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Draft Final Waste Pits Remedial Action Project (WPRAP) Remedial Design Package

Volume 2 of 3

Submitted by:

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Waste Pit Remedial Action Project (WPRAP)
Remedial Design Package Contents

Design Package	Design Document	Document Description
Volume 1 of 3		
Overview of Remedial Design		Summary of Remedial Design Package Contents
Plant Facilities Engineering Package	Description of Operation and Processes	Contains facility process and control descriptions for waste preparation, drying, blending, loadout, air emissions control, water management
	Design Criteria and Assumptions	Description of the criteria which effect the facility design including DOE orders, engineering standards and performance requirements
	Process Flow Diagrams (PFDs) w/Mass and Energy Balances	Contains process flow diagrams for the facility. Dryer process conditions are for the average waste profile.
	Site Plans	Plan view drawings of the overall facility layout
	General Arrangement Plans	Drawings of the facility equipment and building configuration with plan and elevation views
	Equipment Data Sheets/ Specifications	Description of the process duty/performance requirements of the individual facility equipment items
	Utility Plans for Portable Structures	Utility routing drawings for the facility
	Point Source Emission Data	Estimate of air emissions from point sources

Waste Pit Remedial Action Project (WPRAP)
Remedial Design Package Contents

(Page 2 of 2)

Design Package	Design Document	Document Description
Volume 2 of 3		
	Excavation Plan	Description of the waste pit excavation activities
	Pre-Operational Schedule	Detailed schedule of activities through facility startup
Volume 3 of 3		
Site Preparation Package	Description of Site Preparation Activities	Presents the contents of the Site Preparation Package and their inter-relationships.
	Site Plan	Plan view drawings of the overall facility layout
	Grading Plan	Site grading plan drawing
	Associated Profiles and Details	Grading profile and detail drawings
	Specifications	Civil construction specifications
	Manufacturers' Fabrication Drawings of Portable Structures	General floor plan, skirting, and anchoring details for trailers
Project Pre-Operational	Pre-Operational Environmental Control Plan	Description of methods and materials to be used during construction to control erosion, dust and stormwater
	Operation and Maintenance Plan for Existing Facilities	Description of the inspection and maintenance activities to be performed prior to facility operation
	Pre-Operational Health and Safety Plan	Project specific health and safety plan to be used during construction and prior to facility operation

Excavation Plan

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DRAFT

Waste Pits Remedial Action Project
(WPRAP)
EXCAVATION PLAN

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PREPARED
for
Fluor Daniel Fernald, Inc.
Fernald, Ohio

FDF Subcontract No. 98SC000001

***

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Record of Issue/Revisions

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02/13/98	B	Draft Issue for EPA Review
03/27/98	C	Draft Issue for FDF Review
NA	D	Not Issued
06/05/98	E	Draft Issue for EPA Review

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G	Bearing Capacity Evaluation
H	WAC Factor Calculations
I	Total Flow During Pit Excavations

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List of Acronyms/Abbreviations

AASHTO	American Association of State Highway Transportation Officials
ABMA	American Bearing Manufacturers Association
ACGIH	American Conference of Government Industrial Hygienists
ACI	American Concrete Institute
ACM	Asbestos Containing Material
ACOE	United States Army Corps of Engineers
AFBMA	Anti-Friction Bearing Manufacturers Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonably Achievable
ALTER	Accelerated Life Testing and Environmental Research Facility
AMCA	Air Movement and Control Association
ANS	American Nuclear Society
ANSI	American National Standards Institute
APC	Air Pollution Control
API	American Petroleum Institute
ARAR	Applicable or Relevant and Appropriate Requirement.
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
AWWT	Advanced Wastewater Treatment
BAT	Best Available Technology
BSL	Biodenitrification Surge Lagoon
CAM	Continuous Air Monitor
CBR	California Bearing Ratio
CDF	Commercial Disposal Facility
CEM	Continuous Emissions Monitor
CEMA	Conveyor Equipment Manufacturers Association
CERCLA	Comprehensive, Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Constituent of Concern
CPT	Cone Penetrometer Test
CRSI	Concrete Reinforcing Steel Institute
CRU	CERCLA/RCRA Unit
CWA	Clean Water Act of 1977, as amended
D&D	Decontamination and Dismantlement
DAC	Derived Air Concentration
DCD	Design Criteria Document

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DEEP	Dewatering Excavation Evaluation Program
DOE	United States Department of Energy
DOE-NV	United States Department of Energy - Nevada Office of Operations
DOT	United States Department of Transportation
EJMA	Expansion Joint Manufacturers Association
ERDA	Energy Research and Development Administration
F	Fahrenheit
FDF	Fluor Daniel Fernald, Inc.
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facilities Compliance Agreement
fpm	feet per minute
FS	Feasibility Study
FSAR	Final Safety Analysis Report
ft^2	square foot (feet)
GCS	Gas Cleaning System
GFCI	Ground Fault Circuit Interrupter
GLC	Ground Level Concentration
GMA	Greater Miami Aquifer
gpm	gallons per minute
HEPA	High Efficiency Particulate Air (filter)
hr	hour
HVAC	Heating, Ventilation, and Air Conditioning
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineers Society
ID	Induced Draft
IPC	Inclined Plate Clarifier
ISA	International Society for Measurement and Control
IT	IT Corporation
kg	kilogram
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
lb	pound
LLRW	Low Level Radioactive Wastes
m^2	square meter
MAGLC	Maximum Allowable Ground Level Concentration
MAWC	Maximum Average Waste Concentration
MBMA	Metal Building Manufacturers Association
MCC	Motor Control Center
MEI	Maximally Exposed Individual
MHB	Material Handling Building
µCi/cc	microcurie per cubic centimeter
mrem	millirem
MSS	Manufacturers Standardization Society
NAD	North American Datum

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NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESHAP	National Emission Standards for Hazardous Air Pollutants
NETA	National Electrical Testing Association
NFC	National Fuel Code
NFPA	National Fire Protection Association
NP	Nonplastic
NPDES	National Pollutant Discharge Elimination System
NPH	Natural Phenomenal Hazard
NTS	Nevada Test Site
OAC	Ohio Administrative Code
OBBC	Ohio Basic Building Code
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
OSDF	On Site Disposal Facility
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PC	Performance Category
PCB	Polychlorinated Biphenyl
pcf	pounds per cubic foot
pCi/L	picoCuries per liter
PFD	Process Flow Diagram
PID	Photoionizing Detector
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
psf	pounds per square foot
psi	pounds per square inch
psig	pounds per square inch gauge
PTI	Permit to Install
PTO	Permit to Operate
PVC	Polyvinyl Chloride
QAP	Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RLB	Railcar Loadout Building
ROD	Record of Decision
SAE	Society of Automotive Engineers
SCS	Soil Conservation Service
scfm	standard cubic feet per minute
SDI	Steel Deck Institute
sec	second
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPT	Standard Penetration Test
SSC	Structure, System and Component

STD	Standard (DOE)
SWM	Solid Waste Management
SWPPP	FERMCO Storm Water Pollution Prevention Plan
TBC	To Be Considered
TBP	Tributyl Phosphate
TEMA	Tubular Exchanger Manufacturers Association
TOC	Total Organic Carbon
TSDF	Waste Treatment, Storage or Disposal Facility
UBC	Uniform Building Code
UCRL	University of California Research Laboratory
UL	Underwriters Laboratory
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency (EPA)
V	Volt
WAC	Waste Acceptance Criteria
WESP	Wet Electrostatic Precipitator
WPRAP	Waste Pits Remedial Action Project
WTS	IT Corporation Wastewater Treatment System
yd^3	cubic yard
yr	year

1.0 Introduction

IT Corporation (IT) has prepared this Excavation Plan for the Fernald Environmental Management Project (FEMP) Operable Unit 1 (OU1) in accordance with the scope of work, operational phase technical requirements. As required, this Excavation Plan defines all activities, actions, and requirements necessary to properly and safely perform all excavation activities in conformance with applicable regulations and requirements. The Excavation Plan contains descriptions of the processes to be used in the excavation of waste materials from each of the various waste units (Waste Pit Nos. 1 through 6, the Burn Pit, and the Clearwell) and the transfer of these materials to the remediation facilities. The plan also discusses the needed coordination with Fluor Daniel Fernald, Inc. (FDF) relative to the soils excavation.

This Excavation Plan addresses the following topics as listed in the scope of work:

- Overall excavation sequence, methods, and approach
- Criteria (including slope stability and bearing capacity of the waste material) and assumptions
- Profiles, sections, and details of the pits as they currently exist
- Material handling considerations, including considerations specific to the handling of non-typical wastes
- Potential construction dewatering
- Leachate and storm water run-on or runoff management and approach to minimize leachate infiltration to the aquifer
- Excavation sequencing and processes to be used in the excavation of individual waste pits, with plans and sections
- Manpower requirements and equipment selection for waste excavation and transport
- Proposed stockpile areas for potential blending and segregation
- Debris management and segregation
- Air monitoring
- Dust and fugitive emissions controls
- Equipment changeout facilities and procedures
- Interim and final grading.

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The Excavation Plan is divided into six sections. **Section 1.0** provides the requirements of the plan along with an overview of the FEMP, FEMP facility material processes and resulting wastes, material processes, major waste types, and criteria and assumptions. A description of the contents of Sections 2.0 through 8.0 is presented below.

Section 2.0 describes the OU1 area in general. A physical description and operational history of each waste storage area within the OU1 boundary is provided. Waste types and estimated quantities of wastes disposed of in each waste storage area is discussed.

Section 3.0 outlines mobilization activities pertaining to equipment and site preparation, and equipment staging. Documentation forms and personnel training records are also discussed.

Section 4.0 outlines the overall excavation approach for the waste pits and provides a detailed excavation sequence consisting of 19 phases. Engineering controls pertaining to the waste pit berm and waste stability, and Waste Acceptance Criteria (WAC) are presented. Waste pit excavation methodology, material handling including non-typical waste, material hauling procedures as well as interim and final site grading plans are discussed. Manpower and earthmoving equipment requirements to perform excavation and material hauling tasks are defined.

Section 5.0 discusses project environmental controls including dust and fugitive emissions control.

Section 6.0 discusses the management of contact and non-contact storm water during waste pit excavation as well as methods which will be employed to minimize subsurface infiltration and excavation dewatering.

Section 7.0 discusses real-time monitoring.

Section 8.0 discusses the surveying requirements.

A site facilities layout showing the waste pit area and proposed remediation facilities is presented in Figure 1-1.

1.1 FEMP Overview

The FEMP is a 1,050-acre, government-owned, contractor-operated facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati. The facility is located just north of Fernald, Ohio, a small farming community, and lies on the boundary between Hamilton and Butler Counties. Of the total site area, approximately 850 acres are in Crosby Township, in Hamilton County; 200 acres are in Ross and Morgan Townships, in Butler County.

The primary mission of the FEMP during its 37 years of operation was the processing of feed materials to produce high purity uranium metal. These high purity uranium metals were then shipped to other U.S. Department of Energy (DOE) or U.S. Department of Defense (DOD) facilities for use in the nation's weapons program.

Production operations at the FEMP occurred in the fenced in, 136-acre tract of land now referred to as the former production area, located near the center of the property. Liquid and solid wastes were generated by the various operations at the FEMP between 1952 and 1989. Before 1984, solids and slurries wastes from FEMP processes were deposited in the on-property waste storage area. This area, located west of the former production area, includes six low-level radioactive waste storage pits; two earthen-bermed concrete silos containing K-65 residues; one concrete silo containing metal oxides; one unused concrete silo; two lime sludge ponds; a burn pit; a clearwell; a solid waste landfill; and a biodenitrification surge lagoon (BSL) to treat wastewater.

In 1986, the U.S. Environmental Protection Agency (EPA) and DOE entered into a Federal Facility Compliance Agreement (FFCA) covering environmental impacts associated with the FEMP. Production operations at the facility were suspended in 1989 and focus was shifted to environmental restoration and waste management activities.

1.2 FEMP Facility Material Processes and Resulting Wastes

Several chemical and metallurgical processes were used at the FEMP for the manufacture of uranium metal products. These processes occurred in 7 of the FEMP's more than 50 production, storage, and support buildings. In general, the wastes generated at FEMP facilities, as well as some wastes shipped from other DOE/DOD facilities, were disposed of on the property.

1.2.1 Material Processes

Impure starting materials, or feed materials, were first introduced into the process through a sampling plant. Here the materials were sampled to determine their uranium concentrations and their uranium enrichment status. Ore concentrates and impure feed materials from a recovery plant were transferred to a refinery, where they were dissolved in nitric acid. The uranium was then purified through solvent extraction to yield a solution of uranyl nitrate. Evaporation and denitrification converted the uranyl nitrate solution to uranium trioxide (UO_3) powder.

Beginning in 1962, UO_3 recycle tailings containing trace quantities of fission products and transuranics were received from two DOE facilities, the Hanford and Savannah River plants, for reprocessing to metal. Uranium trioxide was introduced to a green salt plant, where it was reduced with hydrogen to form uranium dioxide (UO_2) and then converted to uranium tetrafluoride (UF_4) by reacting with anhydrous hydrogen fluoride. The UF_4 was then transported to a metals production plant, a special materials plant, and a pilot plant, where it was blended with magnesium metal granules and placed in a closed refractory-lined steel pot. At approximately 1,200 degrees Fahrenheit (°F), the UF_4 (500 pounds [lb]) and the magnesium would initiate an exothermic reaction. The result was a 300 to 375 lb piece of pure uranium metal shaped like a gentleman's derby and referred to as a derby. Magnesium fluoride slag also resulted as a by-product of this process. About half of the magnesium fluoride slag was then reused to line the furnace pots.

Small amounts of thorium were processed at the FEMP on several occasions from 1954 through 1975. The FEMP served as the thorium repository for DOE and storage facilities were maintained on the property for a variety of thorium materials. Thorium materials are no longer being received at the FEMP for storage. Existing thorium inventories have now been declared waste and are being overpacked for shipment to DOE's Nevada Test Site (NTS) for disposal.

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1.2.2 Major Waste Types

A wide variety of materials were disposed of in the waste pits, but the overwhelming percentage of waste pit contents, both in mass and volume, is general sump sludge, neutralized raffinate, and magnesium fluoride. The following descriptions include these and other significant waste streams:

- **General Sump Sludge** - The general sump consisted of a series of batch tanks that received filtrates from the various processing plants, wastewater from the laboratory, and general decontamination and cleanup water. Prior to discharging the filtrate to the general sump, the waste streams from the individual processing plants were neutralized and filtered to remove the uranium.

  Filtrate in the general sump was neutralized with lime (calcium oxide - CaO) to obtain maximum precipitation of radioactive materials and other elements, then mixed with air to maintain the solids in suspension for discharge to the waste pits as slurry. After 1984, the solids were settled, and the remaining liquid was pumped to the waste pits. The settled solids were transferred to the processing plant for filtering and packaging for disposal. The filtrate from the processing plant filtering operation was returned to the general sump.

  Many substances would have precipitated with the lime neutralization in the general sump. Because the wastewater had been filtered in the individual processing plants, it has been assumed that half of the nonuranium solids deposited in the waste pits from the general sump was lime (calcium oxide). The remainder is identified as "Unaccounted" since its exact composition is unknown.

- **Neutralized Raffinate** - In the refinery operation, uranium-bearing feed materials were digested in nitric acid to solubilize the uranium. The uranium was then extracted from the nitric acid. The remaining nitric acid, impurities associated with the materials being processed, and small quantities of insoluble, nonextractable uranium are referred to as "raffinate" solution. Before 1960, these raffinates were calcined (cold metal oxide) before disposal. If the raffinate resulted from the processing of ores or ore concentrates with a high radium content, it was called "hot raffinate," and was neutralized and pumped, as a slurry, to the silos. Otherwise, the calcined raffinate was called "cold metal oxide," most of which was also placed in silos. It is likely that some "hot raffinates" were mixed with cold metal oxides and deposited in Waste Pit Nos. 2 and 3. After 1960, the process gradually progressed to neutralization of the raffinate slurry, resulting in "neutralized raffinates."

  The neutralized raffinates generated from the recovery of uranium from process residues were different than that generated from processing ore concentrates. The residues were generated from process operations residues and had a uranium content above the Economical Discard Level (EDL), so the residues were reprocessed to recover the uranium. Because the residues had already been processed, the primary impurities were corrosion products from the process itself.

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The neutralized raffinates primarily contained the impurities from the ore concentrates and residues, nitrates, lime, uranium, and ranged in color from yellow to blue, including brown, orange, and red. The color depended on the primary impurities included. The neutralized raffinates were deposited in slurry form to Waste Pit Nos. 3 and 5, with a small amount deposited in Waste Pit No. 2.

- **Magnesium Fluoride (MgF_2)** - The reduction of UF_4 (green salt) using magnesium metal to produce uranium metal generates MgF_2 slag. This material was deposited in the waste pits in primarily three forms:

  - **Depleted Slag** - The reduction of depleted UF_4 generated depleted MgF_2 slag. A small amount of calcium oxide was deposited in Waste Pit Nos. 1 and 2 from 1955 to 1963. Calcium oxide was generated when dolomite was used to line the reduction pots, before magnesium fluoride was used for that purpose. The remainder of the depleted slag was deposited in Waste Pit Nos. 4 and 6.

  - **Trailer Cake** - Prior to 1965, uranium was recovered from MgF_2 slag by reducing normal and enriched UF_4. The uranium was recovered by first being dissolved in hydrochloric acid and then precipitated. The insoluble materials remaining after the acid digestion were filtered out and the resulting trailer cake transported to Waste Pit Nos. 1, 2, 3, and 4. This material was referred to as trailer cake.

    In addition to the trailer cake generated by the reduction of UF_4 produced on site, the facility received depleted calcium oxide and Interim Reprocessing Plant residues (IRP tailings) from Mallinckrodt Chemical Works (MCW) from 1959 to 1965. The IRP tailings had already been processed to recover some of the uranium. Both of these materials were reprocessed to recover as much uranium as possible. The resultant residue was transported to Waste Pit No. 3 as trailer cake.

  - **Slag Leach Slurry** - After 1965, milled MgF_2 slag from the reduction of normal and enriched UF_4 was transferred to the refinery for recovery of uranium. The uranium was recovered by dissolving it in nitric acid, followed by extraction and denitrification. The insoluble materials left over after the acid digestion were filtered out, reslurried, mixed with lime (calcium oxide) to a pH of around 11, and pumped to the waste pits. This material, known as slag leach slurry, was deposited in Waste Pit No. 3 from 1965 until Waste Pit No. 5 was completed in October 1968, and then in Waste Pit No. 5.

- **Other Waste Streams** - Other wastes known to have been deposited in the waste pits in significant quantities or the presence of which may be of concern from an environmental standpoint include:

  - **Depleted Residues** - Various residues were generated from the processing of depleted materials. These residues included wastes from the packaging of depleted products. A wide variety of material size, density, and uranium content are represented in these residues.

The materials include the following (taken from actual records of discards):

a. Contaminated rags, paper, and polyethylene
b. Contaminated asbestos material
c. Dust collector bags
d. Scrap salts (high in fluoride), including floor sweepings
e. Off-specification UF_4 or thorium tetrafluoride (ThF_4)
f. Contaminated soil, rocks, sand, brick, and ceramics
g. Furnace salt (solidified, nonchloride)
h. Dust collector residues (high fluoride, pyrophoric)
i. Dry crushed slag from furnace pot blowouts
j. Partially oxidized metal (containing no metal-x fire retardant)
k. Bad reductions (no derby)
l. Unrecycled slag (ball mill product)
m. Dirty prill (magnesium metal, high uranium content)
n. Reject UO_3
o. Drum decontamination residues
p. Magnesium oxide and magnesium zirconate from crucible cleanout
q. Sludges (oily, high free metal)
r. Sludges (salt, soft, chloride)
s. Sludges (nonoily, low or high free metal)
t. Wet sump of trailer cake (with and without oil)
u. Scrap uranium oxide U_3O_8
v. Chips and turnings
w. Solid metal (other than ores) U_3O_8
x. Contaminated asbestos materials.

These residues were deposited in Waste Pit Nos. 1, 2, 4, and 6.

- **Water Treatment Sludge** - Sludge from the softening of water for use in the production process was placed in Waste Pit Nos. 3 and 5 to further neutralize and solidify the contents. This material contains precipitated calcium carbonate ($CaCO_3$) and magnesium hydroxide ($Mg(OH)_2$) as well as excess lime ($Ca(OH)_2$).

- **Graphite and Ceramics** - Graphite was used in the various places in the production process, including crucibles and ingot molds. This graphite was regularly replaced. The waste graphite from the processing of normal and enriched uranium was burned in the graphite burner to concentrate the uranium. Waste graphite from the processing of depleted uranium was deposited in Waste Pit Nos. 1, 2, and 4. Ceramic brick was used to line process reduction and remelt furnaces. These ceramics were periodically replaced, and the old ones were deposited in Waste Pit Nos. 1, 2, and 4.

- **Uranium Ammonium Phosphate Filtrate** - Uranium ammonium phosphate (UAP) filtrate was generated from 1953 to 1964 in the UAP process. This process was a method of recovering uranium from magnesium fluoride slag and other residues.

The neutralized UAP filtrate was deposited in Waste Pit Nos. 1 and 2. Although not a major contributor to the contents of these waste pits, the filtrate did contain various impurities.

- **Thorium Wastes** - Thorium wastes were generated at the site from two sources: an impurity in the ore concentrates (mostly Th-230) and production of thorium metal (Th-232). The impurities in the ore concentrates were concentrated up to three times in the raffinate by virtue of removing the uranium, so depending on the ore concentrate, significant concentrations of Th-230 may be expected in Waste Pit Nos. 2, 3, and 5.

  The production of thorium metal generated residues for disposal. In the early 1950s, these residues were stored and later transported off site. Some of these stored residues, as well as those generated during the 1960s and 1970s, were deposited in the waste pits as raffinates (Waste Pit Nos. 1, 3, and 5), solids (Waste Pit No. 4), and liquid wastes (Waste Pit Nos. 1, 2, 3, and 5 through the general sump).

- **Ash** - All contaminated combustibles, such as wooden pallets, paper, general trash, graphite, oils, etc., were burned or incinerated on site. The purpose of this activity was to reduce the volume to be ultimately disposed and to concentrate any recoverable uranium.

  Ash from the burning activities was collected and sampled for uranium content and isotopic level. If these levels were above the EDL, the ash was processed to recover the uranium. In this case, the ash would become part of the raffinate, and been deposited in Waste Pit Nos. 2, 3, or 5. If the uranium content was below the EDL, the ash would have been deposited directly in Waste Pit Nos. 1, 2, 4, or 6.

- **Fly Ash** - Fly ash was generated from an on-site, coal-fired boiler. This material usually was deposited in one of two fly ash storage piles. Some of the fly ash, however, was used as cover material for Waste Pit No. 3. Records indicate that some of this fly ash also was deposited in the Burn Pit prior to 1959.

1.3 Criteria, Assumptions, and Definitions

This section discusses the criteria, assumptions, and definitions relative to the excavation of the pit wastes.

1.3.1 Criteria

The following criteria have been established for the development of this plan:

- Waste Stability - A minimum waste slope of 3 horizontal to 1 vertical for Waste Pit No. 3 and the Clearwell, 4 horizontal to 1 vertical for Waste Pit No. 5, and 2½ or 2 horizontal to 1 vertical for the remaining waste pits will be maintained during the waste excavations. This criterion is based on the slope stability analyses (Appendix E), assuming wet conditions, conducted on the waste pit materials. However, a steeper slope may be maintained in an area where a drained condition exists.

The bearing capacity for the waste material ranges from 9.3 pounds per square inch (psi) for Waste Pit No. 5 and the Clearwell, to 34.3 psi for Waste Pit No. 6. The wastes' bearing capacity will increase providing the material is allowed to drain.

- Material Segregation - A gross segregation using excavation equipment will be performed in the pits to segregate materials into processable wastes, non-processable wastes, and non-typical wastes. Dry and wet materials may be segregated, as needed, to support the blending program. Through gravity drainage, pumping, and segregation, free water will be segregated from solid waste and discharged to the Clearwell or water treatment system prior to discharge to the BSL.

- Storm Water - Contact storm water will be collected in the pit sumps and discharged to the Clearwell or Waste Pit No. 5 (prior to excavation and if storage is available). The addition of these waters to the Clearwell and Waste Pit No. 5 constitutes a request to the Ohio EPA in accordance with the 1988 Consent Decree. This request is discussed in detail in Section 2.8 of the "Description of Operation and Processes" presented in the Plant Facilities Engineering Package. Storm water that falls on clean areas within the waste pit area will be discharged to the Clearwell or the K-65 Runoff Basin.

- Roads - The facility concept for vehicular traffic includes separate service roads and haul roads. Service roads will be used exclusively to access the support zones (office areas, laboratory, and laydown areas). Haul roads will be used for transportation of wastes from the excavation areas to the Material Handling Building.

- Decontamination - All trucks leaving the pit area will pass through a truck wash facility to control the transport of contamination from the waste pit excavations.

- Air Emissions Control - All work areas, including the excavation, embankments, and haul roads will be maintained to minimize the generation of dust. Dust suppressants may be used for dust control.

1.3.2 Assumptions

Based on an engineering review of relevant data provided by FDF, the following assumptions have been made:

- It is assumed that the waste throughout the pits has sufficient strength to maintain a stable slope except that some sloughing of slurry placed materials, such as in Waste Pit Nos. 3 and 5, is expected to occur along the excavation face.

- It is assumed that waste blending (for material characteristics), as a part of the excavation operations, commences at the excavation. As necessary, this blending and mixing will be achieved by excavating in two or more areas with the desired different material characteristics.

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- The caps, liners, and subsoils of the pits are assumed to have lower moisture contents, higher bulk densities, and are less contaminated than the waste material itself. These materials are assumed to be capable of supporting the excavation equipment.

- For purpose of preparing this Excavation Plan, and for developing overall project waste and soils mass balances, an assumption is made that 36 inches of subsoils are contaminated and will be excavated during the waste pit excavation operations. It was further assumed that 18 inches of these materials would be disposed of at the On-Site Disposal Facility (OSDF), and 18 inches of these materials will be disposed of at the Commercial Disposal Facility (CDF). The subsoils will be excavated as directed by FDF based upon survey for contamination. For planning purposes, it has been assumed that the waste properties for each pit's subsoil will be generally similar (depleted or enriched, types of contaminants, etc.) to the waste contained in the pit at about 10 percent of the contamination levels.

- It is currently assumed that no off-site borrow material will be required to grade the excavated pits to the lines and grades as shown on the Waste Pit Restoration Plan (Appendix A), based on the assumed subsoil excavation depth of 36 inches.

- The existing perimeter storm water controls are assumed operational and to be kept in place.

- It is assumed that pit excavation operation will be conducted 8 hours a day, 5 days a week. Change in working hours may be made from time to time due to weather, unforseen equipment breakdowns, or low productivity site conditions.

1.3.3 Definitions

The following definitions are used in this document during discussion of water management:

- **Perched Water** - Subsurface water occurring in the glacial overburden. Perched water that seeps through the sidewalls of the excavations is referred to as "seepage."

- **Contact Storm Water** - Storm water that contacts raw waste material within an open excavation; storm water that lands on the water cover of the Clearwell, Waste Pit No. 5, and Waste Pit No. 6; and storm water that contacts potentially contaminated surfaces (e.g., haul roads, contaminated concrete pads, and roads).

- **Noncontact Storm Water** - Storm water that does not contact any raw waste or potentially contaminated surfaces. Examples include roof drains, storm water that lands on covered sections of the waste pits and is diverted to the K-65 Runoff Basin, and storm water that falls on the ground outside the waste pit area and is diverted to the Storm Water Management (SWM) Pond or to existing drainage swales. Storm water collected in the SWM Pond will require monitoring to verify that it is noncontaminated.

- **Excavation Water** - The combined water pumped from an excavation to the Clearwell. This is composed of contact storm water, drainage from excavated materials, and perched water seepage into the excavation.

- **Wastewater Treatment System (WTS)** - The IT WTS will be used to pretreat water as necessary prior to discharge to the BSL and subsequent treatment in the Advanced Wastewater Treatment (AWWT) Facility.

2.0 Operable Unit 1 Description

OU1 is a 37.7-acre storage area located west of the former FEMP production facility. The area is relatively flat with gentle slopes resulting from the placement of soil cover over buried wastes and topographical modifications to control surface water runoff. Paddys Run, an intermittent tributary of the Great Miami River, runs along the west side of FEMP property between the waste storage area and the property boundary.

The boundary of OU1 encloses Waste Pit Nos. 1 through 6, the Burn Pit (used for the disposal and burning of waste), and the Clearwell (primarily a settling basin for surface water runoff). Miscellaneous structures and facilities such as berms, liners, concrete pads, underground piping, utilities, railroad tracks, and fencing are also present within the OU1 boundary. A plan view, and sections of the pit areas are shown in Drawings M-05-82-001 and M-05-82-002 (Appendix B).

Some pits received wet waste in the form of slurry that was pumped to the pit. These pits include Waste Pit Nos. 3, 5,and 6 and the Clearwell. Other pits received waste that was placed using a dry backfill type operation. These pits include Waste Pit Nos. 1, 2, and 4 as well as the Burn Pit. The methods of filling the pits, along with the natural moisture contents, were useful in addressing blending requirements for providing a consistent thermal load to the drying operations.

Table 2-1 provides, by pit or area, a summary of the waste content, surface area, depth, berm sideslopes, liner and cover types, anticipated groundwater depth, quantities, average assumed properties for the materials, and the anticipated optimum moisture content. The relative contribution of the waste to the WAC's radiological limits, and the hazard categorization factor of the waste pit if fully opened, are also provided in Table 2-1. Details of the WAC's radiological limits are discussed in Section 4.0 of this plan. Detailed information regarding the waste pit contents is presented in the "Remedial Investigation (RI) Report for Operable Unit 1" dated August 1994.

A summary of the waste material properties and quantities with respect to volume, moisture, weight, and required total removal of water to meet the moisture content restrictions is presented in Table 2-2.

2.1 Waste Pit No. 1 Description

Waste Pit No. 1 was constructed in 1952 by excavating into an existing clay layer. The waste pit was then lined with clay excavated from an area to the northeast of the waste pit, which later became the Burn Pit. The waste pit surface area is oval-shaped; the dimensions at the bottom are approximately 165 feet wide by 347 feet long. On average, this waste pit is 29.5 feet deep. It contains approximately 18 feet of waste, 11 feet of lining, and a 6-inch cover. The bottom of Waste Pit No. 1 slopes from east to west.

Although Waste Pit No. 1 was filled using a dry backfill type operation, it was used as a clearwell for Waste Pit No. 2 in 1958 and 1959. A trench, 11 to 12 feet wide and 10 feet deep, was excavated around the bottom of Waste Pit No. 1 and backfilled with clay. A sump area, lined with approximately 6 feet of clay was also constructed in the southwest corner. The trench fed rain water and other liquids to the sump, where they could be removed as necessary. Four feet of excavated clay was placed in the southeast corner of Waste Pit No. 1, and a berm was constructed on the west

side of the waste pit. This berm is elevated approximately 20 feet above the surrounding ground surface. The sides of Waste Pit No. 1 were constructed with 3:1 slopes and then seeded.

2.2 Waste Pit No. 2 Description

In 1957, Waste Pit No. 2 was constructed northeast of Waste Pit No. 1. The surface area boundary of Waste Pit No. 2 resembles a six-sided polygon with dimensions at the top of approximately 190 feet wide by 270 feet long. This waste pit is approximately 23.5 feet deep. It includes approximately 15 feet of waste, 4.5 feet of lining, and 1 to 4 feet of cover.

Although Waste Pit No. 2 was filled using a dry backfill type operation, it was used briefly as a settling pit for neutralized raffinate during 1958 and 1959, before completion of Waste Pit No. 3 (NLO, 1985), because the drying equipment available at that time could not process all of the raffinate. A spring-fed pond (water level elevations 574±1 feet) existed on what became the southern portion of the waste pit. The waste pit was constructed by draining the pond and excavating into the existing native clay. Trees, stumps, and roots had to be removed from the north end. The bottom and sideslopes were then lined with 4.5 feet of additional clay from an area immediately northeast of the waste pit, which later became the Burn Pit. Waste Pit No. 2 was closed and covered with clean fill in mid-1964. In 1972, a portion of this cover material was removed and used to cap Waste Pit No. 3. Currently, 1 to 4 feet of soil cover overlies Waste Pit No. 2. Improvements to a road, built only 4 feet from the east edge of Waste Pit No. 2, could have extended over a portion of the waste pit.

2.3 Waste Pit No. 3 Description

Waste Pit No. 3 was constructed and placed into service in 1958. The surface area boundary of Waste Pit No. 3 is oval-shaped and has dimensions of approximately 450 feet wide by 720 feet long. This waste pit is approximately 42 feet deep. It includes approximately 34 feet of waste, 1 foot of native clay on the bottom, and 7 feet of cover material.

Prior to constructing Waste Pit No. 3, a small creek present along the west embankment of Waste Pit No. 2 was relocated to the north of the Burn Pit. A natural layer of low permeability clay forms the bottom of this waste pit, therefore, the placement of additional clay material was not necessary. The sides of Waste Pit No. 3 were constructed with a 1.5:1 slope and lined with 12 inches of compacted clay. The west berm was constructed approximately 20 feet above the 1958 ground level. Some of the soil excavated from the waste pit itself was used to form the west wall (NLO, 1977). No berm was constructed on the north side of Waste Pit No. 3.

The east side of Waste Pit No. 3 was created from the west sides of Waste Pit Nos. 1 and 2. An effluent line from the general sump was installed through the north dike of Waste Pit No. 3. A 4-foot wide walkway of crushed stone was then constructed on top of the berm between Waste Pit No. 3 and the Clearwell. In the middle of the berm, a 20-foot-long by 19-foot-wide reinforced concrete weir was constructed. The weir allowed water to decant from Waste Pit No. 3 to the Clearwell. In the early 1970s, the weir was removed, and the area was filled with soil to create a wider berm between Waste Pit No. 3 and the Clearwell.

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In 1975, when Waste Pit No. 3 was partially covered, a change in the drainage patterns channeled surface water away from Waste Pit Nos. 1, 2, and 3 to the Clearwell and Waste Pit No. 4. At about this time, Waste Pit No. 5 was almost full, so several-hundred-thousand gallons of sludge were removed, combined with other wastes, and pressed into trailer cake. The resulting trailer cakes were discarded, mostly into Waste Pit No. 3. In 1977, Waste Pit No. 3 was closed for disposal purposes and completely covered with clean fill.

2.4 Waste Pit No. 4 Description

Waste Pit No. 4 was constructed and placed into service in 1960. The surface area boundary of the waste pit is trapezoidal in shape with maximum dimensions of approximately 380 feet wide by 310 feet long. This waste pit is approximately 32 feet deep. It includes approximately 25 feet of waste, 1 to 2 feet of liner, and 6 feet of cover. The waste pit was constructed with 2:1 sideslopes. The sides and bottom were then covered with 1 to 2 feet of clay. Solid wastes were deposited into Waste Pit No. 4 until 1985, but the waste pit was not officially closed until May of 1986.

2.5 Waste Pit No. 5 Description

Waste Pit No. 5 was constructed and placed into service in 1968. The surface area of Waste Pit No. 5 is rectangular in shape and is approximately 820 feet long by 240 feet wide. This waste pit is approximately 29 feet deep. It includes approximately 28 to 29 feet of waste, and a membrane liner. It was constructed with berm sideslopes of 2.5:1 that extend about 10 feet above grade on the south side and 14 to 20 feet above grade on the north side. The waste pit was lined with a 60-mil thick Royal-Seal ethylene propylene diene monomer (EPDM) elastomeric membrane.

Water percolation from porous native material was encountered during the original excavation of the waste pit. The porous seams were overexcavated and filled with compacted clay prior to installation of the liner. Perched water was encountered during excavation activities, but the majority of water was from surface runoff into the waste pit. The waste pit bottom was sloped from east to west to allow for drainage.

All liquid waste entering Waste Pit No. 5 flowed through a 6-inch pipe at the eastern end. Supernatant overflowed through an effluent tower at the southwest corner of the waste pit. Waste Pit No. 5 served as a settling basin for thin slurries pumped from the refinery and the general sump from October 1968 through August 1983, as well as supernatant from Waste Pit Nos. 4 and 6. This waste pit also received supernatant from the general sump from August 1983 into 1987. Waste Pit No. 5 stopped receiving slurried wastes in 1983 and was discontinued for use as a settling basin in 1987.

In 1975, because Waste Pit No. 5 was close to capacity, several-hundred-thousand gallons of sludge were removed from Waste Pit No. 5 and filtered. The majority of the filtered material was deposited in Waste Pit No. 3, with some going to Waste Pit No. 4.

2.6 Waste Pit No. 6 Description

Waste Pit No. 6 was constructed between September 1978 and June 1979. It is square in shape with sides measuring approximately 210 feet. It is approximately 24 feet deep, measured from the top of the berm to the liner, but the depth of the wastes in the waste pit is only 20 feet.

Waste Pit No. 6 was constructed in the same manner as Waste Pit No. 5 and lined with a 60-mil EPDM elastomeric liner. Water percolation and numerous pockets of perched water were encountered during the construction of Waste Pit No. 6. There is a berm around all sides except for the west side, which is adjacent to Waste Pit No. 4. The berm varies in height from approximately 4 to 8 feet above grade. Because of the small size, the waste pit bottom was not sloped during construction.

Waste Pit No. 6 received wastes from June 1979 through March 1985. Generally, to protect the membrane liner, the waste pit received only noncoarse, nonpyrophoric materials. The use of Waste Pit No. 6 ceased on March 11, 1985. In December 1990, exposed material in the waste pit was redistributed so that it could be completely covered with water. The water cover on Waste Pit No. 6 continues to be maintained today.

2.7 Burn Pit Description

Clay to line Waste Pit Nos. 1 and 2 during their construction was obtained from an area immediately northeast of Waste Pit No. 2, which at that time was called the clay pit. A gravel dumping pad was eventually built up on the north end of the resulting excavation so that trucks could back into the deepest part of the waste pit to dump combustible wastes. Thus, this clay pit became known as the Burn Pit. The Burn Pit possesses poorly characterized boundaries and is relatively amorphous in shape, radiologically and chemically heterogeneous. This pit does not have a clearly delineated boundary.

2.8 Clearwell Description

The Clearwell was constructed in 1959 during Waste Pit No. 3 construction activities. To allow for construction of Waste Pit No. 3 and the Clearwell, a small creek that ran along the west embankment of Waste Pit No. 2 was relocated north of the existing Burn Pit. The Clearwell was excavated into existing low permeability material to an elevation of 548±1 feet above mean sea level (MSL). The Clearwell is approximately 200 feet long by 180 feet wide, with a maximum depth of 27 feet.

The east, west, and south sides of the Clearwell were constructed with a 1.5:1 slope and lined with 12 inches of clay. The north side was constructed with a 2:1 slope and also lined with 12 inches of clay. The west berm of the Clearwell was constructed approximately 20 feet above grade in 1958. The north side is adjacent to the south side of Waste Pit No. 3. The east side was formed from the west side of Waste Pit No. 1. A natural layer of low permeability material forms the bottom of the Clearwell, therefore, additional clay material was not placed in the bottom.

The Clearwell was a final settling basin for surface water runoff from the waste pits and supernatant from Waste Pit Nos. 3 and 5. The Clearwell was dredged in the late 1960s or early 1970s, but has never been emptied or dredged again.

3.0 Mobilization for Excavation Activities

Conventional construction equipment will be mobilized to the site to perform the excavation, blending, and on-site transportation of waste soils. This section will mainly focus on the mobilization of the personnel and equipment necessary for preparation, excavation, blending, and on-site transportation of waste soils inside the contamination areas to the Material Handling Building.

3.1 Excavation Personnel

Prior to arrival on site, all personnel will undergo the necessary training as presented in the Operational Health and Safety Plan.

3.2 Construction Equipment

Conventional construction earthmoving equipment will be used to excavate, blend, and transport waste soils from the pit areas to the Material Handling Building for thermal drying and/or loadout. That equipment may include, but is not limited to, tracked excavators (conventional and extended reach booms and sticks), bulldozers, front-end loaders (tracked or rubber tire), articulating 6-wheel drive dump trucks, water truck, fuel/maintenance truck, vacuum truck, dust suppression sprayers, pressure washers, and assorted pumps (submersible and centrifugal, of different sizes) to control groundwater inflow and storm water. Typical performance sheets for selected equipment is presented in Appendix C of this plan. These sheets are presented for information and approximate actual equipment to be used. All equipment will be mobilized to the site on permitted (if required) trailers, pulled by over-the-road semi-rigs and trucks.

3.2.1 Equipment Delivery, Initial Inspection, and Acceptance

Upon delivery to the site, each piece of equipment will undergo a thorough inspection to demonstrate appearance and safe performance. All equipment will undergo a baseline radiological scan prior to use on site. An example of an Equipment Inspection Checklist is presented in Appendix D and provides specific details of these inspections. The Construction Superintendent, or designee, will perform the initial inspection along with the operator or teamster. Noted deficiencies (if any) will be corrected by the individual equipment suppliers. Once approved in this initial inspection, the Site Health and Safety Officer (SHSO) will then inspect each machine for safe operations. Only after each of these inspections are complete, and concurrence reached as to operability and safety of each respective piece of equipment, will it be incorporated into the work.

All acceptance and inspection records will be maintained on site for review and inspection. These records will include both initial and ongoing equipment inspections.

3.2.2 Equipment Preparation and Exposure Protection

Several operational procedures will be implemented to minimize potential contamination to the excavation equipment. First, only the equipment necessary to perform the work will be permitted in contamination areas. Once inside a contamination area, potential cross-contamination of the equipment will be controlled through designating the equipment to specific waste areas and individual pits, to the extent practicable. Repair equipment and standby equipment will be kept in support zone areas until required. Any non-essential or standby equipment utilized in the contamination areas will be removed and decontaminated as soon as possible. This equipment will

be radiologically sampled/surveyed by FDF Radiological Control in accordance with radiological control procedures prior to removal.

Secondly, the individual equipment suppliers will complete reasonable pre-operations protective activities to include smoothing out welds and rough surfaces, and covering those areas normally exposed to high levels of dust and sediments. Areas not expected to contact waste soils on a continuous basis, such as cabs, counterweights, booms, etc., will receive extra coats of paint to prevent wear or scratching resulting in exposed metal surfaces. These bare metal surfaces would be much more susceptible to low level radioactive contamination when contacting the waste soils. The additional painted coating will facilitate decontamination efforts. Protective barriers, such as welded steel plates, may be installed to cover hydraulic and pneumatic fittings which might otherwise collect dust and/or trap sediments. Strippable coatings similar to industrial or floor sealers as manufactured by Sherwin Williams may be applied to cabs, booms, counterweights, truck beds, etc. to provide a buffer to the waste soils and also facilitate decontamination. The selection of non-metal components, such as interior seating, controls, belts, etc., will prioritize the use of the least porous materials practicably available.

During operations, IT will implement controls to maintain the maximum protective level of the equipment. Such measures include:

- Weekly monitoring of air intakes on each piece of equipment, with frequent changeouts of filters to prevent buildup of possibly contaminated sediments.
- Controlling the potential for cross-contamination to the extent practicable, by designating equipment for use in specific areas and waste pits.
- Maintaining a regular gross decontamination/cleaning operation for the excavation equipment. Non-essential equipment or standby equipment used in a contamination area on a temporary basis will be decontaminated and removed from areas contacting waste soils as soon as practicable.
- Maintaining coatings and repainting of worn or exposed areas on a continual basis.

Though these measures are intended to protect the excavation equipment as much as feasibly possible, the tracked equipment, and particularly undercarriages of tracked equipment, will undoubtedly become exposed to low level radioactive wastes. The nature of moving parts, constantly in the presence of soils and abrasive sediments, will wear through several layers of any protective paint and coatings. However, these measures have been proposed in an effort to minimize the degree of radiological contamination to the equipment and to maximize the potential for free release of equipment and recycling of materials. Though these measures are not all inclusive, they do provide a means of protecting as much of each individual piece of equipment as possible.

3.2.3 Equipment Staging Area

A proposed staging area approved by FDF for the excavation equipment will be selected prior to incorporation into the contamination areas. A skid- or trailer-mounted refueling tank will be maintained in the support zone. The refueling tank will be filled from local commercial vendors or

from the on-site fuel/maintenance truck, depending on location and health and safety restrictions. The refueling area shown on Figure 1-1 is the primary location. However, a refueling truck or trailer will be provided for refueling of equipment within the pit area. Individual equipment pieces will be staged at the close of each working shift at the main staging location for each waste pit.

The equipment maintenance building will provide a secure, enclosed area in which to perform preventive, scheduled, and long-term equipment maintenance and repairs. A decontamination pad will provide for decontamination of the equipment prior to entrance into the maintenance building (Figure 1-1). Gross decontamination to remove sediments and waste soils will be performed in each respective contamination area truck wash facility prior to reaching the decontamination pad.

4.0 Overall Excavation Approach

The following sections describe the various phases of excavation, the associated excavation activities, and the anticipated manpower and equipment required to perform the excavation of Waste Pit Nos. 1 through 6, the Burn Pit, and the Clearwell.

Drawings depicting each phase of excavation are presented in Appendix B of this plan. The intent of these drawings is to show the phased progression of the excavation activities. The Final Site Restoration Plan is presented in Appendix A of this plan.

4.1 Development of the Excavation Sequence

The proposed pit excavation sequence is pictorially shown on Figures 4-1 through 4-3. Various pits will be excavated concurrently to provide the necessary materials to create a waste blend acceptable from a radiological and moisture control standpoint, as follows:

- The pit area will remain classified as an "Other Industrial Facility," as defined under DOE-EM-STD-5502-94 (the maximum Fractional Value Hazard Categorization Criteria maintained less than 1).
- OU1 waste will be blended to meet the normalized WAC factor of less than 1.
- OU1 waste will be blended to meet the Normalized Enrichment Factor of less than 1.
- Moisture content will be maintained to within plus or minus 5 percent of the blended materials' Standard Proctor optimum moisture content to meet the WAC. This goal may be modified up or down in response to the CDF requests to assist in dust control and handling during disposal operations.
- Details of the CDF WAC are given in Section 4.2 of the Design Criteria and Assumptions document.

In addition, the material in the OU1 Contaminated Soil Stockpile at the northeast corner of the proposed Material Handling Building is also incorporated into the excavation sequence. IT will contact FDF to schedule the transfer of this material at least 10 calendar days before the date of transfer.

DOE-EM-STD-5502-94 establishes criteria for Nuclear, Radiological, Non-Nuclear, and Other Industrial Facility hazard classification. A hazard category calculation is performed to determine the facility hazard classification with Other Industrial Facility being the lowest hazard classification. The calculation considers several factors including meteorological conditions, exposed waste surface area, and waste composition (radiological and chemical). Estimated hazard categorization fractional values of less than one (1) indicate that the Other Industrial Facility classification is valid.

As shown in Table 2-1, the most restrictive hazard categorization criterion are for the chemical hazards in Waste Pit Nos. 3 and 5, and are direct result of the existing arsenic levels within these pits. This is demonstrated by the Hazard Categorization Fractional Values column showing the

maximum value for a fully exposed pit area. For the chemical hazards, Waste Pit No. 3 could contribute up to 3.60 and Waste Pit No. 5 could contribute up to 0.55 (for smooth surface). Therefore, it is proposed that Waste Pit No. 3 will be incrementally excavated from north to south such that only part of the pit waste will be exposed at any given time. As such, the waste in the northern portion of the pit will be removed to the liner, while the pit cover materials in the southern portion remain undisturbed. Furthermore, the excavation of Waste Pit No. 5 will not be initiated until nearly all of the Waste Pit No. 3 waste material has been removed to avoid the cumulative impact to the hazard categorization and to assure that the site remains "Other Industrial Facility."

The proposed excavation sequence is controlled in a large part by the need to produce a waste meeting specific moisture content, bulk unit weight, and radiological criteria. As shown in Table 4-1 (Waste Blending Plan), the high moisture content materials, from such pits as Waste Pit No. 3 and Waste Pit No. 5, will be blended with lower moisture content materials for moisture content control. In addition, the blending plan was developed using average values. Therefore, as the excavation progresses, the sequence and rates will be driven by the needs of the blending and drying program; thus, minor variations in material properties will result in minor variations in the ratios of concurrent waste excavation. Low bulk density wastes, such as the material from Waste Pit No. 5, may be blended with higher bulk density wastes, such as subsoils, to optimize railcar loads. For radiological concerns, enriched waste source materials from Waste Pit No. 2, the Burn Pit, and the Clearwell will be blended with depleted waste source materials from Waste Pit Nos. 1, 3, 4, 5, and 6.

Waste Pit No. 4 will provide an active highly depleted uranium source for most of the project. As shown in the Waste Blending Plan, Waste Pit No. 4 waste material will be staged in the Material Handling Building during Phase 12 for use as a depleted uranium source in Phases 18 and 19. The proposed Material Handling Building will provide sufficient space for these processing quantities.

Extended active excavation and blending periods will occur for Waste Pit Nos. 3 and 5 due to their size and moisture content. The water cover over Waste Pit No. 5 will be maintained during the Waste Pit No. 3 excavation to assure the pit area will remain classified as an "Other Industrial Facility."

As Drawing M-05-82-100 indicates, excavation at OU1 will commence at Waste Pit No. 3. If unforseen delays preclude the timely operation of the dryer facility as scheduled during the pre-operational phase, alternative production (in lieu of thermal drying) can be accomplished by blending Waste Pit No. 3 cap material with OU1 Contaminated Soil Stockpile material. It is anticipated that both these materials have a near-optimum moisture content. It is also anticipated that both of these materials, and therefore, a mixture of them in any proportion, will meet the WAC criteria.

A detailed discussion of the overall excavation sequence is presented in the following sections.

4.2 Excavation Phases

The overall excavation sequence will consist of 19 phases as shown on Drawings M-05-82-100 through M-05-82-118 (Appendix B). Table 4-2 shows the cumulative percentage of materials removed from each waste pit. The indicated percentages are based on the neat line excavation quantities (waste pit cap, waste, and liner materials) only. This table also indicates the phase during which the subsoils will be excavated (directed excavation) from each waste pit bottom. Since this

portion of the excavation will be directed by FDF, the total amount of material removed from each waste pit bottom cannot be quantified at this time. For planning purposes, a directed excavation of 36 inches of subsoils under each pit has been assumed. It was further assumed that 18 inches of the subsoils will be disposed of at the CDF and the remaining materials will be disposed of at the OSDF. Furthermore, the OU1 Contaminated Soil Stockpile volume is estimated to be 47,600 cubic yards (cy).

Excavation phases are expected to range from 1 day (Phase 15) to 268 days (Phase 2). The estimated quantity of material associated with each phase will be excavated and transported to the Material Handling Building for drying, if needed, and blending. Once the radiological and moisture content criteria have been met, the material will be sampled for CDF WAC compliance and, if acceptable, loaded into railcars for off-site disposal.

4.2.1 Phase 1

Phase 1 will consist of excavating approximately 2 percent of the material by volume (approximately 6,150 cy) from Waste Pit No. 3 and blending it with approximately 950 cy of stockpiled OU1 contaminated soils. Currently, it is estimated that this excavation phase will require 9 working days to complete. However, as this is the first phase executed, a schedule duration of approximately 23 working days has been budgeted.

Much of the Waste Pit No. 3 cap material and all of the OU1 Contaminated Soil Stockpile material is expected to have near-optimum moisture content. It is also anticipated that both of these materials, and therefore, a mixture of them in any proportion, will meet the WAC criteria. Most of this material is expected to be blended and, bypassing the dryer operations, directed to the railcar loadout building.

A haul road will be constructed from the truck wash facility to the northeast corner of Waste Pit No. 3. The haul road alignment, approximate limits of excavation within Waste Pit No. 3, and traffic routing are shown in Drawing M-05-82-100. A collection sump and pump station will also be installed at the approximate location shown. This system will collect contact storm water, drainage water from the material, and any perched water seepage which may enter the excavation, and transfer it to the Clearwell. This water will then be transferred to the WTS for treatment prior to discharge to the BSL.

4.2.2 Phase 2

Phase 2 will consist of excavating 100 percent of the material by volume (approximately 68,400 cy) from Waste Pit No. 1, approximately 22 percent of the material by volume (approximately 8,230 cy) from Waste Pit No. 2, and approximately 32 percent of the material by volume (approximately 98,400 cy) from Waste Pit No. 3. Currently, it is estimated that this excavation phase will require 268 working days to complete.

The haul road constructed during the Phase 1 excavation will be extended to provide access to the bottom of Waste Pit No. 3. Additional haul roads and ramps will also be constructed to access Waste Pit Nos. 1 and 2. The excavation of Waste Pit Nos. 1, 2, and 3 will commence at the truck turnaround areas, located at the base of each of the access ramp, and progress southward. This will minimize the amount of run-on into the excavation areas. Collection sumps and force mains will

be relocated, as necessary, as the working faces of the excavations progress. Water within Waste Pit No. 3 will continue to be transferred through the force main installed during Phase 1. A collection sump and force main will be installed within Waste Pit No. 2 to collect contact water which may accumulate within the waste pit. This force main will tie into the Waste Pit No. 3 force main at the approximate location shown on Drawing M-05-82-101. Waste Pit No. 1 excavation water will be directly discharged to the Clearwell. The haul road alignments, force main locations, traffic routings, and the approximate limits of excavation within Waste Pit Nos. 1, 2, and 3 are shown in Drawing M-05-82-101.

4.2.3 Phase 3

Phase 3 will consist of excavating 15 percent of the material by volume (approximately 46,130 cy) from Waste Pit No. 3 and blending it with approximately 10,950 cy of OU1 Contaminated Soil Stockpile material. Currently, it is estimated that this excavation phase will require 85 working days to complete.

During this phase, the working face within Waste Pit No. 3 will advance approximately 75 feet southward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 1 and 2 will continue to be managed as described in Phase 2. The approximate area of excavation within Waste Pit No. 3 and traffic routing are shown in Drawing M-05-82-102.

4.2.4 Phase 4

Phase 4 will consist of excavating the subsoils from Waste Pit No. 1 and approximately 15 percent of the material by volume (approximately 46,130 cy) from Waste Pit No. 3. Currently, it is estimated that this excavation phase will require 88 working days to complete.

During this phase, the working face within Waste Pit No. 3 will advance approximately 75 feet southward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit No. 2 will continue to be managed as described in Phase 2. After directed excavation in Waste Pit No. 1 is completed, during the period before the waste pit is certified as clean, water from the pit will continue to be collected and treated. The approximate area of excavation within Waste Pit No. 3 and traffic routing are shown in Drawing M-05-82-103.

4.2.5 Phase 5

Phase 5 will consist of excavating the remaining waste material (approximately 29,170 cy) from Waste Pit No. 2, approximately 16 percent of the material by volume (approximately 49,200 cy) from Waste Pit No. 3, and approximately 42 percent of the material (approximately 30,580 cy) from Waste Pit No. 4. Currently, it is estimated that this excavation phase will require 175 working days to complete.

During this phase, the working face within Waste Pit No. 3 will advance approximately 100 feet southward. The remaining material within Waste Pit No. 2 will be removed as the excavation of this pit progresses southward. The collection sumps and force mains within these pits will be relocated as necessary as the excavations progress. The excavation water which is generated within Waste Pit Nos. 1, 2, and 3 will continue to be managed as described in Phase 2. After Waste Pit No. 1 has been

certified as "clean," any water which accumulates within the pit will be considered noncontact storm water and will no longer be collected and treated.

A haul road, extending from the truck wash facility to the southwest corner of Waste Pit No. 4, will also be constructed during this phase. A ramp will then be constructed to access the bottom of Waste Pit No. 4. A collection sump and pump station will also be installed and tied into the Waste Pit No. 3 force main at the approximate location shown on Drawing M-05-82-104. This system will collect excavation water and transfer it to the Clearwell. This water will then be transferred to the WTS for treatment prior to discharge to the BSL.

The haul road alignments, force main locations, traffic routing, and the approximate limits of excavation within Waste Pit Nos. 2, 3, and 4 are shown in Drawing M-05-82-104.

4.2.6 Phase 6

Phase 6 will consist of excavating approximately 5 percent of the material by volume (15,380 cy) from Waste Pit No. 3 and blending it with approximately 3,330 cy of OU1 Contaminated Soil Stockpile material. Currently, it is estimated that this excavation phase will require 29 working days to complete.

During this phase, the working face within Waste Pit No. 3 will advance approximately 40 feet southward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 2, 3, and 4 will continue to be managed as described in Phase 5. The approximate area of excavation within Waste Pit No. 3 and traffic routing are shown in Drawing M-05-82-105.

4.2.7 Phase 7

Phase 7 will consist of excavating the subsoils from Waste Pit No. 2, approximately 7 percent of the material by volume (approximately 21,510 cy) from Waste Pit No. 3, and approximately 1 percent of the material by volume (approximately 730 cy) from Waste Pit No. 4. Currently, it is estimated that this excavation phase will require 41 working days to complete.

During this phase, the working faces within Waste Pit Nos. 3 and 4 will advance southward approximately 65 feet and 5 feet, respectively. The collection sumps and force mains within these pits will be relocated, as necessary, as the excavations progress. After directed excavation in Waste Pit No. 2 is completed, during the period before the waste pit is certified as clean, water from the pit will continue to be collected and treated. The approximate area of excavation within Waste Pit Nos. 3 and 4 and traffic routing are shown in Drawing M-05-82-106.

4.2.8 Phase 8

Phase 8 will consist of excavating the remaining material (approximately 24,600 cy) from Waste Pit No. 3 and 100 percent of the material by volume (approximately 9,600 cy) from Waste Pit No. 6. Currently, it is estimated that this excavation phase will require 59 working days to complete.

The haul road constructed during the Phase 1 excavation will be extended to provide access to Waste Pit No. 6. The ramp into Waste Pit No. 6, shown in Drawing M-05-82-107, will also be constructed during this excavation phase. A collection sump and force main will also be installed within Waste

Pit No. 6 to collect excavation water which may accumulate within the waste pit. This force main will tie into the Waste Pit No. 3 force main at the approximate location shown on Drawing M-05-82-107. The excavation water which is generated within Waste Pit Nos. 2, 3, and 4 will continue to be managed as described in Phase 5. The haul road alignments, force main locations, traffic routing, and the approximate limits of excavation within Waste Pit Nos. 3 and 6 are shown in Drawing M-05-82-107.

4.2.9 Phase 9

Phase 9 will consist of excavating the subsoils from Waste Pit No. 3 and approximately 27 percent of the material by volume (approximately 26,430 cy) from Waste Pit No. 5. Currently, it is estimated that this excavation phase will require 101 working days to complete.

The haul road constructed during the Phase 1 excavation will be extended to provide access to the southern side of Waste Pit No. 5. A collection sump and force main will also be installed within Waste Pit No. 5 to collect excavation water which may accumulate within the waste pit. This force main will tie into the Waste Pit No. 3 force main at the approximate location shown on Drawing M-05-82-108.

The excavation water which is generated within Waste Pit Nos. 3, 4, and 6 will continue to be managed as described in Phase 5. After directed excavation in Waste Pit No. 3 is completed, during the period before the waste pit is certified as clean, water from the pit will continue to be collected and treated. After Waste Pit No. 2 has been certified as "clean," any water which accumulates within the pit will be considered noncontact storm water and will no longer be colleted and treated. The approximate area of excavation within Waste Pit No. 5 and traffic routing are shown in Drawing M-05-82-108.

4.2.10 Phase 10

Phase 10 will consist of excavating approximately 17 percent of the material by volume (approximately 16,640 cy) from Waste Pit No. 5 and blending it with approximately 17,140 cy of OU1 Contaminated Soil Stockpile material. Currently, it is estimated that this excavation phase will require 65 working days to complete.

During this phase, the working face within Waste Pit No. 5 will advance approximately 20 feet northward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 3, 4, 5, and 6 will continue to be managed as described in Phase 9. The approximate area of excavation within Waste Pit No. 5 and traffic routing are shown in Drawing M-05-82-109.

4.2.11 Phase 11

Phase 11 will consist of excavating approximately 4 percent of the material by volume (approximately 3,920 cy) from Waste Pit No. 5 and the subsoils from Waste Pit No. 6. Currently, it is estimated that this excavation phase will require 14 working days to complete.

During this phase, the working face within Waste Pit No. 5 will advance approximately ½ foot northward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 3, 4, 5, and 6

will continue to be managed as described in Phase 9. After directed excavation in Waste Pit No. 6 is completed, during the period before the waste pit is certified as clean, water from the pit will continue to be collected and treated. The approximate area of excavation within Waste Pit No. 5 and traffic routing are shown in Drawing M-05-82-110.

4.2.12 Phase 12

Phase 12 will consist of excavating approximately 5 percent of the material by volume (approximately 3,640 cy) from Waste Pit No. 4, approximately 11 percent of the material by volume (approximately 10,770 cy) from Waste Pit No. 5, and 100 percent of material by volume (approximately 30,300 cy) from the Burn Pit. Currently, it is estimated that this excavation phase will require 93 working days to complete.

During this phase, the working face in Waste Pit No. 4 will advance approximately 10 feet southward, and the working face within Waste Pit No. 5 will advance approximately 20 feet northward. Furthermore, the ramp in Waste Pit No. 4 will be extended into the Burn Pit. The location of the Burn Pit ramp and actual limits of excavation will be determined in the field. Approximately 1,900 tons of materials excavated from Waste Pit No. 4 will be stockpiled within the Material Handling Building for blending with the Clearwell subsoils during Phases 18 and 19. The collection sumps and force mains within these pits will be relocated, as necessary, as the excavations progress. The excavation water which is generated with in Waste Pit Nos. 4, 5, and 6 will continue to be managed as described in Phase 11. After Waste Pit No. 3 has been certified as "clean," any water which accumulates within the pit will be considered noncontact storm water and will no longer be collected and treated. The approximate limits of excavation within Waste Pit Nos. 4 and 5 and the Burn Pit and traffic routing are shown in Drawing M-05-82-111.

4.2.13 Phase 13

Phase 13 will consist of excavating approximately 3 percent of the material by volume (approximately 2,940 cy) from Waste Pit No. 5 and the subsoils from the Burn Pit. Currently, it is estimated that this excavation phase will require 10 working days to complete.

During this phase, the working face within Waste Pit No. 5 will advance approximately ½ foot northward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 4, 5, and 6 and the Burn Pit will continue to be managed as described in Phase 11. After directed excavation in the Burn Pit is completed, during the period before the pit is certified as clean, water from the pit will continue to be collected and treated. The approximate area of excavation within Waste Pit No. 5 and traffic routing are shown in Drawing M-05-82-112.

4.2.14 Phase 14

Phase 14 will consist of excavating approximately 52 percent of the material by volume (approximately 37,850 cy) from Waste Pit No. 4 and approximately 14 percent of the material by volume (approximately 13,700 cy) from Waste Pit No. 5. Currently, it is estimated that this excavation phase will require 105 working days to complete.

During this phase, the remaining waste within Waste Pit No. 4 will be removed and the working face within Waste Pit No. 5 will advance approximately 20 feet northward. The collection sumps and

force mains within these pits will be relocated, as necessary, as the excavations progress. The excavation water which is generated within Waste Pit Nos. 4 and 5 and the Burn Pit will continue to be managed as described in Phase 11. After Waste Pit No. 6 has been certified as "clean," any water which accumulated within the pit will be considered noncontact storm water and will no longer be collected and treated. The approximate limits of excavation within Waste Pit Nos. 4 and 5 and traffic routing are shown in Drawing M-05-82-113.

4.2.15 Phase 15

Phase 15 will consist of excavating approximately 1 percent of the material by volume (approximately 980 cy) from Waste Pit No. 5 and blending it with approximately 480 cy of OU1 Contaminated Soil Stockpile material. Currently, it is estimated that this excavation phase will require 1 working day to complete.

During this phase, the working face within Waste Pit No. 5 will advance approximately ½ foot northward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. Excavation water which is generated within Waste Pit Nos. 4 and 5 and the Burn Pit will continue to be managed as described in Phase 11. The approximate area of Waste Pit No. 5 to be excavated and traffic routing are shown in Drawing M-05-82-114.

4.2.16 Phase 16

Phase 16 will consist of excavating the subsoils from Waste Pit No. 4 and approximately 8 percent of the material by volume (approximately 7,830 cy) from Waste Pit No. 5. Currently, it is estimated that this excavation phase will require 30 working days to complete.

During this phase, the working face within Waste Pit No. 5 will advance approximately 24 feet northward. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 4 and 5 and the Burn Pit will continue to be managed as described in Phase 11. After directed excavation in Waste Pit No. 4 is completed, during the period before the pit is certified as clean, water from the pit will continue to be collected and treated. The approximate area of excavation within Waste Pit No. 5 and traffic routing are shown in Drawing M-05-82-115.

4.2.17 Phase 17

Phase 17 will consist of excavating approximately 15 percent of the material by volume (approximately 14,690 cy) from Waste Pit No. 5 and blending it with approximately 14,750 cy of OU1 Contaminated Soil Stockpile material. Currently, it is estimated that this excavation phase will require 56 working days to complete.

During this phase, the remaining wastes within Waste Pit No. 5 will be removed. The collection sump and force main within the pit will be relocated, as necessary, as the excavation progresses. The excavation water which is generated within Waste Pit Nos. 4 and 5 will continue to be managed as described in Phase 11. After the Burn Pit has been certified as "clean," any water which accumulates within the pit will be considered noncontact storm water and will no longer be collected and treated. The approximate area of excavation within Waste Pit No. 5 and traffic routing are shown in Drawing M-05-82-116.

4.2.18 Phase 18

Phase 18 will consist of excavating the subsoils from Waste Pit No. 5 and 100 percent of material by volume (approximately 4,300 cy) from the Clearwell. These materials will be blended with the Waste Pit No. 4 material that was stockpiled in the Material Handling Building during Phase 12 excavation activities. Currently, it is estimated that this excavation phase will require 78 working days to complete.

The ramp into the Clearwell, as shown in Drawing M-05-82-117, will be constructed during this excavation phase. During the Clearwell excavation and following its completion, all water discharges previously directed to the Clearwell will be routed to the BSL. After directed excavation in Waste Pit No. 5 is completed, during the period before the pit is certified as clean, water from the pit will continue to be collected and treated. The approximate areas of Waste Pit No. 5 and the Clearwell to be excavated and traffic routing are shown in Drawing M-05-82-117.

4.2.19 Phase 19

Phase 19 will consist of excavating the subsoils from the Clearwell and blending it with the Waste Pit No. 4 material that was stockpiled in the Material Handling Building during Phase 12 excavation activities. Currently, it is estimated that this excavation phase will require 13 working days to complete. The excavation water from Waste Pit Nos. 4 and 5 and the Clearwell will continue to be managed as described in Phase 18. After directed excavation in the Clearwell is completed, during the period before the pit is certified as clean, water from the pit will continue to be collected and treated. The approximate area of Clearwell to be excavated is shown in Drawing M-05-82-118.

4.2.20 Clearwell Maintenance

The storm water and contact water operations will be executed to reasonably limit the solids loading to the Clearwell. As the Clearwell will be used for settling prior to treatment in the WTS, some intermediate excavation of Clearwell sediments may be required to maintain operational storage capacity. The need for maintenance excavation of the Clearwell will be forecasted based upon observed solids buildup in the Clearwell. Prior to excavation, the existing supernatant within the Clearwell will be removed and treated in the WTS and discharged to the BSL.

The Clearwell is a wet, enriched uranium waste source. Excavated materials will be blended with depleted waste from Waste Pit No. 4 so that the mixture qualifies as depleted.

4.3 Engineering Controls

Engineering controls which have been addressed and analyzed during the development of this Excavation Plan include the waste pit berm stability, waste stability, waste bearing capacity, and WAC factors and moisture contents for the various pits and the Clearwell.

The analyses presented herein are based on information obtained from the RI. As the excavation progresses, additional analyses will be performed using information obtained from field observations and testing.

4.3.1 Berm Slope Stability Analysis

Berm stability analyses were performed using the PCSTABL5 slope stability computer program developed by Purdue University for the Federal Highway Administration. Using the program search routine, a given number of trial circular failure surfaces were generated and the corresponding factors of safety were calculated based on the Modified Bishop Method. Comparing the results of each trial failure surface, a minimum factor of safety for each analyzed section was determined. These analyses considered both static and seismic conditions. A seismic coefficient of 0.10 g (acceleration due to gravity) was utilized for seismic analyses. Minimum factors of safety of 1.2 and 1.0 are considered adequate for static and seismic conditions, respectively.

The following sections present the assumptions and results for the analyses performed for each pit and the Clearwell. These results are summarized in Appendix E of this plan. The geotechnical properties from past site investigations which were used in the analyses are also presented in Appendix E.

4.3.1.1 Waste Pit No. 1 Berm Slope Stability

Waste Pit No. 1 is located adjacent to Waste Pit No. 2, Waste Pit No. 3, and the Clearwell. From a technical point of view, the most critical condition for the stability of the berm around Waste Pit No. 1 exists when Waste Pit No. 1 is empty and an adjacent pit contains waste and/or water. In addition, the width of the berm between two waste pits may also be significant to berm stability. Based on the proposed excavation sequence and the berm widths, the stability of the berms between Waste Pit No. 1 and Waste Pit No. 3, and the Clearwell are considered to be critical. These analyses were performed based on the following assumptions:

- Waste Pit Nos. 1 and 3 Berm (Figures E1 and E2, Appendix E) - The material in Waste Pit No. 3 is at the top of the berm and the water level in Waste Pit No. 1 is at the bottom of the pit. The phreatic surface within the berm was assumed to be a straight line from approximately 7 feet below the top of the berm at the Waste Pit No. 3 side of the berm, to the toe of the berm at the Waste Pit No. 1 side of the berm.

- Waste Pit No. 1 and Clearwell Berm (Figures E3 and E4, Appendix E) - The water and sediment in the Clearwell is approximately 12 feet below the top of the berm (Clearwell will be maintained with 12 feet freeboard at all times prior to its removal to provide additional storage capacity for anticipated storm events) and the water level in Waste Pit No. 1 is at the bottom of the waste pit. The phreatic surface within the berm was assumed to be a straight line from approximately 12 feet below the top of the berm at the Clearwell side of the berm, to the toe of the berm at the Waste Pit No. 1 side of the berm. Figures E3 and E4 (Appendix E) show a second water level within 2 feet of the Clearwell crest which represents the anticipated water level following a 25-year, 24-hour storm event.

Under the assumed conditions, the minimum factors of safety for the sections analyzed are 1.91 and 2.05 for the Waste Pit Nos. 1 and 3 berm and the Waste Pit No. 1 and Clearwell berm, respectively, under static conditions. The minimum factors of safety for the sections analyzed are 1.38 and 1.50 for the Waste Pit Nos. 1 and 3 berm and the Waste Pit No. 1 and Clearwell berm, respectively, under seismic conditions.

4.3.1.2 Waste Pit No. 2 Berm Slope Stability

Waste Pit No. 2 is located adjacent to Waste Pit No. 1, Waste Pit No. 3, Waste Pit No. 4, and the Burn Pit. From a technical point of view, the most critical condition for the stability of the berm around Waste Pit No. 2 exists when Waste Pit No. 2 is empty and an adjacent pit contains waste and/or water. In addition, the width of the berm between two waste pits may also be significant to berm stability. Based on the proposed excavation sequence and the berm widths, the stability of the berm between Waste Pit No. 2 and Waste Pit No. 1 is considered to be critical. These analyses were performed based on the following assumptions.

- Waste Pit Nos. 2 and 1 Berm (Figures E5 and E6, Appendix E) - The material in Waste Pit No. 1 is at the top of the berm and the water level in Waste Pit No. 2 is at the bottom of the pit. The phreatic surface within the berm was assumed to be a straight line from approximately 5.5 feet below the top of the berm at the Waste Pit No. 1 side of the berm, to the toe of the berm at the Waste Pit No. 2 side of the berm.

Under the assumed conditions, the minimum factor of safety for the section analyzed is 1.48 for the Waste Pit Nos. 2 and 1 berm under static condition. The minimum factor of safety for the section analyzed is 1.25 for the Waste Pit Nos. 2 and 1 berm under seismic condition.

4.3.1.3 Waste Pit No. 3 Berm Slope Stability

Waste Pit No. 3 is located adjacent to Waste Pit No. 1, Waste Pit No. 2, Waste Pit No. 5, the Burn Pit, and the Clearwell. From a technical point of view, the most critical condition for the stability of the berm around Waste Pit No. 3 exists when Waste Pit No. 3 is empty and an adjacent pit contains waste and/or water. In addition, the width of the berm between two waste pits may also be significant to berm stability. Based on the proposed excavation sequence and the berm widths, the stability of the berms between Waste Pit No. 3 and Waste Pit No. 5, and the Clearwell are considered to be critical. These analyses were performed based on the following assumptions:

- Waste Pit Nos. 3 and 5 Berm (Figures E7 and E8, Appendix E) - The waste and water in Waste Pit No. 5 is approximately 2 feet below the top of the berm and the water level in Waste Pit No. 3 is at the bottom of the pit. The phreatic surface within the berm was assumed to be a straight line from approximately 2 feet below the top of the berm at the Waste Pit No. 5 side of the berm, to the toe of the berm at the Waste Pit No. 3 side of the berm.

- Waste Pit No. 3 and Clearwell Berm (Figures E9 and E10, Appendix E) - The water and sediment in the Clearwell is approximately 12 feet below the top of the berm (Clearwell will be maintained with 12 feet freeboard at all times prior to its removal to provide additional storage capacity for anticipated storm events) and the water level in Waste Pit No. 3 is at the bottom of the waste pit. The phreatic surface within the berm was assumed to be a straight line from approximately 12 feet below the top of the berm at the Clearwell side of the berm, to the toe of the berm at the Waste Pit No. 3 side of the berm. Figures E9 and E10 (Appendix E) show a second water level within 2 feet of the Clearwell crest which represents the anticipated water level following a 25-year, 24-hour storm event.

Under the assumed conditions, the minimum factors of safety for the sections analyzed are 1.24 and 1.35 for the Waste Pit Nos. 3 and 5 berm and the Waste Pit No. 3 and Clearwell berm, respectively, under static conditions. The minimum factors of safety for the sections analyzed are 1.03 and 1.09 for the Waste Pit Nos. 3 and 5 berm and the Waste Pit No. 3 and Clearwell berm, respectively, under seismic conditions.

4.3.1.4 Waste Pit No. 4 Berm Slope Stability

Waste Pit No. 4 berm soil and waste parameters of the adjacent waste pits are considered to be identical to those parameters used to analyze Waste Pit No. 2 berm stability. Since the groundwater elevation at this portion of the site is approximately the same as the groundwater elevation adjacent to Waste Pit No. 2, and the berm slope of Waste Pit No. 4 (2H:1V) is shallower than the berm slope of Waste Pit No. 2 (1H:1V), it is assumed the factor of safety of Waste Pit No. 4 berm slope will be greater than the factor of safety of Waste Pit No. 2 berm slope (1.48 and 1.25, under static and seismic conditions, respectively). Therefore, the factor of safety for Waste Pit No. 4 berm slope will be greater than 1.2 and 1.0 for static and seismic conditions, respectively, which is considered to be adequate.

4.3.1.5 Waste Pit No. 5 Berm Slope Stability

Waste Pit No. 5 berm soil and waste parameters of the adjacent waste pits are considered to be identical to those parameters used to analyze Waste Pit No. 2 berm stability. Since the groundwater elevation at this portion of the site is approximately the same as the groundwater elevation adjacent to Waste Pit No. 2, and the berm slope of Waste Pit No. 5 (2½H:1V) is shallower than the berm slope of Waste Pit No. 2 (1H:1V), it is assumed the factor of safety of Waste Pit No. 5 berm slope will be greater than the factor of safety of Waste Pit No. 2 berm slope (1.48 and 1.25, under static and seismic conditions, respectively). Therefore, the factor of safety for Waste Pit No. 5 berm slope will be greater than 1.2 and 1.0 for static and seismic conditions, respectively, which is considered to be adequate.

4.3.1.6 Waste Pit No. 6 Berm Slope Stability

Waste Pit No. 6 berm soil and waste parameters of the adjacent waste pits are considered to be identical to those parameters used to analyze Waste Pit No. 2 berm stability. Since the groundwater elevation at this portion of the site is approximately the same as the groundwater elevation adjacent to Waste Pit No. 2, and the berm slope of Waste Pit No. 6 (2½H:1V) is shallower than the berm slope of Waste Pit No. 2 (1H:1V), it is assumed the factor of safety of Waste Pit No. 6 berm slope will be greater than the factor of safety of Waste Pit No. 2 berm slope (1.48 and 1.25, under static and seismic condition, respectively). Therefore, the factor of safety for Waste Pit No. 6 berm slope will be greater than 1.2 and 1.0 for static and seismic conditions, respectively, which is considered to be adequate.

4.3.1.7 Burn Pit Berm Slope Stability

The Burn Pit berm slopes are unknown at the time this plan was prepared. Therefore, a berm stability analysis was not performed.

4.3.1.8 Clearwell Berm Slope Stability

Clearwell is located adjacent to Waste Pit No. 1 and Waste Pit No. 3. From a technical point of view, the most critical condition for the stability of the berm around the Clearwell exists when the Clearwell is partially full and an adjacent pit contains waste and/or water. In addition, the width of the berm between two waste pits may also be significant to berm stability. Based on the proposed excavation sequence and the berm widths, the stability of the berms between the Clearwell and Waste Pit No. 1, and Waste Pit No. 3 are considered to be critical. These analyses were performed based on the following assumptions:

- Clearwell and Waste Pit No. 1 Berm (Figures E11 and E12, Appendix E) - The material in Waste Pit No. 1 is at the top of the berm and the sediment and water level in the Clearwell are approximately 12 feet below the top of the berm (Clearwell will be maintained with 12 feet freeboard at all times prior to its removal to provide additional storage capacity for anticipated storm events). The phreatic surface within the berm is a straight line from approximately 5.5 feet below the top of the berm at the Waste Pit No. 1 side of the berm, to 12 feet below the top of the berm at the Clearwell side of the berm.

- Clearwell and Waste Pit No. 3 Berm (Figures E13 and E14, Appendix E) - The material in Waste Pit No. 3 is at the top of the berm and the water and sediment level in the Clearwell is approximately 12 feet below the top of the berm (Clearwell will be maintained with 12 feet freeboard at all times prior to its removal to provide additional storage capacity for anticipated storm events). The phreatic surface within the berm was assumed to be a straight line from approximately 7 feet below the top of the berm at the Waste Pit No. 3 side of the berm, to 12 feet below the top of the berm at the Clearwell side of the berm.

Under the assumed conditions, the minimum factors of safety for the sections analyzed are 1.86 and 2.05 for the Clearwell and Waste Pit No. 1 berm and the Clearwell and Waste Pit No. 3 berm, respectively, under static conditions. The minimum factors of safety for the sections analyzed are 1.34 and 1.40 for the Clearwell and Waste Pit No. 1 berm and the Clearwell and Waste Pit No. 3 berm, respectively, under seismic conditions.

4.3.2 Waste Stability Analyses

Slope stability analyses were performed to determine the maximum excavated waste slopes which may be maintained in the various pits. The slope stability analyses were performed with the PCSTABL5 computer program. Using the search routine, a given number of trial circular failure surfaces were generated and the corresponding factors of safety were calculated based on the Modified Bishop Method. Comparing the results of each trial failure surface, the minimum factor of safety for the section analyzed was determined.

These analyses did assume a conservative phreatic surface which would occur due to dewatering. Initially, a cross section with an assumed slope based on the waste material characteristics was selected and analyzed. A factor of safety of 1.2 or greater is considered adequate. If a factor of safety for the assumed slope was less than 1.2, then a shallower slope was selected and analyzed. If the factor of safety for this cross section was still less than 1.2, a third trial was performed with

an even shallower assumed slope. This iterative process was continued until a factor of safety of greater than 1.2 was obtained.

If a factor of safety for the assumed slope was significantly greater than 1.2, then a steeper slope was selected and analyzed. If the factor of safety for this cross section was still greater than 1.2, a third trial was performed with an even steeper assumed slope. This iterative process was continued until a factor of safety of less than 1.2 was obtained. Then the assumed slope used in the previous iteration was selected. The results of these analyses as well as the available geotechnical parameters of the various waste pit materials is presented in Appendix F of this plan.

4.3.2.1 Waste Pit No. 1 Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 2 horizontal to 1 vertical must be maintained during the excavation of Waste Pit No. 1 to provide a stable slope.

4.3.2.2 Waste Pit No. 2 Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 2 horizontal to 1 vertical must be maintained during the excavation of Waste Pit No. 2 to provide a stable slope.

4.3.2.3 Waste Pit No. 3 Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 3 horizontal to 1 vertical must be maintained during the excavation of Waste Pit No. 3 to provide a stable slope.

4.3.2.4 Waste Pit No. 4 Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 2½ horizontal to 1 vertical must be maintained during the excavation of Waste Pit No. 4 to provide a stable slope.

4.3.2.5 Waste Pit No. 5 Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 4 horizontal to 1 vertical must be maintained during the excavation of Waste Pit No. 5 to provide a stable slope.

4.3.2.6 Waste Pit No. 6 Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 2½ horizontal to 1 vertical must be maintained during the excavation of Waste Pit No. 6 to provide a stable slope.

4.3.2.7 Burn Pit Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 2 horizontal to 1 vertical must be maintained during the excavation of the Burn Pit to provide a stable slope.

4.3.2.8 Clearwell Stability Analyses

Based on the results of the stability analyses under the stated conditions, a minimum slope of 3 horizontal to 1 vertical must be maintained during the excavation of the Clearwell to provide a stable slope.

4.3.3 Waste Bearing Capacity

The bearing capacity of the wastes within the various pits was analyzed using Terzaghi's bearing capacity equation for strip foundations. It was assumed that the track width of the excavation equipment is 2.5 feet. The bearing capacity calculations, including the assumed geotechnical parameters for the various wastes, are presented in Appendix G of this plan. The allowable operating ground pressures for each waste pit is as follows:

- Waste Pit No. 1 - 32.6 psi
- Waste Pit No. 2 - 14.8 psi
- Waste Pit No. 3 - 13.3 psi
- Waste Pit No. 4 - 33.5 psi
- Waste Pit No. 5 - 9.3 psi
- Waste Pit No. 6 - 34.3 psi
- Burn Pit - 32.9 psi
- Clearwell - 9.3 psi.

4.3.4 WAC Factors and Moisture Contents

The primary purpose of the blending plan is to blend the waste such that the resulting blends qualify as a depleted uranium waste and meet the radiological requirements of the CDF WAC. The total WAC factor and enrichment factor were calculated for the various waste pit materials. The total WAC factor is the sum of the fractions as defined in the CDF WAC. The enrichment factor is defined as the percent of Uranium-235 within the total uranium present in the material, as defined in 10 Code of Federal Regulations (CFR) 20, Appendix B, Footnote 3, 1993 Revision. The assumptions made in these calculations and calculation procedures for determining these factors are presented in Appendix H of this plan.

The average natural moisture content and average optimum moisture content are based on data obtained from previous studies conducted at the site.

4.3.4.1 Waste Pit No. 1

The calculated total WAC factor and enrichment factor for Waste Pit No. 1 material are 0.54 and 0.37, respectively. Waste Pit No. 1 is categorized as depleted since the enrichment factor is less than 0.72. With a WAC factor of 0.54, the Waste Pit No. 1 waste is expected to meet the radiological criteria of the CDF WAC.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 28 percent and 13 percent, respectively. Since the moisture content of the material from Waste Pit No. 1 is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from Waste Pit No. 1 does not meet the acceptance criteria for moisture content.

4.3.4.2 Waste Pit No. 2

The calculated total WAC factor and enrichment factor for Waste Pit No. 2 material are 1.23 and 5.22, respectively. Waste Pit No. 2 is categorized as enriched since the enrichment factor is greater than 0.72. Waste Pit No. 2 materials will be blended with depleted uranium pit materials so that the resulting mixture qualifies as depleted. Since the WAC factor exceeds the CDF radiological criteria, the Waste Pit No. 2 waste will be blended with other pit materials with lower radiological contamination such that the resulting blend has a WAC factor of less than 1.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 44 percent and 15 percent, respectively. Since the moisture content of the material from Waste Pit No. 2 is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture), the material from Waste Pit No. 2 does not meet the acceptance criteria for moisture content.

4.3.4.3 Waste Pit No. 3

The calculated total WAC factor and the enrichment factor for Waste Pit No. 3 material are 0.56 and 0.38, respectively. Waste Pit No. 3 is categorized as depleted since the enrichment factor is less than 0.72. With a WAC factor of 0.56, the Waste Pit No. 3 waste meets the radiological criteria of the CDF WAC.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 54 percent and 19 percent, respectively. Since the moisture content of the material from Waste Pit No. 3 is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from Waste Pit No. 3 does not meet the acceptance criteria for moisture content.

Due to the large quantity and high moisture content of the Waste Pit No. 3 waste, this waste material is a primary source of thermal drying feed material.

4.3.4.4 Waste Pit No. 4

The calculated total WAC factor and the enrichment factor for Waste Pit No. 4 material are 0.59 and 0.17, respectively. Waste Pit No. 4 is categorized as depleted since the enrichment factor is less than 0.72. With a WAC factor of 0.59, the Waste Pit No. 4 waste meets the radiological criteria of the CDF WAC.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 21 percent and 12 percent, respectively. Since the moisture content of the material from Waste Pit No. 4 is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from Waste Pit No. 4 does not meet the acceptance criteria for moisture content.

Due to the Waste Pit No. 4 waste's highly depleted uranium content, this waste will be the primary source of blending materials with enriched sources so that the resulting blend qualifies as depleted.

4.3.4.5 Waste Pit No. 5

The calculated total WAC factor and the enrichment factor for Waste Pit No. 5 material are 0.52 and 0.51, respectively. Waste Pit No. 5 is categorized as depleted since the enrichment factor is less than 0.72. With a WAC factor of 0.52, the Waste Pit No. 5 waste meets the radiological criteria of the CDF WAC.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 80 percent and 26 percent, respectively. Since the moisture content of the material from Waste Pit No. 5 is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from Waste Pit No. 5 does not meet the acceptance criteria for moisture content.

Due to the high moisture content of the Waste Pit No. 5 waste, this waste material is a primary source of thermal drying feed material.

4.3.4.6 Waste Pit No. 6

The calculated total WAC factor and the enrichment factor for Waste Pit No. 6 material are 0.32 and 0.48, respectively. Waste Pit No. 6 is categorized as depleted since the enrichment factor is less than 0.72. With a WAC factor of 0.32, the Waste Pit No. 6 waste meets the radiological criteria of the CDF WAC. With an enrichment factor of 0.48, the Waste Pit No. 6 waste also provides a depleted uranium source for blending with enriched waste.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 16 percent and 8 percent, respectively. Since the moisture content of the material from Waste Pit No. 6 is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from Waste Pit No. 6 does not meet the acceptance criteria for moisture content.

4.3.4.7 Burn Pit

The calculated total WAC factor and the enrichment factor for the Burn Pit material are 0.20 and 0.92, respectively. The Burn Pit is categorized as enriched since the enrichment factor is greater than 0.72. With a WAC factor of 0.20, the Burn Pit waste will meet the radiological criteria of the CDF WAC if blended with depleted uranium waste sources such that the resulting blend qualifies as depleted.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 23 percent and 17 percent, respectively. Since the moisture content of the material from the Burn Pit is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from the Burn Pit does not meet the acceptance criteria for moisture content.

4.3.4.8 Clearwell

The calculated total WAC factor and the enrichment factor for the Clearwell material are 0.56 and 2.59, respectively. The Clearwell is categorized as enriched since the enrichment factor is greater than 0.72. With a WAC factor of 0.56, the Clearwell waste will meet the radiological criteria of the

CDF WAC if blended with depleted uranium waste sources such that the resulting blend qualifies as depleted.

