediately.

13.10.2.3 Emergency Decontamination

In the case of medical emergency, gross decontamination procedures will be implemented and the person transported to the nearest medical facility immediately. If a life threatening injury occurs and the injured person cannot undergo decontamination procedures without causing additional injuries, he/she will be transported in a body bag, plastic wrap, or wrapped in a blanket. The medical facility will be informed that an injured person is on the way and has not been decontaminated. The medical facility will be notified of the potential chemicals present and the exposure prevention measures that can be employed during treatment.

Decontamination measures for other emergencies will be based upon the toxicity of the contaminants on site and the immediacy of the emergency.

13.10.3 Fire

WILLIAMS personnel will not respond to fires which are larger than those which can be handled by the fire extinguishers maintained on site. Any sign of fire will be reported at once to Woods Industries Base which will in turn notify the local fire departments.

13.10.4 Explosion

13.10.4.1 General

An explosion can be the most difficult emergency situation to deal with for multiple reasons: severe trauma, death, fire, unstable structures, secondary explosions, toxic clouds, and destruction of emergency response and communication equipment may all be associated with and explosion. Therefore, multiple response measures and backup systems may be required:

+ Initiate evacuation procedures.
+ Notify appropriate response agencies (fire, police, ambulance).
+ Assess situation: will secondary emergencies be immediately occurring?
+ Attend to the injured.
+ Turn off/remove sources of explosive gases or flammable liquids.
+ Check for exposed live utilities.
+ Initiate spill response measures, if necessary.
+ Contact the Community Relations Manager to appraise the situation.

13.10.4.2 Explosive Atmospheres

+ Initiate evacuation procedures if action levels dictate.
+ Notify the fire department of potentially explosive condition.
+ Remove sources of ignition.
+ Ventilate the area.
+ Continue monitoring.

13.10.5 Spills/Environmental Release

13.10.5.1 General

All hazardous waste spills will be contained as close to the source as possible. For small spills, sorbent materials such as sand, sawdust, or commercial sorbents will be placed directly on the waste to prevent further spreading and aid in recovery. If the waste is very hazardous, it should be neutralized prior to attempting the recovery, and provisions should be made to contain and recover the neutralizing solution. Berms of earthen or sorbent material will be used to contain large spills and will be constructed downstream of the leading edge of the spill. These berms are especially effective in containing continuing spills such as impoundment or pipeline leaks. Drains or drainage in the spill area will also be blocked or surrounded by berms to exclude the spilled waste and any materials applied to it. Any contaminated sorbents or earthen materials will be cleaned up and placed in drums for proper storage or disposal as hazardous waste.

If any spill is large and/or continuing, an initial isolation area of at least 100 feet in all directions will be used. Small spills or leaks from a drum, tank, or pipe will require evacuation of at least 50 feet in all directions to allow cleanup and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard areas. If necessary, the area will be roped off or otherwise blocked.

If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire), further excavation may be required. Additional spill control procedures are contained in the Spill Control and Response Plan required by 40 CFR 264.

13.10.5.2 Spill Guidelines

In general cleanup personnel will:

+ Make sure all necessary persons are removed from the hazard area;
+ Wear proper protective clothing;
+ If a flammable waste is involved, remove all ignition sources and use sparkproof and explosionproof equipment and clothing in containment and cleanup;
+ If possible try to stop leak. Special materials will be kept on hand for temporary repairs; and
+ Remove all surrounding materials that could be specially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.

13.10.6 Natural Hazards

Because of the amount of planning that goes into preventing the other types of emergencies, these uncontrollable hazards (hurricanes, tornadoes, etc.) conceivably have the highest probability of occurrence on the Woods Industries Site. With the approach of an impending natural disaster, operations will be halted and the site secured to the extent possible. Restoration after the event will include a recheck of all operating system, containment and cleanup of spills, and resumption of site operations

13.10.7 Bomb Threats/Civil Commotion

Activists, labor disputes, angry residents, racial tensions, disgruntled employees and pranksters may result in bomb threats, vandalism, arson, riots, and even assault. It is difficult to anticipate these occurrences but security measures can be taken to prevent or reduce their impact and the proper responses can control further loss.

13.10.8 Hospital Route

The HSO will provide a map, including written directions, to all on-site personnel showing the route from the Woods Industries Site to the selected medical facility.

APPENDIX A
HEALTH AND SAFETY PLAN FORMS

WILLIAMS ENVIRONMENTAL SERVICES, INC.

AEROSOL SAMPLING DATA

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110
Project Contact:	Mark A. Fleri		

CALIBRATION DATA

Pump Number ____________ Calibration Instrument ____________

Pre-Calibration Flow Rate (Liters/Minute)	Post-Calibration Flow Rate (Liters/Minute)
$\bar{X}$ =	$\bar{X}$ =

AVERAGE FLOW RATE = ____________ (L/M)

Date: ____________ Date: ____________

Initials: ____________ Initials: ____________

SAMPLING DATA

Technician: ____________ Date: ____________ Sampling Media: ____________

Substance(s) Sampled: ____________

Pump Location or User Name: ____________

Temperature: ______ °F Wind: ______ at ______ mph Relative Humidity ______ %

FILTER I.D.	TIME ON	TIME OFF	TIME, MIN.	VOLUME AIR (L)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DAILY CHECKLIST

Project Name:	WOODS INDUSTRIES SITE	Williams Project No.	0380-001-110
Project Contact:	Mark A. Fleri	Benchmark Project No.	1100-101-110
Facility Location:	Yakima, Washington		
Inspector's Name:		Date:	

ITEM MORNING (0630-0730)	YES	NO	N/A
Pumps Calibrated and Ready for Monitoring			
Direct Reading Instruments Calibrated			
Aerosol Sampling Data Sheets Completed			
Bull Horn Operating			
Two-Way Radios Operating			
First Aid Kits Supplied			
SCBA Operating			
Record Weather Conditions			
Daily Safety Meeting Conducted			
Check Sampling Media			
Deploy Perimeter Pumps			
Conduct Direct Sampling in EZ and RZ (to include Decon Area)			
Inspect Electrical Outlets in EZ, RZ and SZ			
Inspect Personnel Decon Area			
Conduct Personnel Weigh-in			
Issue Personnel Pumps/Passive Dosimeter Badges			
Inspect Personnel			

ITEM MORNING (0800-1200)	YES	NO	N/A
Check Pumps (Area and Personnel)			
Inspect Decon Operation Equipment			
Inspect Work Area			
Inspect Vehicles			
Inspect Personnel Safety Practices			
Conduct Point Monitoring in EZ, RZ and SZ			
Inspect Personnel Decon			
Change Tubes and Filters, if necessary			
Record Weather Conditions			

ITEM AFTERNOON (1300-1700)	YES	NO	N/A
Check Pumps (Area and Personnel)			
Inspect Work Area			
Inspect Equipment Decon Operations			
Inspect Personnel Safety Practices			
Conduct Point Monitoring in EZ, RZ and SZ			
Record Weather Conditions			
Change Tubes and Filters, if necessary			
Inspect Vehicles			

ITEM EVENING (1630-1800)	YES	NO	N/A
Collect Personnel Pumps			
Monitor Personnel Decon			
Sample Equipment Decon Area			
Collect Area Pumps			
Read and Document Samples Collected			
Place Pumps on Charge			
Prepare Next Day's Forms			
File Day's Paper Work			

WILLIAMS ENVIRONMENTAL SERVICES, INC.

TAILGATE SAFETY MEETING

Project Name: WOODS INDUSTRIES SITE
Project Contact: Mark A. Fleri
Facility Location: Yakima, Washington

Williams Project No. 0380-001-110
Benchmark Project No. 1100-101-110
Date: ____________________

DAILY WORK PLAN ACTIVITIES

____
____
____
____
____

SAFETY TOPICS

Required Protective Clothing/Equipment ____________________
____
Chemical Hazards ____________________
____
Special Equipment ____________________
____
Other Discussion Items/Requirements ____________________
____
Emergency Procedures ____________________
____
Hospital and Address: ____________________ Telephone: ____________
Paramedic Telephone: 911

ATTENDED

NAME PRINTED	SIGNATURE
(go to back of page)	*(go to back of page)*

Meeting Conducted By:

____________________ ____________________
Name Printed *Signature*

Supervisor ____________________ **Manager** ____________________

WOODSFMT.PM4 (6/93-jkn) (FORM A-3)

TAILGATE SAFETY MEETING

PAGE 2

ATTENDED

NAME PRINTED	SIGNATURE

WILLIAMS ENVIRONMENTAL SERVICES, INC.

RESPIRATOR QUALITATIVE FIT TEST

Name: ______________________________

S.S. No.: ______________________________

Division: ______________ **Project No.** ______________

Method: Irritant Smoke Test ________ Other ________

Respirator: Brand ______________ Model ________

Half Face ______________ Full Face ______________

Small ________ Medium ________ Large ________

Fit Test Procedure:

1) Visual ______________
2) Negative Pressure ______________
3) Positive Pressure ______________
4) Gross Leak Check ______________
5) Breath Normally ______________
6) Breath Deeply ______________
7) Turn Head ______________
8) Nod Head ______________
9) Repeat Passage ______________
10) Jog in Place ______________
11) Breath Normally ______________

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon, there is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Test Given By: ______________________________ ______________

(Name) *(Date)*

Expiration Date: ______________

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DAILY VISITOR SIGN-IN/SIGN-OUT LOG

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri	**Benchmark Project No.**	1100-101-110
Facility Location:	Yakima, Washington	**DATE:**	

NAME	EMPLOYER/PURPOSE OF VISIT	VISITOR I.D. NO.	TIME OUT	TIME OUT

WILLIAMS ENVIRONMENTAL SERVICES, INC.

EMERGENCY INCIDENT REPORT

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

Nature of Incident: (fire, medical emergency/team response, flood, etc.). Give brief description.

____

____

____

____

Time of Occurrence: ______________ **Date of Incident:** ______________

Location of Incident: ______________________________

____

Describe Procedures Followed in Responding to Incident: (List all people involved in response and describe each person's actions. Use additional sheets if necessary. Complete Medical Incident Report for each person injured or any incident of illness during the response to the emergency.)

____

____

____

____

Brief Summary of Corrective Action to be Taken to Prevent Recurrence:

____

____

____

____

List Officials and Agencies Notified at Time of Incident:

____

____

____

____

Signed: ______________________________ ______________

(Safety Officer) *(Date)*

______________________________ ______________

(Site Manager) *(Date)*

Copies: ____ Site Representative; ____ Other (______________________)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

SUPERVISOR'S EMPLOYEE INJURY REPORT

Project Name: WOODS INDUSTRIES SITE
Project Contact: Mark A. Fleri
Facility Location: Yakima, Washington

Williams Project No. 0380-001-110

Benchmark Project No. 1100-101-110

This is an official document to be initiated by the employee's supervisor. Please answer all questions completely. This report must be forwarded to the employee's Health and Safety Office within 24 hours of the injury.

Injured's Name ______ Sex ___ S.S. No. ______ Birthdate ______
Home Address ______ City ______ State ___ Zip ___ Phone ______
Job Title ______ Employee No. ______ Hire Date ______ Hourly Wage ______

SUPERVISOR

Date of Incident ______ Time ______ Time Reported ______ To Whom? ______
Client Name ______ Client Address ______ Time Shift Began ______
Exact Location of Incident ______ Did Employee Leave Work? No ___ Yes ___ When ______
Has Employee Returned to Work? No ___ Yes ___ When ______ Did Employee Miss a Regularly Scheduled Shift? No ___ Yes ___
Doctor/Hospital Name ______ Address ______
Witness Names ______ Statements Attached? No ___ Yes ___
Nature of Injury ______ Exact Body Part ______
Medical Attention: None ______ First Aid on Site ______ Doctor's Office ______ Hospital ER ______ Hospitalize ______
Job Assignment at Time of Incident ______ Job: ______ Phase: ______ Task: ______ Subtask: ______
Describe Incident ______

What Unsafe Physical Condition or Unsafe Act Caused the Incident? ______

What Corrective Action Has Been Taken to Prevent Recurrence? ______

Supervisor/Foreman ______ (Print) ______ (Signature) ______ (Date)

MANAGER

Comments on Incident and Corrective Action ______

Manager's Name ______ (Print) ______ (Signature) ______ (Date)

HEALTH AND SAFETY

Concur with Action Taken? No ___ Yes ___ Remarks ______

OSHA Classification: ❑ Incident Only ❑ First Aid ❑ No Lost Workdays ❑ Restricted Activity ❑ Fatality
Days Away From Work ______ Days Restricted Work ______ Total Days Charged ______
❑ State Jurisdiction ❑ Federal L&H ❑ Date ER Submitted ______ Which Claims Office? ______
Coding: A. Injury Type or Illness ___ B. Injured Body Parts ___ C. Activity at Time of Incident ___
D. Injury Cause Code ___ E. Agent Code ___ F. Safety Rule Violated Code ___ G. Accident Prevention Code ___
Name ______ (Print) ______ (Signature) ______ (Date)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

HEALTH & SAFETY LOG

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

TIME	EVENT

❑ First Shift ❑ Second Shift ❑ Third Shift

Date: ____________ Project Supervisor: ____________

Time On: ____________ Project Manager: Mark A. Fleri

Time Off: ____________ Health & Safety Officer: ____________

Health & Safety Technician: ____________

WOODSFMT.PM4 (6/93-jkn) (FORM A-8)

DAILY HEALTH & SAFETY FIELD LOG

PAGE 2

TIME	EVENT

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DAILY WEATHER DATA SHEET

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fieri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

MORNING Time: ____________

Temperature ______ °F Wind Direction ________ at _____ MPH Humidity ______ %

Heat Index (WBGT) ______ °F Wind Chill ______ °F

MORNING Time: ____________

Temperature ______ °F Wind Direction ________ at _____ MPH Humidity ______ %

Heat Index (WBGT) ______ °F Wind Chill ______ °F

AFTERNOON Time: ____________

Temperature ______ °F Wind Direction ________ at _____ MPH Humidity ______ %

Heat Index (WBGT) ______ °F Wind Chill ______ °F

EVENING Time: ____________

Temperature ______ °F Wind Direction ________ at _____ MPH Humidity ______ %

Heat Index (WBGT) ______ °F Wind Chill ______ °F

Signed: ____________________ Date: ____________________

WILLIAMS ENVIRONMENTAL SERVICES, INC.

PERSONNEL BADGE MONITOR LOG

Project Name:	WOODS INDUSTRIES SITE	Williams Project No.	0380-001-110
Project Contact:	Mark A. Fleri		
Facility Location:	Yakima, Washington	Benchmark Project No.	1100-101-110

Badge Number	Date	
Employee's Name	Employee's I.D. Number	
Temperature (°F)	Relative Humidity (%)	
Time On	Time Off	Total Exposure Time
Sampled By		

DESCRIPTION OF EMPLOYEE'S ACTIVITY

Location:

Location:

Location:

Comments:

Lab Results:

WOODSFMT.PM4 (6/93-jkn) (FORM A-10)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DAILY SITE SIGN-IN/ SIGN-OUT LOG

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri	**Benchmark Project No.**	1100-101-110
Facility Location:	Yakima, Washington	**DATE:**	

EMPLOYEE NAME	EMPLOYER	TIME IN	TIME OUT

WILLIAMS ENVIRONMENTAL SERVICES, INC.

Williams Project No.
0380-001-110
Benchmark Project No.
1100-101-110

Physician's Written Opinion of EMPLOYEE HEALTH STATUS

(To be completed by the Examining Physician after Review of all Lab Data)

Employee: ______________________________
Social Security No. ____________________ **Date Examined** ______________
Title: ______________________________

Reason Examined (check appropriate exam):

_____ Pre-Placement Baseline _____ Annual or Periodic _____ Exit

CLASSIFICATION

Based on all the information available to me, it is my opinion that: *(Circle No.)*

1. The above-named person does not have a medical condition which would interfere with work involving hazardous waste cleanup operations, asbestos abatement projects, or where respiratory protection equipment will be worn.

2. The above-named person has a medical condition(s) which may be aggravated by his/her work exposures or activities.

3. Abnormalities were noted that should be addressed by his/her personal physician. I have made these abnormalities known to the above-named person. These abnormalities should not affect job placement as described in Item No. 1.

4. Classification should be deferred at this time. The following information is required before classification can be made: ______________________________
____
____

RESTRICTIONS

Based on all the information available to me, it is my opinion that: *(Circle No.)*

1. No restrictions are recommended.

2. The following restrictions are recommended: ______________________
Duration of Restriction: ______________________

3. The above-named person is unacceptable for work on a hazardous waste site, or an asbestos abatement project, or where respirators must be worn.

______________________________ ______________________
(Examining Physician) *(Date)*

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DOCUMENT REVIEW AND CERTIFICATION

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

I have reviewed the Health & Safety Plan developed for the T H Agriculture & Nutrition Site and to the best of ability I will conduct myself, and operations under my responsibility, in a safe manner and in compliance with this Plan. I will report any injury, illness, or recognizable symptoms, if developed, immediately to my supervisor.

I understand that failure to comply with the requirements established in this Plan may be grounds for immediate termination of employment.

SIGNATURE	PRINTED NAME	DATE SIGNED

WILLIAMS ENVIRONMENTAL SERVICES, INC.

CUTTING, WELDING, AND BURNING PERMIT

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

DATE PERMIT ISSUED: ______________________

SHIFT: ______________________

LOCATION OF WORK:

Building: ______________________

Elevation: ______________________

Specific Location: ______________________

____

____

REQUESTED BY: ______________________

POSITION/TITLE: ______________________

Permit must be posted before work may begin. Necessary precautions have been taken to prevent fire and to protect any material or equipment which may be endangered. Work areas and all adjacent areas where sparks might spread have been inspected and no fire conditions exist.

Verified By: ______________________

____

(Sign legibly or print name below signature. An illegible signature invalidates this form.)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DAILY VISITOR SIGN-IN/SIGN-OUT LOG

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri	**Benchmark Project No.**	1100-101-110
Facility Location:	Yakima, Washington	**DATE:**	

NAME	EMPLOYER/PURPOSE OF VISIT	VISITOR I.D. NO.	TIME OUT	TIME OUT

WILLIAMS ENVIRONMENTAL SERVICES, INC.

DAILY VEHICLE SIGN-IN/SIGN-OUT LOG

Project Name: WOODS INDUSTRIES SITE
Project Contact: Mark A. Fleri
Facility Location: Yakima, Washington

Williams Project No. 0380-001-110
Benchmark Project No. 1100-101-110
DATE: ____________________

NAME	EMPLOYER	VEHICLE DESCRIPTION/TAG NO.	TIME OUT	TIME OUT

WILLIAMS ENVIRONMENTAL SERVICES, INC.

SECURITY INCIDENT REPORT

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fieri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

Date Incident Occurred: ______________________

Incident Location (site-specific): ______________________

Time Incident Occurred: ______________________

Brief Description of Incident: ______________________

Action Taken: ______________________

Brief Summary of Corrective Action to be Taken to Prevent Recurrence:

List Officials and Agencies Notified at Time of Incident (if any):

Signed: ______________________ *(Safety Officer)* ______________ *(Date)*

______________________ *(Site Manager)* ______________ *(Date)*

Copies: _____ Site Representative; _____ Other (______________________)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

INCIDENT REPORT FOR SPILLS, LEAKS, RELEASES

Project Name:	WOODS INDUSTRIES SITE	**Williams Project No.**	0380-001-110
Project Contact:	Mark A. Fleri		
Facility Location:	Yakima, Washington	**Benchmark Project No.**	1100-101-110

Date and Time Incident Occurred: ______________________________

Incident Location: ______________________________

Materials Involved: ______________________________

Brief Description of Incident: ______________________________

____

____

____

Action Taken: ______________________________

____

____

____

____

Brief Summary of Corrective Action to be Taken to Prevent Recurrence:

____

____

____

____

List Officials and Agencies Notified at Time of Incident (if any):

____

____

____

____

Signed: ______________________________ *(Safety Officer)* ______________ *(Date)*

______________________________ *(Site Manager)* ______________ *(Date)*

Copies: ____ Site Representative; ____ Other (______________________)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY RECORD

Project Name: WOODS INDUSTRIES SITE Williams Project No. 0380-001-110 Benchmark Project No. 1100-101-110	**WILLIAMS ENVIRONMENTAL SERVICES, INC.** 2075 West Park Place, Stone Mountain, GA 30087 404/879-4000 ◆ Fax 404/879-4831 Wats 800/892-0992	Date Received: Results Needed By:

FIELD NO.	LAB I.D. NO.	COLLECTION			SAMPLE TYPE/ DESCRIPTION	ANALYSIS REQUESTED
		DATE	VOLUME (L)	LOCATION		

Was Shipping Container Intact When Received By Lab?
Yes ____ No ____ Initials ____ Total No. of Containers _____

RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED BY (Signature)

WERE ALL INDIVIDUAL SAMPLE SEALS INTACT? YES ____ NO ____.
IF NO, INDICATE SAMPLE NUMBERS ON WHICH SEALS WERE BROKEN AT TIME OF RECEIPT.

ANALYST ______________________ DATE ________
(Signature)

WILLIAMS ENVIRONMENTAL SERVICES, INC.

Project: WOODS INDUSTRIES SITE
Williams Project No. 0380-001-110
Benchmark Project No. 1100-101-110

DAILY WEIGH-IN RECORD

EMPLOYEE NAME	DATE	WEIGHT BEFORE (LBS)	WEIGHT AFTER (LBS)	HEAT STRESS-RELATED PROBLEMS/COMMENTS

WILLIAMS ENVIRONMENTAL SERVICES, INC.

Project: WOODS INDUSTRIES SITE
Williams Project No. 0380-001-110
Benchmark Project No. 1100-101-110

DAILY AIR MONITORING — INSTANTANEOUS READINGS

(OVM/OVA/TUBE)

INSTRUMENT	DATE	LOCATION	TIME	WORK IN PROGRESS	MEASUREMENTS MAX. ppm	AVG. ppm	COMMENTS

WILLIAMS ENVIRONMENTAL SERVICES, INC.

Project: WOODS INDUSTRIES SITE
Williams Project No. 0380-001-110
Benchmark Project No. 1100-101-110

DAILY AIR MONITORING — INSTANTANEOUS READINGS

(SNIFFER 505)

INSTRUMENT	DATE	LOCATION	TIME	WORK IN PROGRESS	MEASUREMENTS			COMMENTS
					% LEL	% O_2	% H_2SO_4	
Sniffer 505								

APPENDIX B
CONFINED SPACE ENTRY PROCEDURES

TABLE OF CONTENTS

LIST OF ATTACHMENTS —

CONFINED SPACE ENTRY PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to provide guidelines for entering and working in confined spaces.

2.0 RESPONSIBILITY

The supervisor or project manager on site shall be responsible for implementation of the requirements set forth in this procedure. It should be noted that this is a general procedure and may not address all of the details which should be considered in every instance. It is the responsibility of the project manager to understand the practice of safe confined space procedures, or have a competent person in charge of such operations who does.

3.0 REQUIREMENTS

Entry into any confined space will only be allowed after adequate steps to ensure employee safety has been taken and, at a minimum, the protocols set forth in this document have been adhered to.

4.0 REFERENCES

- "Criteria for a Recommended Standard... Working in Confined Spaces," U.S. Department of Health, Education and Welfare, Public Health Service, National Institute for Occupational Safety and Health, Division of Safety Research, DHEW (NIOSH) Publications No. 80-106, Cincinnati, Ohio, 1980.
- CFR 1910.146 , Permit-Required Confined Spaces for General Industry; Final Rule, U.S. Department of Labor (OSHA), Federal Register, January 14,1993, pp 4462-4563.

5.0 DEFINITIONS

Acceptable Entry Conditions—The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter and work within the space.

Attendant—An individual stationed outside the permit space who monitors the authorized entrants and who performs all of the attendant's duties assigned in this procedure.

Authorized Entrant—An employee who is authorized by the employers to enter a permit space.

Blanking or Blinding—The absolute closure of a pipe, line, or duct by fastening a solid plate that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined Space—A space that:

1) Is large enough and so configured that employees can bodily enter and perform assigned work;

2) Has limited or restricted means for entry (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits); and

3) Is not designated for continuous human occupancy.

Double Block and Bleed—Closure of a line, duct, or pipe by closing and locking or tagging two individual valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency—Any occurrence, including any failure of hazard control or monitoring equipment, or an event internal or external to the permit space that could endanger the entrants.

Engulfment—The surrounding and effective capture of a person by a liquid or finely divided solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry—The action by which a person passes through an opening into a permit–required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry Permit—Written or printed document that is provided by the employer to allow and control entry into a permit space and which contains the information specified in this procedure.

Entry Supervisor—Person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry, as required by this procedure.

Hazardous Atmosphere—An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from one or more of the following causes:

1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);

2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

3) Atmospheric concentration of oxygen below 19.5 percent or above 23.5 percent

4) Atmospheric concentration of any substance for which a dose or permissible exposure limit (PEL) is published in Subpart G, "Occupational Health and Environmental Control," or in Subpart Z, "Toxic and Hazardous Substances" of this part, and which could result in employee exposure in excess of the PEL.

5) Any other atmospheric condition that is immediately dangerous to life or health.

Hot Work Permit—Employer's written authorization to perform operations, (e.g., cutting, welding, burning, or heating) capable of providing a source of ignition.

Immediately Dangerous to Life or Health (IDLH)—Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Inerting—The displacement of the atmosphere in a permit space by a noncombustible gas (e.g., nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Isolation—The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines pipes or ducts; a double block–and–bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line Breaking—The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing death or serious physical harm.

Oxygen-Deficient Atmosphere—An atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-Enriched Atmosphere—An atmosphere containing more than 23.5 percent oxygen by volume.

Permit-Required Confined Space (PRCS or permit space)—A confined space that has one or more of the following characteristics:

1) Contains or has potential to contain a hazardous atmosphere;
2) Contains a material that has the potential for engulfing an entrant;
3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
4) Contains any other recognized serious safety or health hazard.

Permit-Required Confined Space Program (Permit Space Program)—Employer's overall program for controlling and, where appropriate, for protecting employees from permit space hazards and for regulating employee entry into permit spaces.

Permit System—Employer's written procedures for preparing and issuing permits for entry and for returning the permit space to service following the termination of an entry.

Prohibited Condition—Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue Service—Personnel designated to rescue employees from permit spaces.

Retrieval System—The equipment (including a retrieval line, chest or fullbody harness, wristletts, if appropriate, and a lifting device or anchor) used for non-entry rescues or persons from permit spaces.

Testing—The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

6.0 ENTRY REQUIREMENTS—PERMIT-REQUIRED CONFINED SPACE

All entries into permit-required confined spaces shall be carried out in strict accordance with the following requirements.

1) Any conditions making it unsafe to remove the cover of the permit space shall be eliminated before the cover is removed.

2) When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will protect each employee working in the space from foreign objects entering the space.

3) Before an employee enters the space, the internal atmosphere shall be tested with a calibrated direct–reading instrument for the following conditions, in the following order:

   a. Oxygen content

   b. Flammable gases and vapors

   c. Potential toxic air contaminants

4) There may be no hazardous atmosphere present within the space whenever any employee is inside the space.

5) Continuous forced–air ventilation shall be used according to the following guidelines:

   a. An employee may not enter the space until the forced–air ventilation has eliminated any hazardous atmosphere;

   b. The forced–air ventilation system shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and will continue until all employees have left the space; and

   c. The air supply for the forced–air ventilation shall be from a clean source and may not increase the hazards in the space.

6) The atmosphere within the space shall be be periodically tested as necessary to ensure that the continuous forced–air ventilation is preventing the accumulation of a hazardous atmosphere.

7) If a hazardous atmosphere is detected during entry:

   a. Each employee shall leave the space immediately;

b. The space shall be evaluated to determine how the hazardous atmosphere developed; and

c. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

8) Prior to entry by any employee, the entry supervisor will verify that the space is safe for entry and that the measures outlined in 1) through 7) above have been taken. This verification will be in the form of a written permit and pre-entry checklist *(Attachments A and B)* that contains, as a minimum, the date, the location of the space, and the signature of the person providing the certification (permit). The permit shall be executed before entry and shall be made available to each employee entering the space.

7.0 CONTRACT ENTRY INTO PRCSs

As a contractor retained to perform permit space entry operations on host employer sites, for each site Williams will:

1) Obtain any available information regarding permit space hazards and entry operations from the host employer;

2) Coordinate entry operations with the host employer, when both host employer and Williams personnel will be working in or near permit spaces;

3) Inform the host employer of the permit space program that Williams will follow and of any hazards confronted or created in permit spaces either through a debriefing or during the entry operation.

8.0 ACCEPTABLE ENTRY CONDITIONS—ATMOSPHERE

Entry into a PRCS is acceptable only if the following atmospheric conditions are met:

1) Flammable gas, vapor, or mist is less than of 10 percent of its lower flammable limit (LFL);

2) Airborne combustible dust concentration is less than its LFL (this condition may be approximated as a condition in which the dust obscures vision at a distance of five feet or less);

3) Atmospheric concentration of oxygen must be within the range of 19.5 percent to 23.5 percent;

4) Atmospheric concentration of any substance for which a dose or permissible exposure limit (PEL) is published in Subpart G, "Occupational Health and Environmental Control," or in Subpart Z, "Toxic and Hazardous Substances" of this part must not be present above the PEL; and

5) No other atmospheric condition that is immediately dangerous to life or health may be present.

9.0 ISOLATION

The permit space will be removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block–and–bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

10.0 PURGING, INERTING, FLUSHING, OR VENTILATING

Environmental control within a PRCS will be accomplished by purging, inerting, flushing, and/or ventilation. The method or combination of methods will be selected based on the hazard evaluation:

1) Exhaust systems shall be designed to protect workers in the surrounding areas;
2) If the potential for flammable atmospheres exists, all lighting and electrical equipment used in the operation will be explosionproof.
3) After initial purging and ventilation has been performed, additional testing as described in Section 6.0 above will be performed to ensure that the hazardous atmosphere has been abated.
4) The ventilation system will be such that it can dilute the atmosphere below the PEL and/or 10 percent of the LFL.

11.0 TESTING

Testing and monitoring will be used to evaluate conditions in the PRCS any time entry operations will be conducted. Testing will be accomplished with properly calibrated instruments in accordance with the following guidelines:

1) Conditions will be tested in the PRCS to determine if acceptable entry conditions exist before entry is authorized to begin;
2) The PRCS will be monitored as necessary to determine if acceptable entry conditions are being maintained throughout the entry operation; and
3) When tests for atmospheric hazards are conducted, oxygen will always be tested first, followed by tests for combustible gases and vapors, and then for toxic gases and vapors.

12.0 PERMIT SYSTEM

1) Prior to entry into the PRCS, the entry supervisor will document that required measures have been completed. This documentation will be in the form of an executed entry permit (consists of permit and pre-entry checklist, *Attachments A and B*).
2) Before entry begins, the entry supervisor designated on the permit shall sign the entry permit for authorized entry.

3) The completed permit will be made available at the time of entry to all authorized entrants by posting it at the entry portal.

4) The duration of the permit will not exceed the time required to complete the assigned job or task.

5) The entry supervisor will terminate the entry and cancel the entry permit when:

   a. The entry operations covered by the permit have been completed; or

   b. A condition not allowed under the entry permit arises in or near the permit space

6) Williams will retain each canceled permit for at least one year. Any problems encountered during entry operation will be noted on the permit.

13.0 TRAINING

1) All employees authorized to enter and work in PRCSs shall be trained before assignment to such duties when there is a change in assigned duties, and whenever a change in PRCS operations results in exposure to a new hazard. Additional training will be required if there is reason to believe that there is deviation from PRCS procedures or if inadequacies in the employee's knowledge of these procedures is noted. The training will include as a minimum:

   - Hazard recognition
   - Communication
   - Protective Equipment
   - Lock-out/Tag-out Procedures
   - Respiratory Protection
   - Self-Rescue
   - Permit System

2) In addition to the above, the attendant must be trained in the following:

   - Tracking the number of entrants
   - Effects of hazard exposure
   - Monitoring multiple spaces
   - Emergency procedures as they pertain to the attendant
   - Rescue procedures.

3) A written certification indicating the above training has been accomplished will be provided for each employee who will participate in an entry operation. The certification will contain each employee's name, the signatures or initials of the trainers, and dates of the training.

14.0 DUTIES OF AUTHORIZED ENTRANTS

1) Knows the hazards that may be encountered during entry, including information on the mode of entry, signs or symptoms, and consequences of exposure;

2) Knows properly use of equipment provided for entry operation;

3) Communicates with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants to the need of evacuating the space.

4) Alert the attendant whenever:

   a. The entrant recognizes any warning sign or symptoms of exposure to a dangerous situation; or

   b. The entrant detects a prohibited condition.

5) Exit from the PRCS as quickly as possible whenever:

   a. An order to evacuate is given by the attendant or the entry supervisor;

   b. The entrant recognizes any warning sign or symptoms of exposure to a dangerous situation;

   c. The entrant detects a prohibited condition; or

   d. An evacuation alarm is activated.

15.0 DUTIES OF ATTENDANTS

1) Know the hazards that may be encountered during entry, including information on the mode of entry, signs or symptoms, and consequences of exposure;

2) Is aware of possible behavioral effects of hazard exposure in authorized entrants;

3) Continuously maintains an accurate count of authorized entrants in the PRCS and ensures that only authorized entrants are in the space;

4) Remains outside the PRCS during entry operations until relieved by another attendant;

5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.

6) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the PRCS immediately under any of the following conditions:

   a. If the attendant detects a prohibited condition;

   b. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;

   c. If the attendant detects a situation outside the space that could endanger the authorized entrants; or

d. If the attendant cannot safely perform all of his assigned duties during the entry operation.

7) Summons rescue and other emergency services as soon as determination is made that authorized entrants may need assistance to escape form PRCS hazards.

8) Takes the following actions when unauthorized persons approach or enter the PRCS while entry is underway:

a. Warns unauthorized persons to stay away from the PRCS;

b. Advises unauthorized persons that they must exit immediately if they have entered the PRCS; and

c. Informs authorized entrants and entry supervisor if unauthorized persons have entered the PRCS.

9) Performs non-entry rescues. The attendant may also enter the PRCS during a rescue effort but only if:

a. He has been replaced on the outside by another qualified person;

b. He is properly trained in rescue procedures; and

c. He has the proper personal protective equipment (PPE) and other equipment needed to conduct a safe rescue effort.

10) The attendant may perform no duties which will interfere with his primary duty to monitor and protect the authorized entrants.

16.0 DUTIES OF ENTRY SUPERVISORS

1) Knows the hazards that may be encountered during entry, including information on the mode of entry, signs or symptoms, and consequences of exposure;

2) Verifies by checking that the appropriate entrys have been made on the permit and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing the entry to begin.

3) Terminates the entry and cancels the permit as required above.

4) Verifies that rescue services are available and that the means for summoning them are operational.

5) Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and

6) Determines whenever responsibility for PRCS entry operation is transferred and, at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

17.0 RESCUE AND EMERGENCY SERVICES

Williams employees may enter a PRCS to perform a rescue operation. Employees providing such services or participating rescue and emergency service operations will comply with the following requirements:

1) Each member of the rescue service will be provided with and trained to properly use the PPE and rescue equipment necessary for making rescues from confined spaces.

2) Each member of the rescue service will be trained to perform his assigned rescue duties and will also receive the training required for authorized entrants.

3) Each member of the rescue service will practice making permit space rescues at least once every 12 months by means of simulated rescue operations in which they remove dummies, mannequins, or actual persons from actual PRCSs or representative PRCSs. Representative spaces will simulate the actual types of PRCSs from which rescues may occur in terms of opening size, configuration, and accessibility.

4) Each member of the rescue service will be trained in basic first aid and cardiopulmonary resuscitation (CPR). At least one member of the rescue service team will hold a current certification in first aid and in CPR.

To facilitate non-entry rescue, retrieval systems or methods will be used whenever an entrant enters a PRCS, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. The retrieval system will meet the following requirements:

1) Each authorized entrant will use a chest or fullbody harness, with a retrieval line attached at the center of the entrant's back, near shoulder level, or above the entrant's head. Wristletts may be used in lieu of the chest or fullbody harness if it can be demonstrated that the use of a chest or fullbody harness is impractical or creates a greater hazard and that the use of wristletts is the safest and most effective alternative.

2) The other end of the retrieval line will be attached to a mechanical device or fixed point outside the PRCS in such a manner that rescue can begin as soon as the rescuer becomes aware that it is necessary. A mechanical device will be available to retrieve personnel from vertical–type PRCSs more than five feet deep.

ATTACHMENT A
Confined Space Entry Permit
(Pre-Entry/Entry Checklist)

FORM 1-B

CONFINED SPACE ENTRY PERMIT (PRE-ENTRY/ENTRY CHECKLIST)

Date and Time Issued: ______________________

Job Site: ______________________

Equipment to be Worked On: ______________________

Date and Time Expires: ______________________

Job Supervisor: ______________________

Work to be Performed: ______________________

Pre-Entry (see Safety Procedure):

1. Atmospheric Checks: Time __________
   - Oxygen __________ %
   - Explosive __________ % LFL
   - Toxic __________ ppm

2. Source Isolation (No Entry):

	N/A	Yes	No
Pumps or lines blinded, disconnected,	( )	( )	( )
or blocked	( )	( )	( )

3. Ventilation Modification:

	N/A	Yes	No
Mechanical	( )	( )	( )
Natural Ventilation Only	( )	( )	( )

4. Atmospheric Check after Isolation and Ventilation:

Oxygen ________	%	>	19.5	%
Explosive ________	% LFL	<	10	%
Toxic ________	ppm	<	10	ppm H_2S
Time ________				

If conditions are in compliance with the above requirements and there is no reason to believe conditions may change adversely, then proceed to the Permit Space Pre-Entry Checklist. Complete and post with this permit. If conditions are not in compliance with the above requirements or there is reason to believe that conditions may change adversely, proceed to the Entry Checklist portion of this permit.