The calculated average natural moisture content and average optimum moisture content, on a wet basis, are 37 percent and 17 percent, respectively. Since the moisture content of the material from the Clearwell is greater than the WAC (± 5 percent of the materials' Standard Proctor optimum moisture content), the material from the Clearwell does not meet the acceptance criteria for moisture content.

4.3.5 Excavation Contingencies

Contingency measures for encountering slurried wastes and other nontypical wastes have been developed. In particular, Pit Nos. 3, 5, and 6 are of more concern due to the increased likelihood of encountering these conditions in those locations. Certain unique factors arise when evaluating contingency measures, in particular those contingency measures associated with slurried waste excavation.

Though the possibility of encountering slurries during the excavation of these pits is certainly real, the excavation of those slurries themselves is not anticipated. Waste dewatering will be undertaken in the pits prior to, and during the excavation so as to allow for the use of conventional excavation methods. Site excavation and pit dewatering will be performed in a manner to ensure that a safe waste pit working face and berm slope stability is maintained at all times. In the event that pockets of waste slurry are encountered, stabilization efforts will be performed by dewatering, admixing suitable dryer materials, or allowing adequate drying to occur in the waste pit to allow for the safe removal of the material using conventional excavation techniques.

Additional contingency measures for excavation operations in Pit Nos. 3, 5, and 6 as a result of slurry waste conditions include daily observations of the excavation sidewalls, faces, and upper edges for such indicators as spalling, heaving, and tension cracking which are used to indicate whether the existing controls are adequate. Should these conditions be observed, IT will relocate equipment to a safe operating range (as determined by a Competent Person in accordance with OSHA requirements), perform a cut back of the waste materials to a flatter slope, use equipment with extended reaching capabilities (i.e. long reach excavator in lieu of excavators with conventional booms and sticks), perform additional dewatering, perform excavation operations of the affected area from a drier position, or relocate the excavation efforts to a more suitable location until such time as the affected area is stabilized.

Contingencies for bearing capacity concerns include all of these measures in addition to the proper equipment selection of machinery which imposes the lowest ground pressures while suitably capable of performing the required work. Examples include machinery with high tracks, wide tracks, or swamp tracks.

Contingencies for encountering nontypical waste during the excavation operations include relocating to another work area (if deemed necessary by IT's Safety and Health Representative) while nontypical waste is properly identified and associated hazards for its excavation are analyzed. Examples include drum encounters and concrete or associated construction debris encounters.

4.4 Equipment Access

Access to the pits will be via haul roads constructed along the pit berms between the truck wash facility and the various waste pits areas at the locations shown on the phase drawings (Appendix B). Ramps from these haul roads to the bottom of the waste pits will be constructed by cutting the berm along the alignments shown on the phase drawings. Ramp construction will commence once a 15- to 20-foot thick (more, if possible) layer of waste over the proposed ramp location has been excavated. The upper portion of the ramp from the top of the berm to the bottom of the 15- to 20-foot deep excavation will then be constructed. This portion of the ramp will be used by the equipment as the waste excavation proceeds. The lower portion of the ramp will be constructed concurrently with the waste pit excavation.

Once a sufficient quantity of material has been removed from the waste pit, the truck turnaround area will also be constructed to complete the ramp installation. At the lower end of the ramp, an area 60 feet in diameter will be constructed to permit the articulating dump trucks to turn around. This turnaround area will be constructed using the pit cover soil. The top of this turn around area will be 10 feet higher than the bottom elevation of the waste pit.

Haul roads and ramps will be constructed with grades not to exceed 12 percent. Haul roads and ramps will be 20 feet wide and their surfaces will consist of a layer of geotextile and a 6-inch layer of gravel. Additional aggregate road base will be added, as necessary, based on field conditions and use.

In addition, reusable landing mat-type roadbeds may be used along the pit bottom to provide a stable roadbed or working platform for trucks and excavating equipment. These metal or fiberglass mesh sheets are interlocking and can be quickly placed. They can easily be washed off and relocated to create temporary roadbeds.

The haul road and ramp widths were determined by multiplying the largest vehicle width by 2, or by adding 2 feet to each side of the widest vehicle, whichever is greater. In this case, the proposed articulating dump trucks have a width of approximately 9 feet; therefore, the proposed 20-foot wide haul roads and ramps will be adequate. The haul roads and ramps will be designed by a competent person qualified in structural design and will be constructed in accordance with the design.

4.5 Excavation

With the exception of Waste Pit No. 3 and the Clearwell, the excavation of the waste pits will proceed in two phases: Neat Line Excavation and Directed Excavation. Neat line excavation will involve the removal of material to the pit bottom which includes the cap, waste material, and the pit liner material. Directed excavation will be concerned with the removal of soil below the pit bottom as directed by FDF. Waste Pit Nos. 1,2,4,5, and 6 are constructed on top of relatively low permeability soil barriers (consisting of native glacial till or placed common fill) between the respective pit liners and the GMA. These soil barriers typically range in thickness from 5 to 15 feet, and will act to reduce the possible infiltration of storm water into the GMA while also serving to prevent incidental contact between the excavation equipment and the GMA.

However, for Waste Pit No. 3 and the Clearwell, neatline excavation will be handled differently due to the relatively thin soil liners and the proximity of these liners to the GMA. Neatline excavation

of Waste Pit No. 3 and the Clearwell will involve the complete removal of cover and waste materials while initially leaving the soil liners in place. The soil liner will then be removed concurrently with approximately one foot of the underlying subsoils in an effort to ensure the utmost protection of the GMA, as detailed in Sections 4.5.1 and 4.5.2 which follow.

The excavation operations will allow for separate handling and transfer (to the Material Handling Building) for drier wastes and soils and also for debris encountered in the pits. Inside the Material Handling Building, the drier materials will be blended with the wetter material to improve handleability.

Due to the heterogeneity of the waste pits, minor field adjustments to this plan will be implemented to assure the execution of the work remains consistent with the concepts of the design.

4.5.1 Neat Line Excavation

For Waste Pit Nos. 1,2,4,5, and 6 the neatline excavation will include removing the covers and waste materials down to the point where the respective liners (soil or EPDM) are visible. Elevation controls will be used to guide the excavations such that the equipment operators will be kept informed of the working excavation elevation at all times. As the excavation approaches the given design elevation of the liners, smaller cuts (i.e., less depth) will be made until the liners are visibly located or the given design elevations of the respective liners are reached.

Once the liner (or liner design elevation) is reached, excavation of the waste materials will proceed laterally along the top elevation of the liner (or liner design elevation) until a suitable working surface area is established. A suitable working surface area will basically consist of a suitable subgrade with adequate reach to both the forward excavation working face, and the liner material, previously exposed. For Waste Pit Nos. 1,2, and 4, the liner materials will be utilized to construct storm water segregation berms between contact storm water (falling within an active, disturbed excavation area of the waste) and non-contact storm water (falling in an area already excavated to subsoil elevation). These storm water segregation berms will be removed, along with applicable portions of the soil liners, as the excavation work progresses laterally. New segregation berms will then be constructed out of and on top of the liner material at the back edge of the working area, with the excavation proceeding in this manner until the pit waste and liner have been removed. Directed excavation will then proceed to remove additionally contaminated subsoils.

For Waste Pit Nos. 5 and 6, the neatline excavation is identical to the manner described above, with the exception that the storm water segregation berms will be constructed entirely of subsoils since the EPDM liners will have been removed.

The potential for penetration into the GMA will be minimized through initiation of proper elevation control at all times. Waste Pit Nos. 1,2,4,5, and 6 have adequate native soil (relatively low permeability glacial till) and/or common fill between the liner bottoms and the aquifer layer so as to avoid direct cross contamination of the aquifer by the construction equipment during excavation activities. Based on waste pit construction records, and the known thickness of the glacial overburden in the Waste Storage Area, these soil layers are expected to range between 5 and 15 feet in depth, as given in Figure 2-2 of the Design Criteria and assumptions section of this RDP. Liner breaches during the neatline excavation phase (cover, waste, and liner) should not pose a significant

risk of contamination to the GMA from infiltration as the low permeability till would act to restrict flow into the GMA.

Waste Pit No. 3 and the Clearwell appear to be constructed directly on top of the GMA. Based on construction records for these two pits, thin, low permeability clay liners are currently in place to separate the wastes and the GMA. Though the integrity of these thin soil liners as they currently exist is unknown, best efforts will be made during the neatline excavation phase for these pits to leave the existing clay liners in place until all of the waste materials have been removed.

However, since these liners are constructed of clay, there exists a likelihood that a certain amount of waste materials will remain within the cracks and uneven interim surface of the exposed clay liners, which is typical when excavating cohesive soils. Additionally, due to thin depth of these clay liners, corresponding concerns arise such as dessication and degradation resulting from the clay liners being exposed to the atmosphere (sun, wind, rain, etc.) for an extended period of time prior to their excavation. Re-entering the pit bottom with construction equipment could then pose a breaching concern. For these reasons, and in order to ensure that the wastes and liner are completely removed, the remaining Waste Pit No. 3 and Clearwell clay liners will be removed concurrently with approximately one (1) foot of the underlying subsoils, as the final part of the waste pit excavation (i.e. prior to directed excavation).

Excavation of these clay liner materials will proceed laterally across the pit bottoms. Liner/subsoil materials (as discussed above) will be utilized to construct storm water segregation berms between contact storm water (falling within the liner area) and non-contact storm water (falling within the exposed subsoils area). These storm water segregation berms will be constructed during the liner excavation similar to the method described for the excavation of the other pits. Following liner removal, directed excavation will then proceed to remove contaminated subsoils.

For excavation activities within all of the pits, pumping of storm water will be a priority, both in the cover/waste/liner excavation and in the exposed subsoil portion of the pits as the excavation progresses, in order to reduce the amount of possible infiltration into the underlying GMA.

In general, an excavator will be used to initially excavate from on top of the waste soil cover on Waste Pit Nos. 1, 2, 3, and 4 to a maximum possible depth with stable sideslopes. Initial excavation of Waste Pit Nos. 5 and 6 and the Clearwell will commence from the berms using the long-reach excavator. This initial operation will strip 15 to 20 feet (more, if possible) of soil cover and waste. The material will be loaded into dump trucks and transported to the Material Handling Building.

Prior to the excavation of Waste Pit Nos. 5 and 6, the supernatant within these pits will be pumped to the Clearwell for subsequent treatment by the WTS. The existing surfaces will then be sprayed with Poly-Shell (or equivalent). Poly-Shell is a mixture of fly ash and shredded plastic that creates a thin, lightweight erosion and water resistant barrier that will also provide dust and erosion control.

If perched water is encountered during the excavation operation, low points will be graded in the pits to create sumps for excavation water collection. Sump pumps will be used to remove the collected water. Caution will be taken near the bottom of the waste pit so that sumps are not excavated prematurely through the pit liner or into the top of the GMA. As discussed previously,

surveyed elevation controls will be utilized to guide the waste pit excavation such that the equipment operators will be kept informed of their working elevation at all times. As the excavation approaches the anticipated liner elevation, smaller cuts will be made until the liner is located or the design elevation of the liner is reached. Also, as the excavations progress with Waste Pit Nos. 5 and 6, the existing EPDM liners will be removed as they are encountered.

Once an area measuring roughly 50 feet by 50 feet has been excavated to an approximate depth of 15 to 20 feet, the excavation operation will be altered to remove the remaining waste material from the pit bottom. Direct loadout of the waste by the excavator into the truck will occur when access permits. Otherwise, a bulldozer will be used to push waste material so that an excavator can load dump trucks that will transport this material to the Material Handling Building.

Upon completion of the neat line excavation and prior to initiating the directed excavation, soil sampling will be performed as described in the following section.

4.5.2 Directed Excavation

This phase of excavation will be directed by FDF in lifts not less than 6 inches in depth. The subsoil excavation will be performed as directed using bulldozer(s) to push the materials to the end of the ramp. At this location the excavator will be staged to load this material into the dump trucks for transport to the Material Handling Building until such time that FDF determines that the constituent levels in the soils show that the soils meet the OSDF WAC. Soils which meet the OSDF WAC will be transported to the transfer point for staging for eventual transport to disposal in the OSDF.

The depth of the excavation, and the final disposition of the excavated soils, will be based on the data from field screening activities performed by FDF in accordance with the FDF sampling and analysis plan. Field screening techniques will cover one acre per day when mobile equipment is used and one acre per week when a high-purity Germanium detector is used.

Once field screening indicates that the final remediation levels (FRL) are met, FDF will collect samples for laboratory analyses, in accordance with the FDF sampling and analysis plan, to certify that the FRLs have been met. Turnaround time for laboratory sample and analysis, report preparation, and data review by the EPA may require a six-month period of time. If it is determined that the FRLs have not been attained, additional excavation will be directed until FRLs are attained.

During the directed excavation activities, storm water, emissions, and dust controls will be maintained.

4.6 Material Separation and Handling

As the excavation of the various waste pits and the Clearwell progresses, initial material separation activities will be conducted within the limits of the excavation to reasonably identify and segregate processable, non-processable, and non-typical wastes. These activities will be performed using the excavating equipment to the maximum extent practical, thereby minimizing the need for personnel exposure and manual waste handling. It is anticipated that personnel will primarily be used to visually inspect the contents of the excavation spoil and working face while performing minimal manual sorting activities.

4.6.1 Processable Wastes

Processable wastes are those waste materials which are less than 4 inches in size, or can be reasonably size-reduced to less than 4 inches, and are not classified as non-typical. These materials will be removed using low ground pressure (LGP) bulldozers, a track mounted excavator, a track mounted loader, and articulating dump trucks.

In order to provide an early assessment of the condition (extremely wet or dry) of the excavated materials, the working face of the excavation and the spoil being staged for loadout will be visually inspected by site personnel. Personnel will also ascertain if large quantities of non-processable or non-typical wastes are being encountered so that the appropriate procedures for handling these materials are instituted in a timely manner.

Processable wastes which appear to be relatively dry will be loaded directly onto dump trucks for transport to the Material Handling Building. Materials identified as being wet may either be loaded onto trucks for subsequent blending at the Material Handling Building, or placed in a segregating and loading area within Waste Pit Nos. 1, 2, 3 and 4. This area will be constructed of recompacted cover soils removed within the limits of excavation during the various phases. The area will be sloped to promote drainage of the wastes. The area is located along the base of the excavations to aid in preventing wind dispersion and potential retransport of radioactive particulate into the air. Dust control measures will be utilized as necessary to preclude the generation of dust.

Materials which require conditioning or further field inspection and segregation will be spread in a relatively uniform layer not exceeding one foot in thickness. The material will then be bladed with a bulldozer or raked with an excavator-mounted raking attachment. This exposed surface will again be inspected by site personnel to identify any additional non-processable or non-typical wastes and to evaluate the physical properties of the waste. Any identifiable non-processable or non-typical materials will be removed manually or by using the excavating equipment, depending on their size, condition, or type. Once conditioning and inspection is complete, the materials will be loaded onto dump trucks for transport to the Material Handling Building for subsequent blending, processing, and drying.

4.6.2 Non-processable Wastes

Non-processable wastes are those waste materials which are greater than 4 inches in size and cannot be reasonably size-reduced to less than 4 inches in size, and are not suitable for processing through the dryer. These materials will be obtained directly from the excavation or from the activities implemented to obtain processable wastes (Section 4.6.1). Depending on the quantity of materials encountered, these materials may be loaded directly into trucks for transport to the Material Handling Building prior to loadout. In the event that the volume of these materials is relatively low, or they are only encountered on an intermittent basis, they will be temporarily staged within the pit area at the locations shown on the phase drawings. Staging will be performed so that full loads of these materials may be removed.

4.6.3 Non-typical Wastes

During the excavation of the various waste pits and the Clearwell, non-typical wastes may be encountered which will require special planning, handling, and treatment. These types of wastes may include the following:

- Pyrophoric materials
- Compressed gas cylinders
- Transformers
- Unopened intact drums
- Polychlorinated biphenyl (PCB) wastes
- Large debris (mechanical equipment or reinforced concrete)
- Thorium metal/oxide
- Asbestos.

Non-typical wastes which are determined to meet the CDF WAC, or can be treated or size-reduced (i.e., non-processable waste) to meet the CDF WAC, will be transferred to the Material Handling Building. Treatment of non-typical wastes includes emptying and appropriately managing the contents of drums, cylinders, transformers, etc. It may not be feasible to treat or otherwise make acceptable for the CDF all non-typical waste streams. Non-typical wastes which cannot be made to meet the CDF WAC will be placed in containers for transfer to FDF for further handling and disposition.

It is understood that there is a potential for encountering materials within the various units which may possess pyrophoric properties. Units which may present a potential for encountering pyrophoric materials include Waste Pit Nos. 3 and 5, the Clearwell, and the Burn Pit. Units which possess a greater potential for encountering these types of wastes include Waste Pit Nos. 2, 4, and 6. Care will be taken during the removal of any materials which are deemed pyrophoric. These materials will be handled in a manner which will prevent them from igniting due to the excavation activities. These materials will require handling by both on-site personnel and the excavation equipment. Once removed, the materials will be staged at a location within the excavation where minimal disturbance will occur. These materials will then be wetted as necessary and packaged in a manner which will minimize disturbance during transport to the Non-Typical Waste Transfer Area located between Waste Pit Nos. 4 and 6. In the event that pyrophoric materials are encountered which have ignited, they will be smothered using available soils. After these materials have been extinguished, they will be wetted and handled in the same manner as described above.

Debris which may be encountered within the waste pits include drums, cylinders, transformers, concrete rubble, and abandoned equipment. These materials will be identified by the on-site personnel who will be monitoring the working face. In the event that debris is encountered, it will be inspected to assess its condition. Furthermore, the location from which it was obtained will also be inspected to determine if additional debris is present.

Prior to the removal of additional debris, an area within the pit will be prepared to provide a suitable foundation upon which personnel may work and where excavated debris may be temporarily staged. It will be located at a safe distance away from the excavator. Depending upon the elevation along the working face at which the debris is encountered, it may be necessary to establish an area on top of the unexcavated cover due to safety concerns. If this is required, the slopes will be evaluated to assess their stability due to the loads induced by the excavator. The slopes will then be cut back, as necessary, based on this evaluation.

In order to minimize the handling of potentially damaged drums by personnel, a drum grappler mounted to the excavator will be used to extract these items. Once extracted, personnel will visually inspect the drum to assess its integrity. Intact drums will be overpacked and transferred to the Non-Typical Waste Transfer Area for subsequent disposal. The contents of all damaged drums will be emptied using the grappler and the contents will be inspected to determine if they shall be handled as either processable or non-processable. The drums will then be flattened using the tracks of the excavator. The flattened drum will then be handled as non-processable wastes. The work area will be monitored as described in Section 7.0 of this plan. All drum handling procedures will be performed in accordance with the Operational Health and Safety Plan to be submitted as part of this project.

Cylinders will primarily be handled by the on-site personnel to minimize the potential of damage which may be incurred if excavation equipment is used to remove these items. Once extricated, the cylinders will be stored at a stable and secure location within the excavation. These cylinders will be secured and/or palletized, if necessary, for transport to the Non-Typical Waste Transfer Area. All cylinders will be handled in accordance with the procedures outlined in the Operational Health and Safety Plan.

Transformers will also be removed using the drum grappler. Once removed, the transformer will be inspected by the on-site personnel to assess its integrity. If necessary, the transformer will be overpacked for transport to the Non-Typical Waste Transfer Area. Absorbent clothes and materials will be staged at the excavation so that any spills due to leaking oils may be contained. These materials will also be drummed prior to transport to the Non-Typical Waste Transfer Area.

Extremely large debris such as concrete rubble and abandoned equipment will be removed from the excavation using the earthmoving equipment. These objects will be sized as necessary to facilitate transport and placement into the railcar for disposal at the CDF, or into other containers for disposal as directed by FDF. Sizing of rubble will primarily be achieved using the buckets or blades of the heavy equipment. Some dismantling of equipment may be required by on-site personnel. Dismantling will be performed using mechanical means to the maximum extent practical. If necessary, acetylene torches may be required. The use of open fames in cutting/welding operations will be performed in accordance with the permits and procedures outlined in the Operational Health and Safety Plan. Loading, slinging, and hoisting of oversized debris will be performed in accordance with the procedures outlined in the FDF Hoisting and Rigging Manual.

Asbestos materials, if encountered, will be removed manually and using the excavation equipment. Materials containing asbestos will be double-bagged or double-wrapped prior to transport to the Non-Typical Waste Transfer Area. Small items will typically be bagged. Larger items, such as pipes, will typically be wrapped in plastic sheeting.

4.7 Material Staging

Materials which will be temporarily staged within the pit area will include processable waste requiring free water drainage, non-processable wastes, and non-typical wastes. Processable wastes will only be staged within the pit for the time reasonably required. At the end of each working shift and whenever inclement weather (high winds, rain, etc.) is expected, staged material will be secured to preclude dust generation by proofrolling, or bucket compacting to provide a tight surface, or

covering with a fabric cover, or by spraying with polyshell or equivalent. Non-processable and non-typical wastes will be staged within the pit area at the approximate locations shown on the excavation phase drawings. These staging areas may be relocated within the pit area as required to facilitate material handling. These materials will be removed when a sufficient volume has accumulated (at least one load).

Additional information regarding the suppression of dust and other fugitive emissions is presented in Section 5.0 of this plan.

4.8 Loading and Hauling

Excavated materials will be loaded into dump trucks using either an excavator or track loader. The trucks will travel along the access ramps and haul roads to the truck wash facility. At this facility, any loose materials will be removed from the truck tires and undercarriage to minimize the accumulation of sediments on the haul road. This practice will also minimize the potential for radioactive sediments to dry and become airborne. Dust generation from the haul roads will be controlled by the application of water or other dust suppression materials. The truck beds will also be equipped with automatic/retractable covers to prevent spillage, dispersion, and blowing of debris.

Additional information regarding safe driving practices, driver PPE, and maximum speed limits is presented in the Operational Health and Safety Plan.

4.9 Additional Excavation Activities

Additional excavation activities will be performed on an ongoing basis to support and facilitate the excavation activities described above. The activities will include dewatering operations and geophysical surveys.

4.9.1 Dewatering Activities

The primary dewatering will consist of sumps and low points located along the base of the excavation. However, during pit excavations, IT will supplement this system using effective methods for in situ dewatering as demonstrated in the DEEP Test Data. This may include wellpoints, trenching, and mixing to enhance drainage concurrent with the excavation process.

4.9.2 Geophysical Surveys

IT may utilize at its discretion certain geophysical surveys to estimate the location of certain types of nontypical wastes (e.g., concentrated radioactive materials, drums, etc.). In particular, these geophysical surveys may be utilized to assist the excavation work in areas where drums, debris, etc., are found in an effort to better define the lateral extent of the buried debris, approximate depth, and relative size. Typical geophysical survey instruments include Ground Penetrating Radar (GPR) and electromagnetic (EM) devices. If used, these instruments will be calibrated and operated in accordance with the manufacturers recommendations.

4.10 Interim Grading

Interim grading will be performed upon the completion of Waste Pit Nos. 1, 2, and 3. Interim grading will consist of the removal of the berm between Waste Pit No. 1 and the northern face of Waste Pit No. 2. This material will be used to buttress the berm between the Clearwell and Waste Pit No. 3 and to fill in low areas within the finished pits. The buttress and fill activities are temporary measures to improve the slope stabiltiy and drainage.

Additional interim grading will occur when the southern berm of Waste Pit No. 5 is removed during Phase 9. These materials will be used to buttress the southern face of the berm between Waste Pit Nos. 3 and 5.

Once a waste pit is complete and certified as clean, interim berms will be constructed along berms and haul roads, as necessary, to reduce the potential for storm water run-on from contaminated areas.

During interim grading operations, temporary seeding of the exposed materials may be utilized for dust and erosion control.

4.11 Final Grading

Upon completion of all waste pit excavations, the entire area will be graded to the lines and grades as shown on the Waste Pit Restoration Plan (Appendix A), or according to the approved final design grading plan. It is assumed no off-site borrow material will be required to regrade the area. The final graded surface will be seeded with a combination of seeds as recommended by the local Soil Conservation Service (SCS) office.

The final grading of the site will include all grading, excavation, fill placement, and compaction. All earthwork will meet Ohio Department of Transportation (ODOT) standards. During the site final grading operations, IT will install erosion and sedimentation control measures (i.e., silt fences, erosion mats, etc.), as needed, to minimize sediment loadings on Paddys Run. All grading and erosion and sedimentation control measures will be designed and installed in accordance with Ohio Department of Natural Resources (ODNR) "Rainwater and Land Development, Ohio's Standards for Storm Water Management, Land Development, and Urban Stream Protection," Second Edition, 1996 (ODNR Rainwater and Land Development Guidance). The final grading will be part of the overall FEMP site regrading program and will utilize the requirements and provisions of this overall plan.

Any pumps, utility lines, monitoring wells, and other appurtenances, within the waste pit area boundaries, will be removed if encountered during the waste site grading activities. These materials will be handled consistent with the handling of debris from the waste pits.

4.12 Manpower Requirements

This project will require an experienced, well-trained, and well-supervised crew, equipped with the appropriate tools and equipment.

4.13 Equipment Requirements

The following sections present the selection parameters as well as the refueling, maintenance, and decontamination requirements for the proposed excavating equipment.

4.13.1 Equipment Selection Parameters

Construction equipment will be selected on the basis of operating safely under site conditions, reliability over an extended usage, versatility, cost, and ability to decontaminate at the end of the project. Due to the length of time over which these machines will operate (expected to be 5½ years), the bulk of the rolling stock will be purchased new or near new. Throughout the project, the planning and execution will attempt to minimize the size of the equipment inventory which will be used in contact with the waste so as to minimize the requirements for contaminated equipment disposal at the conclusion of the work.

Additionally, since existing site data suggests working soils from the waste pits will be highly heterogeneous in nature, with wide variances in moisture contents and unit weights, the equipment must be versatile enough to be utilized effectively in multiple environments. Varying soil consistencies from the localized sludges expected in Waste Pit No. 5, to the highly solid soils of Waste Pit Nos. 1 and 3, require a range of equipment. For example, smaller, low ground pressure machines will be required where conditions such as solids content, unit weight, and associated bearing capacity would preclude the use of normal single grauser tracks. Specifically, the wider, high-tracked, or pyramid pads of a low ground pressure machine exert significantly less force over the area of soils being worked. The result is more stability, less sinking, less rutting, and less disturbance.

Another factor which affects equipment selection is accessibility. For example, an extended reach boom, mounted on a conventional tracked excavator, will be used to access soils from Waste Pit Nos. 5 and 6 while working from the perimeter and may also be employed to access particularly wet materials as they are encountered throughout all of the pits.

Articulated trucks, complete with 6-wheel drive capability, will provide the versatility to safely maneuver through wet conditions over a widely varied landscape. Turning radii are significantly improved through the use of an articulating joint. The articulating joint is located directly between the cab and bed, providing turning capabilities that a conventional frame and trailer truck could not attempt. These articulating joints also provide a factor of safety for the operator. The beds are designed to actually roll over on their sides, while the cab remains upright, if extreme conditions such as road or slope failure are unexpectedly encountered. The 6-wheel drive capability provides the tractive effort necessary to maneuver through a wide range of soils, as is expected throughout the various pits.

Though final equipment selection will not be completed until a date superceded by this plans' submittal, typical equipment performance sheets for construction equipment have been included in Appendix C for reference.

4.13.2 Equipment Refueling

As shown on Figure 1-1, the primary refueling point will be a bulk fuel storage tank. An above-ground fuel line will be installed to transfer fuel to a fueling location along the haul road. IT will provide a maintenance truck or trailer, complete with fuel storage capabilities, to refuel equipment

event of a tank failure and spillage during fill and refueling operations. The tank will be grounded, with power provided from a nearby electric drop.

4.13.3 Equipment Maintenance

Equipment maintenance is a top priority if equipment is to last over the duration of field activities. Equipment will be cleaned regularly, with gross soils and sediments removed at a minimum weekly basis. Vigilant inspection, cleaning, and repainting or recoating will afford protection against excessive radiologic contamination. Routine maintenance such as daily greasing points, and maintaining liquid levels (oil, coolant, fuel, hydraulic fluids, transmission fluids, etc.) will be conducted by the operators in accordance with the respective equipment manufacturer's instructions. Preventive measures of oil and filter changes will likewise be completed at manufacturer's directed intervals. Any major corrective maintenance, such as track changeout or undercarriage work, will be completed inside the maintenance building, or in a suitable secured pad in the pit area. An experienced, well-trained mechanic will be utilized throughout the project to provide maintenance support and maintain the equipment in good working order.

4.13.4 Equipment Decontamination

To accomplish the decontamination of equipment used during the excavation of the waste pits, several measures will be implemented including:

- Pre-operation measures
- Operational measures
- Decontamination measures.

During the pre-operational phase of work, the following measures may be implemented:

- Evaluate the minimization and/or elimination of inaccessible areas as part of the equipment design and selection.

- Cover or protect, to the extent feasibly possible, inaccessible areas that remain using methods that include:

  - Smoothing out welds and rough surfaces

  - Using protective barriers to cover areas such as hydraulic and pneumatic fittings, grooved casings, and wiring bundles

  - Using strippable coatings on accessible porous materials and areas of high contamination potential

  - Implementing an effective maintenance program to include the installation, frequent monitoring, and replacement of filters on all air intakes.

- Minimize on-site equipment — repair and standby equipment to be kept in "clean" areas until required.

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- Select and use low porosity materials where feasible.

During operations, standard operating procedures will provide direction for controlling the spread of contamination. Provisions in the operational phase will include:

- Control of the potential for cross-contamination of excavation equipment by designating equipment for the exclusive use in specific areas.
- Develop, implement, and maintain a program for routine cleaning of equipment.
- Use effective containment and control methods during equipment maintenance and repair.
- Implement and maintain an effective materials management system.
- Ongoing decontamination of nonessential equipment.

The pre-operational and operational measures are aimed at minimizing the decontamination activities which may be required. Several decontamination methods are available and they will vary based on the material/equipment, type of contaminants present, amount of contamination, and fixed-versus-loose contamination. Decontamination will be performed in accordance with standard operating procedures. A listing of decontamination methods and examples of their use includes, but may not be limited to:

- <u>Decontamination (Wet Methods)</u>:

  - Simple wet wiping with premoistened towels or with towels used in conjunction with a chemical cleaner similar to "Simple Green."
    Example: This method is typically used on smaller areas and equipment or when other methods are not practical or available. A small amount of compactable waste is generated with this activity.

  - Standard hydroblasting using high-pressure/low-volume water as the decontamination media. Chemicals such as Scrubbing Bubbles can be added as a surfactant to make cleaning more effective.
    Example: This method may be used to remove gross contamination or primarily loose contaminants that are not water sensitive. Contaminants can be filtered or treated to be removed from the water.

  - Steam cleaning utilizing heated water at moderate pressures. Steam is more effective on contaminants that may be contained within greasy surfaces. Chemical surfactants may be added to make cleaning more effective and a water recovery system (vacuum) can be added which uses demisters, high-efficiency particulate air (HEPA) ventilation, and waste collection to recover contaminants and maximize effluent control.

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Example: Motors, gear boxes, and drive lines are examples of equipment where steam cleaning is the most effective. Less water is used than with standard hydroblasting and contaminants can be filtered or treated for removal from the water.

- Environmentally safe degreasers are available for small-scale wiping and additives to other decontamination methods.

- Decontamination (Dry Methods, Nonaggressive):

  - HEPA filtered vacuums used as a preliminary to wet methods or as a dry method to remove gross contamination.
    Example: Materials/equipment on which water cannot be used or where excessive dust, dirt, or water-sensitive contaminants are present, HEPA vacuuming will be conducted prior to beginning other decontamination methods. HEPA vacuums can be adapted to decontaminate either wet or dry materials.

  - Dry tackified towels may be used to perform a dry wipe of water-sensitive contaminants or on materials/equipment where water cannot be used.
    Example: Sensitive electronic equipment may require dry decontamination.

- Decontamination (Dry Methods, Aggressive):

  - Blasting techniques, typically used to remove fixed contamination where other decontamination methods are either not effective or are not cost efficient. Dry methods are also effective when the contaminants are water sensitive. Blasting methods that may be used include, but may not be limited to:

    a. Sponge blasting with small sponges that are propelled with air pressure at the piece to be decontaminated. The nature of the sponge material causes contaminated material to adhere to the sponge, which is then processed to remove contaminants and reused, minimizing secondary waste. Sponges are available that are impregnated with materials (i.e., aluminum oxide, steel grit) for more aggressive decontamination.

    b. Grit blasting using materials such as steel shot as the decontamination media. The grit blaster is available with a HEPA-filtered integrated recovery and recycling system to minimize cross-contamination and secondary waste.

    c. Carbon dioxide blasting which has the benefit of minimizing secondary waste.

  - Removal of strippable coatings on equipment/materials where the coating was applied prior to entering contaminated areas.

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- Scabbling methods for concrete and similar materials, consisting of hand-held needle and rotating scabblers and larger walk-behind or equipment-mounted scabble units. All scabbling equipment is available with vacuum shrouds to minimize fugitive dust. Additional airborne dust control measures include containment and localized HEPA-filter air units. Scabbling may be used to remove the fixed contamination on concrete or other similar porous materials. By removing only the contaminated surface area, the resulting contaminated waste is minimized and the remaining material can be disposed as clean waste.

- Alternate Methods for Site Release:

  - Equipment/material where it is deemed that it cannot be decontaminated to free-release limits or where it is determined that further decontamination is not cost effective, will be classified into salvageable or non-salvageable:

    a. Salvageable equipment may have further use on this site or at another site licensed to accept equipment with fixed contamination; salvageable equipment/ materials may require the application of coatings to fix contamination.

    b. Non-salvageable equipment will be characterized by survey and/or sample, volume reduced, if applicable, to or below the disposal facility WAC to minimize the volume of waste.

  - Equipment/materials that have been deemed as non-salvageable and either do not require decontamination or can be appropriately decontaminated will be disposed at a licensed industrial sanitary landfill.

All equipment decontamination will follow the procedures outlined in the Operational Health and Safety Plan and the standard operating procedures. These procedures will be developed in accordance with the current FDF procedures and a list of these procedures will be included in the Remedial Action documents.

Once the equipment is thoroughly decontaminated, it will be inspected by the SHSO, or his designee. If additional decontamination is required, it will be performed and the equipment reinspected upon completion. Once the equipment is accepted by IT's health and safety, FDF will be asked to perform a compliance inspection. If additional decontamination is deemed necessary, it will likewise be performed and the equipment reinspected upon completion.

A certificate of decontamination will be filed for each equipment item upon successful completion of the decontamination process. An example certificate has been included in Appendix D. The SHSO will be responsible for maintaining a file on site for all of the equipment decontaminated.

4.13.5 Equipment Changeout Facilities

A prefabricated truck wash facility (Appendix C) with collection sumps and side curtains, will be utilized to wash down the tires and undercarriages of trucks leaving the pits to deliver soils to the Material Handling Building. This effort will result in maintaining the waste soils inside designated

areas and preventing the unnecessary distribution of sediments across the paved haul road to the Material Handling Building. The wash water will be collected and transferred to the Clearwell. This water will then be pumped to the WTS for treatment prior to discharge to the BSL.

A decontamination pad located near the maintenance building will serve as the primary decontamination facility for equipment leaving the work zone. Side curtains will be utilized to contain wind blown sediments, water vapors, and steam. Wash water will be pumped to the Clearwell. This water will then be pumped to the WTS for treatment prior to discharge to the BSL.

5.0 Environmental Control

The following sections describe the environmental controls which will be implemented during the excavation of the various waste pits. These include dust and fugitive emissions control and monitoring.

5.1 Dust and Fugitive Emissions Control

IT will comply with the requirements of the project to minimize the creation/dispersion of dust in accordance with Ohio Administrative Code (OAC) 3745-17-01(B) and OAC 3745-17-08(B). Work areas which may include excavations, embankments, haul roads, and material storage areas will be maintained to minimize the creation of dust. Dust suppression techniques may vary for different areas and proposed procedures for the areas identified above are discussed separately in the following sections.

5.1.1 Haul and Service Roads

Haul roads and service roads in the pit excavation areas will be compacted road surfaces covered with gravel. Hoses and nozzles will be utilized in the excavation areas to spray water. A trailer-mounted system will apply polyseal or other approved dust suppressant to control dust on the roadways and work surfaces. The application of water will be applied judiciously to avoid runoff, ponding, or the generation of mud and will be dependent on ambient conditions. Water from the SWM Pond may be utilized for dust suppression activities for haul roads within excavation areas. Roadways outside the excavation areas will be sprayed with clean water taken from a designated fire hydrant for dust suppression activities. A water truck or trailer will be used for service roads outside the pit area.

5.1.2 Excavations and Embankments

Exposed pit surfaces and embankments at waste pits will be covered with fabric covers, Poly-Shell, or equivalent material to control dust, erosion, and to minimize water run-on. Water or other dust suppressants will be applied during excavation activities as deemed necessary to control dust.

5.1.3 Staged Materials and Material Stockpiles

Staged materials and stockpiles of material generated and/or utilized during excavation activities will be secured to preclude dust generation by proofrolling or bucket compacting, if necessary, to provide a tight surface covering with a fabric cover, or by spraying with polyseal or equivalent. The type of dust suppression method to be used will be dependent upon the intended use of the material and the time period the material will be staged. Materials with a short exposure time may use water sprays to control dust, while materials with longer exposure times may be covered, compacted, or sprayed with Poly-Shell.

5.1.4 Miscellaneous Areas

All areas within the pit excavation boundaries will be visually monitored for dust by on-site personnel. It will be the responsibility of all IT personnel to work with FDF personnel to monitor and report any potential dust problem. If a potential dust problem is identified in any area not specifically identified in this plan, the appropriate dust suppression technique will be determined by on-site personnel and implemented to meet the dust control goals of the project.

5.1.5 Fugitive Emissions

The primary fugitive emission identified as a concern during excavation activities is the generation of dust from haul trucks carrying excavated materials to the process area. These potential emissions will be controlled by covering all truck beds hauling excavated materials. The articulating dump trucks will be equipped with automatic/retractable covers over their beds. If required, the surface of each truck load could be sprayed with a water mist to help control dust generation during transport. The tires and undercarriages of haul trucks will be washed at the truck wash facility to help control the potential for dust generation. A speed limit of 15 miles per hour will be enforced for heavy equipment and all vehicles traveling within the unsurfaced excavation area to minimize the potential for dust generation.

5.2 Dust Monitoring Methods

Sampling of ambient air monitoring will be performed to evaluate dust levels if determined to be necessary by the site SHSO. Monitoring for dust will be performed visually. It will be the responsibility of each IT employee to observe his work area for the potential and/or actual generation of dust. Any dust condition will be reported to the supervisor, foreman, or group leader in the work area who will arrange for immediate wetting of the area or implementation of other measures necessary to control the dust. If necessary, the work activities will be minimized or stopped in that area until dust emissions are controlled. IT will work cooperatively with those FDF personnel who routinely patrol the site to identify and correct dust nuisance hazards.

6.0 Water Management

Remediation activities will be performed in a manner so as to minimize entrance and accidental spillage of solid or liquid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, water courses, flowing or dry, and underground water sources. Properly managing excavation water and storm water at the site will be extremely important to reducing the potential for waste migration from OU1.

6.1 Excavation Water Management

Perched water that seeps into the excavation, free drainage from the waste material, and storm water which falls or flows into the excavation and contacts raw waste have been defined as excavation water for the purposes of this plan since water from the various sources will be recovered and treated together. Sources of water within the excavations will be derived from free-drainage or pumping of the waste material, water flowing through the wastes, water flow through the sideslopes due to perched water outside of the waste pits, and direct precipitation into the open areas. Currently, it is planned that water will be collected and removed by pumping sumps placed or constructed in the bottom of the excavation. Dewatering prior to excavation is not currently planned. The quantity of excavation water to be collected and treated will change as construction proceeds through the 19 phases of excavation. The expected range of flow from all sources which will be pumped from the pits is approximately 10 to 90 gallons per minute. A hydrograph of the expected flow rates for the phases of excavation is presented in Appendix I of this plan.

Factors which will affect the amount of water to be removed from the excavation for treatment include: the amount of waste which is disturbed and allowed to drain, the amount of open area collecting direct precipitation, the amount of highwall exposed allowing seepage from outside, and storm water inflow from above the highwall. As described in Section 6.2 below, storm water flow from outside of the excavation will be controlled and directed away from the area.

As the excavation proceeds, the amount of open area and exposed sidewalls will increase until regrading is completed. Typically, the amount of water within the excavation requiring removal and treatment will also increase, reaching a maximum value as the maximum excavation area is approached. Perched water seepage through the sidewalls of an excavation reaches a maximum as the amount of highwall exposed to perched water reaches a maximum.

Water pumped from the excavation will be transferred to the Clearwell for temporary storage prior to treatment in the WTS. The excavations will continue to be pumped down until the pit area has been confirmed by FDF as meeting the cleanup criteria. As per the requirements of the scope of work, water from the Clearwell will be treated and discharged to the BSL. The total 24-hour average to the BSL will not exceed 200 gallons per minute. Water will be removed from the excavation and stored in the Clearwell as long as capacity is available. As a contingency, Waste Pit No. 5 may be used as additional storage provided that there is sufficient freeboard and that it has not yet been disturbed. Once the Clearwell and Waste Pit No. 5 have reached their capacity, pumping from the excavation will cease. The previous description of placing water into Waste Pit No. 5 constitutes a request to the Ohio EPA in accordance with the 1988 Consent Decree.

6.2 Storm Water Control

Storm water control in the excavations will consist of the following measures to keep storm water from contacting the waste material and prevent contaminated water from contacting clean materials:

- The exposed area of the waste materials will be minimized by advancing an excavation face across the waste pits in lieu of working from the top of the pits down.
- The excavation of each pit will commence at an upgradient location and progress in a manner so as to prevent run-on into the excavations.
- The interior of the excavation will be graded to a low point to ensure that contact storm water does not migrate along the surface out of the excavation.
- Storm water in the excavation will not be allowed to remain in contact with waste materials for long periods of time; water will be pumped from the excavation as soon and as rapidly as possible during storm events until the water in the Clearwell and Waste Pit No. 5 has reached its maximum allowable level.

The following presents a detailed discussion of the contact and noncontact storm water to be encountered within the pit area.

6.2.1 Contact Storm Water

The following is a list of contact storm water sources that originate inside the pit area:

- Storm water falling on Waste Pit No. 6 water cover.
- Storm water falling on Waste Pit No. 5 water cover.
- Storm water, drainage water, and perched water seepage in the excavation area.
- Storm water from contaminated haul roads.
- Rinsate water from the truck wash facility.
- Storm water falling on the Clearwell and surrounding portions of Waste Pit Nos. 1 and 3 (which drain to the Clearwell).
- Storm water falling in excavated areas awaiting certification as clean.

Handling of these streams will change as the areas where the water originates are excavated and subsequently deemed clean. The sections below describe the method by which the water will be collected and transferred to the appropriate destination, the expected flow rate, and notes on the chemical composition of each wastewater stream.

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6.2.1.1 Storm Water From Waste Pit No. 6

During excavation Phases 1 though 7, the water cap on Waste Pit No. 6 will be maintained. The only source of water entering Waste Pit No. 6 is storm water that falls within the limits of the pit (an area of approximately 0.74 acres or 32,234 square feet). Water is drained from the pit using a portable pump. In the event the water meets the BSL WAC, the water will be pumped from the pit directly to the BSL (per current Fernald operating procedures). In the event the water does not meet the WAC, the water will be transferred to the Clearwell for subsequent treatment in the WTS. The average flow rate is not expected to be greater than 2,210 gallons per day. The water is expected to be transferred to the Clearwell, as it may contain contaminants at levels higher than the BSL WAC.

In the event of a 25-year/24-hour storm event, the freeboard in the pit will be used to manage the storm water (4.8 inches). Managing the water level in Waste Pit No. 6 may also involve adding water to the pit during especially dry periods, although this is not common. Water must be added to the pit when the level drops lower than 6 inches below the mark on the level gauge in the pit.

Beginning in excavation Phase 8, the water cap on Waste Pit No. 6 will be pumped to the Clearwell for subsequent treatment in the WTS. When the water has been removed, the surface of the material in the pit will be sprayed with Poly-Shell (or equivalent). For Phases 8 through 14 of the excavation, any storm water that lands in the open section of the pit and perched water seepage into the excavated portion will be handled as described in Section 6.2.1.3 below (Excavation Water). For Phases 15 through 19, storm water from Waste Pit No. 6 (storm water and perched water seepage) will be handled as noncontact storm water.

6.2.1.2 Storm Water From Waste Pit No. 5

During excavation Phases 1 though 8, the water cap on Waste Pit No. 5 will be maintained. The only source of water entering Waste Pit No. 5 is storm water that falls within the limits of the pit (an area of approximately 3.74 acres or 162,914 square feet). Water is drained from the pit through a concrete "well" structure located near the southwest corner of the pit. The "well" is equipped with several slide gate valves which act as weirs to control the water level in the pit. Water that drains into the "well" flows by gravity through a buried line to the Clearwell. The overflow rate from the "well" must not exceed the maximum flow rate of 100 gallons per minute to the Clearwell, based on the existing Fernald operating procedures for the pit. The average flow rate is not expected to be greater than 11,170 gallons per day. The water may contain contaminants at levels higher than the BSL WAC.

In the event of a 25-year/24-hour storm event, the freeboard in the pit will be used to manage the storm water (4.8 inches). Managing the water level in Waste Pit No. 5 may also involve adding water to the pit during especially dry periods, although this is not common. Water must be added to the pit when the level drops lower than 2.5 feet below the top of the pit.

Beginning in excavation Phase 9, the water cap on Waste Pit No. 5 will be pumped to the concrete "well" and will drain to the Clearwell for subsequent treatment in the WTS. When the water has been removed, the surface of the waste material in the pit will be sprayed with Poly-Shell (or equivalent). For Phases 9 through 19 of the excavation, any storm water that lands in the open section of the pit and perched water seepage into the excavated portion will be handled as described

in Section 6.2.1.3 below (Excavation Water). Storm water from the portion of the pit covered with Poly-Shell must be pumped to the concrete "well" for drainage to the Clearwell.

6.2.1.3 Excavation Water

During the excavation of a waste pit, several means will be employed to reduce the amount of contact storm water in the excavation area. These methods include minimization of exposed waste material surface and excavating from a high area to a low area to allow continued drainage of untouched areas within the pit. The excavation sequence and the details of the excavation process for each phase are described in previous sections of this plan.

Water from the open excavations will consist of contact storm water, free drainage from excavated materials, and perched water seepage into the excavation. The amount of water generated will change constantly during the excavation process. The water in the excavations will be directed to "sumps" by grading the bottom of the excavations and/or digging shallow (e.g., 6-inch) trenches in the excavations to direct the water to the sumps. One or more sumps may be required in each excavation (i.e., each waste pit) depending of the amount of open area. Portable pumps will be used to transfer water from the excavation areas to the Clearwell for subsequent treatment.

A summary of the anticipated generation rates for these streams is presented in Appendix I of this plan. The excavation water values shown in the table in Appendix I do not include water from waste pits awaiting certification as "clean." This contact storm water is calculated separately.

6.2.1.4 Storm Water From Contaminated Haul Roads

Storm water that lands on the haul roads in the waste pit area will be directed to excavation areas to be collected and transferred to the Clearwell and subsequent water treatment. The existing area that will be used as haul roads consists of the road that runs along the southern side of Waste Pit No. 5 and Waste Pit No. 6, the branch that runs from that road to the south between Waste Pit No. 3 and Waste Pit No. 4 (over the burn pit), and a strip that continues toward the south between Waste Pit No. 3 and Waste Pit Nos. 2 and 1. The haul roads will be isolated from the current noncontact storm water drainage patterns by curbing the road sides, regrading the roads to change the direction of drainage, and running noncontact storm water through designated ditches and under haul roads through drain pipes. All of these methods will be utilized to segregate the noncontact storm water in the waste pit area from contacting the potentially contaminated haul road storm water. This segregation allows the noncontact storm water to continue to flow to the K-65 Runoff Basin.

6.2.1.5 Truck Wash Facility Collection Sump

The truck wash facility and personnel boot wash facility is curbed and sloped to drain to a collection sump. Decontamination water, storm water landing in the area, and excess water from dust suppression spraying will be collected by this sump. In addition, water from the haul road outside the waste pit area (adjacent to the truck turnaround area) will flow by gravity through a buried line to this sump. The truck wash facility sump pump will transfer the water to the Clearwell. The sump pump will transfer water at a maximum flow rate of 50 gallons per minute. The average flow rate of decontamination water and contact storm water from the truck wash facility pad is not expected to be greater than 400 gallons per day. The average combined flow from the truck haul road and the truck wash facility is not expected to be greater than 1,000 gallons per day. The water from this sump may contain contaminants at levels higher than the BSL WAC.

6.2.1.6 Storm Water in the Clearwell and Surrounding Areas

Storm water that falls directly onto the Clearwell or surrounding areas that are sloped to drain into the Clearwell will be treated by the WTS. The sections of Waste Pit Nos. 1 and 3 that currently drain to the Clearwell will continue to drain in this way until some time during excavation Phases 4 and 9, respectively. The Clearwell will remain in operation until all the waste pits have been cleaned; therefore, storm water that falls in the Clearwell must be treated until the Clearwell is excavated starting during Phase 18. The average storm water rate from the Clearwell and surrounding drainage areas (total surface area of approximately 106,000 square feet) is 7,270 gallons per day. This water falls or drains directly into the Clearwell. When the drainage area in Waste Pit No. 1 (approximately 45,000 square feet) is removed, the average storm water flow from the remaining area is 4,180 gallons per day. When the drainage area in Waste Pit No. 3 (approximately 32,700 square feet) is removed, the average storm water flow from the remaining area is 1,940 gallons per day.

While the Clearwell is being excavated during excavation Phases 18 and 19, the water that falls in the excavation will be pumped to the influent tank at the WTS.

6.2.1.7 Storm Water on Excavated Areas Awaiting Certification

Storm water that falls on waste pit areas that have been completely excavated (i.e., including directed excavation) and are awaiting certification as "clean" will continue to be collected and transferred to the Clearwell for treatment. This water will be handled in the same fashion as excavation water.

6.2.2 Noncontact Storm Water

There are locations in the pit area where storm water does not contact raw waste. These locations include the following:

- Storm water from the covered sections of Waste Pit Nos. 1, 2, and 3.
- Storm water from the covered section of Waste Pit No. 4 and the Burn Pit.
- Storm water from other areas bordering the waste pits.

This storm water will not be routed through the WTS for treatment.

6.2.2.1 Noncontact Storm Water From Waste Pit Nos. 1, 2, and 3

Storm water that falls on the portions of Waste Pit Nos. 1, 2, and 3 that have not been exposed will continue to drain to the K-65 Runoff Basin (except for the small sections which drain to the Clearwell). For purposes of discussion, this water is referred to as noncontact storm water. This water drains off the western side of Waste Pit No. 3 to drainage trenches along the western boundary of the waste pit area to the basin. Water from the eastern side of Waste Pit No. 3 and most of Waste Pit Nos. 1 and 2 drains to drainage ditches along the access road that runs along the east side of Waste Pit No. 2 and collects in the K-65 Runoff Basin.

Noncontact storm water will be kept out of the excavation by placing berms around the excavation area where necessary. After Waste Pit Nos. 1, 2, and 3 have been excavated and certified as "clean," the storm water that falls on the areas will be treated as noncontact storm water.

6.2.2.2 Noncontact Storm Water From Waste Pit No. 4

Noncontact storm water from Waste Pit No. 4 consists of the storm water that runs off the covered pit materials (an approximate area of 1.5 acres or 65,340 square feet) and is collected in the trench around the pit. The average flow of noncontact storm water from Waste Pit No. 4 during Phases 1 through 4 is 4,480 gallons per day. This water currently makes its way to the K-65 Runoff Basin through storm trenches that run along the access roads through the waste pit area. During excavation activities, care will be taken to route these streams across the waste pit area without allowing them to combine with potentially contaminated haul road storm water. This will be achieved by designating certain drainage trenches and culverts as "clean" and keeping them decoupled from contact storm water streams.

Beginning in Phase 5, a portion of the pit will be excavated. The pit will remain covered to some degree through Phase 16. During this period, measures will be taken to separate storm water that lands on the covered portion of the pit from entering the excavation and continuing to drain to the K-65 Runoff Basin. After Phase 16, storm water from the area will be treated as excavation water and will be directed to the Clearwell.

Noncontact storm water from the Burn Pit consists of the storm water that drains off the pit (an area of 0.5 acres or 21, 780 square feet) and is collected in the drainage trenches that lead to the K-65 Runoff Basin. The average flow of storm water from the Burn Pit during Phases 1 through 11 is 1,500 gallons per day. Beginning in Phase 12, the Burn Pit will be excavated. After Phase 13, storm water from the Burn Pit area will be treated as excavation water and will be directed to the Clearwell until the area has been certified as "clean."

6.2.2.3 Noncontact Storm Water From Areas Bordering the Waste Pits

There are other areas within the waste pit area of OU1 which are considered uncontaminated and from which the storm water is handled as noncontact storm water. These areas include the areas between the radiological fences and the boundaries of the waste pits, such as, the area between Waste Pit 3 and the access road which runs along the western side of Waste Pit 3. Currently, these areas drain to the K-65 Runoff Basin or to drainage ditches to the north of the waste pit area. During excavation activities, all operations in the pits will be performed from the inside of the waste pit area toward the fence limits, thus these streams should not be affected.

6.3 Minimization of Subsurface Infiltration

Water will be managed within the excavation to minimize infiltration of contaminated water into the soils and aquifer below. Water within the excavation will be removed and not allowed to accumulate in areas where wastes are present. Perched water seeping in through the sideslopes prior to removal of the contaminated subsoils will also be removed. Berms will be constructed across the areas where excavation has been completed to prevent precipitation falling into the pits and sideslope seepage from coming into contact with waste materials. This water will be collected and pumped to the Clearwell and/or Waste Pit No. 5 if capacity is available. If capacity is not available in the Clearwell and/or Waste Pit No. 5, the water will be held in the excavation area until it can be removed.

6.4 Potential Construction Dewatering

Dewatering of the excavation area may be conducted prior to the start of waste removal and continue throughout the excavation period. This may include trenching, dewatering, wellpoints, and mixing to enhance drainage concurrently with the excavation process. Dewatering will also be conducted using sump areas adjacent to the excavation face and transferring the water to the Clearwell. To the extent possible, wastes will be allowed to drain to the excavation sumps prior to removal.

7.0 Real-Time Monitoring

Real-time air monitoring will be conducted at the following frequencies:

- Organic vapor monitoring will be performed periodically adjacent to contaminated material/debris handling areas and when a suspected hazardous condition exists.
- Combustible gas monitoring will be performed periodically adjacent to contaminated material/debris handling areas and when a suspected hazardous condition exists.
- Boundary sampling for airborne radioactivity will be performed by FDF as determined by FDF WPRAP Radiological Control.

If real-time monitoring indicates abnormal conditions or the safety representative feels that an imminent health hazard exists, the affected work area will be shut down and personnel evacuated to an upwind location. IT project management and FDF project management and safety will be notified immediately and work will not be resumed until:

- The IT Safety and Health Representative consults with IT Industrial Hygiene (chemical) and/or FDF Radiological Control (radiological) as applicable.
- Appropriate corrective measures are implemented.
- Authorization to continue work is given by project management.

An initial noise survey will be conducted to identify areas where exposures could or do exceed 85 A-weighted decibels (dBA). Reasonable engineering controls will be implemented to control noise levels in the work areas. Areas that consistently exceed 85 dBA will have signs posted notifying personnel that hearing protection is required. Hearing protection shall be worn in areas where levels exceed or are expected to exceed 85 dBA.

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8.0 Surveying

Surveying will be required throughout the excavation of the waste pits on an as-needed basis. During the initial phase, in preparation for excavation activities, the boundaries of the waste pits, elevation benchmarks, and state plane coordinate reference locations will be surveyed at selected berm locations. These locations will be utilized throughout excavation activities to reference various excavation activities. This survey work will be completed by a surveyor registered in the state of Ohio with coordinate locations referenced to the NAD 83 Ohio State Planer Coordinate System. Surveying will be completed to third order accuracy standards as established by the Standards and Specifications for Geodetic Control Networks. If during the course of the excavation work any reference points must be relocated, this work will also be completed by the registered surveyor. The surveyor will also complete the initial layout for haul roads, ramps, and the truck wash facility to be constructed and utilized during excavation activities.

During the completion of waste pit excavation activities, surveying will be performed on an as-needed basis for such activities as:

- Determination of liner elevations
- Excavation bottom elevations
- Heights of excavations
- Determining berm and/or excavation slopes
- Interim and final grades.

This survey work will be completed by on-site personnel with experience in the appropriate surveying techniques required to obtain the necessary information.

After the completion of excavation activities, the survey information required for the development of the final "As-Built" and topographic maps for the excavation areas will be generated by the registered surveyor.

TABLES

TABLES

Table 2-1
Summary of Waste Data by Pit

Waste Pit	Content Type[1]	Area[2] (acre)	Maximum Depth[3] (feet)	Sideslope[3]	Liner Type[2]	Cover Type[2]	Groundwater Depth in Pit[4] (feet)	Wet Waste Quantity[5] (wet) (yd³)	Wet Waste Quantity[5] (wet) (tons)	Average Natural Moisture Content[5] (wet basis)	Waste Quantity @ Optimum Moisture[5] (yd³)	Waste Quantity @ Optimum Moisture[5] (tons)	Average Optimum Moisture Content[5] (wet basis)	Analytical Weighted WAC Factor[6]	Hazard Categorization Fractional Values[7]
Pit No. 1	Filter cake Sump sludge Slag Filtrates	2.11	29.5 (waste 18 liner 11 cap 6")	3:1	Clay	Soil	5.5	68,400	100,617	28%	52,521	83,672	13%	0.5337	0.2466 0.1527
Pit No. 2	Trailer cake Sludges Filtrates Raffinates	0.90	23.5 (waste 15 liner 4.5 cover 4)	1:1	Clay	Soil	3	37,400	44,031	44%	19,763	29,002	15%	1.2382	0.0163 0.0016
Pit No. 3	Raffinates Sludges Trailer cake Slags	5.00	42 (waste 34 liner 1 cover 7)	1.5:1	Clay	Soil	7	307,500	343,911	54%	137,021	193,341	19%	0.5629	0.8942 3.6309
Pit No. 4	Trailer cake Slags Debris Sludges	1.50	32 (waste 25 liner 1 cover 6)	2:1	Clay	RCRA	6	72,800	120,777	21%	65,907	108,560	12%	0.5915	0.0919 0.0152
Pit No. 5	Sludges Raffinates Slags	3.74	29	2.5:1	60-mil EPDM Elastomeric Liner	Water	N/A	97,900	94,828	80%	18,489	26,138	26%	0.5228	0.0860 0.5519
Pit No. 6	Slags Debris	0.74	24	2.5:1	60-mil EPDM Elastomeric Liner	Water	N/A	9,600	19,207	16%	8,038	17,682	8%	0.3223	0.0004 1.77E-05
Burn Pit	Burnables solid wastes solid wastes	0.50	26	Unknown	None	Soil	5	30,300	49,577	23%	28,403	45,553	17%	0.1953	6.93E-05 3.24E-06
Clearwell	Runoff Sediment	0.65	27	1.5:1 (north side: 2:1)	Clay	Water	NA	4,300	6,020	37%	2,745	4,549	17%	0.5615	0.0446 0.0028
	Subtotal	15.1						628,200	778,968		332,887	508,497			
Subsoil	Soils	15.1	--	--	N/A	N/A	N/A	83,640	159,000	18%	83,640	159,000	18%	0.1	--
OU1 Contaminated Soil Stockpile	Soils	2.0	--	--	N/A	N/A	N/A	47,600	90,440	14.7%	47,600	90,440	14.7%	0.2	--
	Total							759,440	1,028,408		464,127	757,937			

NOTES:

1. Information obtained from Fluor Daniel Fernald, Inc. and Waste Pit Content Study Report, September 10, 1993.
2. Information obtained from the Waste Pit Content Study Report, September 10, 1993.
3. Information obtained from Section 1.4 of DOE Operable Unit Remedial Design Pre-Final Design Package II, March 1996 and from Section 1 of RI Report for OU1, February 1994, and Waste Pit Content Study Report, September 10, 1993.
4. Groundwater information was obtained from Figures 3-24, 3-25, and 3-27 of the OU1 RFI Report. The groundwater depths listed in this table represent October of 1993 data, and measured from the ground surface.
5. Wet waste and optimum waste quantities, average natural moisture contents, and optimum moisture contents obtained from proposal Table II.A.1-2 - volume, weight, moisture of waste soil cover, and soil liner of individual
6. Analytical weighted WAC factor is defined as total WAC factor multiplying analytical weight percent. The total WAC factor is the sum of individual average concentration divided by WAC. The analytical weight percent is assumed that soil cover contains 0%, the waste contains 100%, and the soil liner contains 50% of the radiological analytes.
7. Hazard categorization fractional values were calculated for 1-in-100-year high wind event. Smooth surface was used for Waste Pit Nos. 5 and 6 when selecting values for potential releasable material and use rough surface for the remaining pits and areas. The two values indicated are for radiological facility and non-nuclear facility, respectively.

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Table 2-2
Volume, Weight, Moisture of Waste, Soil Cover, and Soil Liner of Individual Pit

Location	Type of material	Est. Vol. (yd^3)	Est. Density (pcf)	Est. Wet Weight (tons)	Est. Dry Weight (tons)	Natural Moisture (%wet basis)	Average Natural Moisture (%wet basis)	Optimum Moisture (%wet basis)	Average Optimum Moisture (%wet basis)	Est. Weight @ Optimum Moisture (tons)	Est. Volume @ Optimum Moisture (yd^3)	Tons Water Removed
Pit No. 1	Soil cover	1,700	95.5	2,191	1,869	14.7		14.7		2,191	1,700	0
	Waste	48,500	114.5	74,969	51,349	31.5	28	11.5	13	58,024	32,621	16,945
	Soil liner	18,200	95.5	23,457	19,235	18.0		18.0		23,457	18,200	0
	Subtotal	**68,400**		**100,617**	**72,453**					**83,672**	**52,521**	**16,945**
Pit No. 2	Soil cover	4,200	95.5	5,413	4,617	14.7		14.7		5,413	4,200	0
	Waste	24,200	82.7	27,018	10,517	61.1	44	12.3	15	11,989	6,563	15,029
	Soil liner	9,000	95.5	11,600	9,512	18.0		18.0		11,600	9,000	0
	Subtotal	**37,400**		**44,031**	**24,646**					**29,002**	**19,763**	**15,029**
Pit No. 3	Soil cover	46,850	95.5	60,383	51,506	14.7		14.7		60,383	46,850	0
	Waste	250,950	80.0	271,026	95,600	64.7	54	20.6	19	120,456	80,471	150,570
	Soil liner	9,700	95.5	12,502	10,252	18.0		18.0		12,502	9,700	0
	Subtotal	**307,500**		**343,911**	**157,358**					**193,341**	**137,021**	**150,570**
Pit No. 4	Soil cover	14,600	95.5	18,817	16,051	14.7		14.7		18,817	14,600	0
	Waste	55,100	131.7	97,965	75,883	22.5	21	11.5	12	85,748	48,207	12,217
	Soil liner	3,100	95.5	3,995	3,276	18.0		18.0		3,995	3,100	0
	Subtotal	**72,800**		**120,777**	**95,210**					**108,560**	**65,907**	**12,217**
Pit No. 5	Soil cover	0	95.5	0	0	14.7		14.7		0	0	0
	Waste	97,900	71.8	94,828	19,219	79.7	80	26.5	26	26,138	18,489	68,690
	Soil liner	0	95.5	0	0	18.0		18.0		0	0	0
	Subtotal	**97900**		**94,828**	**19,219**					**26,138**	**18,489**	**68,690**
Pit No. 6	Soil cover	0	95.5	0	0	14.7		14.7		0	0	0
	Waste	9,600	148.2	19,207	16,222	15.5	16	8.3	8	17,682	8,038	1,525
	Soil liner	0	95.5	0	0	18.0		18.0		0	0	0
	Subtotal	**9600**		**19,207**	**16,222**					**17,682**	**8,038**	**1,525**
Burn Pit	Soil cover	0	95.5	0	0	14.7		14.7		0	0	0
	Waste	30,300	121.2	49,577	37,961	23.4	23	16.7	17	45,553	28,403	4,024
	Soil liner	0	95.5	0	0	18.0		18.0		0	0	0
	Subtotal	**30,300**		**49,577**	**37,961**					**45,553**	**28,403**	**4,024**
Clearwell	Soil cover	0	95.5	0	0	14.7		14.7		0	0	0
	Waste	4,300	103.7	6,020	3,791	37.0	37	16.7	17	4,549	2,745	1,471
	Soil liner	0	95.5	0	0	18.0		18.0		0	0	0
	Subtotal	**4,300**		**6,020**	**3,791**					**4,549**	**2,745**	**1,471**
Other Area (OU1 Contaminated Soil Stockpile)	FDF waste	47,600	140.7	90,440	77,145	14.7	15	14.7	15	90,440	47,600	0
	Subtotal	**47,600**		**90,440**	**77,145**					**90,440**	**47,600**	**0**
Subsoils	Soil	83,640	140.8	159,000	130,380	18.0	18	18.0	18	159,000	83,640	0
	Subtotal	**83,640**		**159,000**	**130,380**					**159,000**	**83,640**	**0**
	Total	**759,440**		**1,028,408**	**634,385**					**757,937**	**464,127**	**270,471**

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Table 4-1
Waste Blending Plan

Operation Phase	High Moisture Waste Source	Enriched Uranium Waste Source	Depleted Uranium Waste Source	Low Moisture Waste Source	High Moisture Waste (tons)	Enriched Uranium Waste (tons)	Depleted Uranium Waste (tons)	Low Moisture Waste (tons)	Total Weight per Phase (tons)	Planned Excavation Rate (tons/day)	Planned Excavation Rate (days)	Depleted WAC Factor	Normalized Enrichment Factor	Blend Density (tons/yd^3)
1	Pit No. 3			OU1 Contaminated Soil Stockpile	2,469			1,783	4,252	480.6	9	0.40	0.52	1.26
2	Pit No. 3	Pit No. 2	Pit No. 1		51,026	5,390	72,453		128,869	480.6	268	0.55	0.89	1.21
3	Pit No. 3			OU1 Contaminated Soil Stockpile	23,538			17,341	40,879	480.6	85	0.40	0.52	1.26
4	Pit No. 3			Pit No. 1 Subsoil	24,196			18,207	42,403	480.6	88	0.34	0.52	1.27
5	Pit No. 3	Pit No. 2	Pit No. 4		24,690	19,256	40,150		84,097	480.6	175	0.67	0.85	1.22
6	Pit No. 3			OU1 Contaminated Soil Stockpile	8,065			5,672	13,737	480.6	29	0.41	0.52	1..26
7	Pit No. 3		Pit No. 4	Pit No. 2 Subsoil	11,193		753	7,766	19,712	480.6	41	0.40	0.68	1.26
8	Pit No. 3		Pit No. 6		12,180		16,222		28,402	480.6	59	0.42	0.66	1.40
9	Pit No. 5			Pit No. 3 Subsoil	5,200			43,145	48,345	480.6	101	0.13	0.68	1.46
10	Pit No. 5			OU1 Contaminated Soil Stockpile	3,350			27,876	31,226	480.6	65	0.23	0.70	1.46
11	Pit No. 5			Pit No. 6 Subsoil	700			6,040	6,740	480.6	14	0.08	0.67	1.46
12	Pit No. 5	Burn Pit	Pit No. 4		2,100	37,961	4,768		44,829	480.6	93	0.22	0.52	1.28
13	Pit No. 5			Burn Pit No. Subsoil	500			4,314	4,814	480.6	10	0.07	0.76	1.46
14	Pit No. 5		Pit No. 4		2,900		47,657		50,557	480.6	105	0.57	0.23	1.30
15	Pit No. 5			OU1 Contaminated Soil Stockpile	50			486	536	480.6	1	0.23	0.70	1.47
16	Pit No. 5			Pit No. 4 Subsoil	1,550			12,943	14,493	480.6	30	0.12	0.36	1.46
17	Pit No. 5			OU1 Contaminated Soil Stockpile	2,869			23,987	26,856	480.6	56	0.23	0.70	1.46
18		Clearwell	Pit No. 4	Pit No. 5 Subsoil		3,791	1,757	31,926	37,474	480.6	78	0.13	0.72	1.49
19			Pit No. 4	Clearwell Subsoil			125	6,040	6,165	480.6	13	0.07	0.47	1.52
								TOTALS:	634,386		1,320			

NOTES:

1. Weights shown in this table are dry weights.
2. Daily excavation rate is based on 5 days per week, 48 weeks per year and the operation will be completed in 5.5 years.
3. WAC factors shown are for depleted materials.
4. Enrichment factors shown have been normalized so that a factor of below 1.00 is considered depleted.
5. Blend density values include a 0.80 bulking factor.

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Table 4-2
Waste Pit Excavations, Cumulative Percentage Complete

Waste Pit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	Phase 9	Phase 10	Phase 11	Phase 12	Phase 13	Phase 14	Phase 15	Phase 16	Phase 17	Phase 18	Phase 19
1		100		Subsoil															
2		22			100		Subsoil												
3	2	34	49	64	80	85	92	100	Subsoil										
4					42		43					48		100		Subsoil			
5									27	44	48	59	62	76	77	85	100	Subsoil	
6								100			Subsoil								
Burn Pit												100	Subsoil						
Clearwell																		100	Subsoil

Note: The percentage is based on the neat line excavation quantity (waste pit cap, waste, and liner material) only.

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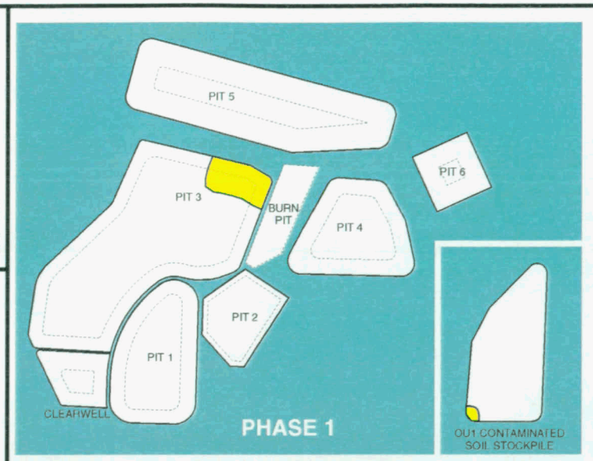
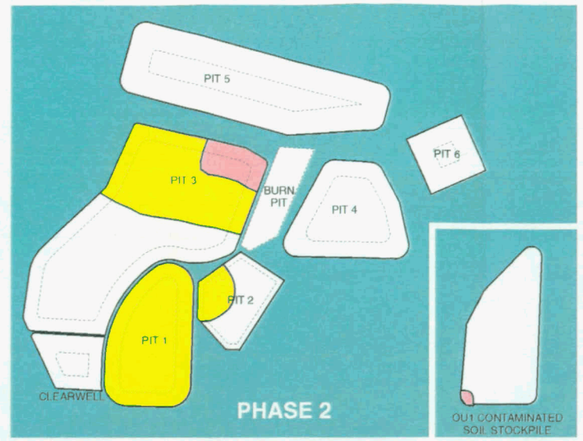
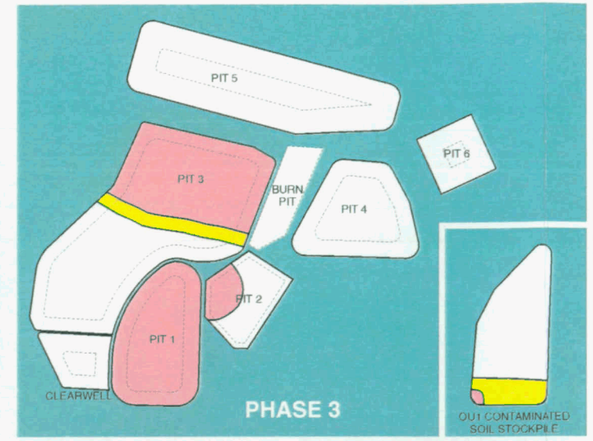
FIGURES

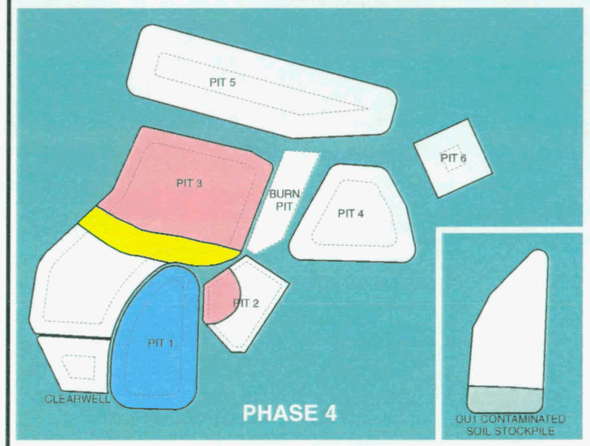
FIGURES

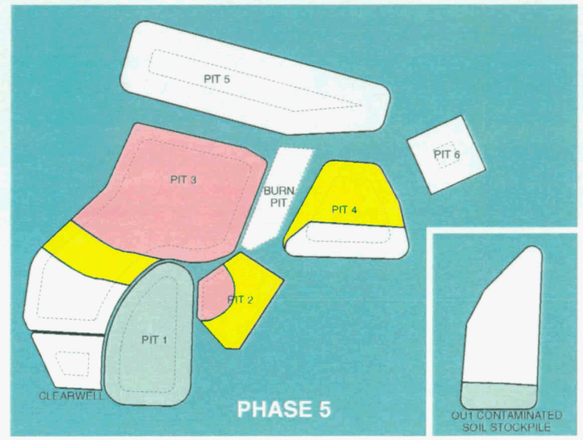
DRAWING NUMBER 773481-B11

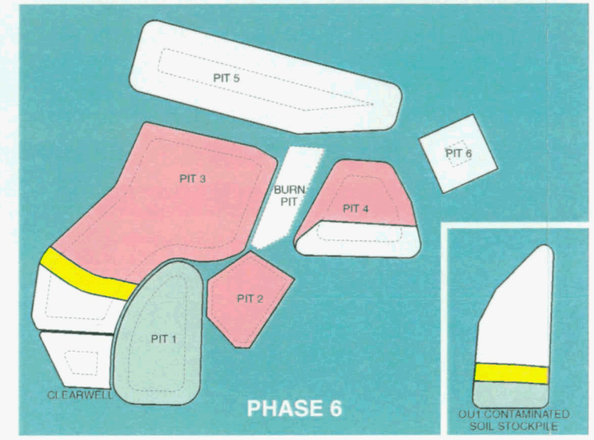


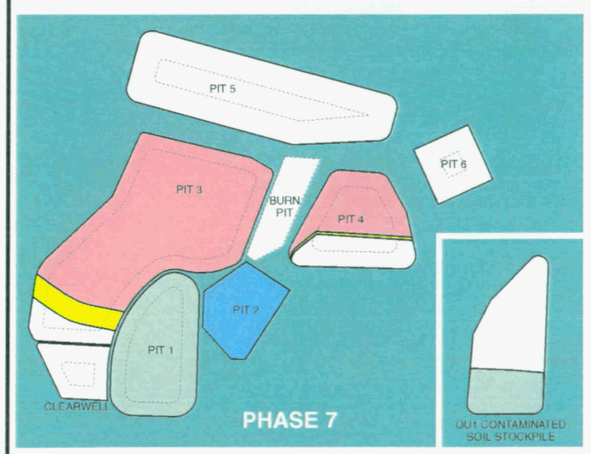












EXCAVATION SUMMARY FOR PHASES 1-7

EXCAVATION PHASE	DAYS OF OPERATION	BLENDED DRY WEIGHT (TONS)	NORMALIZED ENRICHMENT FACTOR
1	9	4,252	0.52
2	268	128,869	0.89
3	85	40,879	0.52
4	88	42,403	0.52
5	175	84,097	0.85
6	29	13,737	0.52
7	41	19,712	0.68

GENERAL NOTES:

1. HAZARD CATEGORIZATION FRACTIONAL VALUES (NUCLEAR, RADIOLOGICAL, AND NON-NUCLEAR) ARE LOWER THAN UNITY FOR EACH EXCAVATION PHASE.
2. ENRICHMENT FACTOR IS NORMALIZED SUCH THAT A FACTOR OF BELOW 1.00 IS CONSIDERED DEPLETED
3. FOR WASTE PIT NO. 3 AND THE CLEARWELL, THE WASTE EXCAVATION DOES NOT INCLUDE THE SOIL LINERS. FOR THESE TWO PITS, THE LINERS WILL BE REMOVED CONCURRENTLY WITH APPROXIMATELY ONE (1) FOOT OF SUBSOILS AS DISCUSSED IN SECTION 4.5.1 OF THE EXCAVATION PLAN. FOR ALL OTHER PITS, WASTE EXCAVATION (AS DEPICTED HERE) INCLUDES COVER, WASTE, AND LINER MATERIALS.

LEGEND:

- EXISTING PIT
- WASTE EXCAVATION
- WASTE EXCAVATION COMPLETED EXCEPT SUBSOIL (SEE GENERAL NOTE 3)
- SUBSOIL EXCAVATION
- COMPLETED EXCAVATION OF SUBSOILS

APPROXIMATE SCALE

0 450 900 FEET

000085

DRAFT

FIGURE 4-1

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
SEQUENCE OF EXCAVATION
PHASES 1-7

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	PJI	CHECKED BY	PJ 1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY		E
DATE	11-25-97	DWG. SCALE	NONE	
IT PROJECT NO.	773481	DRAWING NO.		

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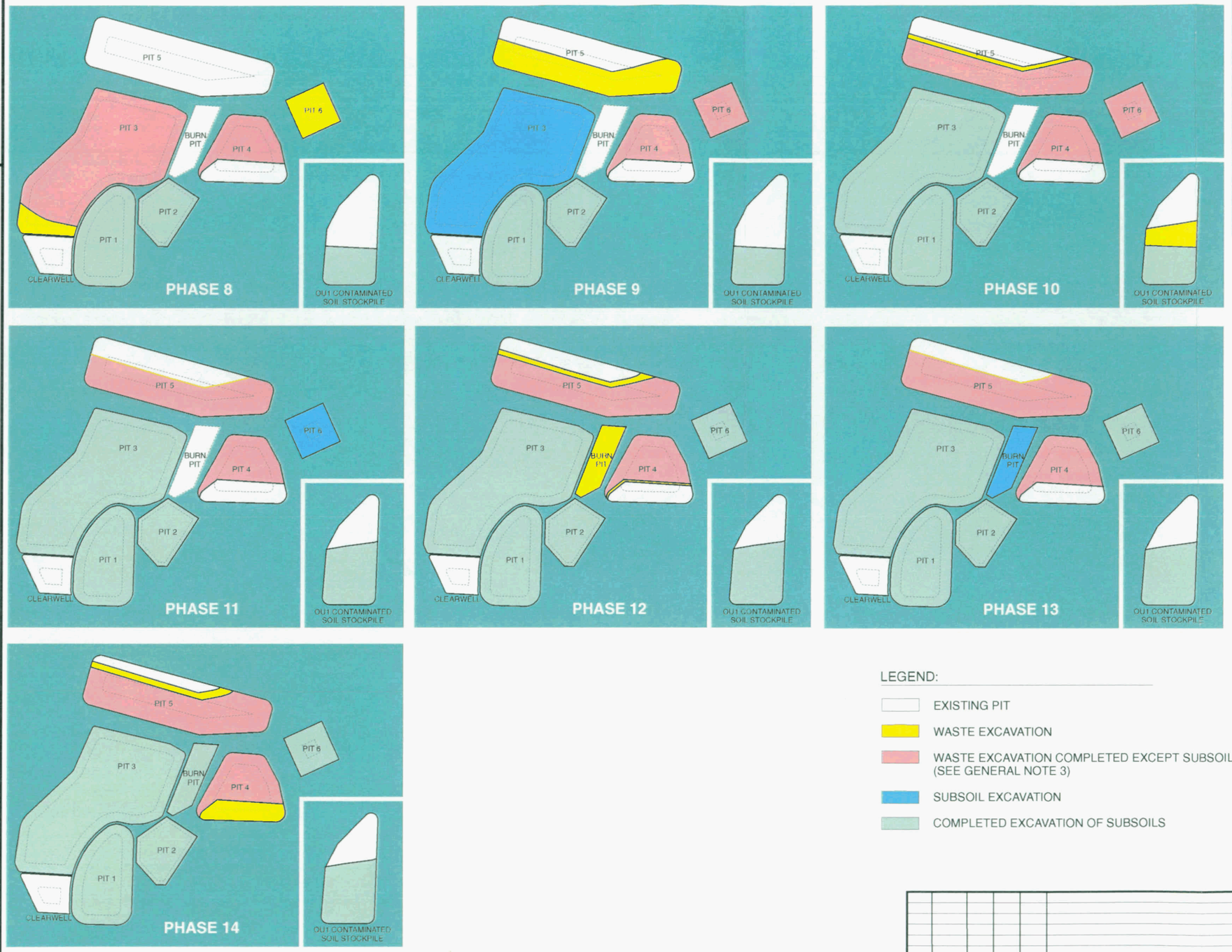
Do Not Scale This Drawing

DRAWING NUMBER 773481-B12



EXCAVATION SUMMARY FOR PHASES 8-14

EXCAVATION PHASE	DAYS OF OPERATION	BLENDED DRY WEIGHT (TONS)	NORMALIZED ENRICHMENT FACTOR
8	59	28,402	0.66
9	101	48,345	0.68
10	65	31,226	0.70
11	14	6,740	0.67
12	93	44,829	0.52
13	10	4,814	0.76
14	105	50,557	0.23

GENERAL NOTES:

1. HAZARD CATEGORIZATION FRACTIONAL VALUES (NUCLEAR, RADIOLOGICAL, AND NON-NUCLEAR) ARE LOWER THAN UNITY FOR EACH EXCAVATION PHASE.
2. ENRICHMENT FACTOR IS NORMALIZED SUCH THAT A FACTOR OF BELOW 1.00 IS CONSIDERED DEPLETED
3. FOR WASTE PIT NO. 3 AND THE CLEARWELL, THE WASTE EXCAVATION DOES NOT INCLUDE THE SOIL LINERS. FOR THESE TWO PITS, THE LINERS WILL BE REMOVED CONCURRENTLY WITH APPROXIMATELY ONE (1) FOOT OF SUBSOILS AS DISCUSSED IN SECTION 4.5.1 OF THE EXCAVATION PLAN. FOR ALL OTHER PITS, WASTE EXCAVATION (AS DEPICTED HERE) INCLUDES COVER, WASTE, AND LINER MATERIALS.

000086

LEGEND:

- EXISTING PIT
- WASTE EXCAVATION
- WASTE EXCAVATION COMPLETED EXCEPT SUBSOIL (SEE GENERAL NOTE 3)
- SUBSOIL EXCAVATION
- COMPLETED EXCAVATION OF SUBSOILS

APPROXIMATE SCALE

0 450 900 FEET

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DRAFT

FIGURE 4-2

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
SEQUENCE OF EXCAVATION
PHASES 8-14

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

DESIGNED BY	PJI	CHECKED BY	PJI 1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY		E
DATE	11-25-97	DWG. SCALE	NONE	
IT PROJECT NO.	773481	DRAWING NO.		

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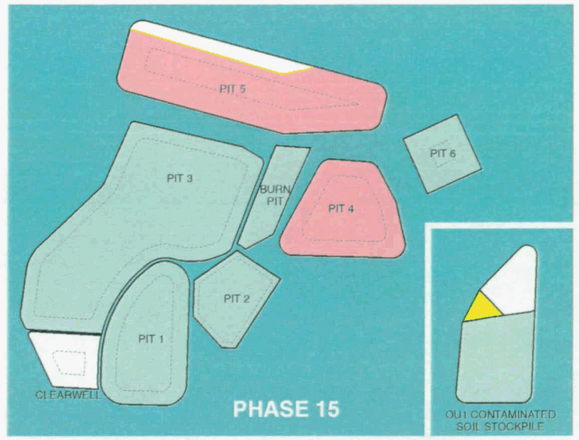
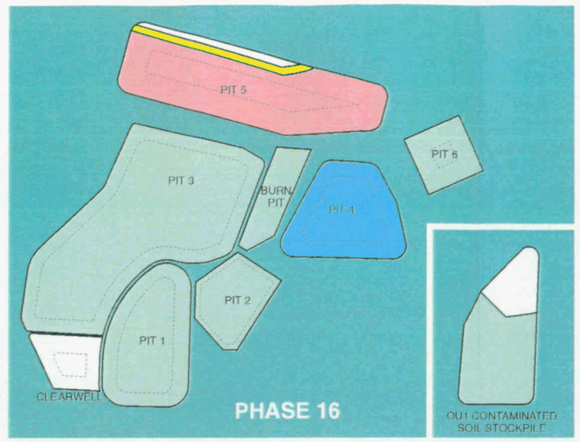
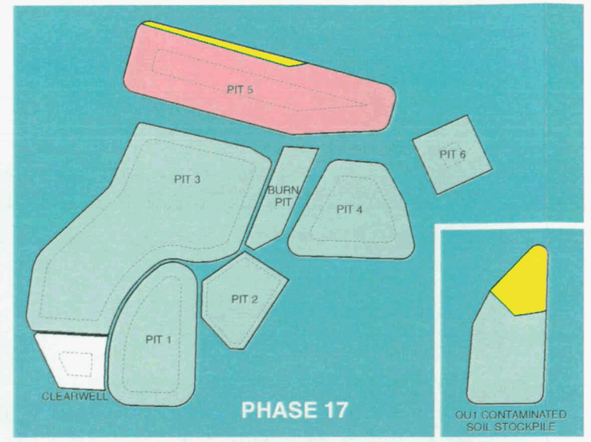
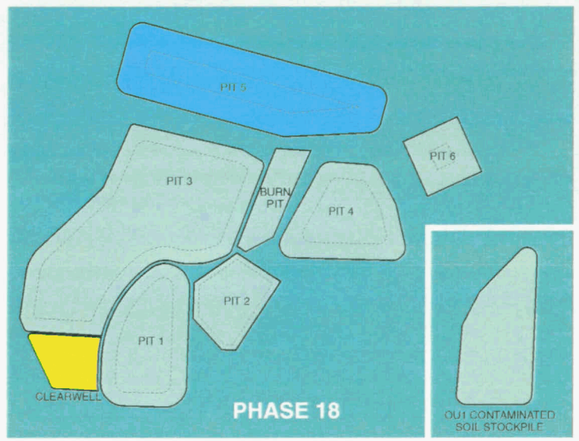
Do Not Scale This Drawing

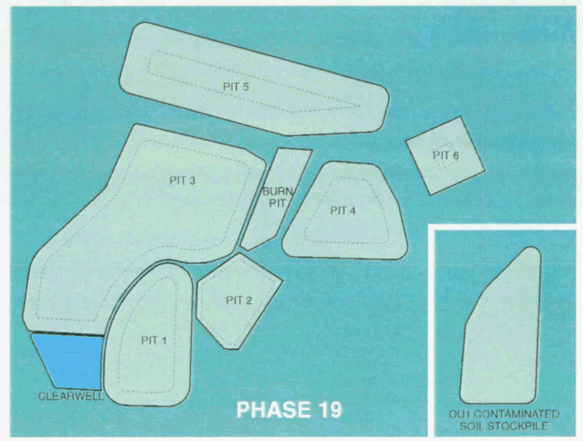
DRAWING NUMBER 773481-B14

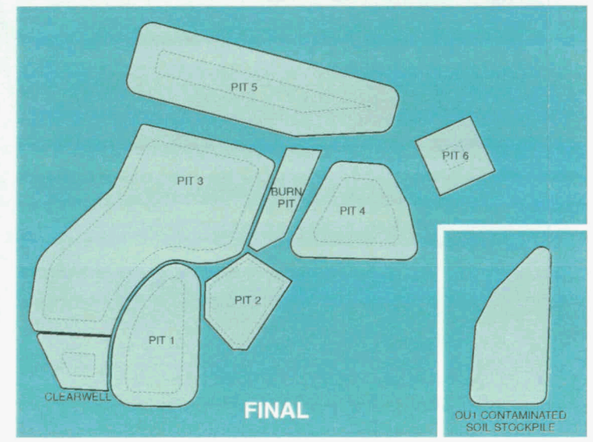












EXCAVATION SUMMARY FOR PHASES 15-FINAL

EXCAVATION PHASE	DAYS OF OPERATION	BLENDED DRY WEIGHT (TONS)	NORMALIZED ENRICHMENT FACTOR
15	1	536	0.70
16	30	14,493	0.36
17	56	26,856	0.70
18	78	37,474	0.72
19	13	6,165	0.47

GENERAL NOTES:

1. HAZARD CATEGORIZATION FRACTIONAL VALUES (NUCLEAR, RADIOLOGICAL, AND NON-NUCLEAR) ARE LOWER THAN UNITY FOR EACH EXCAVATION PHASE.
2. ENRICHMENT FACTOR IS NORMALIZED SUCH THAT A FACTOR OF BELOW 1.00 IS CONSIDERED DEPLETED
3. FOR WASTE PIT NO. 3 AND THE CLEARWELL, THE WASTE EXCAVATION DOES NOT INCLUDE THE SOIL LINERS. FOR THESE TWO PITS, THE LINERS WILL BE REMOVED CONCURRENTLY WITH APPROXIMATELY ONE (1) FOOT OF SUBSOILS AS DISCUSSED IN SECTION 4.5.1 OF THE EXCAVATION PLAN. FOR ALL OTHER PITS, WASTE EXCAVATION (AS DEPICTED HERE) INCLUDES COVER, WASTE, AND LINER MATERIALS.