Entry (see Safety Procedure):

1. Entry, Standby and Backup Persons:

	Yes	No
Successfully completed required training?	( )	( )
Is it current?	( )	( )

2. Equipment:

	N/A	Yes	No
Direct Reading Gas Monitor Tested?	( )	( )	( )
Safety harnesses and lifelines for entry and standby persons	( )	( )	( )
Hoisting equipment	( )	( )	( )
Powered communications	( )	( )	( )
SCBAs for entry and standby persons	( )	( )	( )
Protective clothing	( )	( )	( )
All electric equipment listed Class I, Division I, Group D, and nonsparking tools	( )	( )	( )

3. Rescue Procedure:

____

____

____

____

____

____

____

____

We have reviewed the work authorized by this permit and the information contained herein. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit and Checklist Prepared by: (Supervisor) ______________________

Approved By: (Unit Supervisor: ______________________

Reviewed By (Confined Space Operations Personnel): (printed name and signature)

______________________ ______________________

______________________ ______________________

In Compliance with OSHA 29 CFR Part 1910 (Permit-Required Confined Spaces for General Industry; Final Rule)

ATTACHMENT B
Entry Permit

FORM 2

ENTRY PERMIT

________ CONFINED SPACE ________ HAZARDOUS AREA

PERMIT VALID FOR EIGHT HOURS ONLY. ALL COPIES OF PERMIT WILL REMAIN AT JOBSITE UNTIL JOB IS COMPLETED.

SITE LOCATION AND DESCRIPTION ________

PURPOSE OF ENTRY ________

SUPERVISOR(S) in charge of crews ________ Type of Crew ________ Phone Number ________

✱ BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY ✱

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lock-out/Deenergize/Try-out	____	____	**Full-Body Harness with "D" Ring**	____	____
Line(s) Broken—Capped—Blanked	____	____	**Emergency Escape Retrieval Equipment**	____	____
Purge-Flush and Vent	____	____	**Lifelines**	____	____
Ventilation	____	____	Fire Extinguishers	____	____
Secure Area (Post and Flag)	____	____	Lighting (Explosive Proof)	____	____
Breathing Apparatus	____	____	Protective Clothing	____	____
Resuscitator – Inhalator	____	____	Respirator(s) (Air-Purifying)	____	____
Standby Safety Personnel	____	____	Burning and Welding Permit	____	____

NOTE: ITEMS THAT DO NOT APPLY ENTER N/A IN THE BLANK

RECORD CONTINUOUS MONITORING RESULTS EVERY TWO HOURS **

CONTINUOUS MONITORING ** TEST(S) TO BE TAKEN:	Permissible Entry Level:									
Percent of Oxygen	**19.5% to 23.5%**									
Lower Flammable Limit	**Under 10%**									
Carbon Monoxide	**✦ 35 ppm**									
CONTAMINANTS:										
________	✦ ____ ✱ ____									
________	✦ ____ ✱ ____									
________	✦ ____ ✱ ____									
________	✦ ____ ✱ ____									

✦ Eight-Hour Time-Weighted Average: Employee can work in area eight hours (longer with appropriate respiratory protection).

✱ Short-Term Exposure Limit: Employee can work in the area up to 15 minutes.

REMARKS: ________

GAS TESTER NAME & CHECK NO.	INSTRUMENTS USED	MODEL AND/OR TYPE	SERIAL AND/OR UNIT NO.

SAFETY STANDBY PERSON(S)	CHECK NO.	NAME OF SAFETY STANDBY PERSONS	CHECK NO.

SUPERVISOR AUTHORIZING ENTRY ________ AMBULANCE ________ FIRE ________

ALL ABOVE CONDITIONS SATISFIED ________ SAFETY ________ GAS COORDINATOR ________

DEPARTMENT ________ PHONE ________ Original to ________ Copy to ________

In Compliance with OSHA 29 CFR Part 1910 (Permit-Required Confined Spaces for General Industry; Final Rule)

APPENDIX C
EQUIPMENT CALIBRATION PROCEDURES

MIE, Inc.
1 Federal Street, #2
Billerica, Massachusetts 01821-3500
U.S.A.
Telephone: 508-663-7900
Fax: 508-663-4890

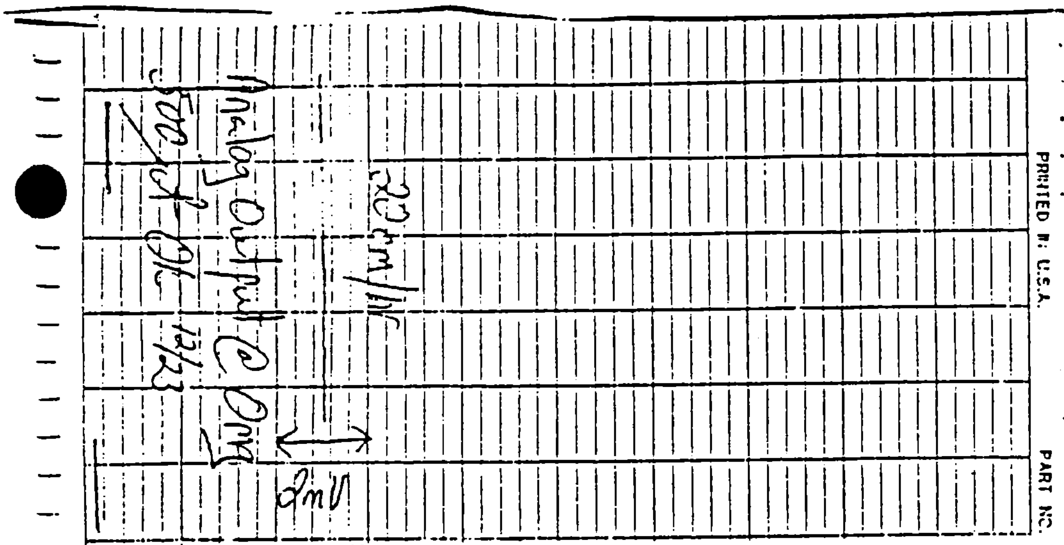
Z-BAG™ ZEROING KIT FOR MINIRAM™

Description

The MIE Z-Bag is a convenient kit for field zeroing the MIE MINIRAM. The Z-Bag provides a clean-air environment inside a sturdy plastic bag within which the MINIRAM is placed in order to zero it. The Z-Bag kit consists of a one-way flow rubber bulb for manual air pumping, a filter cartridge, a zippered plastic container, and connecting hardware.

Instructions

1. Place Z-Bag on flat surface with red flow fitting facing up. Flatten bag and then unzip it.
2. Insert ribbed elbow connector (attached to filter cartridge) into red flow fitting of plastic bag, until connector is flush with bottom of red flow fitting.
3. MINIRAM should be in its OFF condition (observe display). If display is blanked, or if MINIRAM is in the MEAS mode, key OFF.
4. Open Z-Bag and place MINIRAM inside Z-Bag, approximately at its center.
5. Key ZERO through the open end of the Z-Bag. Immediately zip close the Z-Bag and begin to pump hand bulb
6. Z-Bag should inflate as hand pumping continues, up to a height of about five inches (12 cm). Continue pumping gently to maintain bag interior pressure, until the MINIRAM displays OFF again.
7. Unzip Z-Bag and remove MINIRAM from it.
8. Store Z-Bag flattened and zipped closed, with ribbed elbow connector plugged in to ensure cleanliness of the bag interior.



MIE, Inc.
1 Federal Street, #2
Billerica, Massachusetts 01821-3500
U.S.A.
Telephone: 508-663-7900
Fax: 508-663-4890

S/N 5653

Calibration:

1) Set Dust Concentration for 2-6 mg/m³ ✓
2) Check seal of sample chamber and flow adapter ✓
3) Record calibration zero: 1.71 mg/m³ ✓
4) Record 15 min. PDM average (TWA): 2.36 mg/m³ ✓
5) Record 15 min. Master average (ASA): 2.31 mg/m³ ✓
6) Confirm that PDM reads within ± .05 mg/m³ of RAM-1 ✓

Final Assembly:

1) Inspect sample chamber for excessive calibration dust ✓
2) Inspect battery pack for fit with front bezel (flush to 1/16 in.) ✓
3) Record average zero readings with battery pack: 1.73 mg/m³ ✓
4) Install belt clip ✓
5) Attach labels square to housings ✓
6) Attach Sun Shield ✓

Final Test:

1) Record clean room zero: 1.65 mg/m³ ✓
2) Record reading with Sun Shield only: ____ mg/m³ N/A
3) If Ref. Scat is included with unit enter value here and in log book ____ mg/m³
4) Test digital output ✓
5) Test analog output, attach recorder sample ✓
6) Life test (12 hour minimum) ✓
7) Charge battery fully, approx 8.5 VDC @ 8 hours ✓
8) Turn off instrument ✓
9) Record S/N above and record S/N and calibration data in log book ✓

Technician [signature]   Date 23 Dec. 92

Rev. 8/20/92 MONITORING INSTRUMENTS for the ENVIRONMENT, INC.

A TRC COMPANY

BACHARACH

INSTRUCTION 51-9915

SNIFFER® 505

Part Number 51-7264

Installation/Operation/Maintenance
Rev. 2 - June 1990

FM
APPROVED

WARNING!

Because this instrument is used to detect and monitor materials and conditions which are listed by OSHA or others as potentially hazardous to personnel and property, the information in this manual must be fully understood and utilized to ensure that the instrument is operating properly and is both used and maintained in the proper manner by qualified personnel. An instrument that is not properly calibrated, operated and maintained by qualified personnel is likely to provide erroneous information, which could prevent user awareness of a potentially hazardous situation for the instrument user, other personnel and property.

If, after reading the information in this manual, the user has questions regarding the operation, application or maintenance of the instrument, supervisory or training assistance should be obtained before use. Factory assistance is available by calling (412) 963-2000.

Bacharach, Inc.
625 Alpha Drive, Pittsburgh, PA 15238-2878 (412) 963-2000

Printed in U.S.A.

4.3 CALIBRATION AND ADJUSTMENT, GENERAL

4.3.1 Scope

Subsections 4.3 thru 4.7 define the procedures necessary for calibrating and adjusting the circuits in the Sniffer 505. The instrument is designed for direct %L.E.L. readings when sampling methane-in-air mixtures. Therefore, to calibrate the instrument's combustible sensor, a methane-in-air mixture is used. Consult Appendix "A" for conversion factors when a methane calibrated Sniffer 505 is used on combustibles other than methane.

4.3.2 Equipment Required

- CALIBRATION KIT - Part No. 51-7324. (See Fig. 4-2).
- GAS CYLINDER, 1.0% METHANE-IN-AIR - Part No. 51-1818
- GAS CYLINDER, ZERO CALIBRATION GAS - Part No. 51-7131
- GAS CYLINDER, 20 PPM H_2S-IN-NITROGEN - Part No. 51-1993
- SMALL SCREWDRIVER, 3/32" BLADE, XCELITE R3323 OR EQUIVALENT
- DIGITAL VOLTMETER, ±0.5% ACCURACY OR BETTER*

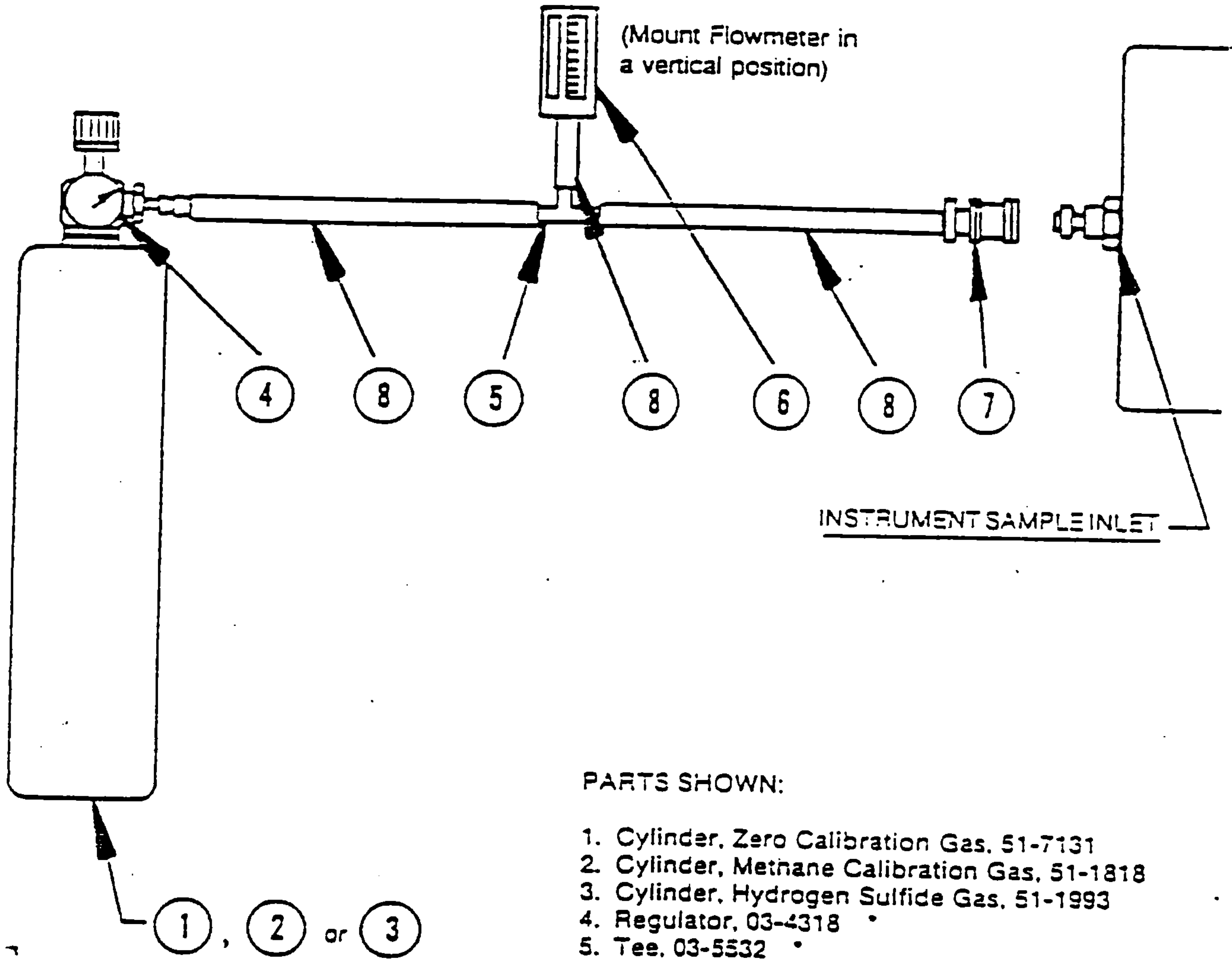
4.3.3. Adjusting Sensor Voltage

The sensor voltage is factory adjusted to 3.70 ±0.10 VDC and should never need further adjustment, unless components on the printed circuit board are replaced or the adjustment itself (R27) has been tampered with. If it becomes necessary to make this adjustment, proceed as follows:

1. Loosen the four thumbscrews retaining front panel. First lift up right-hand side of panel, then lift entire panel clear of case.
2. See Fig. 4-3 and connect a digital voltmeter as follows:
   positive lead to TP-7;
   negative lead to TP-6.
3. Turn the FUNCTION switch to the BATTERY TEST position and observe the digital voltmeter indication. If the indication is not 3.70 ± 0.10 volts, adjust Sensor Voltage pot R27 (Fig. 4-5) to obtain this value.
4. Re-position the front panel and tighten the thumbscrews.

---

*Needed only when performing the optional sensor voltage adjustment procedure described in Paragraph 4.3.3.



PARTS SHOWN:

1. Cylinder, Zero Calibration Gas, 51-7131
2. Cylinder, Methane Calibration Gas, 51-1818
3. Cylinder, Hydrogen Sulfide Gas, 51-1993
4. Regulator, 03-4318 *
5. Tee, 03-5532 *
6. Flowmeter, 06-6163 *
7. Connector, 03-5393 *
8. Tubing, 03-6109 *

* CONTAINED IN CALIBRATION KIT 51-7324

Figure 4-2. Calibration Set-Up

4.4 CALIBRATION OF OXYGEN DETECTOR

4.4.1 Oxygen Zero Adjustment

1. Turn the FUNCTION switch to the BATTERY TEST position. Press the TEST switch and observe the %O_2 meter indication. If the indication is zero, no further adjustment is necessary. If not, proceed with Step 2.

2. Loosen the four thumbscrews retaining the front panel. First lift up the right-hand side of the panel, then lift the entire panel clear of the case.

3. While pressing the TEST switch, adjust Oxygen Zero pot R7 (see Fig. 4-5) for a %O_2 meter indication of zero.

4. Re-position the front panel and tighten the thumbscrews.

4.4.2 Oxygen Calibrate Adjustment

1. Turn the FUNCTION switch to the %O_2 position.

2. Place the instrument in fresh air. If there is doubt about the quality of the surrounding air, proceed with Step 3. If not, proceed to Step 5.

3. Connect a Zero Calibration Gas Cylinder (Part No. 51-7131) and the Calibration Kit (Part No. 51-7324) together as shown in Fig. 4-2. Connect the gas output of this setup to the instrument's SAMPLE INLET.

4. Adjust the regulator on the calibration setup until the ball in the flowmeter just begins to rise (indicating a positive pressure in the gas-supply line).

5. Unlock the OXYGEN CALIB knob and adjust it for a %O_2 meter indication of 21 or at the CAL mark. Relock OXYGEN CALIB knob.

6. If using the gas cylinder, disconnect the calibration setup and unscrew the cylinder from the regulator.

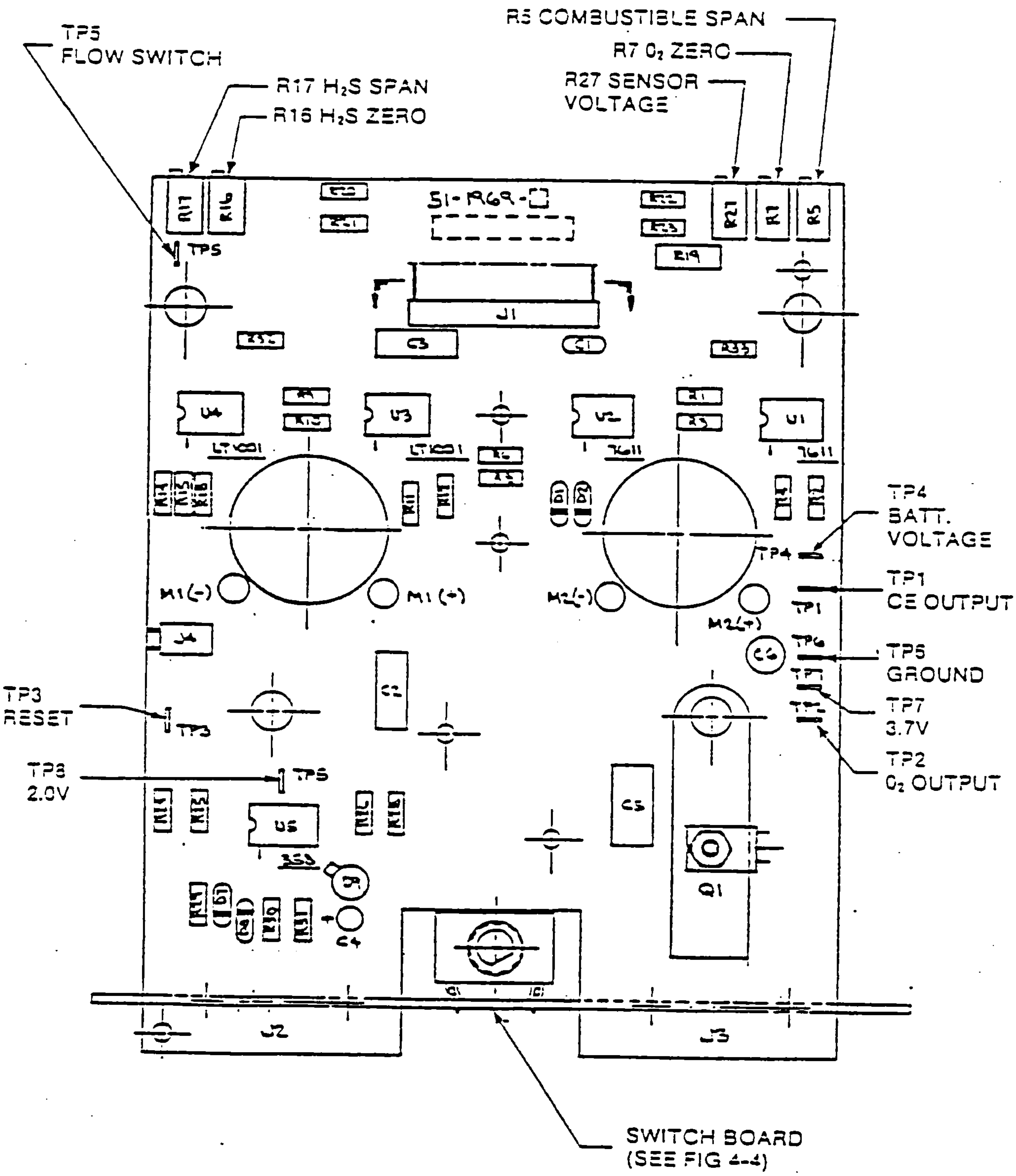


Figure 4-3. Main PC Board Test Point and Potentiometer Layout

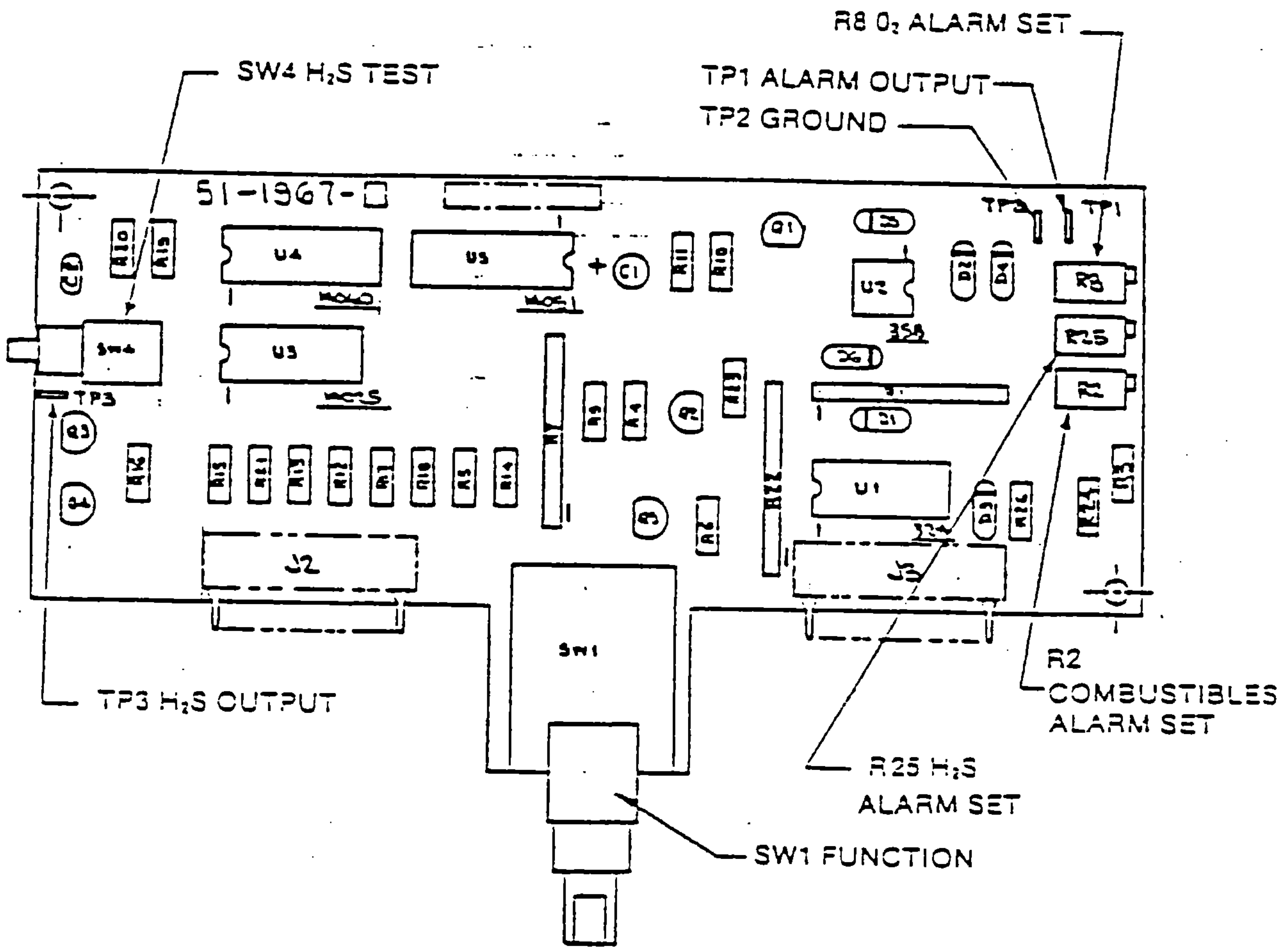


Figure 4-4. Switch Board Test Point, Switch, and Potentiometer Layout

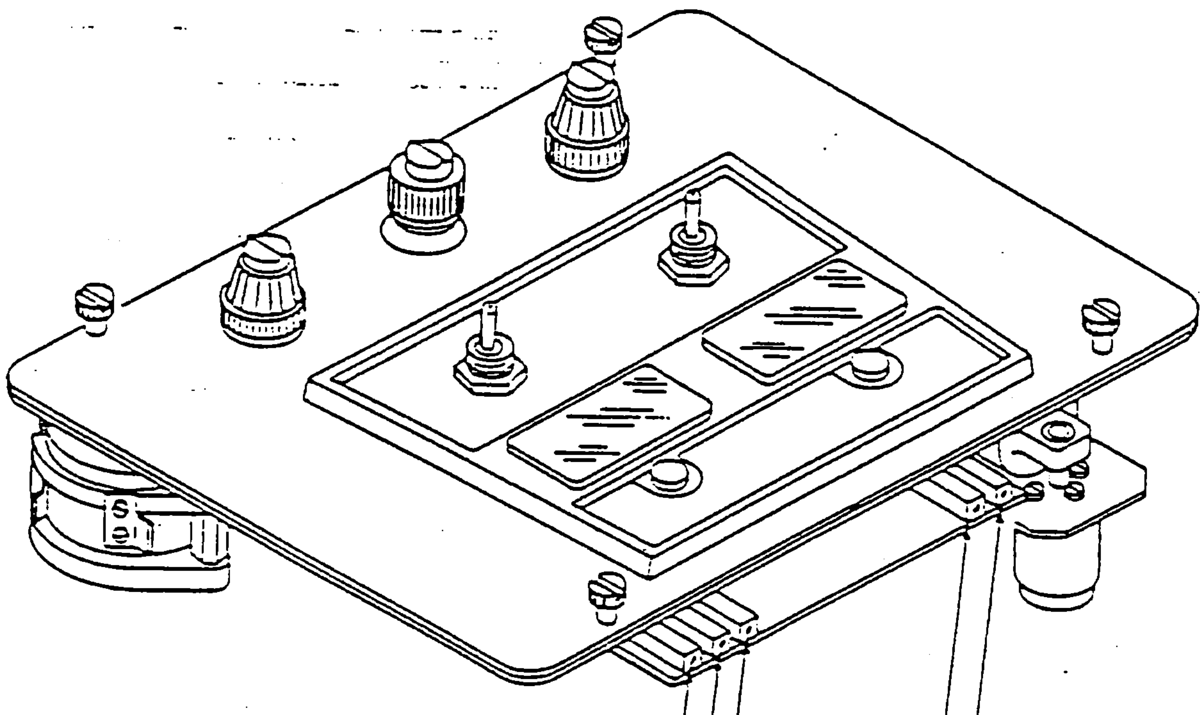


Figure 4-5. Calibration Adjustments

4.5 CALIBRATION OF THE COMBUSTIBLES DETECTOR

4.5.1 Disabling the Audible Alarm

To eliminate the annoyance of the audible alarm sounding during the calibration of the detector and alarm circuits, the audible alarm can be disabled. Note that all meter functions and visual alarms will continue to operate normally.

To disable the alarm, proceed as follows:

1. Loosen the four thumbscrews retaining the front panel. First lift up the right-hand side of the panel, then lift the entire panel clear of the case.

2. Pull apart the 4-conductor plug that is connected to the audible alarm, the battery charger jack and the remote alarm jack.

3. Proceed with the calibration and alarm trip-point procedures.

4. After adjustment, reconnect the 4-conductor plug. Then press the TEST switch to verify operation of the audible alarm.

4.5.2 Calibrating the % LEL Range

1. Turn the FUNCTION switch to the BATTERY TEST position. Verify that the batteries have a sufficient charge. If not, refer to Paragraph 4.2.2 and charge the batteries.

2. Allow 5 minutes for the instrument to warm up.

3. Turn the function switch to the %O_2 or PPM H_2S position.

4. See Fig. 4-2 and connect the zero calibration gas cylinder 51-7131 to the instrument. Adjust the regulator until the ball in the flowmeter just begins to rise (indicating a positive pressure in the gas-supply line).

5. Allow the zero calibration gas to flow for 1 minute; then use the COMB. ZERO ADJ control to zero the combustibles meter.

6. Unscrew the calibration gas cylinder from the regulator and replace it with the 1% Methane-in-Air cylinder, 51-1818. Adjust the regulator until the ball in the flowmeter just begins to rise.

7. Allow the gas to flow for 1 minute; then read the %L.E.L. meter.

8. The methane cylinder has a concentration value stamped on its label. To determine the desired meter indication, use the formula:

% LEL Meter Calibration Value = % Methane in Cylinder x 20% LEL

9. Compare the %L.E.L. meter indication in Step 7 to the calibration value calculated in Step 8. If the meter indication is within ±5% LEL of the calibration value, no further adjustment is required. Otherwise proceed with Step 10.

10. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel, without disconnecting the calibration setup, to gain access to the Combustibles Span pot, R5, shown in Fig. 4-5.

11. Adjust pot R5 using a small screwdriver until the meter indication matches the calibration value from Step 8.

12. Re-position the front panel and secure the four thumbscrews. Remove the calibration setup and disconnect the gas cylinder from the regulator.

4.6 CALIBRATION OF THE HYDROGEN SULFIDE DETECTOR

4.6.1 Adjusting the Hydrogen Sulfide Zero

1. Turn the FUNCTION switch to PPM H_2S.

   - Allow the sensor to warm up for 1 minute.
   - Observe the PPM H_2S meter indication.
   - If the indication is at or close to zero, no further adjustment is necessary.
   - If not, proceed with Step 2.

2. Loosen the four thumbscrews retaining the front panel.

3. Lift the right-hand side of the panel to gain access to H_2S zero potentiometer R16 (Fig. 4-5).

4. Adjust potentiometer R16 until the PPM H_2S meter indicates zero.

5. Reposition the front panel and tighten the thumbscrews.

4.6.2 Adjusting the Hydrogen Sulfide Span

1. Turn the FUNCTION switch to PPM H_2S.

2. Allow the sensor to warm up for 1 minute.

3. See Fig. 4-2 and connect 20 PPM H_2S gas cylinder 51-1993 to the instrument.

4. Adjust the regulator until the ball in the flowmeter just begins to rise.

5. Allow the gas to flow for 1 minute.

6. Loosen the four thumbscrews retaining the front panel.

7. Without disconnecting the calibration setup, lift the right-hand side of the panel to gain access to the H_2S span potentiometer R17 (see Fig. 4-5).

8. Adjust potentiometer R17 using a small screwdriver until the PPM H_2S meter shows 20 PPM.

9. Reposition the front panel, secure the four thumbscrews, remove the calibration setup, and disconnect the gas cylinder from the regulator.

4.7 ADJUSTING THE ALARM TRIP POINTS

4.7.1 Adjusting the Oxygen Deficiency Alarm Point

1. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel to gain access to the O_2 Alarm Set pot, R8, shown in Fig. 4-6.

2. Turn pot R8 fully counterclockwise.

3. Unlock the OXYGEN CALIB knob and adjust it until the $\%O_2$ meter indicates the concentration of the desired trip point.

4. Turn pot R8 clockwise <u>very</u> slowly and stop as soon as the oxygen alarm activates.

5. Turn OXYGEN CALIB knob clockwise and press the RESET switch to clear the alarm.

6. While observing the $\%O_2$ meter, slowly turn OXYGEN CALIB knob counterclockwise and verify that the alarm activates at the desired trip point. Again turn OXYGEN CALIB knob clockwise and press the RESET switch to clear the alarm.

7. Readjust the OXYGEN CALIB control per Paragraph 4.4.2.

8. Re-position the front panel and tighten the thumbscrews.

4.7.2 Adjusting the Combustibles Alarm Point

1. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel to gain access to the Combustibles Alarm Set pot, R2, shown in Fig. 4-6.

2. Turn pot R2 fully clockwise.

3. Unlock the COMB. ZERO ADJ knob and adjust it until the %L.E.L. meter indicates the concentration of the desired trip point.

4. Turn pot R2 counterclockwise <u>very</u> slowly and stop as soon as the combustibles alarm activates.

5. Turn COMB. ZERO ADJ knob counterclockwise and press the RESET switch to clear the alarm.

6. While observing the %L.E.L. meter, slowly turn COMB. ZERO ADJ knob clockwise and verify that the alarm activates at the desired trip point. Again turn COMB. ZERO ADJ knob counterclockwise and press the RESET switch to clear the alarm.

7. Readjust the COMB. ZERO ADJ control for a %L.E.L. meter indication of zero. Then relock the COMB. ZERO ADJ control.

8. Re-position the front panel and tighten the thumbscrews.

4.7.3 Adjusting the Hydrogen Sulfide Alarm Point

1. Loosen the four thumbscrews retaining the front panel.

2. First lift the right-hand side of the panel, then lift the entire panel clear of the case.

3. Turn the FUNCTION switch to the PPM H_2S position.

4. Press and hold the H_2S test switch, shown in Fig. 4-4. This will trigger the H_2S alarm and display its alarm set point on the PPM H_2S meter.

5. Adjust the H_2S Alarm Set pot R25, shown in Fig. 4-6, so that the PPM H_2S meter displays the desired alarm set point.