LEGEND:

- EXISTING PIT
- WASTE EXCAVATION
- WASTE EXCAVATION COMPLETED EXCEPT SUBSOIL (SEE GENERAL NOTE 3)
- SUBSOIL EXCAVATION
- COMPLETED EXCAVATION OF SUBSOILS

APPROXIMATE SCALE

0 450 900 FEET

000087

DRAFT

FIGURE 4-3

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
SEQUENCE OF EXCAVATION
PHASES 15-FINAL

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APRVD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	PJI	CHECKED BY	PJI 1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY		E
DATE	11-25-97	DWG. SCALE	NONE	
IT PROJECT NO.	773481	DRAWING NO.		

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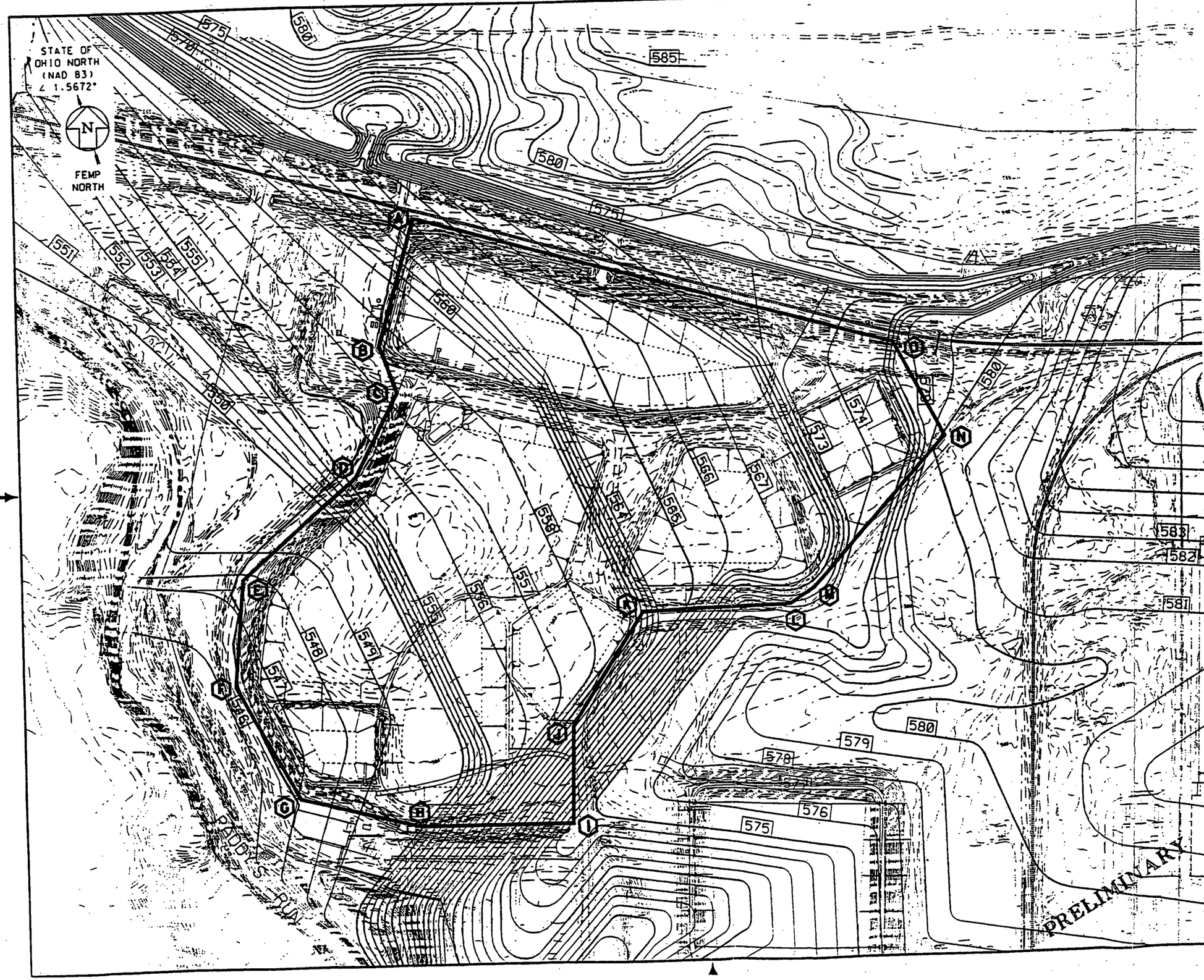
Do Not Scale This Drawing

APPENDIX A

WASTE PIT RESTORATION PLAN



SITE RESTORATION COORDINATES

	STATE PLANAR (NAD83) EASTING	NORTHING
A	1346758.29	482405.43
B	1346684.10	482140.94
C	1346717.51	482042.54
D	1346630.35	481866.02
E	1346390.53	481657.41
F	1346369.85	481434.11
G	1346502.03	481197.09
H	1346745.14	481135.22
I	1347067.68	481135.03
J	1347073.29	481337.83
K	1347226.54	481572.73
L	1347543.67	481581.43
M	1347595.46	481615.46
N	1347880.70	481926.73
O	1347776.00	482126.21

000089

0' 200'

FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION

FERMCO Fernald Environmental Management Project

U.S. DEPARTMENT OF ENERGY

WASTE PIT REMEDIAL ACTION PROJECT

WASTE PIT RESTORATION PLAN

SCALE: 1" = 200'-0"

RES #2964
DATE 5/21/96
DRAWN S.J.SMOC

FIGURE C.8-1

FILE NAME: [illegible]

APPENDIX
A

APPENDIX
B

APPENDIX B

WASTE PIT EXCAVATION PLAN DRAWINGS

Appendix B
List of Drawings

Drawing No.	Title
M-05-82-001	Waste Pit Area Existing Conditions, Plan View
M-05-82-002	Waste Pit Area Existing Conditions, Cross Sections A-A Through D-D
M-05-82-100	Phase 1 - 2% Waste Pit No. 3
M-05-82-101	Phase 2 - 100% Waste Pit No. 1, 22% Waste Pit No. 2, and 34% Waste Pit No. 3
M-05-82-102	Phase 3 - 49% Waste Pit No. 3
M-05-82-103	Phase 4 - 64% Waste Pit No. 3 and Subsoils Waste Pit No. 1
M-05-82-104	Phase 5 - 100% Waste Pit No. 2, 80% Waste Pit No. 3, and 42% Waste Pit No. 4
M-05-82-105	Phase 6 - 85% Waste Pit No. 3
M-05-82-106	Phase 7 - 92% Waste Pit No. 3, 43% Waste Pit No. 4, and Subsoils Waste Pit No. 2
M-05-82-107	Phase 8 - 100% Waste Pit No. 3 and 100% Waste Pit No. 6
M-05-82-108	Phase 9 - 25% Waste Pit No. 5 and Subsoils Waste Pit No. 3
M-05-82-109	Phase 10 - 44% Waste Pit No. 5
M-05-82-110	Phase 11 - 48% Waste Pit No. 5 and Subsoils Waste Pit No. 6
M-05-82-111	Phase 12 - 48% Waste Pit No. 4, 59% Waste Pit No. 5, and 100% Burn Pit
M-05-82-112	Phase 13 - 62% Waste Pit No. 5 and Subsoils Burn Pit
M-05-82-113	Phase 14 - 100% Waste Pit No. 4 and 76% Waste Pit No. 5
M-05-82-114	Phase 15 - 77% Waste Pit No. 5
M-05-82-115	Phase 16 - 85% Waste Pit No. 5 and Subsoils Waste Pit No. 4
M-05-82-116	Phase 17 - 100% Waste Pit No. 5
M-05-82-117	Phase 18 - Subsoils Waste Pit No. 5 and 100% Clearwell
M-05-82-118	Phase 19 - Subsoils Clearwell

APPENDIX
C

APPENDIX C

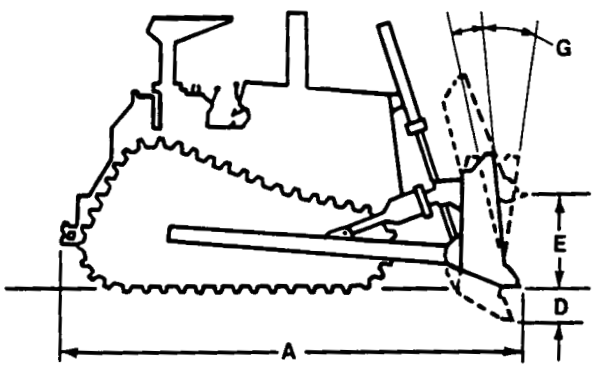
TYPICAL EQUIPMENT PERFORMANCE SHEETS

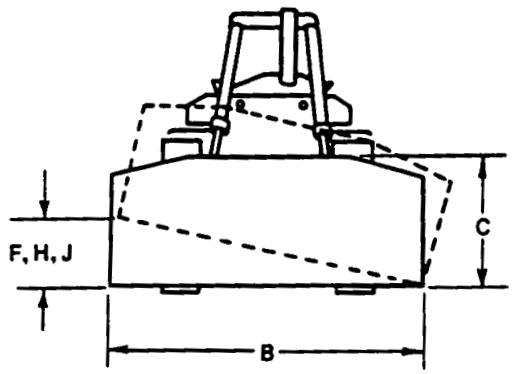
C-1

BULLDOZER

Bulldozers

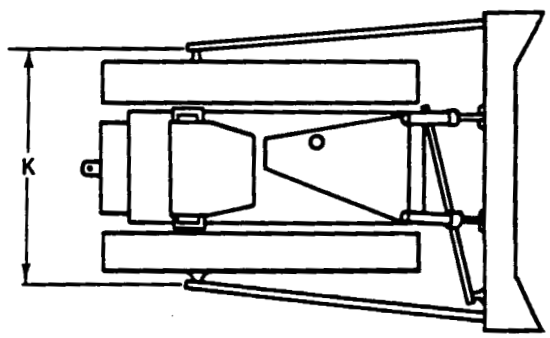
General Dimensions Key
- Tractor and Blade
- SAE Blade Capacity Definition





KEY

A Length (Blade Straight)
Blade:
B Width (including standard end bits)
C Height
D Maximum Digging Depth
E Ground Clearance @ Full Lift
F Maximum Tilt (Manual)
G Maximum Pitch Adjustment
H Maximum Hydraulic Tilt
J Hydraulic Tilt (manual brace centered)
K Pusharm Trunnion Width (to Ball Centers)



Blade capacities on the following pages are as determined by SAE recommended practice J1265. Capacities are defined as:

$Vs = 0.8\ WH^2$.

$Vu = Vs + ZH\ (W\text{-}Z)\ \tan X$.

Where: Vs = Capacity of straight or angling blade.
Vu = Capacity of semi-U or full U-blade.
W = Blade width exclusive of end bits.
H = Effective blade height considering tapered top corners, etc.
Z = Wing length measured parallel to blade width @ ground line of cutting edges.
X = Wing angle.

Track-Type Tractors | Specifications

MODEL	D5E▶		D6M XL		D6M LGP		D6G	
Flywheel Power: Power Shift	78 kW	105 hp	104 kW	140 hp	104 kW	140 hp	116 kW	155 hp
Operating Weight: Power Shift	—		15 050 kg	33,200 lb	16 500 kg	36,400 lb	15 432 kg	34,028 lb
Direct Drive	11 702 kg	25,800 lb	—		—		—	
Engine Model	3306		3116		3116		3306	
Rated Engine RPM: Power Shift	1750		2200		2200		1900	
Direct Drive	—		—					
No. of Cylinders	6		6		6		6	
Bore	121 mm	4.75"	105 mm	4.1"	105 mm	4.1"	121 mm	4.75"
Stroke	152 mm	6"	127 mm	5.0"	127 mm	5.0"	152 mm	6"
Displacement	10.5 L	638 in³	6.6 L	403 in³	6.6 L	403 in³	10.5 L	638 in³
Track Rollers (Each Side)	6		7		8		7	
Width of Standard Track Shoe	457 mm	18"	600 mm	24"	860 mm	34"	508 mm	20"
Length of Track on Ground	2.21 m	87"	2.55 m	100"	3.08 m	121"	2.67 m	105"
Ground Contact Area (W/Std. Shoe)	2.05 m²	3154 in²	3.06 m²	4743 in²	5.30 m²	8217 in²	2.72 m²	4216 in²
Track Gauge	1.52 m	60"	1.89 m	74"	2.16 m	85"	1.88 m	74"
GENERAL DIMENSIONS:								
Height (Stripped Top)**	1.90 m	6'6"	2.30 m	7'6.5"	2.41 m	7'11"	2.10 m	6'11"
Height (To Top of ROPS Canopy)	—		3.02 m	9'11"	3.14 m	10'4"	—	
Height (To Top of ROPS)	2.95 m	9'8"	—		—		3.20 m	10'5"
Height (To Top of Cab ROPS)	—		3.08 m	10'1"	3.19 m	10'6"	—	
Overall Length (With P Blade)***	—		4.80 m	15'9"	5.37 m	17'8"	—	
(Without Blade)	—		3.74 m	12'3"	4.15 m	13'7"	—	
Overall Length (With S Blade)	—		4.92 m	16'2"	—		5.00 m	16'4"
(Without Blade)	3.88 m	12'8"	3.74 m	12'3"	4.15 m	13'7"	3.94 m	12'9"
Width (Over Trunnion)	—		3.19 m	10'6"	—		—	
Width (W/O Trunnion — Std. Shoe)	2.03 m	6'8"	2.49 m	8'2"	3.02 m	9'11"	2.39 m	7'10"
Ground Clearance	277 mm	10.9"	424 mm	16.7"	538 mm	21.2"	310 mm	12.2"
Blade Types and Widths:								
Straight	—		—		—		3.20m	10'6"
Angle	3.34 m	10'11"	—		—		3.90m	12'9"
Semi-U	—		3.17 m	10'6"	—		3.20m	10'6"
"P" Straight	—		—		—		—	
Power Angle & Tilt	—		3.27 m†	10'9"	4.08 m†	13'5"	—	
Fuel Tank Refill Capacity	295 L	78 U.S. gal	311 L	82.2 U.S. gal	311 L	82.2 U.S. gal	300 L	80 U.S. gal

* Operating Weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluids, straight dozer with tilt (UPAT on D5M LGP and D6M) rigid drawbar, front towing device, engine enclosures and suspension seat.
** Height (stripped top) — without ROPS canopy, exhaust, pre-cleaner, seat back or other easily removed encumbrances.
*** UPAT blade on D5M LGP and D6M.
† SU blade on D6M.
▶ Brazilian Domestic only.

MODEL	D5C XL Series III		D5C LGP Series III		D5M XL		D5M LGP	
Flywheel Power: Power Shift	67.1 kW	90 hp	67.1 kW	90 hp	82 kW	110 hp	82 kW	110 hp
Direct Drive	—		—		—		78 kW	105 hp
Operating Weight*								
(Power Shift)	8437 kg	18,600 lb	8735 kg	19,256 lb	11 700 kg	25,800 lb	12 600 kg	27,800 lb
(Direct Drive)	—		—		—		12 050 kg	26,600 lb
Engine Model	3046		3046		3116		3116	
Rated Engine RPM	2400		2400		2100		2100	
No. of Cylinders	6		6		6		2000	
Bore	94 mm	3.7"	94 mm	3.7"	105 mm	4.1"	105 mm	4.1"
Stroke	120 mm	4.7"	120 mm	4.7"	127 mm	5.0"	127 mm	5.0"
Displacement	5.0 L	305 in³	5.0 L	305 in³	6.6 L	403 in³	6.6 L	403 in³
Track Rollers (Each Side)	7		6		7		7	
Width of Standard Track Shoe	508 mm	20"	660 mm	26"	560 mm	22"	760 mm	30"
Length of Track on Ground	2.32 m	7'7.2"	2.14 m	7'0.4"	2.39 m	94"	2.60 m	103"
Ground Contact Area (W/Std. Shoe)	2.36 m²	3648 in²	2.83 m²	4389 in²	2.67 m²	4144 in²	3.96 m²	6133 in²
Track Gauge	1.54 m	5'1"	1.72 m	5'8"	1.77 m	5'10"	2.00 m	79"
GENERAL DIMENSIONS:								
Height (Stripped Top)**	1.75 m	5'9.1"	1.75 m	5'9.1"	2.22 m	7'3"	2.26 m	7'5"
Height (To Top of ROPS Canopy)	2.73 m	8'11.4"	2.72 m	8'11.4"	3.00 m	9'10"	3.04 m	10'0"
Height (To Top of ROPS Cab)	—		—		3.00 m	9'10"	3.05 m	10'0"
Overall Length (With S Blade)***	4.17 m	13'8.1"	3.98 m	13'0.7"	4.56 m	14'11"	5.13 m	16'10"
(Without Blade)	3.17 m	10'4.6"	2.99 m	9'9.8"	3.54 m	11'8"	3.73 m	12'3"
Width (W/O Trunnion — Std. Shoe)	2.06 m	6'9"	2.38 m	7'10"	2.33 m	7'8"	2.76 m	9'1"
Ground Clearance	361 mm	14.2"	361.4 mm	14.2"	385 mm	15.2"	437 mm	17.2"
Blade Types and Widths:								
Straight	—		—		—		—	
Angle	—		—		—		—	
"P" Straight	—		3.26 m	10'8"	—		—	
Angled	—		2.95 m	9'8"	—		—	
Power Angle & Tilt***	2.69 m	8'9.9"	3.26 m	10'8.4"	3.08 m	10'1"	3.36 m	11'0"
Fuel Tank Refill Capacity	157 L	41.4 U.S. gal	157 L	41.4 U.S. gal	218 L	57.5 U.S. gal	218 L	57.5 U.S. gal

*Operating Weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluids, D4H Series II PAT blade, rigid drawbar, front towing device, standard service crankcase guards, engine enclosures and suspension seat.
**Height (stripped top) — without ROPS canopy, exhaust, pre-cleaner, seat back or other easily removed encumbrances.
***D5M XL, D5M LGP with UPAT blade.

Bulldozers | Blade Specifications
• D5C Series III • D5C LGP Series III
• D5M XL • D5M LGP

MODEL	D5C Series III 5P		D5C LGP Series III 5P LGP	
Type	Power Angling and Tilt		Power Angling and Tilt	
Blade Capacities*	1.94 m³	2.53 yd³	2.08 m³	2.70 yd³
Weight, Shipping** (Dozer)	1355 kg	2987 lb	1376 kg	3027 lb
Tractor & Dozer Dimensions:				
A Length (Blade Straight)	3.98 m	13'1"	4.025 m	13'2"
Length (Blade Angled)	4.51 m	14'10"	4.631 m	15'2"
Width (Blade Angled)	2.44 m	8'0"	2.95 m	9'8"
Width (with C-Frame only)	—		—	
Blade Dimensions:	(inside mounted)		(inside mounted)	
B Width (including std. end bits)	2.69 m	8'10"	3.25 m	10'8"
C Height	1000 mm	39.4"	929 mm	36.6"
D Max. Digging Depth	441 mm	16.4"	424 mm	16.7"
E Ground Clearance @ Full Lift	820 mm	33.1"	863 mm	34.0"
G Max. Pitch	+2°–4°		+2°–4°	
J Hydraulic Tilt	373 mm	14.7"	487 mm	18.9"
Blade Angle	25°		25°	

MODEL	D5M XL 5P		D5M LGP 5P LGP	
Type	Power Angling and Tilt		Power Angling and Tilt	
Blade Capacities*	2.59 m³	3.39 yd³	2.03 m³	2.66 yd³
Weight, Shipping** (Dozer)	1932 kg	4250 lb	2000 kg	4400 lb
Tractor & Dozer Dimensions:				
A Length (Blade Straight)	4.56 m	14'8"	5.13 m	16'10"
Length (Blade Angled)	5.24 m	16'10"	5.80 m	19'0"
Width (Blade Angled)	2.79 m	9'2"	3.04 m	10'0"
Width (with C-Frame only)	—		—	
Blade Dimensions:	(inside mounted)		(inside mounted)	
B Width (including std. end bits)	3.08 m	10'1"	3.36 m	11'0"
C Height	1109 mm	43.6"	910 mm	35.8"
D Max. Digging Depth	441 mm	17.4"	491 mm	19.3"
E Ground Clearance @ Full Lift	916 mm	36.1"	923 mm	36.3"
G Max. Pitch	—		—	
J Hydraulic Tilt	460 mm	18.1"	491 mm	19.3"
Blade Angle	25°		25°	

*Blade capacities as determined by SAEJ1265.
**Shipping Weight — Total bulldozer arrangement includes: Blade, push arms or C-frame, braces, cylinders, lines, trunnions and lift cylinder mountings.

MODEL	D6M XL 6SU		D6M XL 6P	
Type	Semi-U			
Blade Capacities*	4.28 m³	5.60 yd³	3.18 m³	4.14 yd³
Weight, Shipping** (Dozer)	2427 kg	5351 lb	2372 kg	5229 lb
Tractor & Dozer Dimensions:				
A Length (Blade Straight)	4.92 m	16'2"	4.80 m	15'9"
Length (Blade Angled)	—		5.44 m	17'10"
Width (Blade Angled)	—		2.96 m	9'9"
Width (with C-Frame only)	—		—	
Blade Dimensions:	(outside mounted)		(inside mounted)	
B Width (including std. end bits)	3.19 m	10'6"	3.27 m	10'9"
C Height	1244 mm	49"	1195 mm	47"
D Max. Digging Depth	520 mm	20.5"	444 mm	17.5"
E Ground Clearance @ Full Lift	983 mm	38.7"	925 mm	36.4"
G Max. Pitch	±5°		—	
H Max. Hydraulic Tilt	665 mm	26.2"	—	
J Hydraulic Tilt	372 mm	14.6"	497 mm	19.6"
Blade Angle	—		25°	

MODEL	D6M LGP LGP	
Type	Power Angling and Tilt	
Blade Capacities*	3.16 m³	4.11 yd³
Weight, Shipping** (Dozer)	2819 kg	6215 lb
Tractor & Dozer Dimensions:		
A Length (Blade Straight)	5.39 m	17'8"
Length (Blade Angled)	6.20 m	20'4"
Width (Blade Angled)	3.70 m	12'2"
Width (with C-Frame only)	—	
Blade Dimensions:	(inside mounted)	
B Width (including std. end bits)	4.08 m	13'5"
C Height	1025 mm	40.4"
D Max. Digging Depth	433 mm	17.0"
E Ground Clearance @ Full Lift	1024 mm	40.3"
G Max. Pitch	—	
H Max. Hydraulic Tilt	—	
J Hydraulic Tilt	598 mm	23.5"
Blade Angle	25°	

Notice that the capacity of the U-blade is the volume carried by a straight blade of the same dimensions plus the volume included in the "cup" of the U-blade. It is intended for **relative comparisons of dozer sizes**, and not for predicting capacities or productivities in actual field conditions.

*Blade capacities as determined by SAE J1265.

**Shipping Weight — Total Bulldozer Arrangement includes: Blade, push arms or C-frame, braces, cylinders, lines, trunnions and lift cylinder mountings.

GROUND PRESSURES

Pressures computed from operating weights given earlier in this section in the specifications tables.

MODEL	SHOE WIDTH		CONTACT AREA		GROUND PRESSURE	
	mm	in	m²	in²	kPa	psi
D3C Series III	356	14	1.35	2097	52	7.2
◀	406	16	1.54	2396	44.5	6.45
D3C XL Series III	406	16	1.67	2589	42.5	6.16
D3C LGP Series III	635	25	2.61	4045	28.6	4.15
D4C Series III	406	16	1.67	2589	42.4	6.15
D4C XL Series III	457	18	2.02	3132	36.2	5.25
D4C LGP Series III	635	25	2.61	4045	30	4.2
D5C Series III	457	18	1.97	3038	41	6.0
D5C XL Series III	508	20	2.36	3648	35	5.1
D5C LGP Series III	660	26	2.83	4389	30.3	4.4
D5M XL ◀	510	20	2.44	3775	48	6.83
	560	22	2.67	4146	44	6.22
D5M LGP	610	24	3.18	4922	40	5.64
◀	760	30	3.96	6133	32	4.53
	770	30	4.01	6213	31	4.47
D5E	406	16	1.77	2745	62	9.00
◀	457	18	1.99	3085	55	7.98
D6M XL	560	22	2.89	4427	52	7.49
◀	600	24	3.06	4743	48	6.99
D6M LGP	710	28	4.38	6783	37	5.36
◀	860	34	5.30	8217	31	4.43
	865	34	5.33	8264	30	4.40
D6G	457	18	2.43	3766	60	8.70
◀	508	20	2.71	4200	54	7.83
	560	22	2.98	4619	49	7.10
	610	24	3.25	5040	45	6.54
D6H Series II ◀	560	22	2.92	4518	61	8.82
	610	24	3.18	4930	56	8.14

◀ Standard Shoe

MODEL	SHOE WIDTH		CONTACT AREA		GROUND PRESSURE	
	mm	in	m²	in²	kPa	psi
D6H XL ◀	560	22	3.16	4888	60	8.60
Series II	610	24	3.44	5332	55	7.93
D6H XL (IG) Series II	762	30	4.3	6696	44	6.50
D6H XR ◀	560	22	3.08	4770	60	8.68
Series II	610	24	3.36	5203	56	8.01
D6H LGP	760	30	4.93	7662	41	5.80
Series II ◀	915	36	5.93	9194	35	4.94
	1000	39	6.49	9961	32	4.55
D7G ◀	508	20	2.76	4280	73	10.60
◀	559	22	3.04	4708	66	9.60
	610	24	3.31	5136	60	8.80
D7H Series II	510	20	2.94	4560	82	11.71
◀	560	22	3.24	5016	75	10.69
	610	24	3.53	5472	69	9.87
	660	26	3.82	5928	64	9.17
D7H XR Series II	560	22	3.43	5315	71.5	10.16
◀	610	24	3.75	5808	65.9	9.37
	660	26	4.06	6282	61.2	8.70
D7H LGP	760	30	4.8	7504	54	7.74
Series II	915	36	5.82	9029	46	6.55
D8R ◀	560	22	3.59	5565	101.1	14.67
	610	24	3.91	6062	92.8	13.47
	660	26	4.23	6559	85.9	12.47
	710	28	4.55	7056	79.7	11.57
D8R LGP*	965	38	6.2	9576	58.6	8.50
D9R	560	22	3.86	6009	121.1	17.58
◀	610	24	4.24	6569	110.8	16.08
	685	27	4.74	7374	98.7	14.32
	760	30	5.26	8194	88.8	12.89
D10R ◀	610	24	4.73	7326	136.4	19.79
	710	28	5.50	8527	117.1	17.00
	860	31.5	6.66	10,328	96.7	14.04
D11R ◀	710	28	6.31	9781	152.8	22.18
	810	32	7.20	11,159	133.9	19.44
	915	36	8.13	12,605	118.6	17.21

◀ Standard shoe. *Offered as a Custom Product.

NOTE: Ground contact area = width of track shoe × length of track on ground × 2.

$$\text{Ground pressure} = \frac{\text{operating weight}}{\text{ground contact area}}$$

Bulldozers | Summary
Blade Options for Caterpillar Built Machines

	CATERPILLAR BLADES							SPECIAL ATTACHMENTS													
MODEL	S	U	SU	A	FS	LFS	P	RC	WC	CL	HU	LF	PAT	CU	CPB	CB	VR	WCB	CS	WCS	W
D3C Series III							●						●								
D4C Series III							●						●								
D3C LGP Series III							●														
D4C LGP Series III							●						●								
D4E SR				●																	
D5C Series III							●						●								
D5C LGP Series III							●						●								
D5M XL							●														
D5M LGP	●						●														
D5E				●																	
D6M XL			●				●		●	●							●				
D6M LGP	●						●										●				
D6H Series II	●		●	●					●	●	●	●	▲				●				
D6H XL Series II			●	●									▲								
D6H LGP Series II	●								●	●		●									
D6G	●		*	●						●		●					●				
D7H Series II	●	●	●	●					●	●	●	●					●				
D7H LGP Series II	●											●					●				
D7G	●	●		●					●	●	●	●	●	●	●		●				
D8R		●	●	●				●	●	●	●	●		●	●	●	●				
D8R LGP			*																		
D9R		●	●						●	●		●		●	●		●	●			
D10R		●	●					●	●	●				●	●	●	●				
D11R		●	●					●		●							●				
814F	●								●	●	●								●	●	
815F					●																●
816F						●						●									
824G	●								●	●	●								●	●	
825G					●																●
826G						●						●									
834B	●	●							●	●									●	●	
836												●									●

CATERPILLAR SUPPLIED
- S — Straight
- U — Universal
- SU — Semi-Universal
- A — Angling
- FS — Fill Spreading
- LFS — Landfill Spreading
- P — Power Angle Tilt

SPECIAL ATTACHMENTS SUPPLIED
- RC — Reclamation U
- WC — Woodchips
- CL — Coal
- HU — Heavy U
- LF — Landfill
- PAT — Power Angle Tilt
- CU — Cushion Dozer
- CPB — Cushion Push Block
- CB — Coal Bowldozer
- VR — Variable Radius
- WCB — Wood Chip Bowldozer
- CS — Coal Scoop
- WCS — Wood Chip Scoop
- W — W-Blade

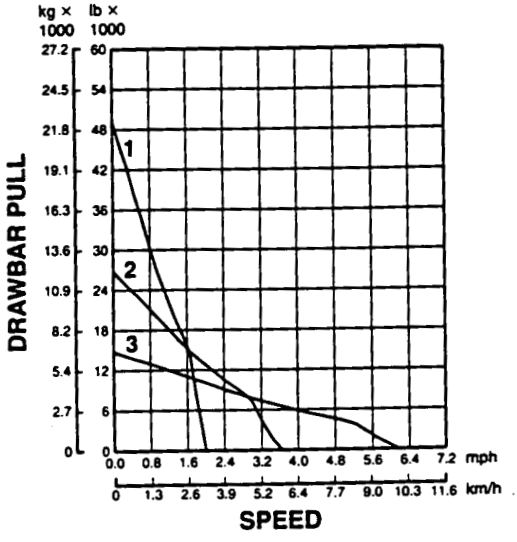
Heavy duty PAT mold board on D3C, D4C and D5C

Note: This chart suggests a range of blade options for Caterpillar built machines. It is not totally inclusive of all blades available. For additional information consult Caterpillar Special Attachments, Balderson.

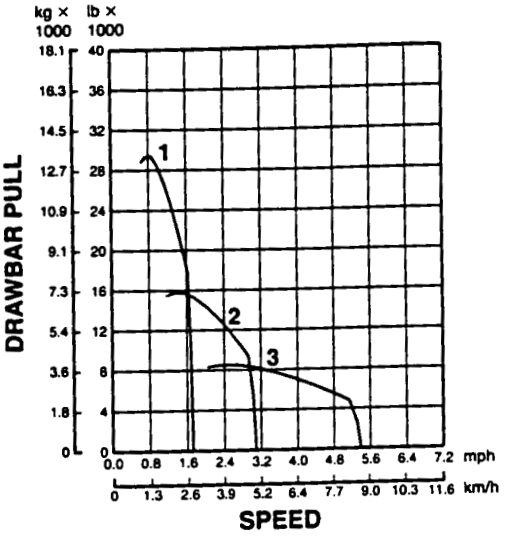
*Available as a Cat Special Attachment.
■ Heavy duty logging special.
▲ Available from Bateman Mfg.

1484

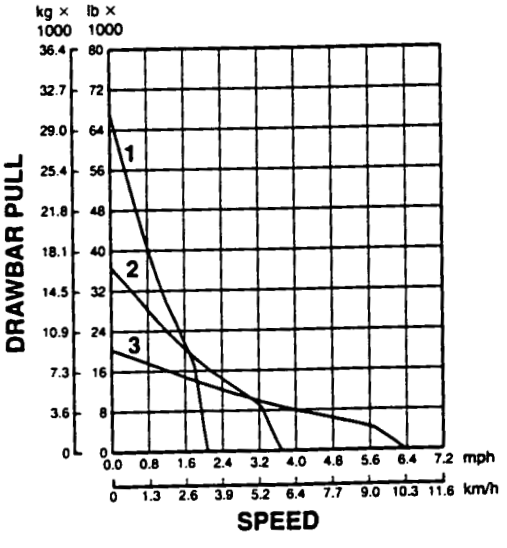
D5M XL
D5M LGP



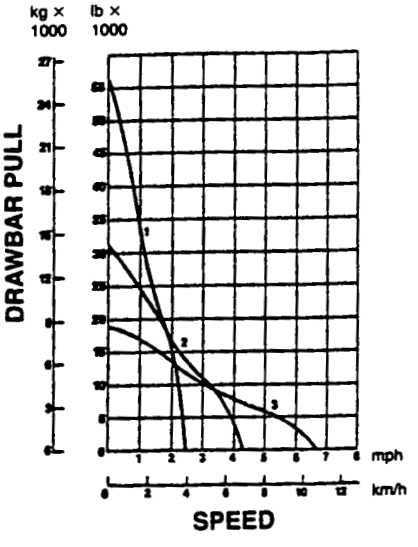
D5M LGP PSDD



D6M XL
D6M LGP



D6G



KEY

1 — 1st Gear
2 — 2nd Gear
3 — 3rd Gear

Note: Usable pull will depend upon weight and traction of equipped tractor.

C-2

TRACKED EXCAVATOR

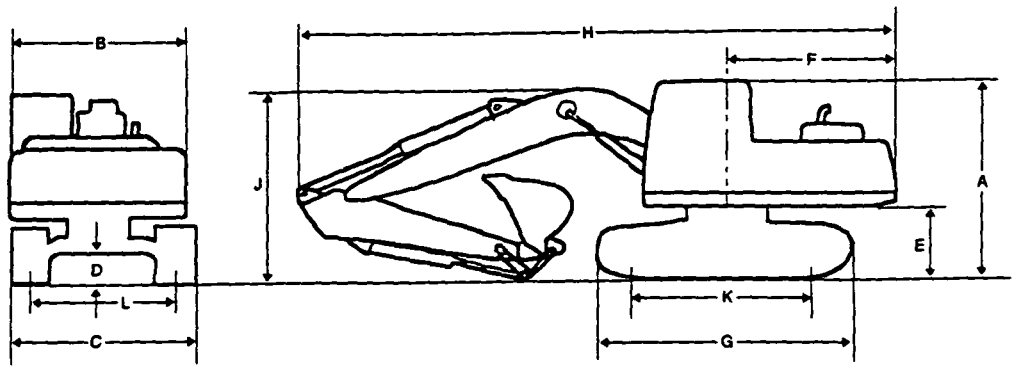
MODEL	322 LN		325B		325		325B L	
Sourcing	Belgium		Japan		Belgium		Japan, U.S.	
Flywheel Power	114 kW	153 hp	125 kW	168 hp	125 kW	168 hp	125 kW	168 hp
Operating Weight*	23 710 kg	52,340 lb	25 900 kg	57,100 lb	25 940 kg	57,250 lb	27 500 kg	60,630 lb
Bucket Capacity Range (heaped)	0.63-1.9 m³	0.82-2.5 yd³	0.9-1.9 m³	1.18-2.49 yd³	0.7-1.7 m³	0.92-2.2 yd³	0.9-1.9 m³	1.18-2.49 yd³
Engine Model	3116T		3116TA		3116TA		3116TA	
Rated Engine RPM	1950		2000		2000		2000	
No. of Cylinders	6		6		6		6	
Bore	105 mm	4.1"	105 mm	4.1"	105 mm	4.1"	105 mm	4.1"
Stroke	127 mm	5.0"	127 mm	5.0"	127 mm	5.0"	127 mm	5.0"
Displacement	6.6 L	403 in³	6.6 L	403 in³	6.6 L	403 in³	6.6 L	403 in³
Max. Implement Hydraulic Pump at Rated RPM	2 × 205 L/min	2 × 54 gpm	2 × 210 L/min	2 × 55.5 gpm	2 × 208 L/min	2 × 55 gpm	2 × 210 L/min	2 × 55.5 gpm
Relief Valve Settings:								
Implement Circuits	31 390 kPa	4550 psi	34 300 kPa	4980 psi	31 390 kPa	4550 psi	34 300 kPa	4980 psi
Travel Circuits	34 330 kPa	4980 psi	34 300 kPa	4980 psi	34 330 kPa	4980 psi	34 300 kPa	4980 psi
Swing Circuits	25 500 kPa	3980 psi	27 500 kPa	3980 psi	27 470 kPa	3980 psi	27 500 kPa	3980 psi
Pilot Circuits	3430 kPa	500 psi	4140 kPa	600 psi	3430 kPa	500 psi	4140 kPa	600 psi
	Two Speed Travel		Two Speed Travel		Two Speed Travel		Two Speed Travel	
Maximum Drawbar Pull	Lo: 194 kN Hi: 108 kN	43,440 lb 24,030 lb	Lo: 215 kN Hi: 131 kN	48,500 lb 29,540 lb	Lo: 216 kN Hi: 128 kN	48,000 lb 29,000 lb	Lo: 215 kN Hi: 131 kN	48,500 lb 29,540 lb
Maximum Travel Speed at Rated RPM	Lo: 3.4 km/h Hi: 5.5 km/h	2.1 mph 3.4 mph	Lo: 3.1 km/h Hi: 5.0 km/h	1.9 mph 3.2 mph	Lo: 3.1 km/h Hi: 4.6 km/h	1.9 mph 2.9 mph	Lo: 3.1 km/h Hi: 5.0 km/h	1.9 mph 3.2 mph
Width of Standard Track Shoe	600 mm	24"	600 mm	24"	600 mm	24"	800 mm	32"
Overall Track Length	4640 mm	15'3"	4360 mm	14'4"	4358 mm	14'3.6"	4660 mm	15'3"
Ground Contact Area with Std. Shoe and Std. Undercarriage	4.94 m²	7650 in²	4.55 m²	7050 in²	4.55 m²	7056 in²	6.56 m²	10,200 in²
Track Gauge	2390 mm	7'10"	2390 mm	7'10"	2390 mm	7'10"	2590 mm	8'6"
Fuel Tank Refill Capacity	370 L	98 U.S. gal	420 L	111 U.S. gal	400 L	106 U.S. gal	420 L	111 U.S. gal

*Operating weight includes coolant, lubricants, full fuel tank, standard shoes, bucket and operator 75 kg (165 lb).

Note: Certain models may not be available in all Sales areas.
Specifications may also vary by Sales area.
Contact your Caterpillar District Office for details.

Excavators

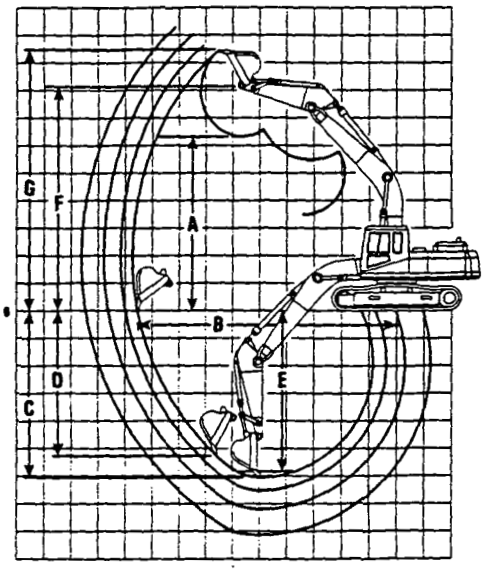
Shipping Dimensions
- 325B, 325B L
- Japan/U.S. Sourced



	325B Reach		325B Mass		325B L Reach		325B L Mass	
A	3023 mm	9'11"	3023 mm	9'11"	3023 mm	9'11"	3023 mm	9'11"
B	2850 mm	9'4"	2850 mm	9'4"	2850 mm	9'4"	2850 mm	9'4"
C	2990 mm	9'10"	2990 mm	9'10"	3390 mm	11'1"	3390 mm	11'1"
D	510 mm	1'8"	510 mm	1'8"	510 mm	1'8"	510 mm	1'8"
E	1130 mm	3'8"	1130 mm	3'8"	1130 mm	3'8"	1130 mm	3'8"
F	3050 mm	10'0"	3050 mm	10'0"	3050 mm	10'0"	3050 mm	10'0"
G	4360 mm	14'4"	4360 mm	14'4"	4660 mm	15'3"	4660 mm	15'3"
H	10 290 mm	33'10"	9710 mm	31'10"	10 290 mm	33'10"	9710 mm	31'10"
J	3270 mm	10'9"	3460 mm	11'4"	3270 mm	10'9"	3460 mm	11'4"
K	3490 mm	11'5"	3490 mm	11'5"	3795 mm	12'5"	3795 mm	12'5"
L	2390 mm	7'10"	2390 mm	7'10"	2590 mm	8'6"	2590 mm	8'6"

Excavators

Range Dimensions
- 320B
- 320B L
- 320B N
- Japan/U.S. Sourced



One-Piece Boom Digging Envelope
- Standard shoes and undercarriage

KEY:

A Maximum loading height of bucket with teeth

B Maximum reach at ground level

C Maximum digging depth

D Maximum vertical wall

E Maximum depth of cut for 2.44 m (8') level bottom (straight clean up)

F Maximum bucket hinge pin height

G Maximum height, to bucket teeth at highest arc

320B, 320B L, 320B N with Reach Boom

Stick	2920 mm	9'7"	2500 mm	8'2"	1900 mm	6'3"
	m	ft	m	ft	m	ft
A	6.57	21'5"	6.46	21'2"	5.96	19'7"
B	9.78	32'1"	9.31	30'7"	8.76	28'9"
C	6.64	21'9"	6.15	20'2"	5.63	12'6"
D	6.04	19'10"	5.33	17'6"	4.68	15'4"
E	6.38	20'11"	5.85	19'2"	5.31	17'5"
F	8.06	26'5"	7.87	25'10"	7.45	24'5"
G	9.47	31'1"	9.16	30'1"	8.78	28'10"

320B, 320B L, 320B N with Mass Boom

Stick	2400 mm	7'10"	1900 mm	6'3"
	m	ft	m	ft
A	5.92	19'5"	5.69	18'8"
B	8.76	28'9"	8.30	27'3"
C	5.70	18'8"	5.20	17'1"
D	4.91	16'1"	4.43	14'6"
E	5.39	17'8"	4.88	16'0"
F	7.42	24'4"	7.18	23'7"
G	8.77	28'9"	8.54	28'0"

320B

• Reach Boom • 600 mm (24") Track Shoes

Stick	Bucket		3.0 m 10' Front	3.0 m 10' Side	4.5 m 15' Front	4.5 m 15' Side	6.0 m 20' Front	6.0 m 20' Side	7.5 m 25' Front	7.5 m 25' Side	9.0 m 30' Front	9.0 m 30' Side	At Max. Reach Front	At Max. Reach Side
1900 mm	C1370X	kg	—	—	7950	4650	4950	2950	—	—	—	—	3000	1750
6'3"	54"	lb			17,050	10,000	10,600	6300					6550	3800
2500 mm	B1260X	kg	—	—	8350	5050	5300	3300	3700	2300	—	—	2900	1750
8'2"	50"	lb			17,950	10,850	11,350	7050	7950	4900			6350	3900
2920 mm	B1130X	kg	5450	5450	8450	5150	5350	3350	3800	2350	—	—	2400	1700
9'7"	44"	lb	12,500	12,500	18,150	11,050	11,500	7200	8100	5050			5300	3700
3860 mm	B900T	kg	6850	6850	8600	5250	5450	3400	3800	2400	2850	1750	2050	1450
12'8"	35"	lb	15,750	15,750	18,450	11,300	11,650	7350	8200	5150	6100	3700	4450	3150

320B

• Mass Boom • 600 mm (24") Track Shoes

Stick	Bucket		3.0 m 10' Front	3.0 m 10' Side	4.5 m 15' Front	4.5 m 15' Side	6.0 m 20' Front	6.0 m 20' Side	7.5 m 25' Front	7.5 m 25' Side	9.0 m 30' Front	9.0 m 30' Side	At Max. Reach Front	At Max. Reach Side
1900 mm	C1470X	kg	—	—	8100	4750	5000	3000	—	—	—	—	3350	1950
6'3"	58"	lb			17,350	10,200	10,750	6400					7300	4300
2400 mm	C1370X	kg	7600	7600	8150	4800	5050	3050	—	—	—	—	3000	1750
7'10"	40"	lb	17,600	17,600	17,500	10,350	10,800	6500					6600	3850

320B L

• Reach Boom • 800 mm (32") Track Shoes

Stick	Bucket		3.0 m 10' Front	3.0 m 10' Side	4.5 m 15' Front	4.5 m 15' Side	6.0 m 20' Front	6.0 m 20' Side	7.5 m 25' Front	7.5 m 25' Side	9.0 m 30' Front	9.0 m 30' Side	At Max. Reach Front	At Max. Reach Side
1900 mm	C1470X	kg	—	—	9600	5550	6250	3500	—	—	—	—	3800	2100
6'3"	58"	lb			20,800	11,850	13,400	7550					8300	4600
2500 mm	B1370X	kg	—	—	9900	5950	6600	3850	4600	2700	—	—	2950	2050
8'2"	54"	lb			21,450	12,750	14,150	8250	9900	5800			6500	4550
2920 mm	B1260X	kg	5350	5350	9750	6000	6650	3900	4650	2750	—	—	2400	1950
9'7"	50"	lb	12,350	12,350	21,100	12,850	14,250	8350	9950	5050			5200	4300
3860 mm	B1130X	kg	6850	6850	9200	6150	6650	4000	4750	2800	3550	2100	2050	1700
12'8"	44"	lb	15,700	15,700	19,900	13,200	14,350	8550	10,150	6050	7550	4450	4450	3750

320B L

• Mass Boom • 800 mm (32") Track Shoes

Stick	Bucket		3.0 m 10' Front	3.0 m 10' Side	4.5 m 15' Front	4.5 m 15' Side	6.0 m 20' Front	6.0 m 20' Side	7.5 m 25' Front	7.5 m 25' Side	9.0 m 30' Front	9.0 m 30' Side	At Max. Reach Front	At Max. Reach Side
1900 mm	C1440HX	kg	—	—	9700	5650	6350	3550	—	—	—	—	4200	2350
6'3"	54"	lb			20,950	12,100	13,550	7650					9250	5150
2400 mm	C1470X	kg	7600	7600	9600	5700	6350	3600	—	—	—	—	3800	2150
7'10"	58"	lb	17,550	17,550	20,750	12,250	13,650	7700					8350	4650

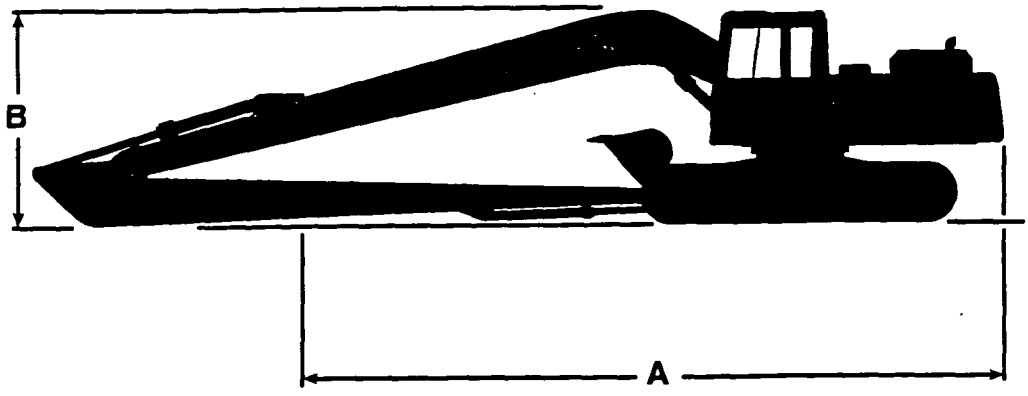
*Load limited by hydraulic capacity rather than tipping.

Model	ShoeType	Shoe Width mm	Shoe Width in	Pressure kPa	Pressure psi
315	Triple	500	20	47.1	6.8
	Triple	600	24	40.2	5.8
	Triple	700	28	34.3	5.0
315 L	Triple	500	20	44.1	6.4
	Triple	600	24	38.2	5.5
	Triple	700	28	32.4	4.7
317	Triple	500	20	53.0	7.7
	Triple	600	24	44.1	6.4
	Triple	700	28	38.2	5.5
	Triple	800	32	34.3	5.0
	Triple	900	36	31.4	4.6
317 N (France Sourced Only)	Triple	500	20	54.0	7.8
	Triple	600	24	45.0	6.5
	Triple	700	28	39.0	5.7
320B*	Triple	600	24	44.7	6.36
	Triple	700	28	39.0	5.55
	Triple	800	32	34.5	4.91
320B L*	Triple	600	24	41.8	5.95
	Triple	700	28	36.4	5.18
	Triple	800	32	32.3	4.59
320B N	Triple	500	20	55.4	7.88
	Triple	600	24	46.7	6.64
322B	Triple	600	24	49.8	7.22
	Triple	700	28	43.4	6.29
	Triple	800	32	38.3	5.55
322B L	Triple	600	24	46.4	6.73
	Triple	700	28	40.3	5.85
	Triple	800	32	35.8	5.19
322B LN	Triple	600	24	46.3	6.72
325B	Triple	600	24	54.92	7.96
	Triple	700	28	48.05	6.97
	Triple	800	32	42.17	6.11
325B L	Triple	600	24	51.98	7.54
	Triple	700	28	45.11	6.54
	Triple	800	32	40.21	5.80
325B LN	Triple	600	24	52.7	7.64
330B	Triple	600	24	67.0	9.7
	Triple	750	30	54.0	7.8
	Triple	850	33	49.0	7.1

*3066T Engine.
Note: Belgium sourced excavators have different ground pressures. See Technical Data Sheets.

Model	Bucket Type	Bucket Family	Bucket Bite Width		Bucket Tip Radius		Heaped Capacity		Bucket Weight With Teeth	
			mm	in	mm	in	L	yd³	kg	lb
325B	Mass Excavation	C	1440	56.7	1487	58.5	1300	1.70	937	2061
		C	1590	62.6	1487	58.5	1500	1.96	991	2185
		D	1520	59.8	1660	65.4	1600	2.25	1328	2928
		D	1700	66.9	1660	65.4	1900	2.48	1324	2919
	Trenching	C	1075	42.4	1550	61.0	1000	1.31	798	1756
		D	1225	48.2	1730	68.1	1400	1.75	1163	2564
		D	1400	55.1	1730	68.1	1600	2.25	1120	2469
	General Purpose*	C	775	30.5	1778	70.0	800	1.12	823	1815
		D	775	30.5	1854	73.0	800	1.12	972	2143
		D	925	36.4	1854	73.0	1100	1.50	1049	2313
		C	948	37.3	1778	70.0	1100	1.50	924	2038
		C	1098	43.2	1778	70.0	1300	1.75	985	2172
		D	1098	43.2	1854	73.0	1400	1.88	1159	2555
		D	1246	49.1	1854	73.0	1200	2.25	1189	2621
		C	1248	49.1	1778	70.0	1600	2.12	1098	2421
		C	1395	54.9	1778	70.0	1900	2.50	1177	2595
		D	1400	55.1	1854	73.3	2000	2.62	1234	2722
		D	1540	60.6	1854	73.3	2200	3.00	1451	3200
	Heavy Duty*	C	775	30.5	1638	64.5	700	0.88	817	1802
		D	775	30.5	1764	69.4	700	1.00	908	2003
		D	925	36.4	1764	69.4	900	1.25	1001	2208
		C	948	37.3	1638	64.5	900	1.25	922	2034
		C	1098	43.2	1638	64.5	1100	1.50	1005	2216
		D	1098	43.2	1764	69.4	1200	1.50	1124	2478
		D	1246	49.1	1764	69.4	1400	1.88	1262	2783
		C	1248	49.1	1638	64.5	1300	1.75	1080	2381
		C	1378	54.3	1518	59.8	1200	1.50	1125	2480
		D	1400	55.1	1764	69.4	1600	2.12	1362	3003
		D	1440	56.7	1695	66.7	1500	2.00	1386	3056
		C	1522	59.9	1638	64.5	1700	2.25	1256	2769
		D	1540	60.6	1764	69.4	1800	2.50	1474	3251
		C	1680	66.1	1638	64.5	1900	2.50	1341	2958
		D	1695	66.7	1764	69.4	2000	2.75	1561	3441
		D	1820	71.7	1764	69.4	2200	3.00	1699	3746
	Heavy Duty Rock*	C	948	37.3	1638	64.5	700	0.88	1034	2280
		C	1098	43.2	1638	64.5	900	1.25	1127	2485
		D	1098	43.2	1764	69.4	1200	1.50	1338	2951
		C	1248	49.1	1638	64.5	1100	1.50	1211	2670
		D	1246	49.1	1764	69.4	1400	1.88	1493	3291
		D	1400	55.1	1764	69.4	1600	2.12	1612	3554
	Ditch Cleaning*	C	1676	66.0	1133	44.6	1100	1.50	811	1789
		D	1676	66.0	1424	56.1	1700	2.25	1189	2622
		C	1829	72.0	1133	44.6	1200	1.62	858	1892
		D	1829	72.0	1424	56.1	1900	2.50	1236	2726

*Available only from U.S.A.



LONG REACH ATTACHMENT SHIPPING DIMENSIONS

Model	320B L m	320B L ft	320 L* m	320 L* ft	322B L m	322B L ft	317 L m	317 L ft
A Overall Transport Length (Front Folded)	12.65	41'6"	12.99	42'7"	14.24	46'9"	11.23	36'10"
B Overall Height (To Top of Boom)	3.21	10'6"	3.35	10'0"	3.17	10'5"	2.93	9'7"
Overall Width (To Widest Point)	3.18	10'5"	3.7	12'2"	3.39	11'1"	2.48	8'2"

*Belgium sourced. Extra wide gauge and 900 mm (35") track shoes.
Note: For other base machine dimensions, see section on machines with GP attachments.

LONG REACH ATTACHMENT COMPONENT WEIGHTS

Model	320B L kg	320B L lb	320 L* kg	320 L* lb	322B L kg	322B L lb	317 L kg	317 L lb
Additional Counterweight	960	2116	1100	2425	1450	3197	—	—
Long Reach Boom: Includes boom, stick cylinder, hydraulic lines, and pins for stick, stick cylinder, and boom rod end	2185	4817	2504	5515	3130	6900	1618	3560
Long Reach Stick: Includes stick, bucket linkage and pins, bucket cylinder and pin, and hydraulic lines	1260	2778	1290	2841	1570	3461	993	2185

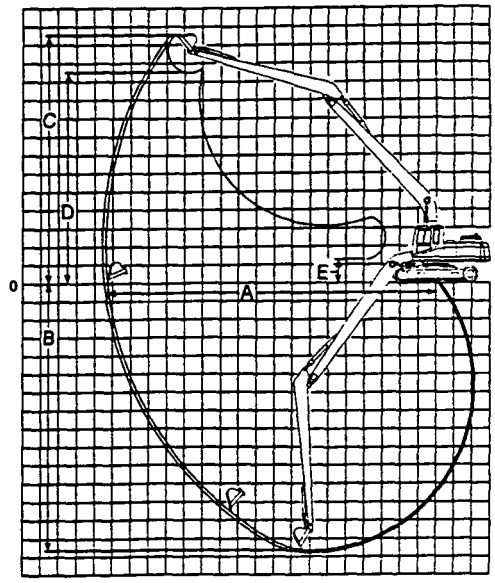
*Belgium sourced. Includes extra wide gauge and reinforced upperframe.

Excavators | Long Reach
- Introduction
- Arrangement Description
- Range Dimensions

INTRODUCTION

Long reach excavators are designed specifically for those jobs requiring reach capability beyond the range of normal excavators. Applications for which long reach excavators are ideally suited include ditch cleaning, slope finishing, river conservation, and other work formerly reserved for draglines.

Caterpillar offers two hydraulic excavator models in long reach arrangements. Each model uses purpose-built booms and sticks designed by Caterpillar for maximized performance and durability.



320 L LONG REACH
325 L LONG REACH

Long Reach Front Includes: Boom, stick, linkage cylinders (boom, stick, and bucket), hydraulic lines, and additional counterweight for stability while working over the side. Dimensions include ditch cleaning bucket.

Note: All dimensions are with ditch cleaning bucket.

Long Reach Model	320B L mm	320B L ft	320 L* mm	320 L* ft	322B L mm	322B L ft	317 L mm	317 L ft
A Maximum Reach at Ground Level	15 725	51'7"	16 540	54'3"	18 430	60'6"	13 000	42'5"
B Maximum Digging Depth	11 880	39'0"	12 800	42'0"	14 720	48'4"	10 100	33'2"
C Maximum Cutting Height	13 290	43'7"	13 400	43'11"	14 230	46'8"	11 640	38'2"
D Maximum Dumping Height	11 010	36'1"	11 350	37'3"	12 005	39'5"	10 670	35'0"
E Minimum Loading Height	1970	6'6"	2300	7'6"	1360	4'6"	9580	31'5"

Bucket Type	Bucket Width mm	Bucket Width in	Tip Radius mm	Tip Radius in	SAE Heaped Cap. L	SAE Heaped Cap. yd³	Bucket Weight kg	Bucket Weight lb	No. of Teeth	Bucket Curl Force kN	Bucket Curl Force lb	Stick Crowd Force kN	Stick Crowd Force lb
320B L • Long Reach • Japan/U.S. Sourced													
General Purpose	810	32	1220	48	450	0.59	365	805	5	—	—	—	—
Ditch Cleaning	1140	45	1090	43	600	0.78	280	617	0	—	—	—	—
320 L* • Long Reach • Belgium Sourced													
General Purpose	—		—		—		—		—	—		—	
Ditch Cleaning	1800	70.8	780	30.7	600	0.78	400	882	—	63.25	14,231	62.82	14,134
322B L • Long Reach • Japan/U.S. Sourced													
General Purpose	700	28	1220	48	380	0.50	335	739	4	—	—	—	—
Ditch Cleaning	965	38	1090	43	480	0.63	265	584	0	—	—	—	—
317 • Long Reach • France Sourced													
General Purpose	—	—	—	—	—	—	—	—	—	—	—	—	—
Ditch Cleaning	1010	40	1310	52	500	0.65	350	770	0	—	—	—	—

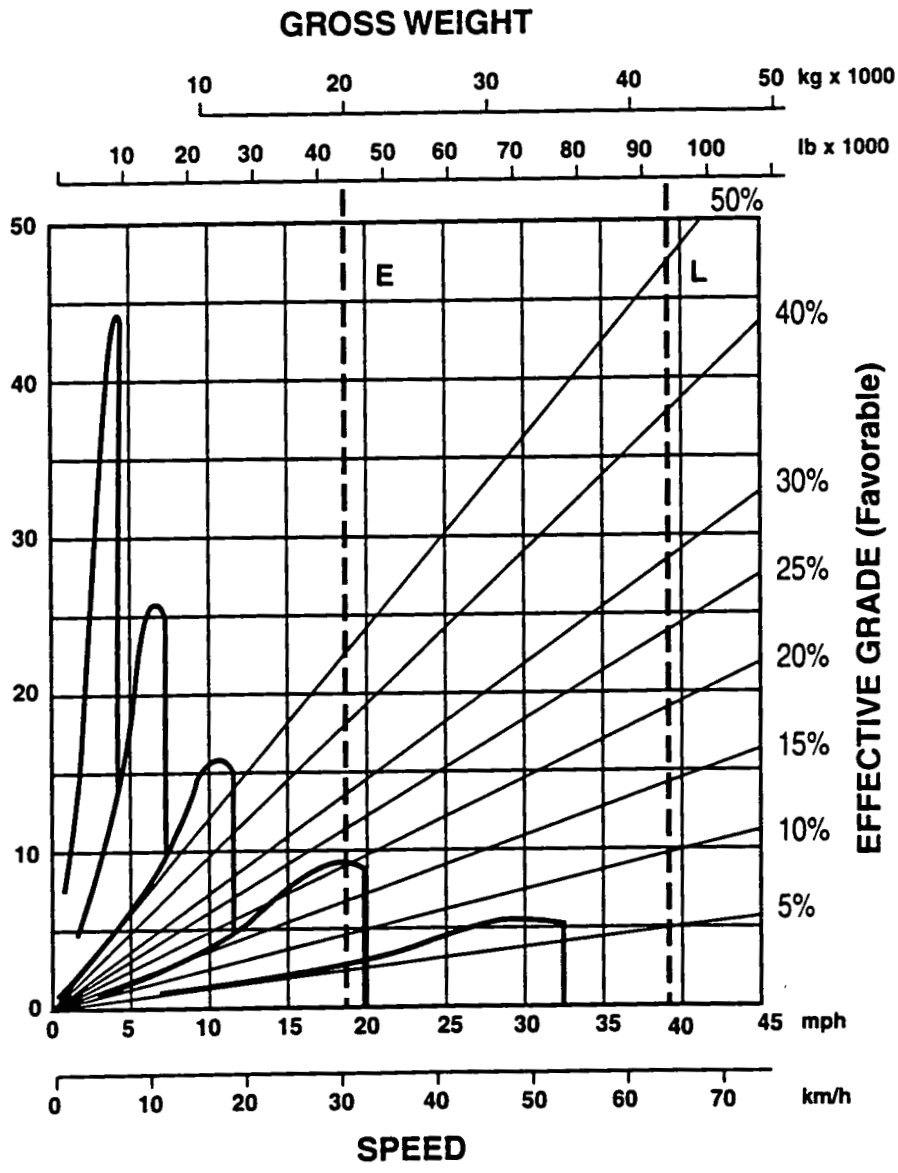
*Belgium sourced.

C-3

ARTICULATED DUMP TRUCK

MODEL	D250E		D300E		D350E		D400E	
Flywheel Power	194 kW	260 hp	213 kW	285 hp	253 kW	340 hp	287 kW	385 hp
Operating Weight (Empty)*	21 000 kg	46,300 lb	21 180 kg	46,695 lb	27 871 kg	61,455 lb	29 263 kg	64,512 lb
Top Speed (Loaded)	50.9 km/h	31.6 mph	49.0 km/h	30.5 mph	50.7 km/h	31.5 mph	54.7 km/h	34.0 mph
GMW — Gross Machine Weight	43 680 kg	96,300 lb	48 400 kg	106,695 lb	59 631 kg	131,486 lb	65 563 kg	144,512 lb
Distribution Empty:								
Front	58%		58%		60%		60%	
Center	21%		21%		20%		20%	
Rear	21%		21%		20%		20%	
Distribution Loaded:								
Front	32%		30%		35%		34%	
Center	34%		35%		33%		33%	
Rear	34%		35%		32%		33%	
Max. Capacity**	22.7 t	25 T	27.2 t	30 T	31.8 t	35 T	36.3 t	40 T
Struck (SAE)	10.5 m³	13.7 yd³	13.0 m³	16.5 yd³	14.6 m³	19.1 yd³	16.5 m³	21.6 yd³
Heaped (2:1) (SAE)	13.7 m³	18.0 yd³	16.5 m³	22.0 yd³	19.2 m³	25.1 yd³	22.0 m³	28.8 yd³
Engine Model	3306TA		3306TA		3406DITA		3406TA	
No. Cylinders	6		6		6		6	
Bore	121 mm	4.75"	121 mm	4.75"	137 mm	5.4"	137 mm	5.4"
Stroke	152 mm	6.0"	152 mm	6.0"	165 mm	6.5"	165 mm	6.5"
Displacement	10.5 L	638 in³	10.5 L	638 in³	14.6 L	893 in³	14.6 L	893 in³
Tires, Front, Center & Rear	23.5R25 Radials		23.5R25 Radials 30/65R25 Radials (Opt.)		26.5R25 Radials		29.5R25 Radials	
Circle Clearance Diameter	14.9 m	48'10"	15.1 m	49'8"	16.42 m	53'10"	16.5 m	54'3"
Fuel Tank Refill Capacity	360 L	95 U.S. gal.	360 L	95 U.S. gal.	570 L	150 U.S. gal	450 L	120 U.S. gal
GENERAL DIMENSIONS (Empty):								
Height to Cab Top	3.35 m	11'0"	3.35 m	11'0"	3.51 m	11'6"	3.58 m	11'9"
Wheel Base (Front-Center of Bogie)	4.61 m	15'2"	4.66 m	15'3"	5.02 m	16'6"	5.12 m	16'10"
Overall Length	9.94 m	32'7"	9.94 m	32'7"	10.38 m	34'1"	10.52 m	34'6"
Loading Height (Empty)	2.70 m	8'10"	2.85 m	9'4"	2.94 m	9'8"	3.05 m	10'0"
Height at Full Dump	6.20 m	20'4"	6.26 m	20'6"	6.60 m	21'8"	6.58 m	21'7"
Body Length	5.70 m	18'8"	5.42 m	17'9"	6.01 m	19'9"	5.90 m	19'4"
Width (Operating)	2.74 m	9'0"	2.91 m	9'7"	3.26 m	10'8"	3.30 m	10'10"
Front Tire Tread	2.11 m	6'11"	2.27 m	7'6"	2.23 m	10'6"	2.55 m	8'4"

*Includes coolant, lubricant and full fuel tank.
**Rating dependent on optional equipment. Maximum gross weight (empty weight plus payload) should not be exceeded.



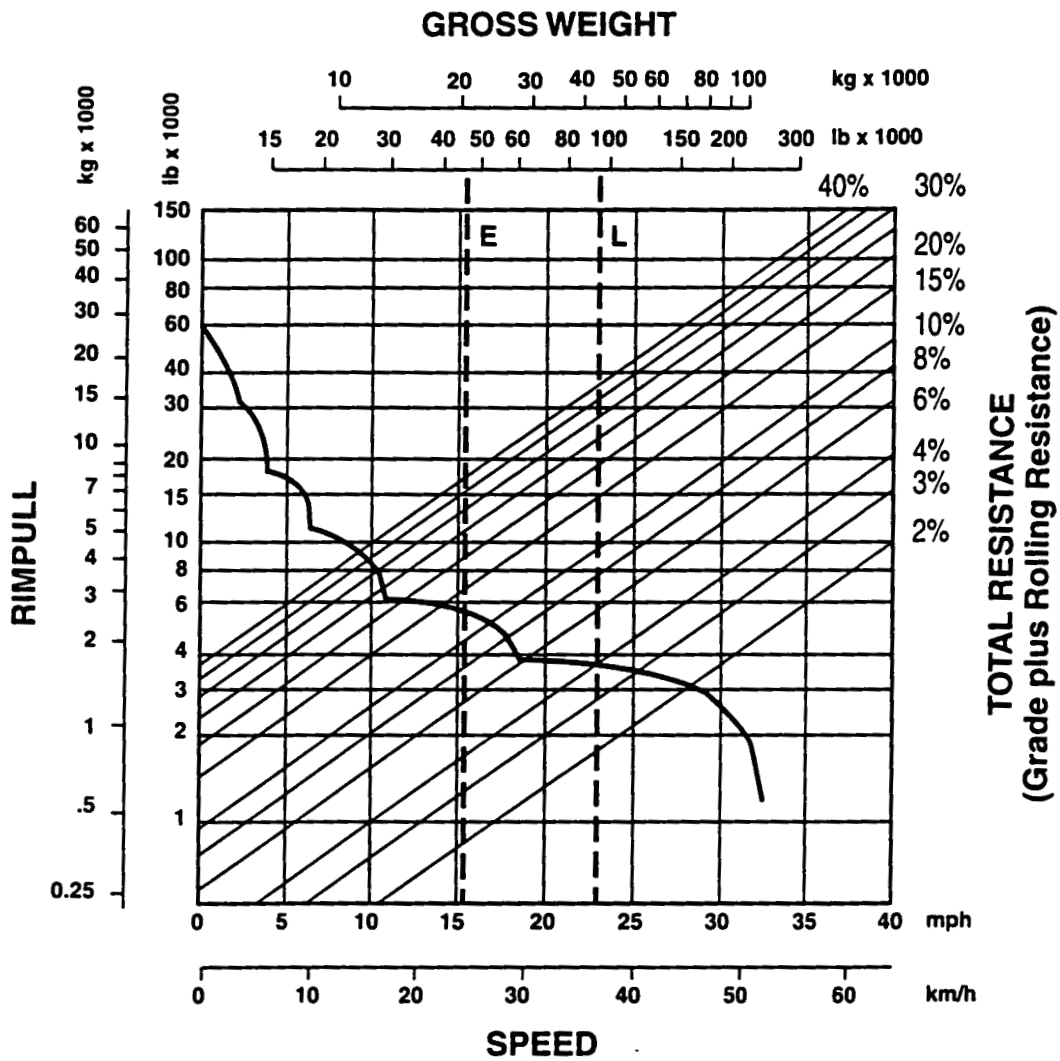
KEY

1 — 1st Gear
2 — 2nd Gear
3 — 3rd Gear
4 — 4th Gear
5 — 5th Gear

KEY

E — Empty 21 000 kg (46,300 lb)
L — Loaded 43 680 kg (96,300 lb)

Articulated Trucks | D250E Rimpull-Speed-Gradeability
• 23.5R25 Tires



KEY

1 — 1st Gear
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KEY

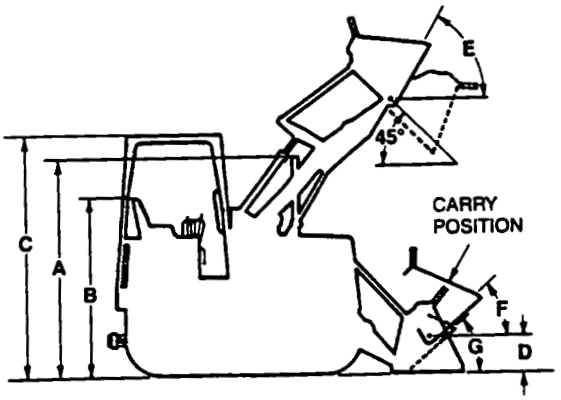
E — Empty 21 000 kg (46,300 lb)
L — Loaded 43 680 kg (96,300 lb)

C-4

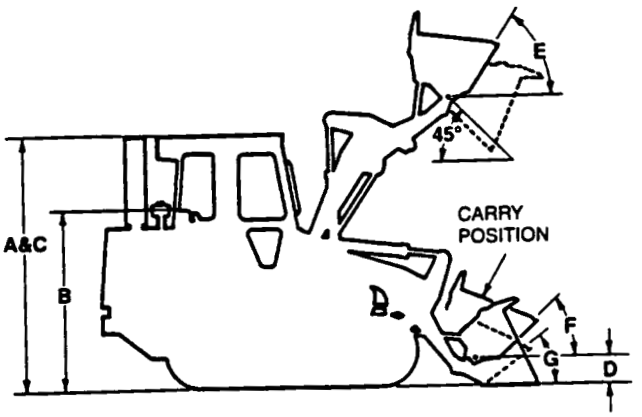
TRACKED FRONT-END LOADER

Track Loaders | Machine Dimensions
• With General Purpose Bucket

933-939



953C-973



	933		939		953C	
A Height to Top of Stack	2.60 m	8'6"	2.68 m	8'10"	3.084 m	121"
B Height to Top of Seat	1.99 m	6'6"	2.09 m	6'10"	2.353 m	93"
C Height to Top of ROPS	2.68 m	8'10"	2.77 m	9'1"	3.084 m	121"
D Hinge Pin Height at Carry Position	405 mm	1'4"	406 mm	1'4"	424 mm	16.7"
E Rollback at Maximum Lift	64.9°		64.9°		56°	
F Rollback at Carry Height	50.2°		50.2°		48°	
G Rollback at Ground Level	42°		43°		41°	
Grading Angle (Bare Edge)	—		—		74°	
Width Without Bucket (std. track)	1.78 m	5'10"	1.96 m	6'5"	2.18 m	86"
(optional track)	—	—	2.01 m	6'7"	2.30 m	90"

	963B		973	
A Height to Top of Stack	3307 mm	131"	3.357 m	132"
B Height to Top of Seat	2681 mm	106"	2.681 m	106"
C Height to Top of ROPS	3423 mm	135"	3.423 m	135"
D Hinge Pin Height at Carry Position	467 mm	18.4"	492 mm	19.4"
E Rollback at Maximum Lift	59°		59°	
F Rollback at Carry Height	50°		50°	
G Rollback at Ground Level	42°		42°	
Grading Angle (Bare Edge)	68°		69°	
Width Without Bucket (std. track)	2580 mm	102"	2580 mm	102"
(optional track)	2755 mm	108.9"	2760 mm	108"

MODEL	953C		963B		973	
Flywheel Power	90 kW	121 hp	119 kW	160 hp	157 kW	210 hp
Operating Weight	13 824 kg	30,467 lb	19 295 kg	42,545 lb	24 679 kg	54,417 lb
Engine Model	3116T		3116TA		3306	
Rated Engine RPM	2200		2200		2200	
Bore	105 mm	4.13"	105 mm	4.13"	121 mm	4.75"
Stroke	127 mm	5"	127 mm	5"	152 mm	6"
No. Cylinders	6		6		6	
Displacement	6.6 L	403 in³	6.6 L	403 in³	10.5 L	638 in³
Speeds Forward	km/h	mph	km/h	mph	km/h	mph
1st	0-10.0	0-6.2	0-10.1	0-6.0	0-10.3	0-6.4
2nd	Infinitely		Infinitely		Infinitely	
3rd	Variable		Variable		Variable	
Speeds Reverse						
1st	0-10.35	0-6.4	0-10.1	0-6.0	0-10.3	0-6.4
2nd	Infinitely		Infinitely		Infinitely	
3rd	Variable		Variable		Variable	
Hydraulic Cycle Time, Bucket Empty, in Seconds:						
Raise	6.7		6.2		7.4	
Dump	1.4		1.3		1.4	
Lower (Empty, Float Down)	3.0		2.3		2.6	
Total	11.1		9.8		11.4	
Track Rollers (Each Side)	6		6		7	
Width of Standard Track Shoe	380 mm	15"	450 mm	17.7"	500 mm	19.7"
Length of Track on Ground	2.295 m	90"	2.454 m	97"	2.917 m	115"
Ground Contact Area (With Std. Shoe)	1.74 m²	2704 in²	2.21 m²	3423 in²	2.92 m²	4522 in²
Ground Pressure	79.4 kPa	11.3 psi	0.873 bar	12.4 psi	0.880 bar	12.0 psi
Ground Clearance	377 mm	14.8"	439 mm	17.0"	456 mm	18.0"
Track Gauge	1.80 m	71"	1.85 m	72.8"	2.08 m	82"
Width Without Bucket	2.18 m	86"	2.30 m	90.5"	2.58 m	102"
Fuel Tank Refill Capacity	241 L	63.6 U.S. gal	296 L	78 U.S. gal	356 L	94 U.S. gal
Hydraulic System Refill Capacity	65 L	17.2 U.S. gal	68 L	18 U.S. gal	60 L	16 U.S. gal

Equipped With Wide Track Shoe Option

(Specs that differ from above)	953C		963B		973	
Operating Weight	14 115 kg	31,109 lb	19 568 kg	43,147 lb	25 534 kg	56,293 lb
Width of Track Shoe	500 mm	20"	550 mm	21.7"	675 mm	26.6"
Ground Contact Area	2.30 m²	3558 in²	2.70 m²	4184 in²	3.94 m²	6104 in²
Ground Pressure	61.4 kPa	8.7 psi	0.724 bar	10.3 psi	0.642 bar	9.14 psi
Track Gauge	1.80 m	71"	1.85 m	90.5"	2.08 m	82"
Width Without Bucket	2300 mm	90"	2400 mm	112.2"	2755 mm	108"

See Track Loader section of this book for summary of S.A.E. Guidelines for Loader Specifications, to which Caterpillar adheres.

Bucket:	1.75 m³/2.25 yd³ GENERAL PURPOSE Bare		1.75 m³/2.25 yd³ GENERAL PURPOSE Bolt-on Segments & Long Teeth		1.75 m³/2.25 yd³ GENERAL PURPOSE Bolt-on Cutting Edge	
Capacity, Rated (Nominal Heaped)	1.75 m³	2.25 yd³	1.85 m³	2.4 yd³	1.85 m³	2.4 yd³
Struck	1.45 m³	1.90 yd³	1.55 m³	2.05 yd³	1.55 m³	2.05 yd³
Cutting Edge, Type	Straight		Straight		Straight	
Bucket Width◂	2380 mm	94"	2380 mm	94"	2380 mm	94"
Teeth	— —		8, optional, bolt-on with replaceable tips.		— —	
Dump Clearance @ Full Lift and 45° Discharge	2899 mm	113"	2706 mm	106"	2834 mm	111"
Reach at 45° Discharge Angle 2133 mm (7') Clearance	1554 mm	61"	1495 mm	58"	1563 mm	61"
Reach @ Full Lift and 45° Discharge	1011 mm	39.8"	1051 mm	41.4"	1051 mm	41.4"
Digging Depth	107 mm	4.2"	132 mm	5.2"	132 mm	5.2"
Overall Length	5814 mm	229"	6058 mm	238"	913 mm	232"
Overall Height	4869 mm	191"	4869 mm	191"	4869 mm	191"
Static Tipping Load**	9231 kg	20,345 lb	8850 kg	19,505 lb	8972 kg	19,774 lb
Breakout Force*	121 kN	27,201 lb	108.7 kN	24,436 lb	109.7 kN	24,661 lb
Operating Weight**	14 115 kg	31,109 lb	14 340 kg	31,605 lb	14 237 kg	31,378 lb

◂Bolt-on teeth increase bucket width by 52 mm (2.0"). Bolt-on cutting edge increases bucket width by 17 mm (.67").
*Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.
**Operating weight includes coolant, lubricants, full fuel tank, ROPS cab, General Purpose bucket, and 80 kg (176 lb) operator.

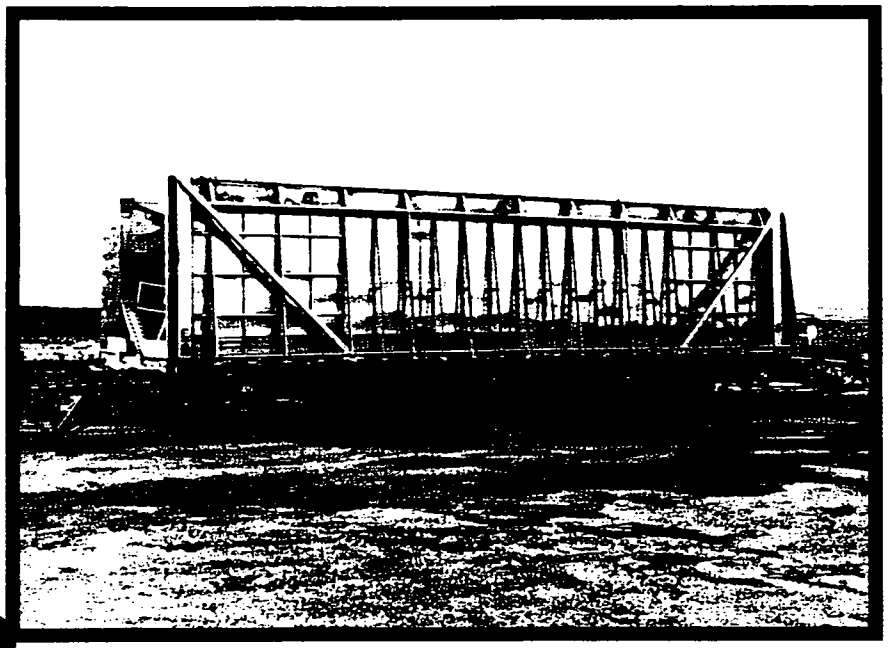
Machine stability can be affected by the addition of other attachments. Add or subtract the following to/from machine operating weight and static tipping load:

	Change in Operating Weight		Change in Static Tipping Load for General Purpose Bucket	
	kg	lb	kg	lb
ROPS canopy only (cab removed)	–205	–452	– 261	– 575
Ripper (includes rear hydraulic arrangement and bumper removal)	+404	+889	+ 752	+1658
Air conditioner	+108	+239	+ 155	+ 342
Wide track shoes	+291	+642	+ 189	+ 417
Rear bumper (removed)	–227	–500	– 467	–1030

C-5

TRUCK WASH FACILITY

Mobile Decon Pad (MDP)



Mobile Decon Pad Exterior: 1st setup stage

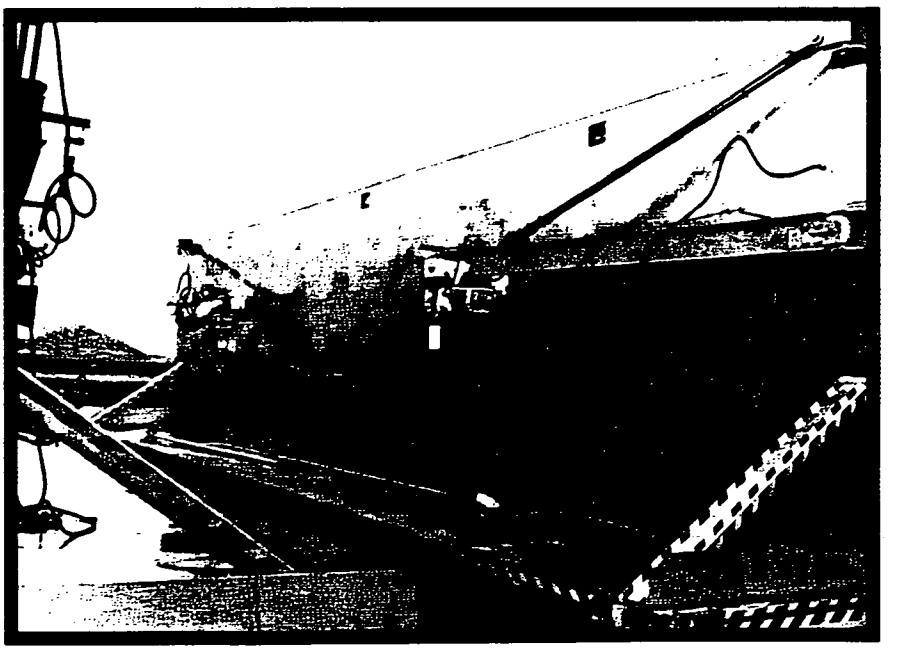
Introduced in 1994, the Mobile Decon Pad is able to grossly decontaminate people as well as items ranging in size from small hand tools to bulldozers, excavaters, military vehicles. This extremely mobile system is ready to locate anywhere and sets up in less than two hours. It is specifically engineered to resist contaminates and chemical agents with its stainless steel structure. It creates a true entrance and exit to your exclusion zone. Costs are saved in two ways; by eliminating the need for fixed facilities and by waste minimization.