6. Release the H_2S test switch and press the reset switch to clear the alarm.

7. Reposition the front panel and tighten the thumbscrews.

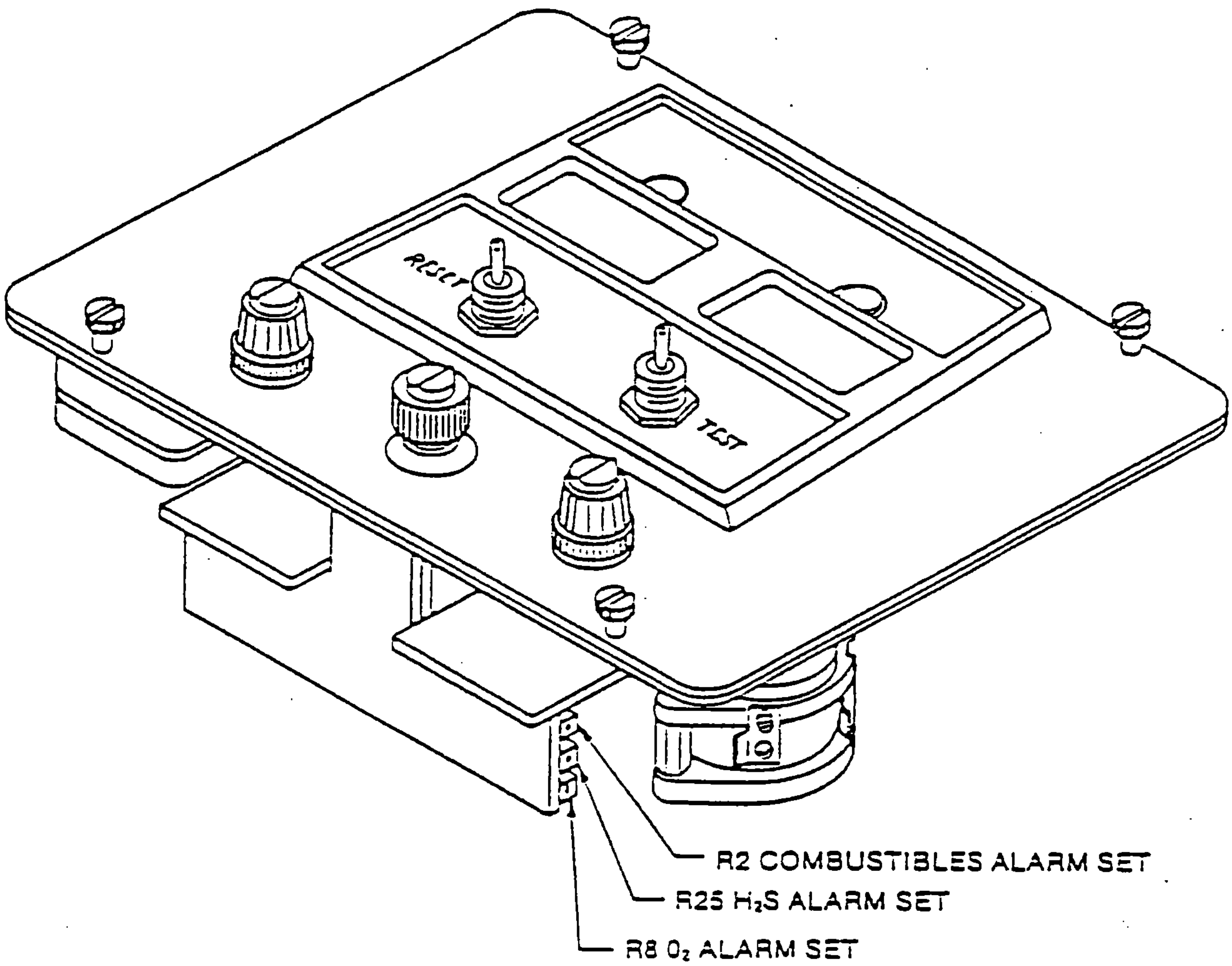
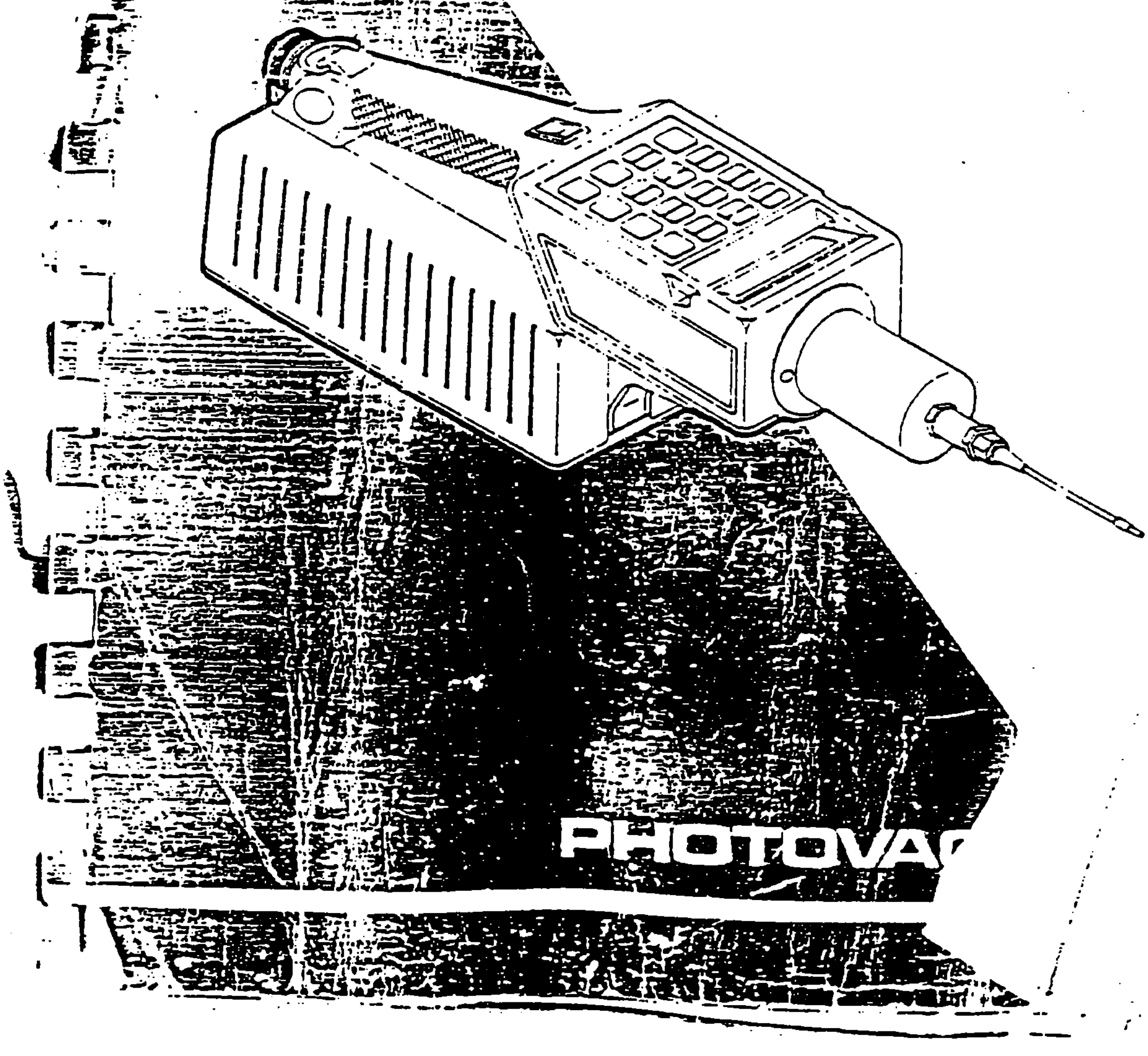


Figure 4-6. Alarm Adjustment Locations

MICROTIP

HAND HELD AIR MONITOR/PHOTOIONIZATION DETECTO.

User's Manual



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The PLAY function provides a speed search to find the desired start and stop Event numbers for printing or graphing.

8
CAL

2.14 CAL

MicroTIP must be calibrated in order to display concentration in units equivalent to ppm. First a supply of "Zero Gas" which contains no ionizable gases or vapors is used to set MicroTIP's zero point. Then, "Span Gas" containing a known concentration of an ionizable gas or vapor, is used to set the response factor.

Usually clean outdoor air will be suitable as Zero Gas. If there is any doubt, use a commercial source of Zero Grade Gas and a second sampling bag. A supply of Span Gas of the desired compound and concentration must be obtained for calibration. Observe proper handling techniques for all gases.

Isobutylene at 100 ppm in air is recommended as Span Gas. To calibrate the instrument use the Calibration Kit (Photovac Part No. 390033) as follows:

1. Connect the supplied regulator to the Span Gas cylinder. Hand tighten the fittings.
2. Open the valve on the gas bag by turning the valve stem fully counterclockwise.
3. Attach the gas bag adapter nut to the regulator. Hand tighten the fittings.
4. Turn the regulator knob counterclockwise about half a turn to start the flow of gas.
5. Fill the gas bag about half full and then close the regulator fully clockwise to turn off the flow of gas.
6. Disconnect the bag from the adapter and empty it. Flush the bag a few times with the Span Gas and then fill it.
7. Close the gas bag by turning the valve clockwise.
8. Press SETUP and select the desired Cal Memory with the arrow keys and press ENTER. Press EXIT to leave Setup.
9. Press CAL and expose MicroTIP to Zero Gas. Press ENTER and MicroTIP sets its zero point.
10. MicroTIP then asks for the Span Gas concentration. Enter

Cal memory ?
1

Connect zero gas
then press ENTER

Span conc ? ppm
100.00

Calibrating now,
please wait...

the known Span Gas concentration and then connect the Span Gas bag adapter to the inlet.

11. Press ENTER and MicroTIP sets its response factor.
12. When MicroTIP's display reverts to normal, MicroTIP is calibrated and ready for use. Remove the Span Gas bag from th inlet.

MicroTIP has 5 Cal Memories and can be calibrated with 5 different span gases if desired. Only one Cal Memory can be used at a time. Each memory stores a different zero point and response factor. To program the Cal Memories:

1. Press SETUP and select the desired Cal Memory (1 to 5) wit the arrow keys.
2. Exit from Setup and press CAL.
3. Follow the displayed calibration instructions. When the calibration is completed it is automatically stored in the selected Cal Memory.

Whenever the instrument is calibrated, MicroTIP updates the selecte Cal Memory. The instrument should be calibrated once a day.

MicroTIP can also be used as a high sensitivity leak detector. When High Sensitivity is selected in Setup, only Zero Gas is required for calibration. MicroTIP does not read directly in ppm but shows a reading proportional to the concentration of ionizable gases and vapors in the sample. During calibration in High Sensitivity MicroTIF does not ask for Span Gas but automatically sets itself to the maximum response factor.

5
PRINT

2.15 PRINT

MicroTIP is compatible with Epson FX-80®-type serial dot matrix printers. The printer must be set to 8 data bits and 1 stop bit to communicate with MicroTIP. Refer to the printer user's manual for more information.

To print recorded data:

1. Use the printer cable and suitable adapter (Photovac Part 395006) to connect the MicroTIP I/O connector to the pri
2. Press the PRINT key and then the * key to select the de setup options.

ENTER to Print
* for Options

Start at Event ?
001

Stop with Event?
024

Baud rate ?
9600

Parity ?
None

Printing now,
please wait...

3. MicroTIP will ask for the number of the start and stop Events. Enter the desired values and press ENTER.

4. Enter the baud rate and parity. These values are specific to the type of printer being used. Again, refer to the printer user's manual for more information.

When the setup is correct, ensure the printer is on line and press ENTER. MicroTIP will format the selected data and calculate an averaging interval so that all Events between the selected start and stop Events will fit on one page. The following information is printed:

a. The number of readings in an interval and the length of the interval are printed at the top of the page.

   In Figure 3 there are 14 readings in an interval and the interval is 210 seconds long. MicroTIP always stores one set of readings (Min, Avg and Max) each 15 seconds.

b. The interval start time.

c. The lowest Event number in the interval, only if the Event number has changed.

d. The highest priority status of the interval.

e. Space for the user to add Notes to the report. Notes could include identification of particular samples or sampling location based on Event numbers.

While the information is being printed, the display shows that printing is in progress. The keypad will not accept commands until the present print job has been completed.

In order to print all information between two Events, the averaging interval should be one reading or 15 seconds. The start and stop Events can be adjusted to obtain this averaging interval.

Pressing EXIT during printing stops the job and the display reverts to normal.

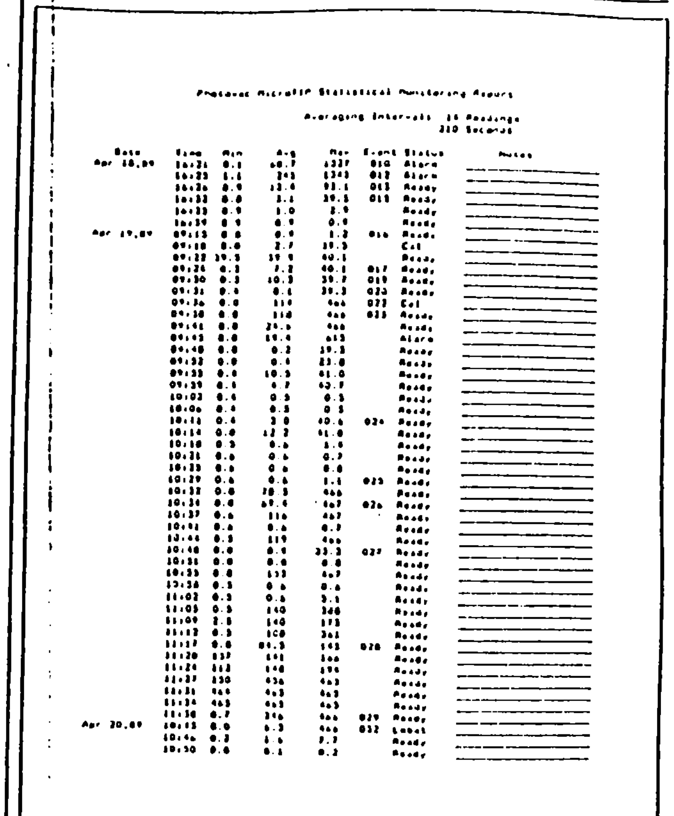

Figure 3 Printed Output

6
GRAPH

2.16 GRAPH

Pressing the GRAPH key also prints the recorded data but in graphical format. See Figure 4. The same printer and MicroTIP setup must be selected as for the Print command.

When the setup is correct, ensure the printer is on line and press ENTER. Again MicroTIP will format the selected data and calculate averaging interval so that all Events between the selected start a stop Events will be graphed and so that the graph is kept on a page.

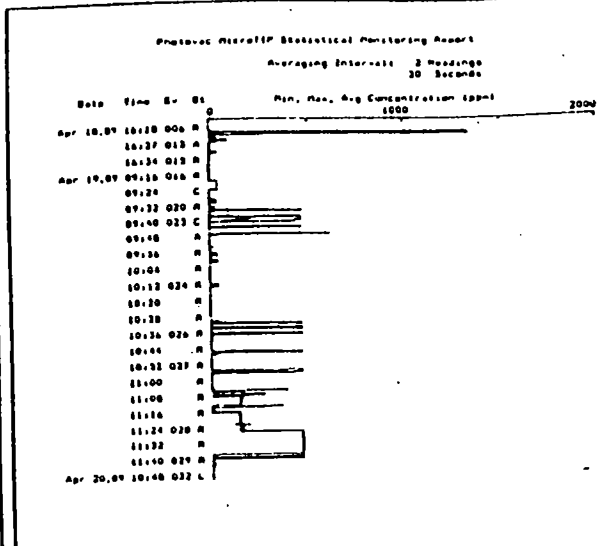

Figure 4 Graphed Output

The following information is printed with GRAPH:

a. The number of readings in an interval and the length of the interval is printed at the top of the page. In Figure 4 there are 2 readings in an interval and the interval is 30 seconds long.

b. Time is printed once every 16 intervals. This time will be the start time of the next 16 intervals.

c. The lowest Event number of the 16 intervals is printed, only if it has changed from the previous set of 16 intervals.

d. The highest priority status of the 16 intervals is printed.

While the information is being printed, the display shows that printing is in progress. The keypad will not accept commands until the present print job has been completed.

Pressing EXIT during printing stops the job and the display reverts to normal.

Chapter 3 Accessories and Other Devices

3.1 COMPUTER

MicroTIP will send information stored in its datalogger to either a printer or to a computer. The computer must be set up to emulate a terminal. Connect the computer's serial port to MicroTIP's I/O connector using the printer cable and a suitable adapter (Photovac Part No. 395006). The computer must be set to 8 data bits and 1 stop bit for communication. Use the PRINT key , not the GRAPH Key. See Section 2.15.

3.2 CHART RECORDER

MicroTIP's output can be displayed as a 0-1V analog voltage on a chart recorder in real time. Set the chart recorder to 1V full scale and connect it to MicroTIP's I/O connector using the analog output cable (Photovac Part No. 395005). The concentration range of the analog output signal is selected with the SETUP key, and can be 0-20, 0-200, or 0-2000 ppm full-scale.

3.3 HEADPHONES

Connection and operation of the headphones (Photovac Part No. 395004) is described in Section 2.11.

3.4 SAMPLE BAG

MicroTIP is equipped with a sample outlet fitting (See Figure 1.) from which samples may be collected for further analysis. Connect a sample bag to the fitting with a short length of 1/8" inside diameter flexible tubing.

NOTE: MicroTIP's reading may fluctuate due to changes in detector flowrate as the sample bag is filling. The bag contents will not perfectly represent the sample. Some ozone produced by MicroTIP's detector will be present, and sample composition may have been changed by passage through MicroTIP's sampling pump.

3.5 THREE-METER (9.8FT) SAMPLE LINE

For remote sampling, connect the 3m sample line to Micr' sample inlet in place of the 17cm sample probe supplie'

APPENDIX D
HEAT STRESS

HEAT STRESS

(Adopted Threshold Limit Values (1987–1988)

WORK-REST REGIMEN

These threshold limit values (TLVs) refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The TLVs shown in *Table 1* are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C.

TABLE 1
PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(Values are given in °C WBGT)

	WORK LOAD		
WORK-REST REGIMEN	**LIGHT**	**MODERATE**	**HEAVY**
Continuous Work	30.0	26.7	25.0
75% Work-25% Rest, Each Hour	30.6	28.0	25.9
50% Work-50% Rest, Each Hour	31.4	29.4	27.9
25% Work-75% Rest, Each Hour	32.2	31.1	30.0

1. WORK LOAD CATEGORIES

Heat produced by the body and the environmental heat together determine the total heat load. Therefore, if work is to be performed under hot environmental conditions, the workload category of each job shall be established and the heat exposure limit pertinent to the workload evaluated against the applicable standard in order to protect the worker exposure beyond the permissible limit.

The workload category may be established by ranking each job into light, medium, and heavy categories on the basis of type of operation. Where the workload is ranked into one of said three categories, i.e.,

a. **Light work (up to 200 kcal/hr or 800 Btu/hr):** e.g., sitting or standing to control machines, performing light hand or arm work,

b. **Moderate work (200–350 kcal/hr or 800–1400 Btu/hr):** e.g., walking about with moderate lifting and pushing or

c. **Heavy work (350–500 kcal/hr or 1400–2000 Btu/hr):** e.g., pick and shovel work,

The permissible heat exposure limit for that workload shall be determined from *Table 1*.

2. WORK-REST REGIMEN

The permissible exposure limits specified in *Table 1* and *Figure 1* are based on the assumption that the WBGT value of the resting place is the same or very close to that of the workplace.

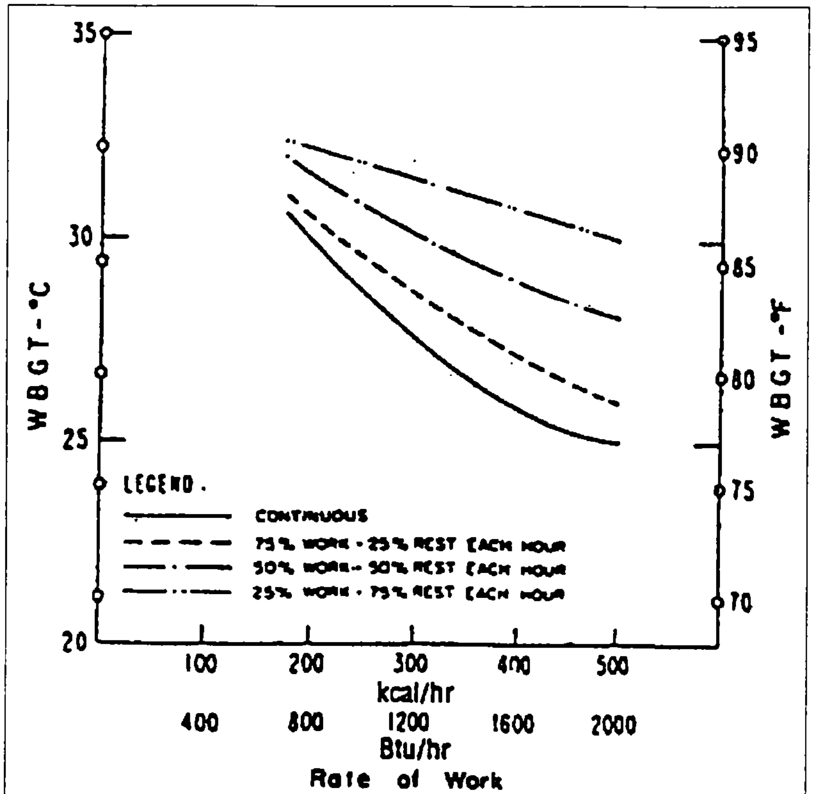

FIGURE 1-PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES

The permissible exposure limits for continuous work are applicable where there is a work-rest regimen of a five-day work week and an eight-hour work day with a short morning and afternoon break (approximately 15 minutes). Higher exposure limits are permitted if additional resting time is allowed. All breaks, including unscheduled pauses and administrative or operational waiting periods during work, may be counted as rest time when additional rest allowance must be given because of high environmental temperatures.

3. CLOTHING

The permissible heat exposure TLVs are valid for light summer clothing as customarily worn by workers when working under hot environmental conditions. If special clothing is required for performing a particular job and this clothing is heavier or it impedes sweat evaporation or has higher insulation value, the worker's heat tolerance is reduced, and the permissible heat exposure limits indicated in *Table 1* and *Figure 1* are not applicable. For each job category where special clothing is required, the permissible heat exposure limit shall be established by an expert.

4. ACCLIMATIZATION AND FITNESS

Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during this first week of exposure to hot environmental conditions. The recommended heat stress TLVs are valid for acclimated workers who are physically fit. Extra caution must be employed when unacclimated or physically unfit workers must be exposed to heat stress conditions.

HEAT STRESS (PREVENTIVE MANAGEMENT)

Adverse weather conditions are important considerations in planning and conducting site operations. Hot or cold weather can cause physical discomfort, loss of efficiency, and personal injury. Of particular importance is heat stress resulting when protective clothing decreases natural body ventilation.

Provide plenty of liquids. To replace body fluids (water and electrolytes) lost because of sweating, use a 0.1 percent saltwater solution, more heavily salted foods, or commercial mixes. The commercial mixes may be preferable for those employees on a low-sodium diet.

Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. The scale should be accurate to plus or minus one-quarter pound. BWL should not exceed 1.5 percent of the total body weight. If it does, the worker should be instructed to increase his daily intake of fluids by the weight lost. Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable four-ounce cups and water that is maintained at .50–60°F. Urge workers to drink one to two of these cups of water every 20 minutes for a total of one to two gallons per day. Provide a cool, preferably air-conditioned area, for rest breaks. Discourage the use of alcohol during nonworking hours, and discourage the intake of coffee during working hours. Monitor for signs of heat stress.

Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 80°F, workers should be monitored for heat stress after every work period. The following are important considerations.

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.
2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period

should not exceed 99.6°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.6°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure it has dropped below 99.6°F.

Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.

3. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. Long cotton underwear acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing. It should be the minimum under-garment worn.

   Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.

   In extremely hot weather, conduct nonemergency response operations in the early morning or evening.

   Ensure that adequate shelter is available to protect personnel against heat, cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of accidents.

   In hot weather, rotate shifts of workers wearing impervious clothing.

4. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

HEAT STRESS CONDITIONS

1. HEAT CRAMPS

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- **Symptoms**—Acute painful spasms of voluntary muscles, e.g., abdomen and extremities.
- **Treatment**—Remove victim to a cool area and loosen clothing. Have patient drink one to two cups water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be one to two gallons per day. Consult with physician.

2. HEAT RASH

Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. The condition decreases ability to tolerate heat.

- **Symptoms**—Mild red rash, especially in areas of the body in contact with protective gear.
- **Treatment**—Decrease amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

3. **HEAT STROKE**

Heat stroke is nonacute and dangerous reaction to heat stress caused by a failure of heat-regulating mechanisms of the body—the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- **Symptoms**—Red, hot, dry skin, although person may have been sweating earlier; nausea, dizziness; confusion; extremely **high** body temperature; rapid respiratory and pulse rate; unconsciousness or coma.
- **Treatment**—Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool, but not cold, water; sponge the body with cool water or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages.

4. **HEAT EXHAUSTION**

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.

Symptoms—Pale, clammy, moist skin; profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.

Treatment—Remove the person to a cool, air-conditioned place, loosen clothing, place in a head-low position, and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink one to two cups water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be about one to two gallons per day.

APPENDIX E
COLD STRESS

APPENDIX E
COLD STRESS

These Threshold Limit Values (TLVs) are intended to protect workers from the severest effects of cold stress (hypothermia) and cold injury, and to describe exposures to cold working conditions under which is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body core temperatures from falling below 36°C and to prevent cold injury to body extremities. Deep body temperature is the core temperature of the body as determined by rectal temperature measurements. For a single, occasional exposure to a cold environment a drop in core temperature to no more than 35°C should be permitted. In addition to provisions for total body protection, the TLV objective is to product all parts of the body, with emphasis on hands, feet, and head from cold injury. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: ① shivering; ② apathy, listlessness, sleepiness, and rapid cooling of the body to less than 95°F; ③ unconsciousness, glassy stare, slow pulse, and slow respiratory rate; ④ freezing of the extremities; and, finally, ⑤ death.

Workmen should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (96.8°F); lower body temperatures will vary and likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness, with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers, and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, whole-body protection must be provided.

1. Adequate insulating clothing to maintain core temperatures above 36°C must be provided to workers if work is performed in air temperatures below 4°C (40°F). Wind chill factor or the cooling power of the air is a critical factor. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. An equivalent chill temperature chart relating the actual dry bulb air temperature and the wind velocity is presented in the Wind Chill Chart. The

equivalent chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of cold stress factors and the medical condition of the worker.

3. Employees shall be excluded from work in cold at -1°C (30°F) or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below -24°C (-10°F) with wind speeds less than five miles per hour, or air temperatures below -18°C (0°F) with wind speeds above five miles per hour should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment.

In cold environments, wind-chill temperature is a better description of thermal conditions than the ambient temperature alone. The wind adds to the rate of cooling and it is the combination of wind speed and air temperature that is most important. In the wind-chill chart, arbitrary risks of frost bite are given for short exposure periods. For example, at a wind-chill temperature of -25 (from a 5°F temperature and 15 mph wind), exposed flesh may freeze within one minute. However, fingers, toes, nose tips, ears, or cheeks may become frost bitten at ambient temperatures as high as 32.8°F with high windows. This is approximately the freezing point of skin in the absence of subcooling.

Hypothermia (general lowering of body temperature) can occur from exposure to conditions well above freezing. The lethal deep body temperature is placed at about 78°F. This condition can occur where a worker is immersed in cold water (divers), is exposed to cool, high winds, is in a state of physical exhaustion, or has insufficient food. Alcohol should not be consumed in cold environments because the resultant dilation of blood vessels can permit a rapid loss of body heat, increasing the risk of hypothermia. For warming purposes, liquid intake should be hot nonalcoholic beverages or soup.

FROST BITE

1. **Frost nip or incipient frostbite.** The condition is characterized by sudden blanching or whitening of skin.
2. **Superficial frostbite.** Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
3. **Deep frostbite.** Tissues are cold, pale, and solid; extremely serious injury.

Frostbite may be either superficial involving only the skin or deep, extending below the skin. Frostbite may be considered to be superficial if exposure time is short. Otherwise, assume the injury to be deep and therefore serious, in which case it should be treated at a hospital rather than in the field. Superficial frostbite can be treated by:

1. Covering the cheeks with warm hands until pain returns;
2. Placing uncovered frostbitten fingers under the opposing armpit next to the skin;
3. Placing a bare frostbitten feet under the clothing against the skin of a companion;
4. Never rewarm a frostbitten part by massage, exposure to open fire, cold water soaks, or rubbing with snow. Gradual rewarming against the skin is always preferred. It is important to know that pain will occur when thawing has occurred; and
5. Where deep frostbite exists, it is essential to get the patient to the hospital as quickly as possible. Frozen parts should be protected from additional cold injury but no attempts should be made to thaw them in the field. The patient should also be kept warm.

For work practices at or below -12°C (10°F) equivalent chill temperature (ECT), the following shall apply:

1. The worker shall be kept under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
3. New employees shall not be required to work full time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing shall be included in estimating the required work performance and weight to be lifted by the worker.

5. The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers shall be instructed in health and safety procedures. The training program shall include, as a minimum, instruction in:
   a. Proper rewarming procedures and appropriate first aid treatment.
   b. Proper clothing practices.
   c. Proper eating and drinking habits.
   d. Recognition of impending frostbite.
   e. Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
   f. Safe work practices.

Special caution shall be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow- and/or ice-covered terrain shall be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals are required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C (60°F) to enable overall compliance with the requirements of the TLV to be maintained.

In outdoor situations, the windspeed should be measured and recorded at least every four hours, together with the air temperature whenever the air temperature is below -1°C (30°F).

For exposed skin, continuous exposure should not be permitted when the air speed results in an equivalent chill temperature of -32°C (-25°F). Superficial or deep local tissue freezing will occur at temperatures below -1°C regardless of wind speed.

WORK-WARMING REGIMEN

If work is performed continuously in the cold at an ECT or below -7°C (20°F), heated warming shelters (tents, cabins, restrooms, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending upon the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm, sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect.

PROTECTIVE CLOTHING

1. Clothing for both cold-wet (moderate cold weather above 14°F) and cold-dry (temperatures below 14°F) should be available.
2. Clothing worn loosely and in layers provides maximum protection because the trapped layers of warm air are more effective insulators than the cloth itself.
3. Clothing must be kept dry. If not, the exposure to cold must be altered with periods of rewarming and drying of clothes.
4. Moisture should be kept off clothes by brushing or shaking snow from it prior to entering heated shelters.
5. Means of evaporating perspiration should be encouraged by opening the neck, waist, arm sleeves, and ankle fasteners as needed to provide periodic fresh air circulation.
6. During severe wind-chill conditions, a cold weather mask or wool scarf should also be worn.
7. When wearing face protectors they must be removed periodically to check for frostbite.
8. Skin on the hands can freeze easily, therefore, cold metal should never be touched with bare hands. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents. If the air temperature is -17.5°C (0°F), the hands should be protected by mittens.
9. Pants should be tucked in and lapped over boot tops to prevent the entry of snow and cold water into the boot.
10. The footwear for outdoor work in wet snow should be waterproof and reach well up on the leg. The soles and upper part of the boot should provide good insulation as well. A combination of working boots and rubber overboots provides this insulation.
11. Socks should be fairly heavy and reach well up on the leg to encourage wicking and evaporation of sweat.

OTHER PRECAUTIONS

Balanced meals and adequate liquid intake are essential to body heat production and the prevention of dehydration. Dehydration is as prevalent in cold regions as it is in hot, dry areas. Warm liquids (hot soup or tea) are obviously preferable since they do not have to be warmed by the body after consumption. Cold foods and drinks should only be consumed as a matter of necessity.

Hair should be cut and beards shaved or clipped closely. Long hair or a beard add very little in insulation value and natural hair oils soil the clothing. In the open, a beard serves as a base for ice buildup and will mask the appearance of frostbite. Electric razors are preferable since they do not remove protective oils from the face.

APPENDIX F
MATERIAL SAFETY DATA SHEETS

SITE-SPECIFIC HEALTH & SAFETY PLAN
WOODS INDUSTRIES SITE
THERMAL TREATMENT

APPENDIX F

PART F.1
DIESEL FUEL

Material Safety Data Sheet

Prepared According to the OSHA Hazard Communication Standard (29 CFR 1910.1200)
(Formerly Called MATERIAL INFORMATION BULLETIN)

Chevron

CHEVRON Diesel Fuel No. 1

CPS 270003

DANGER! HARMFUL OR FATAL IF SWALLOWED
PROLONGED OR REPEATED CONTACT WITH SKIN CAN BE HARMFUL
MAY CAUSE SKIN IRRITATION
COMBUSTIBLE
KEEP OUT OF REACH OF CHILDREN

TYPICAL COMPOSITION

Petroleum mid-distillate (CAS 8008-20-6) 100%

EXPOSURE STANDARD

No Federal OSHA exposure standard or ACGIH TLV has been established for this material.

PHYSIOLOGICAL & HEALTH EFFECTS		EMERGENCY & FIRST AID PROCEDURES
	Eyes	
Expected to cause no more than minor eye irritation.		Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If irritation persists, see a doctor.
	Skin	
May cause skin irritation. Application of similar materials onto the skin of rabbits produced moderate to severe skin irritation. Prolonged or repeated skin contact may be harmful. See Additional Health Data.		Remove contaminated clothing. Wash skin thoroughly with soap and water. See a doctor if irritation occurs. Launder contaminated clothing.
	Inhalation	
Prolonged breathing of the vapor can cause central nervous system effects. See Additional Health Data.		If there are signs or symptoms due to breathing this material as described in this MSDS, move the person to fresh air. If any of these effects continue, see a doctor.
	Ingestion	
Not expected to have acute systemic toxicity by ingestion. Note to Physician: Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid which can cause pneumonitis.		If swallowed, give water or milk to drink and telephone for medical advice. DO NOT make person vomit unless directed to do so by medical personnel. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

ADDITIONAL HEALTH DATA

See following pages

SPECIAL PROTECTIVE INFORMATION

Eye Protection: Do not get in eyes. Eye contact can be avoided by wearing chemical safety goggles.

Skin Protection: Avoid contact with skin or clothing. Skin contact can be minimized by wearing impervious protective clothing including gloves.

Respiratory Protection: This material may be an inhalation hazard and, unless ventilation is adequate, the use of an approved respirator is recommended.

Ventilation: Use this material only in well ventilated areas.

Comment: If you experience any of the signs or symptoms described in this MSDS, you may be exposed to harmful levels of this product. Your exposure can be minimized if you follow the protective measures presented above.

FIRE PROTECTION

Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 85°F.

Flash Point: (TCC)100°F(38°C (Min.)

Autoignition Temp.: NDA

Flammability Limits: NDA

Extinguishing Media: CO_2, Dry Chemical, Foam, Water Fog

Special Fire Fighting Procedures: For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Read the entire MSDS.

SPECIAL PRECAUTIONS

See following pages

ENVIRONMENTAL PROTECTION

Environmental Impact: This material is not expected to present any environmental problems other than those associated with oil spills.

Precautions if Material is Released or Spilled: Eliminate all open flame in vicinity of spill or released vapor. Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in Special Protective Information. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases.

Waste Disposal Methods: Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

REACTIVITY DATA

Stability (Thermal, Light, etc.): Stable.

Incompatibility (Materials to Avoid): May react with strong oxidizing materials.

Hazardous Decomposition Products: Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

Hazardous Polymerization: Will not occur.

PHYSICAL PROPERTIES

Solubility: Insoluble in water; miscible with hydrocarbons.

Appearance (Color, Odor, etc.): Pale yellow liquid.

Boiling Point: 215-288°C (Range)

Melting Point: n/a

Specific Gravity: 0.85 @ 15.6/15.6°C (Min.)

Vapor Pressure: NDA

Vapor Density (Air=1): NDA

Percent Volatile (Volume %): NDA

Evaporation: NDA

Viscosity: 1.3 cSt @ 40°C (Min.)

n/a = Not Applicable
NDA = No Data Available

Material Safety Data Sheet

CHEVRON Diesel Fuel No. 1 CPS 27000

ADDITIONAL HEALTH DATA

Signs and symptoms of central nervous system effects may include one or more of th following: headache, dizziness, loss of appetite, weakness and loss of coordination Affected persons usually experience complete recovery when removed from the exposure area

This product contains a petroleum mid-distillate. Toxicology data from studies on simila hydrocarbon mid-distillates indicate that lifetime application to the skin of mic resulted in a low-level skin carcinogenicity response characterized by low tumor incidenc and long latency.

Brief or intermittent skin contact with this product is not expected to produce an serious effects if it is washed from the skin. While normal handling of this product i not likely to cause cancer in humans, skin contact and breathing of mists, fumes or vapor should be reduced to a minimum. We strongly recommend that the precautions outlined i this MSDS be followed when handling this material.

This product is similar to some jet fuels. Reports in the literature conclude that long term exposure to jet fuels may result in changes in 1) the incidence and prevalence o psychiatric symptoms 2) psychological tests and 3) EEGs. These studies were conducted i specific work situations where there were exposures to jet fuels. We have reviewed thes studies and it is our opinion that the work situations are too complex and the analytica methods that define brain damage are too imprecise to state with scientific certainty tha either the condition occurs or that it was due to the type of material discussed in thi MSDS. Since this product contains chemicals which are similar to those used in the wor situations discussed above, it should be handled strictly in accordance with th instructions on the product label and in this MSDS in order to minimize the occurrence o any adverse health effects.

SPECIAL PRECAUTIONS

READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL.

DO NOT USE OR STORE near flame, sparks or hot surfaces. USE ONLY IN WELL VENTILATED AREA Keep container closed.

DO NOT weld, heat or drill container. Replace cap or bung. Emptied container stil contains hazardous or explosive vapor or liquid.

CAUTION! Do not use pressure to empty drum or explosion may result.

WARNING! Not for use as portable heater or appliance fuel. Toxic fumes may accumulate an cause death.

APPENDIX F

PART F.2
GASOLINE

Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MID-GRADE UNLEADED GASOLINES

PRODUCT NUMBER(S): CPS201001 CPS201003 CPS201004 CPS201007
CPS201015 CPS201018 CPS201458 CPS338154

COMPANY IDENTIFICATION

Chevron USA Products Company
Environmental, Safety, and Health
575 Market St.
San Francisco, CA 94105-2856

EMERGENCY TELEPHONE NUMBERS

HEALTH (24 hr): (800)231-0623 or (510)231-0623 (International)
TRANSPORTATION (24 hr): CHEMTREC (800)424-9300 or (202)483-7616

PRODUCT INFORMATION: (800)822-5823 MSDS Requests
(510)242-5357 Technical

2. COMPOSITION/INFORMATION ON INGREDIENTS

SPECIAL NOTES: Ethyl Alcohol is only added in limited specific distribution areas.
COMPOSITION COMMENT:
All the components of this material are on the Toxic Substances Control Act Chemical Substances Inventory.

The proportion compositions are given to allow for the various ranges of the components present in the whole product and may not equal 100%.

100.0 % MID-GRADE UNLEADED GASOLINES

CONTAINING

COMPONENTS	AMOUNT	LIMIT/QTY	AGENCY/TYPE
GASOLINE (GENERIC)			
	100.0%	300ppm	ACGIH TWA
		500ppm	ACGIH STEL
		300ppm	OSHA TWA

Prepared according to the OSHA Hazard Communication Standard
(29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology
and Health Risk Assessment Unit, CRTC, P.O. Box 4054, Richmond, CA 94804

		500ppm	OSHA STEL
INCLUDING			
BENZENE Chemical Name: BENZENE CAS71432	< 4.9%	32 mg/m3 1ppm 5ppm 25 ppm 10 LBS	ACGIH TWA OSHA TWA OSHA STEL OSHA CEILING CERCLA 302.4 RQ

Refer to the OSHA Benzene Standard (29 CFR 1910.1028) for detailed training, exposure monitoring, respiratory protection and medical surveillance requirements before using this product.