Dimensions:

In operation: 24'(w) x 45'(l)
In Transit: 16'(w) x 45'(l)

Features & Benefits

- Mobility
- Easy to decontaminate
- Secondary containment
- Waste minimization
- Cost savings
- Maintains exclusion zone
- Rapid deployment
- Self-contained
- Durable, noncorrosive structure
- Accepts tire & track equipment up to 300,000 lbs.
- Customizing available



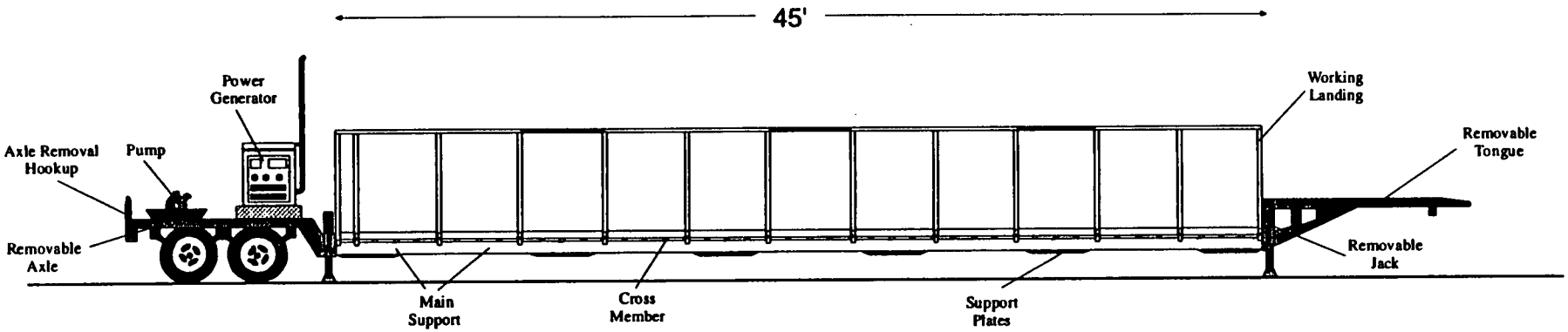
Mobile Decon Pad Interior: 1st setup stage

phone: 513/299-3179
fax: 513/299-5179

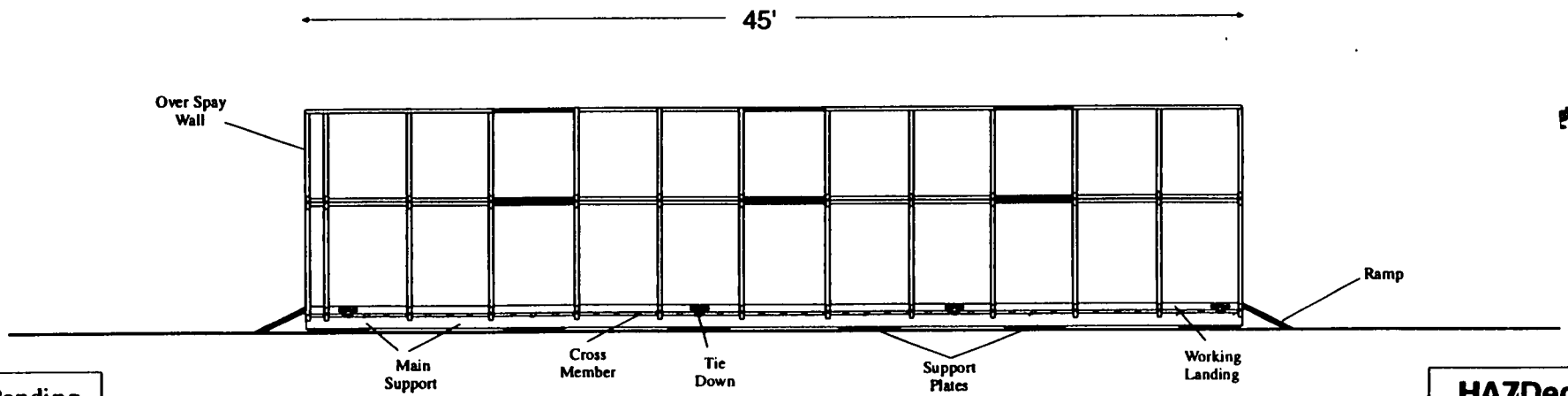
2445 Mobile Decon Pad

Side Views

Transport



Operational



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No. _____

HAZDecon
Proprietary Information
DP2445 - Mobile Decon Pad
Date: Feb.14, 1996

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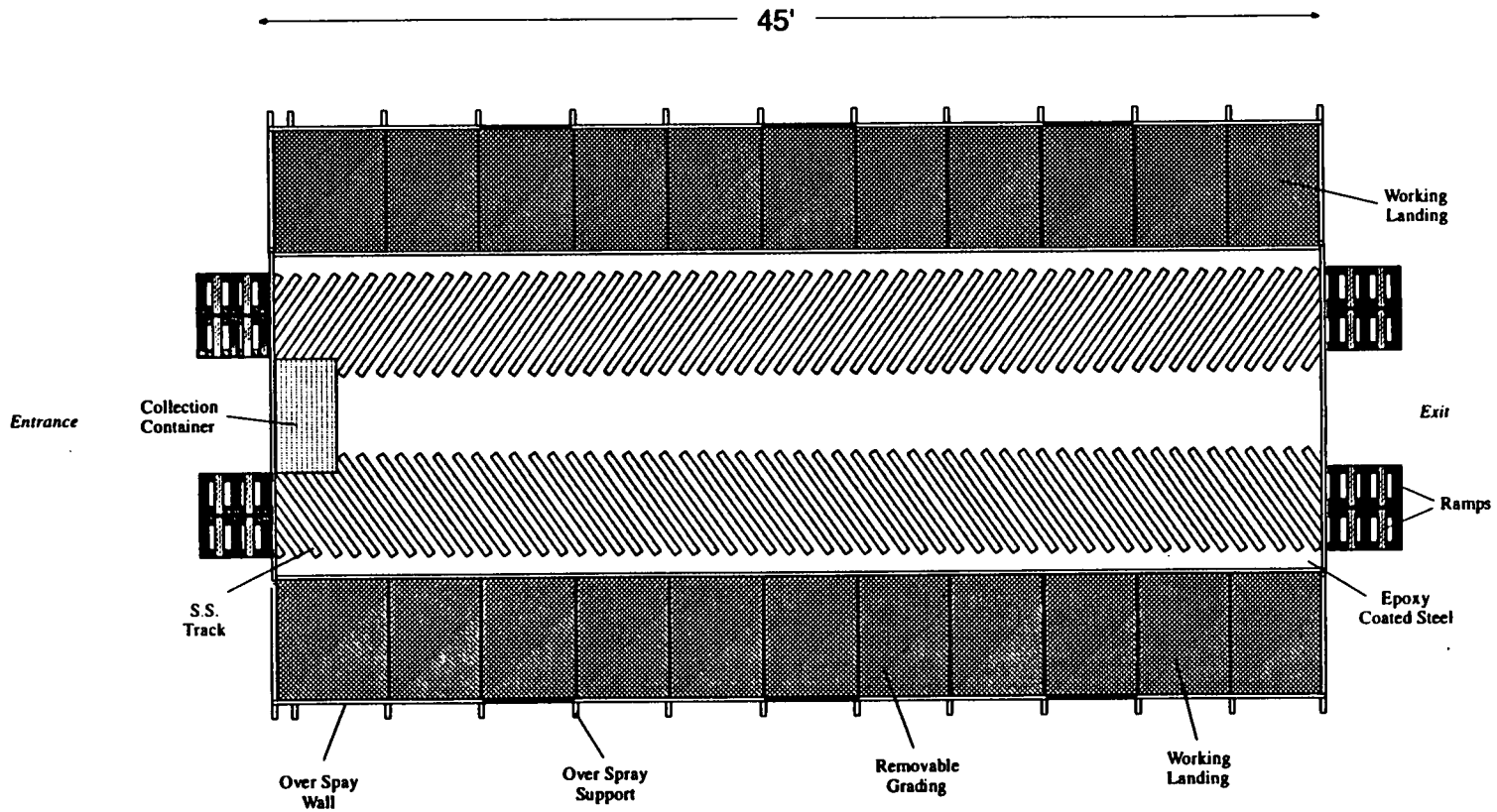
2445 Mo[illegible]e Decon Pad

Top View
Operational



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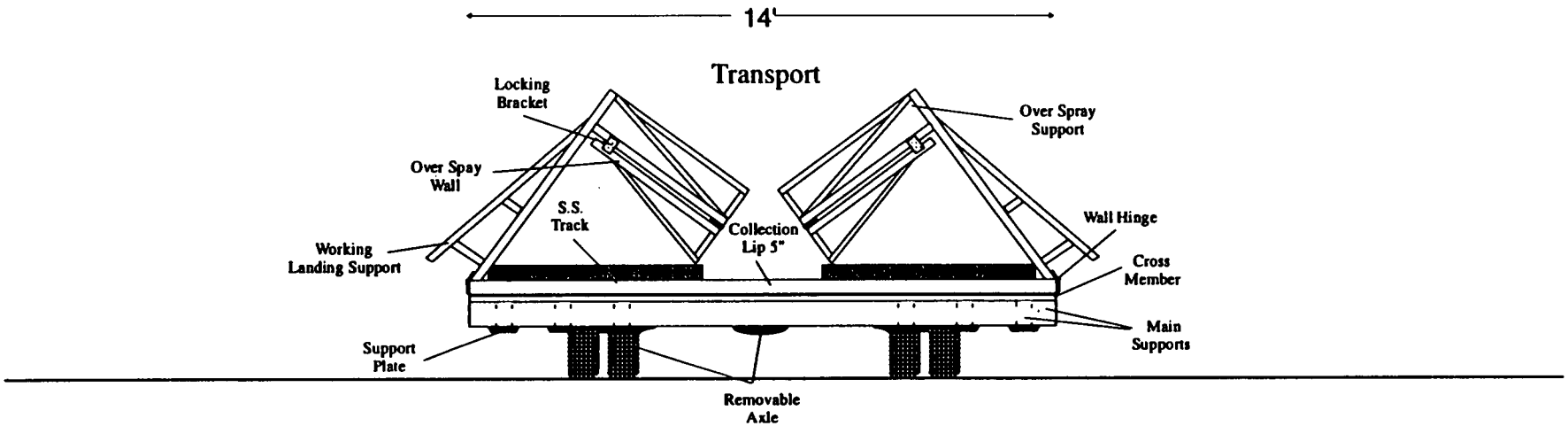
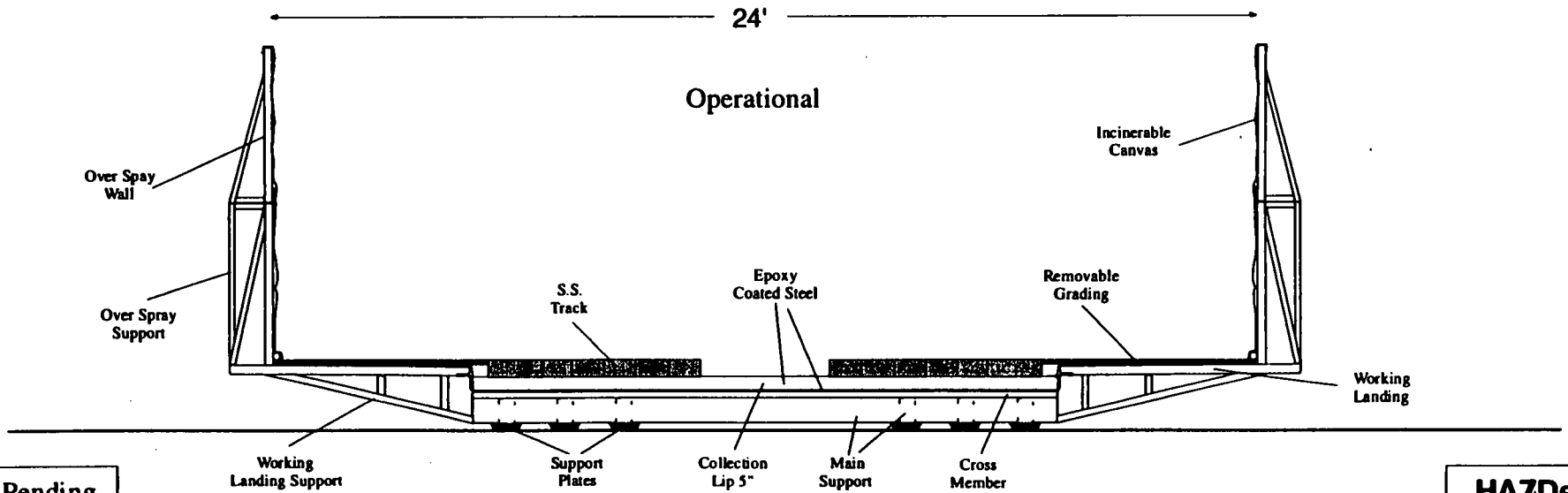
HAZDecon
Proprietary Information
DP2445 - Mobile Decon Pad
Date: Feb.14, 1996

2445 Mobil[illegible]econ Pad

End Views
Cutaway





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Proprietary Information
DP2445 - Mobile Decon Pad
Date: Feb. 14, 1998

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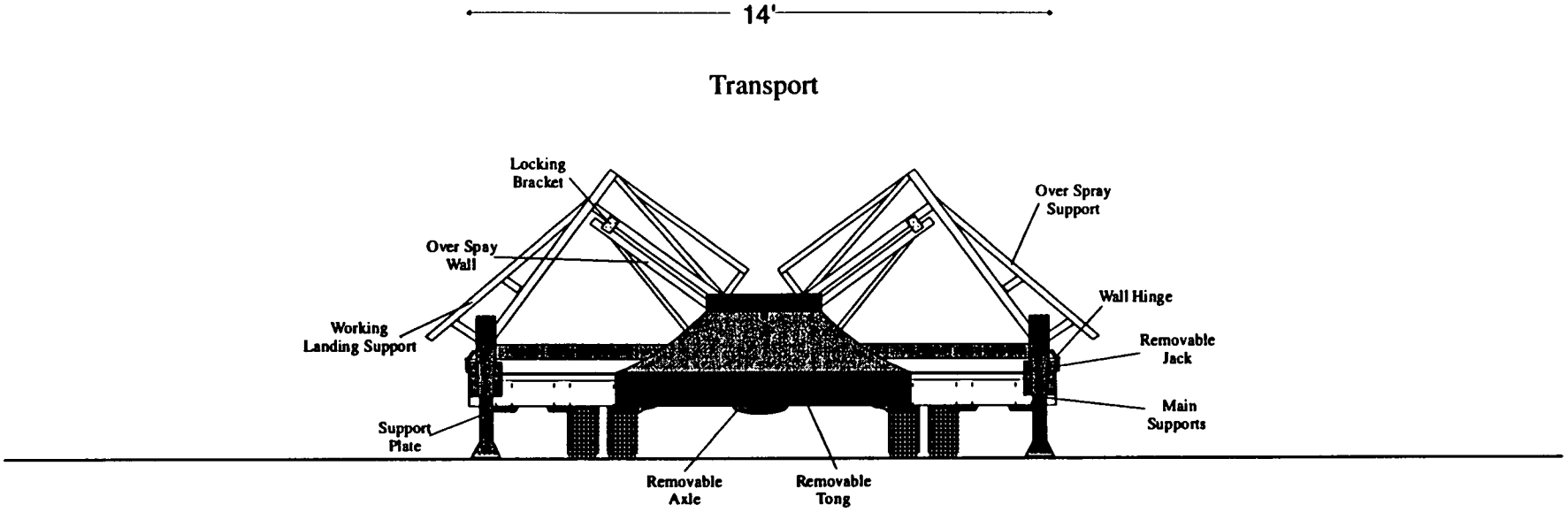
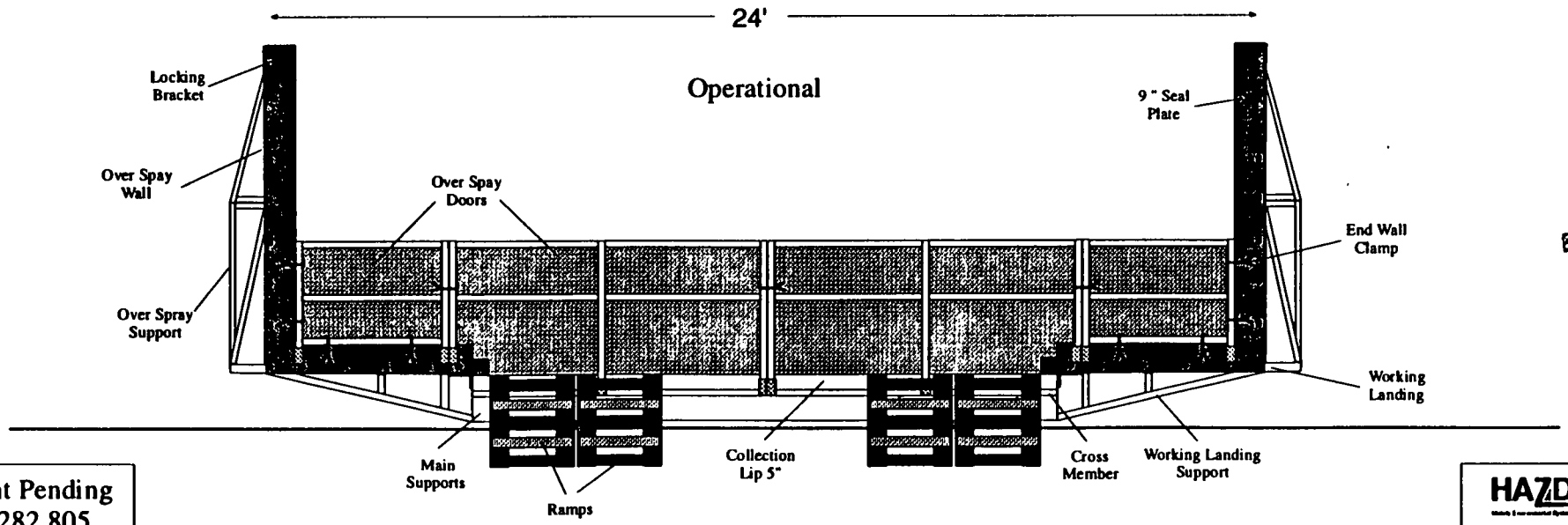
2445 Mobile Decon Pad

End Views





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HAZDecon
Proprietary Information
DP2445 - Mobile Decon Pad
Date: Feb.14, 1996

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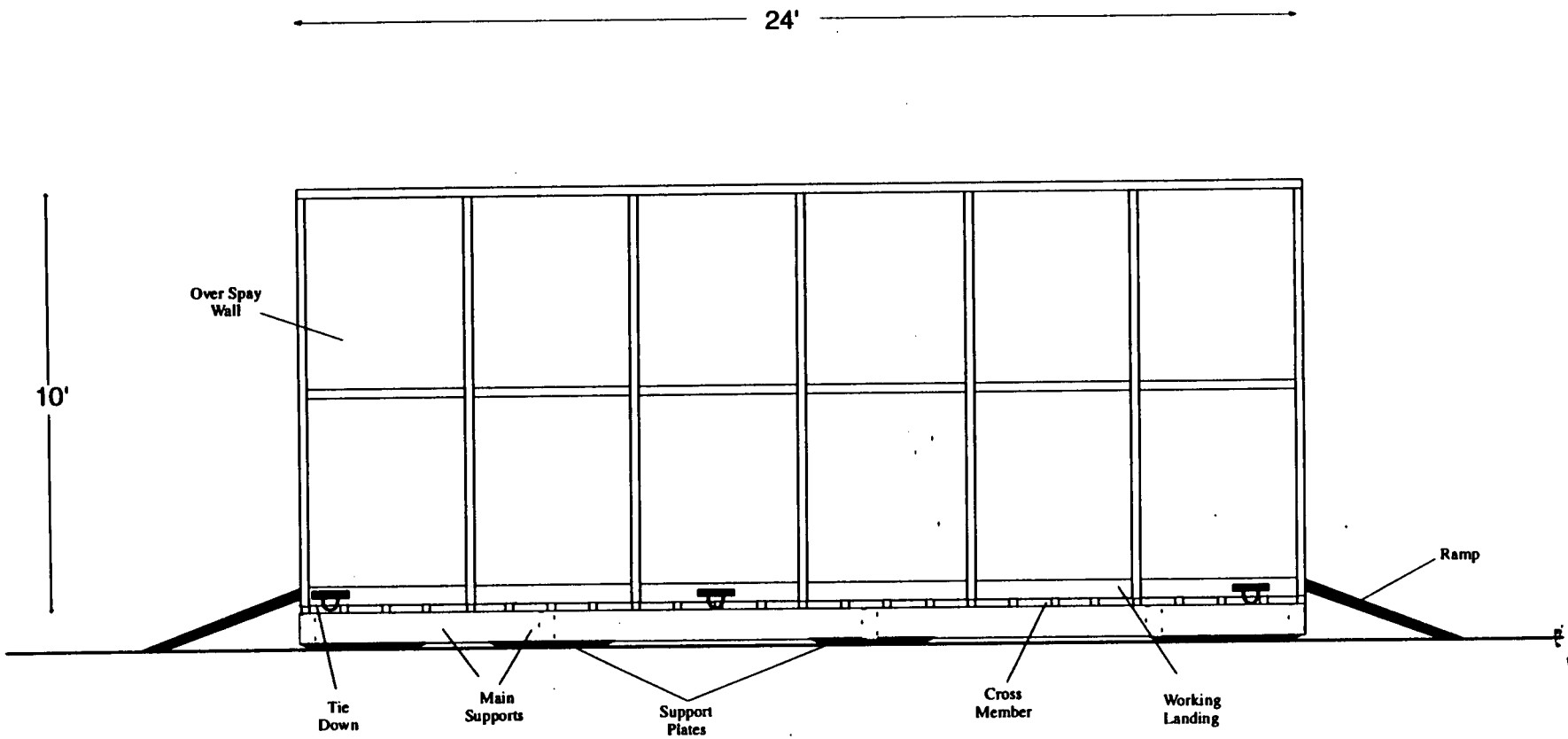
1224 Mobile Decon Pad

Side Views

Transport / Operational



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HAZDecon

Proprietary Information
DP1224 - Mobile Decon Pad
Date: Mar 27, 1998

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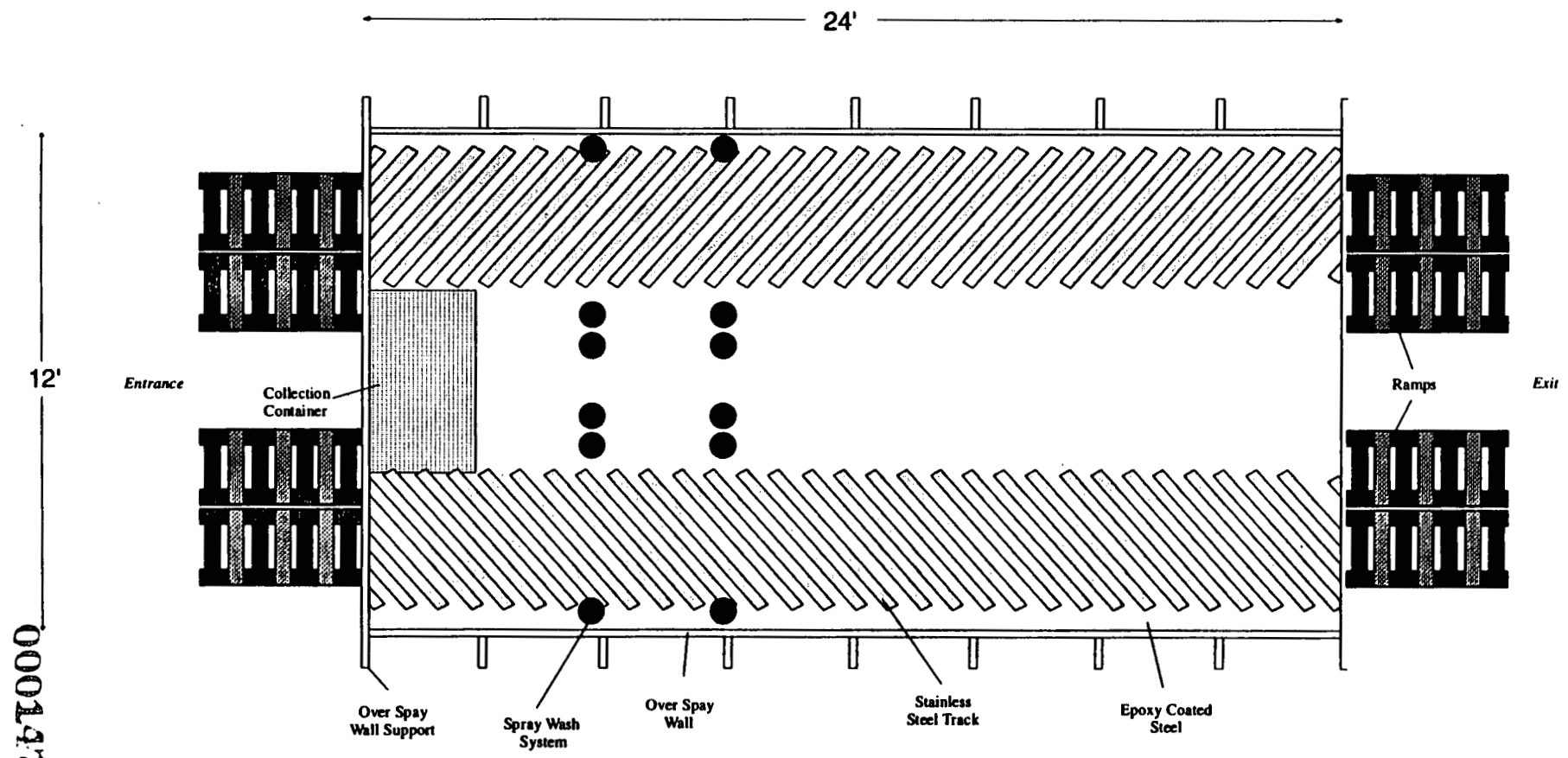
1224 Mobile Decon Pad

Top View
Operational



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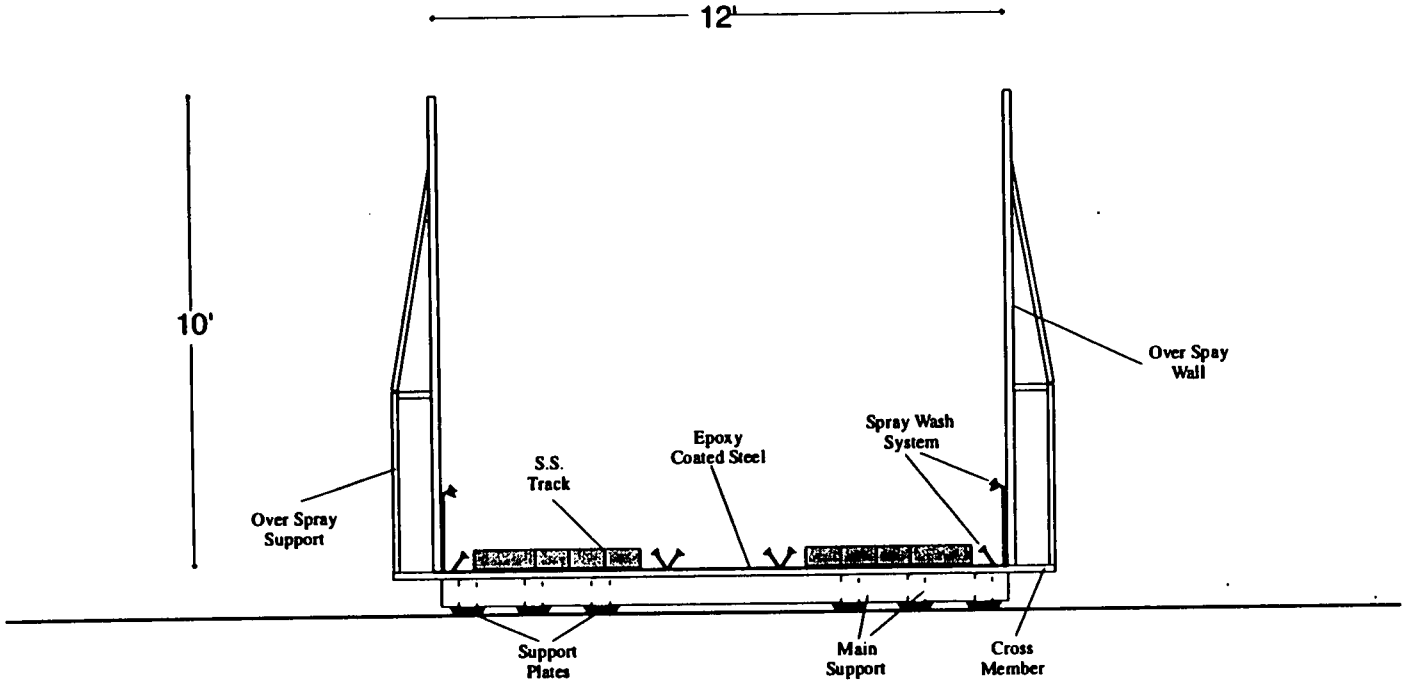
Proprietary Information
DP1224 - Mobile Decon Pad
Date: Mar 27, 1996

1224 Mo.. .e Decon Pad

End Views
Cutaway

Transport / Operational



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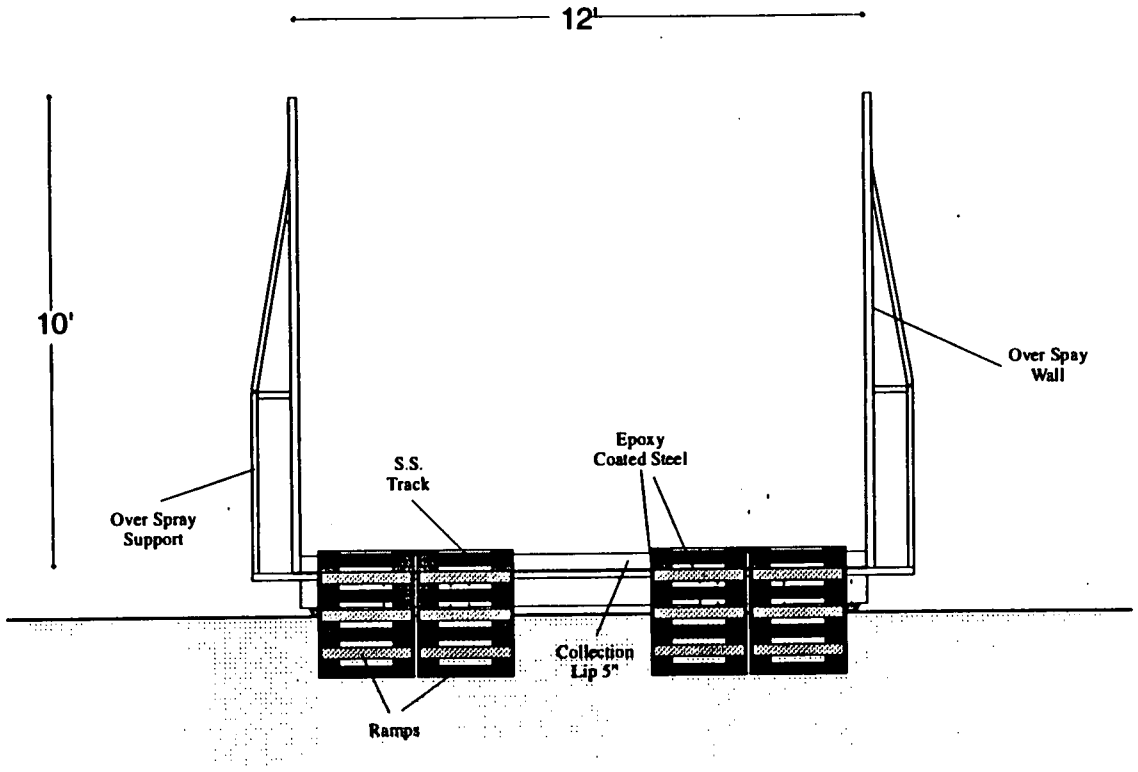
DP1224 - Mobile Decon Pad
Date: Mar 27, 1998

1224 Mobile Decon Pad

End Views



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HAZDecon
Proprietary Information
DP1224 - Mobile Decon Pad
Date: Mar 27, 1998

APPENDIX
D

APPENDIX D

CHECKLIST AND INSPECTION FORMS

IT Corporation

Project No. 773481
Waste Pits Remedial Action Program, Fernald

EQUIPMENT DECONTAMINATION CERTIFICATION

Date: _____

Equipment Name: _____

Model Number: _____

Serial Number: _____

Methods Utilized During Decontamination:

	Satisfactory	Unsatisfactory
Gross Removal with Hand Tools	_____	_____
Soap and Water	_____	_____
High Pressure Wash	_____	_____
High Pressure Steam	_____	_____

Describe Condition of Exterior Paint: _____

_____

_____

Describe Radiological Measurements, If Analysis Performed: _____

_____

Is Equipment Decontamination Approved For:

Site Use Only _____

Removal From Site _____

This equipment was cleaned and decontaminated using the above-described methods and is approved as designated above.

CONTRACT	UNIT NO.	IT EQUIPMENT INSPECTION (Initial & Final) ☐ Initial ☐ Final	DATE
EQUIPMENT			INSP. BY
OTHER			APPROVED

Item No.	Lower Unit	(✓)	Item No.	Lower Unit (contd.)	(✓)	Item No.	Upper Unit (cont'd.)	(✓)
1	General Appearance		37	O'Rigger Pads		72	Oil Level	
2	Mileage		38	Clutch, Trans., Rear		73	Water Level	
3	Engine Hrs.		39	Tires		74	Battery Cond.	
4	Oil Pressure		40	Drive Sprockets		75	Battery Level	
5	Water Temp.		41	Track Rollers		76	Battery Cables	
6	Amp. Meter		42	Tracks		77	Starting Ability	
7	Fuel Level		43	Manuals		78	Air System	
8	Air Pressure		44	Fire Extinguisher		79	Clutches	
9	Lo Air Warning		45	Electrical System		80	Linings	
10	Brakes		46	Exhaust System		81	House Rollers	
11	Parking Brake		47	Steering		82	Lubrication Cond.	
12	Throttle		48	Cab Heater or Air Cond.		83	Manuals	
13	Back Up Alarm		49	Lift & Tilt Mech.		84	Electrical System	
14	Horn		Upper Unit			85	Exhaust System	
15	Wiper		50	General Appearance		86	Guards	
16	Mirrors		51	Engine Hours		87	Cab Heater or Air Cond.	
17	Stop Lights		52	Inst. Panel Appearance		Boom		
18	Clearance Lights		53	Oil Pressure		88	Hyd. System	
19	Headlights		54	Water Temp.		89	Boom Sections	
20	Turn Signals		55	Fuel Level		90	Wear Pads	
21	4 Way Flashers		56	Air Pressure		91	Main Cords	
22	General Engine Cond.		57	Lo Air Warning		92	Lattice	
23	Oil Level		58	Parking Brake		93	Pin Holes	
24	Water Level		59	Horn		94	Pins	
25	Transmission Level		60	Wipers		95	Cotter Pins	
26	Power Steering Level		61	Lights		96	Shackles & Sockets	
27	Battery Cond.		62	Load Indicator		97	Sheaves (All)	
28	Battery Level		63	Capacity Chart		98	Load Hook Block	
29	Battery Cables		64	Throttles (Hand & Foot)		99	Overhaul Ball	
30	Fan Belts		65	House Lock		100	Boom Cable	
31	Lubrication Cond.		66	Main Hoist Mech.		101	Pendent Cables	
32	Starting Ability		67	Aux. Hoist Mech.		102	Main Load Cable	
33	Air System		68	Swing Mech.		103	Aux. Load Cable	
34	Hyd. System		69	Boom Mech.		104	Boom Angle Indicator	
35	O'Rigger Boxes		70	Travel Mech.		105	Jib	
36	O'Rigger Beams		71	Boom Dog		106	Bucket	

NOTE: Use reverse side for Comments. Enter by Item No.

Are rated load capacities, recommended operating speeds, special hazard warnings or instructions, hand signals posted and visible to the operator?
☐ Yes ☐ No

INTERNATIONAL TECHNOLOGY CORPORATION

Equipment Inspection Log

Project No.: _____

Equipment Type: _____

Equipment Supplier: _____

Date: _____ I.D. No.: _____

BRAKES	COOLING WATER
AIR SYSTEM	OPERATING CONTROLS
TIRES/TRACKS	LIGHTS/REFLECTORS
HORN	WINDSHIELD WIPERS
SEAT BELTS/ROLLOVER PROTECTION	FIRE EXTINGUISHER
GLASS	BACK-UP ALARM
MIRRORS	ENGINE OIL add/check
SPILL KIT	EXHAUST SYSTEM
STEERING SYSTEM	FLUID LEVELS
WIRE ROPE	OPERATING MANUALS
APPEARANCE	LOAD CHARTS
ELECTRICAL SYSTEM	MISCELLANEOUS
INSPECTOR:	DATE:
H&S REVIEW:	DATE:

Photographs Taken: _____

Equipment Checklist for Inspections

EQUIPMENT CHECKLIST

This is a guide indicating the numbered items on the inspection sheet that pertain to various units of construction equipment.

Mechanical Truck Crane	Lower Unit 1 thru 39, 43 thru 48, Upper Unit 50 thru 69, 71 thru 87, Boom 91 thru 105
Crawler Crane	Lower Unit 1, 23, 40, 41, 42, Upper Unit 50 thru 87, Boom 91 thru 105
Hydraulic Truck Crane	Lower Unit 1 thru 39, 43 thru 48, Upper Unit 50 thru 69, 71 thru 78, 81 thru 87, Boom 88 thru 90, 93 thru 99, 101 thru 105
Hydraulic Cherry Picker	Lower Unit 1, 3 thru 39, 43 thru 48, 62 thru 71, 81, 82, 84 thru 87, Boom 88 thru 90, 93 thru 99, 101 thru 105
Backhoe Mechanical	Lower Unit 1, 31, 40 thru 42, Upper Unit 50 thru 61, 64 thru 87, Boom 89, 93 thru 97, 101 thru 103, 106
Backhoe Hydraulic Rubber Tire	Lower Unit 1, 31, 34, 39, 49, Upper Unit 50 thru 61, 64, 65, 68 thru 70, 72 thru 78, 81 thru 87, Boom 88, 89, 93 thru 97, 106
Backhoe Hydraulic Crawler	Lower Unit 1, 31, 40 thru 42, Upper Unit 50 thru 61, 64, 65, 68 thru 70, 72 thru 78, 81 thru 87, Boom 88, 89, 93 thru 97, 106
Loader-Dozer Crawler	1, 3 thru 8, 10 thru 16, 19, 22 thru 25, 27 thru 32, 34, 38, 40 thru 49, 106
Loader-Dozer Rubber Tire	1, 3 thru 8, 10 thru 32, 34 thru 39, 43 thru 49, 106
Air Compressor	1, 3 thru 8, 12, 22 thru 24, 27 thru 33, 38, 39, 43 thru 46
Forklift Truck	1, 3 thru 7, 10 thru 20, 22 thru 32, 38, 39, 43 thru 49
Manlift Boom Type (JLG)	1, 3 thru 14, 22 thru 32, 34 thru 39, 43 thru 47, 49, 68 thru 70, 81, 86
Welding Machine Pump Generators Mixers (Gas & Diesel)	1, 3 thru 7, 12, 22 thru 25, 27 thru 32, 38, 39, 44 thru 46
Trailers	1, 10, 17, 18, 20, 21, 39, 44, 45, 48

APPENDIX
E

APPENDIX E

BERM SLOPE STABILITY ANALYSES

Summary of Waste Pit Berm Slope Stability Analyses

Berm ID \ Condition	Static Condition	Seismic Condition
Pit 1/3 Berm	FS = 1.91	FS = 1.38
Pit 1/Clearwell Berm	FS = 2.05	FS = 1.50
Pit 2/1 Berm	FS = 1.48	FS = 1.25
Pit 3/5 Berm	FS = 1.24	FS = 1.03
Pit 3/Clearwell Berm	FS = 1.35	FS = 1.09
Clearwell/Pit 1 Berm	FS = 1.86	FS = 1.34
Clearwell/Pit 3 Berm	FS = 2.05	FS = 1.40

Note: All cases were analyzed under drained conditions.

REFERENCE : "TECHNICAL SUMMARY OF DEEP TEST DATA" REPORT, BY PARSONS.

Table G1 - Soil Parameters for Drained and Undrained Conditions

Soil Parameters							
				Total Stress		Effective Stress	
Soil Layer Number	Soil Type	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
1	Clay Liner	133.1	145.0	0.0	22.0	0.0	22.0
2	Pit 3 Waste	81.2	85.2	50.0	13.0	0.0	28.0
3	Cap	100.0	112.3	0.0	26.0	0.0	26.0
4	Berm	120.0	130.0	300.0	19.0	300.0	19.0
5	GMA	140.0	149.8	0.0	33.0	0.0	33.0

REFERENCE : "FDF SUBCONTRACT NO. 98SC000001"

TABLE J.2-2

SUMMARY OF GEOTECHNICAL DATA BY WASTE PIT (In-Situ Conditions)

Note: See Table C.5-1 for data reference sources

Parameters	Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6	Burn Pit	* Clearwell	Soil Below Pits[1]
Wet Density (lb/ft³)	114.5	82.7	80.0	131.7	71.75	148.2	121.2	103.7 (72)*	140.5
Average Moisture Content (w)(percent Dry Basis)	46	156.9	183.5	29.1	393.4	18.4	30.6	58.8	15
Moisture Content Range (percent wet basis)	14.7 - 47.6	14.3 - 76.0	15.2 - 72.9	9.2 - 38.1	35.9 - 91.9	10.1 - 81.0	20.3 - 23.1	12.2 - 42.5	
Optimum Moisture Content Goal (from Compaction Test) (percent)	13	14	26	13	36	9	20	20	15
Major Types of Waste (USCS Group Name)	ML (low plasticity silt), ML (NP) (non-plastic), GC (clayey gravel with sand)	ML (NP), MH (high plasticity silt), SM (silty sand), SC (clayey sand with gravel), CL (clay)	SM, MH, ML, CL	CL, ML (NP), ML	MH, ML, ML (NP)	ML (NP), SM, ML, MH	CL, MH, SM	CL, ML, SM	CL, ML
Average Specific Gravity of Solids	2.98	2.71	2.66	3.12	2.8	3.18	2.76	2.74	2.78
Percentage of Material Less Than 200 Mesh (percent Silt and Clay)	46 - 96	15 - 99	43 - 96	55 - 94	68 - 100	46 - 96	36 - 59	45 - 77	36 - 55
Undrained Internal Friction Angle (deg)	19 - 23 (21°)[1]	18 (18°)	13 - 24 (18°)[1]	NA (21°)[2]	15 (15°)	NA (21°)[2]	NA (21°)[2]	NA (15°)*	16 - 26
Cohesion (psi) Drained	4.9 - 6.7 (830 psf)[1]	1.7 (240 psf)	0 - 2.4 (170 psf)[1]	NA	1.0 (140 psf)	NA	NA	NA (140 psf)*	0 - 7.8
Drained Internal Friction Angle (deg)	30 - 39 (34°)[1]	36 (36°)	28 - 40 (34°)[1]	NA	32 (32°)	NA	NA	NA (32°)*	27 - 44
Cohesion (psi) Undrained	0 - 3.3 (240 psf)[1]	0.9 (130 psf)	0.0 - 1.6 (115 psf)[1]	NA	0.7 (100 psf)	NA (240 psf)[2]	NA (240 psf)[2]	NA (100 psf)*	0 - 4.0

NA = Not Available
w = Moisture Content
[1] = Soils Data inferred from borings at similar depths and soil conditions at other on-site locations (i.e., new on-site cell location).

NOTES: 1. AVERAGE VALUE IS USED. 2. USE SAME VALUES AS IN WASTE PIT #1.

* CLEARWELL IS ASSUMED TO HAVE SAME PROPERTIES AS WASTE PIT #5.

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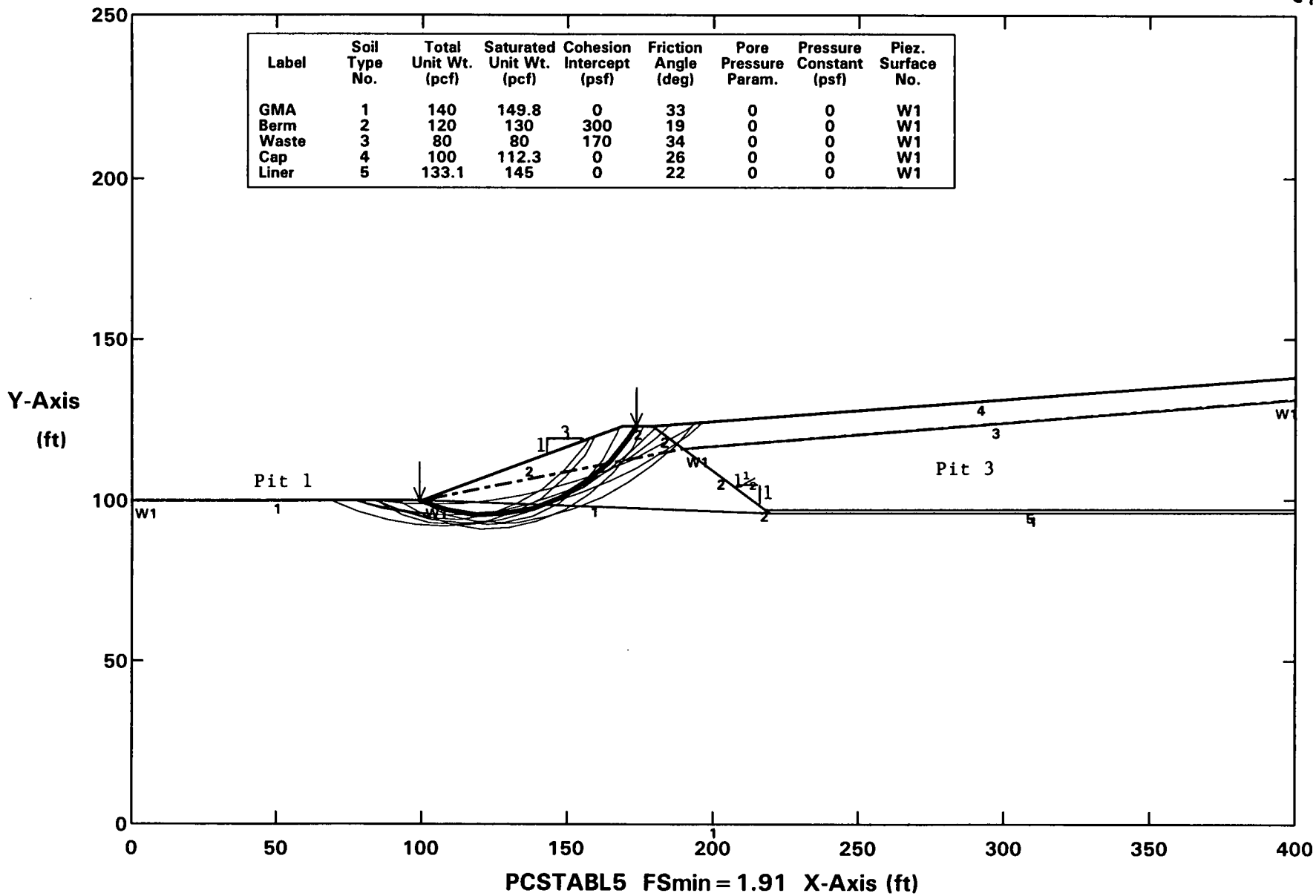
FDF SUBCONTRACT 98SC000001 1484

Figure E1 - Static Condition, Pit 1/3 Berm Stability

Ten Most Critical. G:BERMP13.PLT By: LIN LIU 01-03-98 4:57pm CK by D CM 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	80	80	170	34	0	0	W1
Cap	4	100	112.3	0	26	0	0	W1
Liner	5	133.1	145	0	22	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	4:57pm
Run By:	LIN LIU
Input Data Filename:	G:BERMP13
Output Filename:	G:BERMP13.OUT
Plotted Output Filename:	G:BERMP13.PLT

ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure E1 - Static Condition,
Pit 1/3 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	169.00	123.00	2
3	169.00	123.00	179.00	123.00	2
4	179.00	123.00	400.00	138.00	4
5	179.00	123.00	189.50	116.00	2
6	189.50	116.00	400.00	131.00	3
7	189.50	116.00	218.00	97.00	2
8	218.00	97.00	400.00	97.00	5
9	218.00	97.00	219.50	96.00	2
10	100.00	100.00	219.50	96.00	1
11	219.50	96.00	400.00	96.00	1
12	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Total Saturated Cohesion Friction Pore Pressure Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	80.0	80.0	170.0	34.0	.00	.0	1
4	100.0	112.3	.0	26.0	.00	.0	1
5	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	189.50	116.00
4	400.00	131.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 145.00 ft.

Each Surface Terminates Between X = 145.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical

First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.21	100.00
2	108.75	96.99
3	118.64	95.56
4	128.64	95.76
5	138.48	97.57
6	147.89	100.95
7	156.63	105.81
8	164.46	112.02
9	171.19	119.42
10	173.51	123.00

Circle Center At X = 122.4 ; Y = 157.0 and Radius, 61.5

*** 1.908 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.32	100.00
2	86.04	97.68
3	95.93	96.19
4	105.91	95.53
5	115.91	95.71
6	125.86	96.73
7	135.68	98.58
8	145.32	101.26
9	154.70	104.73
10	163.75	108.98
11	172.41	113.97
12	180.63	119.67
13	185.16	123.42

Circle Center At X = 108.7 ; Y = 214.4 and Radius, 118.9

*** 1.960 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.32	100.00
2	86.07	97.80
3	95.96	96.31
4	105.93	95.53
5	115.93	95.48
6	125.91	96.14
7	135.81	97.53
8	145.59	99.62
9	155.19	102.42
10	164.57	105.90
11	173.67	110.04
12	182.44	114.83
13	190.85	120.24
14	196.06	124.16

Circle Center At X = 111.7 ; Y = 234.0 and Radius, 138.6

*** 1.976 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.36	96.63
3	103.07	94.23
4	112.97	92.84
5	122.97	92.46
6	132.95	93.10
7	142.81	94.75
8	152.45	97.40
9	161.78	101.02
10	170.68	105.56
11	179.08	110.99
12	186.89	117.24
13	193.75	124.00

Circle Center At X = 121.7 ; Y = 190.6 and Radius, 98.1

*** 1.988 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.58	100.00
2	100.48	95.45
3	110.02	92.44
4	119.92	91.06
5	129.92	91.34
6	139.73	93.29
7	149.08	96.83
8	157.71	101.89
9	165.38	108.30
10	171.88	115.91
11	176.13	123.00

Circle Center At X = 123.2 ; Y = 150.9 and Radius, 59.9

*** 2.022 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.68	100.00
2	78.09	96.60
3	87.78	94.14
4	97.67	92.66
5	107.66	92.16
6	117.65	92.64
7	127.54	94.11
8	137.24	96.55
9	146.64	99.94
10	155.67	104.24
11	164.23	109.41
12	172.24	115.40
13	179.62	122.15
14	180.46	123.10

Circle Center At X = 107.7 ; Y = 193.3 and Radius, 101.1

*** 2.072 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	99.21	100.00
2	108.24	95.71
3	117.98	93.41
4	127.97	93.23
5	137.79	95.16
6	146.97	99.11
7	155.11	104.92
8	161.85	112.31
9	166.87	120.96
10	167.35	122.45

Circle Center At X = 123.8 ; Y = 140.2 and Radius, 47.1

*** 2.081 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.28	96.40
3	103.08	94.44
4	113.08	94.18
5	122.97	95.64
6	132.48	98.75
7	141.31	103.44
8	149.21	109.57
9	155.95	116.96
10	157.33	119.11

Circle Center At X = 109.6 ; Y = 152.5 and Radius, 58.4

*** 2.126 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.91	99.10
3	103.90	98.78
4	113.90	99.05
5	123.86	99.89
6	133.76	101.32
7	143.56	103.32
8	153.22	105.88
9	162.72	109.01

10	172.02	112.68
11	181.10	116.89
12	189.91	121.62
13	193.79	124.00

Circle Center At X = 104.4 ; Y = 270.4 and Radius, 171.6

*** 2.135 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	92.99	95.74
3	102.66	93.18
4	112.63	92.40
5	122.58	93.44
6	132.17	96.25
7	141.10	100.75
8	149.08	106.78
9	155.83	114.16
10	159.37	119.79

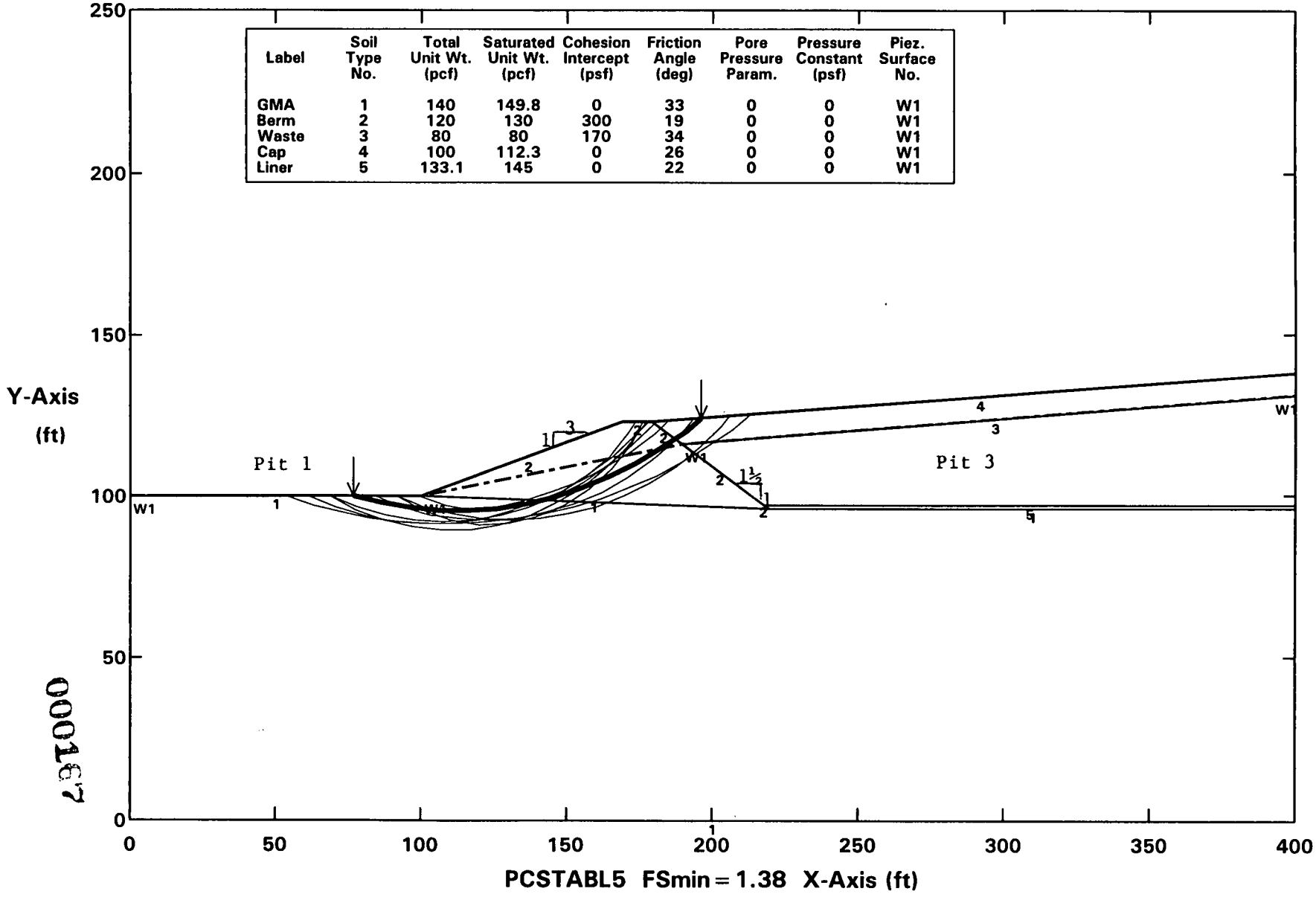
Circle Center At X = 111.9 ; Y = 147.6 and Radius, 55.2

*** 2.138 ***

Figure E2- Seismic Condition, Pit 1/3 Berm Stability

Ten Most Critical. G:BERMP13E.PLT By: LIN LIU 01-03-98 4:59pm ck by DCH 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	80	80	170	34	0	0	W1
Cap	4	100	112.3	0	26	0	0	W1
Liner	5	133.1	145	0	22	0	0	W1



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** PCSTABL5 **

1484

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 4:59pm
Run By: LIN LIU
Input Data Filename: G:BERMP13E
Output Filename: G:BERMP13E.OUT
Plotted Output Filename: G:BERMP13E.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION Figure E2- Seismic Condition,
Pit 1/3 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	169.00	123.00	2
3	169.00	123.00	179.00	123.00	2
4	179.00	123.00	400.00	138.00	4
5	179.00	123.00	189.50	116.00	2
6	189.50	116.00	400.00	131.00	3
7	189.50	116.00	218.00	97.00	2
8	218.00	97.00	400.00	97.00	5
9	218.00	97.00	219.50	96.00	2
10	100.00	100.00	219.50	96.00	1
11	219.50	96.00	400.00	96.00	1
12	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Total Saturated Cohesion Friction Pore Pressure Piez.

000168

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	80.0	80.0	170.0	34.0	.00	.0	1
4	100.0	112.3	.0	26.0	.00	.0	1
5	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	189.50	116.00
4	400.00	131.00

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 145.00 ft.

Each Surface Terminates Between X = 145.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation

At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.32	100.00
2	86.07	97.80
3	95.96	96.31
4	105.93	95.53
5	115.93	95.48
6	125.91	96.14
7	135.81	97.53
8	145.59	99.62
9	155.19	102.42
10	164.57	105.90
11	173.67	110.04
12	182.44	114.83
13	190.85	120.24
14	196.06	124.16

Circle Center At X = 111.7 ; Y = 234.0 and Radius, 138.6

*** 1.381 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.32	100.00
2	86.04	97.68
3	95.93	96.19
4	105.91	95.53
5	115.91	95.71
6	125.86	96.73
7	135.68	98.58
8	145.32	101.26

9	154.70	104.73
10	163.75	108.98
11	172.41	113.97
12	180.63	119.67
13	185.16	123.42

Circle Center At X = 108.7 ; Y = 214.4 and Radius, 118.9

*** 1.397 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.36	96.63
3	103.07	94.23
4	112.97	92.84
5	122.97	92.46
6	132.95	93.10
7	142.81	94.75
8	152.45	97.40
9	161.78	101.02
10	170.68	105.56
11	179.08	110.99
12	186.89	117.24
13	193.75	124.00

Circle Center At X = 121.7 ; Y = 190.6 and Radius, 98.1

*** 1.399 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.21	100.00
2	108.75	96.99
3	118.64	95.56
4	128.64	95.76
5	138.48	97.57
6	147.89	100.95
7	156.63	105.81
8	164.46	112.02
9	171.19	119.42
10	173.51	123.00

Circle Center At X = 122.4 ; Y = 157.0 and Radius, 61.5

*** 1.415 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.68	100.00
2	78.09	96.60
3	87.78	94.14
4	97.67	92.66
5	107.66	92.16
6	117.65	92.64
7	127.54	94.11
8	137.24	96.55
9	146.64	99.94
10	155.67	104.24
11	164.23	109.41
12	172.24	115.40
13	179.62	122.15
14	180.46	123.10

Circle Center At X = 107.7 ; Y = 193.3 and Radius, 101.1

*** 1.450 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.58	100.00
2	100.48	95.45
3	110.02	92.44
4	119.92	91.06
5	129.92	91.34
6	139.73	93.29
7	149.08	96.83
8	157.71	101.89
9	165.38	108.30
10	171.88	115.91
11	176.13	123.00

Circle Center At X = 123.2 ; Y = 150.9 and Radius, 59.9

*** 1.477 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.58	100.00
2	101.02	96.70
3	110.73	94.31
4	120.63	92.87
5	130.61	92.38
6	140.60	92.86
7	150.50	94.28
8	160.21	96.65
9	169.66	99.94
10	178.74	104.12
11	187.38	109.15
12	195.50	114.99
13	203.03	121.58
14	206.10	124.84

Circle Center At X = 130.7 ; Y = 196.6 and Radius, 104.2

*** 1.486 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.68	100.00
2	77.69	95.65
3	87.14	92.39
4	96.92	90.28
5	106.87	89.34
6	116.87	89.58
7	126.77	91.00
8	136.43	93.59
9	145.71	97.30
10	154.49	102.08
11	162.65	107.87
12	170.06	114.59
13	176.62	122.13
14	177.21	123.00

Circle Center At X = 109.8 ; Y = 173.6 and Radius, 84.3

*** 1.512 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.05	100.00
2	70.41	96.46
3	80.05	93.83
4	89.91	92.13
5	99.88	91.38
6	109.88	91.58
7	119.81	92.72
8	129.59	94.81
9	139.13	97.82
10	148.33	101.73
11	157.13	106.49
12	165.43	112.07
13	173.16	118.41
14	177.78	123.00

Circle Center At X = 102.8 ; Y = 196.3 and Radius, 105.0

*** 1.519 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.42	100.00
2	63.01	97.17
3	72.75	94.88
4	82.60	93.15
5	92.53	91.96
6	102.51	91.33
7	112.51	91.26
8	122.49	91.75
9	132.44	92.80
10	142.31	94.40
11	152.07	96.55
12	161.70	99.25
13	171.17	102.48
14	180.44	106.23
15	189.48	110.50
16	198.27	115.26
17	206.79	120.51
18	213.74	125.36

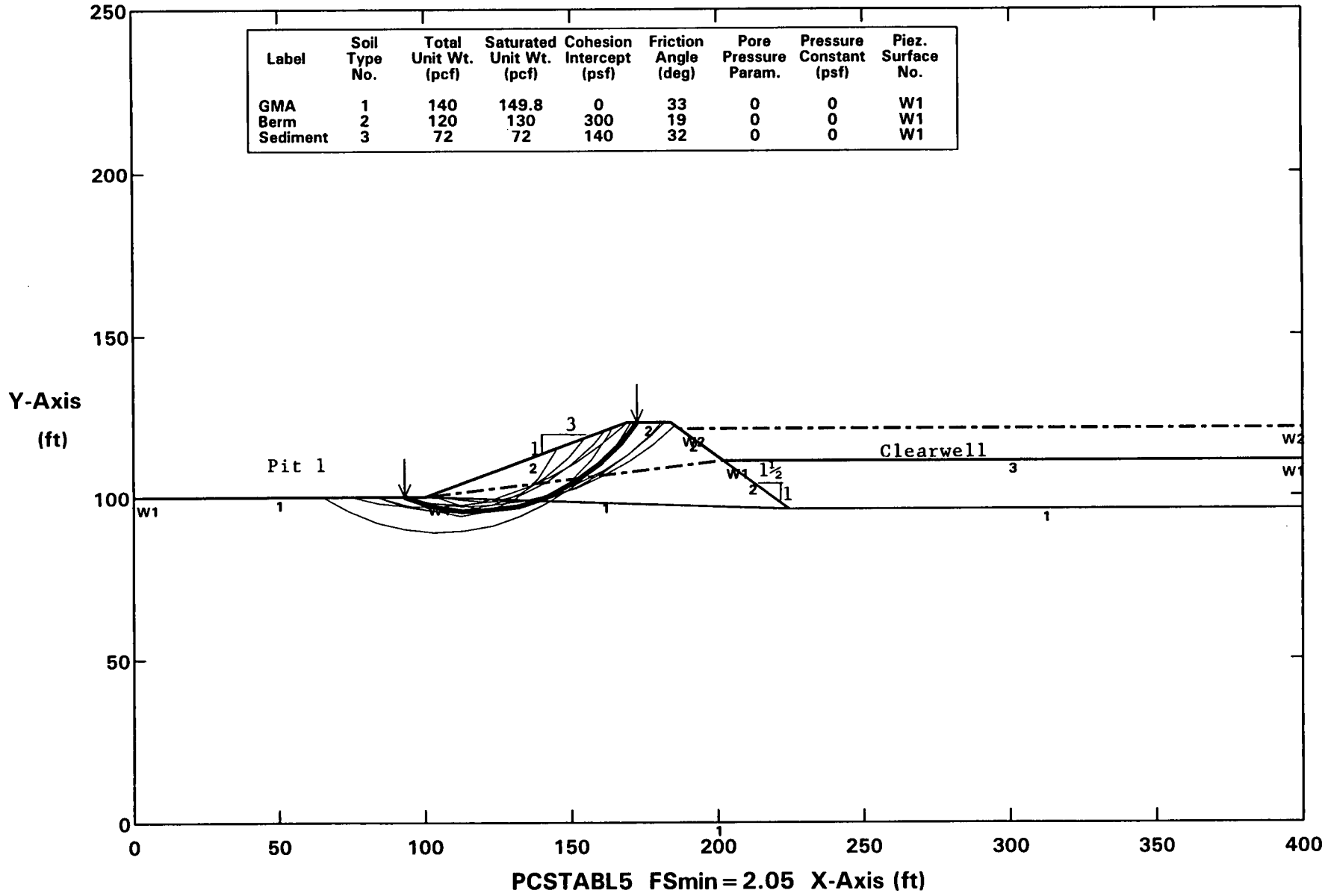
Circle Center At X = 108.7 ; Y = 270.0 and Radius, 178.7

*** 1.524 ***

Figure E3 - Static Condition, Pit 1/Clearwell Berm Stability

Ten Most Critical. G:BERMP1CL.PLT By: LIN LIU 01-03-98 2:26pm CK by D CH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Sediment	3	72	72	140	32	0	0	W1



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0001176

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 2:26pm
Run By: LIN LIU
Input Data Filename: G:BERMP1CL
Output Filename: G:BERMP1CL.OUT
Plotted Output Filename: G:BERMP1CL.PLT

ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure E3 - Static Condition,
Pit 1/Clearwell Berm Stability

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	169.00	123.00	2
3	169.00	123.00	184.00	123.00	2
4	184.00	123.00	202.00	111.00	2
5	202.00	111.00	400.00	111.00	3
6	202.00	111.00	224.50	96.00	2
7	224.50	96.00	400.00	96.00	1
8	100.00	100.00	224.50	96.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	72.0	72.0	140.0	32.0	.00	.0	1

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	202.00	111.00
4	400.00	111.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	187.00	121.00
2	400.00	121.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

150 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 130.00 ft.

Each Surface Terminates Between X = 130.00 ft.
and X = 200.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.45	97.17
3	112.35	95.74
4	122.35	95.76
5	132.24	97.21
6	141.82	100.07
7	150.89	104.28
8	159.26	109.76
9	166.76	116.38
10	172.37	123.00

Circle Center At X = 117.2 ; Y = 164.9 and Radius, 69.3

*** 2.047 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.67	98.08
3	112.63	97.18
4	122.63	97.32
5	132.56	98.49
6	142.32	100.67
7	151.80	103.86
8	160.90	108.01
9	169.52	113.07
10	177.57	119.00
11	181.96	123.00

Circle Center At X = 116.3 ; Y = 193.7 and Radius, 96.6

*** 2.061 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	100.00
2	93.21	97.32
3	103.07	95.66
4	113.05	95.04
5	123.04	95.47
6	132.93	96.95
7	142.61	99.46
8	151.98	102.96
9	160.92	107.43
10	169.35	112.81
11	177.17	119.04
12	181.19	123.00

Circle Center At X = 113.9 ; Y = 190.3 and Radius, 95.3

*** 2.071 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.14	100.71
2	111.99	98.98
3	121.97	98.32
4	131.96	98.72
5	141.85	100.20
6	151.53	102.72
7	160.88	106.26
8	169.80	110.79
9	178.18	116.24
10	185.36	122.09

Circle Center At X = 123.2 ; Y = 191.6 and Radius, 93.3

*** 2.199 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.64	97.92
3	112.62	97.34
4	122.58	98.28
5	132.28	100.70
6	141.50	104.57
7	150.03	109.79
8	157.68	116.23
9	161.37	120.46

Circle Center At X = 111.4 ; Y = 163.3 and Radius, 66.0

*** 2.207 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.14	100.71
2	111.56	97.35
3	121.48	96.06
4	131.44	96.89
5	141.01	99.81
6	149.74	104.69
7	157.23	111.30
8	163.17	119.36
9	164.06	121.35

Circle Center At X = 122.6 ; Y = 143.0 and Radius, 47.0

*** 2.271 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	100.00
2	93.13	97.06
3	103.04	95.69
4	113.03	95.92
5	122.87	97.74
6	132.28	101.10
7	141.04	105.93
8	148.91	112.10

9	154.53	118.18

Circle Center At X = 106.6 ; Y = 158.0 and Radius, 62.4

*** 2.343 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	101.92	95.76
3	111.79	94.20
4	121.72	95.42
5	130.92	99.34
6	138.68	105.64
7	144.39	113.85
8	144.76	114.92

Circle Center At X = 112.4 ; Y = 130.0 and Radius, 35.8

*** 2.420 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.29	100.00
2	84.09	98.00
3	94.03	96.96
4	104.03	96.87
5	113.99	97.75
6	123.82	99.57
7	133.43	102.33
8	142.74	106.00
9	151.64	110.55
10	160.07	115.93
11	167.95	122.09
12	168.84	122.95

Circle Center At X = 99.9 ; Y = 200.9 and Radius, 104.1

*** 2.428 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.00	100.00
2	73.94	95.53
3	83.38	92.20
4	93.15	90.08
5	103.11	89.18
6	113.10	89.53
7	122.97	91.12
8	132.57	93.92
9	141.75	97.89
10	150.36	102.98
11	158.27	109.09
12	165.36	116.15
13	170.72	123.00

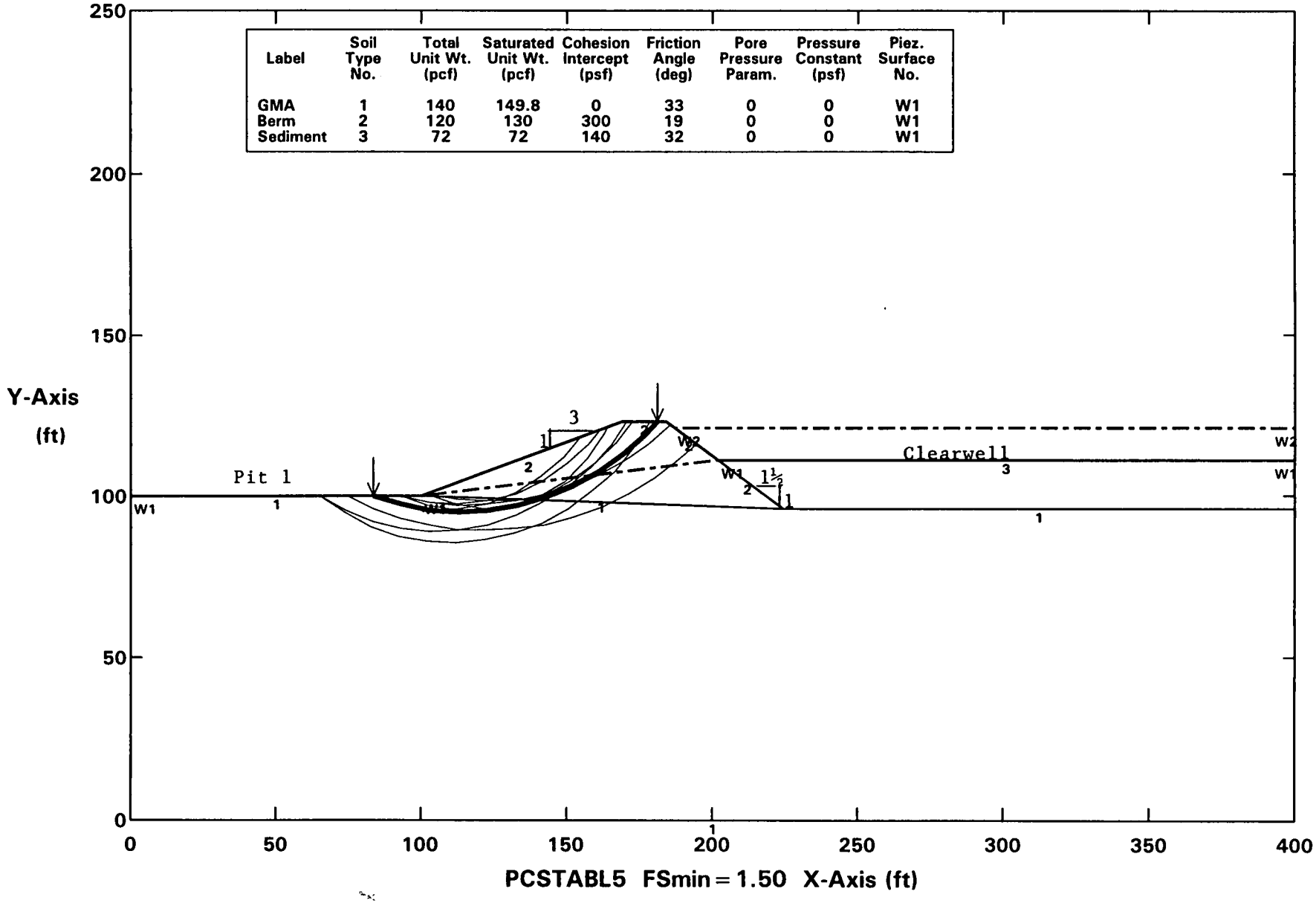
Circle Center At X = 105.3 ; Y = 169.4 and Radius, 80.3

*** 2.470 ***

Figure E4 - Seismic Condition, Pit 1/Clearwell Berm Stability

Ten Most Critical. G:BERM1CLE.PLT By: LIN LIU 01-03-98 2:34pm ok by PCH 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Sediment	3	72	72	140	32	0	0	W1



1484

0001184

** PCSTABL5 **

E-1484

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	2:34pm
Run By:	LIN LIU
Input Data Filename:	G:BERM1CLE
Output Filename:	G:BERM1CLE.OUT
Plotted Output Filename:	G:BERM1CLE.PLT

Ck by DCH 61158

PROBLEM DESCRIPTION Figure E4 - Seismic Condition, Pit 1/Clearwell Berm Stability

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	169.00	123.00	2
3	169.00	123.00	184.00	123.00	2
4	184.00	123.00	202.00	111.00	2
5	202.00	111.00	400.00	111.00	3
6	202.00	111.00	224.50	96.00	2
7	224.50	96.00	400.00	96.00	1
8	100.00	100.00	224.50	96.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	72.0	72.0	140.0	32.0	.00	.0	1

---

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	202.00	111.00
4	400.00	111.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	187.00	121.00
2	400.00	121.00

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

150 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 15 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 130.00 ft.

Each Surface Terminates Between X = 130.00 ft.
and X = 200.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	100.00
2	93.21	97.32
3	103.07	95.66
4	113.05	95.04
5	123.04	95.47
6	132.93	96.95
7	142.61	99.46
8	151.98	102.96
9	160.92	107.43
10	169.35	112.81
11	177.17	119.04
12	181.19	123.00

Circle Center At X = 113.9 ; Y = 190.3 and Radius, 95.3

*** 1.498 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.67	98.08
3	112.63	97.18
4	122.63	97.32

5	132.56	98.49
6	142.32	100.67
7	151.80	103.86
8	160.90	108.01
9	169.52	113.07
10	177.57	119.00
11	181.96	123.00

Circle Center At X = 116.3 ; Y = 193.7 and Radius, 96.6

*** 1.510 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.45	97.17
3	112.35	95.74
4	122.35	95.76
5	132.24	97.21
6	141.82	100.07
7	150.89	104.28
8	159.26	109.76
9	166.76	116.38
10	172.37	123.00

Circle Center At X = 117.2 ; Y = 164.9 and Radius, 69.3

*** 1.515 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.14	100.71
2	111.99	98.98
3	121.97	98.32
4	131.96	98.72
5	141.85	100.20
6	151.53	102.72
7	160.88	106.26
8	169.80	110.79
9	178.18	116.24
10	185.36	122.09

Circle Center At X = 123.2 ; Y = 191.6 and Radius, 93.3

*** 1.603 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.64	97.92
3	112.62	97.34
4	122.58	98.28
5	132.28	100.70
6	141.50	104.57
7	150.03	109.79
8	157.68	116.23
9	161.37	120.46

Circle Center At X = 111.4 ; Y = 163.3 and Radius, 66.0

*** 1.642 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.00	100.00
2	73.94	95.53
3	83.38	92.20
4	93.15	90.08
5	103.11	89.18
6	113.10	89.53
7	122.97	91.12
8	132.57	93.92
9	141.75	97.89
10	150.36	102.98
11	158.27	109.09
12	165.36	116.15
13	170.72	123.00

Circle Center At X = 105.3 ; Y = 169.4 and Radius, 80.3

*** 1.687 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	100.00
2	93.13	97.06
3	103.04	95.69
4	113.03	95.92
5	122.87	97.74
6	132.28	101.10
7	141.04	105.93
8	148.91	112.10
9	154.53	118.18

Circle Center At X = 106.6 ; Y = 158.0 and Radius, 62.4

*** 1.688 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.14	100.71
2	111.56	97.35
3	121.48	96.06
4	131.44	96.89
5	141.01	99.81
6	149.74	104.69
7	157.23	111.30
8	163.17	119.36
9	164.06	121.35

Circle Center At X = 122.6 ; Y = 143.0 and Radius, 47.0

*** 1.695 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.00	100.00
2	73.53	94.78
3	82.65	90.67
4	92.20	87.73
5	102.05	86.00

6	112.04	85.51
7	122.01	86.28
8	131.81	88.28
9	141.28	91.48
10	150.28	95.84
11	158.67	101.29
12	166.31	107.75
13	173.08	115.10
14	178.71	123.00

Circle Center At X = 110.9 ; Y = 165.6 and Radius, 80.0

*** 1.717 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.29	100.00
2	83.51	96.15
3	93.05	93.14
4	102.82	90.98
5	112.73	89.71
6	122.73	89.33
7	132.71	89.84
8	142.62	91.24
9	152.35	93.51
10	161.85	96.65
11	171.03	100.61
12	179.82	105.38
13	188.15	110.92
14	194.49	116.01

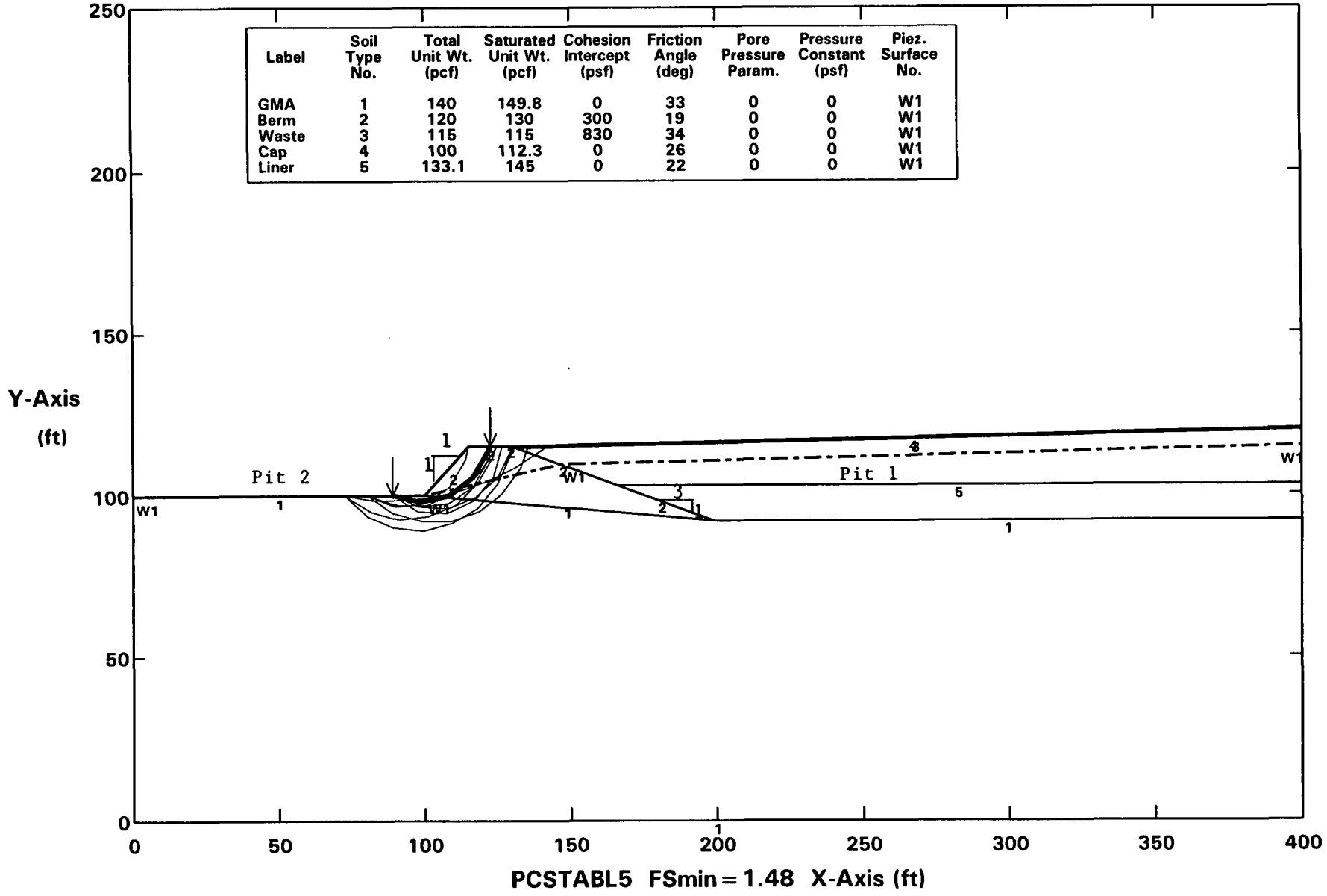
Circle Center At X = 122.0 ; Y = 201.4 and Radius, 112.1

*** 1.718 ***

Figure E5 - Static Condition, Pit 2/1 Berm Stability

Ten Most Critical. G:BERMP21.PLT By: LIN LIU 01-03-98 5:03pm ck by D CH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	115	115	830	34	0	0	W1
Cap	4	100	112.3	0	26	0	0	W1
Liner	5	133.1	145	0	22	0	0	W1



PCSTABL5 FSmin = 1.48 X-Axis (ft)

1484

000192

** PCSTABL5 **

by
Purdue University

1484

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	5:03pm
Run By:	LIN LIU
Input Data Filename:	G:BERMP21
Output Filename:	G:BERMP21.OUT
Plotted Output Filename:	G:BERMP21.PLT

Ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure E5 - Static Condition,
Pit 2/1 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	115.00	115.00	2
3	115.00	115.00	130.00	115.00	2
4	130.00	115.00	400.00	120.00	4
5	130.00	115.00	131.50	114.50	2
6	131.50	114.50	400.00	119.50	3
7	131.50	114.50	166.00	103.00	2
8	166.00	103.00	400.00	103.00	5
9	166.00	103.00	199.00	92.00	2
10	100.00	100.00	199.00	92.00	1
11	199.00	92.00	400.00	92.00	1
12	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Total Saturated Cohesion Friction Pore Pressure Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	115.0	115.0	830.0	34.0	.00	.0	1
4	100.0	112.3	.0	26.0	.00	.0	1
5	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	146.50	109.50
4	400.00	114.50

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 113.00 ft.

Each Surface Terminates Between X = 113.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical

First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.56	97.89
3	108.38	99.77
4	116.67	105.36
5	122.11	113.75
6	122.33	115.00

Circle Center At X = 98.8 ; Y = 122.9 and Radius, 25.0

*** 1.484 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.14	96.46
3	108.10	97.37
4	116.65	102.55
5	122.09	110.95
6	122.58	115.00

Circle Center At X = 101.1 ; Y = 118.5 and Radius, 22.3

*** 1.523 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.71	100.00
2	90.29	97.10
3	100.29	97.19
4	109.80	100.25
5	117.98	106.01

6	124.06	113.95
7	124.45	115.00

Circle Center At X = 95.0 ; Y = 129.9 and Radius, 33.2

*** 1.606 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.06	96.26
3	108.06	96.00
4	117.51	99.26
5	125.23	105.63
6	130.23	114.29
7	130.35	115.01

Circle Center At X = 103.8 ; Y = 123.8 and Radius, 28.1

*** 1.708 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	97.56	95.21
3	107.55	94.62
4	116.83	98.35
5	123.63	105.68
6	126.58	115.00

Circle Center At X = 103.9 ; Y = 117.2 and Radius, 22.9

*** 1.797 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	72.64	100.00
2	81.28	94.96
3	91.03	92.73
4	101.00	93.51
5	110.28	97.24
6	118.02	103.57
7	123.51	111.93
8	124.39	115.00

Circle Center At X = 93.4 ; Y = 125.7 and Radius, 33.1

*** 1.991 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.71	100.00
2	89.14	94.61
3	98.76	91.88
4	108.76	92.04
5	118.28	95.08
6	126.53	100.73
7	132.79	108.53
8	135.45	115.10

Circle Center At X = 103.2 ; Y = 125.9 and Radius, 34.3

*** 2.077 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.64	100.00
2	80.45	93.75
3	89.74	90.05
4	99.70	89.21
5	109.48	91.32
6	118.21	96.19
7	125.15	103.39
8	129.69	112.30
9	130.16	115.00

Circle Center At X = 97.5 ; Y = 123.1 and Radius, 33.9

*** 2.262 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.71	100.00
2	90.11	96.57
3	100.06	97.51
4	108.65	102.63
5	114.21	110.94
6	114.78	114.78

Circle Center At X = 93.0 ; Y = 119.1 and Radius, 22.7

*** 2.355 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.64	100.00
2	82.56	98.74
3	92.56	98.56
4	102.52	99.46
5	112.32	101.44
6	121.85	104.48
7	130.99	108.53
8	139.65	113.54
9	141.93	115.22

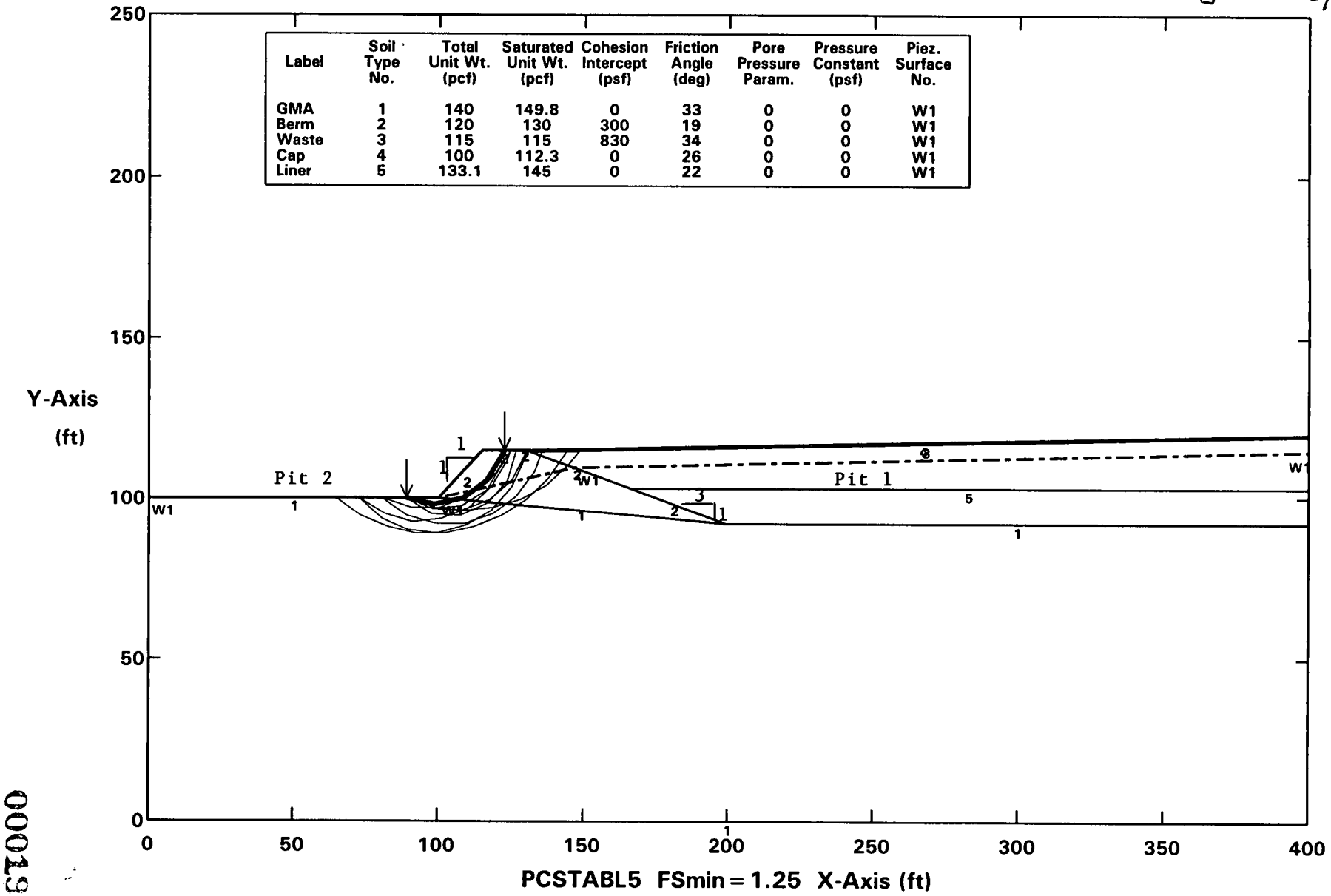
Circle Center At X = 89.2 ; Y = 190.5 and Radius, 92.0

*** 2.361 ***

Figure E6- Seismic Condition, Pit 2/1 Berm Stability

Ten Most Critical. G:BERMP21E.PLT By: LIN LIU 01-03-98 5:06pm ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	115	115	830	34	0	0	W1
Cap	4	100	112.3	0	26	0	0	W1
Liner	5	133.1	145	0	22	0	0	W1



** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	5:06pm
Run By:	LIN LIU
Input Data Filename:	G:BERMP21E
Output Filename:	G:BERMP21E.OUT
Plotted Output Filename:	G:BERMP21E.PLT

Ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure E6- Seismic Condition, Pit 2/1 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	115.00	115.00	2
3	115.00	115.00	130.00	115.00	2
4	130.00	115.00	400.00	120.00	4
5	130.00	115.00	131.50	114.50	2
6	131.50	114.50	400.00	119.50	3
7	131.50	114.50	166.00	103.00	2
8	166.00	103.00	400.00	103.00	5
9	166.00	103.00	199.00	92.00	2
10	100.00	100.00	199.00	92.00	1
11	199.00	92.00	400.00	92.00	1
12	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Total Saturated Cohesion Friction Pore Pressure Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	115.0	115.0	830.0	34.0	.00	.0	1
4	100.0	112.3	.0	26.0	.00	.0	1
5	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	146.50	109.50
4	400.00	114.50

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 113.00 ft.