ETHYL BENZENE Chemical Name: BENZENE, ETHYL- CAS100414	< 2.4%	434 mg/m3 125ppm 100ppm 125ppm 1,000 LBS	ACGIH TWA ACGIH STEL OSHA TWA OSHA STEL CERCLA 302.4 RQ
XYLENE-P Chemical Name: BENZENE, 1,4-DIMETHYL- CAS106423	< 2.3%	150 ppm 1,000 LBS	ACGIH STEL CERCLA 302.4 RQ
XYLENE-M Chemical Name: BENZENE, 1,3-DIMETHYL- CAS108383	< 6.3%	145 mg/m3 150ppm 100ppm 150ppm 1,000 LBS	ACGIH TWA ACGIH STEL OSHA TWA OSHA STEL CERCLA 302.4 RQ
XYLENE-O Chemical Name: BENZENE, 1,2-DIMETHYL- CAS95476	< 3.0%	434 mg/m3 150ppm 100ppm 150ppm 1,000 LBS	ACGIH TWA ACGIH STEL OSHA TWA OSHA STEL CERCLA 302.4 RQ
TOLUENE Chemical Name: TOLUENE CAS108883	< 9.5%	377 mg/m3 150ppm 100ppm 150ppm 300 ppm 1,000 LBS	ACGIH TWA ACGIH STEL OSHA TWA OSHA STEL OSHA CEILING CERCLA 302.4 RQ

HEXANE Chemical Name: HEXANE CAS110543	< 5.0%	176 mg/m3 1000 ppm 50ppm	ACGIH TWA ACGIH STEL OSHA TWA
CYCLOHEXANE Chemical Name: CYCLOHEXANE CAS110827	< 2.4%	1030 mg/m3 300ppm 1,000 LBS	ACGIH TWA OSHA TWA CERCLA 302.4 RQ
CAN CONTAIN			
METHYL TERT BUTYL ETHER (MTBE) Chemical Name: 2-METHOXY-2-METHYL PROPANE CAS1634044	< 15.0%	50 PPM 1 LBS	Chevron STEL CERCLA 302.4 RQ
OR			
ETHANOL Chemical Name: ETHYL ALCOHOL CAS64175	< 10.0%	1880 mg/m3 1000ppm	ACGIH TWA OSHA TWA

TLV - Threshold Limit Value
STEL - Short-term Exposure Limit
RQ - Reportable Quantity
CC - Chevron Chemical Company

TWA - Time Weighted Average
TPQ - Threshold Planning Quantity
CPS - CUSA Product Code
CAS - Chemical Abstract Service Number

3. HAZARDS IDENTIFICATION

************************** EMERGENCY OVERVIEW **************************

Orange to bronze liquid

- EXTREMELY FLAMMABLE
- HARMFUL OR FATAL IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE
- VAPOR HARMFUL
- MAY CAUSE EYE AND SKIN IRRITATION
- LONG-TERM EXPOSURE TO VAPOR HAS CAUSED CANCER IN LABORATORY ANIMALS
- KEEP OUT OF REACH OF CHILDREN

****

POTENTIAL HEALTH EFFECTS
EYE:
This substance is slightly irritating to the eyes and could cause prolonged (days) impairment of your vision. The degree of the injury will

depend on the amount of material that gets into the eye and the speed and thoroughness of the first aid treatment. Eye contact with the vapors, fumes, or spray mist from this substance could also cause similar signs and symptoms.

SKIN:

If absorbed through the skin, this substance is considered practically non-toxic to internal organs. Prolonged or frequently repeated contact may cause the skin to become cracked or dry from the defatting action of this material.

INGESTION:

This substance is slightly toxic to internal organs if swallowed. The degree of injury will depend on the amount absorbed from the gut. The target organ(s) is the nervous system. Because of the low viscosity of this substance, it can directly enter the lungs if it is swallowed (this is called aspiration). This can occur during the act of swallowing or when vomiting the substance. Once in the lungs, the substance is very difficult to remove and can cause severe injury to the lungs and death.

INHALATION:

This substance is slightly toxic to internal organs if inhaled. The degree of injury will depend on the airborne concentration and duration of exposure. The target organ(s) is the nervous system. Inhalation of gasoline vapor at airborne concentrations exceeding 1000 ppm may cause signs and symptoms of central nervous system effects such as headache, dizziness, loss of appetite, weakness and loss of coordination. Vapor concentrations in excess of 5000 ppm may cause loss of consciousness, coma and death. Brief exposures to high vapor concentrations may also cause pulmonary edema and bronchitis. Intentional exposures to excessively high concentrations (e.g., when used as a drug of abuse) have been reported to result in clinical manifestations that may include convulsions, delirium, and hallucinations. These manifestations are not known to occur following accidental inhalation of gasoline vapor during normal operations.

SIGNS AND SYMPTOMS OF EXPOSURE:

INGESTION: May include one or more of the following: headache, dizziness, loss of appetite, weakness and loss of coordination.

4. FIRST AID MEASURES

EYE:

Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. Remove contact lenses if worn. No additional first aid should be necessary. However, if irritation persists, see a doctor.

SKIN:

No first aid procedures are required. As a precaution, wash skin thoroughly with soap and water. Remove and wash contaminated clothing.

INGESTION:

If swallowed, give water or milk to drink and telephone for medical advice. DO NOT make person vomit unless directed to do so by medical personnel. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

INHALATION:

If respiratory irritation or any signs or symptoms as described in this document occur, move the person to fresh air. If any of these effects continue, see a doctor.
NOTE TO PHYSICIANS:
Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid which can cause pneumonitis.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: (P-M) < -49F (-45C)
AUTOIGNITION: NDA
FLAMMABILITY LIMITS (% by volume in air): Lower: 1.4 Upper: 7.6
EXTINGUISHING MEDIA:
Fire Fighting Foam: Alcohol Resistant Type (AR)
AFFF, CO2, Dry Chemical.
NFPA RATINGS: Health 1; Flammability 3; Reactivity 0.
FIRE FIGHTING INSTRUCTIONS:
This product presents an extreme fire hazard. Liquid very quickly evaporates, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches.

For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Read the entire document.
COMBUSTION PRODUCTS:
Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (202)483-7616
ACCIDENTAL RELEASE MEASURES:
Eliminate all sources of ignition in vicinity of spill or released vapor.

Clean up spills immediately, observing precautions in Exposure Controls/ Personal Protection section. This material is considered to be a water pollutant and releases of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems.

U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

7. HANDLING AND STORAGE

HANDLING AND STORAGE:
Never siphon gasoline by mouth. READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL. Use only as a motor fuel. Do not use for cleaning, pressure appliance fuel, or any other such use.

DO NOT USE OR STORE near flame, sparks or hot surfaces. USE ONLY IN WELL VENTILATED AREA. Keep container closed. DO NOT TRANSFER LIQUID TO AN UNLABELED CONTAINER. DO NOT weld, heat or drill container. Replace cap or bung. Emptied container still contains hazardous or explosive vapor or liquid.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT
EYE/FACE PROTECTION:
Do not get this material in your eyes. Eye contact can be avoided by wearing chemical goggles.
SKIN PROTECTION:
No special skin protection is usually necessary. Avoid prolonged or frequently repeated skin contact with this material. Skin contact can be minimized by wearing protective clothing.
RESPIRATORY PROTECTION:
No special respiratory protection is normally required. However, if operating conditions create airborne concentrations which exceed the recommended exposure standards, the use of an approved respirator is required. Refer to the OSHA Benzene Standard to determine what type of respirator is required based on exposure levels.
ENGINEERING CONTROLS:
Use this material only in well ventilated areas.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:
Orange to bronze liquid

pH:	NDA
VAPOR PRESSURE:	5 - 15 PSI (max.) @ 100F (Variable)
VAPOR DENSITY (AIR=1):	3-4
BOILING POINT:	25 - 225C (Variable)
FREEZING POINT:	NDA
MELTING POINT:	NA
SOLUBILITY:	Soluble in hydrocarbons; insoluble in water.
SPECIFIC GRAVITY:	0.7 - 0.8
DENSITY:	NDA

EVAPORATION RATE: NDA
PERCENT VOLATILE
(VOL): 99+%

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:
NDA.
CHEMICAL STABILITY:
Stable.
CONDITIONS TO AVOID:
No data available.
INCOMPATIBILITY WITH OTHER MATERIALS:
May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
HAZARDOUS POLYMERIZATION:
Polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:
The Draize Eye Irritation Score (range, 0-110) in rabbits is 0.
SKIN EFFECTS:
This material was not a skin sensitizer in the modified Buehler Guinea Pig Sensitization Test. The Draize Skin Primary Irritation Score (range, 0-8) for a 4-hour exposure (rabbits) is 0.98.
ACUTE ORAL EFFECTS:
The oral LD50 in rats is > 5 ml/kg.
ACUTE INHALATION EFFECTS:
No product toxicology data available. The hazard evaluation was based on data on the components.
ADDITIONAL TOXICOLOGY INFORMATION:
Lifetime inhalation of whole gasoline vapor has caused increased liver tumors in female mice. The mechanism of this response is still being investigated but it is thought to be an epigenetic process unique to the female mouse. Inhalation exposure to whole gasoline vapor also caused kidney damage and eventually kidney cancer in male rats. No other animal model studied has shown these adverse kidney effects and there is no physiological reason to believe that they would occur in man.

The data above is obtained from studies sponsored by the American Petroleum Institute (API).

This product contains benzene. The OSHA Benzene Standard (29 CFR 1910.1028) contains detailed requirements for training, exposure monitoring, respiratory protection and medical surveillance triggered by the exposure level. Refer to the OSHA Standard before using this product. Repeated or prolonged breathing of benzene vapors has been associated with the development of chromosomal damage in experimental animals and various blood diseases in humans ranging from aplastic anemia to leukemia (a form of cancer). All of these diseases can be fatal. No birth defects have been shown to occur in pregnant laboratory animals exposed to doses not toxic to the mother. However, some evidence of fetal toxicity such as delayed physical development has been seen at such levels. The available information on the effects of benzene on human pregnancies is inadequate but it has been established that benzene can cross the human placenta.

This product contains n-hexane. Prolonged or repeated skin contact or breathing of vapors may cause nerve damage characterized by progressive weakness and numbness in the arms and legs. Recovery ranges from no recovery to complete recovery depending upon the severity of the nerve damage.

This product contains toluene. Toluene has been reported to decrease immunological responses in test animals. It has also been reported that when young rats were exposed to 1000 ppm toluene for 14 hours daily, for two weeks, irreversible hearing loss was detected. The same daily exposure to 700 ppm for as long as 16 weeks was without effect. Since the level necessary to produce hearing loss is greater than 7 times the ACGIH TLV-TWA for toluene, worker exposures at or below 100 ppm is not expected to cause any adverse effects. There are also reports that chronic solvent abusers (glue sniffers, solvent huffers) who deliberately inhale high concentrations (several thousand ppm) of toluene for prolonged periods (up to ten hours/day) have suffered liver, kidney and brain damage. Toluene may also cause mental and/or growth retardation in the children of female solvent abusers who directly inhale toluene when they are pregnant. Toluene caused growth retardation in rats when administered at doses that were toxic to the mothers (1500 ppm). Concentrations of up to 5000 ppm did not cause birth defects. There were no effects in the offspring at doses that did not intoxicate the pregnant rats. The exposure level at which no effects were seen (No Observed Effect Level, NOEL) is 750 ppm. We recommend that the precautions outlined in this MSDS be followed to keep toluene concentrations below the recommended exposure standards.

This product contains xylene, a chemical that has been reported to cause developmental toxicity in rats and mice exposed by inhalation during pregnancy. The effects noted consisted of delayed development and minor skeletal variations; additionally, when pregnant mice were exposed by ingestion to a level that killed nearly one-third of the test group, lethality (resorptions) and malformations (primarily cleft palate) occurred. Malformations have not been reported following inhalation exposure. Because of the very high levels of exposure used in these studies, we do not believe that their results imply an increased risk of reproductive toxicity to workers exposed to xylene levels at or below the exposure standard.

Xylene has given negative results in several mutagen testing assays including the Ames assay. In a cancer study sponsored by the National Toxicology Program (NTP), technical grade xylene gave no evidence of carcinogenicity in rats or mice dosed daily for two years.

This product can contain methyl tert butyl ether (MTBE). Most mutagenicity data on MTBE, including the Ames Test, indicate that it is not mutagenic. However, one test called "mouse lymphoma" was positive under certain conditions. The positive results are thought to be due to a metabolite (formaldehyde) and not MTBE directly.

MTBE was shown to cause maternal toxicity at exposure levels of 4,000 and 8,000 ppm when mice were exposed for 6 hours per day during their pregnancy. A decrease in the number of successful pregnancies and a reduction in birth weight was also seen at those exposure levels. A significant number of pups had a birth defect (cleft palate) at the 8,000 ppm exposure level. The exposure concentration where there was no maternal toxicity or birth defects was determined to be 1,000 ppm. There were no birth defects in rabbits exposed to the same MTBE concentrations (up to 8,000 ppm). No birth defects were observed in rats exposed to MTBE at concentrations up to 2,500 ppm. These results suggest that the risk of birth defects in humans from MTBE is negligible at the anticipated exposure concentrations.

MTBE exposure for 18 months caused an increased incidence of liver tumors in female mice. The increase was only observed in the high dose group (8000 ppm). MTBE exposure for 24 months caused an increased incidence of kidney and testicular tumors in male rats.

Whole gasoline exhaust was reviewed by the International Agency for Research on Cancer (IARC) in their Monograph Volume 46 (1989). Evidence for causing cancer was considered inadequate in animals and inadequate in humans. IARC placed whole gasoline exhaust in Category 2B, considering it possibly carcinogenic to humans.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:
No data available.
ENVIRONMENTAL FATE:
No data available.

13. DISPOSAL CONSIDERATIONS

DISPOSAL CONSIDERATIONS:
Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: GASOLINE
DOT HAZARD CLASS: 3 (FLAMMABLE LIQUID)
DOT IDENTIFICATION NUMBER: UN1203
DOT PACKING GROUP: II

15. REGULATORY INFORMATION

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects: YES
2. Delayed (Chronic) Health Effects: YES
3. Fire Hazard: YES
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

REGULATORY LISTS SEARCHED:

01=SARA 313
02=MASS RTK
03=NTP Carcinogen
04=CA Prop 65-Carcin
05=CA Prop 65-Repro Tox
06=IARC Group 1
07=IARC Group 2A
08=IARC Group 2B
09=SARA 302/304
10=PA RTK
11=NJ RTK
12=CERCLA 302.4
13=MN RTK
14=ACGIH TWA
15=ACGIH STEL
16=ACGIH Calc TLV
17=OSHA TWA
18=OSHA STEL
19=Chevron TWA
20=EPA Carcinogen
21=TSCA Sect 4(e)
22=TSCA Sect 5(a)(e)(f)
23=TSCA Sect 6
24=TSCA Sect 12(b)
25=TSCA Sect 8(a)
26=TSCA Sect 8(d)
28=Canadian WHMIS
29=OSHA CEILING
30=Chevron STEL

The following components of this material are found on the regulatory lists indicated.

BENZENE, ETHYL-
is found on lists: 01,02,10,11,12,13,14,15,17,18,26,28,
BENZENE, 1,4-DIMETHYL-
is found on lists: 01,02,10,11,12,15,26,28,
BENZENE, 1,3-DIMETHYL-
is found on lists: 01,02,10,11,12,14,15,17,18,26,28,
TOLUENE
is found on lists: 01,02,05,10,11,12,13,14,15,17,18,26,28,29,
HEXANE
is found on lists: 02,10,11,13,14,15,17,28,
CYCLOHEXANE
is found on lists: 01,02,10,11,12,13,14,17,26,28,
2-METHOXY-2-METHYL PROPANE
is found on lists: 01,02,10,11,12,21,24,26,30,
ETHYL ALCOHOL
is found on lists: 02,10,11,13,14,17,28,
BENZENE
is found on lists: 01,02,03,04,06,10,11,12,13,14,17,18,20,28,29,
BENZENE, 1,2-DIMETHYL-
is found on lists: 01,02,10,11,12,14,15,17,18,26,28,

GASOLINE (GENERIC)
is found on lists: 04,08,14,15,17,18,20,

16. OTHER INFORMATION

NFPA RATINGS: Health 1; Flammability 3; Reactivity 0; (Least-0, Slight-1, Moderate-2, High-3, Extreme-4). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT:
This Material Safety Data Sheet has been revised to comply with the ANSI Z400.1 Standard and revises Section 1 (Product Identification) and Section 11 (Toxicological Information).

****

APPENDIX F

PART F.3
HYDRAULIC FLUID

Dear Customer: This Bulletin contains important environmental, health and toxicology information for your employees who recently ordered this product. Please make sure this information is given to them. If you resell this product, this Bulletin should be given to the Buyer. This Form may be reproduced without permission.

Chevron U.S.A. Inc.

Material Safety Data Sheet

Prepared According to the OSHA Hazard Communication Standard (29 CFR 1910.1200).
(Formerly Called MATERIAL INFORMATION BULLETIN)

Chevron

CHEVRON Tractor Hydraulic Fluid

CPS 226606

CAUTION! MAY CAUSE EYE AND SKIN IRRITATION
KEEP OUT OF REACH OF CHILDREN

TYPICAL COMPOSITION

Highly refined base oils (CAS 64741-96-4/64742-52-5 and 64742-65-0 or 72623-87-1 and 72623-85-9)	>90%
Additives including inhibitors, antiwear agents and zinc alkyl dithiophosphate (CAS 68649-43-3)	<10%

EXPOSURE STANDARD

No Federal OSHA exposure standard or ACGIH TLV has been established for this material. Based upon information reviewed to date, this product fits the definition for mineral oil mist. The applicable Federal OSHA exposure standard and ACGIH TLV (1985-86) for mineral oil mist is 5 mg/m^3.

PHYSIOLOGICAL & HEALTH EFFECTS		EMERGENCY & FIRST AID PROCEDURES
May cause eye irritation. Application into the eyes of rabbits produced slight to moderate membrane irritation without corneal involvement.	Eyes	Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If irritation persists, see a doctor.
May cause skin irritation. Application onto the skin of rabbits produced slight to moderate erythema and edema. The Draize score was 2.8. See Additional Health Data.	Skin	Wash skin thoroughly with soap and water. Launder contaminated clothing.
Not expected to be acutely toxic by inhalation. Breathing mineral oil mist at concentrations in air that exceed the recommended exposure standard can cause respiratory irritation or discomfort. See Additional Health Data.	Inhalation	If respiratory discomfort or irritation occurs, move the person to fresh air. See a doctor if discomfort or irritation continues.
Not expected to have acute systemic toxicity by ingestion.	Ingestion	If swallowed, give water or milk to drink and telephone for medical advice. Consult medical personnel before inducing vomiting. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

Chevron Environmental Health Center, Inc., P.O. Box 4054, Richmond, CA 94804-0054
Emergency Phone Number (415) 233-3737

X-IRC021 (07-85)

No. 1042
Rev. 4 10/23/86

ADDITIONAL HEALTH DATA

See following pages

SPECIAL PROTECTIVE INFORMATION

Eye Protection: Do not get in eyes. Eye contact can be avoided by wearing chemical safety goggles.

Skin Protection: Avoid prolonged or frequently repeated skin contact with this material. Skin contact can be minimized by wearing impervious protective clothing including gloves.

Respiratory Protection: No special respiratory protection is normally required. However, if operating conditions create airborne concentrations which exceed the recommended exposure standard, the use of an approved respirator is recommended.