Each Surface Terminates Between X = 113.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation

At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.56	97.89
3	108.38	99.77
4	116.67	105.36
5	122.11	113.75
6	122.33	115.00

Circle Center At X = 98.8 ; Y = 122.9 and Radius, 25.0

*** 1.249 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.14	96.46
3	108.10	97.37
4	116.65	102.55
5	122.09	110.95
6	122.58	115.00

Circle Center At X = 101.1 ; Y = 118.5 and Radius, 22.3

*** 1.268 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.71	100.00
2	90.29	97.10
3	100.29	97.19
4	109.80	100.25
5	117.98	106.01
6	124.06	113.95
7	124.45	115.00

Circle Center At X = 95.0 ; Y = 129.9 and Radius, 33.2

*** 1.301 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.06	96.26
3	108.06	96.00
4	117.51	99.26
5	125.23	105.63
6	130.23	114.29
7	130.35	115.01

Circle Center At X = 103.8 ; Y = 123.8 and Radius, 28.1

*** 1.380 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	97.56	95.21
3	107.55	94.62
4	116.83	98.35
5	123.63	105.68
6	126.58	115.00

Circle Center At X = 103.9 ; Y = 117.2 and Radius, 22.9

*** 1.472 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.64	100.00
2	81.28	94.96
3	91.03	92.73
4	101.00	93.51
5	110.28	97.24
6	118.02	103.57
7	123.51	111.93
8	124.39	115.00

Circle Center At X = 93.4 ; Y = 125.7 and Radius, 33.1

*** 1.518 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.71	100.00
2	89.14	94.61
3	98.76	91.88
4	108.76	92.04
5	118.28	95.08
6	126.53	100.73
7	132.79	108.53
8	135.45	115.10

Circle Center At X = 103.2 ; Y = 125.9 and Radius, 34.3

*** 1.592 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.64	100.00
2	80.45	93.75
3	89.74	90.05

4	99.70	89.21
5	109.48	91.32
6	118.21	96.19
7	125.15	103.39
8	129.69	112.30
9	130.16	115.00

Circle Center At X = 97.5 ; Y = 123.1 and Radius, 33.9

*** 1.703 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	64.57	100.00
2	73.06	94.72
3	82.38	91.08
4	92.20	89.19
5	102.20	89.13
6	112.04	90.89
7	121.40	94.42
8	129.96	99.59
9	137.43	106.24
10	143.56	114.14
11	144.14	115.26

Circle Center At X = 97.5 ; Y = 143.6 and Radius, 54.6

*** 1.749 ***

Failure Surface Specified By 8 Coordinate Points

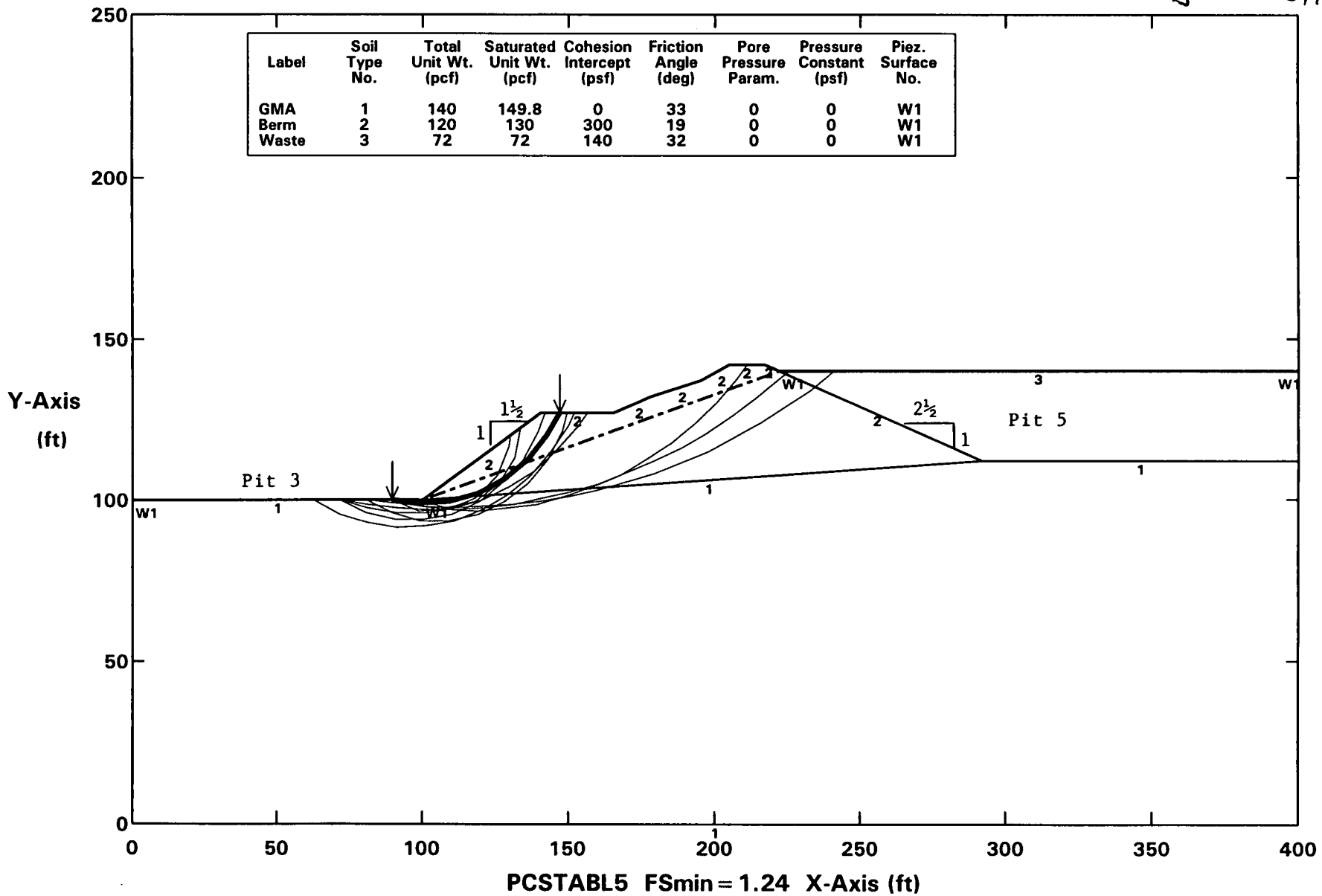
Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.79	100.00
2	98.35	97.09
3	108.30	96.05
4	118.26	96.92
5	127.88	99.67
6	136.80	104.19
7	144.70	110.32
8	149.10	115.35

Circle Center At X = 108.7 ; Y = 148.5 and Radius, 52.4

Figure E7 - Static Condition, Pit 3/5 Berm Stability

Ten Most Critical. G:BERMP35.PLT By: LIN LIU 01-03-98 5:23pm CK by PCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	72	72	140	32	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 5:23pm
Run By: LIN LIU
Input Data Filename: G:BERMP35
Output Filename: G:BERMP35.OUT
Plotted Output Filename: G:BERMP35.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION Figure E7 - Static Condition, Pit 3/5 Berm Stability

BOUNDARY COORDINATES

9 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	140.50	127.00	2
3	140.50	127.00	165.50	127.00	2
4	165.50	127.00	178.00	132.00	2
5	178.00	132.00	195.00	137.00	2
6	195.00	137.00	205.00	142.00	2
7	205.00	142.00	217.00	142.00	2
8	217.00	142.00	222.00	140.00	2
9	222.00	140.00	400.00	140.00	3
10	222.00	140.00	292.00	112.00	2
11	100.00	100.00	292.00	112.00	1
12	292.00	112.00	400.00	112.00	1
13	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	72.0	72.0	140.0	32.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	222.00	140.00
4	400.00	140.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

150 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 125.00 ft.

Each Surface Terminates Between X = 125.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	99.21	98.79
3	109.19	99.48
4	118.85	102.06
5	127.85	106.43
6	135.85	112.43
7	142.56	119.84
8	146.90	127.00

Circle Center At X = 100.6 ; Y = 151.1 and Radius, 52.4

*** 1.237 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	81.09	97.40
3	91.00	96.11
4	101.00	96.15
5	110.91	97.51
6	120.55	100.18
7	129.75	104.10
8	138.34	109.21
9	146.19	115.41
10	153.14	122.60
11	156.38	127.00

Circle Center At X = 95.7 ; Y = 171.2 and Radius, 75.2

*** 1.322 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	80.36	100.00
2	89.42	95.76
3	99.16	93.53
4	109.16	93.40
5	118.96	95.39
6	128.13	99.39
7	136.24	105.23
8	142.94	112.66
9	147.93	121.33
10	149.74	127.00

Circle Center At X = 104.8 ; Y = 140.4 and Radius, 47.2

*** 1.349 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	107.93	97.64
3	117.79	99.32
4	126.18	104.76
5	131.74	113.08
6	133.44	122.29

Circle Center At X = 108.8 ; Y = 122.4 and Radius, 24.8

*** 1.434 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.69	96.60
3	108.69	96.79
4	117.96	100.53
5	125.29	107.33
6	129.71	116.30
7	130.06	120.04

Circle Center At X = 103.2 ; Y = 123.8 and Radius, 27.6

*** 1.448 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	81.31	98.46
3	91.26	97.45
4	101.25	96.97
5	111.25	97.01
6	121.23	97.59
7	131.17	98.69
8	141.04	100.31
9	150.80	102.46
10	160.45	105.11
11	169.93	108.28
12	179.24	111.94
13	188.34	116.08
14	197.21	120.71
15	205.82	125.79
16	214.15	131.32
17	222.17	137.29
18	225.44	140.00

Circle Center At X = 105.4 ; Y = 286.0 and Radius, 189.1

*** 1.458 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	99.10	98.08
3	109.04	96.98
4	119.04	96.71
5	129.02	97.28
6	138.92	98.67
7	148.67	100.88
8	158.21	103.90
9	167.46	107.70
10	176.36	112.26
11	184.85	117.54
12	192.87	123.51
13	200.37	130.13
14	207.29	137.34
15	211.07	142.00

Circle Center At X = 117.3 ; Y = 216.8 and Radius, 120.1

*** 1.492 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	80.57	95.95
3	90.35	93.84
4	100.35	93.77
5	110.15	95.73
6	119.35	99.65
7	127.56	105.35
8	134.44	112.61
9	139.70	121.12
10	141.84	127.00

Circle Center At X = 95.7 ; Y = 142.4 and Radius, 48.9

*** 1.522 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.50	100.00
2	71.55	95.74
3	81.14	92.92
4	91.06	91.63
5	101.05	91.88
6	110.89	93.67
7	120.33	96.97
8	129.15	101.69
9	137.13	107.71
10	144.09	114.89
11	149.85	123.07
12	151.79	127.00

Circle Center At X = 94.4 ; Y = 156.0 and Radius, 64.5

*** 1.533 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	90.28	98.77
3	100.25	98.00
4	110.25	97.68
5	120.25	97.82
6	130.23	98.42
7	140.17	99.47
8	150.06	100.98
9	159.86	102.94
10	169.57	105.35
11	179.15	108.20
12	188.60	111.48
13	197.88	115.20
14	206.99	119.33
15	215.89	123.88
16	224.58	128.83
17	233.04	134.18
18	241.23	139.90
19	241.36	140.00

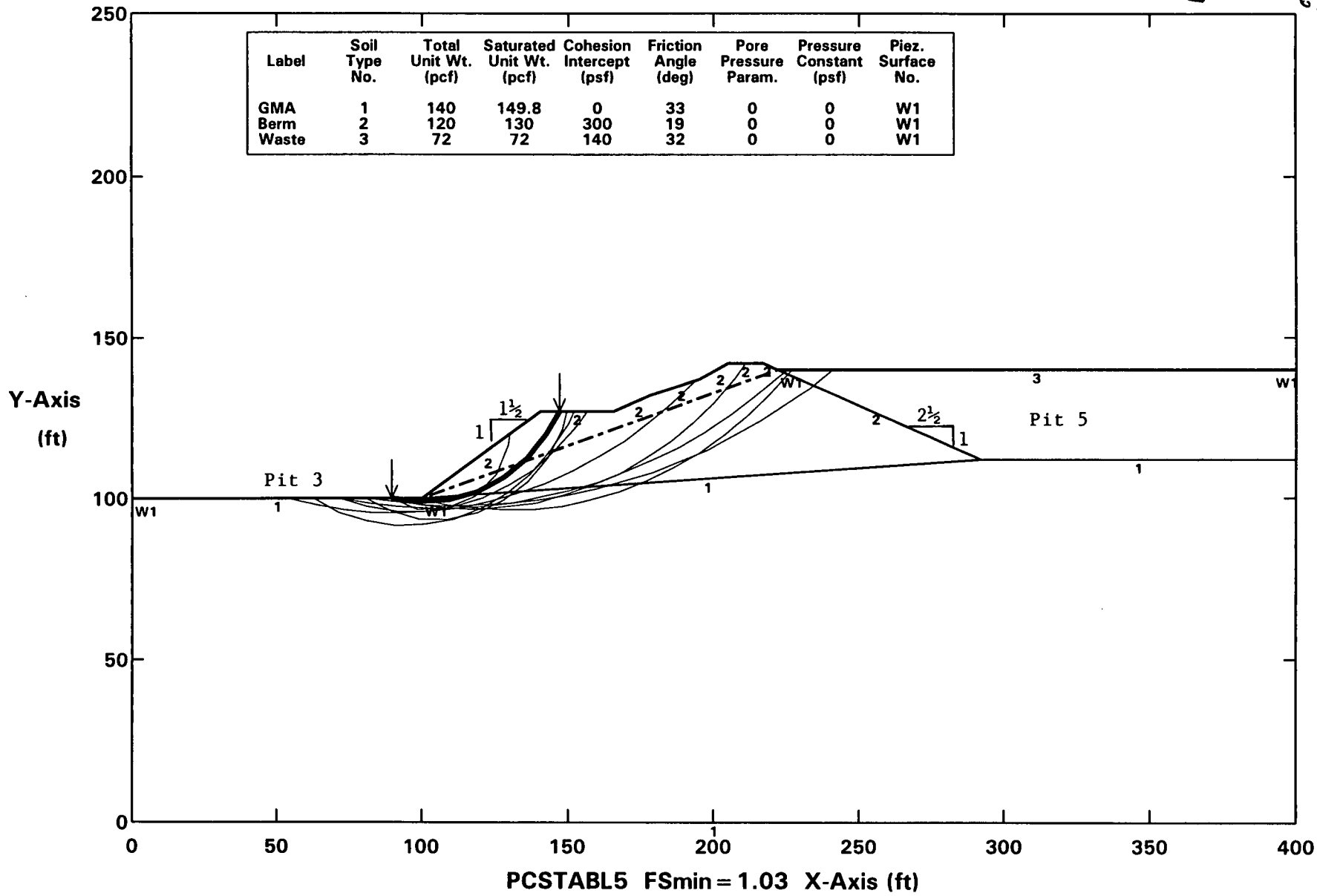
Circle Center At X = 112.2 ; Y = 316.0 and Radius, 218.3

*** 1.536 ***

Figure E8- Seismic Condition, Pit 3/5 Berm Stability

Ten Most Critical. G:BERMP35E.PLT By: LIN LIU 01-03-98 5:25pm Ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	72	72	140	32	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	5:25pm
Run By:	LIN LIU
Input Data Filename:	G:BERMP35E
Output Filename:	G:BERMP35E.OUT
Plotted Output Filename:	G:BERMP35E.PLT

CK by D CH 6/1/98

PROBLEM DESCRIPTION Figure E8- Seismic Condition,
Pit 3/5 Berm Stability

BOUNDARY COORDINATES

9 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	140.50	127.00	2
3	140.50	127.00	165.50	127.00	2
4	165.50	127.00	178.00	132.00	2
5	178.00	132.00	195.00	137.00	2
6	195.00	137.00	205.00	142.00	2
7	205.00	142.00	217.00	142.00	2
8	217.00	142.00	222.00	140.00	2
9	222.00	140.00	400.00	140.00	3
10	222.00	140.00	292.00	112.00	2
11	100.00	100.00	292.00	112.00	1
12	292.00	112.00	400.00	112.00	1
13	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	72.0	72.0	140.0	32.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	222.00	140.00
4	400.00	140.00

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

150 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 15 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 125.00 ft.

Each Surface Terminates Between X = 125.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	99.21	98.79
3	109.19	99.48
4	118.85	102.06
5	127.85	106.43
6	135.85	112.43
7	142.56	119.84
8	146.90	127.00

Circle Center At X = 100.6 ; Y = 151.1 and Radius, 52.4

*** 1.026 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	81.09	97.40
3	91.00	96.11
4	101.00	96.15
5	110.91	97.51
6	120.55	100.18
7	129.75	104.10
8	138.34	109.21
9	146.19	115.41
10	153.14	122.60
11	156.38	127.00

Circle Center At X = 95.7 ; Y = 171.2 and Radius, 75.2

*** 1.046 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	81.31	98.46
3	91.26	97.45
4	101.25	96.97
5	111.25	97.01
6	121.23	97.59
7	131.17	98.69
8	141.04	100.31
9	150.80	102.46
10	160.45	105.11
11	169.93	108.28
12	179.24	111.94
13	188.34	116.08
14	197.21	120.71
15	205.82	125.79
16	214.15	131.32
17	222.17	137.29
18	225.44	140.00

Circle Center At X = 105.4 ; Y = 286.0 and Radius, 189.1

*** 1.076 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	89.42	95.76
3	99.16	93.53
4	109.16	93.40
5	118.96	95.39
6	128.13	99.39
7	136.24	105.23
8	142.94	112.66
9	147.93	121.33
10	149.74	127.00

Circle Center At X = 104.8 ; Y = 140.4 and Radius, 47.2

*** 1.087 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	90.28	98.77
3	100.25	98.00
4	110.25	97.68
5	120.25	97.82
6	130.23	98.42
7	140.17	99.47
8	150.06	100.98
9	159.86	102.94
10	169.57	105.35
11	179.15	108.20
12	188.60	111.48
13	197.88	115.20
14	206.99	119.33
15	215.89	123.88
16	224.58	128.83
17	233.04	134.18
18	241.23	139.90
19	241.36	140.00

Circle Center At X = 112.2 ; Y = 316.0 and Radius, 218.3

*** 1.103 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	99.10	98.08
3	109.04	96.98
4	119.04	96.71
5	129.02	97.28
6	138.92	98.67
7	148.67	100.88
8	158.21	103.90
9	167.46	107.70
10	176.36	112.26
11	184.85	117.54
12	192.87	123.51
13	200.37	130.13
14	207.29	137.34
15	211.07	142.00

Circle Center At X = 117.3 ; Y = 216.8 and Radius, 120.1

*** 1.127 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	108.02	98.03
3	117.94	96.81
4	127.93	96.35
5	137.93	96.65
6	147.87	97.71
7	157.71	99.52
8	167.38	102.07
9	176.83	105.34
10	186.00	109.33
11	194.84	114.00
12	203.30	119.32
13	211.34	125.28
14	218.90	131.83
15	225.94	138.93
16	226.85	140.00

Circle Center At X = 129.0 ; Y = 228.0 and Radius, 131.6

*** 1.150 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.57	100.00
2	63.34	97.88
3	73.24	96.41
4	83.20	95.61
5	93.20	95.47
6	103.19	95.99
7	113.12	97.18
8	122.95	99.03
9	132.63	101.52
10	142.13	104.65
11	151.39	108.41
12	160.39	112.78
13	169.08	117.73

14	177.42	123.25
15	185.37	129.31
16	192.90	135.89
17	193.60	136.59

Circle Center At X = 90.3 ; Y = 245.8 and Radius, 150.3

*** 1.159 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.69	96.60
3	108.69	96.79
4	117.96	100.53
5	125.29	107.33
6	129.71	116.30
7	130.06	120.04

Circle Center At X = 103.2 ; Y = 123.8 and Radius, 27.6

*** 1.181 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.50	100.00
2	71.55	95.74
3	81.14	92.92
4	91.06	91.63
5	101.05	91.88
6	110.89	93.67
7	120.33	96.97
8	129.15	101.69
9	137.13	107.71
10	144.09	114.89
11	149.85	123.07
12	151.79	127.00

Circle Center At X = 94.4 ; Y = 156.0 and Radius, 64.5

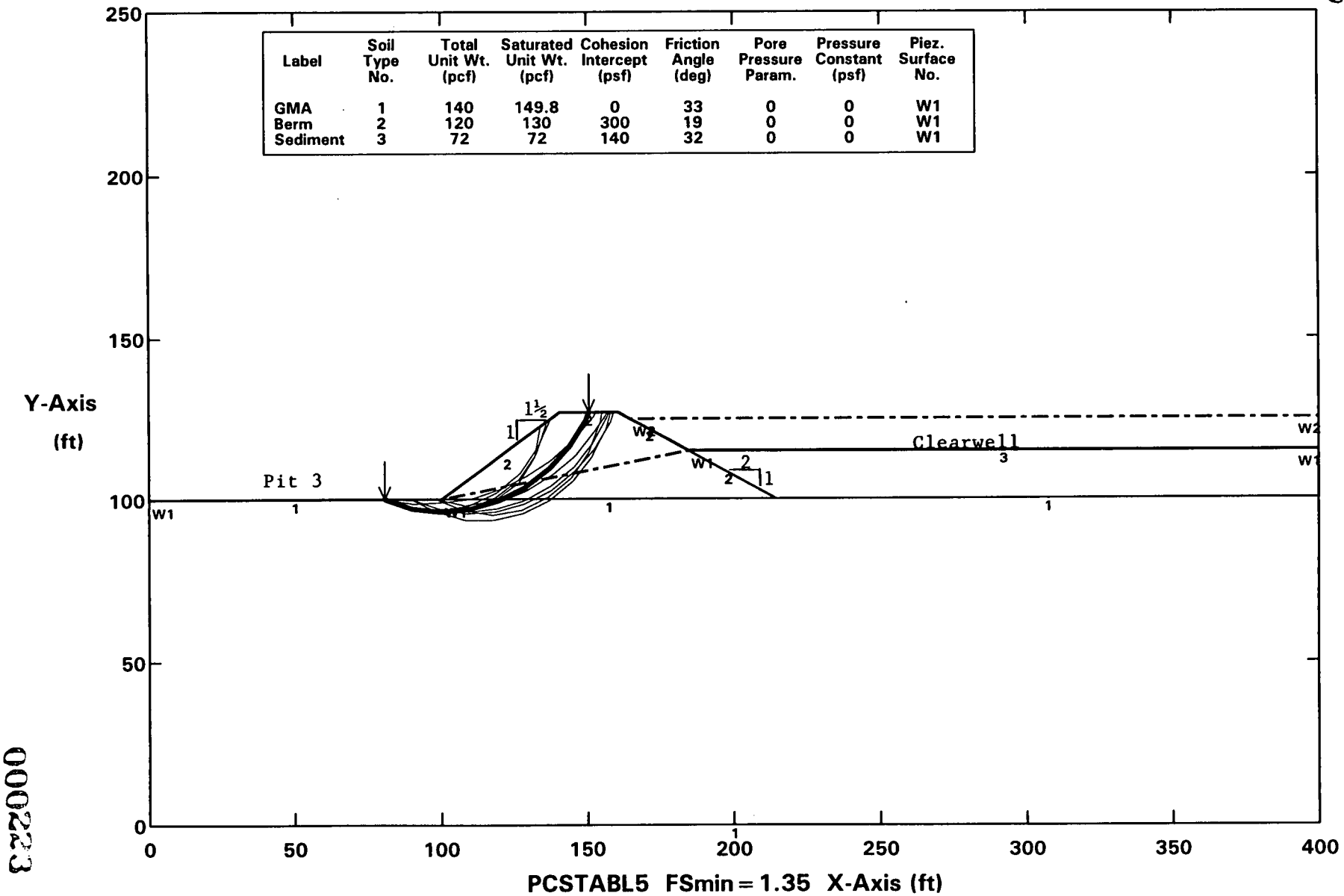
*** 1.183 ***

Figure E9 - Static Condition, Pit 3/Clearwell Berm Stability

Ten Most Critical. G:BERMP3CL.PLT By: LIN LIU 01-04-98 8:48am

Ck by DCW 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Sediment	3	72	72	140	32	0	0	W1



PCSTABL5 FSmin = 1.35 X-Axis (ft)

1484

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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-04-98
Time of Run: 8:48am
Run By: LIN LIU
Input Data Filename: G:BERMP3CL
Output Filename: G:BERMP3CL.OUT
Plotted Output Filename: G:BERMP3CL.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION Figure E9 - Static Condition, Pit 3/Clearwell Berm Stability

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	140.50	127.00	2
3	140.50	127.00	160.50	127.00	2
4	160.50	127.00	184.50	115.00	2
5	184.50	115.00	400.00	115.00	3
6	184.50	115.00	214.50	100.00	2
7	214.50	100.00	400.00	100.00	1
8	100.00	100.00	214.50	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	72.0	72.0	140.0	32.0	.00	.0	1

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2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	184.50	115.00
4	400.00	115.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	164.50	125.00
2	400.00	125.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 125.00 ft.

Each Surface Terminates Between X = 125.00 ft.
and X = 180.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	89.95	97.17
3	99.89	96.11
4	109.87	96.84
5	119.55	99.35
6	128.62	103.55
7	136.80	109.31
8	143.81	116.44
9	149.43	124.71
10	150.45	127.00

Circle Center At X = 100.8 ; Y = 151.7 and Radius, 55.6

*** 1.348 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	90.05	97.55
3	100.01	96.59
4	109.99	97.14
5	119.78	99.18
6	129.15	102.67
7	137.90	107.52
8	145.81	113.64
9	152.71	120.87
10	157.01	127.00

Circle Center At X = 101.4 ; Y = 162.9 and Radius, 66.4

*** 1.367 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	90.28	98.74
3	100.28	98.81
4	110.18	100.23
5	119.80	102.95
6	128.97	106.94
7	137.52	112.12
8	145.31	118.40
9	152.18	125.66
10	153.14	127.00

Circle Center At X = 94.7 ; Y = 173.2 and Radius, 74.5

*** 1.401 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.85	97.09
3	108.80	96.04
4	118.76	96.88
5	128.39	99.58
6	137.34	104.04
7	145.29	110.11
8	151.95	117.57
9	157.09	126.15
10	157.40	127.00

Circle Center At X = 109.4 ; Y = 148.9 and Radius, 52.9

*** 1.411 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	89.29	100.00
2	98.78	96.87
3	108.70	95.57
4	118.68	96.13
5	128.39	98.54
6	137.47	102.72
7	145.62	108.51
8	152.55	115.72
9	158.02	124.10
10	159.22	127.00

Circle Center At X = 110.7 ; Y = 149.0 and Radius, 53.5

*** 1.454 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.86	97.10
3	108.86	97.22
4	118.36	100.33
5	126.49	106.16
6	132.48	114.16
7	135.80	123.60
8	135.81	123.87

Circle Center At X = 103.5 ; Y = 129.7 and Radius, 32.9

*** 1.476 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	107.99	97.89
3	117.83	99.65
4	126.27	105.02
5	132.02	113.20
6	134.20	122.80

Circle Center At X = 108.5 ; Y = 123.7 and Radius, 25.8

*** 1.552 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	89.91	97.03
3	99.89	96.39
4	109.73	98.13
5	118.90	102.13
6	126.86	108.18
7	133.17	115.94
8	137.48	124.96
9	137.48	124.99

Circle Center At X = 97.6 ; Y = 138.5 and Radius, 42.1

*** 1.564 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.35	95.79
3	108.11	93.60
4	118.11	93.53
5	127.90	95.60
6	137.02	99.69
7	145.06	105.64
8	151.65	113.16
9	156.50	121.91
10	158.03	127.00

Circle Center At X = 113.4 ; Y = 140.0 and Radius, 46.8

*** 1.576 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00

2	107.53	96.35
3	117.46	95.20
4	127.36	96.62
5	136.57	100.52
6	144.47	106.65
7	150.56	114.58
8	154.41	123.81
9	154.86	127.00

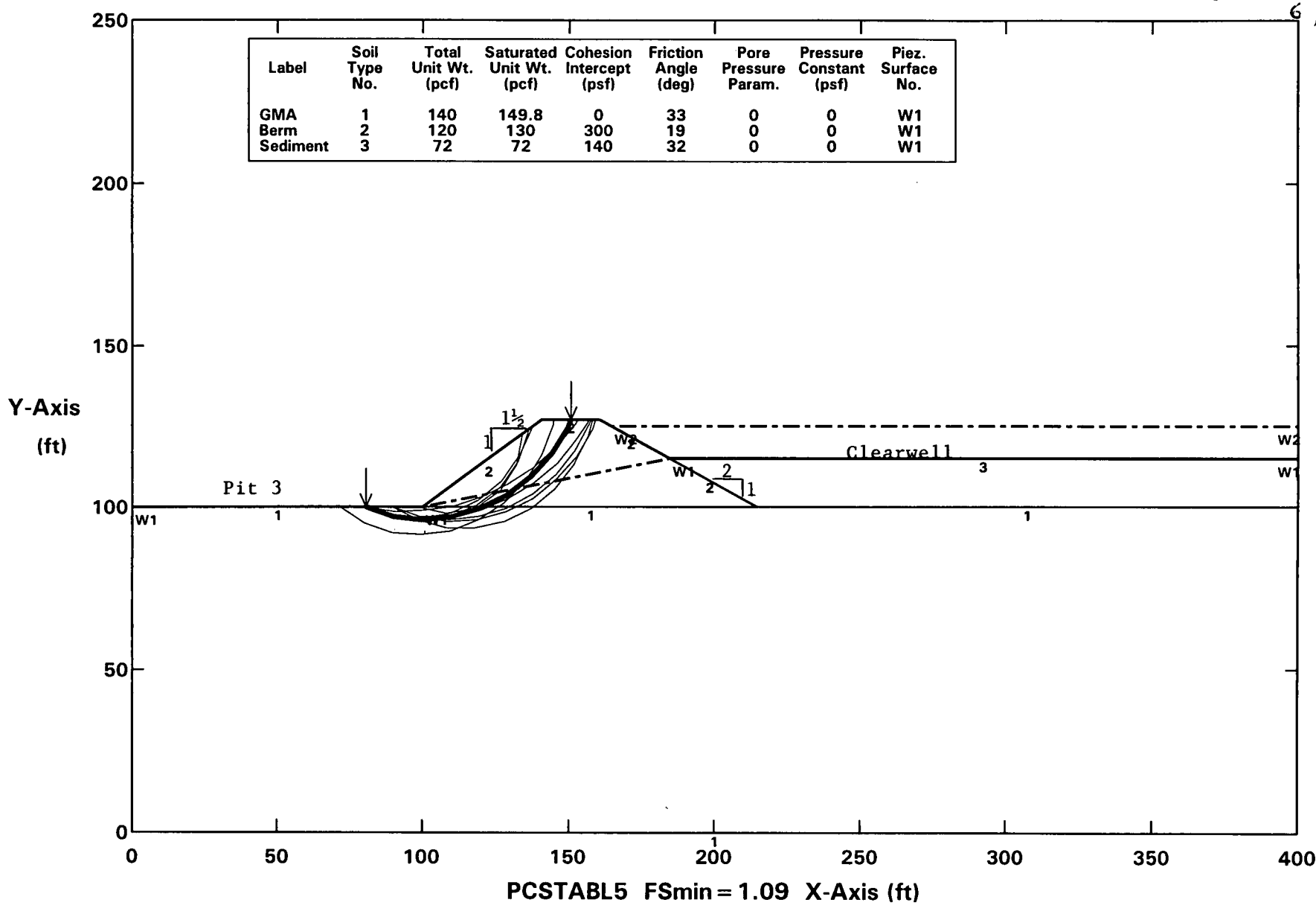
Circle Center At X = 116.9 ; Y = 134.1 and Radius, 38.9

*** 1.612 ***

Figure E10 - Seismic Condition, Pit 3/Clearwell Berm Stability

Ten Most Critical. G:BERMP3CE.PLT By: LIN LIU 01-04-98 8:50am ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Sediment	3	72	72	140	32	0	0	W1



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1484

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-04-98
Time of Run: 8:50am
Run By: LIN LIU
Input Data Filename: G:BERMP3CE
Output Filename: G:BERMP3CE.OUT
Plotted Output Filename: G:BERMP3CE.PLT

Ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure E10 - Seismic Condition, Pit 3/Clearwell Berm Stability

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	140.50	127.00	2
3	140.50	127.00	160.50	127.00	2
4	160.50	127.00	184.50	115.00	2
5	184.50	115.00	400.00	115.00	3
6	184.50	115.00	214.50	100.00	2
7	214.50	100.00	400.00	100.00	1
8	100.00	100.00	214.50	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	72.0	72.0	140.0	32.0	.00	.0	1

---

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	184.50	115.00
4	400.00	115.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	164.50	125.00
2	400.00	125.00

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 125.00 ft.

Each Surface Terminates Between X = 125.00 ft.
and X = 180.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	89.95	97.17
3	99.89	96.11
4	109.87	96.84
5	119.55	99.35
6	128.62	103.55
7	136.80	109.31
8	143.81	116.44
9	149.43	124.71
10	150.45	127.00

Circle Center At X = 100.8 ; Y = 151.7 and Radius, 55.6

*** 1.094 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	90.05	97.55
3	100.01	96.59
4	109.99	97.14
5	119.78	99.18
6	129.15	102.67

7	137.90	107.52
8	145.81	113.64
9	152.71	120.87
10	157.01	127.00

Circle Center At X = 101.4 ; Y = 162.9 and Radius, 66.4

*** 1.098 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.85	97.09
3	108.80	96.04
4	118.76	96.88
5	128.39	99.58
6	137.34	104.04
7	145.29	110.11
8	151.95	117.57
9	157.09	126.15
10	157.40	127.00

Circle Center At X = 109.4 ; Y = 148.9 and Radius, 52.9

*** 1.144 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	90.28	98.74
3	100.28	98.81
4	110.18	100.23
5	119.80	102.95
6	128.97	106.94
7	137.52	112.12
8	145.31	118.40
9	152.18	125.66
10	153.14	127.00

Circle Center At X = 94.7 ; Y = 173.2 and Radius, 74.5

*** 1.147 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.78	96.87
3	108.70	95.57
4	118.68	96.13
5	128.39	98.54
6	137.47	102.72
7	145.62	108.51
8	152.55	115.72
9	158.02	124.10
10	159.22	127.00

Circle Center At X = 110.7 ; Y = 149.0 and Radius, 53.5

*** 1.172 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.86	97.10
3	108.86	97.22
4	118.36	100.33
5	126.49	106.16
6	132.48	114.16
7	135.80	123.60
8	135.81	123.87

Circle Center At X = 103.5 ; Y = 129.7 and Radius, 32.9

*** 1.218 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00

2	89.91	97.03
3	99.89	96.39
4	109.73	98.13
5	118.90	102.13
6	126.86	108.18
7	133.17	115.94
8	137.48	124.96
9	137.48	124.99

Circle Center At X = 97.6 ; Y = 138.5 and Radius, 42.1

*** 1.266 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	98.35	95.79
3	108.11	93.60
4	118.11	93.53
5	127.90	95.60
6	137.02	99.69
7	145.06	105.64
8	151.65	113.16
9	156.50	121.91
10	158.03	127.00

Circle Center At X = 113.4 ; Y = 140.0 and Radius, 46.8

*** 1.273 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	80.15	95.10
3	89.70	92.15
4	99.66	91.26
5	109.59	92.48
6	119.03	95.76
7	127.58	100.94
8	134.86	107.81
9	140.53	116.04
10	144.34	125.29
11	144.65	127.00

Circle Center At X = 98.9 ; Y = 138.6 and Radius, 47.4

*** 1.296 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	107.99	97.89
3	117.83	99.65
4	126.27	105.02
5	132.02	113.20
6	134.20	122.80

Circle Center At X = 108.5 ; Y = 123.7 and Radius, 25.8

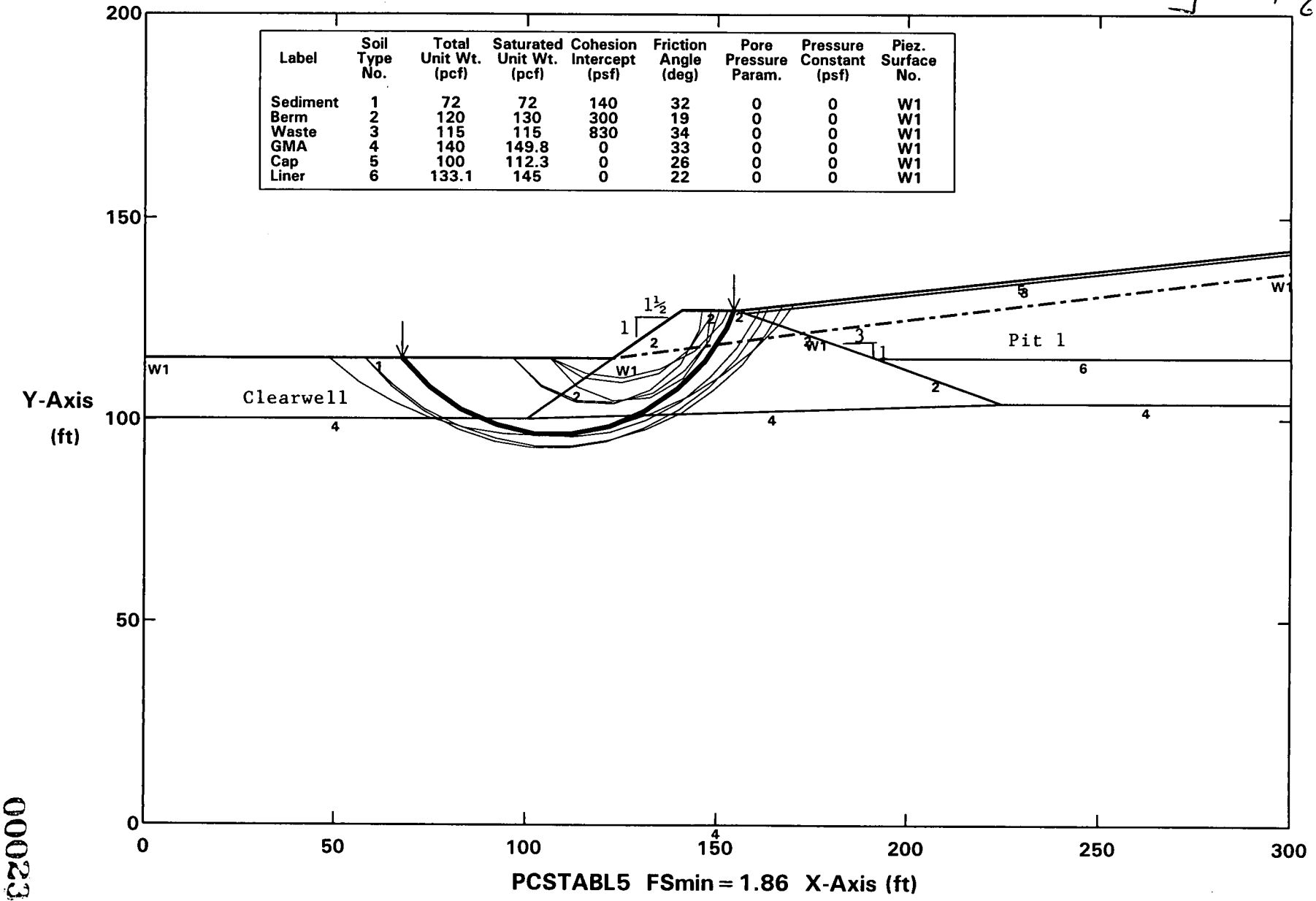
*** 1.301 ***

Figure E11 - Static Condition, Clearwell/Pit 1 Berm Stability

Ten Most Critical. G:BERMCL1.PLT By: LIN LIU 01-04-98 9:13am

CK by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sediment	1	72	72	140	32	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	115	115	830	34	0	0	W1
GMA	4	140	149.8	0	33	0	0	W1
Cap	5	100	112.3	0	26	0	0	W1
Liner	6	133.1	145	0	22	0	0	W1



PCSTABL5 FSmin = 1.86 X-Axis (ft)

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-04-98
Time of Run: 9:13am
Run By: LIN LIU CK by DCH 6/11/98
Input Data Filename: G:BERMCL1
Output Filename: G:BERMCL1.OUT
Plotted Output Filename: G:BERMCL1.PLT

PROBLEM DESCRIPTION Figure E11 - Static Condition, Clearwell/Pit 1 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	115.00	122.50	115.00	1
2	122.50	115.00	140.50	127.00	2
3	140.50	127.00	155.50	127.00	2
4	155.50	127.00	300.00	142.00	5
5	155.50	127.00	157.00	126.50	2
6	157.00	126.50	300.00	141.50	3
7	157.00	126.50	191.50	115.00	2
8	191.50	115.00	300.00	115.00	6
9	.00	100.00	100.00	100.00	4
10	100.00	100.00	122.50	115.00	2
11	191.50	115.00	224.50	104.00	2
12	100.00	100.00	224.50	104.00	4
13	224.50	104.00	300.00	104.00	4
14	.00	.00	300.00	.00	4

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	72.0	72.0	140.0	32.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	115.0	115.0	830.0	34.0	.00	.0	1
4	140.0	149.8	.0	33.0	.00	.0	1
5	100.0	112.3	.0	26.0	.00	.0	1
6	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	115.00
2	122.50	115.00
3	172.00	121.50
4	300.00	136.50

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 135.00 ft.

Each Surface Terminates Between X = 135.00 ft.
and X = 300.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.50	115.00
2	74.59	107.95
3	82.91	102.39
4	92.13	98.54
5	101.93	96.54
6	111.93	96.47
7	121.76	98.32
8	131.05	102.03
9	139.45	107.45
10	146.64	114.40
11	152.37	122.60
12	154.31	127.00

Circle Center At X = 107.3 ; Y = 147.9 and Radius, 51.7

*** 1.860 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.50	115.00
2	74.72	108.08
3	83.05	102.54
4	92.22	98.55
5	101.95	96.24
6	111.93	95.68
7	121.86	96.89
8	131.42	99.82
9	140.31	104.39
10	148.26	110.46
11	155.02	117.83
12	160.37	126.27
13	160.90	127.56

Circle Center At X = 110.1 ; Y = 152.2 and Radius, 56.6

*** 1.890 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.43	115.00
2	104.04	108.51
3	113.30	104.74
4	123.28	104.08
5	132.96	106.58
6	141.37	112.00
7	147.64	119.78
8	150.35	127.00

Circle Center At X = 120.4 ; Y = 135.4 and Radius, 31.4

*** 1.941 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.43	115.00
2	103.74	108.18
3	112.99	104.37
4	122.98	104.04
5	132.46	107.25
6	140.20	113.58
7	145.22	122.23
8	146.03	127.00

Circle Center At X = 118.9 ; Y = 131.8 and Radius, 28.0

*** 2.013 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.21	115.00
2	56.38	109.23

3	65.15	104.43
4	74.42	100.67
5	84.06	98.01
6	93.94	96.46
7	103.93	96.07
8	113.90	96.82
9	123.72	98.72
10	133.26	101.73
11	142.38	105.81
12	150.98	110.92
13	158.93	116.98
14	166.14	123.92
15	169.91	128.50

Circle Center At X = 102.4 ; Y = 182.9 and Radius, 86.9

*** 2.027 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.07	115.00
2	114.85	110.21
3	124.77	108.96
4	134.46	111.42
5	142.58	117.26
6	148.00	125.66
7	148.27	127.00

Circle Center At X = 123.1 ; Y = 135.8 and Radius, 26.9

*** 2.038 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.86	115.00
2	64.96	107.96
3	73.08	102.12
4	82.00	97.61
5	91.53	94.56
6	101.41	93.02
7	111.41	93.05
8	121.28	94.64
9	130.78	97.74

10	139.69	102.30
11	147.77	108.18
12	154.84	115.26
13	160.71	123.35
14	162.97	127.78

Circle Center At X = 106.2 ; Y = 156.7 and Radius, 63.9

*** 2.065 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.86	115.00
2	65.19	108.20
3	73.43	102.54
4	82.42	98.15
5	91.95	95.13
6	101.82	93.54
7	111.82	93.40
8	121.73	94.74
9	131.34	97.51
10	140.44	101.66
11	148.83	107.10
12	156.34	113.71
13	162.79	121.34
14	167.04	128.20

Circle Center At X = 107.7 ; Y = 161.4 and Radius, 68.1

*** 2.070 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.07	115.00
2	113.15	107.93
3	122.55	104.52
4	132.51	105.41
5	141.16	110.44
6	146.87	118.65
7	148.30	127.00

Circle Center At X = 125.5 ; Y = 127.4 and Radius, 23.1

*** 2.079 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.07	115.00
2	115.35	111.26
3	125.31	110.35
4	135.10	112.36
5	143.90	117.10
6	150.97	124.19
7	152.47	127.00

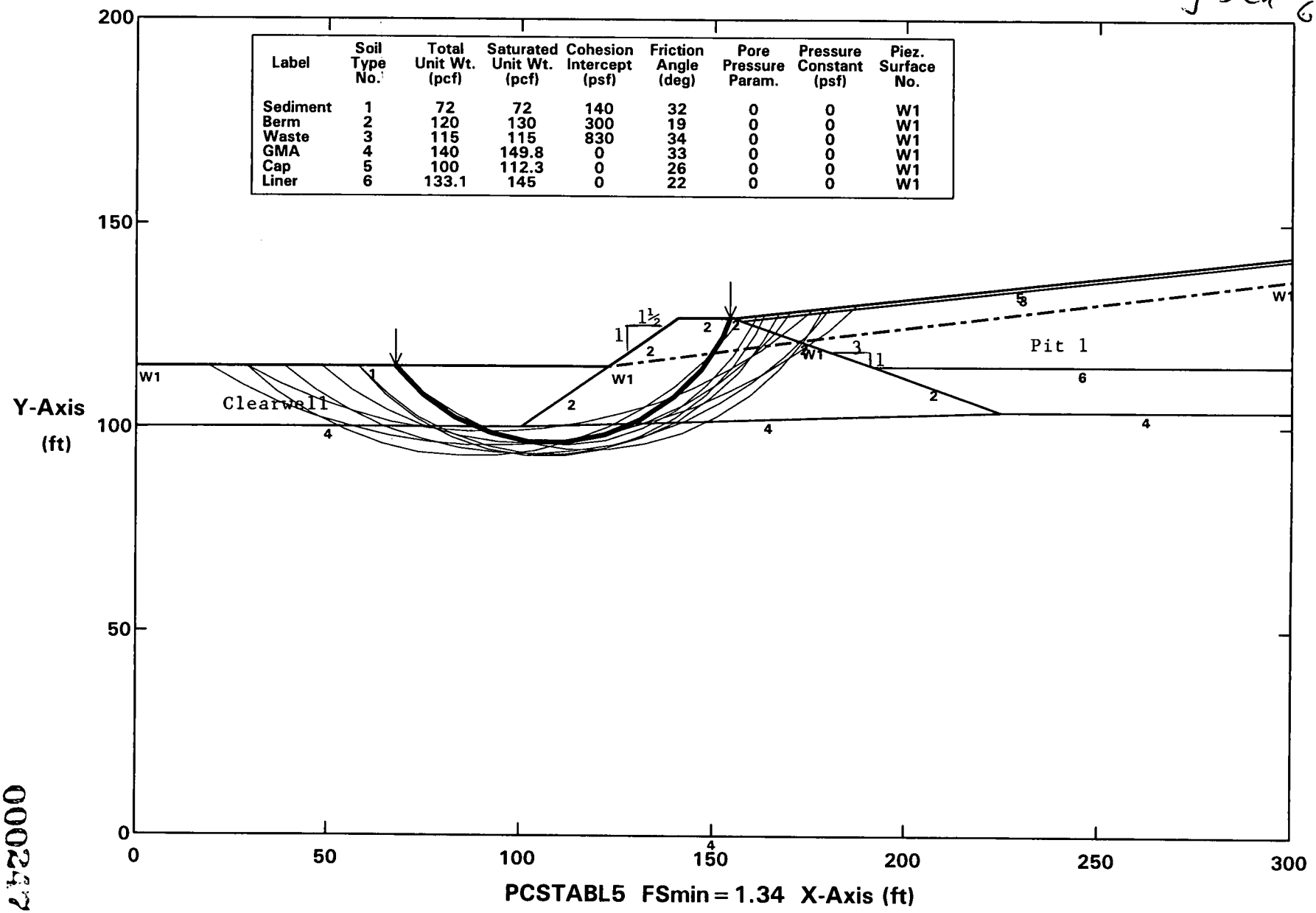
Circle Center At X = 123.4 ; Y = 144.6 and Radius, 34.3

*** 2.110 ***

Figure E12 - Seismic Condition, Clearwell/Pit 1 Berm Stability

Ten Most Critical. G:BERMCL1E.PLT By: LIN LIU 01-04-98 9:16am ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sediment	1	72	72	140	32	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	115	115	830	34	0	0	W1
GMA	4	140	149.8	0	33	0	0	W1
Cap	5	100	112.3	0	26	0	0	W1
Liner	6	133.1	145	0	22	0	0	W1



PCSTABL5 FSmin = 1.34 X-Axis (ft)

** PCSTABL5 **

1484

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-04-98
Time of Run: 9:16am
Run By: LIN LIU
Input Data Filename: G:BERMCL1E
Output Filename: G:BERMCL1E.OUT
Plotted Output Filename: G:BERMCL1E.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION Figure E12 - Seismic Condition, Clearwell/Pit 1 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	115.00	122.50	115.00	1
2	122.50	115.00	140.50	127.00	2
3	140.50	127.00	155.50	127.00	2
4	155.50	127.00	300.00	142.00	5
5	155.50	127.00	157.00	126.50	2
6	157.00	126.50	300.00	141.50	3
7	157.00	126.50	191.50	115.00	2
8	191.50	115.00	300.00	115.00	6
9	.00	100.00	100.00	100.00	4
10	100.00	100.00	122.50	115.00	2
11	191.50	115.00	224.50	104.00	2
12	100.00	100.00	224.50	104.00	4
13	224.50	104.00	300.00	104.00	4
14	.00	.00	300.00	.00	4

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	72.0	72.0	140.0	32.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	115.0	115.0	830.0	34.0	.00	.0	1
4	140.0	149.8	.0	33.0	.00	.0	1
5	100.0	112.3	.0	26.0	.00	.0	1
6	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	115.00
2	122.50	115.00
3	172.00	121.50
4	300.00	136.50

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 135.00 ft.

Each Surface Terminates Between X = 135.00 ft.
and X = 300.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.50	115.00
2	74.59	107.95
3	82.91	102.39
4	92.13	98.54
5	101.93	96.54
6	111.93	96.47
7	121.76	98.32
8	131.05	102.03
9	139.45	107.45
10	146.64	114.40
11	152.37	122.60
12	154.31	127.00

Circle Center At X = 107.3 ; Y = 147.9 and Radius, 51.7

*** 1.340 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.21	115.00
2	56.38	109.23
3	65.15	104.43
4	74.42	100.67
5	84.06	98.01
6	93.94	96.46
7	103.93	96.07

8	113.90	96.82
9	123.72	98.72
10	133.26	101.73
11	142.38	105.81
12	150.98	110.92
13	158.93	116.98
14	166.14	123.92
15	169.91	128.50

Circle Center At X = 102.4 ; Y = 182.9 and Radius, 86.9

*** 1.346 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.50	115.00
2	74.72	108.08
3	83.05	102.54
4	92.22	98.55
5	101.95	96.24
6	111.93	95.68
7	121.86	96.89
8	131.42	99.82
9	140.31	104.39
10	148.26	110.46
11	155.02	117.83
12	160.37	126.27
13	160.90	127.56

Circle Center At X = 110.1 ; Y = 152.2 and Radius, 56.6

*** 1.351 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.86	115.00
2	65.19	108.20
3	73.43	102.54
4	82.42	98.15
5	91.95	95.13
6	101.82	93.54
7	111.82	93.40
8	121.73	94.74

9	131.34	97.51
10	140.44	101.66
11	148.83	107.10
12	156.34	113.71
13	162.79	121.34
14	167.04	128.20

Circle Center At X = 107.7 ; Y = 161.4 and Radius, 68.1

*** 1.418 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.86	115.00
2	64.96	107.96
3	73.08	102.12
4	82.00	97.61
5	91.53	94.56
6	101.41	93.02
7	111.41	93.05
8	121.28	94.64
9	130.78	97.74
10	139.69	102.30
11	147.77	108.18
12	154.84	115.26
13	160.71	123.35
14	162.97	127.78

Circle Center At X = 106.2 ; Y = 156.7 and Radius, 63.9

*** 1.421 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	38.57	115.00
2	46.75	109.24
3	55.45	104.31
4	64.58	100.24
5	74.07	97.08
6	83.82	94.86
7	93.74	93.59
8	103.74	93.30
9	113.71	93.97

10	123.58	95.61
11	133.24	98.20
12	142.60	101.72
13	151.57	106.13
14	160.08	111.38
15	168.03	117.44
16	175.36	124.25
17	180.06	129.55

Circle Center At X = 101.8 ; Y = 196.1 and Radius, 102.9

*** 1.463 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.93	115.00
2	37.88	110.53
3	47.14	106.76
4	56.66	103.70
5	66.39	101.38
6	76.26	99.81
7	86.23	99.00
8	96.23	98.94
9	106.20	99.66
10	116.09	101.12
11	125.84	103.34
12	135.40	106.30
13	144.70	109.97
14	153.69	114.35
15	162.32	119.40
16	170.55	125.09
17	175.46	129.07

Circle Center At X = 91.9 ; Y = 229.9 and Radius, 131.0

*** 1.477 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	19.29	115.00
2	28.13	110.34
3	37.27	106.28
4	46.67	102.86

5	56.28	100.08
6	66.05	97.95
7	75.94	96.50
8	85.91	95.71
9	95.91	95.60
10	105.89	96.17
11	115.82	97.41
12	125.63	99.32
13	135.29	101.89
14	144.76	105.11
15	153.99	108.97
16	162.94	113.43
17	171.56	118.50
18	179.82	124.13
19	187.68	130.32
20	187.71	130.34

Circle Center At X = 92.5 ; Y = 243.2 and Radius, 147.7

*** 1.489 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.93	115.00
2	36.76	108.78
3	45.24	103.49
4	54.28	99.20
5	63.74	95.96
6	73.51	93.83
7	83.46	92.82
8	93.46	92.94
9	103.38	94.21
10	113.09	96.59
11	122.47	100.07
12	131.39	104.59
13	139.73	110.09
14	147.40	116.51
15	154.29	123.76
16	156.84	127.14

Circle Center At X = 87.3 ; Y = 180.5 and Radius, 87.7

*** 1.491 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.50	115.00
2	75.09	108.49
3	83.52	103.10
4	92.62	98.96
5	102.21	96.12
6	112.10	94.67
7	122.10	94.61
8	132.01	95.96
9	141.63	98.69
10	150.77	102.74
11	159.26	108.03
12	166.92	114.46
13	173.60	121.90
14	178.64	129.40

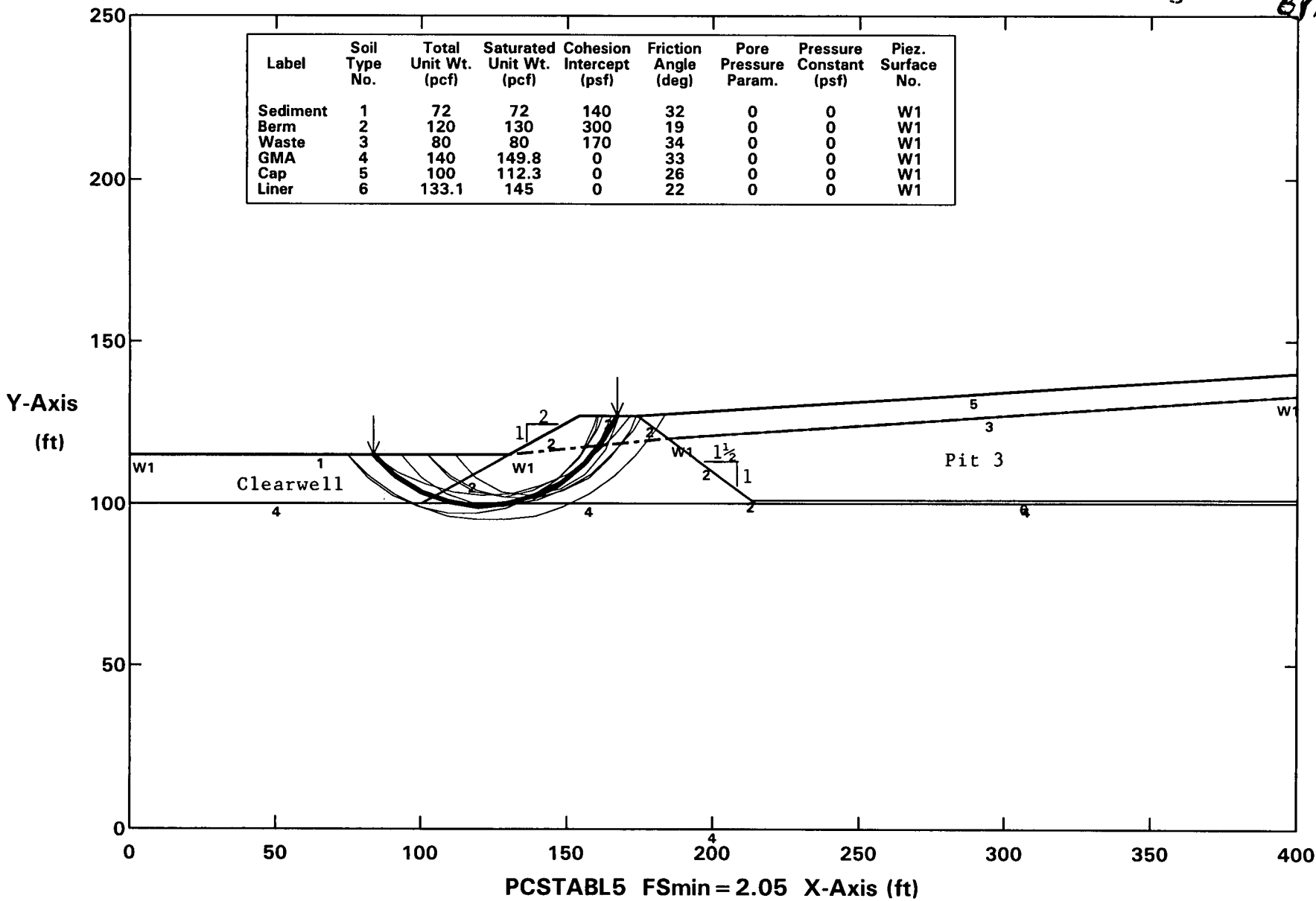
Circle Center At X = 117.5 ; Y = 165.6 and Radius, 71.1

*** 1.494 ***

Figure 13 - Static Condition, Clearwell/Pit 3 Berm Stability

Ten Most Critical. G:BERMCL3.PLT By: LIN LIU 01-04-98 9:36am ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sediment	1	72	72	140	32	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	80	80	170	34	0	0	W1
GMA	4	140	149.8	0	33	0	0	W1
Cap	5	100	112.3	0	26	0	0	W1
Liner	6	133.1	145	0	22	0	0	W1



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1484

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-04-98
Time of Run:	9:36am
Run By:	LIN LIU
Input Data Filename:	G:BERMCL3
Output Filename:	G:BERMCL3.OUT
Plotted Output Filename:	G:BERMCL3.PLT

ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure 13 - Static Condition, Clearwell/Pit 3 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	115.00	130.00	115.00	1
2	130.00	115.00	154.00	127.00	2
3	154.00	127.00	174.00	127.00	2
4	174.00	127.00	400.00	140.00	5
5	174.00	127.00	184.50	120.00	2
6	184.50	120.00	400.00	133.00	3
7	184.50	120.00	213.00	101.00	2
8	213.00	101.00	400.00	101.00	6
9	.00	100.00	100.00	100.00	4
10	100.00	100.00	130.00	115.00	2
11	213.00	101.00	214.50	100.00	2
12	100.00	100.00	214.50	100.00	4
13	214.50	100.00	400.00	100.00	4
14	.00	.00	400.00	.00	4

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	72.0	72.0	140.0	32.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	80.0	80.0	170.0	34.0	.00	.0	1
4	140.0	149.8	.0	33.0	.00	.0	1
5	100.0	112.3	.0	26.0	.00	.0	1
6	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	115.00
2	130.00	115.00
3	184.50	120.00
4	400.00	133.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 130.00 ft.

Each Surface Terminates Between X = 130.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	115.00
2	91.18	108.51
3	99.89	103.60
4	109.38	100.43
5	119.29	99.14
6	129.27	99.76
7	138.95	102.28
8	147.97	106.60
9	156.00	112.56
10	162.74	119.94
11	167.05	127.00

Circle Center At X = 121.0 ; Y = 151.2 and Radius, 52.1

*** 2.051 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	115.00
2	91.51	108.91
3	100.33	104.21
4	109.81	101.01
5	119.68	99.41
6	129.68	99.45
7	139.54	101.13
8	148.99	104.39
9	157.78	109.16
10	165.66	115.31
11	172.44	122.67
12	175.33	127.08

Circle Center At X = 124.4 ; Y = 160.1 and Radius, 60.8

*** 2.058 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	115.00
2	99.94	107.94
3	108.50	102.77
4	118.04	99.78
5	128.02	99.15
6	137.86	100.91
7	147.00	104.96
8	154.92	111.07
9	161.15	118.89
10	164.89	127.00

Circle Center At X = 125.6 ; Y = 140.8 and Radius, 41.7

*** 2.083 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.29	115.00
2	81.51	108.08
3	89.89	102.64
4	99.16	98.86
5	108.96	96.89
6	118.96	96.80
7	128.80	98.58
8	138.13	102.17
9	146.63	107.45
10	153.98	114.23
11	159.93	122.26
12	162.21	127.00

Circle Center At X = 114.5 ; Y = 149.7 and Radius, 53.1

*** 2.093 ***

Failure Surface Specified By 10 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	102.14	115.00
2	109.86	108.64
3	118.80	104.17
4	128.53	101.83
5	138.53	101.74
6	148.29	103.91
7	157.32	108.21
8	165.14	114.44
9	171.37	122.26
10	173.62	127.00

Circle Center At X = 133.9 ; Y = 145.7 and Radius, 44.2

*** 2.132 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	115.00
2	99.94	107.94
3	108.58	102.91
4	118.22	100.24
5	128.22	100.10
6	137.92	102.51
7	146.70	107.30
8	153.98	114.16
9	159.27	122.64
10	160.63	127.00

Circle Center At X = 123.8 ; Y = 138.9 and Radius, 39.1

*** 2.162 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.14	115.00
2	109.40	108.12
3	118.38	103.73
4	128.27	102.23
5	138.15	103.77
6	147.12	108.19
7	154.34	115.11

8	159.16	123.87
9	159.79	127.00

Circle Center At X = 128.2 ; Y = 135.2 and Radius, 33.0

*** 2.182 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.29	115.00
2	81.87	108.49
3	90.31	103.11
4	99.41	98.98
5	109.01	96.18
6	118.91	94.76
7	128.91	94.76
8	138.81	96.17
9	148.42	98.96
10	157.53	103.08
11	165.96	108.45
12	173.56	114.96
13	180.16	122.47
14	183.47	127.55

Circle Center At X = 123.9 ; Y = 165.2 and Radius, 70.6

*** 2.182 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	115.00
2	92.06	109.72
3	101.28	105.83
4	110.98	103.42
5	120.94	102.55
6	130.92	103.24
7	140.67	105.48
8	149.94	109.22
9	158.53	114.35
10	166.21	120.75
11	171.67	127.00

Circle Center At X = 121.5 ; Y = 166.5 and Radius, 64.0

*** 2.191 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.43	115.00
2	118.59	108.02
3	127.59	103.66
4	137.51	102.36
5	147.33	104.25
6	156.05	109.14
7	162.78	116.54
8	166.84	125.68
9	166.97	127.00

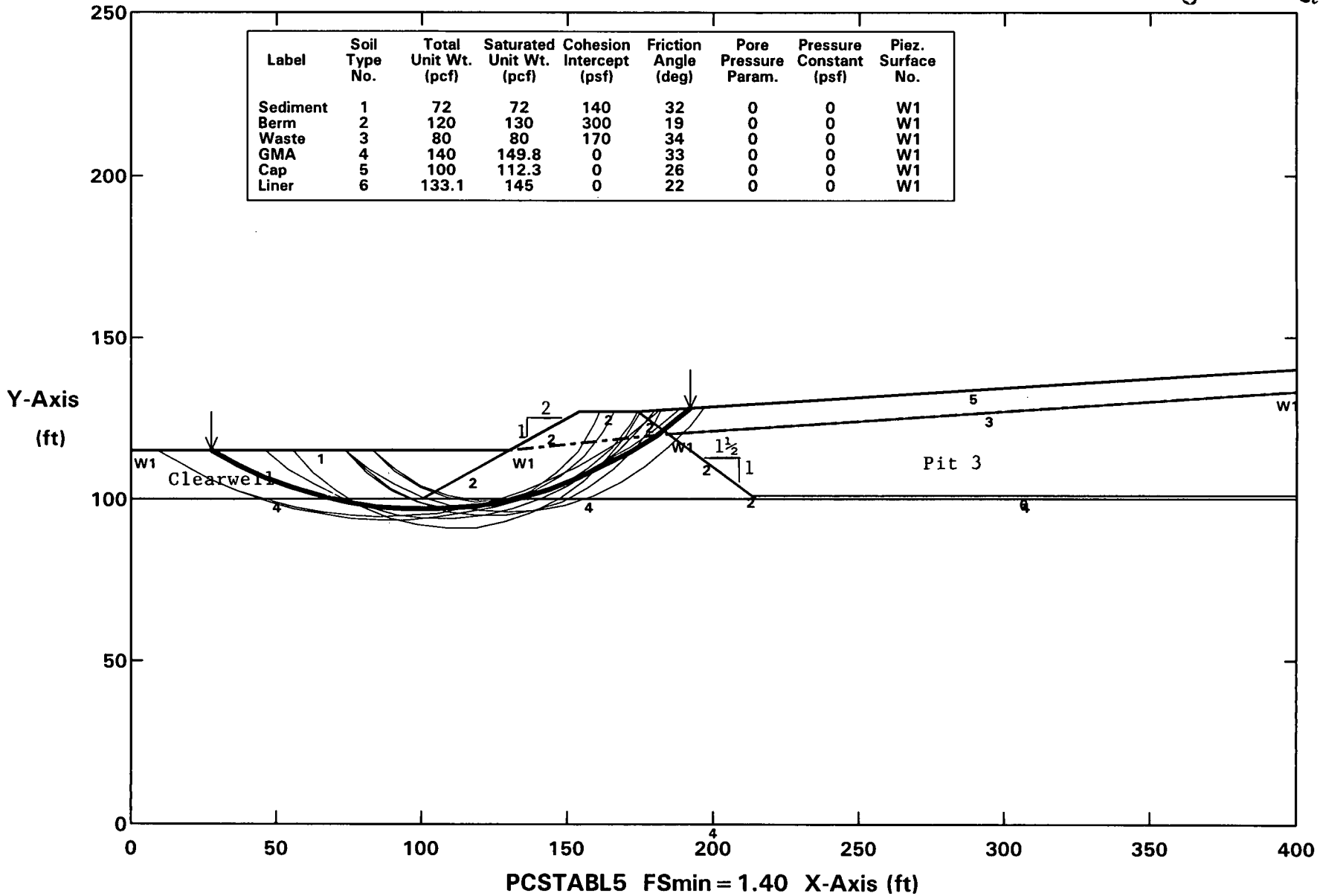
Circle Center At X = 136.6 ; Y = 133.6 and Radius, 31.3

*** 2.220 ***

Figure 14 - Seismic Condition, Clearwell/Pit 3 Berm Stability

Ten Most Critical. G:BERMCL3E.PLT By: LIN LIU 01-04-98 9:51am CK by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Sediment	1	72	72	140	32	0	0	W1
Berm	2	120	130	300	19	0	0	W1
Waste	3	80	80	170	34	0	0	W1
GMA	4	140	149.8	0	33	0	0	W1
Cap	5	100	112.3	0	26	0	0	W1
Liner	6	133.1	145	0	22	0	0	W1



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1484

** PCSTABL5 **

by
Purdue University

1484

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-04-98
Time of Run:	9:51am
Run By:	LIN LIU
Input Data Filename:	G:BERMCL3E
Output Filename:	G:BERMCL3E.OUT
Plotted Output Filename:	G:BERMCL3E.PLT

ck by DCH 6/1/98

PROBLEM DESCRIPTION Figure 14 - Seismic Condition, Clearwell/Pit 3 Berm Stability

BOUNDARY COORDINATES

4 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	115.00	130.00	115.00	1
2	130.00	115.00	154.00	127.00	2
3	154.00	127.00	174.00	127.00	2
4	174.00	127.00	400.00	140.00	5
5	174.00	127.00	184.50	120.00	2
6	184.50	120.00	400.00	133.00	3
7	184.50	120.00	213.00	101.00	2
8	213.00	101.00	400.00	101.00	6
9	.00	100.00	100.00	100.00	4
10	100.00	100.00	130.00	115.00	2
11	213.00	101.00	214.50	100.00	2
12	100.00	100.00	214.50	100.00	4
13	214.50	100.00	400.00	100.00	4
14	.00	.00	400.00	.00	4

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	72.0	72.0	140.0	32.0	.00	.0	1
2	120.0	130.0	300.0	19.0	.00	.0	1
3	80.0	80.0	170.0	34.0	.00	.0	1
4	140.0	149.8	.0	33.0	.00	.0	1
5	100.0	112.3	.0	26.0	.00	.0	1
6	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	115.00
2	130.00	115.00
3	184.50	120.00
4	400.00	133.00

A Horizontal Earthquake Loading Coefficient
Of .100 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 129.00 ft.

Each Surface Terminates Between X = 129.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.64	115.00
2	36.59	110.53
3	45.81	106.66
4	55.27	103.41
5	64.92	100.78
6	74.72	98.80
7	84.63	97.47
8	94.61	96.79
9	104.61	96.77
10	114.58	97.41
11	124.50	98.70
12	134.31	100.64
13	143.97	103.23
14	153.44	106.44
15	162.68	110.28
16	171.64	114.71
17	180.29	119.72
18	188.60	125.29
19	192.17	128.05

Circle Center At X = 99.9 ; Y = 248.5 and Radius, 151.8

*** 1.395 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	46.07	115.00
2	54.24	109.23
3	62.95	104.32
4	72.12	100.32
5	81.64	97.28
6	91.43	95.23
7	101.38	94.19
8	111.38	94.17
9	121.33	95.17
10	131.12	97.18
11	140.66	100.18
12	149.84	104.14
13	158.58	109.01
14	166.77	114.75
15	174.33	121.29
16	180.02	127.35

Circle Center At X = 106.6 ; Y = 191.9 and Radius, 97.9

*** 1.414 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.93	115.00
2	90.86	108.91
3	99.69	104.22
4	109.18	101.05
5	119.05	99.48
6	129.05	99.57
7	138.90	101.31
8	148.33	104.65
9	157.08	109.49
10	164.90	115.72
11	171.59	123.15
12	174.05	127.00

Circle Center At X = 123.5 ; Y = 159.7 and Radius, 60.4

*** 1.453 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.71	115.00

2	81.30	108.49
3	89.74	103.12
4	98.86	99.01
5	108.46	96.24
6	118.37	94.86
7	128.37	94.90
8	138.26	96.37
9	147.84	99.23
10	156.92	103.42
11	165.31	108.86
12	172.84	115.45
13	179.36	123.03
14	182.19	127.47

Circle Center At X = 123.1 ; Y = 164.8 and Radius, 70.1

*** 1.467 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.71	115.00
2	80.93	108.08
3	89.33	102.65
4	98.60	98.90
5	108.42	96.98
6	118.42	96.94
7	128.24	98.79
8	137.54	102.46
9	145.98	107.83
10	153.26	114.69
11	159.10	122.80
12	161.05	127.00

Circle Center At X = 113.6 ; Y = 149.4 and Radius, 52.7

*** 1.467 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.93	115.00
2	90.54	108.51
3	99.25	103.61
4	108.75	100.47

5	118.67	99.22
6	128.65	99.91
7	138.31	102.50
8	147.29	106.90
9	155.25	112.94
10	161.91	120.41
11	165.81	127.00

Circle Center At X = 120.1 ; Y = 150.9 and Radius, 51.7

*** 1.477 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	9.21	115.00
2	18.03	110.29
3	27.13	106.13
4	36.47	102.55
5	46.01	99.56
6	55.72	97.17
7	65.56	95.38
8	75.49	94.22
9	85.48	93.67
10	95.47	93.75
11	105.45	94.45
12	115.36	95.77
13	125.17	97.70
14	134.85	100.24
15	144.34	103.38
16	153.62	107.10
17	162.65	111.40
18	171.40	116.24
19	179.83	121.63
20	187.90	127.52
21	188.26	127.82

Circle Center At X = 89.2 ; Y = 254.1 and Radius, 160.5

*** 1.482 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	9.21	115.00

2	18.05	110.31
3	27.17	106.21
4	36.53	102.70
5	46.10	99.80
6	55.84	97.53
7	65.70	95.89
8	75.65	94.88
9	85.65	94.53
10	95.64	94.82
11	105.60	95.75
12	115.48	97.32
13	125.23	99.53
14	134.82	102.36
15	144.21	105.81
16	153.35	109.85
17	162.22	114.48
18	170.77	119.66
19	178.96	125.39
20	181.52	127.43

Circle Center At X = 86.2 ; Y = 249.4 and Radius, 154.9

*** 1.499 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.29	115.00
2	62.56	108.14
3	70.68	102.30
4	79.49	97.57
5	88.85	94.06
6	98.60	91.81
7	108.55	90.86
8	118.54	91.24
9	128.40	92.93
10	137.95	95.91
11	147.02	100.12
12	155.45	105.49
13	163.11	111.92
14	169.84	119.31
15	175.23	127.07

Circle Center At X = 110.7 ; Y = 166.5 and Radius, 75.6

*** 1.529 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.71	115.00
2	81.88	109.22
3	90.64	104.41
4	99.90	100.62
5	109.52	97.90
6	119.39	96.29
7	129.38	95.81
8	139.36	96.46
9	149.20	98.24
10	158.77	101.12
11	167.96	105.07
12	176.64	110.03
13	184.71	115.94
14	192.05	122.73
15	196.85	128.31

Circle Center At X = 128.6 ; Y = 183.9 and Radius, 88.1

*** 1.532 ***

APPENDIX
F

APPENDIX F

WASTE SLOPE STABILITY ANALYSES

Summary of Waste Slope Stability Analyses

pit ID \ slope	5H : 1V	$4^1/_2$H:1V	4H : 1V	$3^1/_2$H:1V	3H : 1V	$2^1/_2$H:1V	2H : 1V	$1^1/_2$H:1V
Waste Pit 1	--	--	--	--	--	FS=1.33	**FS=1.20**	--
Waste Pit 2	--	--	--	--	--	FS=1.29	**FS=1.24**	FS=1.01
Waste Pit 3	--	--	--	--	**FS=1.28**	FS=1.15	--	--
Waste Pit 4	--	--	--	--	--	**FS=1.33**	FS=1.18	---
Waste Pit 5	FS=1.59	FS=1.45	**FS=1.32**	FS=1.19	--	--	--	--
Waste Pit 6	--	--	--	--	--	**FS=1.41**	FS=1.17	--
Burn Pit	--	--	--	--	--	FS=1.61	**FS=1.38**	FS=1.17
Clearwell	--	--	--	--	**FS=1.48**	FS=1.18	--	--

REFERENCE: "TECHNICAL SUMMARY OF DEEP TEST DATA" REPORT, BY PARSONS.

Table G1 - Soil Parameters for Drained and Undrained Conditions

Soil Parameters							
				Total Stress		Effective Stress	
Soil Layer Number	Soil Type	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
1	Clay Liner	133.1	145.0	0.0	22.0	0.0	22.0
2	Pit 3 Waste	81.2	85.2	50.0	13.0	0.0	28.0
3	Cap	100.0	112.3	0.0	26.0	0.0	26.0
4	Berm	120.0	130.0	300.0	19.0	300.0	19.0
5	GMA	140.0	149.8	0.0	33.0	0.0	33.0

REFERENCE: "FDF SUBCONTRACT NO. 985C000001"

TABLE J.2-2

SUMMARY OF GEOTECHNICAL DATA BY WASTE PIT (In-Situ Conditions)

Note: See Table C.5-1 for data reference sources

Parameters	Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6	Burn Pit	* Clearwell	Soil Below Pits[1]
Wet Density (lb/ft^3)	114.5	82.7	80.0	131.7	71.75	148.2	121.2	103.7 (72)*	140.5
Average Moisture Content (w)(percent Dry Basis)	46	156.9	183.5	29.1	393.4	18.4	30.6	58.8	15
Moisture Content Range (percent wet basis)	14.7 - 47.6	14.3 - 76.0	15.2 - 72.9	9.2 - 38.1	35.9 - 91.9	10.1 - 81.0	20.3 - 23.1	12.2 - 42.5	
Optimum Moisture Content Goal (from Compaction Test) (percent)	13	14	26	13	36	9	20	20	15
Major Types of Waste (USCS Group Name)	ML (low plasticity silt), ML (NP) (non-plastic), GC (clayey gravel with sand)	ML (NP), MH (high plasticity silt), SM (silty sand), SC (clayey sand with gravel), CL (clay)	SM, MH, ML, CL	CL, ML (NP), ML	MH, ML, ML (NP)	ML (NP), SM, ML, MH	CL, MH, SM	CL, ML, SM	CL, ML
Average Specific Gravity of Solids	2.98	2.71	2.66	3.12	2.8	3.18	2.76	2.74	2.78
Percentage of Material Less Than 200 Mesh (percent Silt and Clay)	46 - 96	15 - 99	43 - 96	55 - 94	68 - 100	46 - 96	36 - 59	45 - 77	36 - 55
Undrained Internal Friction Angle (deg)	19 - 23 (21°)[1]	18 (18°)	13 - 24 (18°)[1]	NA (21°)[2]	15 (15°)	NA (21°)[2]	NA (21°)[2]	NA (15°)*	16 - 26
Cohesion (psi) Drained	4.9 - 6.7 (830 psf)[1]	1.7 (240 psf)	0 - 2.4 (170 psf)[1]	NA	1.0 (140 psf)	NA	NA	NA (140 psf)*	0 - 7.8
Drained Internal Friction Angle (deg)	30 - 39 (34°)[1]	36 (36°)	28 - 40 (34°)[1]	NA	32 (32°)	NA	NA	NA (32°)*	27 - 44
Cohesion (psi) Undrained	0 - 3.3 (240 psf)[1]	0.9 (130 psf)	0.0 - 1.6 (115 psf)[1]	NA (240 psf)[2]	0.7 (100 psf)	NA (240 psf)[2]	NA (240 psf)[2]	NA (100 psf)*	0 - 4.0

NA = Not Available
w = Moisture Content
[1] = Soils Data inferred from borings at similar depths and soil conditions at other on-site locations (i.e., new on-site cell location).

NOTES: 1. AVERAGE VALUE IS USED. 2. USE SAME VALUES AS IN WASTE PIT #1.

* CLEARWELL IS ASSUMED TO HAVE SAME PROPERTIES AS WASTE PIT #5.

000276

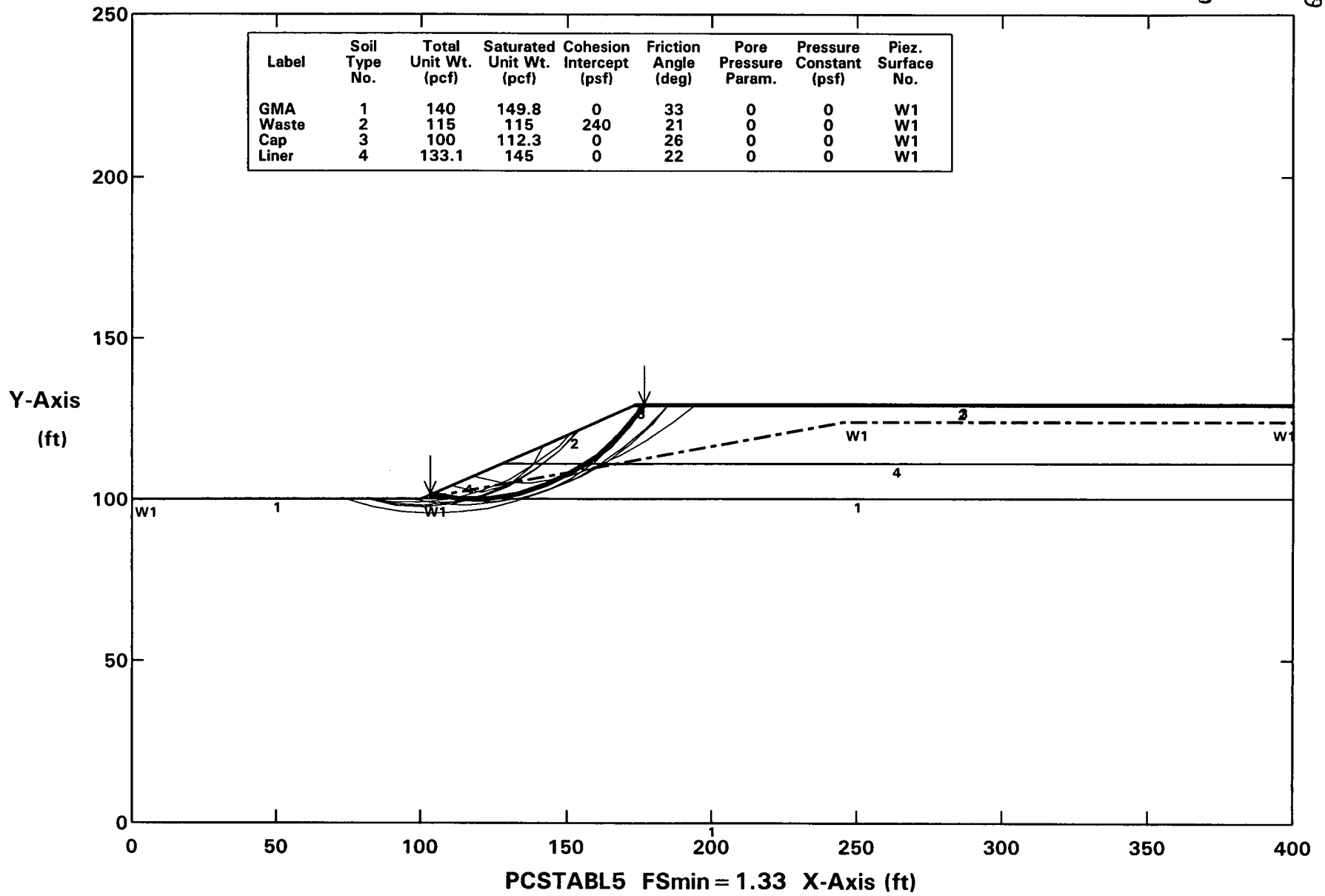
FDF Subcontract 985C000001

1484

WPRAP Waste Stability - Waste Pit 1 Waste Slope - 2.5H to 1V

Ten Most Critical. G:WASTE125.PLT By: LIN LIU 01-02-98 4:58pm ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	115	115	240	21	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 4:58pm
Run By: LIN LIU CK by DCH 6/1/98
Input Data Filename: G:WASTE125
Output Filename: G:WASTE125.OUT
Plotted Output Filename: G:WASTE125.PLT

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 1
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	127.50	111.00	4
3	127.50	111.00	172.50	129.00	2
4	172.50	129.00	173.75	129.50	3
5	173.75	129.50	400.00	129.50	3
6	172.50	129.00	400.00	129.00	2
7	127.50	111.00	400.00	111.00	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	115.0	115.0	240.0	21.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	245.00	124.00
4	400.00	124.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	113.09	100.06
3	123.09	100.20
4	132.98	101.67
5	142.58	104.45
6	151.73	108.49
7	160.26	113.71
8	168.02	120.02
9	174.86	127.31
10	176.42	129.50

Circle Center At X = 117.1 ; Y = 174.7 and Radius, 74.7

*** 1.332 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.79	100.00
2	105.69	98.60
3	115.69	98.24
4	125.66	98.91
5	135.52	100.62
6	145.14	103.33
7	154.43	107.03
8	163.29	111.68
9	171.62	117.21
10	179.33	123.58
11	185.14	129.50

Circle Center At X = 114.2 ; Y = 194.6 and Radius, 96.4

*** 1.486 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	81.05	100.00
2	91.01	99.10
3	101.01	98.82
4	111.00	99.17
5	120.96	100.15
6	130.83	101.74
7	140.58	103.94
8	150.18	106.75
9	159.58	110.16
10	168.75	114.14
11	177.66	118.69
12	186.26	123.79
13	194.53	129.41
14	194.64	129.50

Circle Center At X = 100.4 ; Y = 258.9 and Radius, 160.0

*** 1.533 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	112.96	99.26
3	122.95	98.81
4	132.88	99.92
5	142.52	102.58
6	151.63	106.71
7	159.98	112.21
8	167.38	118.94
9	173.62	126.75
10	175.19	129.50

Circle Center At X = 120.8 ; Y = 162.6 and Radius, 63.8

*** 1.541 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	90.92	98.35
3	100.91	98.00
4	110.87	98.94
5	120.61	101.17

6	129.99	104.64
7	138.84	109.30
8	147.01	115.07
9	154.18	121.67

Circle Center At X = 98.6 ; Y = 174.9 and Radius, 77.0

*** 1.564 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	90.99	98.84
3	100.99	98.89
4	110.91	100.15
5	120.60	102.61
6	129.92	106.23
7	138.74	110.94
8	146.92	116.69
9	151.04	120.42

Circle Center At X = 95.6 ; Y = 181.0 and Radius, 82.3

*** 1.567 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	90.88	98.14
3	100.87	97.64
4	110.83	98.50
5	120.58	100.71
6	129.94	104.23
7	138.73	109.00
8	146.79	114.92
9	153.46	121.38

Circle Center At X = 99.5 ; Y = 170.8 and Radius, 73.2

*** 1.573 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.68	100.00
2	83.41	97.68
3	93.31	96.24
4	103.29	95.68
5	113.29	96.01
6	123.21	97.23
7	132.99	99.33
8	142.54	102.30
9	151.79	106.10
10	160.66	110.71
11	169.09	116.09
12	177.01	122.20
13	184.35	128.99
14	184.80	129.50

Circle Center At X = 104.6 ; Y = 207.9 and Radius, 112.2

*** 1.577 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.90	107.16
2	127.67	105.04
3	137.67	104.90
4	147.50	106.74
5	156.77	110.48
6	165.12	115.98
7	172.22	123.02
8	176.57	129.50

Circle Center At X = 133.4 ; Y = 155.1 and Radius, 50.4

*** 1.589 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	110.53	104.21
2	120.31	102.12
3	130.07	104.28
4	138.06	110.30
5	141.46	116.59

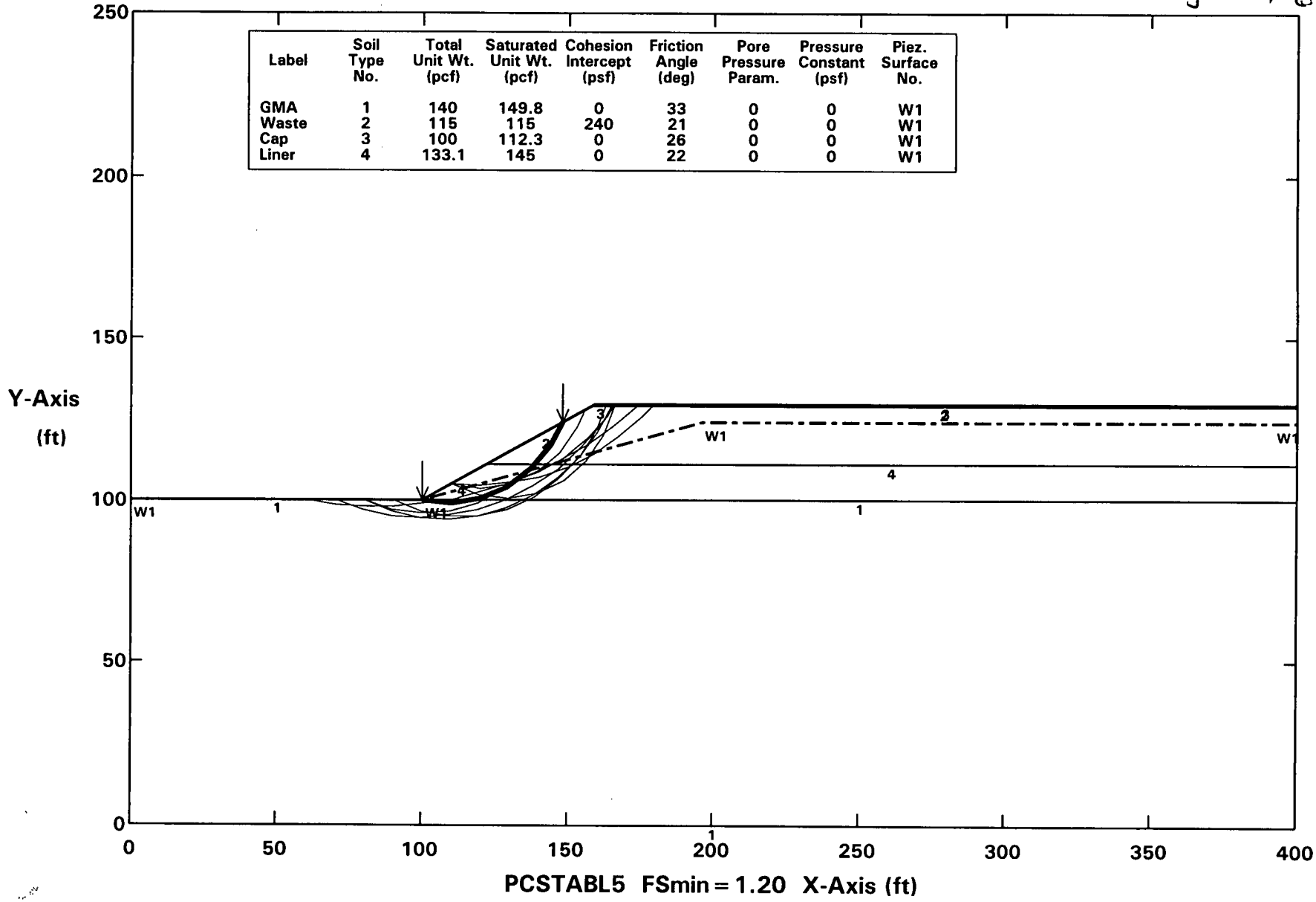
Circle Center At X = 120.2 ; Y = 125.6 and Radius, 23.5

*** 1.594 ***

WPRAP Waste Stability - Waste Pit 1 Waste Slope - 2H to 1V

Ten Most Critical. G:WASTE1H2.PLT By: LIN LIU 01-02-98 4:46pm ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	115	115	240	21	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 4:46pm
Run By: LIN LIU
Input Data Filename: G:WASTE1H2
Output Filename: G:WASTE1H2.OUT
Plotted Output Filename: G:WASTE1H2.PLT

Ck by DCH 6/11/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 1
Waste Slope - 2H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	122.00	111.00	4
3	122.00	111.00	158.00	129.00	2
4	158.00	129.00	159.00	129.50	3
5	159.00	129.50	400.00	129.50	3
6	158.00	129.00	400.00	129.00	2
7	122.00	111.00	400.00	111.00	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	115.0	115.0	240.0	21.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	196.00	124.00
4	400.00	124.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

300 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.00
2	109.96	99.09
3	119.86	100.48
4	129.18	104.11
5	137.42	109.77
6	144.14	117.18
7	147.90	123.95

Circle Center At X = 108.9 ; Y = 142.4 and Radius, 43.3

*** 1.204 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.00	105.00
2	119.35	101.45
3	129.29	100.39
4	139.18	101.90
5	148.35	105.87
6	156.22	112.05
7	162.25	120.03
8	166.05	129.27
9	166.08	129.50

Circle Center At X = 128.4 ; Y = 139.3 and Radius, 39.0

*** 1.281 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.00	105.00
2	119.99	104.50
3	129.92	105.70
4	139.49	108.57
5	148.45	113.02

6	156.51	118.93
7	163.46	126.13
8	165.75	129.50

Circle Center At X = 117.9 ; Y = 163.1 and Radius, 58.6

*** 1.295 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.00	105.00
2	119.91	103.67
3	129.83	104.94
4	139.09	108.71
5	147.07	114.74
6	153.23	122.61
7	155.41	127.70

Circle Center At X = 120.0 ; Y = 142.2 and Radius, 38.6

*** 1.308 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.00	100.00
2	99.38	96.53
3	109.24	94.87
4	119.24	95.07
5	129.02	97.14
6	138.25	100.99
7	146.60	106.49
8	153.78	113.45
9	159.54	121.63
10	163.10	129.50

Circle Center At X = 113.1 ; Y = 148.2 and Radius, 53.4

*** 1.356 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.00
2	89.35	96.46
3	99.14	94.41
4	109.13	93.90
5	119.08	94.94
6	128.74	97.50
7	137.90	101.52
8	146.32	106.91
9	153.81	113.53
10	160.19	121.24
11	165.10	129.50

Circle Center At X = 107.4 ; Y = 158.4 and Radius, 64.5

*** 1.365 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.00	100.00
2	79.55	97.03
3	89.39	95.24
4	99.37	94.66
5	109.35	95.30
6	119.18	97.15
7	128.71	100.18
8	137.80	104.34
9	146.32	109.58
10	154.14	115.81
11	161.14	122.95
12	166.17	129.50

Circle Center At X = 99.1 ; Y = 176.8 and Radius, 82.1

*** 1.373 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.00	100.00

2	69.91	98.65
3	79.89	98.00
4	89.89	98.03
5	99.86	98.75
6	109.76	100.16
7	119.54	102.25
8	129.15	105.01
9	138.55	108.43
10	147.69	112.49
11	156.53	117.17
12	165.02	122.45
13	173.13	128.30
14	174.57	129.50

Circle Center At X = 84.4 ; Y = 242.7 and Radius, 144.7

*** 1.380 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.00
2	89.54	97.00
3	99.47	95.84
4	109.44	96.58
5	119.10	99.19
6	128.09	103.56
7	136.10	109.56
8	142.83	116.95
9	146.77	123.39

Circle Center At X = 100.6 ; Y = 148.7 and Radius, 52.9

*** 1.386 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.00	105.00
2	119.99	104.55
3	129.96	105.26
4	139.79	107.13
5	149.33	110.12
6	158.46	114.20
7	167.06	119.31

8	175.00	125.38
9	179.26	129.50

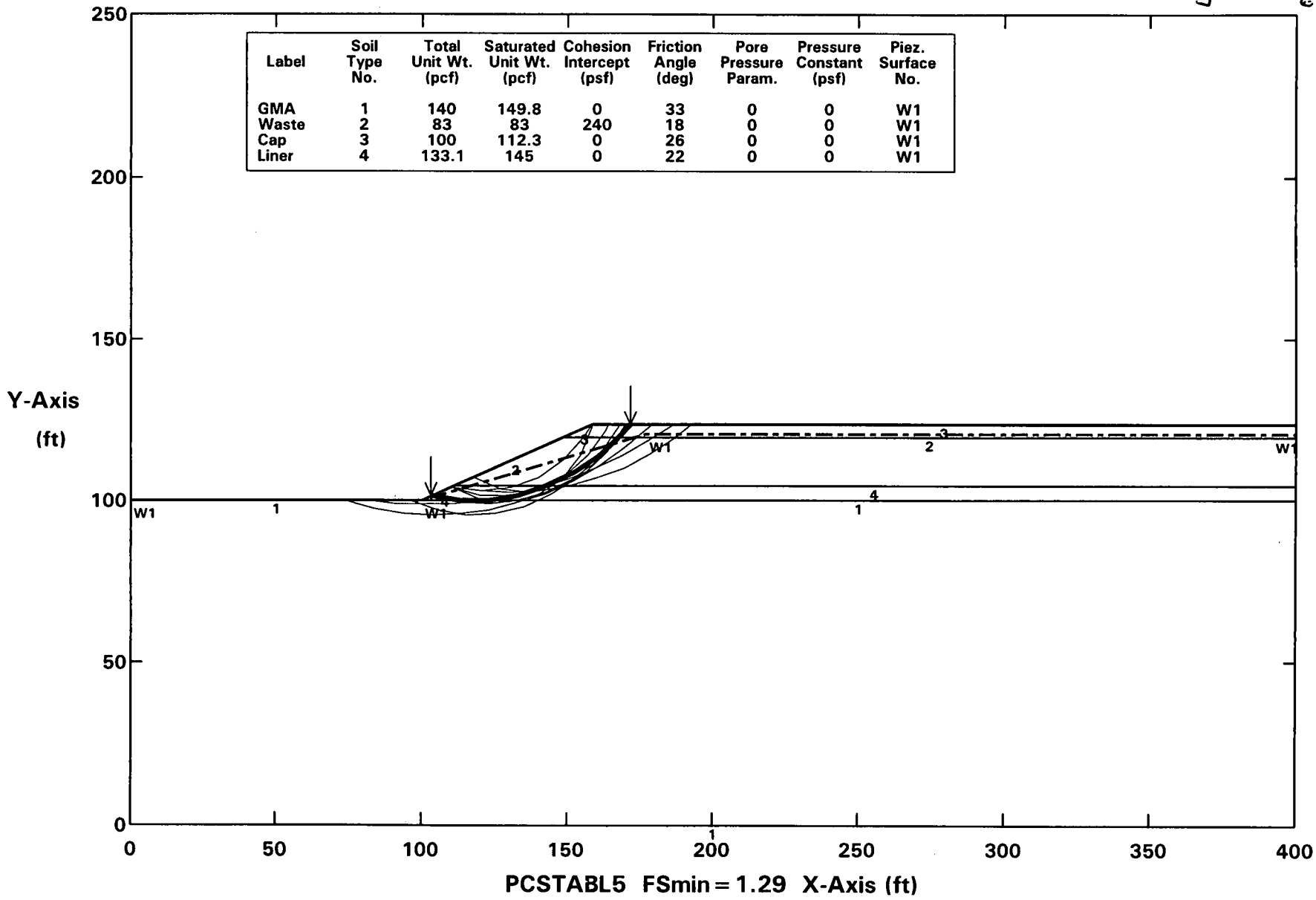
Circle Center At X = 118.9 ; Y = 190.6 and Radius, 86.0

*** 1.412 ***

WPRAP Waste Stability - Waste Pit 2 Waste Slope - 2.5H to 1V

Ten Most Critical. G:WASTE225.PLT By: LIN LIU 01-02-98 5:17pm ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	83	83	240	18	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



PCSTABL5 FSmin = 1.29 X-Axis (ft)

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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 5:17pm
Run By: LIN LIU
Input Data Filename: G:WASTE225
Output Filename: G:WASTE225.OUT
Plotted Output Filename: G:WASTE225.PLT

Ck by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 2
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	111.25	104.50	4
3	111.25	104.50	148.75	119.50	2
4	148.75	119.50	158.75	123.50	3
5	158.75	123.50	400.00	123.50	3
6	148.75	119.50	400.00	119.50	2
7	111.25	104.50	400.00	104.50	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	83.0	83.0	240.0	18.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	176.88	120.50
4	400.00	120.50

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	113.09	100.06
3	123.09	100.19
4	132.98	101.65
5	142.59	104.40
6	151.75	108.41
7	160.30	113.60
8	168.09	119.87
9	171.53	123.50

Circle Center At X = 117.1 ; Y = 175.2 and Radius, 75.2

*** 1.285 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.53	104.21
2	120.18	101.61
3	130.18	101.31
4	139.97	103.33
5	149.03	107.57
6	156.86	113.79
7	163.04	121.65
8	163.90	123.50

Circle Center At X = 126.4 ; Y = 144.1 and Radius, 42.9

*** 1.354 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	112.96	99.26
3	122.94	98.80
4	132.88	99.90

5	142.53	102.53
6	151.65	106.63
7	160.03	112.10
8	167.45	118.80
9	171.24	123.50

Circle Center At X = 120.9 ; Y = 162.9 and Radius, 64.1

*** 1.494 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	91.01	99.10
3	101.01	98.82
4	111.00	99.15
5	120.96	100.11
6	130.83	101.67
7	140.60	103.84
8	150.20	106.61
9	159.62	109.97
10	168.82	113.91
11	177.75	118.40
12	186.39	123.44
13	186.48	123.50

Circle Center At X = 100.6 ; Y = 260.6 and Radius, 161.8

*** 1.530 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.53	104.21
2	120.42	102.78
3	130.41	102.32
4	140.40	102.84
5	150.29	104.33
6	159.98	106.78
7	169.39	110.16
8	178.43	114.45
9	187.00	119.60
10	192.27	123.50

Circle Center At X = 130.1 ; Y = 204.7 and Radius, 102.4

*** 1.535 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.90	107.16
2	127.19	103.48
3	137.14	102.43
4	147.00	104.07
5	156.07	108.30
6	163.67	114.80
7	169.25	123.09
8	169.39	123.50

Circle Center At X = 136.0 ; Y = 139.4 and Radius, 37.0

*** 1.575 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.79	100.00
2	105.33	96.99
3	115.24	95.65
4	125.23	96.01
5	135.01	98.07
6	144.30	101.77
7	152.83	107.00
8	160.34	113.60
9	166.61	121.39
10	167.79	123.50

Circle Center At X = 118.1 ; Y = 154.1 and Radius, 58.5

*** 1.601 ***

Failure Surface Specified By 13 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	73.68	100.00
2	83.41	97.68
3	93.31	96.23
4	103.29	95.66
5	113.29	95.98
6	123.21	97.18
7	132.99	99.26
8	142.55	102.19
9	151.82	105.96
10	160.71	110.54
11	169.16	115.88
12	177.11	121.95
13	178.80	123.50

Circle Center At X = 104.7 ; Y = 208.5 and Radius, 112.8

*** 1.643 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.53	104.21
2	119.71	100.26
3	129.67	99.33
4	139.43	101.50
5	148.05	106.58
6	154.68	114.06
7	158.70	123.22
8	158.72	123.49

Circle Center At X = 127.6 ; Y = 131.4 and Radius, 32.1

*** 1.654 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.53	104.21
2	120.44	102.91
3	130.39	103.87
4	139.87	107.06
5	148.39	112.31
6	155.50	119.34

7 157.91 123.16

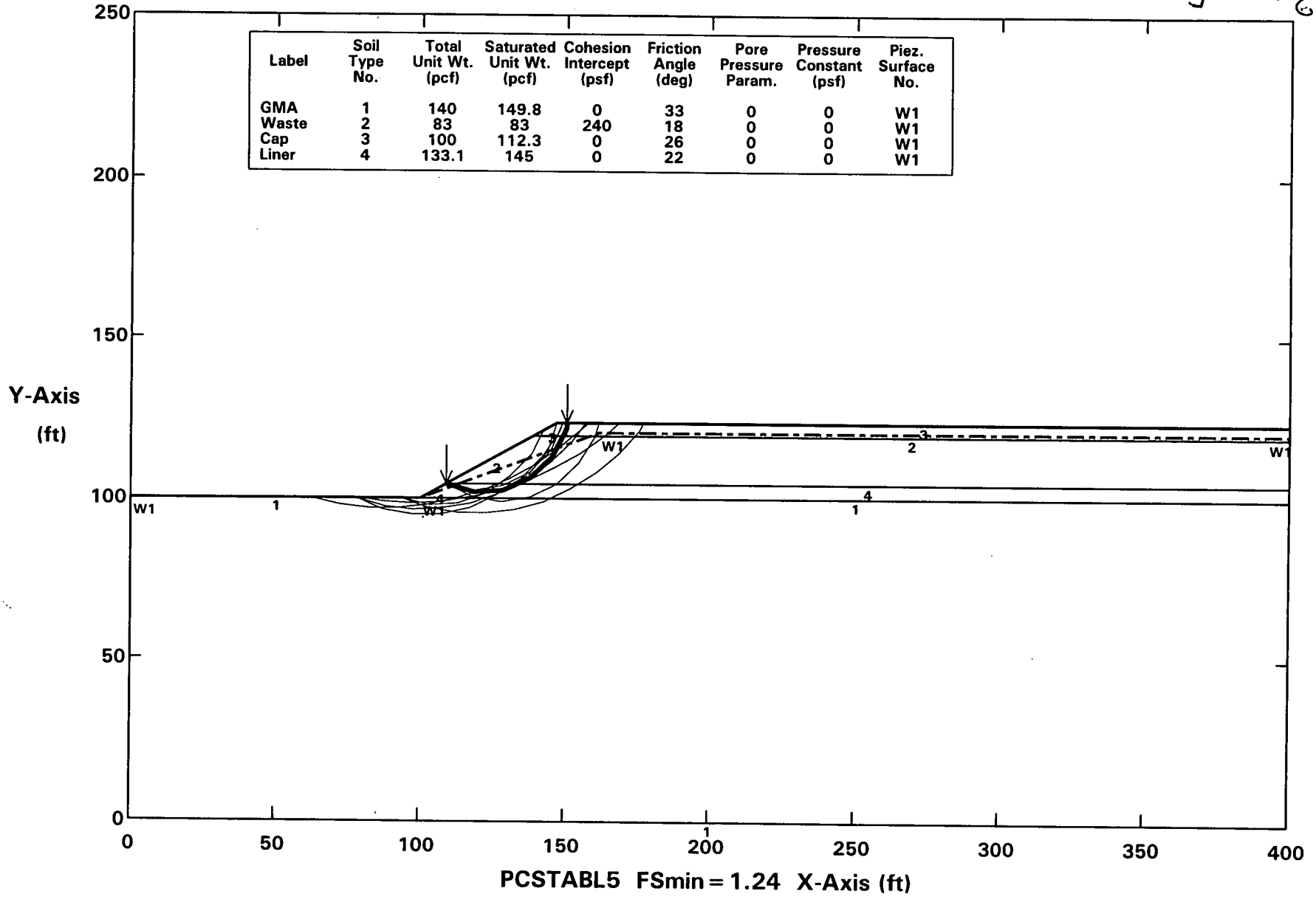
Circle Center At X = 121.2 ; Y = 146.9 and Radius, 44.0

*** 1.661 ***

WPRAP Waste Stability - Waste Pit 2 Waste Slope - 2H to 1V

Ten Most Critical. G:WASTE2H2.PLT By: LIN LIU 01-02-98 5:08pm CK by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	83	83	240	18	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



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** PCSTABL5 **

1484

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-02-98
Time of Run:	5:08pm
Run By:	LIN LIU
Input Data Filename:	G:WASTE2H2
Output Filename:	G:WASTE2H2.OUT
Plotted Output Filename:	G:WASTE2H2.PLT

ck by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 2
Waste Slope - 2H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	109.00	104.50	4
3	109.00	104.50	139.00	119.50	2
4	139.00	119.50	147.00	123.50	3
5	147.00	123.50	400.00	123.50	3
6	139.00	119.50	400.00	119.50	2
7	109.00	104.50	400.00	104.50	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	83.0	83.0	240.0	18.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	161.50	120.50
4	400.00	120.50

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.89	104.44
2	118.58	101.98
3	128.55	102.72
4	137.78	106.57
5	145.31	113.16
6	150.37	121.78
7	150.73	123.50

Circle Center At X = 121.3 ; Y = 133.0 and Radius, 31.2

*** 1.240 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.78	100.00
2	87.70	98.79
3	97.70	98.43
4	107.69	98.94
5	117.59	100.30
6	127.34	102.52
7	136.87	105.56
8	146.10	109.42
9	154.96	114.05
10	163.39	119.43
11	168.69	123.50

Circle Center At X = 96.8 ; Y = 214.4 and Radius, 116.0

*** 1.300 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.89	104.44
2	118.71	102.56
3	128.63	103.86

4	137.63	108.21
5	144.81	115.18
6	149.15	123.50

Circle Center At X = 119.6 ; Y = 134.0 and Radius, 31.4

*** 1.303 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.89	104.44
2	118.54	101.83
3	128.48	102.93
4	137.34	107.57
5	143.89	115.13
6	146.82	123.41

Circle Center At X = 120.6 ; Y = 128.7 and Radius, 26.9

*** 1.337 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.78	100.00
2	87.50	97.64
3	97.44	96.62
4	107.44	96.94
5	117.30	98.60
6	126.85	101.58
7	135.91	105.81
8	144.32	111.22
9	151.92	117.71
10	157.09	123.50

Circle Center At X = 100.1 ; Y = 170.7 and Radius, 74.2

*** 1.363 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.33	100.00
2	103.16	98.14
3	113.14	98.72
4	122.69	101.70
5	131.23	106.90
6	138.26	114.01
7	142.57	121.29

Circle Center At X = 105.8 ; Y = 139.1 and Radius, 41.0

*** 1.401 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.89	104.44
2	118.00	100.31
3	127.89	98.89
4	137.80	100.28
5	146.92	104.38
6	154.53	110.87
7	160.03	119.22
8	161.36	123.50

Circle Center At X = 128.0 ; Y = 134.4 and Radius, 35.5

*** 1.480 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.33	100.00
2	102.93	97.17
3	112.81	95.66
4	122.81	95.49
5	132.74	96.67
6	142.42	99.17
7	151.68	102.96
8	160.34	107.95
9	168.25	114.07
10	175.27	121.19

11	177.00	123.50

Circle Center At X = 119.1 ; Y = 169.6 and Radius, 74.2

*** 1.530 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.78	100.00
2	87.18	96.60
3	97.05	94.96
4	107.05	95.14
5	116.85	97.11
6	126.13	100.83
7	134.59	106.16
8	141.95	112.93
9	147.96	120.92
10	149.25	123.50

Circle Center At X = 101.1 ; Y = 149.9 and Radius, 55.1

*** 1.546 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	100.00
2	72.04	98.10
3	81.99	97.12
4	91.99	97.07
5	101.95	97.96
6	111.79	99.78
7	121.41	102.50
8	130.73	106.11
9	139.68	110.58
10	148.17	115.87
11	156.13	121.92
12	157.85	123.50

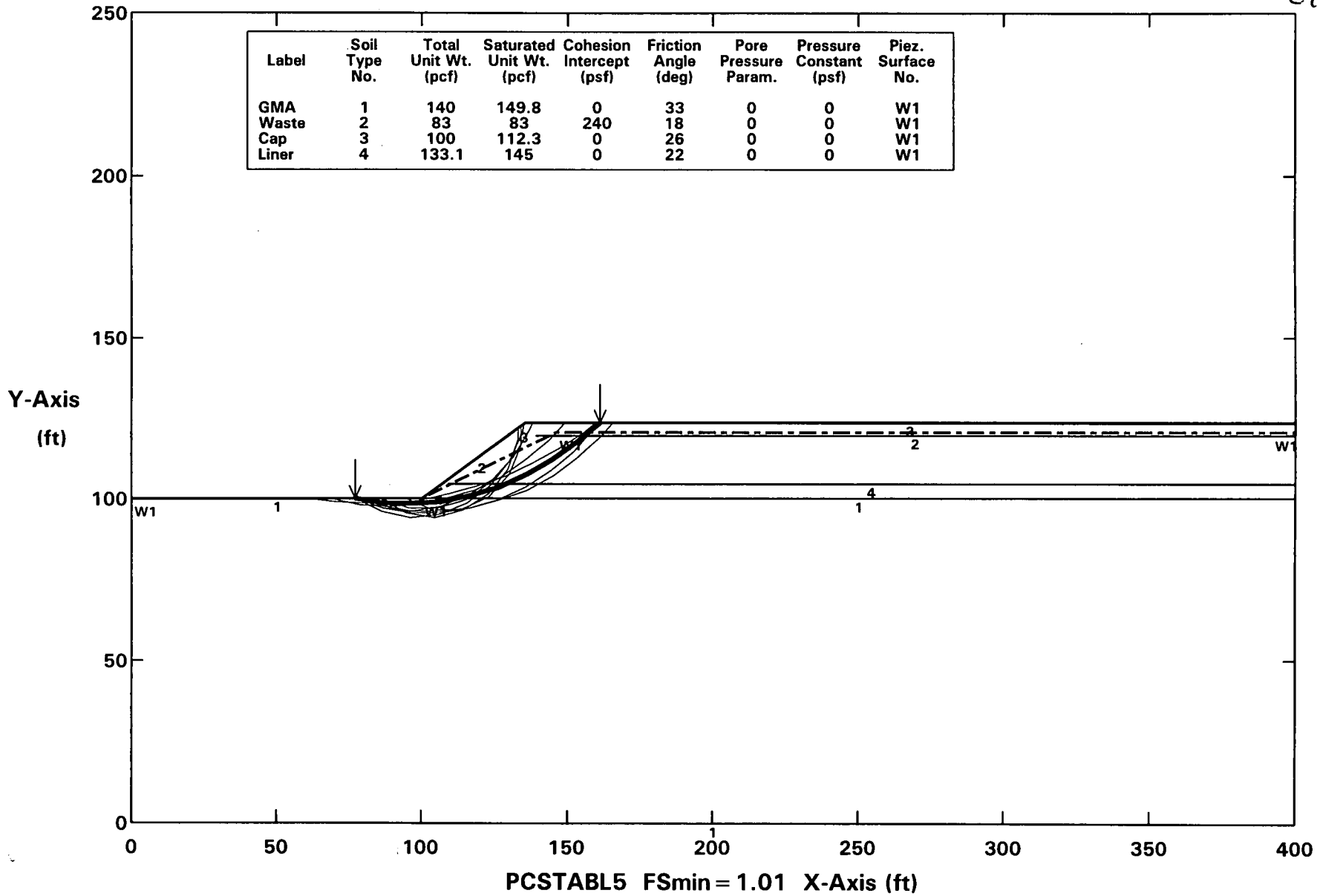
Circle Center At X = 87.5 ; Y = 203.9 and Radius, 107.0

*** 1.616 ***

WPRAP Waste Stability - Waste Pit 2 Waste Slope - 1.5H to 1V

Ten Most Critical. G:WASTE215.PLT By: LIN LIU 01-02-98 5:55pm CK by D Cir 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	83	83	240	18	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 5:55pm
Run By: LIN LIU
Input Data Filename: G:WASTE215
Output Filename: G:WASTE215.OUT
Plotted Output Filename: G:WASTE215.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 2
Waste Slope - 1.5H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	106.80	104.50	4
3	106.80	104.50	129.30	119.50	2
4	129.30	119.50	135.30	123.50	3
5	135.30	123.50	400.00	123.50	3
6	139.00	119.50	400.00	119.50	2
7	109.00	104.50	400.00	104.50	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	83.0	83.0	240.0	18.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	146.13	120.50
4	400.00	120.50

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

225 Trial Surfaces Have Been Generated.

15 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 120.00 ft.

Each Surface Terminates Between X = 120.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.14	100.00
2	87.06	98.74
3	97.06	98.47
4	107.03	99.21
5	116.88	100.94
6	126.51	103.65
7	135.81	107.31
8	144.71	111.88
9	153.10	117.32
10	160.82	123.50

Circle Center At X = 94.7 ; Y = 198.2 and Radius, 99.8

*** 1.006 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.71	100.00
2	95.29	97.10
3	105.28	96.96
4	114.93	99.59
5	123.48	104.79
6	130.25	112.14
7	134.73	121.08
8	135.17	123.41

Circle Center At X = 100.8 ; Y = 132.5 and Radius, 35.8

*** 1.076 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.57	100.00
2	78.40	98.14
3	88.38	97.48

4	98.36	98.02
5	108.21	99.75
6	117.78	102.65
7	126.93	106.69
8	135.53	111.79
9	143.46	117.88
10	149.18	123.50

Circle Center At X = 88.9 ; Y = 180.6 and Radius, 83.1

*** 1.085 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.29	100.00
2	103.59	96.33
3	113.59	96.43
4	122.81	100.29
5	129.91	107.33
6	133.83	116.53
7	133.93	122.59

Circle Center At X = 108.3 ; Y = 122.0 and Radius, 26.1

*** 1.136 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.14	100.00
2	86.69	97.03
3	96.65	96.15
4	106.57	97.42
5	116.00	100.76
6	124.50	106.02
7	131.69	112.97
8	137.24	121.29
9	138.11	123.50

Circle Center At X = 95.7 ; Y = 143.0 and Radius, 46.8

*** 1.154 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.14	100.00
2	86.74	97.17
3	96.62	95.68
4	106.62	95.55
5	116.55	96.79
6	126.21	99.37
7	135.42	103.25
8	144.03	108.35
9	151.85	114.58
10	158.75	121.82
11	159.96	123.50

Circle Center At X = 102.6 ; Y = 168.5 and Radius, 73.1

*** 1.191 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.14	100.00
2	86.83	97.52
3	96.74	96.19
4	106.74	96.05
5	116.69	97.08
6	126.44	99.28
7	135.87	102.62
8	144.84	107.04
9	153.22	112.49
10	160.91	118.89
11	165.27	123.50

Circle Center At X = 103.0 ; Y = 180.6 and Radius, 84.7

*** 1.226 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	60.00	100.00
2	69.93	98.79
3	79.92	98.32
4	89.91	98.59
5	99.86	99.61
6	109.70	101.36
7	119.39	103.85
8	128.86	107.05
9	138.07	110.95
10	146.97	115.52
11	155.50	120.74
12	159.33	123.50

Circle Center At X = 81.2 ; Y = 232.4 and Radius, 134.1

*** 1.228 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.71	100.00
2	94.66	95.53
3	104.58	94.25
4	114.37	96.28
5	122.95	101.41
6	129.38	109.07
7	132.95	118.41
8	133.06	122.01

Circle Center At X = 103.4 ; Y = 124.3 and Radius, 30.1

*** 1.310 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.14	100.00
2	86.24	95.86
3	96.10	94.17
4	106.06	95.05
5	115.47	98.44
6	123.70	104.11
7	130.22	111.70
8	134.59	120.70

9 135.11 123.38

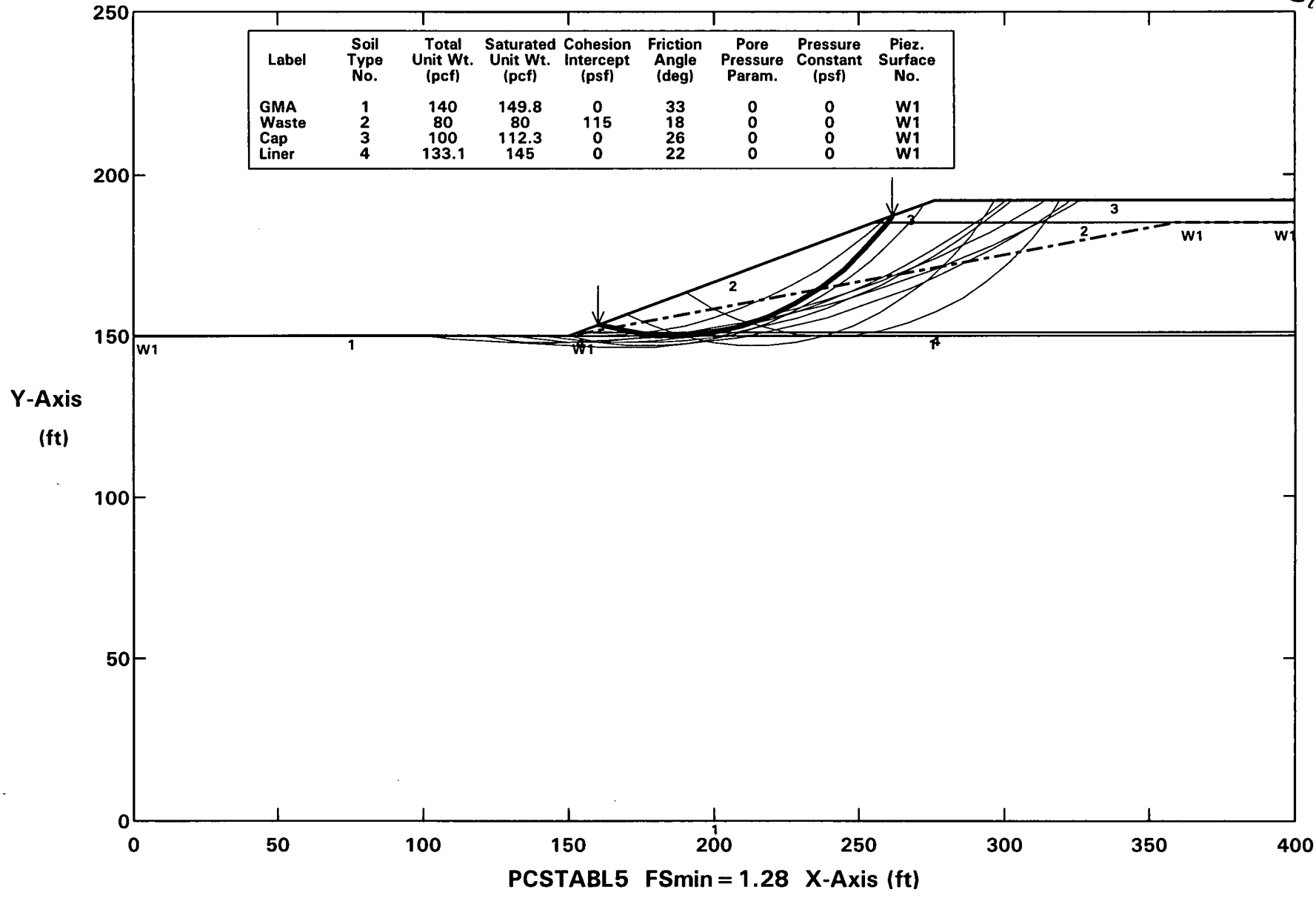
Circle Center At X = 97.7 ; Y = 133.1 and Radius, 38.9

*** 1.389 ***

WPRAP Waste Stability - Waste Pit 3 Waste Slope - 3H to 1V

Ten Most Critical. G:WASTE3H3.PLT By: LIN LIU 01-02-98 6:27pm Ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	80	80	115	18	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 6:27pm
Run By: LIN LIU
Input Data Filename: G:WASTE3H3
Output Filename: G:WASTE3H3.OUT
Plotted Output Filename: G:WASTE3H3.PLT

Ck by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 3
Waste Slope - 3H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	150.00	150.00	150.00	1
2	150.00	150.00	153.00	151.00	4
3	153.00	151.00	255.00	185.00	2
4	255.00	185.00	276.00	192.00	3
5	276.00	192.00	400.00	192.00	3
6	255.00	185.00	400.00	185.00	2
7	153.00	151.00	400.00	151.00	4
8	150.00	150.00	400.00	150.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	80.0	80.0	115.0	18.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	150.00
2	150.00	150.00
3	360.00	185.00
4	400.00	185.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 190.00 ft.

Each Surface Terminates Between X = 190.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	153.33
2	169.78	151.25
3	179.72	150.19
4	189.72	150.15
5	199.68	151.13
6	209.47	153.14
7	219.01	156.13
8	228.20	160.09
9	236.92	164.98
10	245.10	170.73
11	252.65	177.29
12	259.49	184.59
13	261.43	187.14

Circle Center At X = 185.1 ; Y = 247.4 and Radius, 97.3

*** 1.276 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.00	150.00
2	149.93	148.82
3	159.90	148.09
4	169.90	147.81
5	179.90	148.00
6	189.88	148.64
7	199.82	149.74
8	209.70	151.29
9	219.49	153.29
10	229.19	155.74
11	238.76	158.63
12	248.20	161.95
13	257.46	165.70
14	266.55	169.87
15	275.44	174.46
16	284.11	179.44
17	292.54	184.81
18	300.72	190.57
19	302.57	192.00

Circle Center At X = 170.8 ; Y = 366.4 and Radius, 218.6

*** 1.351 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.00	150.00
2	139.94	148.91
3	149.92	148.23
4	159.91	147.96
5	169.91	148.11
6	179.90	148.67
7	189.85	149.64
8	199.75	151.02
9	209.59	152.80
10	219.35	155.00
11	229.01	157.59
12	238.55	160.58
13	247.96	163.96
14	257.22	167.73
15	266.32	171.88
16	275.24	176.40
17	283.97	181.28
18	292.49	186.52
19	300.62	192.00

Circle Center At X = 161.4 ; Y = 390.1 and Radius, 242.1

*** 1.357 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.00	150.00
2	159.84	148.22
3	169.79	147.24
4	179.79	147.04
5	189.77	147.64
6	199.68	149.03
7	209.44	151.21
8	218.99	154.15
9	228.29	157.84
10	237.26	162.26
11	245.85	167.38
12	254.01	173.16
13	261.68	179.57
14	268.82	186.57

15	272.54	190.85

Circle Center At X = 177.2 ; Y = 272.8 and Radius, 125.8

*** 1.424 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.00	150.00
2	160.00	149.89
3	169.99	150.39
4	179.92	151.51
5	189.78	153.23
6	199.50	155.56
7	209.07	158.47
8	218.43	161.97
9	227.57	166.04
10	236.43	170.67
11	245.00	175.83
12	253.23	181.50
13	259.69	186.56

Circle Center At X = 156.8 ; Y = 312.6 and Radius, 162.7

*** 1.453 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.00	150.00
2	129.90	148.59
3	139.84	147.53
4	149.82	146.80
5	159.81	146.42
6	169.81	146.38
7	179.81	146.69
8	189.78	147.33
9	199.74	148.32
10	209.65	149.65
11	219.51	151.32
12	229.30	153.33
13	239.03	155.67
14	248.66	158.34
15	258.20	161.35

16	267.63	164.68
17	276.94	168.33
18	286.12	172.29
19	295.16	176.57
20	304.04	181.16
21	312.76	186.05
22	321.31	191.24
23	322.48	192.00

Circle Center At X = 165.9 ; Y = 437.7 and Radius, 291.4

*** 1.510 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	150.00
2	109.95	149.00
3	119.92	148.28
4	129.91	147.84
5	139.91	147.67
6	149.91	147.78
7	159.91	148.16
8	169.88	148.83
9	179.84	149.77
10	189.77	150.98
11	199.65	152.47
12	209.50	154.23
13	219.29	156.27
14	229.02	158.57
15	238.68	161.14
16	248.27	163.99
17	257.78	167.09
18	267.19	170.46
19	276.51	174.08
20	285.73	177.97
21	294.83	182.10
22	303.82	186.49
23	312.68	191.13
24	314.24	192.00

Circle Center At X = 141.0 ; Y = 508.6 and Radius, 360.9

*** 1.514 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	190.00	163.33
2	198.86	158.69
3	208.15	154.99
4	217.77	152.27
5	227.62	150.56
6	237.60	149.88
7	247.59	150.23
8	257.50	151.61
9	267.21	154.01
10	276.61	157.40
11	285.62	161.74
12	294.13	166.99
13	302.06	173.09
14	309.30	179.98
15	315.80	187.58
16	318.85	192.00

Circle Center At X = 239.2 ; Y = 246.5 and Radius, 96.6

*** 1.544 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	150.00
2	109.96	149.11
3	119.94	148.47
4	129.93	148.07
5	139.93	147.92
6	149.93	148.00
7	159.93	148.34
8	169.91	148.91
9	179.88	149.73
10	189.82	150.79
11	199.73	152.10
12	209.61	153.64
13	219.45	155.43
14	229.25	157.45
15	238.99	159.71
16	248.67	162.21
17	258.29	164.95
18	267.84	167.92
19	277.31	171.12
20	286.70	174.55
21	296.01	178.21
22	305.22	182.09
23	314.34	186.20
24	323.36	190.53

25	326.23	192.00

Circle Center At X = 141.3 ; Y = 558.0 and Radius, 410.1

*** 1.546 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	170.00	156.67
2	179.21	152.77
3	188.77	149.82
4	198.57	147.85
5	208.52	146.87
6	218.52	146.90
7	228.47	147.94
8	238.26	149.97
9	247.80	152.97
10	256.99	156.92
11	265.73	161.77
12	273.94	167.48
13	281.54	173.98
14	288.44	181.21
15	294.58	189.11
16	296.40	192.00

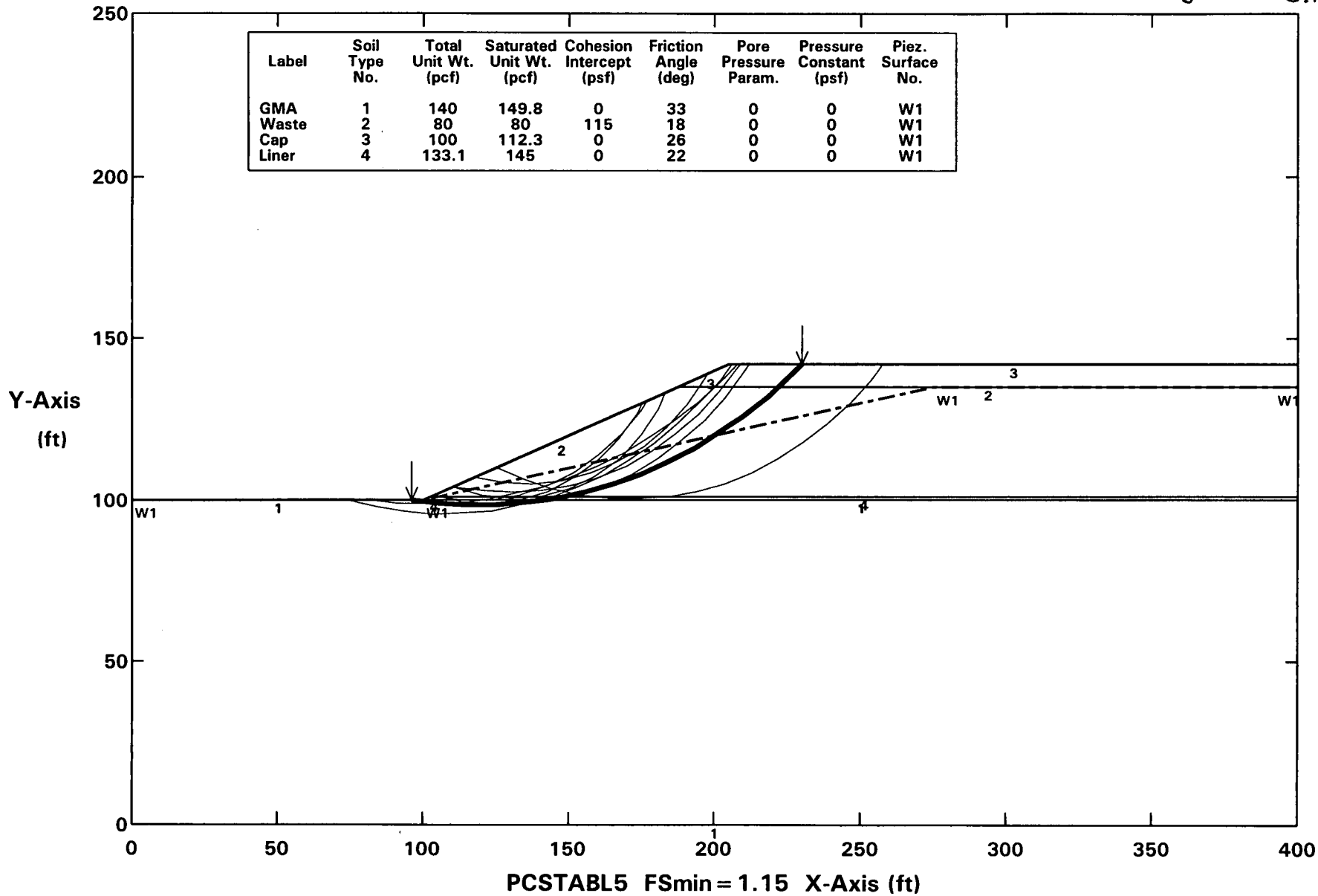
Circle Center At X = 213.2 ; Y = 246.1 and Radius, 99.3

*** 1.550 ***

WPRAP Waste Stability - Waste Pit 3 Waste Slope - 2.5H to 1V

Ten Most Critical. G:WASTE325.PLT By: LIN LIU 01-02-98 6:32pm ck by DCH 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	80	80	115	18	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 6:32pm
Run By: LIN LIU
Input Data Filename: G:WASTE325
Output Filename: G:WASTE325.OUT
Plotted Output Filename: G:WASTE325.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 3
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	102.50	101.00	4
3	102.50	101.00	187.50	135.00	2
4	187.50	135.00	205.00	142.00	3
5	205.00	142.00	400.00	142.00	3
6	187.50	135.00	400.00	135.00	2
7	102.50	101.00	400.00	101.00	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	80.0	80.0	115.0	18.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	275.00	135.00
4	400.00	135.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.79	100.00
2	105.73	98.91
3	115.72	98.42
4	125.72	98.55
5	135.69	99.28
6	145.60	100.61
7	155.41	102.54
8	165.09	105.07
9	174.59	108.18
10	183.89	111.86
11	192.95	116.10
12	201.73	120.88
13	210.21	126.19
14	218.34	132.00
15	226.11	138.30
16	230.16	142.00

Circle Center At X = 118.7 ; Y = 262.9 and Radius, 164.5

*** 1.146 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	112.97	99.35
3	122.93	98.41
4	132.93	98.43
5	142.88	99.42
6	152.69	101.37
7	162.26	104.26
8	171.51	108.07
9	180.34	112.75
10	188.68	118.28
11	196.44	124.58
12	203.56	131.60
13	209.96	139.29
14	211.81	142.00

Circle Center At X = 127.7 ; Y = 201.3 and Radius, 103.0

*** 1.152 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.53	104.21
2	120.42	102.78
3	130.42	102.36
4	140.40	102.94
5	150.27	104.54
6	159.93	107.12
7	169.28	110.66
8	178.23	115.13
9	186.68	120.47
10	194.55	126.65
11	201.75	133.58
12	208.21	141.21
13	208.76	142.00

Circle Center At X = 129.6 ; Y = 201.3 and Radius, 98.9

*** 1.160 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	91.01	99.10
3	101.01	98.84
4	111.00	99.22
5	120.95	100.23
6	130.81	101.88
7	140.55	104.15
8	150.13	107.04
9	159.49	110.54
10	168.62	114.62
11	177.47	119.28
12	186.00	124.50
13	194.18	130.25
14	201.98	136.51
15	207.99	142.00

Circle Center At X = 100.1 ; Y = 255.4 and Radius, 156.6

*** 1.188 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	113.09	100.06
3	123.09	100.22
4	132.97	101.72
5	142.56	104.55
6	151.69	108.64
7	160.17	113.93
8	167.87	120.32
9	174.63	127.68
10	176.72	130.69

Circle Center At X = 117.0 ; Y = 173.8 and Radius, 73.9

*** 1.192 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.53	104.21
2	120.13	101.41
3	130.07	100.32
4	140.05	100.96
5	149.76	103.32
6	158.93	107.33
7	167.26	112.86
8	174.50	119.75
9	180.45	127.80
10	183.18	133.27

Circle Center At X = 131.4 ; Y = 157.9 and Radius, 57.5

*** 1.212 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.68	100.00

2	83.44	97.80
3	93.33	96.36
4	103.31	95.68
5	113.31	95.78
6	123.27	96.66
7	133.14	98.30
8	142.85	100.69
9	152.34	103.83
10	161.57	107.69
11	170.46	112.26
12	178.98	117.49
13	187.07	123.37
14	194.68	129.86
15	201.77	136.91
16	206.15	142.00

Circle Center At X = 107.0 ; Y = 225.0 and Radius, 129.4

*** 1.323 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	125.26	110.11
2	134.56	106.42
3	144.15	103.58
4	153.95	101.62
5	163.89	100.54
6	173.89	100.37
7	183.87	101.10
8	193.73	102.72
9	203.42	105.22
10	212.83	108.59
11	221.91	112.79
12	230.57	117.79
13	238.75	123.54
14	246.37	130.02
15	253.38	137.15
16	257.36	142.00

Circle Center At X = 170.8 ; Y = 211.3 and Radius, 111.0

*** 1.330 ***

Failure Surface Specified By 10 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	103.16	101.26
2	112.96	99.26
3	122.95	98.82
4	132.88	99.97
5	142.51	102.67
6	151.59	106.85
7	159.90	112.41
8	167.23	119.22
9	173.40	127.09
10	175.01	130.00

Circle Center At X = 120.7 ; Y = 162.0 and Radius, 63.2

*** 1.331 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.90	107.16
2	127.74	105.40
3	137.73	105.00
4	147.69	105.96
5	157.42	108.27
6	166.74	111.87
7	175.50	116.71
8	183.51	122.69
9	190.64	129.71
10	196.74	137.62
11	197.54	139.02

Circle Center At X = 135.7 ; Y = 178.4 and Radius, 73.4

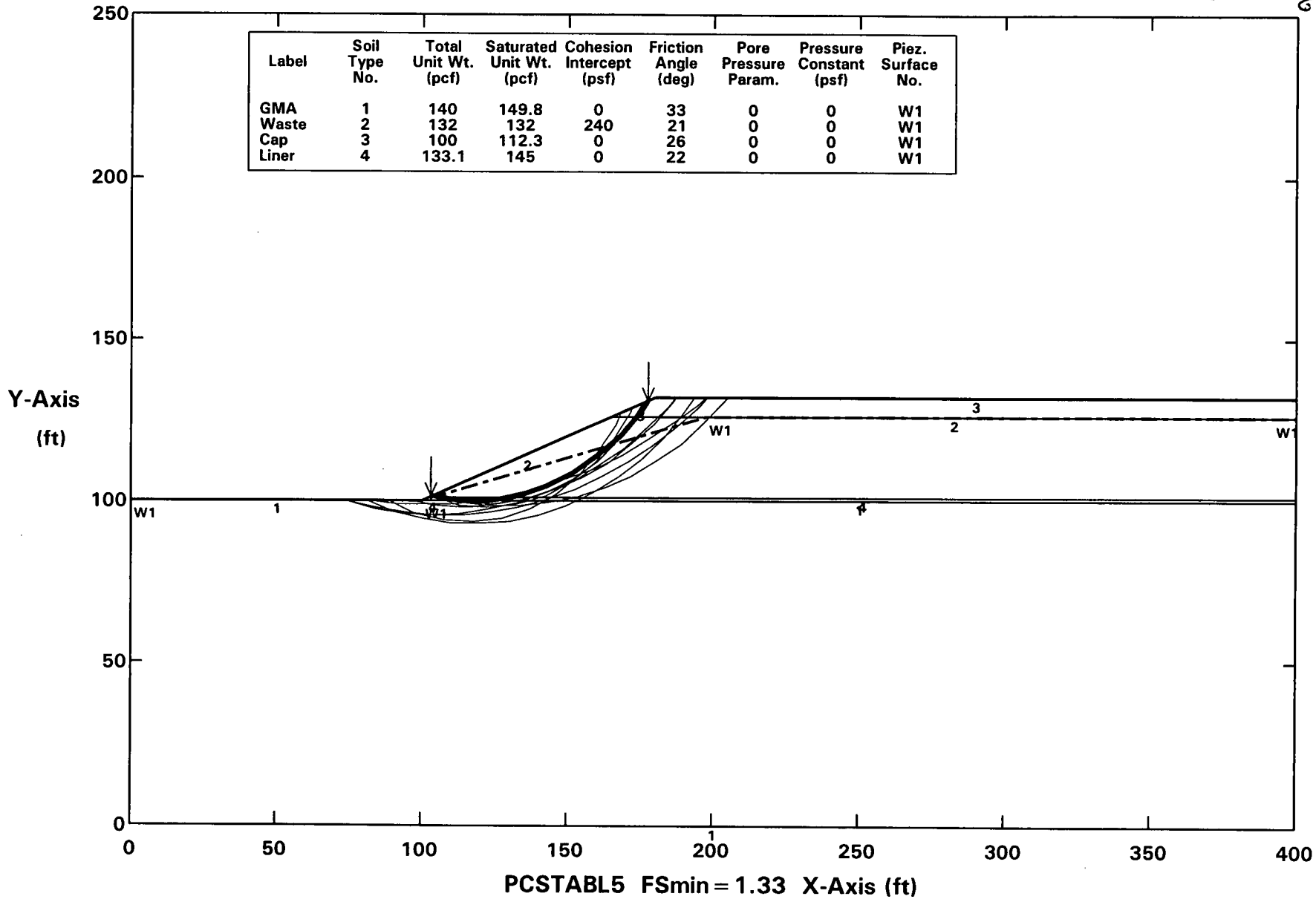
*** 1.335 ***

WPRAP Waste Stability - Waste Pit 4 Waste Slope - 2.5H to 1V

Ten Most Critical. G:WASTE425.PLT By: LIN LIU 01-02-98 6:38pm

CK by DCH 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	132	132	240	21	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



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1484

1484

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-02-98
Time of Run: 6:38pm
Run By: LIN LIU
Input Data Filename: G:WASTE425
Output Filename: G:WASTE425.OUT
Plotted Output Filename: G:WASTE425.PLT

Ck by P CH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 4
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	102.50	101.00	4
3	102.50	101.00	165.00	126.00	2
4	165.00	126.00	180.00	132.00	3
5	180.00	132.00	400.00	132.00	3
6	165.00	126.00	400.00	126.00	2
7	102.50	101.00	400.00	101.00	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	132.0	132.0	240.0	21.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

---

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	197.50	126.00
4	400.00	126.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	113.09	100.06
3	123.09	100.21
4	132.98	101.68
5	142.58	104.47
6	151.72	108.52
7	160.24	113.75
8	167.99	120.08
9	174.81	127.39
10	177.33	130.93

Circle Center At X = 117.0 ; Y = 174.5 and Radius, 74.6

*** 1.334 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.79	100.00
2	105.69	98.60
3	115.69	98.24
4	125.66	98.92
5	135.51	100.64
6	145.13	103.37
7	154.42	107.08
8	163.27	111.74
9	171.58	117.29
10	179.28	123.68
11	186.27	130.83
12	187.19	132.00

Circle Center At X = 114.1 ; Y = 194.3 and Radius, 96.1

*** 1.337 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	103.16	101.26
2	112.96	99.26
3	122.95	98.81
4	132.88	99.93
5	142.52	102.60
6	151.62	106.74
7	159.97	112.25
8	167.35	119.00
9	173.58	126.82
10	175.49	130.20

Circle Center At X = 120.8 ; Y = 162.5 and Radius, 63.7

*** 1.419 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.68	100.00
2	83.41	97.68
3	93.31	96.24
4	103.29	95.68
5	113.29	96.02
6	123.21	97.25
7	132.98	99.36
8	142.53	102.34
9	151.78	106.15
10	160.64	110.78
11	169.06	116.18
12	176.96	122.31
13	184.29	129.11
14	186.88	132.00

Circle Center At X = 104.5 ; Y = 207.6 and Radius, 111.9

*** 1.425 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.68	100.00
2	83.44	97.80
3	93.33	96.35
4	103.31	95.66

5	113.31	95.73
6	123.27	96.56
7	133.15	98.15
8	142.87	100.49
9	152.39	103.57
10	161.64	107.36
11	170.58	111.84
12	179.15	117.00
13	187.30	122.79
14	194.98	129.19
15	197.88	132.00

Circle Center At X = 107.4 ; Y = 226.6 and Radius, 131.0

*** 1.433 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	91.01	99.10
3	101.01	98.83
4	111.00	99.18
5	120.95	100.16
6	130.83	101.77
7	140.58	103.99
8	150.17	106.81
9	159.56	110.23
10	168.73	114.24
11	177.62	118.81
12	186.21	123.93
13	194.46	129.58
14	197.55	132.00

Circle Center At X = 100.4 ; Y = 258.2 and Radius, 159.3

*** 1.436 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	112.81	98.66
3	122.78	97.84
4	132.73	98.81

5	142.35	101.57
6	151.31	106.00
7	159.33	111.97
8	166.15	119.29
9	171.54	127.71
10	171.98	128.79

Circle Center At X = 122.4 ; Y = 153.3 and Radius, 55.4

*** 1.467 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.05	100.00
2	90.47	96.63
3	100.19	94.28
4	110.10	92.99
5	120.10	92.76
6	130.07	93.60
7	139.88	95.50
8	149.44	98.44
9	158.63	102.38
10	167.35	107.28
11	175.50	113.08
12	182.97	119.72
13	189.70	127.12
14	193.27	132.00

Circle Center At X = 117.2 ; Y = 186.2 and Radius, 93.5

*** 1.470 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.16	101.26
2	112.97	99.35
3	122.93	98.39
4	132.93	98.38
5	142.88	99.32
6	152.70	101.21
7	162.30	104.03
8	171.58	107.74
9	180.47	112.33

10	188.88	117.74
11	196.73	123.94
12	203.96	130.85
13	204.95	132.00

Circle Center At X = 128.0 ; Y = 203.0 and Radius, 104.7

*** 1.471 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.42	100.00
2	97.66	96.17
3	107.41	93.97
4	117.40	93.48
5	127.33	94.71
6	136.89	97.62
7	145.82	102.13
8	153.84	108.10
9	160.72	115.35
10	166.26	123.68
11	167.76	127.11

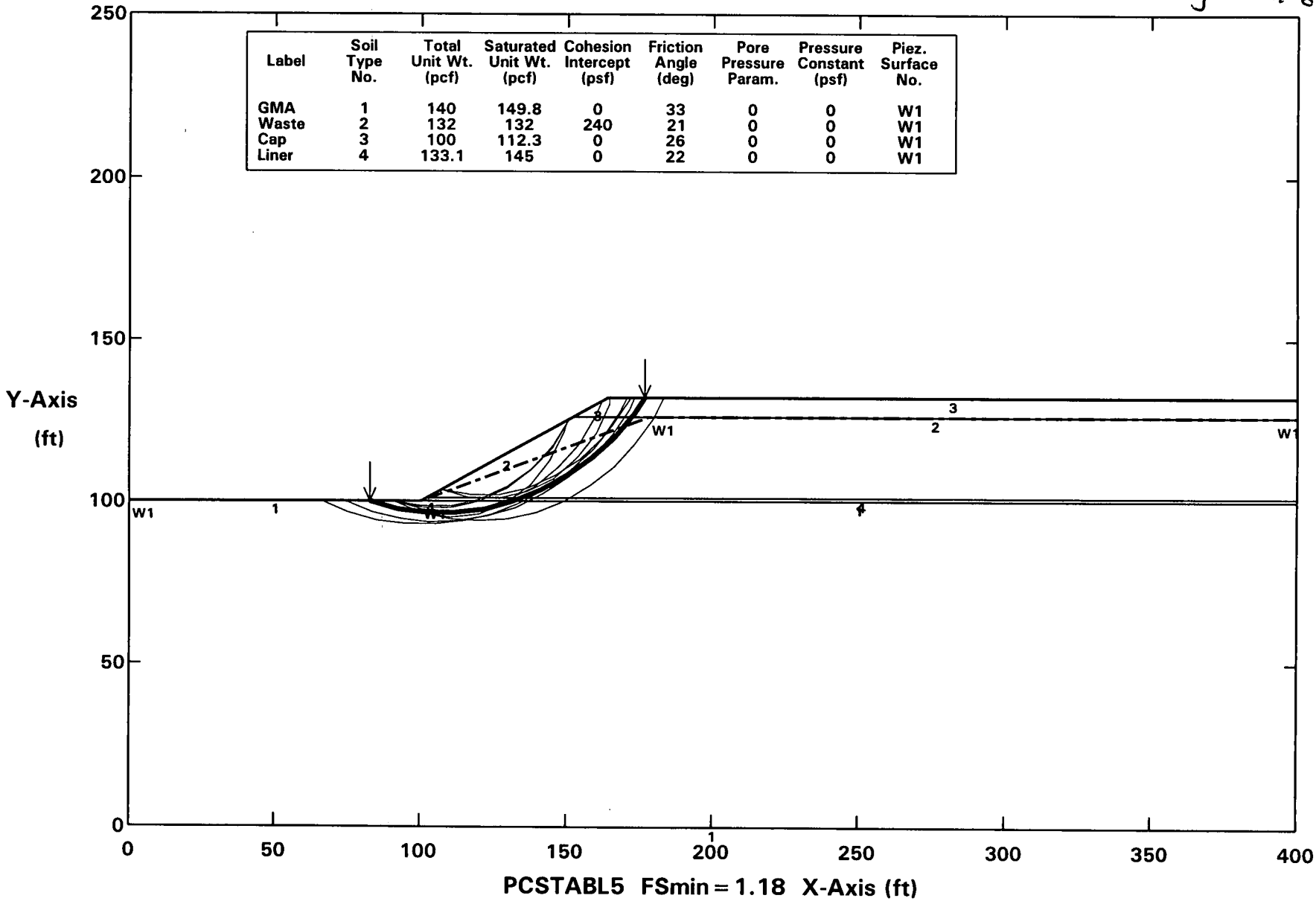
Circle Center At X = 115.2 ; Y = 151.6 and Radius, 58.1

*** 1.530 ***

WPRAP Waste Stability - Waste Pit 4 Waste Slope - 2H to 1V

Ten Most Critical. G:WASTE4H2.PLT By: LIN LIU 01-02-98 6:54pm CK by DCH 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	132	132	240	21	0	0	W1
Cap	3	100	112.3	0	26	0	0	W1
Liner	4	133.1	145	0	22	0	0	W1



PCSTABL5 FSmin = 1.18 X-Axis (ft)

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-02-98
Time of Run: 6:54pm
Run By: LIN LIU
Input Data Filename: G:WASTE4H2
Output Filename: G:WASTE4H2.OUT
Plotted Output Filename: G:WASTE4H2.PLT

ck by DCM 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 4
Waste Slope - 2H to 1V

BOUNDARY COORDINATES

5 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	102.00	101.00	4
3	102.00	101.00	152.00	126.00	2
4	152.00	126.00	164.00	132.00	3
5	164.00	132.00	400.00	132.00	3
6	152.00	126.00	400.00	126.00	2
7	102.00	101.00	400.00	101.00	4
8	100.00	100.00	400.00	100.00	1
9	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	140.0	149.8	.0	33.0	.00	.0	1
2	132.0	132.0	240.0	21.0	.00	.0	1
3	100.0	112.3	.0	26.0	.00	.0	1
4	133.1	145.0	.0	22.0	.00	.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	178.00	126.00
4	400.00	126.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

360 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 18 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.35	100.00
2	92.08	97.68
3	102.01	96.51
4	112.01	96.49
5	121.95	97.64
6	131.68	99.93
7	141.08	103.34
8	150.02	107.82
9	158.38	113.31
10	166.05	119.73
11	172.92	126.99
12	176.65	132.00

Circle Center At X = 107.1 ; Y = 182.3 and Radius, 86.0

*** 1.182 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.27	97.48
3	110.24	96.70
4	120.19	97.66
5	129.82	100.34
6	138.84	104.66
7	146.97	110.49
8	153.95	117.65
9	159.58	125.91
10	161.83	130.92

Circle Center At X = 109.7 ; Y = 153.8 and Radius, 57.1

*** 1.195 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	74.12	100.00
2	83.52	96.60
3	93.28	94.41
4	103.24	93.48
5	113.23	93.82
6	123.10	95.41
7	132.69	98.25
8	141.85	102.27
9	150.42	107.42
10	158.27	113.61
11	165.28	120.75
12	171.33	128.71
13	173.22	132.00

Circle Center At X = 105.6 ; Y = 172.3 and Radius, 78.9

*** 1.273 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.45	98.35
3	110.45	98.57
4	120.23	100.65
5	129.46	104.51
6	137.80	110.02
7	144.97	116.99
8	150.72	125.17
9	150.83	125.41

Circle Center At X = 104.3 ; Y = 151.7 and Radius, 53.5

*** 1.289 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.41	98.14
3	110.41	98.21
4	120.21	100.22
5	129.43	104.09
6	137.73	109.66

7	144.80	116.74
8	150.36	125.05
9	150.43	125.22

Circle Center At X = 105.0 ; Y = 149.4 and Radius, 51.5

*** 1.291 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.00	96.63
3	109.79	94.59
4	119.77	93.92
5	129.75	94.63
6	139.53	96.72
7	148.93	100.13
8	157.77	104.81
9	165.87	110.66
10	173.10	117.57
11	179.30	125.42
12	183.16	132.00

Circle Center At X = 119.6 ; Y = 166.2 and Radius, 72.3

*** 1.310 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	107.06	103.53
2	116.76	101.11
3	126.76	100.93
4	136.55	103.00
5	145.62	107.20
6	153.52	113.34
7	159.84	121.09
8	164.26	130.05
9	164.72	132.00

Circle Center At X = 122.6 ; Y = 145.1 and Radius, 44.3

*** 1.321 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	107.06	103.53
2	116.94	101.97
3	126.93	102.17
4	136.74	104.13
5	146.05	107.79
6	154.56	113.03
7	162.02	119.69
8	168.19	127.56
9	170.55	132.00

Circle Center At X = 120.8 ; Y = 158.4 and Radius, 56.5

*** 1.327 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	99.92	96.40
3	109.84	95.12
4	119.77	96.22
5	129.17	99.66
6	137.47	105.23
7	144.22	112.61
8	149.02	121.38
9	149.99	125.00

Circle Center At X = 110.2 ; Y = 136.9 and Radius, 41.8

*** 1.344 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.88	100.00
2	75.24	96.46

3	84.94	94.06
4	94.87	92.82
5	104.87	92.76
6	114.80	93.88
7	124.54	96.17
8	133.93	99.60
9	142.85	104.12
10	151.18	109.65
11	158.79	116.14
12	165.59	123.48
13	171.46	131.57
14	171.71	132.00

Circle Center At X = 100.4 ; Y = 177.0 and Radius, 84.4

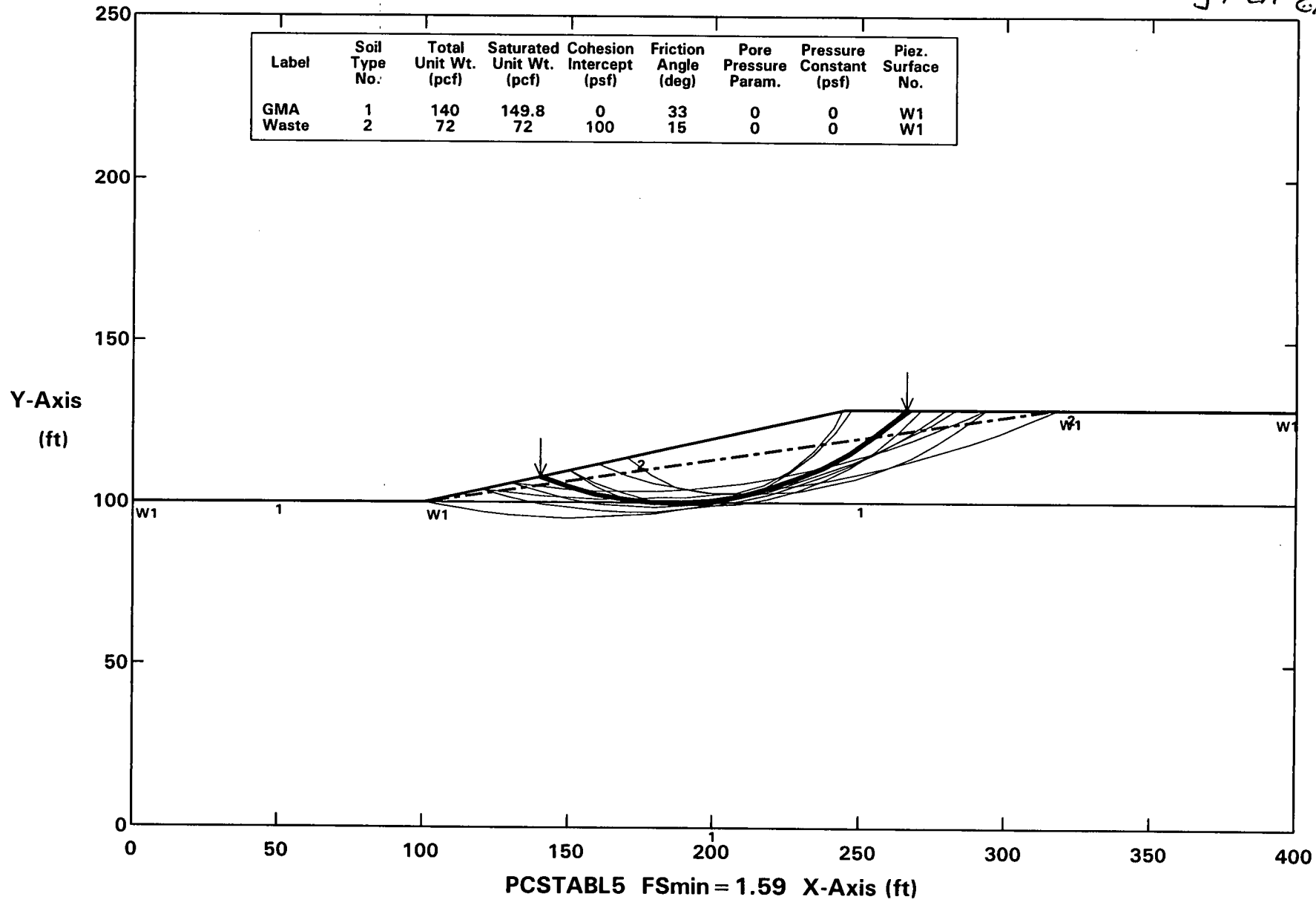
*** 1.352 ***

WPRAP Waste Stability - Waste Pit 5 Waste Slope - 5H to 1V

Ten Most Critical. G:WASTE5H5.PLT By: LIN LIU 01-02-98 7:04pm

ck by PCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	72	72	100	15	0	0	W1



000349

1484

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-02-98
Time of Run: 7:04pm
Run By: LIN LIU ck by DCM 6/11/98
Input Data Filename: G:WASTE5H5
Output Filename: G:WASTE5H5.OUT
Plotted Output Filename: G:WASTE5H5.PLT

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 5
Waste Slope - 5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	245.00	129.00	2
3	245.00	129.00	400.00	129.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	72.0	72.0	100.0	15.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	317.50	129.00
4	400.00	129.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

625 Trial Surfaces Have Been Generated.

25 Surfaces Initiate From Each Of 25 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 240.00 ft.

Each Surface Terminates Between X = 240.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 15 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	140.00	108.00
2	149.49	104.84
3	159.19	102.43
4	169.06	100.79
5	179.02	99.94
6	189.02	99.87
7	199.00	100.58
8	208.88	102.08
9	218.62	104.35
10	228.15	107.38
11	237.41	111.16
12	246.35	115.64
13	254.90	120.82
14	263.03	126.65
15	265.80	129.00

Circle Center At X = 184.9 ; Y = 226.8 and Radius, 127.1

*** 1.593 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.00	106.00
2	139.62	103.25
3	149.39	101.14
4	159.28	99.68
5	169.25	98.86
6	179.25	98.70
7	189.24	99.19
8	199.17	100.34
9	209.01	102.13
10	218.71	104.57
11	228.23	107.63
12	237.53	111.31
13	246.56	115.59
14	255.30	120.45
15	263.70	125.87
16	267.91	129.00

Circle Center At X = 176.7 ; Y = 251.4 and Radius, 152.7

*** 1.689 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.00	110.00
2	159.17	106.00
3	168.67	102.88
4	178.42	100.66
5	188.33	99.36
6	198.32	99.00
7	208.31	99.57
8	218.19	101.08
9	227.90	103.50
10	237.33	106.83
11	246.41	111.02
12	255.05	116.05
13	263.19	121.86
14	270.75	128.41
15	271.31	129.00

Circle Center At X = 197.2 ; Y = 205.6 and Radius, 106.7

*** 1.774 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.00	110.00
2	158.79	105.23
3	168.16	101.73
4	177.92	99.56
5	187.89	98.77
6	197.87	99.38
7	207.67	101.37
8	217.10	104.71
9	225.97	109.32
10	234.11	115.12
11	241.37	122.00
12	246.95	129.00

Circle Center At X = 188.5 ; Y = 170.5 and Radius, 71.7

*** 1.792 ***

Failure Surface Specified By 22 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	120.00	104.00
2	129.94	102.95
3	139.91	102.13
4	149.90	101.56
5	159.89	101.22
6	169.89	101.13
7	179.89	101.28
8	189.88	101.67
9	199.86	102.30
10	209.82	103.17
11	219.76	104.28
12	229.67	105.63
13	239.54	107.21
14	249.38	109.03
15	259.16	111.09
16	268.89	113.39
17	278.57	115.92
18	288.18	118.68
19	297.72	121.67
20	307.19	124.89
21	316.58	128.34
22	318.26	129.00

Circle Center At X = 168.7 ; Y = 516.4 and Radius, 415.3

*** 1.831 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.00	104.00
2	129.71	101.60
3	139.53	99.70
4	149.43	98.31
5	159.39	97.42
6	169.38	97.03
7	179.38	97.16
8	189.36	97.79
9	199.30	98.93
10	209.16	100.58
11	218.93	102.72
12	228.57	105.36
13	238.07	108.49
14	247.40	112.09
15	256.53	116.17
16	265.44	120.70
17	274.11	125.69
18	279.26	129.00

Circle Center At X = 171.9 ; Y = 293.5 and Radius, 196.5

*** 1.858 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	112.00
2	169.46	108.75
3	179.12	106.17
4	188.94	104.27
5	198.86	103.07
6	208.85	102.57
7	218.85	102.77
8	228.81	103.67
9	238.68	105.27
10	248.42	107.55
11	257.97	110.52
12	267.28	114.15
13	276.32	118.42
14	285.04	123.32
15	293.40	128.81
16	293.64	129.00

Circle Center At X = 211.0 ; Y = 244.9 and Radius, 142.4

*** 1.922 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	170.00	114.00
2	178.31	108.44
3	187.58	104.69
4	197.43	102.92
5	207.42	103.20
6	217.15	105.51
7	226.20	109.76
8	234.19	115.78
9	240.79	123.29
10	243.88	128.78

Circle Center At X = 201.1 ; Y = 151.5 and Radius, 48.7

*** 1.934 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.00	106.00
2	139.94	104.90
3	149.91	104.12
4	159.90	103.66
5	169.90	103.51
6	179.90	103.69
7	189.88	104.19
8	199.85	105.00
9	209.79	106.13
10	219.68	107.58
11	229.52	109.35
12	239.31	111.42
13	249.02	113.81
14	258.65	116.51
15	268.18	119.51
16	277.62	122.82
17	286.95	126.43
18	293.02	129.00

Circle Center At X = 169.4 ; Y = 416.6 and Radius, 313.1

*** 1.969 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.00
2	109.86	98.31
3	119.77	96.97
4	129.72	96.00
5	139.70	95.39
6	149.70	95.15
7	159.70	95.27
8	169.69	95.76
9	179.65	96.61
10	189.57	97.83
11	199.45	99.40
12	209.26	101.34
13	218.99	103.63
14	228.64	106.28
15	238.18	109.27
16	247.60	112.61

17	256.90	116.30
18	266.06	120.32
19	275.06	124.67
20	283.24	129.00

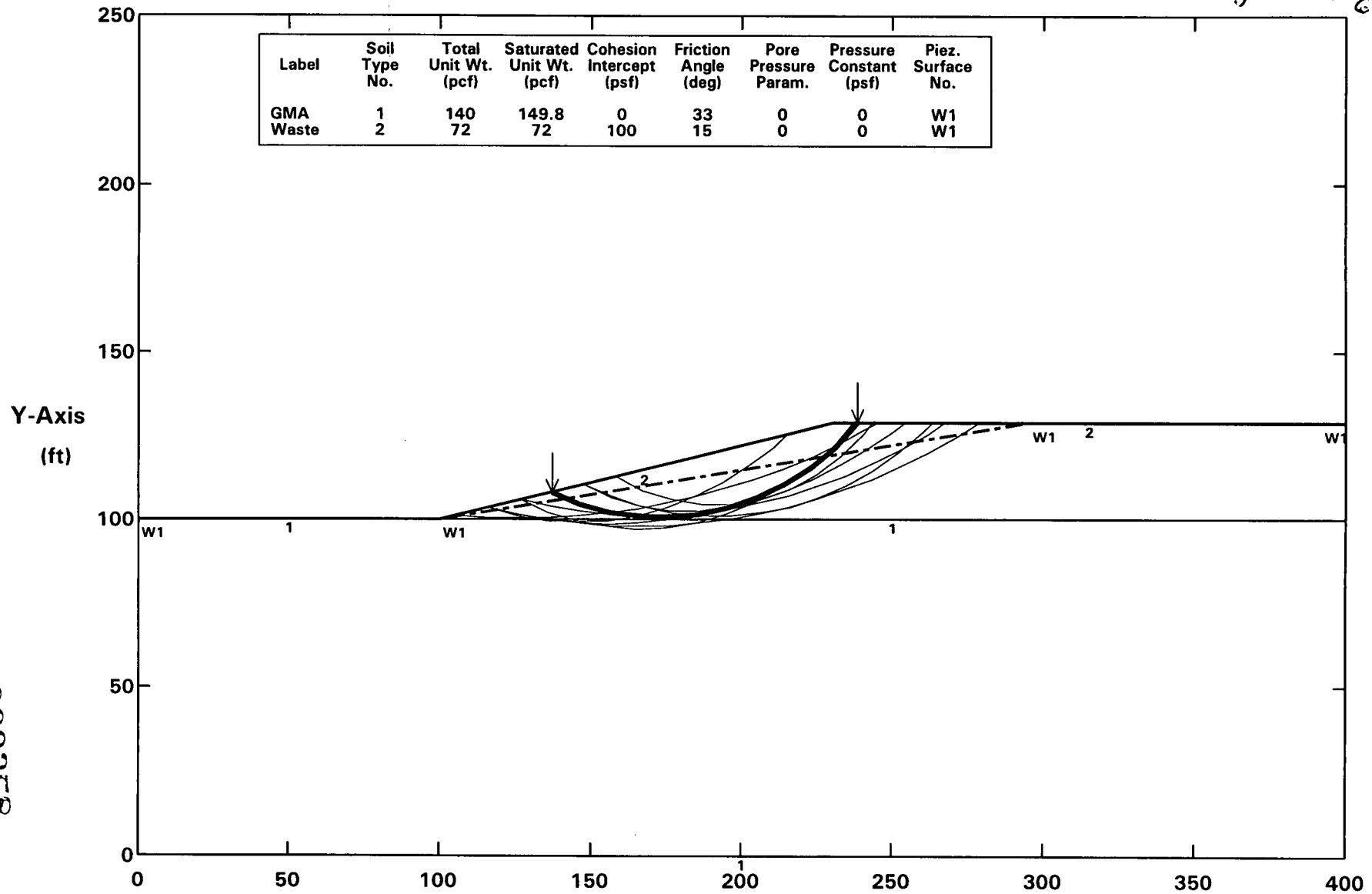
Circle Center At X = 151.3 ; Y = 369.1 and Radius, 274.0

*** 2.004 ***

WPRAP Waste Stability - Waste Pit 5 Waste Slope - 4.5H to 1V

Ten Most Critical. G:WASTE545.PLT By: LIN LIU 01-02-98 7:11pm CK by DCM 6/11/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	72	72	100	15	0	0	W1



PCSTABL5 FSmin = 1.45 X-Axis (ft)

000358

1484

** PCSTABL5 **

by
Purdue University

1484

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-02-98
Time of Run:	7:11pm
Run By:	LIN LIU
Input Data Filename:	G:WASTE545
Output Filename:	G:WASTE545.OUT
Plotted Output Filename:	G:WASTE545.PLT

ck by DCH 6/11/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 5
Waste Slope - 4.5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	230.50	129.00	2
3	230.50	129.00	400.00	129.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	72.0	72.0	100.0	15.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	295.75	129.00
4	400.00	129.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 200.00 ft.