Ventilation: Use adequate ventilation to keep the airborne concentrations of this material below the recommended exposure standard.

FIRE PROTECTION

Flash Point: (COC)374°F(190°C) Min

Autoignition Temp.: NDA

Flammability Limits: n/a

Extinguishing Media: CO_2, Dry Chemical, Foam, Water Fog

Special Fire Fighting Procedures: For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus. See Hazardous Decomposition Products. Read the entire MSDS.

SPECIAL PRECAUTIONS

DO NOT weld, heat or drill container. Residue may ignite with explosive violence if heated sufficiently.

CAUTION! Do not use pressure to empty drum or explosion may result.

ENVIRONMENTAL PROTECTION

X-IRC03

Environmental Impact: This material is not expected to present any environmental problems other than those associated with oil spills.

Precautions if Material is Released or Spilled: Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in Special Protective Information. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases.

Waste Disposal Methods: Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

REACTIVITY DATA

Stability (Thermal, Light, etc.): Stable.

Incompatibility (Materials to Avoid): May react with strong oxidizing materials.

Hazardous Decomposition Products: Normal combustion forms carbon dioxide and water vapor and may produce oxides of phosphorus; incomplete combustion can produce carbon monoxide.

Hazardous Polymerization: Will not occur.

PHYSICAL PROPERTIES

Solubility: Soluble in hydrocarbon solvents; insoluble in water.

Appearance (Color, Odor, etc.): Orange liquid

Boiling Point: n/a

Melting Point: n/a

Specific Gravity: 0.89 @ 15.6/15.6°C

Vapor Pressure: n/a

Vapor Density (Air=1): n/a

Percent Volatile (Volume %): n/a

Evaporation: n/a

Pour Point: -50°F (Typical)

Viscosity: 7.4-8.4 cSt @ 100°C

n/a = Not Applicable
NDA = No Data Available

Material Safety Data Sheet

CHEVRON Tractor Hydraulic Fluid

CPS 22660

ADDITIONAL HEALTH DATA

Signs and symptoms of respiratory tract irritation may include, but may not be limited to one or more of the following, depending on concentration and length of exposure: nasal discharge, sore throat, coughing, bronchitis, pulmonary edema and difficulty in breathing

Several zinc alkyl dithiophosphates (ZDDPs) have been reported to have weak mutagenic activity in cultured mammalian cells but only at concentrations that were toxic to the test cells. Also, in the past, a ZDDP similar to the one used in this product was reported to cause adverse effects on the testicles of rabbits but not of rats after applications to the skin for several weeks. However, follow-up studies in rabbits indicated that the testicular effects were due to a species-specific reaction to stress caused by severe skin irritation and weight loss and not a direct chemical effect of the ZDDP. While toxicologists at Chevron do not believe that there is any mutagenic or testicular risk to workers exposed to ZDDPs as described above, the precautions outlined in this MSDS should be followed.

This product contains base oils which the International Agency for Research on Cancer (IARC) classifies as having no evidence of carcinogenic potential.

This product may contain petroleum base oils refined by a combination of severe hydrocracking and hydrotreating. The carcinogenic potential of paraffinic base oils prepared by this process is not specifically addressed by OSHA, NTP, or IARC. However, the process conditions, chemical analyses, and the results of Ames tests all support our opinion that these oils are not carcinogenic.

APPENDIX F

PART F.4
LIQUID PROPANE GAS (LPG)

AGWAY PROPANE

DATE ISSUED 03/29/90
SUPERSEDES DATE. 05/56

MATERIAL SAFETY DATA SHEET

Agway Propane, PO Box 4852, Syracuse, NY 13221

I. IDENTIFICATION AND EMERGENCY INFORMATION

PRODUCT NAME
PROPANE

CAS NUMBER
74-98-6

OTHER NAMES
Liquified Petroleum Gas (LPG)

FORMULA C_3H_8

PRODUCT APPEARANCE AND ODOR
Vapor and liquid are colorless,
contains stenching agent

CLASSIFICATION Flammable Gas UN 1075

DISTRIBUTOR
Agway Petroleum Corporation
Marketing and Distribution
P O Box 4852
Syracuse, NY 13221
Telephone: 315/449-6494 (daytime)

PRODUCT INFORMATION PHONE NUMBER
315-449-6032

EMERGENCY PHONE NUMBER
Chemtrec 800-424-9300

II. SUMMARY OF HAZARDS

COMPONENTS	CAS NUMBER	CONCENTRATION
Liquified Petroleum Gas	74-98-6	100%
Ethyl Mercaptan	75-08-1	< 1%
Methanol	67-56-1	< 1%

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	1	0-Minimal
Flammability	4	1-Slight
Reactivity	0	2-Moderate
		3-Serious
		4-Severe

OCCUPATIONAL EXPOSURE LIMIT
LPG ACGIH (Source) 1989 TWA 1000 PPM 8 Hours

III. EMERGENCY FIRST AID PROCEDURES

INHALATION
Remove from exposure and call physician. For respiratory distress give air, oxygen and/or administer cardiopulmonary resuscitation. Keep warm and quiet until medical attention arrives.

EYE CONTACT
If liquid gets into eyes, contact physician immediately.

SKIN
This material is not expected to be absorbed through the skin. In case of excessive skin contact with liquid, immediately contact physician for treatment of frostbite.

INGESTION
DO NOT INDUCE VOMITING, call physician immediately.

IV. FIRE AND EXPLOSION

FLASH POINT
AP - 160°F

AUTOIGNITION TEMPERATURE
AP 540°F

FLAMMABLE LIMITS (@ Normal Atmos. Temp. and Pressure)
Lower AP 2.0 (% Vol. in Air) Upper AP 9.5

EXTINGUISHING MEDIA
Dry Chemical, CO2 Halogenated Extinguishing Agent
Water Spray

FIRE AND EXPLOSION HAZARDS
This gas releases flammable vapors at well below ambient temperatures and readily forms flammable mixtures with air. Either the liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources where they may ignite or explode. Exposed to an ignition source it will burn in the open or be explosive in confined spaces

SPECIAL FIREFIGHTING PROCEDURES
Gas fires should not be extinguished unless the gas flow can be stopped immediately. Shut off gas source; use water to keep fire-exposed containers cool and to protect men effecting the shutoff. Control fire until gas supply can be shut off. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or as otherwise needed.

V. HEALTH HAZARDS

	PRIMARY ROUTE
INHALATION Oxygen deficient atmospheres may cause gasping, disorientation, unconsciousness and possibly death.	YES
EYE CONTACT May cause irritation. Direct contact with liquified/pressurized gas or frost particles may produce severe and possibly permanent eye damage from freezer burn	NA
SKIN IRRITATION Neither a "corrosive" nor "irritant" by OSHA standards. Solid or liquid forms of this material and pressurized gas can cause freeze burns. Prolonged exposure tends to remove skin oils, possibly leading to dermatitis.	NA
INGESTION Solid and liquid forms of this material and pressurized gas can cause burns.	NA

Potential human health risks vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

VI. PHYSICAL AND CHEMICAL DATA

The following data are approximate or typical values and should not be used for precise design purposes.

BOILING RANGE
-45°C (-49°F) IBP
to 0°C (32°F) FBP

FREEZING POINT
-305°F

SPECIFIC GRAVITY (H_2O = 1 @ 39.2F)
0.50

VAPOR PRESSURE
208 psig @ 100°F

SOLUBILITY IN WATER @ 1 ATM & 25C (77°F)
Negligible; < 0.1%

pH
Essentially neutral

STABILITY
Stable

MOLECULAR WEIGHT
45

VAPOR DENSITY (Air = 1)
1.5

VOLATILE CHARACTERISTICS
100% Complete

HAZARDOUS POLYMERIZATION
Not expected to occur

OTHER PHYSICAL AND CHEMICAL PROPERTIES
Gross heat of combustion @ 60°F = 21,550 BTU/LB or 2,550 BTU/FT

APPEARANCE AND ODOR
Colorless liquid/invisible vapor, faint gassy odor between 5,000—20,000 PPM

CONDITIONS TO AVOID
Heat, sparks, and open flames

MATERIALS TO AVOID
Strong acids, alkalies, and oxidizers such as chlorine (gas or liquid) and oxygen, sodium hypochlorite or calcium hypochlorite.

HAZARDOUS DECOMPOSITION PRODUCTS
Combustion may produce carbon monoxide and other harmful substances.

VII. PROTECTION AND PRECAUTIONS

GENERAL COMMENTS
Consult D.O.T regulations about the shipment of petroleum gases. The most common hazard is leakage due to faulty pressure control regulators. Large pressure build-up can result in explosive decompression at the cylinder head causing the cylinder to rocket like a missile. Use pressure-reducing regulator when connecting to lower pressure piping systems. Prevent entrapment of liquid in closed systems. Use check valve to prevent back-flow into storage container. Chain cylinders when not in use.

Store and use gas containers only in well-ventilated areas not exceeding 100°F and protected from dampness, salt and corrosive chemicals. Cylinder storage should be segregated from oxidizers and away from heavy traffic areas. Avoid dragging, rolling or sliding cylinders. Avoid creating static electricity.

Odor is not an adequate warning of potentially hazardous concentrations in air. Releases of gases may cause flammable atmosphere with explosion potential. Do not fill or store near heat, sparks, flame or strong oxidants. Before entering into confined spaces safety procedures should be followed such as: monitoring for oxygen deficiency and flammables, use of safety glasses, use of air respiratory protection, chemical-resistant gloves, use of chemical resistant apron or other clothing.

VIII. TRANSPORATION AND OSHA RELATED LABEL INFORMATION

TRANSPORTATION INCIDENT INFORMATION
For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Material Incidents, DOT P 5800.3.

DOT IDENTIFICATION NUMBER
Liquified Petroleum Gas / Flammable Gas / UN 1075

OSHA REQUIRED LABEL INFORMATION
The following Hazard Warning should be found on a label, bill of lading or invoice accompanying this shipment

DANGER!
EXTREMELY FLAMMABLE

ASPHYXIANT
MATERIAL REDUCES OXYGEN AVAILABLE FOR BREATHING
PROLONGED CONTACT MAY CAUSE FROSTBITE

IX. ENVIRONMENTAL INFORMATION

EPA HAZARD CLASSIFICATION CODE:

Acute Hazard	Chronic Hazard	Fire Hazard
		XXX
Pressure Hazard	Reactive Hazard	
XXX		

PRECAUTIONS IF MATERIAL IS SPILLED OR RELEASED

Shut off gas and eliminate all potential sources of ignition. Evacuate all non-essential personnel; minimize breathing vapors. Ventilate enclosed area; water spray may be used to reduce vapors. Minimize skin contact. Liquid spills will vaporize forming cold, dense vapor clouds that do not readily disperse. Avoid vapor cloud, even with proper respiratory equipment.

WASTE DISPOSAL METHODS

Releases are expected to cause only localized non-persistent environmental damage. Waste mixtures containing these gases should not be allowed to enter drains or sewers where there is danger of their vapors being ignited. It is preferable to dispose of these gases in a vaporous form. These gases may be used as an auxiliary fuel or disposed of by burning in a properly designed flare or incinerator. Venting of the gases to the atmosphere should be avoided.

"EMPTY" CONTAINER WARNING

"Empty" containers retain residue and can be dangerous. THEY MAY EXPLODE IF SUBJECTED TO CUTTING, WELDING, GRINDING, EXPOSURE TO STATIC ELECTRICITY, OR ANY OTHER SOURCES OF IGNITION. Do not attempt to clean tanks. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

The information and recommendations contained herein are a compilation of data provided by various suppliers and, to the best of Agway Petroleum Corporation's (APC) knowledge and belief, accurate and reliable as of the date issued. APC does not warrant or guarantee their accuracy or reliability, and APC shall not be liable for any loss or damage arising out of the use thereof. The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container.

The Environmental Information included under Section IX hereof as well as the Hazardous Materials Identification System (HMIS) and National Fire Protection Association (NFPA) ratings have been included by APC in order to provide additional help and hazard classification information. The ratings recommended are based upon the criteria supplied by the developers of these rating systems, together with APC's interpretation of the available data.

APPENDIX F

PART F.5
MOTOR OIL

Dear Customer: This Bulletin contains important environmental, health and toxicology information for your employees who recently ordered this product. Please make sure this information is given to them. If you resell this product, this Bulletin should be given to the Buyer. This Form may be reproduced without permission.

Chevron U.S.A. Inc.

Material Safety Data Sheet

Prepared According to the OSHA Hazard Communication Standard (29 CFR 1910.1200).
(Formerly Called MATERIAL INFORMATION BULLETIN)

Chevron

CHEVRON Special Motor Oil SAE 30

CPS 220003

TYPICAL COMPOSITION

Highly refined base oils (CAS 64742-36-5, 64742-65-0, 64742-57-0, 64742-01-4, 64742-54-7)	>90%
Additives including inhibitors, dispersants, calcium phenate, zinc dialkyldithiophosphate (CAS 68649-42-3)	<10%

EXPOSURE STANDARD

No Federal OSHA exposure standard or ACGIH TLV has been established for this material. Based on information reviewed to date, we recommend an exposure standard of 5 mg/m^3. This is the Federal OSHA exposure standard and the ACGIH (1985-86) TLV for mineral oil mists.

PHYSIOLOGICAL & HEALTH EFFECTS / EMERGENCY & FIRST AID PROCEDURES

Eyes

Expected to cause no more than minor eye irritation.

Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If irritation persists, see a doctor.

Skin

Expected to cause no more than minor skin irritation following prolonged or frequently repeated contact. See Additional Health Data.

Wash skin thoroughly with soap and water. Launder contaminated clothing.

Inhalation

Not expected to be acutely toxic by inhalation. Breathing mineral oil mist at concentrations in air that exceed the recommended exposure standard can cause respiratory irritation or discomfort. See Additional Health Data.

If respiratory discomfort or irritation occurs, move the person to fresh air. See a doctor if discomfort or irritation continues.

Ingestion

Not expected to be acutely toxic by ingestion.

If swallowed, give water or milk to drink and telephone for medical advice. Consult medical personnel before inducing vomiting. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

ADDITIONAL HEALTH DATA

See Page 3.

SPECIAL PROTECTIVE INFORMATION

Eye Protection: No special eye protection is necessary.
Skin Protection: No special skin protection is necessary.
Respiratory Protection: No special respiratory protection is normally required. However, if operating conditions create airborne concentrations which exceed the recommended exposure standard, the use of an approved respirator is recommended.
Ventilation: Use adequate ventilation to keep the airborne concentrations of this material below the recommended exposure standard.

FIRE PROTECTION

Flash Point: (COC)428°F(220°C) Min.
Autoignition Temp.: NDA
Flammability Limits: n/a
Extinguishing Media: CO_2, Dry Chemical, Foam, Water Fog.
Special Fire Fighting Procedures: For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus. See Hazardous Decomposition Products. Read the entire MSDS.

SPECIAL PRECAUTIONS

DO NOT weld, heat or drill container. Residue may ignite with explosive violence if heated sufficiently.

CAUTION! Do not use pressure to empty drum or explosion may result.

ENVIRONMENTAL PROTECTION

Environmental Impact: This material is not expected to present any environmental problems other than those associated with oil spills.
Precautions if Material is Released or Spilled: Stop the source of the leak or release. Clean up releases as soon as possible. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases.
Waste Disposal Methods: Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

REACTIVITY DATA

Stability (Thermal, Light, etc.): Stable.
Incompatibility (Materials to Avoid): May react with strong oxidizing materials.
Hazardous Decomposition Products: Normal combustion forms carbon dioxide and water vapor and may produce oxides of sulfur, nitrogen and phosphorus; incomplete combustion can produce carbon monoxide.
Hazardous Polymerization: Will not occur.

PHYSICAL PROPERTIES

Solubility: Insoluble in water. Miscible with hydrocarbon solvents.
Appearance (Color, Odor, etc.): Dark amber liquid.
Boiling Point: n/a
Melting Point: n/a
Specific Gravity: 0.88 @ 15.6/15.6°C
Vapor Pressure: n/a
Vapor Density (Air=1): n/a
Percent Volatile (Volume %): n/a
Evaporation: (-0.4°F)
Pour Point: -18°C (Max.)
Viscosity: 12.0 cSt @ 100°C

n/a = Not Applicable
NDA = No Data Available

Material Safety Data Sheet

CHEVRON Special Motor Oil SAE 30 CPS 220003

ADDITIONAL HEALTH DATA

Signs and symptoms of respiratory tract irritation may include, but may not be limited to, one or more of the following, depending on concentration and length of exposure: nasal discharge, nosebleed, sore throat, coughing, bronchitis, pulmonary edema and difficulty in breathing.

This product contains zinc dialkyldithiophosphate (ZDDP). ZDDPs have been tested by repeated application to the skin of young rabbits for three weeks. These rabbits developed severe skin damage, weight loss, and adverse testicular effects. Follow-up studies indicated similar testicular effects can be produced by placing rabbits on a restricted diet and causing them to lose weight or by treating rabbits with simple caustic chemicals and causing them to develop both severe skin irritation and weight loss. Rats similarly treated with ZDDP did not develop testicular effects even when skin damage and weight loss occurred. These results indicate that the testicular effects seen in rabbits were not caused by the toxicity of ZDDPs but were due to the species reaction to stress from severe skin irritation and weight loss. There is no evidence that human exposure to ZDDPs in the workplace will cause testicular effects since occupational exposure does not cause stress from severe skin irritation and weight loss similar to that observed in rabbits. In summary, we now believe there is no risk of male reproductive impairment from working with ZDDP.

Several ZDDPs have also been found to have weak mutagenic activity in cultured mammalian cells. The low level of activity occurred only at ZDDP concentrations which were highly toxic to the test cells. Since mutagenic activity was observed with zinc chloride but not with calcium dialkyldithiophosphate, the weak mutagenic activity of ZDDP may be due to the zinc in the chemical. Zinc is abundant in the environment, is an essential element in our diets, and it is generally accepted that zinc is not a health hazard. Therefore, we do not believe the test results discussed above indicate a genetic hazard to employees working with ZDDPs. Appropriate personal hygiene procedures as outlined in the MSDS, should, of course, be followed since ZDDPs in concentrated form are irritating to the skin.

This product also contains calcium phenate. When a similar calcium phenate was applied to the skin of rabbits five days/week for four weeks, the animals developed adverse testicular effects. Studies with other chemicals have since shown that rabbits may develop similar testicular effects due to stress rather than to chemical toxicity. We further investigated the effects of calcium phenates in rats, a species now recognized as more appropriate than rabbits for investigating toxicity by repeated skin exposures. Calcium phenate applied five days/week for four weeks to the skin of rats did not produce adverse testicular effects. Based on these data, we believe that there is no risk of male reproductive impairment from exposure to calcium phenate in the workplace.

This product contains base oils which the International Agency for Research on Cancer (IARC) classifies as having no evidence of carcinogenic potential.

During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly

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removed by washing with soap and water. See Chevron Material Safety Data Sheet No. 1793 for additional information on used motor oil.