Each Surface Terminates Between X = 200.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 13 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	136.84	108.19
2	146.21	104.68
3	155.90	102.24
4	165.81	100.89
5	175.81	100.65
6	185.77	101.52
7	195.57	103.50
8	205.10	106.55
9	214.22	110.64
10	222.83	115.73
11	230.83	121.73
12	238.10	128.60
13	238.45	129.00

Circle Center At X = 173.0 ; Y = 190.4 and Radius, 89.8

*** 1.450 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.79	103.51
2	125.58	101.47
3	135.47	99.99
4	145.43	99.08
5	155.42	98.74
6	165.42	98.98
7	175.39	99.78
8	185.29	101.16
9	195.10	103.10
10	204.79	105.59
11	214.31	108.64
12	223.65	112.22
13	232.76	116.33
14	241.63	120.96
15	250.21	126.09
16	254.51	129.00

Circle Center At X = 156.3 ; Y = 273.6 and Radius, 174.8

*** 1.532 ***

Failure Surface Specified By 16 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	126.32	105.85
2	136.12	103.90
3	146.02	102.47
4	155.98	101.56
5	165.97	101.17
6	175.97	101.31
7	185.95	101.97
8	195.88	103.15
9	205.73	104.86
10	215.48	107.08
11	225.10	109.80
12	234.57	113.03
13	243.85	116.75
14	252.93	120.95
15	261.77	125.63
16	267.41	129.00

Circle Center At X = 168.3 ; Y = 291.7 and Radius, 190.5

*** 1.540 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	147.37	110.53
2	156.64	106.78
3	166.23	103.93
4	176.04	102.00
5	185.99	101.00
6	195.99	100.95
7	205.95	101.83
8	215.78	103.66
9	225.40	106.40
10	234.71	110.04
11	243.64	114.54
12	252.11	119.87
13	260.03	125.97
14	263.28	129.00

Circle Center At X = 191.6 ; Y = 206.7 and Radius, 105.9

*** 1.566 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	147.37	110.53
2	156.57	106.61
3	166.21	103.97
4	176.13	102.67
5	186.13	102.72
6	196.03	104.13
7	205.65	106.87
8	214.80	110.89
9	223.33	116.12
10	231.07	122.45
11	237.15	129.00

Circle Center At X = 180.7 ; Y = 176.1 and Radius, 73.5

*** 1.579 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.79	103.51
2	125.51	101.15
3	135.41	99.73
4	145.40	99.25
5	155.38	99.73
6	165.28	101.14
7	175.00	103.49
8	184.46	106.75
9	193.56	110.89
10	202.23	115.88
11	210.38	121.67
12	214.85	125.52

Circle Center At X = 145.4 ; Y = 204.6 and Radius, 105.3

*** 1.609 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.32	105.85
2	135.62	102.19
3	145.26	99.52

4	155.12	97.87
5	165.10	97.25
6	175.09	97.67
7	184.99	99.14
8	194.67	101.62
9	204.05	105.10
10	213.01	109.53
11	221.46	114.88
12	229.31	121.08
13	236.47	128.05
14	237.26	129.00

Circle Center At X = 166.0 ; Y = 193.2 and Radius, 95.9

*** 1.670 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.26	101.17
2	115.24	100.56
3	125.24	100.32
4	135.24	100.47
5	145.23	101.00
6	155.19	101.91
7	165.10	103.20
8	174.96	104.86
9	184.75	106.90
10	194.46	109.31
11	204.06	112.09
12	213.56	115.24
13	222.92	118.74
14	232.15	122.60
15	241.22	126.81
16	245.51	129.00

Circle Center At X = 126.4 ; Y = 362.6 and Radius, 262.3

*** 1.674 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.79	103.51
2	125.59	101.51

3	135.47	99.95
4	145.40	98.84
5	155.38	98.17
6	165.38	97.95
7	175.38	98.18
8	185.35	98.85
9	195.29	99.97
10	205.17	101.54
11	214.96	103.54
12	224.66	105.98
13	234.24	108.86
14	243.68	112.15
15	252.96	115.87
16	262.07	120.00
17	270.99	124.54
18	278.87	129.00

Circle Center At X = 165.3 ; Y = 321.3 and Radius, 223.3

*** 1.701 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	157.90	112.87
2	166.97	108.66
3	176.56	105.83
4	186.46	104.43
5	196.46	104.49
6	206.34	106.02
7	215.90	108.97
8	224.91	113.29
9	233.20	118.88
10	240.59	125.63
11	243.33	129.00

Circle Center At X = 191.0 ; Y = 172.5 and Radius, 68.2

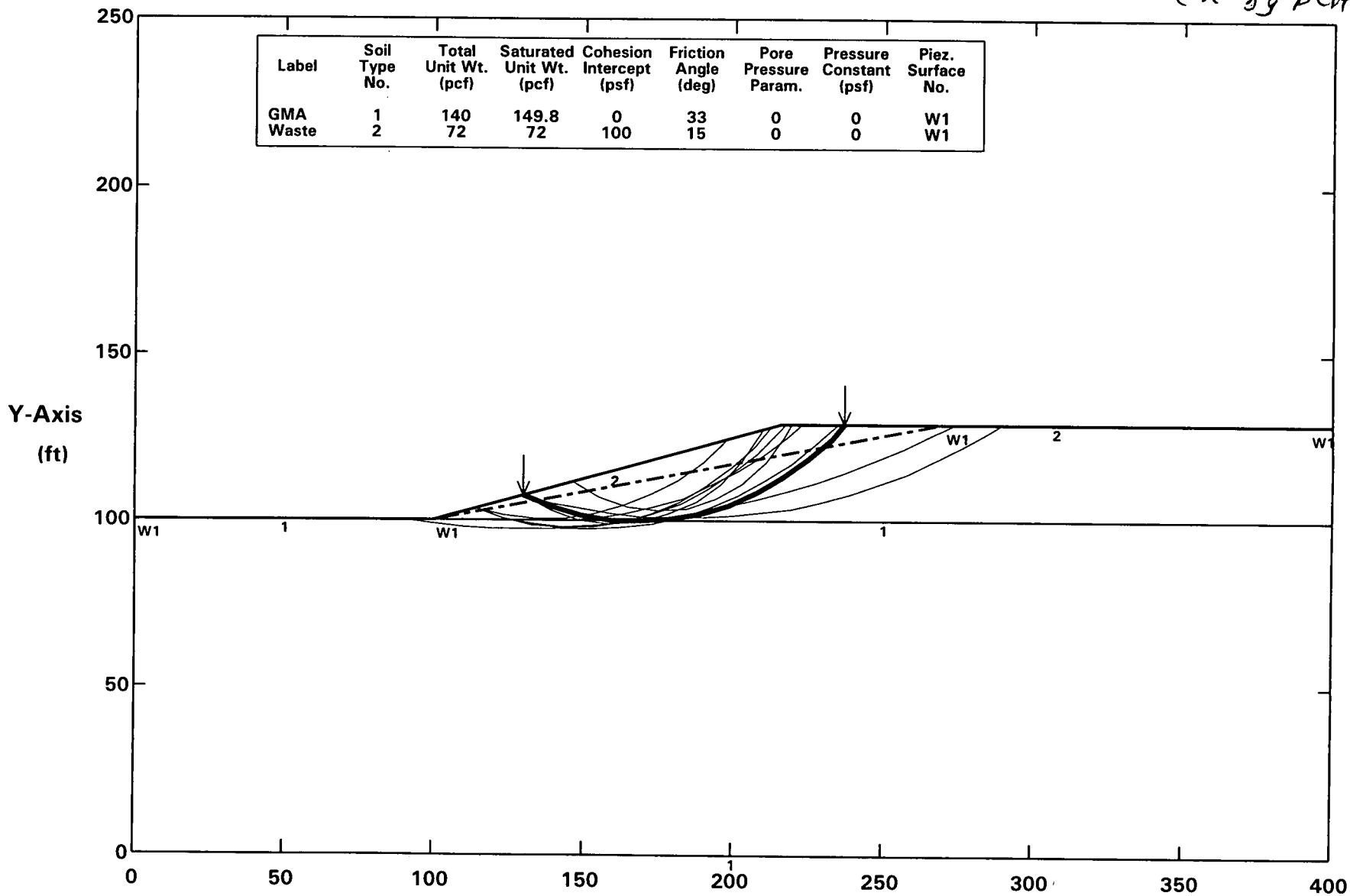
*** 1.714 ***

WPRAP Waste Stability - Waste Pit 5 Waste Slope - 4H to 1V

Ten Most Critical. G:WASTE5H4.PLT By: LIN LIU 01-03-98 8:26am

ck by PCW 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	72	72	100	15	0	0	W1



PCSTABL5 FSmin = 1.32 X-Axis (ft)

1484

000369

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-03-98
Time of Run: 8:26am
Run By: LIN LIU
Input Data Filename: G:WASTE5H4
Output Filename: G:WASTE5H4.OUT
Plotted Output Filename: G:WASTE5H4.PLT

ck by DCM 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 5
Waste Slope - 4H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	216.00	129.00	2
3	216.00	129.00	400.00	129.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	72.0	72.0	100.0	15.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	270.00	129.00
4	400.00	129.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

625 Trial Surfaces Have Been Generated.

25 Surfaces Initiate From Each Of 25 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 195.00 ft.

Each Surface Terminates Between X = 195.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 13 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	130.00	107.50
2	139.39	104.07
3	149.09	101.62
4	158.99	100.18
5	168.98	99.77
6	178.96	100.40
7	188.82	102.04
8	198.46	104.70
9	207.78	108.33
10	216.67	112.90
11	225.05	118.36
12	232.82	124.66
13	237.16	129.00

Circle Center At X = 167.9 ; Y = 196.7 and Radius, 97.0

*** 1.316 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.75	103.44
2	123.57	101.57
3	133.51	100.47
4	143.51	100.16
5	153.50	100.64
6	163.42	101.90
7	173.21	103.93
8	182.81	106.72
9	192.17	110.26
10	201.21	114.52
11	209.90	119.47
12	218.17	125.09
13	223.04	129.00

Circle Center At X = 142.5 ; Y = 227.6 and Radius, 127.4

*** 1.322 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.75	103.44

2	123.36	100.68
3	133.21	98.92
4	143.18	98.15
5	153.17	98.39
6	163.10	99.64
7	172.84	101.89
8	182.31	105.10
9	191.41	109.26
10	200.04	114.31
11	208.11	120.20
12	215.55	126.89
13	217.48	129.00

Circle Center At X = 145.8 ; Y = 197.1 and Radius, 99.0

*** 1.417 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.75	103.44
2	123.38	100.72
3	133.19	98.80
4	143.12	97.66
5	153.12	97.34
6	163.11	97.82
7	173.02	99.10
8	182.80	101.19
9	192.39	104.05
10	201.71	107.67
11	210.70	112.04
12	219.32	117.12
13	227.49	122.87
14	234.85	129.00

Circle Center At X = 152.2 ; Y = 221.2 and Radius, 123.9

*** 1.449 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.75	103.44
2	123.31	100.51
3	133.14	98.65

4	143.11	97.89
5	153.10	98.22
6	163.00	99.65
7	172.68	102.17
8	182.03	105.72
9	190.92	110.29
10	199.26	115.80
11	206.95	122.20
12	212.70	128.17

Circle Center At X = 145.1 ; Y = 188.7 and Radius, 90.8

*** 1.464 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.00	107.50
2	138.94	103.02
3	148.52	100.15
4	158.45	98.97
5	168.44	99.51
6	178.18	101.77
7	187.39	105.67
8	195.78	111.10
9	203.12	117.89
10	209.18	125.85
11	210.05	127.51

Circle Center At X = 160.3 ; Y = 156.8 and Radius, 57.9

*** 1.495 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.00	107.50
2	139.74	105.23
3	149.57	103.42
4	159.48	102.06
5	169.44	101.18
6	179.43	100.76
7	189.43	100.80
8	199.42	101.32
9	209.37	102.30

10	219.27	103.74
11	229.08	105.65
12	238.80	108.01
13	248.40	110.83
14	257.85	114.09
15	267.14	117.78
16	276.25	121.91
17	285.15	126.46
18	289.60	129.00

Circle Center At X = 183.4 ; Y = 314.6 and Radius, 213.9

*** 1.506 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.38	100.00
2	99.32	98.96
3	109.29	98.21
4	119.28	97.75
5	129.28	97.57
6	139.28	97.69
7	149.27	98.10
8	159.25	98.80
9	169.20	99.79
10	179.12	101.07
11	188.99	102.63
12	198.82	104.48
13	208.59	106.62
14	218.29	109.04
15	227.92	111.74
16	237.47	114.72
17	246.92	117.97
18	256.28	121.50
19	265.53	125.29
20	273.86	129.00

Circle Center At X = 130.2 ; Y = 441.9 and Radius, 344.3

*** 1.510 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	146.25	111.56
2	155.04	106.80
3	164.59	103.83
4	174.54	102.77
5	184.49	103.67
6	194.09	106.49
7	202.96	111.11
8	210.75	117.37
9	217.19	125.03
10	219.37	129.00

Circle Center At X = 174.9 ; Y = 154.0 and Radius, 51.2

*** 1.510 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.75	103.44
2	123.54	101.38
3	133.49	100.44
4	143.49	100.61
5	153.41	101.90
6	163.12	104.29
7	172.50	107.75
8	181.43	112.25
9	189.81	117.71
10	197.52	124.07
11	197.91	124.48

Circle Center At X = 137.0 ; Y = 189.6 and Radius, 89.2

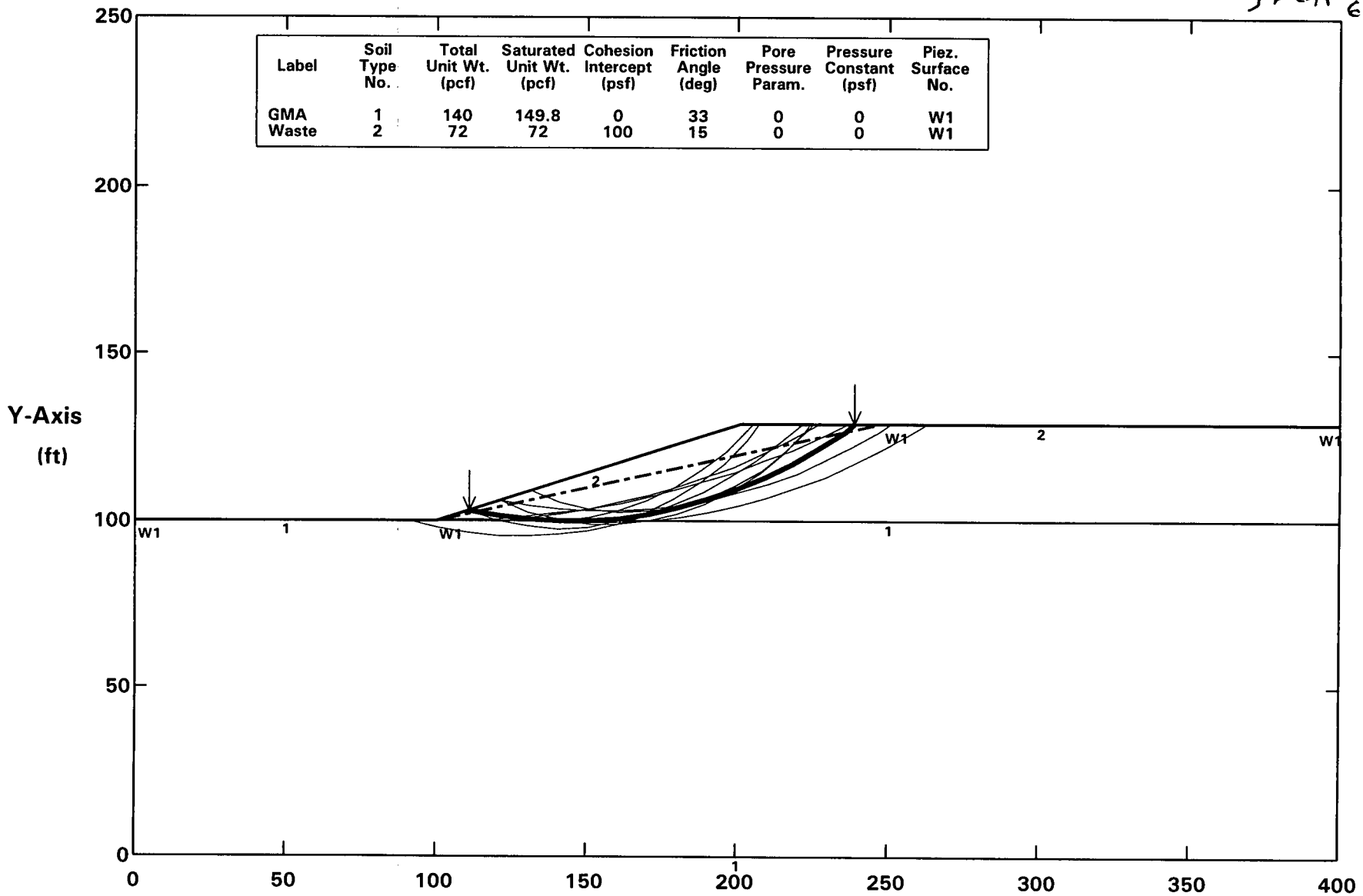
*** 1.513 ***

WPRAP Waste Stability - Waste Pit 5 Waste Slope - 3.5H to 1V

Ten Most Critical. G:WASTE535.PLT By: LIN LIU 01-03-98 8:30am

CK by PCIT 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	72	72	100	15	0	0	W1



PCSTABL5 FSmin = 1.19 X-Axis (ft)

1484

000374

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	8:30am
Run By:	LIN LIU
Input Data Filename:	G:WASTE535
Output Filename:	G:WASTE535.OUT
Plotted Output Filename:	G:WASTE535.PLT

ck by DCM 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 5
Waste Slope - 3.5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	201.50	129.00	2
3	201.50	129.00	400.00	129.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	72.0	72.0	100.0	15.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	248.00	129.00
4	400.00	129.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 192.00 ft.

Each Surface Terminates Between X = 192.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 15 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	111.16	103.19
2	121.02	101.52
3	130.96	100.43
4	140.95	99.94
5	150.95	100.03
6	160.92	100.71
7	170.84	101.98
8	180.67	103.83
9	190.37	106.26
10	199.91	109.25
11	209.26	112.81
12	218.38	116.90
13	227.25	121.53
14	235.82	126.68
15	239.23	129.00

Circle Center At X = 144.4 ; Y = 269.4 and Radius, 169.5

*** 1.189 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.16	103.19
2	120.95	101.18
3	130.90	100.17
4	140.90	100.18
5	150.85	101.20
6	160.65	103.22
7	170.19	106.22
8	179.37	110.17
9	188.11	115.03
10	196.32	120.75
11	203.90	127.27
12	205.54	129.00

Circle Center At X = 135.8 ; Y = 198.7 and Radius, 98.7

*** 1.191 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	121.26	106.08
2	130.66	102.67
3	140.38	100.31
4	150.30	99.03
5	160.30	98.84
6	170.26	99.75
7	180.06	101.75
8	189.58	104.81
9	198.70	108.90
10	207.33	113.95
11	215.35	119.93
12	222.67	126.75
13	224.61	129.00

Circle Center At X = 157.0 ; Y = 189.9 and Radius, 91.1

*** 1.272 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.16	103.19
2	120.70	100.21
3	130.53	98.36
4	140.51	97.66
5	150.50	98.13
6	160.36	99.76
7	169.97	102.53
8	179.19	106.40
9	187.90	111.31
10	195.98	117.20
11	203.32	124.00
12	207.60	129.00

Circle Center At X = 141.5 ; Y = 183.5 and Radius, 85.8

*** 1.284 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.37	108.96
2	140.83	105.72
3	150.60	103.60
4	160.55	102.64

5	170.55	102.85
6	180.46	104.22
7	190.13	106.74
8	199.45	110.38
9	208.28	115.08
10	216.49	120.78
11	223.99	127.40
12	225.43	129.00

Circle Center At X = 163.8 ; Y = 188.0 and Radius, 85.4

*** 1.291 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.16	103.19
2	121.03	101.56
3	130.96	100.38
4	140.93	99.65
5	150.92	99.37
6	160.92	99.54
7	170.90	100.15
8	180.85	101.22
9	190.73	102.73
10	200.54	104.68
11	210.25	107.07
12	219.84	109.89
13	229.30	113.15
14	238.60	116.82
15	247.73	120.91
16	256.66	125.41
17	263.06	129.00

Circle Center At X = 152.2 ; Y = 321.8 and Radius, 222.4

*** 1.301 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.26	106.08
2	131.14	104.50
3	141.08	103.46
4	151.07	102.94

5	161.07	102.96
6	171.06	103.51
7	181.00	104.59
8	190.87	106.20
9	200.64	108.33
10	210.28	110.97
11	219.77	114.12
12	229.08	117.78
13	238.18	121.92
14	247.05	126.54
15	251.20	129.00

Circle Center At X = 155.7 ; Y = 290.9 and Radius, 188.0

*** 1.366 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.05	100.30
2	111.05	100.16
3	121.05	100.40
4	131.03	101.04
5	140.98	102.06
6	150.88	103.47
7	160.71	105.27
8	170.47	107.45
9	180.14	110.00
10	189.70	112.93
11	199.14	116.23
12	208.45	119.90
13	217.60	123.93
14	226.59	128.31
15	227.88	129.00

Circle Center At X = 109.7 ; Y = 356.7 and Radius, 256.6

*** 1.383 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.95	100.00
2	100.72	97.89
3	110.61	96.43

4	120.58	95.63
5	130.58	95.50
6	140.57	96.04
7	150.50	97.24
8	160.32	99.10
9	170.00	101.61
10	179.49	104.76
11	188.75	108.54
12	197.74	112.92
13	206.41	117.90
14	214.74	123.44
15	221.99	129.00

Circle Center At X = 127.5 ; Y = 245.4 and Radius, 150.0

*** 1.417 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.05	100.30
2	111.05	100.33
3	121.05	100.67
4	131.03	101.33
5	140.98	102.30
6	150.89	103.59
7	160.77	105.19
8	170.58	107.10
9	180.33	109.32
10	190.01	111.85
11	199.60	114.68
12	209.09	117.82
13	218.49	121.25
14	227.77	124.97
15	236.92	128.99
16	236.94	129.00

Circle Center At X = 105.2 ; Y = 416.6 and Radius, 316.4

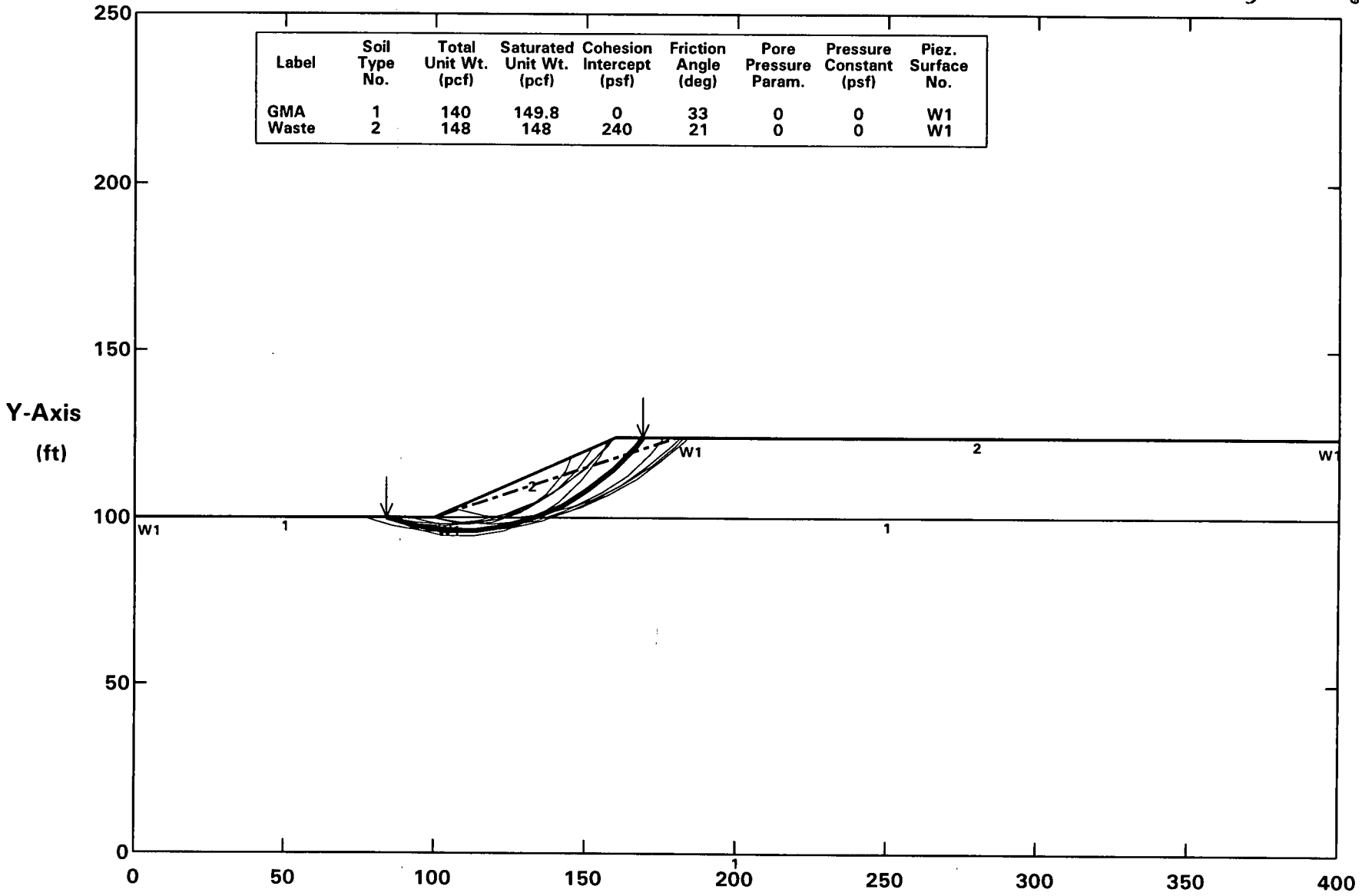
*** 1.435 ***

WPRAP Waste Stability - Waste Pit 6 Waste Slope - 2.5H to 1V

Ten Most Critical. G:WASTE625.PLT By: LIN LIU 01-03-98 9:13am

ck by DCW 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	148	148	240	21	0	0	W1



PCSTABL5 FSmin = 1.41 X-Axis (ft)

1484

000382

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 9:13am
Run By: LIN LIU
Input Data Filename: G:WASTE625
Output Filename: G:WASTE625.OUT
Plotted Output Filename: G:WASTE625.PLT

C.K by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 6
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	160.00	124.00	2
3	160.00	124.00	400.00	124.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	148.0	148.0	240.0	21.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	180.00	124.00
4	400.00	124.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 145.00 ft.

Each Surface Terminates Between X = 145.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 11 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	83.95	100.00
2	93.63	97.48
3	103.54	96.21
4	113.54	96.20
5	123.47	97.45
6	133.15	99.93
7	142.45	103.63
8	151.20	108.46
9	159.27	114.36
10	166.54	121.23
11	168.81	124.00

Circle Center At X = 108.6 ; Y = 175.2 and Radius, 79.1

*** 1.412 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.74	97.96
3	103.68	96.86
4	113.68	96.69
5	123.65	97.46
6	133.50	99.16
7	143.15	101.78
8	152.51	105.30
9	161.50	109.67
10	170.04	114.88
11	178.06	120.86
12	181.53	124.00

Circle Center At X = 110.5 ; Y = 203.0 and Radius, 106.4

*** 1.463 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.21	100.00
2	109.11	98.60
3	119.11	98.23
4	129.08	98.87

5	138.95	100.53
6	148.58	103.20
7	157.90	106.83
8	166.80	111.40
9	175.18	116.85
10	182.96	123.13
11	183.83	124.00

Circle Center At X = 117.8 ; Y = 195.9 and Radius, 97.7

*** 1.490 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	76.32	100.00
2	86.04	97.68
3	95.94	96.22
4	105.92	95.64
5	115.92	95.94
6	125.85	97.12
7	135.63	99.16
8	145.21	102.06
9	154.49	105.79
10	163.40	110.32
11	171.88	115.61
12	179.87	121.63
13	182.50	124.00

Circle Center At X = 107.5 ; Y = 209.3 and Radius, 113.7

*** 1.501 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.58	100.00
2	101.37	97.97
3	111.37	97.76
4	121.24	99.36
5	130.66	102.72
6	139.31	107.74
7	146.90	114.24
8	152.31	120.93

Circle Center At X = 107.6 ; Y = 152.5 and Radius, 54.9

*** 1.502 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.28	96.40
3	103.10	94.51
4	113.10	94.39
5	122.96	96.04
6	132.37	99.41
7	141.04	104.40
8	148.69	110.84
9	155.07	118.54
10	157.62	123.05

Circle Center At X = 108.8 ; Y = 150.4 and Radius, 56.2

*** 1.511 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.77	98.14
3	103.76	97.63
4	113.72	98.47
5	123.48	100.65
6	132.86	104.13
7	141.67	108.85
8	149.77	114.72
9	157.00	121.63
10	158.37	123.35

Circle Center At X = 102.5 ; Y = 171.4 and Radius, 73.7

*** 1.536 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.21	100.00
2	108.98	97.85
3	118.97	98.32
4	128.49	101.36
5	136.90	106.78
6	143.61	114.19
7	145.70	118.28

Circle Center At X = 112.2 ; Y = 135.9 and Radius, 38.1

*** 1.558 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.95	100.00
2	93.81	98.35
3	103.80	97.99
4	113.76	98.92
5	123.51	101.13
6	132.90	104.57
7	141.77	109.20
8	149.96	114.93
9	157.35	121.67
10	158.96	123.59

Circle Center At X = 101.6 ; Y = 175.3 and Radius, 77.4

*** 1.560 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.84	102.74
2	116.64	100.73
3	126.63	100.21
4	136.58	101.19
5	146.27	103.65
6	155.49	107.52
7	164.03	112.73
8	171.69	119.16

9 175.96 124.00

Circle Center At X = 125.1 ; Y = 166.9 and Radius, 66.7

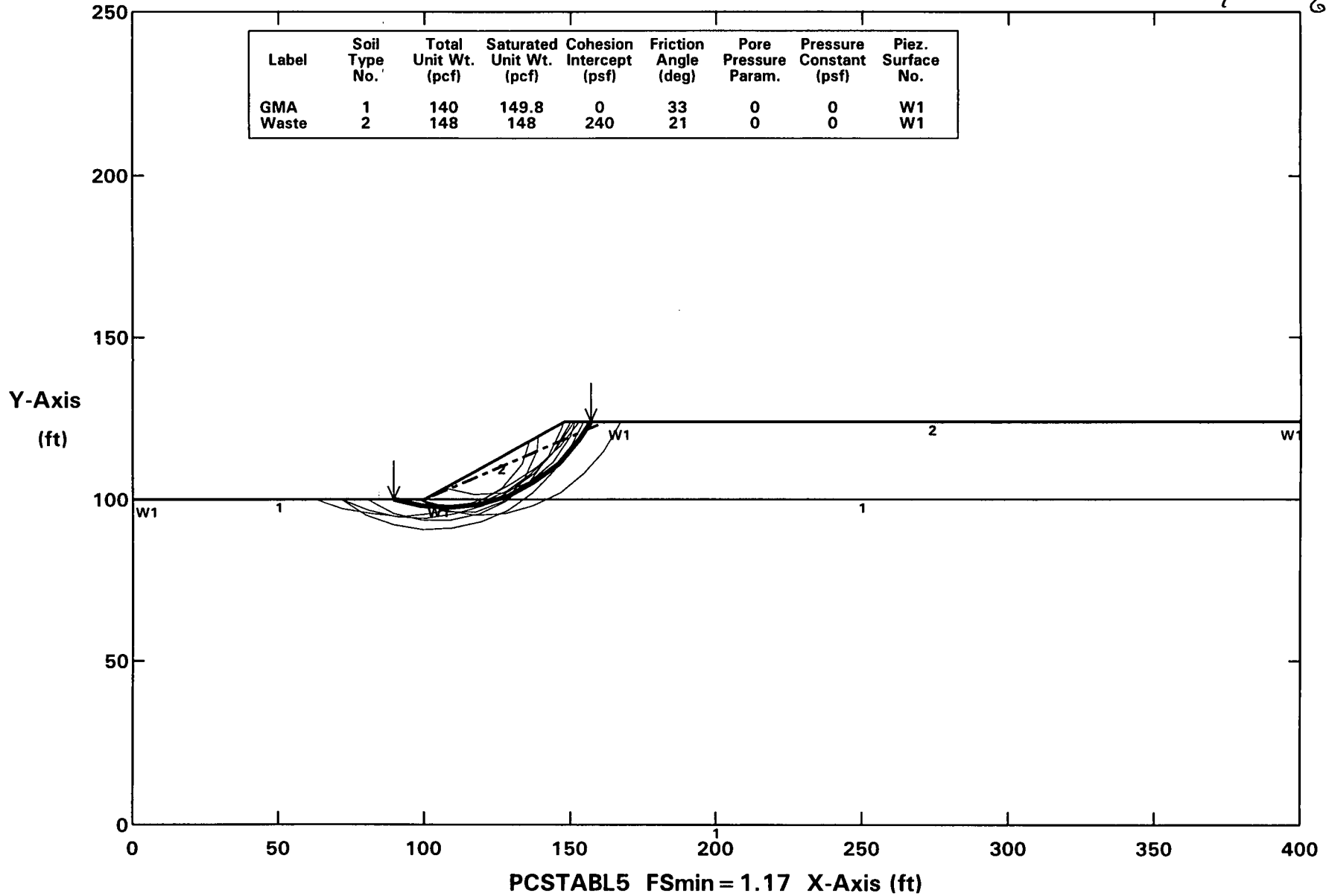
*** 1.577 ***

WPRAP Waste Stability - Waste Pit 6 Waste Slope - 2H to 1V

Ck by D Cy 6/11/98

Ten Most Critical. G:WASTE6H2.PLT By: LIN LIU 01-03-98 9:44am

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	148	148	240	21	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 9:44am
Run By: LIN LIU
Input Data Filename: G:WASTE6H2
Output Filename: G:WASTE6H2.OUT
Plotted Output Filename: G:WASTE6H2.PLT

OK by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Waste Pit 6
Waste Slope - 2H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	148.00	124.00	2
3	148.00	124.00	400.00	124.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	148.0	148.0	240.0	21.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	162.00	124.00
4	400.00	124.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

300 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 125.00 ft.

Each Surface Terminates Between X = 125.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	89.29	100.00
2	99.04	97.80
3	109.03	97.25
4	118.96	98.37
5	128.57	101.13
6	137.59	105.46
7	145.77	111.22
8	152.87	118.26
9	156.98	124.00

Circle Center At X = 107.3 ; Y = 157.1 and Radius, 59.9

*** 1.169 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.29	100.00
2	99.01	97.68
3	109.01	97.33
4	118.87	98.96
5	128.22	102.51
6	136.69	107.84
7	143.93	114.73
8	149.67	122.92
9	150.14	124.00

Circle Center At X = 105.8 ; Y = 147.6 and Radius, 50.3

*** 1.199 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	107.94	97.68
3	117.86	98.94
4	126.70	103.62
5	133.33	111.11
6	135.94	117.97

Circle Center At X = 109.4 ; Y = 125.6 and Radius, 27.9

*** 1.372 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	107.64	96.66
3	117.53	95.17
4	127.52	95.60
5	137.25	97.91
6	146.36	102.04
7	154.52	107.82
8	161.43	115.04
9	166.84	123.45
10	167.06	124.00

Circle Center At X = 120.3 ; Y = 147.4 and Radius, 52.3

*** 1.374 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.36	100.00
2	89.36	95.65
3	99.10	93.37
4	109.10	93.28
5	118.87	95.38
6	127.96	99.57
7	135.90	105.65
8	142.32	113.31
9	146.91	122.20
10	147.29	123.64

Circle Center At X = 104.5 ; Y = 138.5 and Radius, 45.4

*** 1.393 ***

Failure Surface Specified By 11 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	71.43	100.00
2	80.78	96.46
3	90.58	94.48
4	100.58	94.09
5	110.50	95.31
6	120.10	98.11
7	129.12	102.42
8	137.34	108.12
9	144.53	115.07
10	150.51	123.09
11	150.99	124.00

Circle Center At X = 98.0 ; Y = 156.1 and Radius, 62.0

*** 1.397 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	107.14	103.57
2	116.89	101.36
3	126.87	102.03
4	136.24	105.52
5	144.21	111.56
6	150.12	119.63
7	151.68	124.00

Circle Center At X = 119.6 ; Y = 135.8 and Radius, 34.6

*** 1.419 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.21	100.00
2	107.45	96.17
3	117.45	95.99
4	126.82	99.49
5	134.24	106.18
6	138.70	115.13
7	139.08	119.54

Circle Center At X = 112.9 ; Y = 122.4 and Radius, 26.8

*** 1.444 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.43	100.00
2	80.21	95.21
3	89.69	92.04
4	99.58	90.59
5	109.58	90.91
6	119.36	92.98
7	128.62	96.75
8	137.08	102.09
9	144.46	108.84
10	150.53	116.78
11	154.25	124.00

Circle Center At X = 102.8 ; Y = 147.0 and Radius, 56.5

*** 1.469 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.50	100.00
2	72.05	97.03
3	81.89	95.26
4	91.88	94.73
5	101.85	95.43
6	111.66	97.37
7	121.16	100.50
8	130.20	104.79
9	138.63	110.15
10	146.34	116.53
11	153.20	123.80
12	153.34	124.00

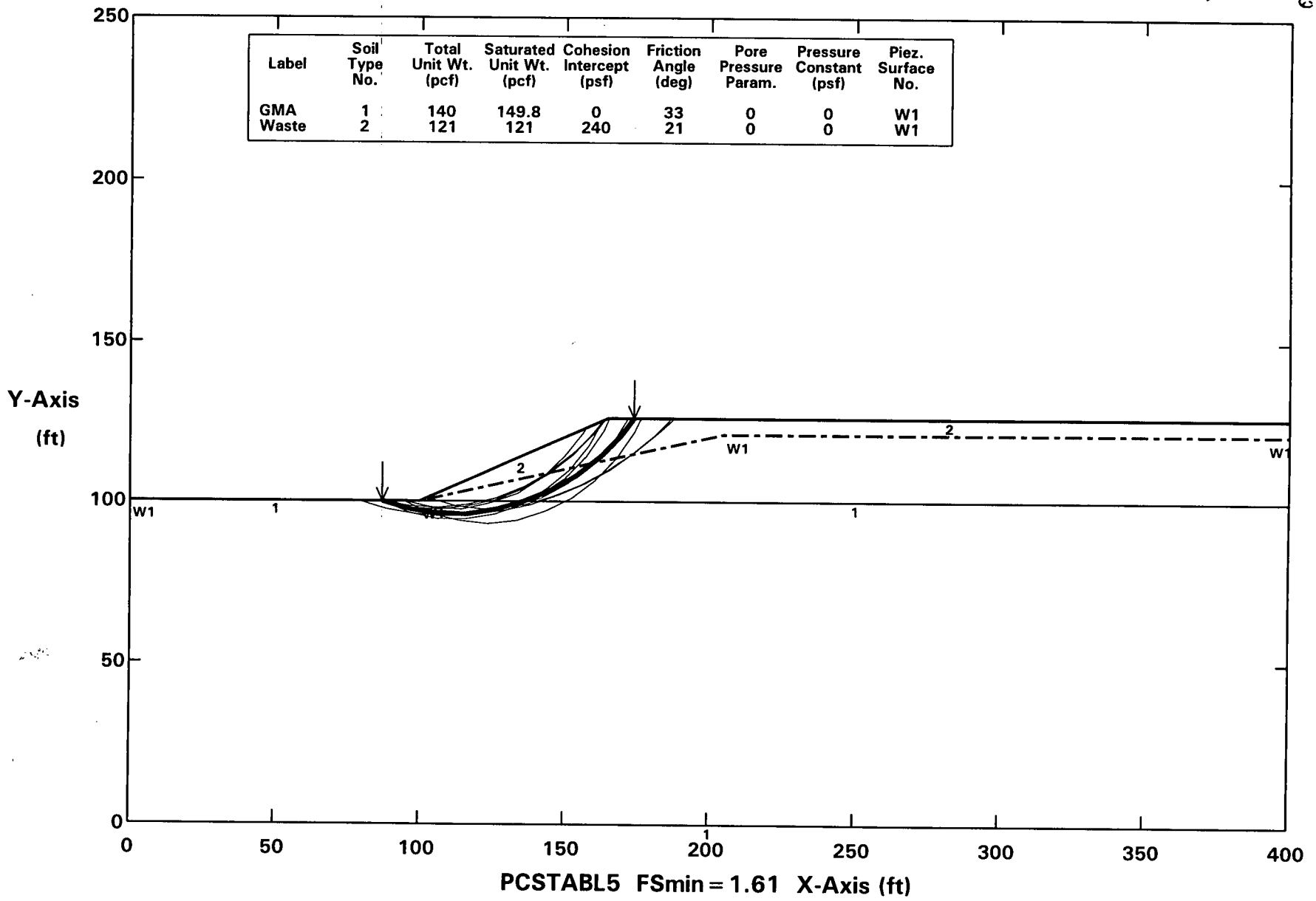
Circle Center At X = 91.2 ; Y = 175.4 and Radius, 80.7

*** 1.498 ***

WPRAP Waste Stability - Burn Pit Waste Slope - 2.5H to 1V

Ten Most Critical. G:BURN25H.PLT By: LIN LIU 01-03-98 9:30am ck by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	121	121	240	21	0	0	W1



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** PCSTABL5 **

by
Purdue University

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--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	9:30am
Run By:	LIN LIU
Input Data Filename:	G:BURN25H
Output Filename:	G:BURN25H.OUT
Plotted Output Filename:	G:BURN25H.PLT

CK by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Burn Pit
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	165.00	126.00	2
3	165.00	126.00	400.00	126.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	121.0	121.0	240.0	21.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	205.00	121.00
4	400.00	121.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 150.00 ft.

Each Surface Terminates Between X = 150.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 11 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	86.84	100.00
2	96.52	97.48
3	106.44	96.19
4	116.44	96.15
5	126.37	97.35
6	136.07	99.78
7	145.39	103.40
8	154.19	108.15
9	162.33	113.96
10	169.68	120.74
11	174.12	126.00

Circle Center At X = 111.8 ; Y = 176.1 and Radius, 80.1

*** 1.611 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.63	101.05
2	112.30	98.50
3	122.27	97.65
4	132.23	98.53
5	141.89	101.11
6	150.97	105.30
7	159.19	111.00
8	166.30	118.02
9	171.99	126.00

Circle Center At X = 122.2 ; Y = 155.6 and Radius, 58.0

*** 1.688 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.84	100.00
2	96.63	97.96
3	106.57	96.85
4	116.57	96.67
5	126.54	97.42
6	136.40	99.09
7	146.06	101.68

8	155.43	105.16
9	164.45	109.50
10	173.01	114.66
11	181.06	120.59
12	187.13	126.00

Circle Center At X = 113.5 ; Y = 203.8 and Radius, 107.2

*** 1.689 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.74	100.00
2	104.53	97.97
3	114.53	97.73
4	124.41	99.29
5	133.85	102.58
6	142.55	107.52
7	150.22	113.93
8	156.62	121.61
9	157.39	122.95

Circle Center At X = 110.9 ; Y = 153.2 and Radius, 55.6

*** 1.696 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.84	100.00
2	96.67	98.14
3	106.65	97.61
4	116.62	98.43
5	126.39	100.58
6	135.78	104.02
7	144.62	108.69
8	152.76	114.50
9	160.05	121.35
10	163.26	125.30

Circle Center At X = 105.6 ; Y = 172.0 and Radius, 74.4

*** 1.713 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.84	100.00
2	96.17	96.40
3	105.98	94.47
4	115.98	94.28
5	125.86	95.82
6	135.32	99.06
7	144.08	103.89
8	151.87	110.17
9	158.44	117.70
10	162.96	125.19

Circle Center At X = 112.1 ; Y = 151.5 and Radius, 57.4

*** 1.716 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.95	100.00
2	88.68	97.68
3	98.57	96.22
4	108.55	95.62
5	118.55	95.90
6	128.48	97.05
7	138.28	99.06
8	147.86	101.92
9	157.16	105.60
10	166.10	110.08
11	174.61	115.32
12	182.64	121.28
13	187.95	126.00

Circle Center At X = 110.4 ; Y = 210.2 and Radius, 114.6

*** 1.726 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.63	101.05
2	112.26	98.36
3	122.24	97.65
4	132.15	98.93
5	141.62	102.17
6	150.24	107.24
7	157.68	113.91
8	163.64	121.94
9	165.54	126.00

Circle Center At X = 120.8 ; Y = 147.5 and Radius, 49.9

*** 1.729 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.74	100.00
2	103.97	96.17
3	113.71	93.89
4	123.69	93.24
5	133.64	94.24
6	143.30	96.84
7	152.39	101.00
8	160.69	106.58
9	167.96	113.44
10	174.01	121.41
11	176.43	126.00

Circle Center At X = 122.6 ; Y = 154.2 and Radius, 60.9

*** 1.732 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.84	100.00
2	96.71	98.35
3	106.70	97.98
4	116.66	98.90
5	126.42	101.08
6	135.82	104.49

7	144.70	109.08
8	152.92	114.77
9	160.35	121.47
10	163.84	125.54

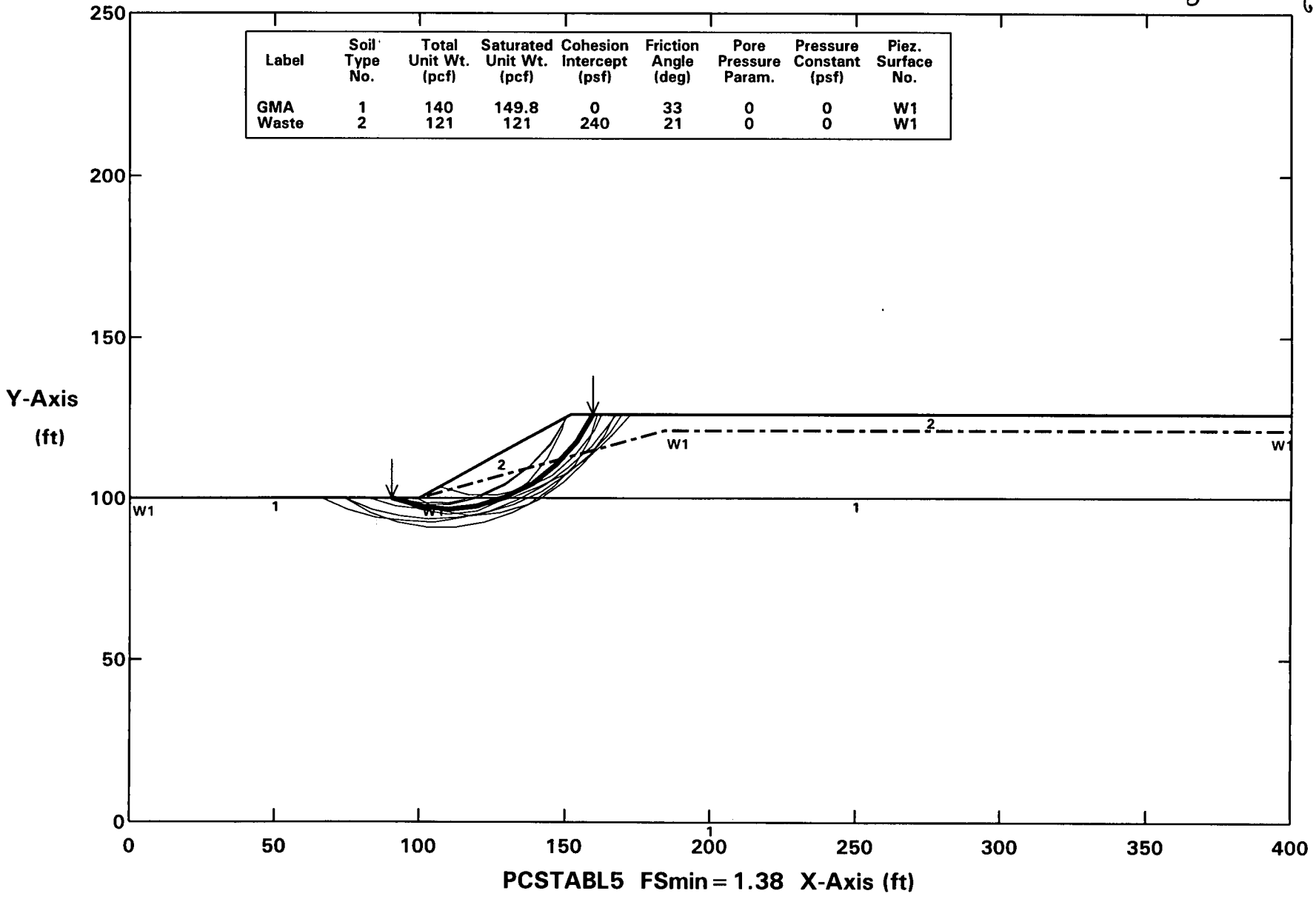
Circle Center At X = 104.6 ; Y = 175.9 and Radius, 77.9

*** 1.736 ***

WPRAP Waste Stability - Burn Pit Waste Slope - 2H to 1V

Ten Most Critical. G:BURN2H.PLT By: LIN LIU 01-03-98 9:53am ck by DCK 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	121	121	240	21	0	0	W1



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** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 01-03-98
Time of Run: 9:53am
Run By: LIN LIU
Input Data Filename: G:BURN2H
Output Filename: G:BURN2H.OUT
Plotted Output Filename: G:BURN2H.PLT

ck by DCH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Burn Pit
Waste Slope - 2H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	152.00	126.00	2
3	152.00	126.00	400.00	126.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	121.0	121.0	240.0	21.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	184.00	121.00
4	400.00	121.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

360 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 18 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	90.59	100.00
2	100.27	97.48
3	110.24	96.69
4	120.19	97.65
5	129.83	100.32
6	138.85	104.62
7	146.99	110.43
8	153.99	117.57
9	159.65	125.82
10	159.73	126.00

Circle Center At X = 109.8 ; Y = 153.9 and Radius, 57.3

*** 1.382 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.41	98.14
3	110.41	98.21
4	120.21	100.22
5	129.44	104.07
6	137.74	109.64
7	144.82	116.71
8	150.39	125.01
9	150.49	125.25

Circle Center At X = 105.0 ; Y = 149.4 and Radius, 51.5

*** 1.466 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.35	100.00
2	92.08	97.68
3	102.01	96.50
4	112.01	96.48
5	121.95	97.61
6	131.68	99.88
7	141.09	103.27
8	150.05	107.72

9	158.43	113.17
10	166.13	119.56
11	172.27	126.00

Circle Center At X = 107.2 ; Y = 182.7 and Radius, 86.3

*** 1.469 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.45	98.35
3	110.45	98.57
4	120.23	100.64
5	129.46	104.50
6	137.81	110.00
7	144.99	116.96
8	150.75	125.13
9	150.89	125.45

Circle Center At X = 104.3 ; Y = 151.7 and Radius, 53.5

*** 1.478 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	99.92	96.40
3	109.83	95.11
4	119.77	96.22
5	129.17	99.65
6	137.48	105.20
7	144.24	112.58
8	149.05	121.34
9	150.04	125.02

Circle Center At X = 110.2 ; Y = 137.0 and Radius, 41.9

*** 1.496 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.12	100.00
2	83.52	96.60
3	93.28	94.41
4	103.24	93.47
5	113.23	93.79
6	123.10	95.37
7	132.70	98.19
8	141.87	102.19
9	150.45	107.31
10	158.32	113.48
11	165.36	120.59
12	169.50	126.00

Circle Center At X = 105.7 ; Y = 172.6 and Radius, 79.1

*** 1.543 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.82	100.00
2	108.06	96.17
3	117.93	94.56
4	127.90	95.27
5	137.45	98.25
6	146.05	103.35
7	153.25	110.29
8	158.66	118.70
9	161.24	126.00

Circle Center At X = 119.9 ; Y = 137.7 and Radius, 43.2

*** 1.573 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	107.06	103.53
2	116.76	101.11

3	126.76	100.93
4	136.55	102.98
5	145.63	107.17
6	153.54	113.28
7	159.89	121.01
8	162.38	126.00

Circle Center At X = 122.6 ; Y = 145.2 and Radius, 44.5

*** 1.620 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.88	100.00
2	75.24	96.46
3	84.94	94.05
4	94.86	92.81
5	104.86	92.74
6	114.80	93.85
7	124.54	96.13
8	133.94	99.53
9	142.87	104.03
10	151.22	109.54
11	158.85	116.00
12	165.67	123.32
13	167.63	126.00

Circle Center At X = 100.4 ; Y = 177.3 and Radius, 84.6

*** 1.623 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.12	100.00
2	83.12	95.65
3	92.67	92.67
4	102.55	91.13
5	112.55	91.06
6	122.45	92.46
7	132.04	95.30
8	141.10	99.53
9	149.44	105.04
10	156.88	111.72

11	163.26	119.43
12	167.23	126.00

Circle Center At X = 108.0 ; Y = 158.6 and Radius, 67.7

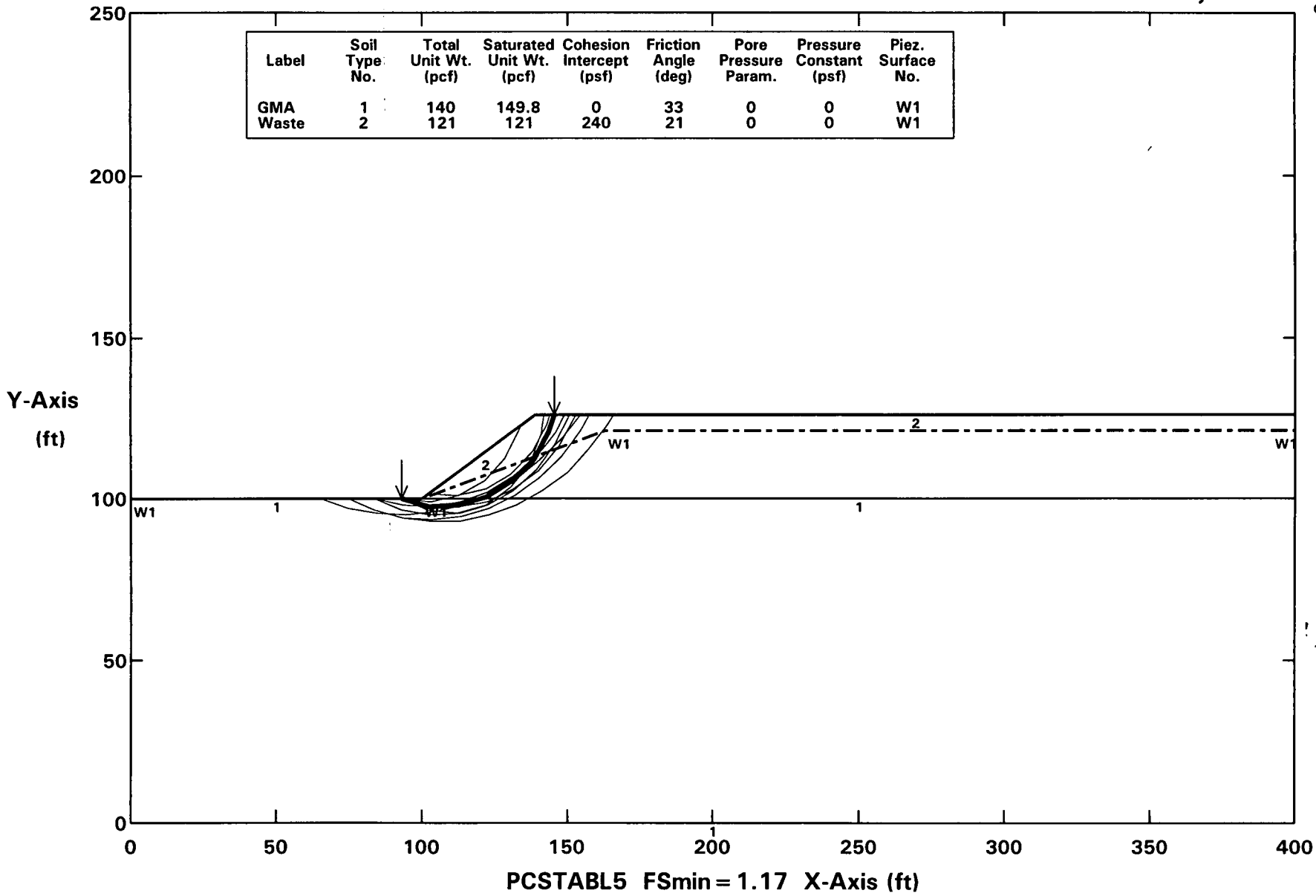
*** 1.629 ***

WPRAP Waste Stability - Burn Pit Waste Slope - 1.5H to 1V

Ten Most Critical. G:BURN215.PLT By: LIN LIU 01-03-98 9:57am

CK by DCM 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	121	121	240	21	0	0	W1



1484

000413

** PCSTABL5 **

1484

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	01-03-98
Time of Run:	9:57am
Run By:	LIN LIU
Input Data Filename:	G:BURN215
Output Filename:	G:BURN215.OUT
Plotted Output Filename:	G:BURN215.PLT

CK by PCW 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Burn Pit
Waste Slope - 1.5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	139.00	126.00	2
3	139.00	126.00	400.00	126.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	121.0	121.0	240.0	21.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	163.00	121.00
4	400.00	121.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

300 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 15 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 130.00 ft.

Each Surface Terminates Between X = 130.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 8 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	92.86	100.00
2	102.59	97.68
3	112.58	97.82
4	122.25	100.39
5	130.99	105.26
6	138.27	112.11
7	143.65	120.53
8	145.47	126.00

Circle Center At X = 107.0 ; Y = 138.0 and Radius, 40.6

*** 1.168 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	100.00
2	93.35	97.89
3	103.34	97.54
4	113.24	98.96
5	122.73	102.11
6	131.51	106.90
7	139.31	113.16
8	145.87	120.70
9	149.03	126.00

Circle Center At X = 100.3 ; Y = 153.7 and Radius, 56.3

*** 1.189 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.58	97.68
3	112.58	97.41
4	122.42	99.21
5	131.68	102.99
6	139.95	108.60
7	146.90	115.79
8	152.22	124.26
9	152.86	126.00

Circle Center At X = 108.9 ; Y = 145.6 and Radius, 48.3

*** 1.202 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.57	100.00
2	92.95	96.53
3	102.84	95.04
4	112.82	95.59
5	122.49	98.16
6	131.43	102.64
7	139.27	108.85
8	145.69	116.52
9	150.41	125.33
10	150.61	126.00

Circle Center At X = 105.1 ; Y = 143.9 and Radius, 48.9

*** 1.248 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.19	96.40
3	112.17	95.75
4	121.88	98.11
5	130.45	103.26
6	137.09	110.74
7	141.20	119.86
8	141.93	126.00

Circle Center At X = 109.3 ; Y = 128.7 and Radius, 33.1

*** 1.266 ***

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	102.14	101.43
2	112.12	100.79
3	121.90	102.89
4	130.75	107.55
5	138.00	114.44
6	143.11	123.04
7	143.90	126.00

Circle Center At X = 109.4 ; Y = 137.2 and Radius, 36.5

*** 1.350 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.29	100.00
2	83.59	96.33
3	93.35	94.16
4	103.33	93.56
5	113.29	94.53
6	122.96	97.06
7	132.12	101.07
8	140.54	106.47
9	148.00	113.13
10	154.32	120.88
11	157.30	126.00

Circle Center At X = 102.2 ; Y = 157.0 and Radius, 63.4

*** 1.353 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.00	100.00
2	74.57	97.10
3	84.44	95.46
4	94.43	95.09
5	104.39	96.00
6	114.15	98.18
7	123.55	101.59
8	132.43	106.18
9	140.65	111.87

10	148.08	118.56
11	154.46	126.00

Circle Center At X = 92.3 ; Y = 173.0 and Radius, 77.9

*** 1.386 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.86	100.00
2	102.82	99.11
3	112.63	101.06
4	121.49	105.69
5	128.70	112.62
6	133.67	121.30
7	133.99	122.66

Circle Center At X = 100.9 ; Y = 134.3 and Radius, 35.2

*** 1.389 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.29	100.00
2	83.56	96.26
3	93.27	93.85
4	103.21	92.82
5	113.21	93.18
6	123.05	94.94
7	132.56	98.04
8	141.53	102.45
9	149.81	108.06
10	157.22	114.77
11	163.63	122.45
12	165.83	126.00

Circle Center At X = 105.6 ; Y = 164.3 and Radius, 71.5

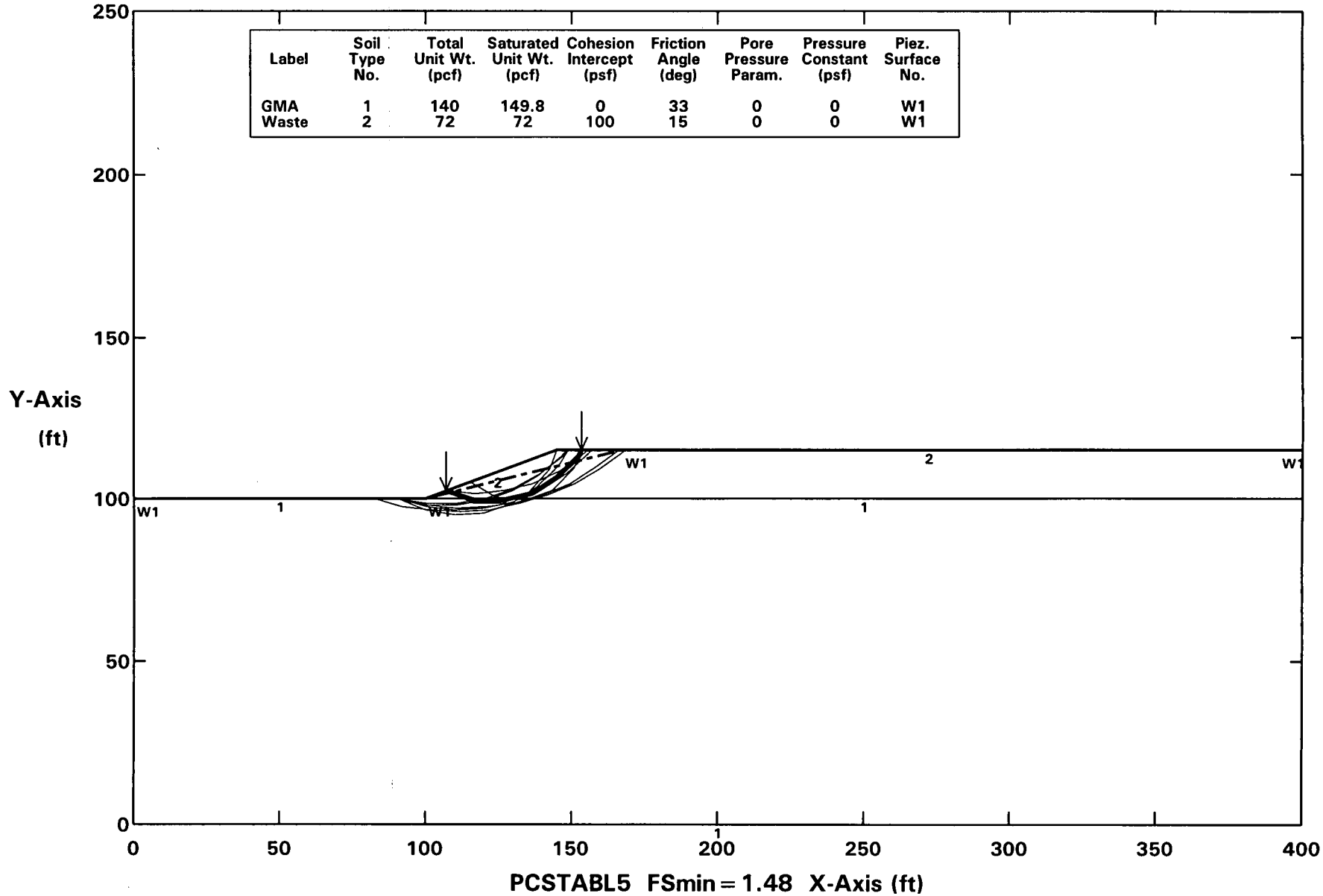
*** 1.444 ***

WPRAP Waste Stability - Clearwell Waste Slope - 3H to 1V

Ten Most Critical. G:CLWELLH3.PLT By: LIN LIU 01-03-98 10:44am

CK by DCH 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Waste	2	72	72	100	15	0	0	W1



1484

000420

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 10:44am
Run By: LIN LIU
Input Data Filename: G:CLWELLH3
Output Filename: G:CLWELLH3.OUT
Plotted Output Filename: G:CLWELLH3.PLT

ck by DCH
6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Clearwell
Waste Slope - 3H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	145.00	115.00	2
3	145.00	115.00	400.00	115.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	72.0	72.0	100.0	15.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	167.50	115.00
4	400.00	115.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

360 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 18 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 140.00 ft.

Each Surface Terminates Between X = 140.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	107.06	102.35
2	116.65	99.53
3	126.65	99.27
4	136.37	101.60
5	145.17	106.37
6	152.43	113.24
7	153.52	115.00

Circle Center At X = 122.6 ; Y = 137.5 and Radius, 38.4

*** 1.478 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.45	98.35
3	110.45	98.28
4	120.34	99.80
5	129.86	102.85
6	138.78	107.37
7	146.87	113.25
8	148.62	115.00

Circle Center At X = 105.9 ; Y = 161.2 and Radius, 63.1

*** 1.570 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.41	98.14
3	110.41	97.94
4	120.30	99.40
5	129.82	102.48
6	138.69	107.10
7	146.66	113.13
8	148.43	115.00

Circle Center At X = 106.6 ; Y = 157.8 and Radius, 60.0

*** 1.586 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.38	97.96
3	110.34	97.05
4	120.34	97.28
5	130.24	98.63
6	139.93	101.11
7	149.28	104.66
8	158.16	109.26
9	166.47	114.83
10	166.67	115.00

Circle Center At X = 113.4 ; Y = 185.0 and Radius, 88.0

*** 1.640 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	100.27	97.48
3	110.22	96.49
4	120.20	97.05
5	129.98	99.14
6	139.32	102.72
7	147.99	107.70
8	155.80	113.95
9	156.75	115.00

Circle Center At X = 111.6 ; Y = 161.1 and Radius, 64.6

*** 1.652 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	107.06	102.35
2	116.26	98.44
3	126.26	98.37
4	135.52	102.15
5	142.62	109.19
6	145.05	115.00

Circle Center At X = 121.4 ; Y = 123.4 and Radius, 25.5

*** 1.719 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.29	105.10
2	124.06	100.28
3	134.02	99.43
4	143.47	102.69
5	150.79	109.51
6	153.14	115.00

Circle Center At X = 131.0 ; Y = 123.4 and Radius, 24.1

*** 1.794 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	107.06	102.35
2	117.02	101.51
3	126.99	102.28
4	136.71	104.66
5	145.90	108.59
6	154.35	113.95
7	155.52	115.00

Circle Center At X = 117.2 ; Y = 163.1 and Radius, 61.5

*** 1.797 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.35	100.00
2	92.08	97.68
3	101.99	96.35
4	111.99	96.02
5	121.96	96.71
6	131.82	98.39
7	141.46	101.05
8	150.78	104.68
9	159.69	109.22
10	168.10	114.63
11	168.56	115.00

Circle Center At X = 110.2 ; Y = 195.3 and Radius, 99.3

*** 1.867 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.59	100.00
2	99.92	96.40
3	109.81	94.93
4	119.78	95.67
5	129.35	98.57
6	138.05	103.51
7	145.46	110.22
8	148.81	115.00

Circle Center At X = 111.5 ; Y = 140.2 and Radius, 45.3

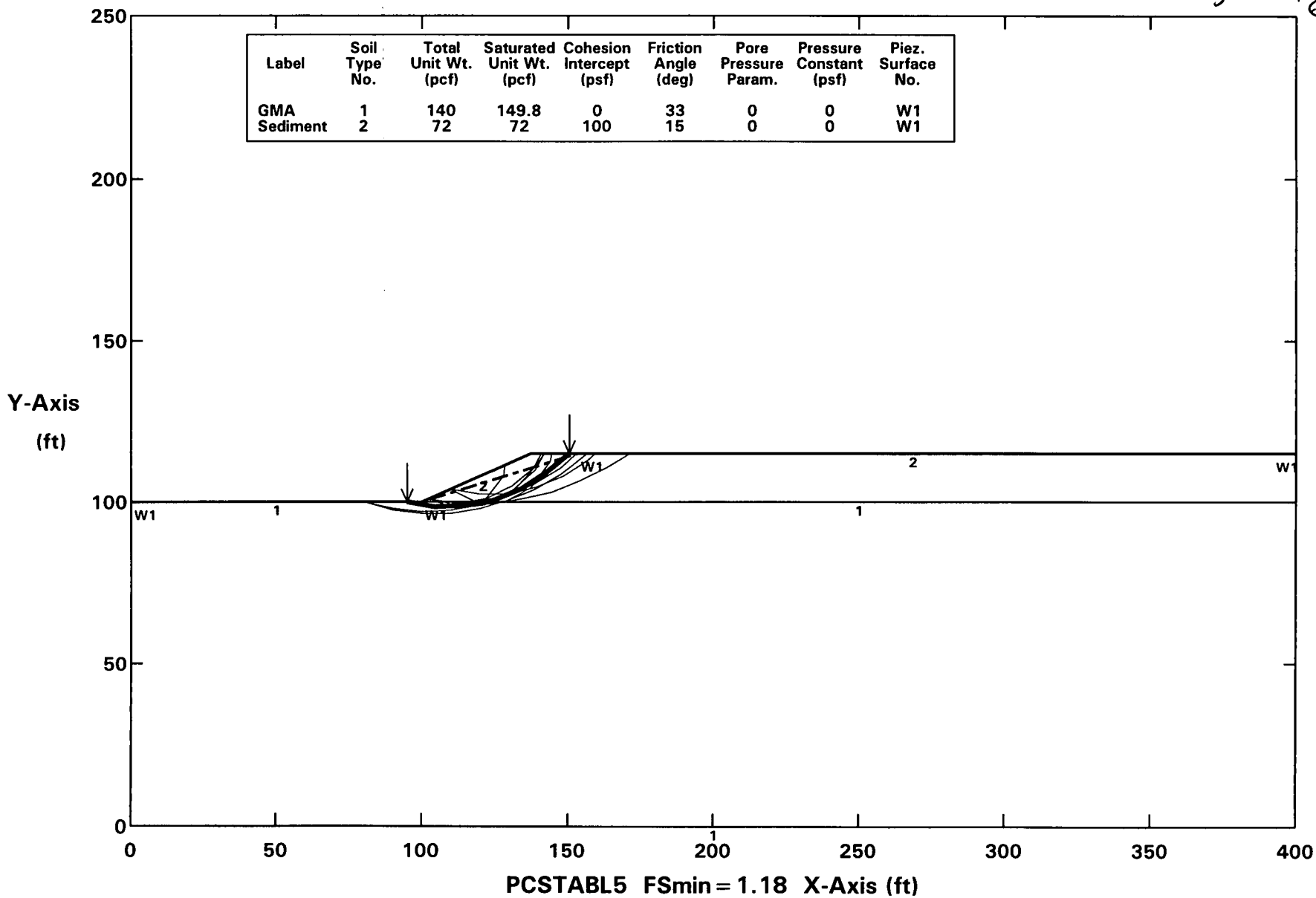
*** 1.905 ***

WPRAP Waste Stability - Clearwell Waste Slope - 2.5H to 1V

Ten Most Critical. G:CLWELL25.PLT By: LIN LIU 01-03-98 10:40am

ck by DCM 6/1/98

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
GMA	1	140	149.8	0	33	0	0	W1
Sediment	2	72	72	100	15	0	0	W1



1484

000427

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 01-03-98
Time of Run: 10:40am
Run By: LIN LIU
Input Data Filename: G:CLWELL25
Output Filename: G:CLWELL25.OUT
Plotted Output Filename: G:CLWELL25.PLT

CK by D CH 6/1/98

PROBLEM DESCRIPTION WPRAP Waste Stability - Clearwell
Waste Slope - 2.5H to 1V

BOUNDARY COORDINATES

3 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	100.00	100.00	1
2	100.00	100.00	137.50	115.00	2
3	137.50	115.00	400.00	115.00	2
4	100.00	100.00	400.00	100.00	1
5	.00	.00	400.00	.00	1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	140.0	149.8	.0	33.0	.00	.0	1
2	72.0	72.0	100.0	15.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	100.00	100.00
3	153.25	115.00
4	400.00	115.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

360 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 18 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 124.00 ft.

Each Surface Terminates Between X = 124.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	94.82	100.00
2	104.73	98.60
3	114.72	98.83
4	124.55	100.66
5	133.96	104.06
6	142.69	108.94
7	150.30	115.00

Circle Center At X = 108.4 ; Y = 160.1 and Radius, 61.6

*** 1.181 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.12	100.85
2	111.92	98.84
3	121.87	99.82
4	131.09	103.68
5	138.76	110.10
6	141.94	115.00

Circle Center At X = 113.7 ; Y = 132.3 and Radius, 33.5

*** 1.213 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.12	100.85
2	111.77	98.24
3	121.74	99.01
4	130.89	103.05
5	138.17	109.91
6	140.78	115.00

Circle Center At X = 114.5 ; Y = 127.7 and Radius, 29.6

*** 1.280 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.12	100.85
2	112.05	99.65
3	121.95	101.06
4	131.14	104.98
5	139.02	111.15
6	141.91	115.00

Circle Center At X = 111.6 ; Y = 138.0 and Radius, 38.3

*** 1.286 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.82	100.00
2	104.76	98.91
3	114.76	98.68
4	124.74	99.33
5	134.63	100.84
6	144.34	103.20
7	153.82	106.39
8	162.98	110.39
9	171.43	115.00

Circle Center At X = 112.3 ; Y = 213.8 and Radius, 115.1

*** 1.321 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.41	103.76
2	118.60	99.81
3	128.60	100.08
4	137.56	104.51
5	143.84	112.30
6	144.52	115.00

Circle Center At X = 123.0 ; Y = 122.7 and Radius, 23.3

*** 1.397 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.24	100.00
2	90.03	97.96
3	99.99	97.12
4	109.98	97.49
5	119.86	99.06
6	129.48	101.81
7	138.69	105.70
8	147.37	110.67
9	153.18	115.00

Circle Center At X = 102.0 ; Y = 179.9 and Radius, 82.8

*** 1.510 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.24	100.00
2	89.97	97.72
3	99.91	96.61
4	109.91	96.70
5	119.83	97.99
6	129.52	100.44
7	138.85	104.04
8	147.69	108.72
9	155.90	114.43
10	156.55	115.00

Circle Center At X = 104.2 ; Y = 180.2 and Radius, 83.7

*** 1.565 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.12	100.85
2	111.70	97.97
3	121.32	100.68
4	127.99	108.13
5	128.54	111.42

Circle Center At X = 111.9 ; Y = 115.9 and Radius, 17.9

*** 1.620 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.41	103.76
2	119.31	102.33
3	129.31	102.58
4	139.12	104.50
5	148.48	108.03
6	157.11	113.08
7	159.39	115.00

Circle Center At X = 122.8 ; Y = 161.7 and Radius, 59.5

*** 1.627 ***

APPENDIX G

APPENDIX G

BEARING CAPACITY EVALUATION

INTERNATIONAL TECHNOLOGY CORPORATION

1484

LL Date 12-16-91 Subject FERNALD PROJECT - Sheet No. 1 of 6

Chkd. By LAN Date 12-22-91 WASTE BEARING CAPACITY CALCULATION Proj. No. 773481

SUMMARY SHEET

WASTE BEARING CAPACITY

WASTE PIT #	1	q_u = 32.6 psi
	2	q_u = 14.8 psi
	3	q_u = 13.3 psi
	4	q_u = 33.5 psi
	5	q_u = 9.3 psi
	6	q_u = 34.3 psi
BURN PIT		q_u = 32.9 psi
CLEARWELL		q_u = 9.3 psi

REFERENCE: 1. "FOUNDATION ENGINEERING HANDBOOK" BY HANS F. WINTERKORN AND HSAI-YANG FANG.

2. WASTE DATA WERE OBTAINED FROM RFP, TABLE J. 2-2, UNDRAINED CONDITION.

000435

108-10-85

By LL Date 12-16-97 Subject BEARING CAPACITY – WASTE Sheet No. 2 of 6
Chkd. By RAP Date 12-22-97 FOR FERNALD PROJECT Proj. No. 773481

OBJECTIVE: TO CALCULATE THE BEARING CAPACITY FOR WASTE MATERIAL.

1. WASTE PIT #1

$$q_u = cN_c + qN_q + \frac{1}{2}\gamma_w B N_\gamma \quad (P.5/5)$$

FROM SUBCONTRACT TABLE J.2-2

$c = 240$ PSF (SEE ATTACHED P.5/5)
$\phi = 21^\circ \Rightarrow N_c = 15.82,\ N_q = 7.07,\ N_\gamma = 6.20$
$\gamma_w = 115$ PCF
$q = 0$ (NO OVERBURDEN)

ASSUMING TRACK WIDTH = 2.5', AND EXCAVATION EQUIPMENT WILL SIT ABOVE WATER TABLE (SUMPS WILL BE INSTALLED AT LOW POINTS TO PUMP WATER OUT OF WASTE)

∴ BEARING CAPACITY q_u,

$$q_u = (240)(15.82) + \frac{1}{2}(115)(2.5)(6.20)$$
$$= 4688 \text{ PSF} = 32.6 \text{ psi}$$

2. WASTE PIT #2

$c = 130$ PSF
$\phi = 18^\circ \Rightarrow N_c = 13.10,\ N_\gamma = 4.07$
$\gamma_w = 83$ PCF
$q = 0$

$$q_u = (130)(13.10) + \frac{1}{2}(83)(2.5)(4.07)$$
$$= 2125 \text{ PSF} = 14.8 \text{ psi}$$

3. WASTE PIT #3

$c = 115$ PSF

$\phi = 18°$ $\Longrightarrow N_c = 13.10$, $N_\gamma = 4.07$

$\gamma_w = 80$ PSF

$q = 0$

FOR $B = 2.5'$

$q_u = (115)(13.10) + \frac{1}{2}(80)(2.5)(4.07)$

$= 1{,}914$ PSF $= 13.3$ PSI

4. WASTE PIT #4

$c = 240$ PSF

$\phi = 21°$ $\Longrightarrow N_c = 15.82$, $N_q = 7.07$, $N_\gamma = 6.20$

$\gamma_w = 132$ PCF

$q = 0$

$q_u = (240)(15.82) + \frac{1}{2}(132)(2.5)(6.20)$

$= 4820$ PSF $= 33.5$ PSI

5. WASTE PIT #5

$c = 100$ psf
$\phi = 15°$ => $N_c = 10.98$, $N_c = 2.65$
$\gamma_w = 72$ pcf

$q_u = (100)(10.98) + \frac{1}{2}(72)(2.5)(2.65)$
$= 1337$ psf $= 9.3$ psi

6. WASTE PIT #6

$c = 240$ psf
$\phi = 21°$ => $N_c = 15.82$, $N_\gamma = 6.20$
$\gamma_w = 148$ pcf

$q_u = (240)(15.82) + \frac{1}{2}(148)(2.5)(6.20)$
$= 4944$ psf $= 34.3$ psi

7. BURN PIT

$c = 240$ psf
$\phi = 21°$ => $N_c = 15.82$, $N_\gamma = 6.20$
$\gamma_w = 121$ pcf

$q_u = (240)(15.82) + \frac{1}{2}(121)(2.5)(6.20)$
$= 4735$ psf $= 32.9$ psi

8. CLEARWELL : ASSUME SAME WASTE PROPERTIES AS WASTE PIT #5, ∴ $q_u = 9.3$ psi.

REFERENCE: "FOUNDATION ENGINEERING HANDBOOK".

P. 5/6

1484

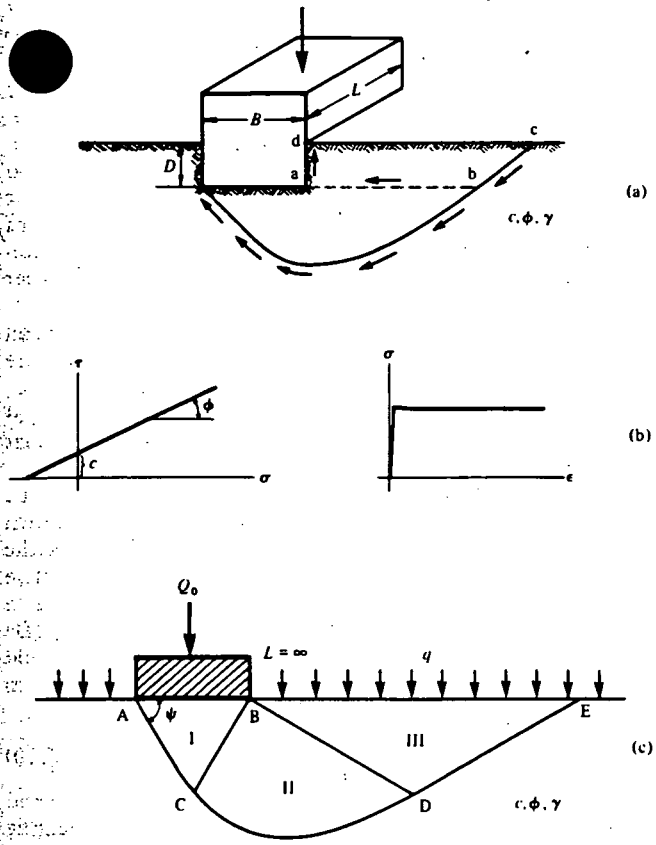


Fig. 3.14 The problem of bearing capacity of shallow footings.

basic solution available (Prandtl, 1921; Reissner, 1924) indicates that the failure pattern should consist of three zones: I, II, and III. Zone I is an active Rankine zone, which pushes the radial Prandtl zone II sideways and the passive Rankine zone III in an upward direction. The lower boundary ACDE of the displaced soil mass is composed of two straight lines AC and DE, inclined at $45° + \phi/2$ and $45° - \phi/2$, respectively, to the horizontal. The shape of the connecting curve CD depends on the angle ϕ and on the ratio $\gamma B/q$. For $\gamma B/q \to 0$ ("weightless soil") the curve becomes a logarithmic spiral which for $\gamma = 0$ degenerates into a circle. In the general case ($\gamma B \neq 0$) the curve lies between a spiral and a circle, as long as $\phi \neq 0$. For a frictionless soil ($\phi = 0$) the curve is always a circle. All these findings have been confirmed experimentally (De Beer and Vesić, 1958), though the angle ψ may be slightly larger than $45° + \phi/2$, at least for long rectangular footings on the surface of sand.

A closed analytical solution of this problem, as posed, has not yet been found and probably will not be found, except for special cases. For weightless soil ($\gamma = 0$), Prandtl and Reissner have found that:

$$q_0 = cN_c + qN_q \tag{3.5}$$

where N_c and N_q are dimensionless *bearing capacity factors*, defined by

$$N_q = e^{\pi \tan \phi} \tan^2 (\pi/4 + \phi/2)$$

$$N_c = (N_q - 1) \cot \phi \tag{3.6}$$

Numerical values of these factors are given in Table 3.1 and shown graphically in Fig. 3.15.

For cohesionless soil without overburden ($c = 0, q = 0$) it can be shown that:

$$q_0 = \tfrac{1}{2} \gamma B N_\gamma \tag{3.7}$$

where N_γ is again a dimensionless bearing capacity factor which can be evaluated only numerically. This factor varies sharply with angle ψ. The numerical values shown by dashed lines in Fig. 3.15 are taken from an analysis made by Caquot and Kérisel (1953) under assumption that $\psi = 45° + \phi/2$. It can be shown (Vesić, 1970) that these values of N_γ can be approximated with an error on the safe side (not exceeding 10 percent for $15° < \phi < 45°$ and not ex-

TABLE 3.1. BEARING CAPACITY FACTORS

ϕ	N_c	N_q	N_γ	N_q/N_c	$\tan \phi$
0	5.14	1.00	0.00	0.20	0.00
1	5.38	1.09	0.07	0.20	0.02
2	5.63	1.20	0.15	0.21	0.03
3	5.90	1.31	0.24	0.22	0.05
4	6.19	1.43	0.34	0.23	0.07
5	6.49	1.57	0.45	0.24	0.09
6	6.81	1.72	0.57	0.25	0.11
7	7.16	1.88	0.71	0.26	0.12
8	7.53	2.06	0.86	0.27	0.14
9	7.92	2.25	1.03	0.28	0.16
10	8.35	2.47	1.22	0.30	0.18
11	8.80	2.71	1.44	0.31	0.19
12	9.28	2.97	1.69	0.32	0.21
13	9.81	3.26	1.97	0.33	0.23
14	10.37	3.59	2.29	0.35	0.25
15	10.98	3.94	2.65	0.36	0.27
16	11.63	4.34	3.06	0.37	0.29
17	12.34	4.77	3.53	0.39	0.31
18	13.10	5.26	4.07	0.40	0.32
19	13.93	5.80	4.68	0.42	0.34
20	14.83	6.40	5.39	0.43	0.36
21	15.82	7.07	6.20	0.45	0.38
22	16.88	7.82	7.13	0.46	0.40
23	18.05	8.66	8.20	0.48	0.42
24	19.32	9.60	9.44	0.50	0.45
25	20.72	10.66	10.88	0.51	0.47
26	22.25	11.85	12.54	0.53	0.49
27	23.94	13.20	14.47	0.55	0.51
28	25.80	14.72	16.72	0.57	0.53
29	27.86	16.44	19.34	0.59	0.55
30	30.14	18.40	22.40	0.61	0.58
31	32.67	20.63	25.99	0.63	0.60
32	35.49	23.18	30.22	0.65	0.62
33	38.64	26.09	35.19	0.68	0.65
34	42.16	29.44	41.06	0.70	0.67
35	46.12	33.30	48.03	0.72	0.70
36	50.59	37.75	56.31	0.75	0.73
37	55.63	42.92	66.19	0.77	0.75
38	61.35	48.93	78.03	0.80	0.78
39	67.87	55.96	92.25	0.82	0.81
40	75.31	64.20	109.41	0.85	0.84
41	83.86	73.90	130.22	0.88	0.87
42	93.71	85.38	155.55	0.91	0.90
43	105.11	99.02	186.54	0.94	0.93
44	118.37	115.31	224.64	0.97	0.97
45	133.88	134.88	271.76	1.01	1.00
46	152.10	158.51	330.35	1.04	1.04
47	173.64	187.21	403.67	1.08	1.07
48	199.26	222.31	496.01	1.12	1.11
49	229.93	265.51	613.16	1.15	1.15
50	266.89	319.07	762.89	1.20	1.19

REFERENCE: "FDF SUBCONTRACT NO. 98SC000001".

TABLE J.2-2

SUMMARY OF GEOTECHNICAL DATA BY WASTE PIT (In-Situ Conditions)

Note: See Table C.5-1 for data reference sources

Parameters	Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6	Burn Pit	* Clearwell	Soil Below Pits[1]
Wet Density (lb/ft³)	114.5	82.7	80.0	131.7	71.75	148.2	121.2	103.7	140.5
Average Moisture Content (w)(percent Dry Basis)	46	156.9	183.5	29.1	393.4	18.4	30.6	58.8	15
Moisture Content Range (percent wet basis)	14.7 - 47.6	14.3 - 76.0	15.2 - 72.9	9.2 - 38.1	35.9 - 91.9	10.1 - 81.0	20.3 - 23.1	12.2 - 42.5	
Optimum Moisture Content Goal (from Compaction Test) (percent)	13	14	26	13	36	9	20	20	15
Major Types of Waste (USCS Group Name)	ML (low plasticity silt), ML (NP) (non-plastic), GC (clayey gravel with sand)	ML (NP), MH (high plasticity silt), SM (silty sand), SC (clayey sand with gravel), CL (clay)	SM, MH, ML, CL	CL, ML (NP), ML	MH, ML, ML (NP)	ML (NP), SM, ML, MH	CL, MH, SM	CL, ML, SM	CL, ML
Average Specific Gravity of Solids	2.98	2.71	2.66	3.12	2.8	3.18	2.76	2.74	2.78
Percentage of Material Less Than 200 Mesh (percent Silt and Clay)	46 - 96	15 - 99	43 - 96	55 - 94	68 - 100	46 - 96	36 - 59	45 - 77	36 - 55
Undrained Internal Friction Angle (deg)	19 - 23 (21°)[1]	18 (18°)	13 - 24 (18°)[1]	NA (21°)[2]	15 (15°)	NA (21°)[2]	NA (21°)[2]	NA (15°)*	16 - 26
Cohesion (psi) Drained	4.9 - 6.7	1.7	0 - 2.4	NA	1.0	NA	NA	NA	0 - 7.8
Drained Internal Friction Angle (deg)	30 - 39	36	28 - 40	NA	32	NA	NA	NA	27 - 44
Cohesion (psi) Undrained	0 - 3.3 (240 psf)[1]	0.9 (130 psf)	0.0 - 1.6 (115 psf)[1]	NA (240 psf)[2]	0.7 (100 psf)	NA (240 psf)[2]	NA (240 psf)[2]	NA (100 psf)*	0 - 4.0

NA = Not Available
w = Moisture Content
[1] = Soils Data inferred from borings at similar depths and soil conditions at other on-site locations (i.e., new on-site cell location).

NOTES: 1. AVERAGE VALUE IS USED. 2. USE SAME VALUES AS IN WASTE PIT #1.

* CLEARWELL IS ASSUMED TO HAVE SAME PROPERTIES AS WASTE PIT #5.

APPENDIX
H

APPENDIX H

WAC FACTOR CALCULATIONS

Appendix H
Waste Acceptance Criteria Factor Calculations

H.1 Blending Schemes

Waste blending will be performed to provide mixtures qualifying as "depleted." In response, IT Corporation (IT) has calculated Waste Acceptance Criteria (WAC) factors to utilize the uranium-depleted Maximum Average Waste Concentration (MAWC) of 110,000 picocuries per gram (pCi/g). IT's calculation of the percent Uranium-235 is based on the average activity of uranium isotopes in each of the pits as averaged from the Characterization Investigation Study (CIS) and Remedial Investigation/Feasibility Study (RI/FS) data and summarized below. A more detailed discussion on the basis for the uranium enrichment/depletion determination is provided in Section H-2.

Waste Pit Number	Uranium-238 (pCi/g)	Uranium-234 (pCi/g)	Uranium-235/ Uranium-236 (pCi/g)	Weight Percent Uranium-235	Depleted WAC Factor
1	2,924	565	7	0.37	0.54
2	3,681	3,033	1,302	5.22	1.23
3	690	365	17	0.38	0.56
4	11,834	1,618	127	0.17	0.59
5	746	642	24	0.51	0.52
6	15,734	2,740	484	0.48	0.32
Burn Pit	444	367	26	0.92	0.20
Clearwell	736	390	126	2.59	0.56

The approach to WAC factors has been incorporated into this blending plan to assure that all waste mixtures qualify as "depleted." The overriding pit wastes affecting the blending plan are in Waste Pit Nos. 2 and 4. Waste Pit No. 2 is enriched and Waste Pit No. 4 is very depleted. Waste Pit No. 4 provides the primary depleted uranium source for blending with enriched sources. Although the Burn Pit and the Clearwell are enriched, the uranium concentration and total quantities are low. When the waste is blended to assure that the waste mixtures qualify as depleted, the WAC factors sum of fractions are substantially reduced. As seen in the table above, all WAC factors for the pit waste, excluding Waste Pit No. 2, are below 0.6. Blending with low contamination sources, such as the cover, liners, and subsoils, will further reduce the WAC factors of shipped waste, but will not help in blending to assure the waste mixtures qualify as depleted.

Once the wastes are blended so that the resulting mixtures qualify as depleted, the WAC factor for each pit source (except Waste Pit No. 2) is less than 0.6. The blending of Waste Pit No. 2 will bring the resulting WAC factor (sum of fractions) of the blend to below the specified limits.

Other components of the blending plan include moisture content blending for optimization of the drier thermal loading, bulk density blending, and sequencing of the blending requirements to assure that a logical and cost-effective excavation sequence is provided at the pits. High moisture content pits, such as Waste Pit Nos. 3 and 5 wastes, are blended with lower moisture content pit wastes to provide a steady thermal load to the dryer.

Table H-1 shows the pit waste blending plan to meet the depleted uranium and other requirements. The blending plan controls the pit excavation sequence and supports an orderly closure of pits inward from the southern site boundary.

In developing the blending plan for the depleted uranium, IT assumed that the liner materials contained 20 percent and the subsoils 2 percent of the contamination of the associated pit's waste. For example, due to this assumption, Waste Pit No. 4 material will be blended with the Clearwell subsoils in Phase 19 to assure the resulting mixture qualifies as depleted.

Selected materials will be accumulated in the waste processing building for impending blends. Waste Pit No. 4 waste will be accumulated during Phase 10 for use later as a depleted uranium source in Phases 18 and 19. The Material Handling Building provides sufficient storage for these accumulated quantities (i.e., less than 2,000 tons). Since the storage area is inside the Material Handling Building, run-on/runoff should not be a concern.

Table H-2 summarizes the specified Commercial Disposal Facility (CDF) WAC for radiological isotopes. This criteria was used with the pit analytical information, as provided in Table H-5, to calculate a total WAC factor for each pit. Table H-4 uses the pit quantities to calculate the analytical weight percentage for each pit. The results of this evaluation are summarized in Table H-3. The analytical weighted WAC factor is used to control the blending plan provided in Table H-1.

Material from different pits will be blended by physically mixing with front-end loaders, then mixing in the dryer processing. Waste from the two pits will be delivered to separate bays at the Material

Handling Building. The material will be removed from the receiving bays and alternatively transferred to blending or feed bins to allow the front-end loader to spread and mix the two materials.

H.2 Basis for Uranium Enrichment/Depletion Determination

The project requirements specify that the waste materials shipped to the CDF qualify as depleted; that the percent of Uranium-235 within the total uranium present (isotopic weight percent) must be ≤0.72 (10 Code of Federal Regulations [CFR] 20 Part B). The available analytical data and method used to calculate the isotopic weight percent has been reviewed and it has been concluded that the choice of pit analytical data sets greatly influences the determination of enriched or depleted status for the waste material.

There have been at least three rounds of data gathering to characterize the waste pits. These data were included in the 1994 Remedial Investigation Report as well as the 1996 Assessment of Radiological Hazards Associated with the Operable Unit 1 Remedial Design. Furthermore, the remedial investigation data were also used. There are thus at least seven sets of data, each consistent within themselves, which may be considered as input for uranium enrichment calculations.

Uranium Isotope Evaluation Conclusions

- Uranium data sets are extremely variable.
- High data variability is probably due to inhomogeneity in pit waste materials.
- Combined set of CIS and RI/FS data will be used for the Waste Pits Remedial Action Project.
- Flexibility in the waste blending plan is required for responsiveness to actual waste characteristics encountered.

CIS Radiological Data. These data were gathered for each pit during the CIS carried out in 1986 and 1987. A combination of these data for each pit was produced for the 1994 Remedial Investigation Report.

RI/FS Radiological Data. This set of data was gathered during investigations from 1987 through 1992, in support of the 1994 Remedial Investigation Report. For the Remedial Investigation Report, the data were combined for each pit.

CIS and RI/FS Data Averaged. A broader database for calculations and decisions can be realized by combining all of the data, on a sample-by-sample basis, from both the CIS and the RI/FS

sets. To generate this set, the concentration of each of the uranium isotopes is averaged over the two full data sets.

RI/FS Radiological Profile. In the 1994 Remedial Investigation Report, the radiological data were presented (RI/FS Table 4-1.1.A) as the "Radiological Profile" of each pit. For this "Profile," the worst case for each nuclide was chosen from the averages of either the CIS or the RI/FS data sets, but not the combination of both. Such a choice is conservative for decisions involving threshold concentrations of individual nuclides, and is used as the basis for the concentrations resulting in WAC factors (Tables H-3, H-4, and H-5). However, this use of the highest average for uranium nuclides from two separate data sets does not necessarily lead to a "best value" of uranium enrichment.

Parsons Remedial Design Assessment Table A-2. Data from the 1994 Remedial Investigation Report were used to prepare a table of "Average Concentrations of Waste Pit Materials" in the Parsons Report. The selection criteria were different than those used for the remedial investigation tables.

Parsons Remedial Design Assessment Table A-4. In this table, the selected concentrations of nuclides were multiplied by the weight of each pit's contents to give a total of each type of radioactive species.

Fernald Environmental Restoration Management Corporation (FERMCO) Table J.2-4. While this table is useful in appreciating the scope and range of radionuclides to be encountered in Operable Unit 1 (OU1), the averaging of all points across the various pits, without weighting for waste volume or total uranium concentration, does not give a viable means of calculating enrichment or determining blending schemes.

The criteria for whether a uranium-containing mixture is depleted, natural, or enriched depend solely on the ratios of the uranium isotopes in the mixture, regardless of the absolute concentration. Thus, a calculation is needed to convert from contamination level — usually measured in picocuries per gram — to percent isotopic Uranium-235. The resulting formula, in the format used, is:

$$\%\ Isotopic\ Uranium\text{-}235 = \frac{100}{1 + 6.42\frac{C_8}{C_5} + 0.000343\frac{C_4}{C_5}}$$

Where:

C_8 = Concentration of Uranium-238, customarily in pCi/g
C_5 = Concentration of Uranium-235, customarily in pCi/g
C_4 = Concentration of Uranium-234, customarily in pCi/g.

Calculations were made for the isotopic ratio of Uranium-235 in each of the eight pits. The same calculation was repeated using each of the six available data sets. The results are provided in Table H-6. Widely varying results were found, depending on the data set used. Waste Pit Nos. 1 and 4 are seen to be depleted within all data sets. Waste Pit No. 2, the Burn Pit, and the Clearwell always show themselves to be enriched. However, Waste Pit Nos. 3, 5, and 6 can be defined as either depleted or enriched, depending on the data set chosen for input. This result highlights the variability of the available sample data.

IT evaluated whether the burden of uranium across the project can be blended to achieve depleted status, using each of the six sets of data. The caps and liners of the pits were not considered, since they should reflect the pit contents and at lower concentrations. The concentration of uranium isotopes (in pCi/g) for each pit was weighted by the total amount of material in the pit. The resulting average was then converted to isotopic weight percent.

The results are summarized at the right. All data sets but one give the result that the project-wide average is depleted, meaning that blending can be successful to meet the waste shipment goal. The CIS radiological data, taken independently, would indicate that depleted mixtures could not be attained for all of the pit materials.

Uranium Ratio for Project, Totaled		
Data Set	**Project Weight Average**	
CIS radiological data	0.9661	Enriched
RI/FS radiological data	0.1351	Depleted
Averaged CIS and RI/FS	0.4127	Depleted
Data from RI "Radiological Profile"	0.5585	Depleted
Parsons Report Table A-2	0.6095	Depleted
Parsons Report Table A-4	0.6423	Depleted

An analysis of the sample data was carried out to evaluate the variability of the data set. The sample-by-sample analytical data were used for isotopic ratio calculations. The individual results were then averaged arithmetically by pit for statistical evaluation, and a standard deviation from that average calculated. This was carried out for CIS samples alone, RI/FS samples alone, and the individual samples combined from the two studies. IT observed that standard deviations are very large (52 to 140 percent), in most cases larger than the differences between the data sets. There is no significant difference in the range of deviations within the combined set compared with the RI/FS set or the CIS

set. The analytical chemistry was performed under established U.S. Environmental Protection Agency (EPA) protocols, with the required spikes and duplicates, and was validated before being collected into the tables used in the remedial investigation. IT concludes that the reason for the wide scattering of sample data lies within the samples themselves and the uranium isotopic contents of the pits are extremely inhomogeneous.

IT chose the combined data set for the basis of evaluating the blending program for the project. All samples taken in both the CIS and RI/FS from any given pit received equal weighting of its reported uranium isotope concentrations. With the large variances in the materials from place to place in the pits, this should give the most realistic assessment of what can be achieved by the blending of these materials. Due to the variability of the data, IT recognizes that frequent in-process sampling of the waste for determination of the percent Uranium-235 will be required to make day-to-day adjustments to the blending program and blending ratios.

TABLES

Table H-1
Waste Blending Plan

Operation Phase	High Moisture Waste Source	Enriched Uranium Waste Source	Depleted Uranium Waste Source	Low Moisture Waste Source	High Moisture Waste (tons)	Enriched Uranium Waste (tons)	Depleted Uranium Waste (tons)	Low Moisture Waste (tons)	Total Weight per Phase (tons)	Planned Excavation Rate (tons/day)	Planned Excavation Rate (days)	Depleted WAC Factor	Normalized Enrichment Factor	Blend Density (tons/yd^3)
1	Waste Pit No. 3			OU1 Contaminated Soil Stockpile	2,469			1,783	4,252	480.6	9	0.40	0.52	1.26
2	Waste Pit No. 3	Waste Pit No. 2	Waste Pit No. 1		51,026	5,390	72,453		128,869	480.6	268	0.55	0.89	1.21
3	Waste Pit No. 3			OU1 Contaminated Soil Stockpile	23,538			17,341	40,879	480.6	85	0.40	0.52	1.26
4	Waste Pit No. 3			Waste Pit No. 1 Subsoil	24,196			18,207	42,403	480.6	88	0.34	0.52	1.27
5	Waste Pit No. 3	Waste Pit No. 2	Waste Pit No. 4		24,690	19,256	40,150		84,097	480.6	175	0.67	0.85	1.22
6	Waste Pit No. 3			OU1 Contaminated Soil Stockpile	8,065			5,672	13,737	480.6	29	0.41	0.52	1..26
7	Waste Pit No. 3		Waste Pit No. 4	Waste Pit No. 2 Subsoil	11,193		753	7,766	19,712	480.6	41	0.40	0.68	1.26
8	Waste Pit No. 3		Waste Pit No. 6		12,180		16,222		28,402	480.6	59	0.42	0.66	1.40
9	Waste Pit No. 5			Waste Pit No. 3 Subsoil	5,200			43,145	48,345	480.6	101	0.13	0.68	1.46
10	Waste Pit No. 5			OU1 Contaminated Soil Stockpile	3,350			27,876	31,226	480.6	65	0.23	0.70	1.46
11	Waste Pit No. 5			Waste Pit No. 6 Subsoil	700			6,040	6,740	480.6	14	0.08	0.67	1.46
12	Waste Pit No. 5	Burn Pit	Waste Pit No. 4		2,100	37,961	4,768		44,829	480.6	93	0.22	0.52	1.28
13	Waste Pit No. 5			Burn Pit Subsoil	500			4,314	4,814	480.6	10	0.07	0.76	1.46
14	Waste Pit No. 5		Waste Pit No. 4		2,900		47,657		50,557	480.6	105	0.57	0.23	1.30
15	Waste Pit No. 5			OU1 Contaminated Soil Stockpile	50			486	536	480.6	1	0.23	0.70	1.47
16	Waste Pit No. 5			Waste Pit No. 4 Subsoil	1,550			12,943	14,493	480.6	30	0.12	0.36	1.46
17	Waste Pit No. 5			OU1 Contaminated Soil Stockpile	2,869			23,987	26,856	480.6	56	0.23	0.70	1.46
18		Clearwell	Waste Pit No. 4	Waste Pit No. 5 Subsoil		3,791	1,757	31,926	37,474	480.6	78	0.13	0.72	1.49
19			Waste Pit No. 4	Clearwell Subsoil			125	6,040	6,165	480.6	13	0.07	0.47	1.52
								TOTALS:	634,386		1,320			

NOTES:

1. Weights shown in this table are dry weights
2. Daily excavation rate is based on 5 days per week, 48 weeks per year and the operation will be completed in 5.5 years
3. WAC factors shown are for depleted materials
4. Enrichment factors shown have been normalized so that a factor of below 1.00 is considered depleted
5. Blend density values include a 0.80 bulking factor

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PT/2/9/98 (9:32 AM)/WP/773481:Table.H-1

Table H-2
Waste Acceptance Criteria (WAC)

Isotope	MAWC, pCi/g
Uranium-238[a]	110,000
Uranium-234[a]	110,000
Thorium-230	15,000
Radium-226	2,000
Uranium-235/236[a]	110,000
Thorium-232	680
Radium-228	670
Thorium-228	N/A
Cesium-137	560
Neptunium-237	2,000
Plutonium-238	1,000
Plutonium-239/240	1,000
Ruthenium-106	19,000
Strontium-90	20,000
Technetium-99	100,000

[a]Assumes all uranium is depleted uranium with a MAWC of 110,000 pCi/g

Table H-3
Weighted Average WAC Factors for Pit Waste

Analyte	Waste Pit No. 1	Waste Pit No. 2	Waste Pit No. 3	Waste Pit No. 4	Waste Pit No. 5	Waste Pit No. 6	Burn Pit	Clearwell	Total
Total WAC Factor	0.6157	1.6440	0.8632	0.7087	0.5228	0.3223	0.1953	0.5615	N/A
Analytical Weight Percent	87%	75%	65%	83%	100%	100%	100%	100%	N/A
Mass Weight Percent	13%	6%	45%	15%	12%	2%	6%	1%	100%
Weighted Total WAC Factor	0.0681	0.0687	0.2508	0.0909	0.0636	0.0079	0.0124	0.0064	**0.5668**
Analytical Weighted WAC Factor	0.5337	1.2382	0.5629	0.5915	0.5228	0.3223	0.1953	0.5615	

NOTE:
Assumes all analyses are on a dry basis.
Analytical data is not available for the materials from "Other Areas" and for the Subsoils.
Therefore, it was assumed that these soils are equally contaminated as the rest of the site and do not have to be included in the weighted average calculation.

Table H-4
Calculation of Analytical Weight Percentages

	Wet Basis				At Optimum Moisture					
Area	Soil Cover (Tons)	Waste (Tons)	Soil Liner (Tons)	Total (Tons)	Soil Cover (Tons)	Waste (Tons)	Soil Liner (Tons)	Total (Tons)	Analytical Weight Percentages[a]	Mass Weight Percent[b]
Waste Pit No. 1	2,083	74,969	22,302	99,354	2,083	58,024	22,302	82,409	87%	13%
Waste Pit No. 2	5,147	27,018	11,029	43,194	5,147	11,989	11,029	28,165	75%	6%
Waste Pit No. 3	114,820	220,428	11,886	347,134	114,820	97,968	11,886	224,674	65%	45%
Waste Pit No. 4	17,891	97,965	3,799	119,655	17,891	85,748	3,799	107,438	83%	15%
Waste Pit No. 5	0	94,828	0	94,828	0	26,138	0	26,138	100%	12%
Waste Pit No. 6	0	19,207	0	19,207	0	17,682	0	17,682	100%	2%
Burn Pit	0	49,577	0	49,577	0	45,553	0	45,553	100%	6%
Clearwell	0	6,020	0	6,020	0	4,549	0	4,549	100%	1%
Total	139,941	590,012	49,016	778,969	139,941	347,651	49,016	536,608	N/A	100%

[a]Assumes the soil cover contains 0% and the soil liner contains 50% of the radiological analytical concentration of the waste, calculated on a wet basis.
[b]Total mass weight of material in a given pit divided by the total mass weight of all pits combined, calculated on a wet basis.

Table H-5
Total WAC Factor Calculations for Pits

Waste Pit No. 1 Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	3,900	16,000	0.0355	0.1455
Uranium-234	570	1,200	0.0052	0.0109
Thorium-230	3,800	5,500	0.2533	0.3667
Radium-226	51	100	0.0255	0.0500
Uranium-235/236	85	260	0.0008	0.0024
Thorium-232	180	490	0.2647	0.7206
Radium-228	20	41	0.0299	0.0612
Thorium-228	300	790	0.0000	0.0000
Cesium-137	0.43	1.1	0.0008	0.0020
Neptunium-237	U	U	0.0000	0.0000
Plutonium-238	U	U	0.0000	0.0000
Plutonium-239/240	U	U	0.0000	0.0000
Ruthenium-106	U	U	0.0000	0.0000
Strontium-90	2.43	7.7	0.0001	0.0004
Technetium-99	3.6	15	0.0000	0.0002
Total WAC Factor			0.6157	1.3597

Waste Pit No. 2 Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	4,700	18,000	0.0427	0.1636
Uranium-234	3,900	18,000	0.0355	0.1636
Thorium-230	1,800	11,000	0.1200	0.7333
Radium-226	440	950	0.2200	0.4750
Uranium-235/236	1,800	8,800	0.0164	0.0800
Thorium-232	220	340	0.3235	0.5000
Radium-228	180	440	0.2687	0.6567
Thorium-228	660	700	0.0000	0.0000
Cesium-137	1.15	3.6	0.0021	0.0064
Neptunium-237	U	U	0.0000	0.0000
Plutonium-238	0.10	0.10	0.0001	0.0001
Plutonium-239/240	0.16	0.60	0.0002	0.0006
Ruthenium-106	3.3	11	0.0002	0.0006
Strontium-90	2.6	4.0	0.0001	0.0002
Technetium-99	130	620	0.0013	0.0062
Total WAC Factor			1.6440	2.1731

Table H-5 (Cont.)
Total WAC Factor Calculations for Pits

Waste Pit No. 3 Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	978	1,700	0.0089	0.0155
Uranium-234	640	990	0.0058	0.0090
Thorium-230	4,930	12,000	0.3287	0.8000
Radium-226	170	450	0.0850	0.2250
Uranium-235/236	49	52	0.0004	0.0005
Thorium-232	170	400	0.2500	0.5882
Radium-228	120	240	0.1791	0.3582
Thorium-228	280	820	0.0000	0.0000
Cesium-137	U	U	0.0000	0.0000
Neptunium-237	1	2	0.0003	0.0011
Plutonium-238	0	1	0.0004	0.0010
Plutonium-239/240	2	14	0.0022	0.0140
Ruthenium-106	U	U	0.0000	0.0000
Strontium-90	1.32	5.2	0.0001	0.0003
Technetium-99	230.0	1,100	0.0023	0.0110
Total WAC Factor			0.8632	2.0237

Waste Pit No. 4 Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	19,000	42,000	0.1727	0.3818
Uranium-234	2,700	4,100	0.0245	0.0373
Thorium-230	1,000	1,800	0.0667	0.1200
Radium-226	23	50	0.0115	0.0250
Uranium-235/236	380	930	0.0035	0.0085
Thorium-232	230	840	0.3382	1.2353
Radium-228	59	140	0.0881	0.2090
Thorium-228	950	2,500	0.0000	0.0000
Cesium-137	U	U	0.0000	0.0000
Neptunium-237	0.18	0.40	0.0001	0.0002
Plutonium-238	0.25	0.50	0.0003	0.0005
Plutonium-239/240	0.15	0.40	0.0002	0.0004
Ruthenium-106	U	U	0.0000	0.0000
Strontium-90	44.0	140.0	0.0022	0.0070
Technetium-99	80	230	0.0008	0.0023
Total WAC Factor			0.7087	2.0272

Table H-5 (Cont.)
Total WAC Factor Calculations for Pits

Waste Pit No. 5 Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	809	1,200	0.0074	0.0109
Uranium-234	640	1,300	0.0058	0.0118
Thorium-230	4,500	8,500	0.3000	0.5667
Radium-226	93	150	0.0465	0.0750
Uranium-235/236	34	79	0.0003	0.0007
Thorium-232	30	55	0.0441	0.0809
Radium-228	22	39	0.0333	0.0582
Thorium-228	31	44	0.0000	0.0000
Cesium-137	24.00	78.0	0.0429	0.1393
Neptunium-237	40	46	0.0200	0.0230
Plutonium-238	2	4	0.0020	0.0044
Plutonium-239/240	5	13	0.0050	0.0130
Ruthenium-106	1	3	0.0001	0.0002
Strontium-90	10.00	31.0	0.0005	0.0016
Technetium-99	1,500.0	3,000	0.0150	0.0300
Total WAC Factor			0.5228	1.0156

Waste Pit No. 6 Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	17,000	29,000	0.1545	0.2636
Uranium-234	3,400	5,300	0.0309	0.0482
Thorium-230	32	62	0.0021	0.0041
Radium-226	4	5	0.0020	0.0025
Uranium-235/236	1,000	1,800	0.0091	0.0164
Thorium-232	1	1	0.0008	0.0018
Radium-228	54	190	0.0806	0.2836
Thorium-228	1	2	0.0000	0.0000
Cesium-137	17.00	31.0	0.0304	0.0554
Neptunium-237	2.00	3.60	0.0010	0.0018
Plutonium-238	0.78	1.40	0.0008	0.0014
Plutonium-239/240	8.70	15.00	0.0087	0.0150
Ruthenium-106	U	U	0.0000	0.0000
Strontium-90	4.1	5.1	0.0002	0.0003
Technetium-99	130	160	0.0013	0.0016
Total WAC Factor			0.3223	0.6955

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Table H-5 (Cont.)
Total WAC Factor Calculations for Pits

Burn Pit Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	850	2,000	0.0077	0.0182
Uranium-234	720	1,700	0.0065	0.0155
Thorium-230	1,180	4,500	0.0787	0.3000
Radium-226	15	39	0.0075	0.0195
Uranium-235/236	53	100	0.0005	0.0009
Thorium-232	57	410	0.0838	0.6029
Radium-228	7	10	0.0099	0.0149
Thorium-228	120	900	0.0000	0.0000
Cesium-137	U	U	0.0000	0.0000
Neptunium-237	0	1	0.0001	0.0003
Plutonium-238	0	1	0.0001	0.0005
Plutonium-239/240	0	0	0.0001	0.0004
Ruthenium-106	U	U	0.0000	0.0000
Strontium-90	0.31	0.5	0.0000	0.0000
Technetium-99	29.0	64	0.0003	0.0006
Total WAC Factor			0.1953	0.9738

Clearwell Waste Acceptance Level				
Analyte	Average Concentration (pCi/g)	Highest Hit (pCi/g)	Average Divided by the WAC	Highest Hit Divided by the WAC
Uranium-238	810	1,600	0.0074	0.0145
Uranium-234	457	1,100	0.0042	0.0100
Thorium-230	1,680	5,600	0.1120	0.3733
Radium-226	74	170	0.0370	0.0850
Uranium-235/236	190	370	0.0017	0.0034
Thorium-232	19	39	0.0279	0.0574
Radium-228	18	26	0.0269	0.0388
Thorium-228	37	56	0.0000	0.0000
Cesium-137	190.00	450.0	0.3393	0.8036
Neptunium-237	1.00	2.20	0.0005	0.0011
Plutonium-238	0.25	0.49	0.0003	0.0005
Plutonium-239/240	0.28	0.54	0.0003	0.0005
Ruthenium-106	1.1	3	0.0001	0.0002
Strontium-90	8.5	26.0	0.0004	0.0013
Technetium-99	360	700	0.0036	0.0070
Total WAC Factor			0.5615	1.3966

Table H-6
Uranium Properties of Available Data Sets

Parameter	CIS Radiological Data (pCi/g)	RI/FS Radiological Data (pCi/g)	RI/FS Radiological Profile (pCi/g)	Parsons Table A-2 (pCi/g)	Parsons Table A-4 Total Curies (Ci)	Averaged CIS and RI/FS (pCi/g)
Pit 1						
U-234	558	574	570	574	47.2	565
U-235/236	56	85	85	85	6.99	71
U-238	1951	3897	3900	3900	320	2924
Wt. % U-235	0.45	0.34	0.34	0.34	0.34	0.37
Status	Depleted	Depleted	Depleted	Depleted	Depleted	Depleted
Pit 2						
U-234	3867	950	3900	3870	64.4	3033
U-235/236	1793	74	1800	1790	29.8	1302
U-238	4725	1070	4700	4730	78.7	3681
Wt. % U-235	5.58	1.07	6.63	5.57	5.57	5.22
Status	Enriched	Enriched	Enriched	Enriched	Enriched	Enriched
Pit 3						
U-234	208	641	640	641	79.7	365
U-235/236	12	52	49	101	12.6	16.7
U-238	442	979	978	979	122	690
Wt. % U-235	0.41	0.82	0.77	1.58	1.58	0.38
Status	Depleted	Enriched	Enriched	Enriched	Enriched	Depleted
Pit 4						
U-234	783	2732	2700	2730	239	1618
U-235/236	152	27	380	411	36	127
U-238	4644	19025	1900	19000	1660	11834
Wt. % U-235	0.51	0.02	0.31	0.34	0.34	0.17
Status	Depleted	Depleted	Depleted	Depleted	Depleted	Depleted
Pit 5						
U-234	638	644	640	644	11.4	642
U-235/236	34	18	34	34	0.61	24
U-238	641	809	809	809	14.3	746
Wt. % U-235	0.83	0.35	0.65	0.65	0.65	0.51
Status	Enriched	Depleted	Depleted	Depleted	Depleted	Depleted
Pit 6						
U-234	3417	2401	3400	3420	46.4	2740
U-235/236	1042	205	1000	1040	14.1	484
U-238	16975	15113	17000	17000	231	15734
Wt. % U-235	0.95	0.21	0.91	0.94	0.94	0.48
Status	Enriched	Depleted	Enriched	Enriched	Enriched	Depleted
Burn Pit						
U-234	135	716	720	716	18.8	367
U-235/236	8.4	53	53	53.4	1.4	26.4
U-238	175	847	850	847	22.2	444
Wt. % U-235	0.74	0.97	0.96	0.97	0.97	0.92
Status	Enriched	Enriched	Enriched	Enriched	Enriched	Enriched
Clearwell						
U-234	290	457	457	457	0.355	390
U-235/236	35	186	190	186	0.144	126
U-238	621	811	810	812	0.63	736
Wt. % U-235	0.87	3.45	3.53	3.45	3.44	2.59
Status	Enriched	Enriched	Enriched	Enriched	Enriched	Enriched

APPENDIX

I

APPENDIX I

TOTAL FLOW DURING PIT EXCAVATIONS

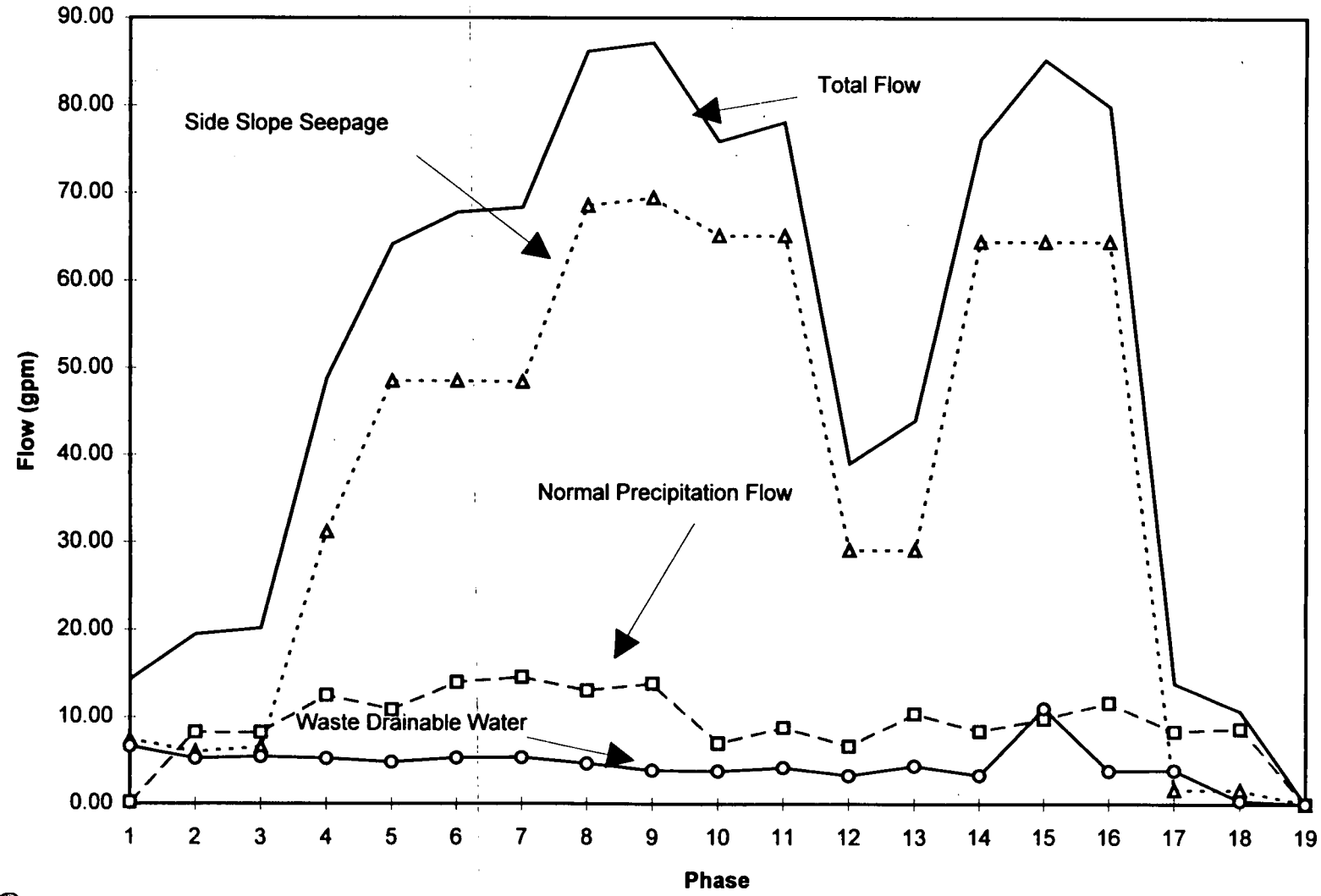
APPENDIX I
WAST[illegible]REA
EXCAVATION WATER/N[illegible]TACT STORM WATER
BY PHASE

SOURCE AREA			PIT 1		PIT 2	PIT 3		PIT 4	PIT 5	PIT 6	BURN PIT	CLEARWELL	TOTAL NC SW TO CLEARWELL	TOTAL NC SW TO K-65 BASIN	TOTAL EXCAV WATER
NONCONTACT STORM WATER TO:			CLEARWELL	K-65 BASIN	K-65 BASIN	CLEARWELL	K-65 BASIN	K-65 BASIN	CLEARWELL	CLEARWELL	K-65 BASIN	CLEARWELL			
TOTAL AREA (SQ. FT.)			45,000	46,912	39,204	32,670	185,130	65,340	162,914	32,234	21,780	28,314	-	-	-
PHASE	PARAMETER	UNITS													
1	Open area	(sq. ft.)	0	0	0	0	4,356	0	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	20,578	0	0	0	0	0	-	-	20,578
	Non-contact Storm Water	(gpd)	3,085	3,216	2,688	2,240	12,394	4,480	11,169	2,210	1,493	1,941	20,645	24,270	-
2	Open area	(sq. ft.)	45,000	46,912	8,712	0	74,052	0	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	13,320	1,541	0	13,176	0	0	0	0	0	-	-	28,037
	Non-contact Storm Water	(gpd)	0	0	2,090	2,240	7,615	4,480	11,169	2,210	1,493	1,941	17,560	15,679	-
3	Open area	(sq. ft.)	45,000	46,912	8,712	0	106,722	0	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	11,678	1,368	0	15,984	0	0	0	0	0	-	-	29,030
	Non-contact Storm Water	(gpd)	0	0	2,090	2,240	5,376	4,480	11,169	2,210	1,493	1,941	17,560	13,439	-
4	Open area	(sq. ft.)	45,000	46,912	8,712	0	139,392	0	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	12,715	37,181	0	20,448	0	0	0	0	0	-	-	70,344
	Non-contact Storm Water	(gpd)	0	0	2,090	2,240	3,136	4,480	11,169	2,210	1,493	1,941	17,560	11,199	-
5	Open area	(sq. ft.)	0	0	39,204	0	174,240	27,443	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	7,862	0	23,083	61,459	0	0	0	0	-	-	92,405
	Non-contact Storm Water	(gpd)	0	0	0	2,240	747	2,598	11,169	2,210	1,493	1,941	17,560	4,838	-
6	Open area	(sq. ft.)	0	0	39,204	0	185,130	27,443	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	8,698	0	26,755	62,035	0	0	0	0	-	-	97,488
	Non-contact Storm Water	(gpd)	0	0	0	2,240	0	2,598	11,169	2,210	1,493	1,941	17,560	4,091	-
7	Open area	(sq. ft.)	0	0	39,204	15,246	185,130	28,314	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	8,266	0	28,008	62,136	0	0	0	0	-	-	98,410
	Non-contact Storm Water	(gpd)	0	0	0	1,195	0	2,538	11,169	2,210	1,493	1,941	16,515	4,032	-
8	Open area	(sq. ft.)	0	0	0	32,670	185,130	28,314	0	32,234	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	27,173	61,531	0	35,410	0	0	-	-	124,114
	Non-contact Storm Water	(gpd)	0	0	0	0	0	2,538	11,169	0	1,493	1,941	13,110	4,032	-
9	Open area	(sq. ft.)	0	0	0	32,670	185,130	28,314	43,996	32,234	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	24,566	61,272	4,838	34,920	0	0	-	-	125,597
	Non-contact Storm Water	(gpd)	0	0	0	0	0	2,538	8,153	0	1,493	1,941	10,094	4,032	-
10	Open area	(sq. ft.)	0	0	0	0	0	28,314	71,874	32,234	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	62,237	10,728	36,230	0	0	-	-	109,195
	Non-contact Storm Water	(gpd)	0	0	0	0	0	2,538	6,242	0	1,493	1,941	8,183	4,032	-
11	Open area	(sq. ft.)	0	0	0	0	0	28,314	78,408	32,234	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	62,726	12,830	36,850	0	0	-	-	112,406
	Non-contact Storm Water	(gpd)	0	0	0	0	0	2,538	5,794	0	1,493	1,941	7,735	4,032	-
12	Open area	(sq. ft.)	0	0	0	0	0	31,363	96,268	0	21,780	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	35,237	11,491	0	9,461	0	-	-	56,189
	Non-contact Storm Water	(gpd)	0	0	0	0	0	2,329	4,569	0	0	1,941	6,510	2,329	-
13	Open area	(sq. ft.)	0	0	0	0	0	31,363	101,059	0	21,780	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	36,504	16,430	0	10,296	0	-	-	63,230
	Non-contact Storm Water	(gpd)	0	0	0	0	0	2,329	4,241	0	0	1,941	6,182	2,329	-
14	Open area	(sq. ft.)	0	0	0	0	0	65,340	125,017	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	96,120	13,478	0	0	0	-	-	109,598
	Non-contact Storm Water	(gpd)	0	0	0	0	0	0	2,598	0	0	1,941	4,539	0	-
15	Open area	(sq. ft.)	0	0	0	0	0	65,340	125,453	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	100,555	22,104	0	0	0	-	-	122,659
	Non-contact Storm Water	(gpd)	0	0	0	0	0	0	2,568	0	0	1,941	4,509	0	-
16	Open area	(sq. ft.)	0	0	0	0	0	65,340	138,521	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	97,502	17,482	0	0	0	-	-	114,984
	Non-contact Storm Water	(gpd)	0	0	0	0	0	0	1,672	0	0	1,941	3,614	0	-
17	Open area	(sq. ft.)	0	0	0	0	0	0	162,914	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	0	19,930	0	0	0	-	-	19,930
	Non-contact Storm Water	(gpd)	0	0	0	0	0	0	0	0	0	1,941	1,941	0	-
18	Open area	(sq. ft.)	0	0	0	0	0	0	162,914	0	0	28,314	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	0	13,392	0	0	1,944	-	-	15,336
	Non-contact Storm Water	(gpd)	0	0	0	0	0	0	0	0	0	0	0	0	-
19	Open area	(sq. ft.)	0	0	0	0	0	0	0	0	0	0	-	-	-
	Excavation Water	(gpd)	0	0	0	0	0	0	0	0	0	0	-	-	0
	Non-contact Storm Water	(gpd)	0	0	0	0	0	0	0	0	0	0	0	0	-

Note: Storm water that falls within a waste pit during the 6-month period prior to its certification as "clean" will continue to be collected and treated. However, this water is not included in the Noncontact Storm Water or Excavation Water calculations above. This contact storm water appears as a separate stream on the Site Water Balance Process Flow Diagram.

000851

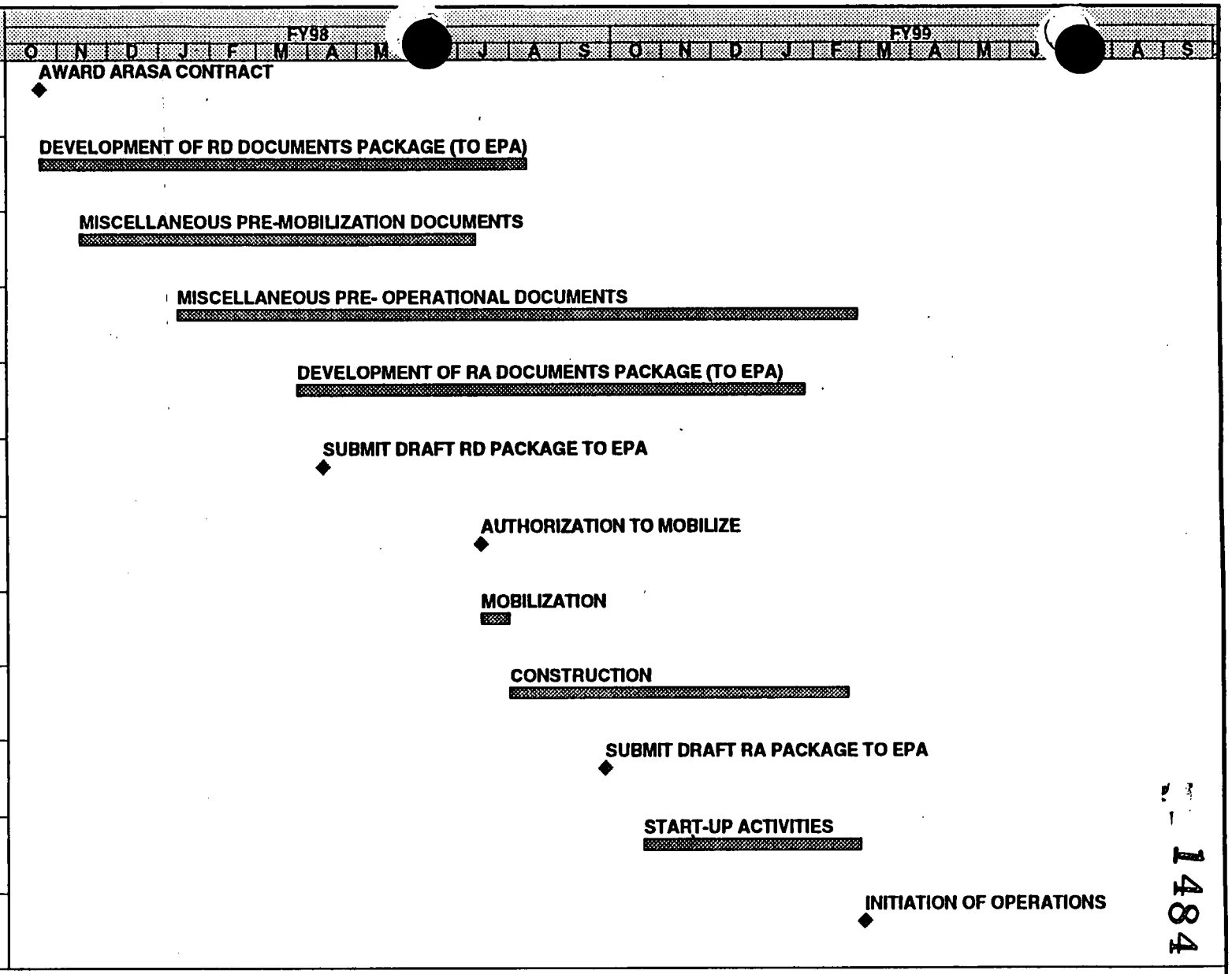
773481- Fernald OU-1 Total Excavation Flow



000458

Pre-Operational
Schedule

Activity ID	Early Start	Early Finish	Duration
1C1DEB1310	21OCT97		0
1CBB121230	21OCT97	10AUG98	200
1CBB103015	14NOV97	10JUL98	162
1CBB103020	12JAN98	26FEB99	283
1CBB135630	25MAR98	25JAN99	209
1CBB121225		09APR98	0
1CBB103016	13JUL98		0
1CBB203202	13JUL98	29JUL98	13
1CBB203205	30JUL98	19FEB99	139
1CBB135625		25SEP98	0
1CBB103230	19OCT98	26FEB99	88
1CB0010055	01MAR99		0



1484

000259

Project Start	01OCT95	Early Bar
Project Finish	31MAY05	Progress Bar
Data Date	01OCT98	Critical Activity
Plot Date	19FEB99	

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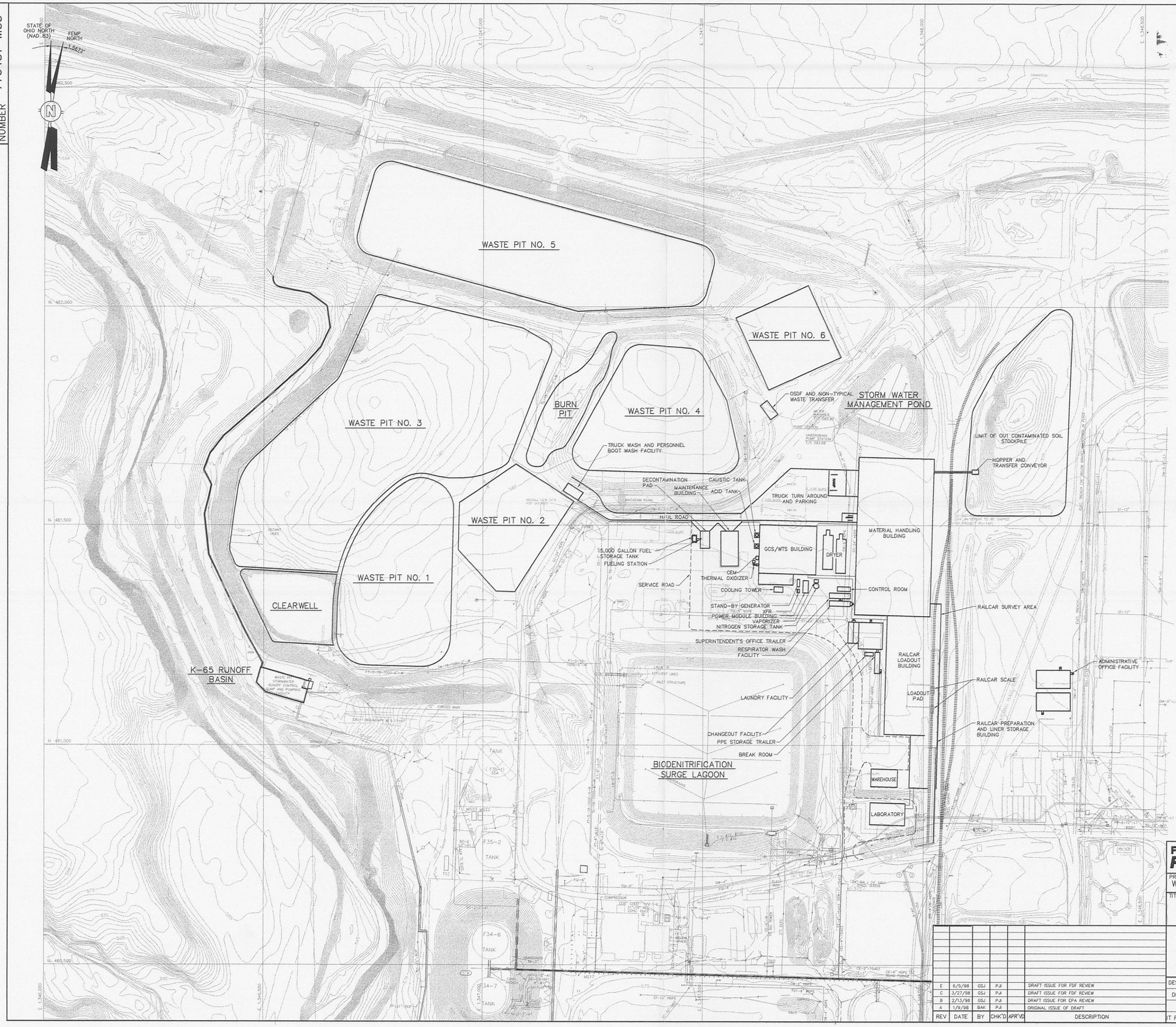
Sheet 1 of 1

OU1 (WPRAP) PRE-OPERATIONAL SCHEDULE

FERNALD
Environmental Management Project

DRAWING NUMBER 773481-M53

1484



000084

SCALE
0 80 160 240 FEET

DRAFT

FIGURE 1-1

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	BAK	PJI		ORIGINAL ISSUE OF DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
OVERALL SITE FACILITIES MAP

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

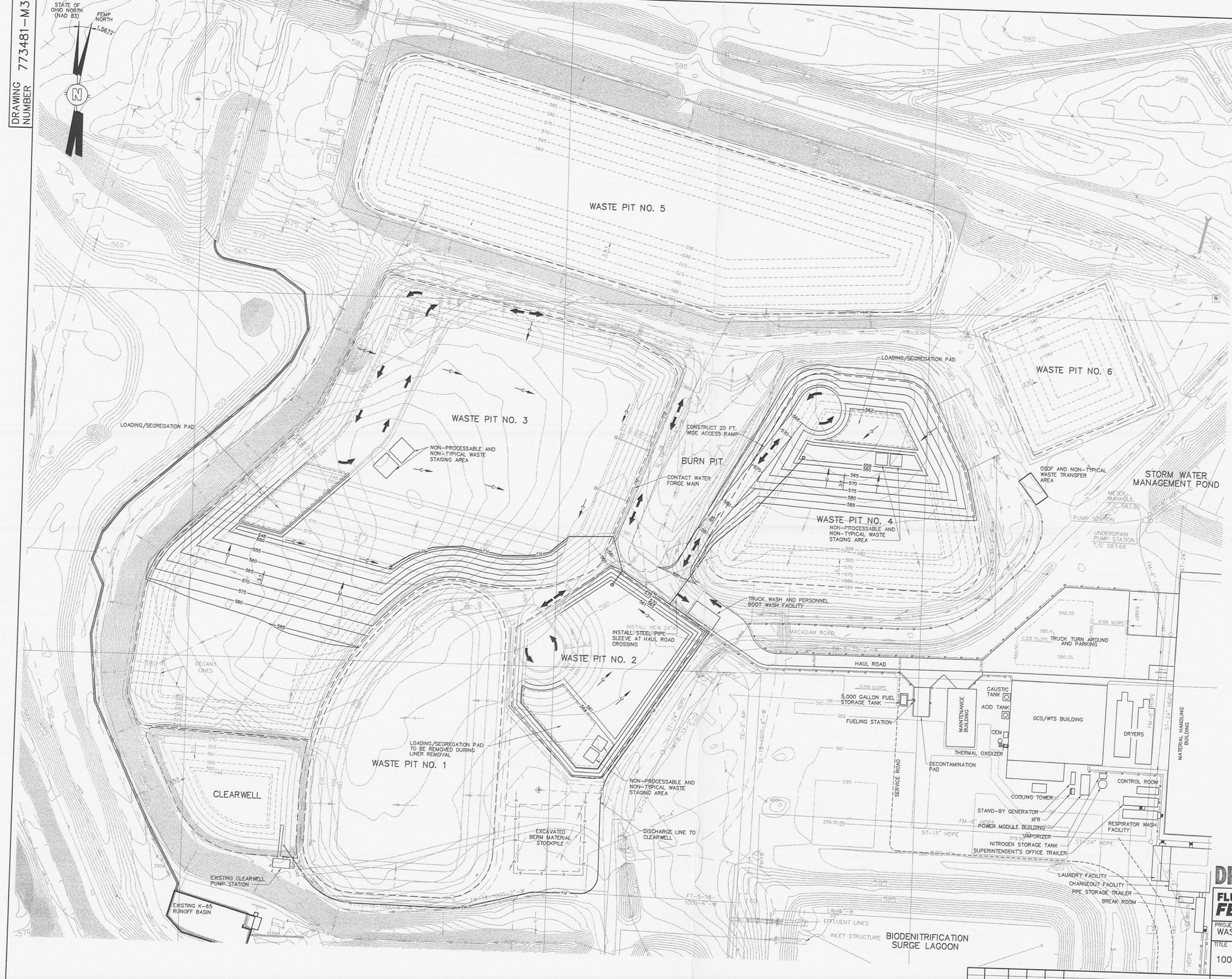
DESIGNED BY	PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	B. A. KUMPF	APPROVED BY			E
DATE	29 DECEMBER 97	DWG. SCALE	1"=80'		
IT PROJECT NO.	773481	DRAWING NO.	M-00-02-001		

28 MAY 98
10:25
XREF: SITECOND

24696L-1

DRAWING NUMBER 773481-M3

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 5
100% WASTE PIT NO. 2, 80% WASTE PIT NO. 3, 42% WASTE PIT NO. 4

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO	773481	DRAWING NO.	M-05-82-104	

REVISION: E

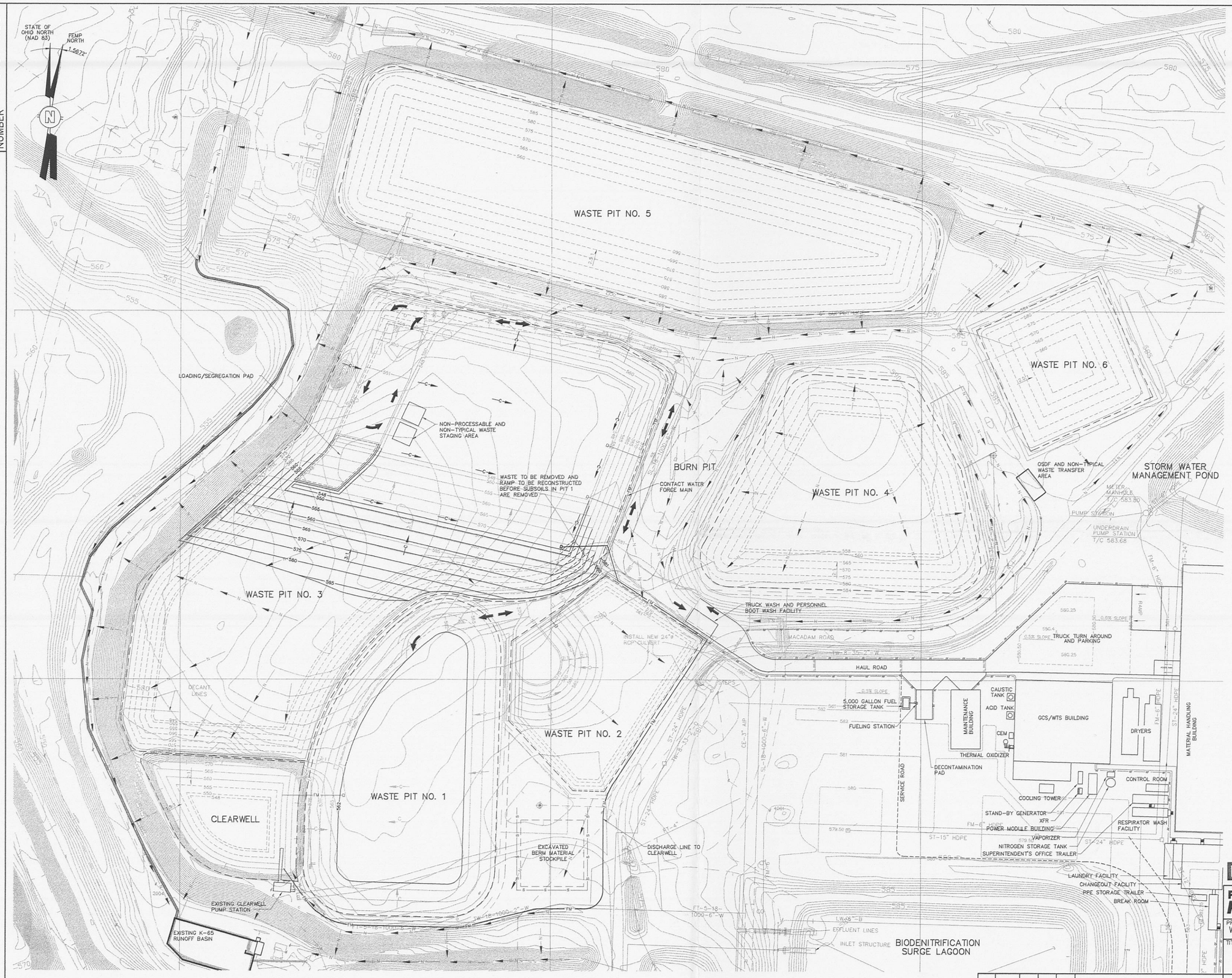
05/29/98 11:50

000092

246691-2

DRAWING NUMBER 773481-M36

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 4
64% WASTE PIT NO. 3,
SUBSOILS WASTE PIT NO. 1

INTERNATIONAL TECHNOLOGY CORPORATION

... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO	773481	DRAWING NO.	M-05-82-103		

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05/29/98 11:43

246251.3

DRAWING NUMBER 773481-M35

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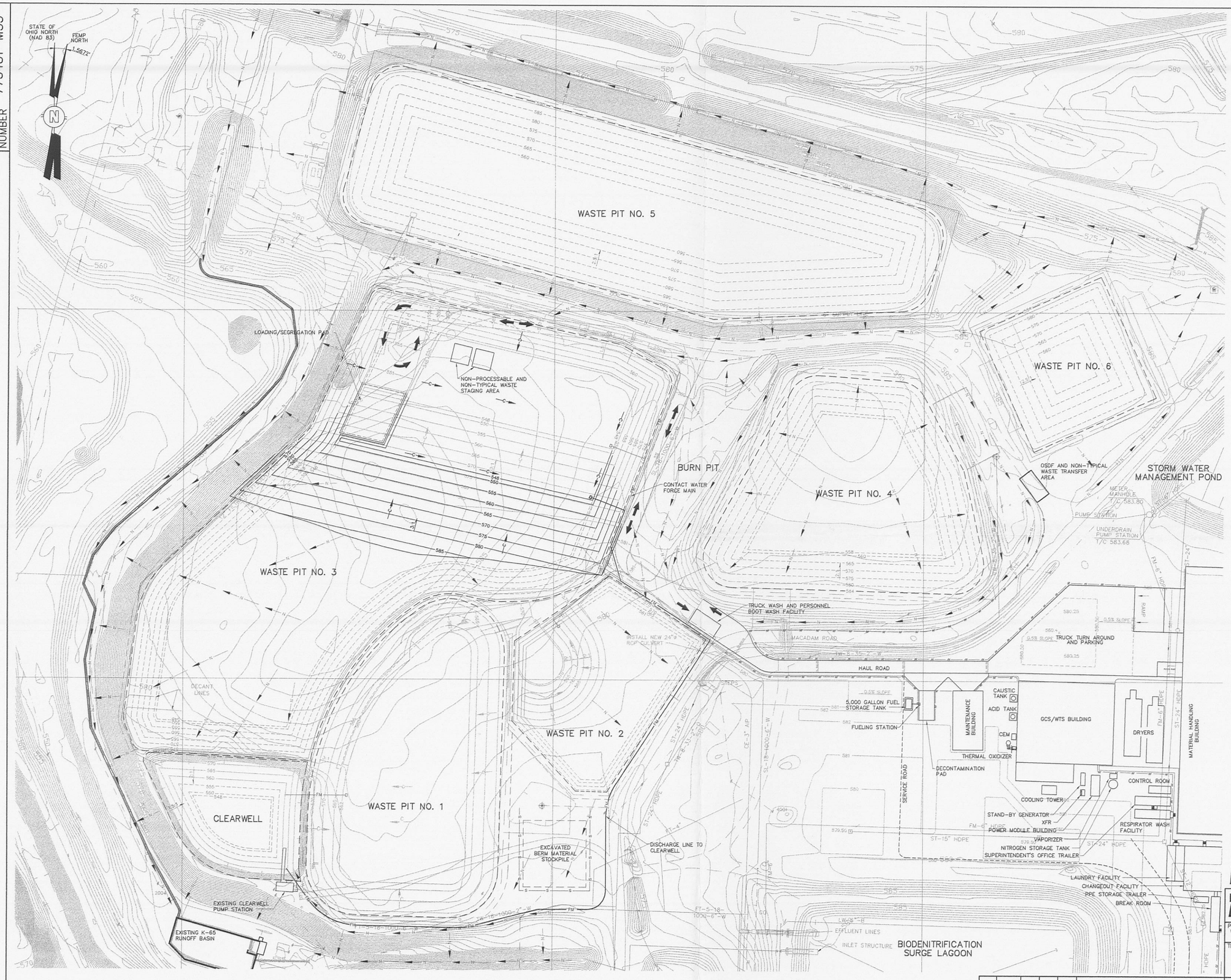

LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 3 49% WASTE PIT NO. 3

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			
DATE	11-25-97	DWG. SCALE	1"=50'-0"		E
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-102		

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DRAWING NUMBER 773481-M34

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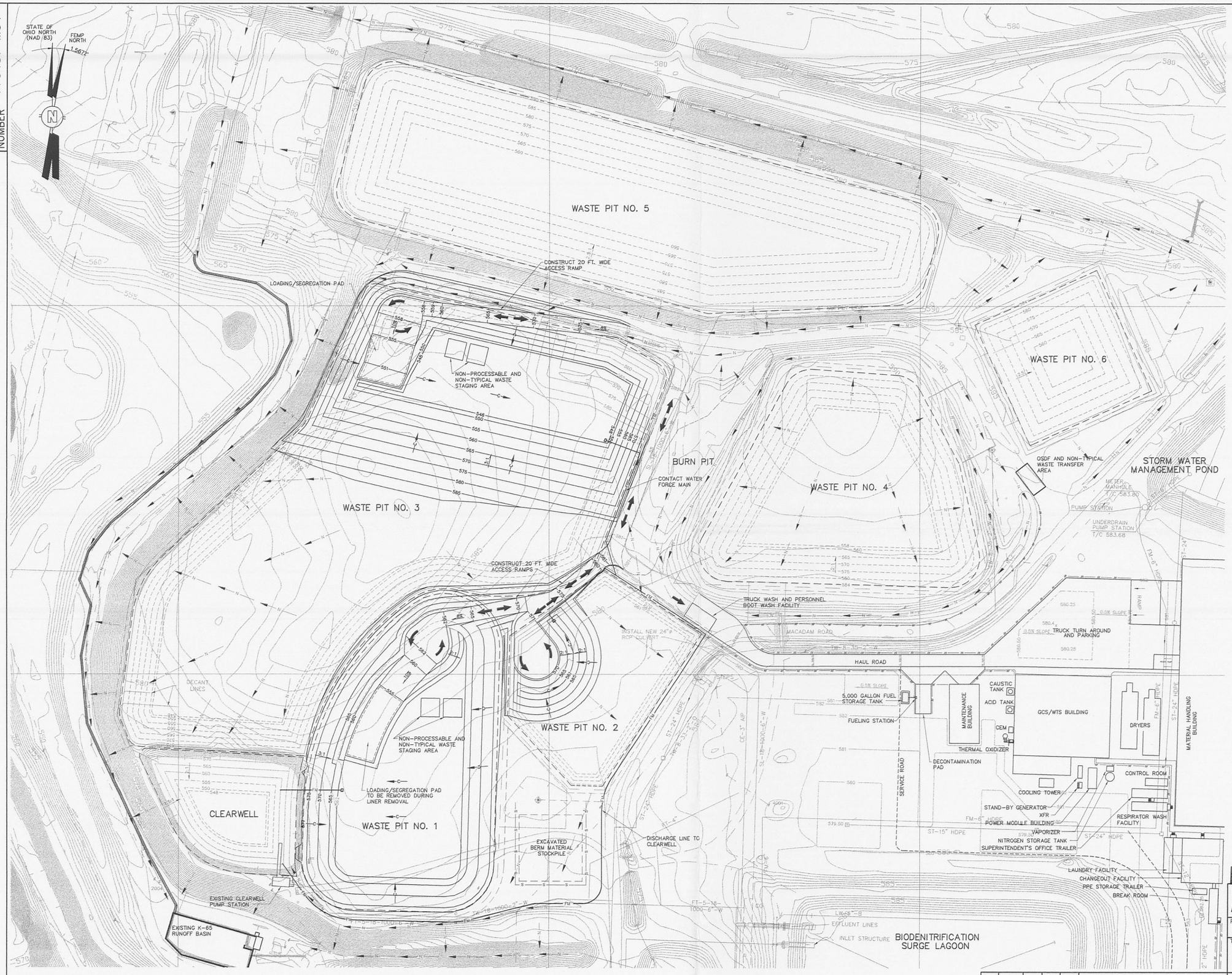

LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 2
100% WASTE PIT NO. 1 ,22% WASTE PIT NO. 2, 34% WASTE PIT NO. 3

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-101		

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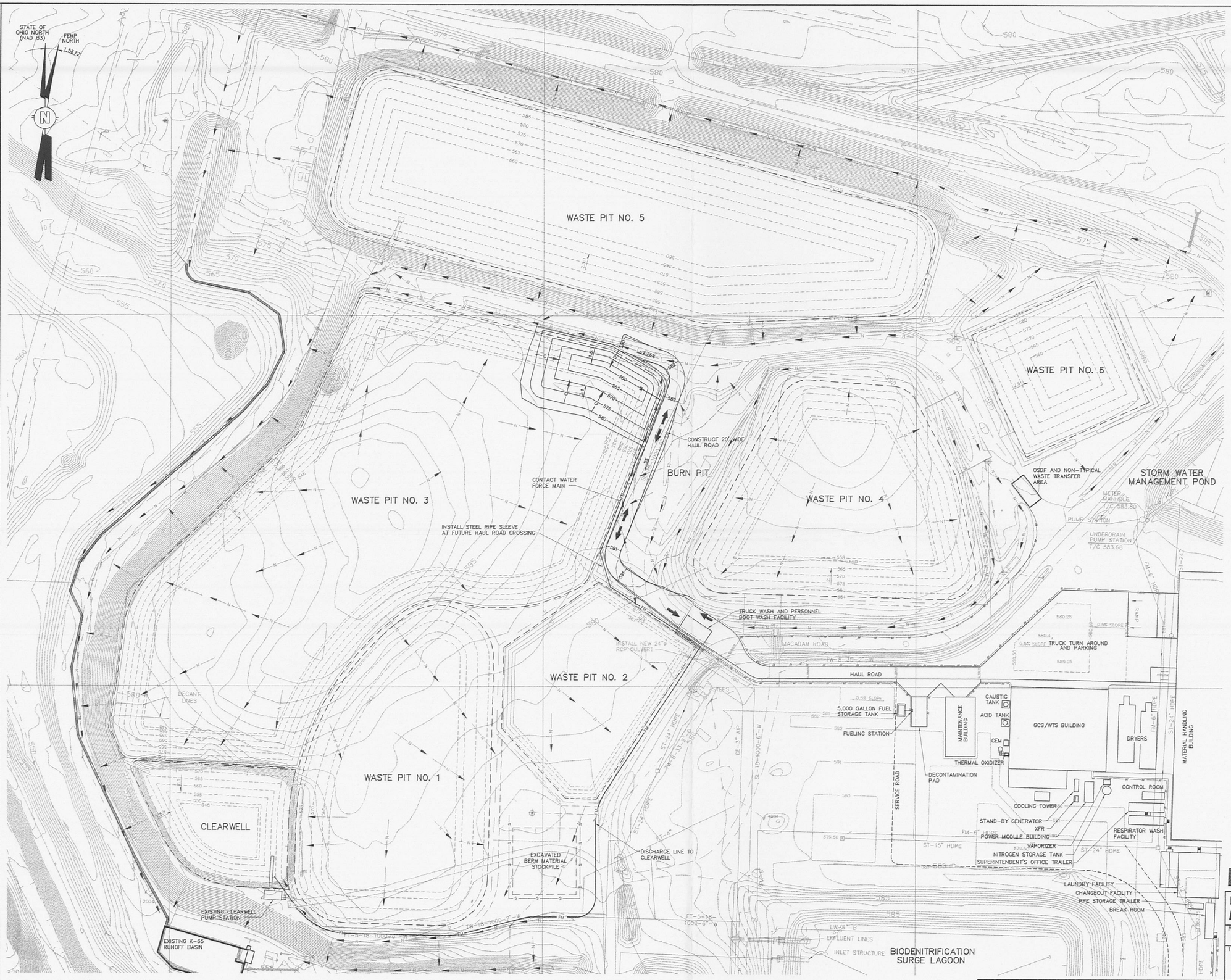

LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 1 2% WASTE PIT NO. 3

INTERNATIONAL TECHNOLOGY CORPORATION

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REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO	773481	DRAWING NO.	M-05-82-100	

REVISION: E

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DRAWING NUMBER 773481-M15

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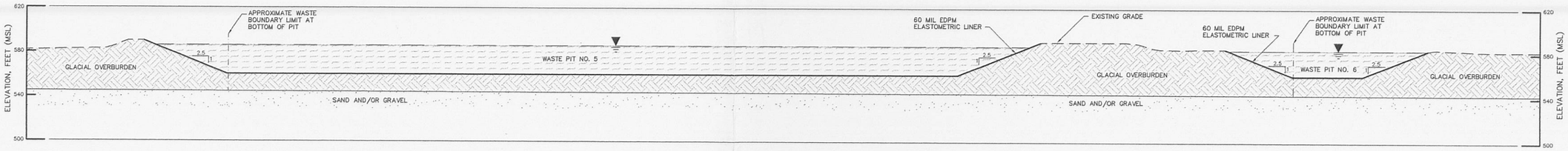
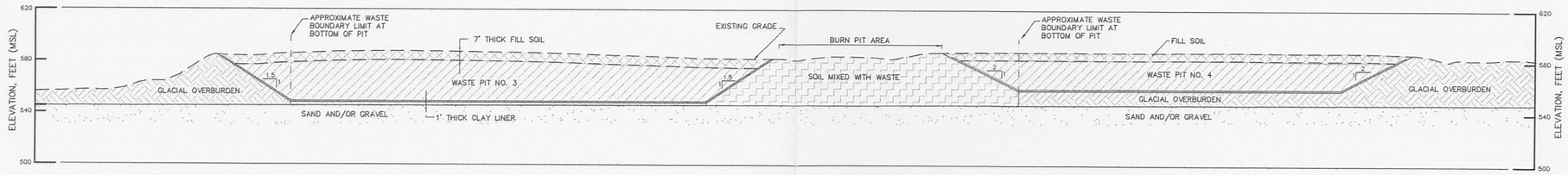


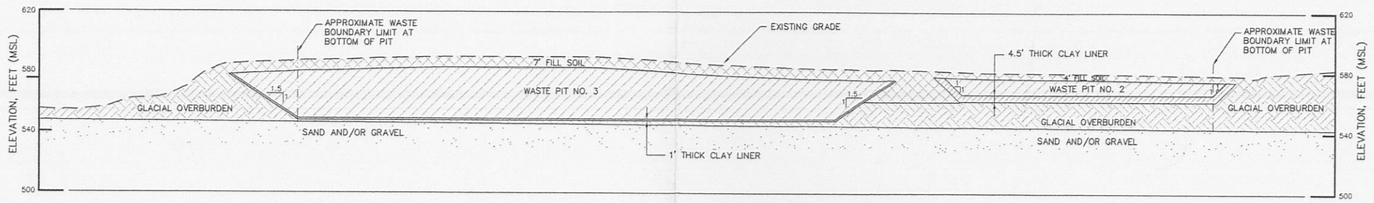
CROSS SECTION A–A

SCALE 0 40 80 120 FEET



CROSS SECTION B–B

SCALE 0 40 80 120 FEET

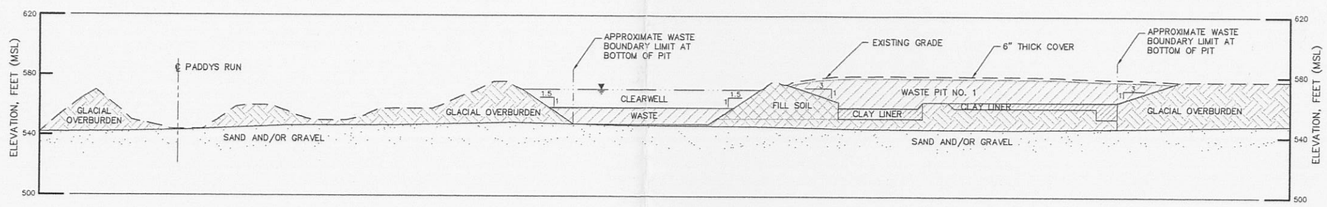


CROSS SECTION C–C

SCALE 0 40 80 120 FEET

NOTES:

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THESE DOCUMENTS:
   - EXISTING SITE DATA SOURCE (IN PLANT FILES)
   - AERIAL PHOTOGRAPHY, 1992
   - FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
2. 2H : 1V IS MINIMUM SLOPE PERMISSIBLE FOR SAFE EXCAVATION OVER AN EXTENDED TIME PERIOD. ACTUAL SLOPE WILL VARY DEPENDENT ON SLOPE CONDITIONS ENCOUNTERED. (TYPICAL TO ALL PITS).
3. THE GEOMETRIC CONFIGURATIONS, THE LINER THICKNESS, AND THE BOTTOM ELEVATIONS OF THE WASTE PITS WERE DETERMINED FROM THE BEST AVAILABLE DATA AT THIS TIME. THIS DATA WAS GATHERED FROM CONSTRUCTION, AS-BUILT, SURVEY, AND FEASIBILITY STUDY DRAWINGS (REV. 1), ALONG WITH ENGINEERING FILES AND THE 1992 AERIAL TOPOGRAPHY.
4. THE BORING LOGS SHOWN ON PARSONS SKETCH SK-G-01221 PROVIDED THE SUBSURFACE PROFILES.
5. BECAUSE OF INADEQUATE INFORMATION, THE BURN PIT AREA LOCATED BETWEEN WASTE PITS 3 AND 4 IS SHOWN AS SOIL MIXED WITH WASTE.
6. FOR PLAN LOCATION OF SECTIONS, SEE DRAWING NO. M-05-82-001.



CROSS SECTION D–D

SCALE 0 40 80 120 FEET

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REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
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C	3-27-98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	RAW	PJI		ORIGINAL ISSUE OF DRAFT

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: WASTE PIT AREA EXISTING CONDITIONS CROSS SECTIONS A–A THROUGH D–D

INTERNATIONAL TECHNOLOGY CORPORATION

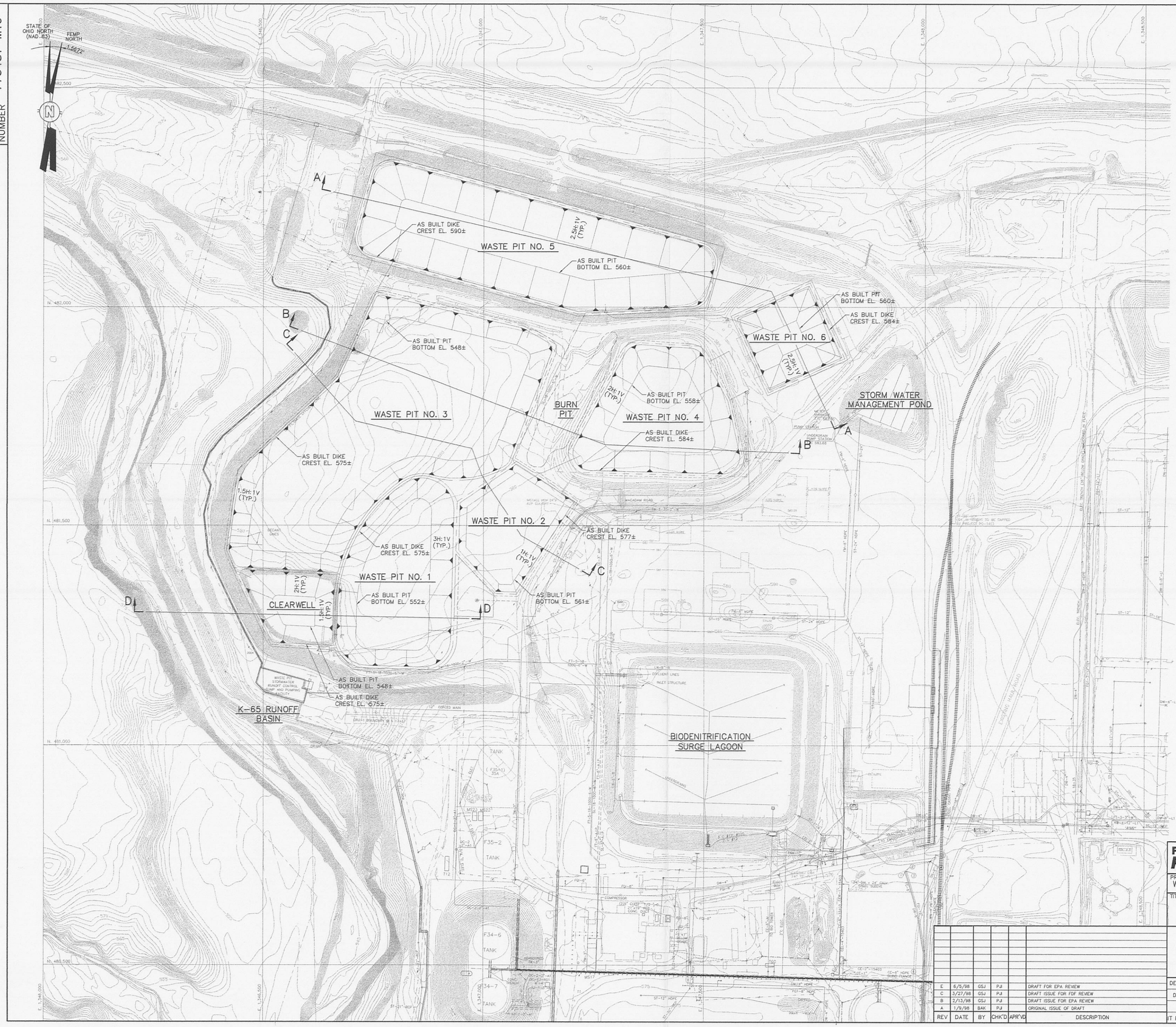
... Creating a Safer Tomorrow

DESIGNED BY	LIU LIN	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	RAW	APPROVED BY			E
DATE	11-18-97	DWG. SCALE	1" = 40'		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-002		

05/27/98 2:30 PM

DRAWING NUMBER 773481-M16

E_1484



000098

NOTES:

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.
   AERIAL TOPOGRAPHY, 1992
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
2. THE GEOMETRIC CONFIGURATIONS, THE LINER THICKNESSES, AND THE BOTTOM ELEVATIONS OF THE WASTE PITS WERE DETERMINED FROM THE BEST AVAILABLE DATA AT THIS TIME. THIS DATA WAS GATHERED FROM CONSTRUCTION, AS-BUILT, SURVEY, AND FEASIBILITY STUDY DRAWINGS (1/31/92, REV. 1), AND FROM THE EXISTING PLANT ENGINEERING FILES. THE DIKE CREST SHOWN AROUND THE WASTE PITS REPRESENTS THOSE BUILT AT THE TIME OF CONSTRUCTION. MOST OF THE DIKES HAVE BEEN BURIED WITH COVER MATERIAL OF DIFFERENT THICKNESSES.
3. THE GEOMETRIC CONFIGURATION OF THE BURN PIT HAS BEEN DETERMINED FROM THE SITE AS-BUILT SURVEY OF THE BURN PIT. DIKE DEPTH AND SLOPES OF THE BURN PIT ARE NOT KNOWN.
4. FOR SECTIONS A-A THROUGH D-D, SEE DRAWING NO. M-05-82-002.

SCALE
0 80 160 240 FEET

DRAFT

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	BAK	PJI		ORIGINAL ISSUE OF DRAFT

FLUOR DANIEL FERNALD
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
WASTE PIT AREA
EXISTING CONDITIONS
PLAN VIEW

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

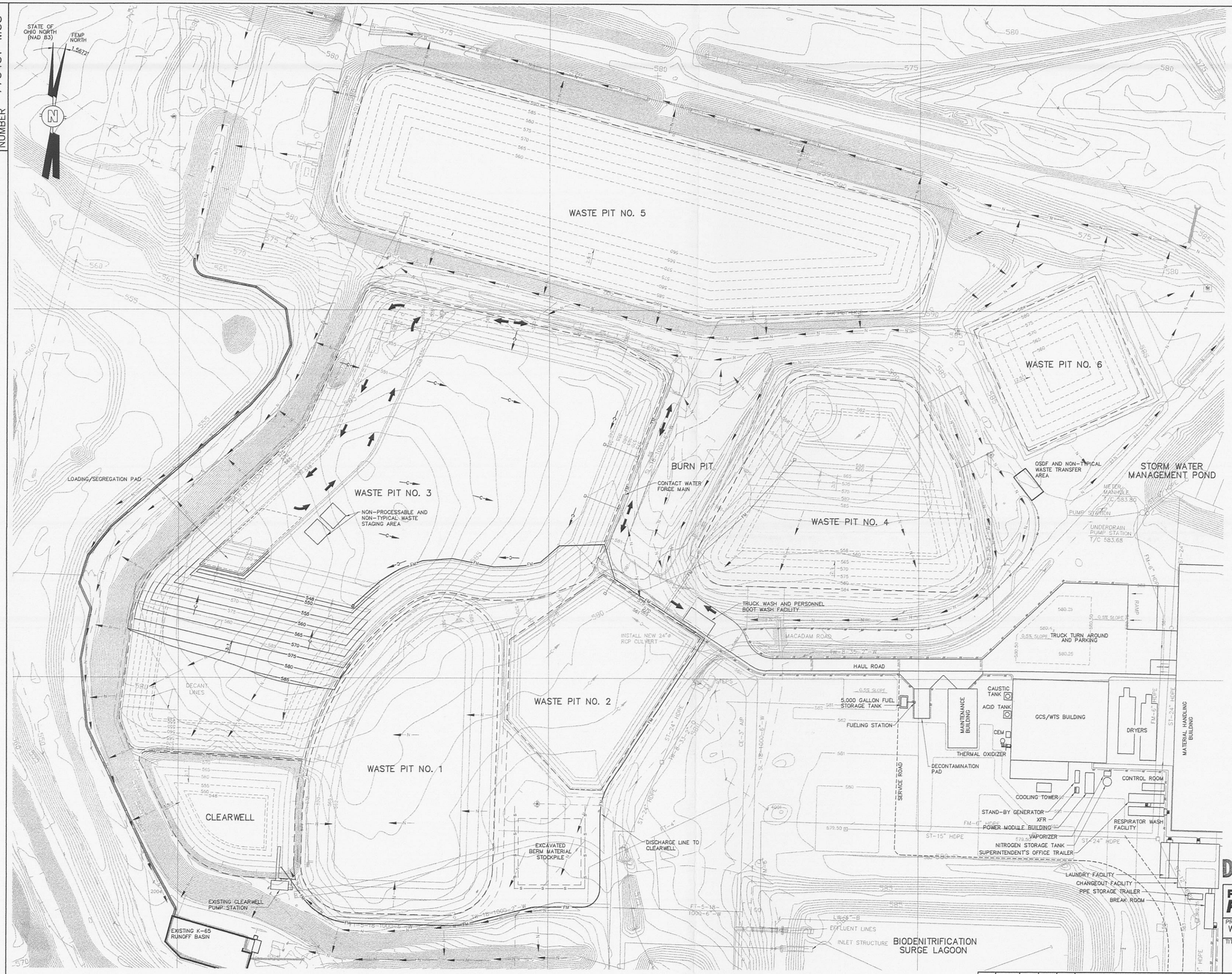
DESIGNED BY	PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	B. A. KUMPF	APPROVED BY			E
DATE	29 DECEMBER 97	DWG. SCALE	1"=80'		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-001		

02-27-98
12:45 PM
WRP SITECOND

246291-8

DRAWING NUMBER 773481-M38

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
PHASE 6
85% WASTE PIT NO. 3

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO	773481	DRAWING NO.	M-05-82-105		

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5/28/98 10:42

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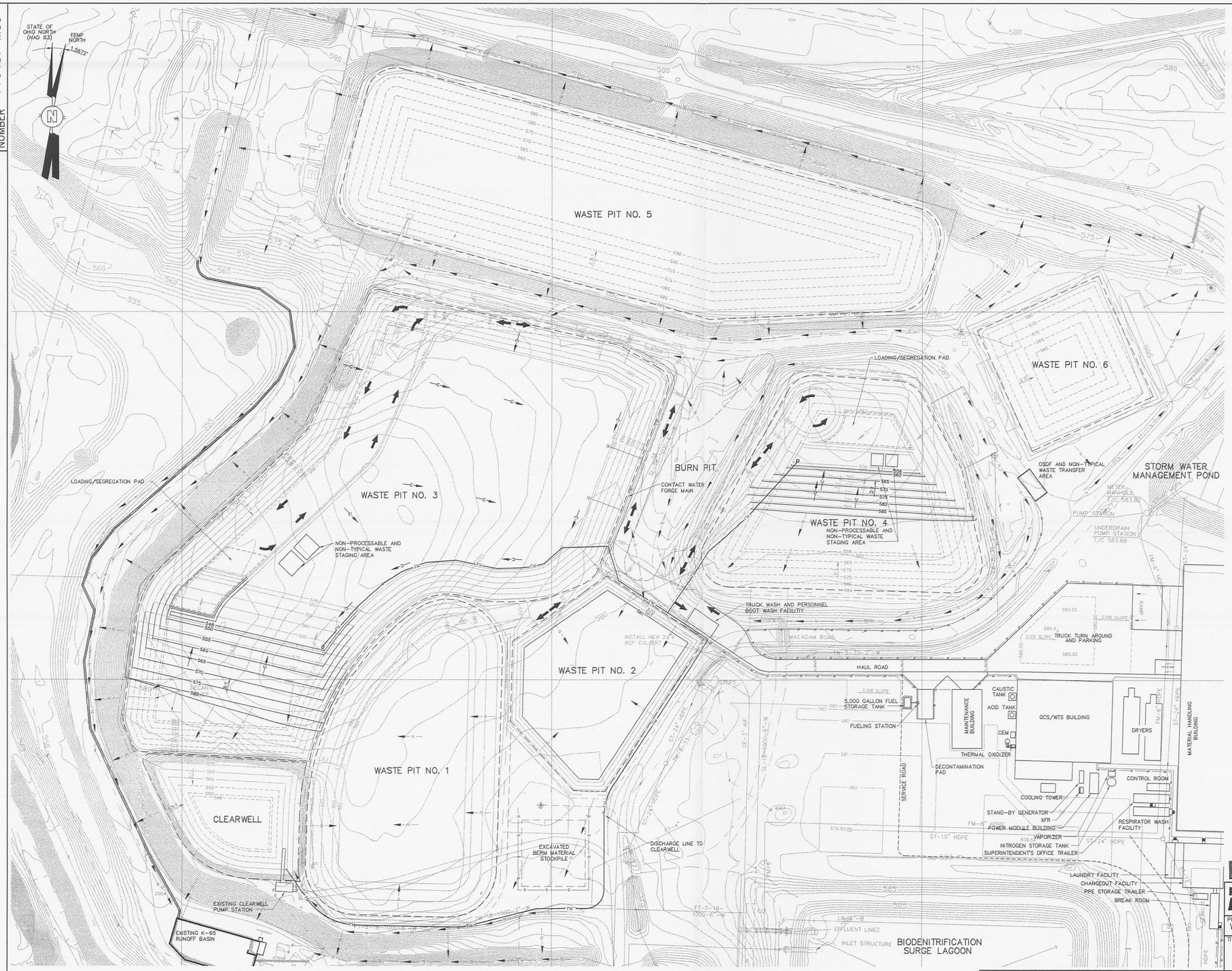
DRAWING NUMBER 773481-M39

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 — WASTE PIT BOTTOM ELEVATION
- 570 — EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 — EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 7
92% WASTE PIT NO. 3, 43% WASTE PIT NO. 4, SUBSOILS WASTE PIT NO. 2

INTERNATIONAL TECHNOLOGY CORPORATION

... Creating a Safer Tomorrow

E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT
REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-106	

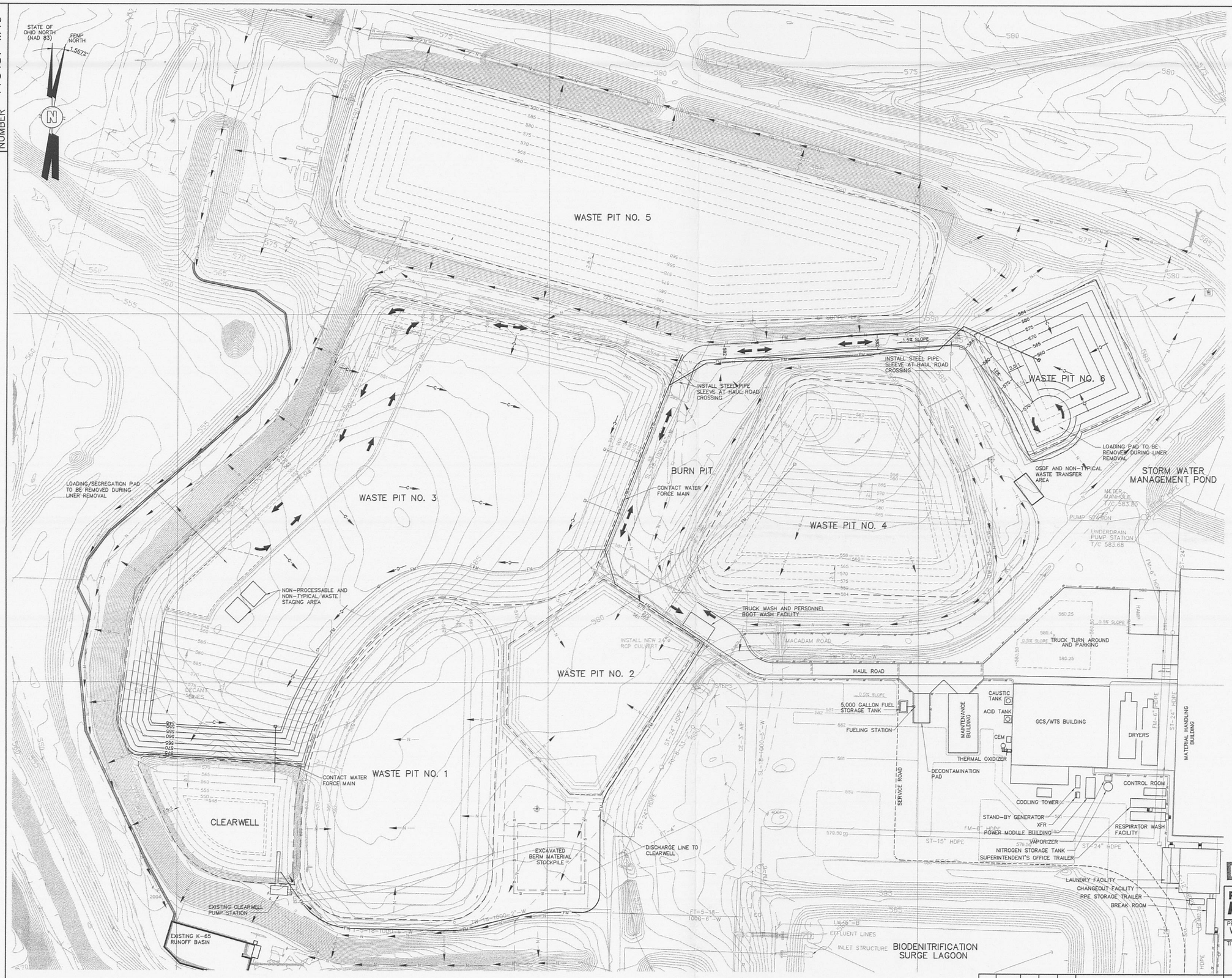
REVISION: E

000200

246291-10

DRAWING NUMBER 773481-M40

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 8
100% WASTE PIT NO. 3, 100% WASTE PIT NO. 6

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-107	

REVISION: E

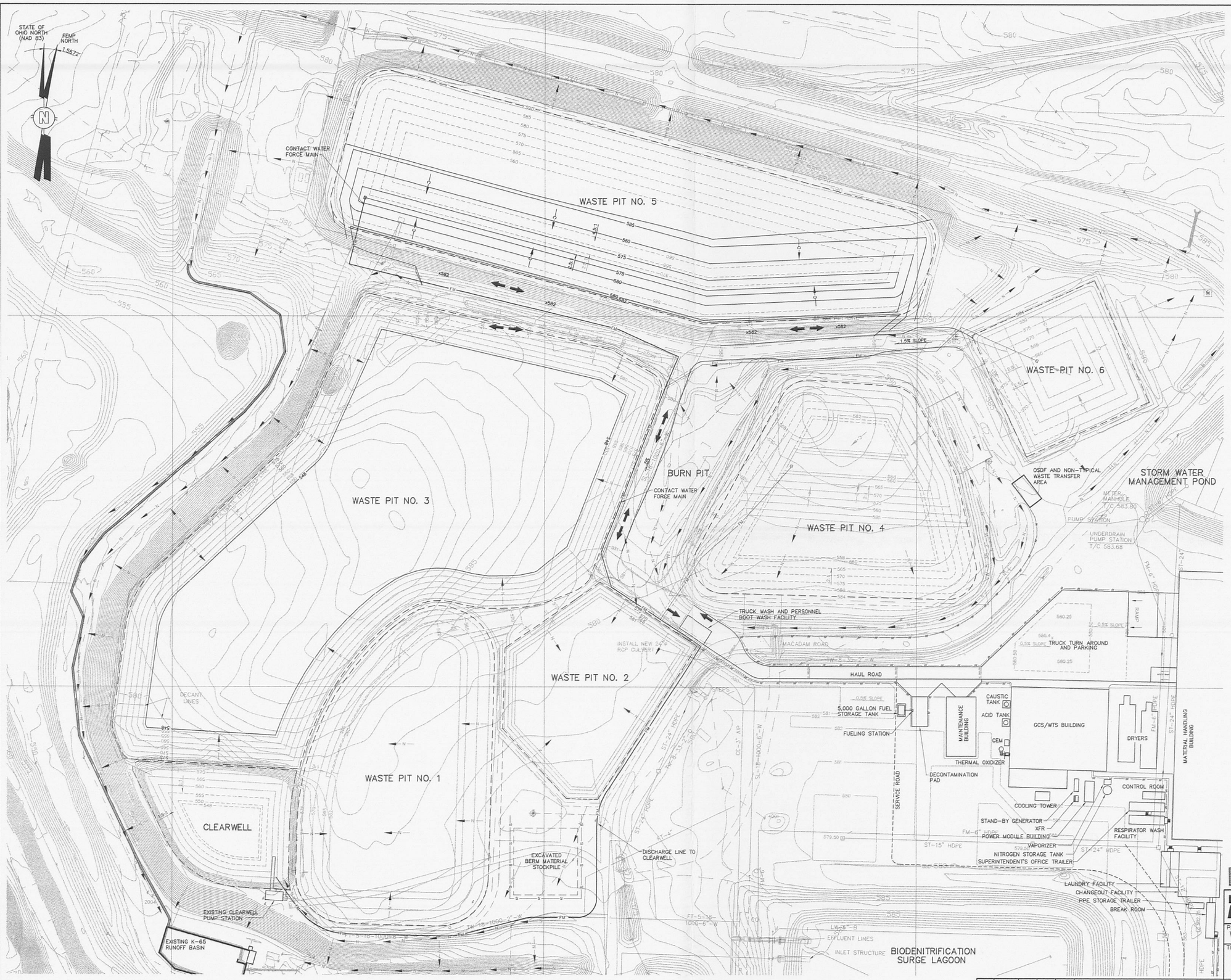
000101

5/28/98 0800

246291-11

DRAWING NUMBER 773481-M41

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 9
27% WASTE PIT NO. 5,
SUBSOILS WASTE PIT NO. 3

INTERNATIONAL TECHNOLOGY CORPORATION

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REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-108	

REVISION: E

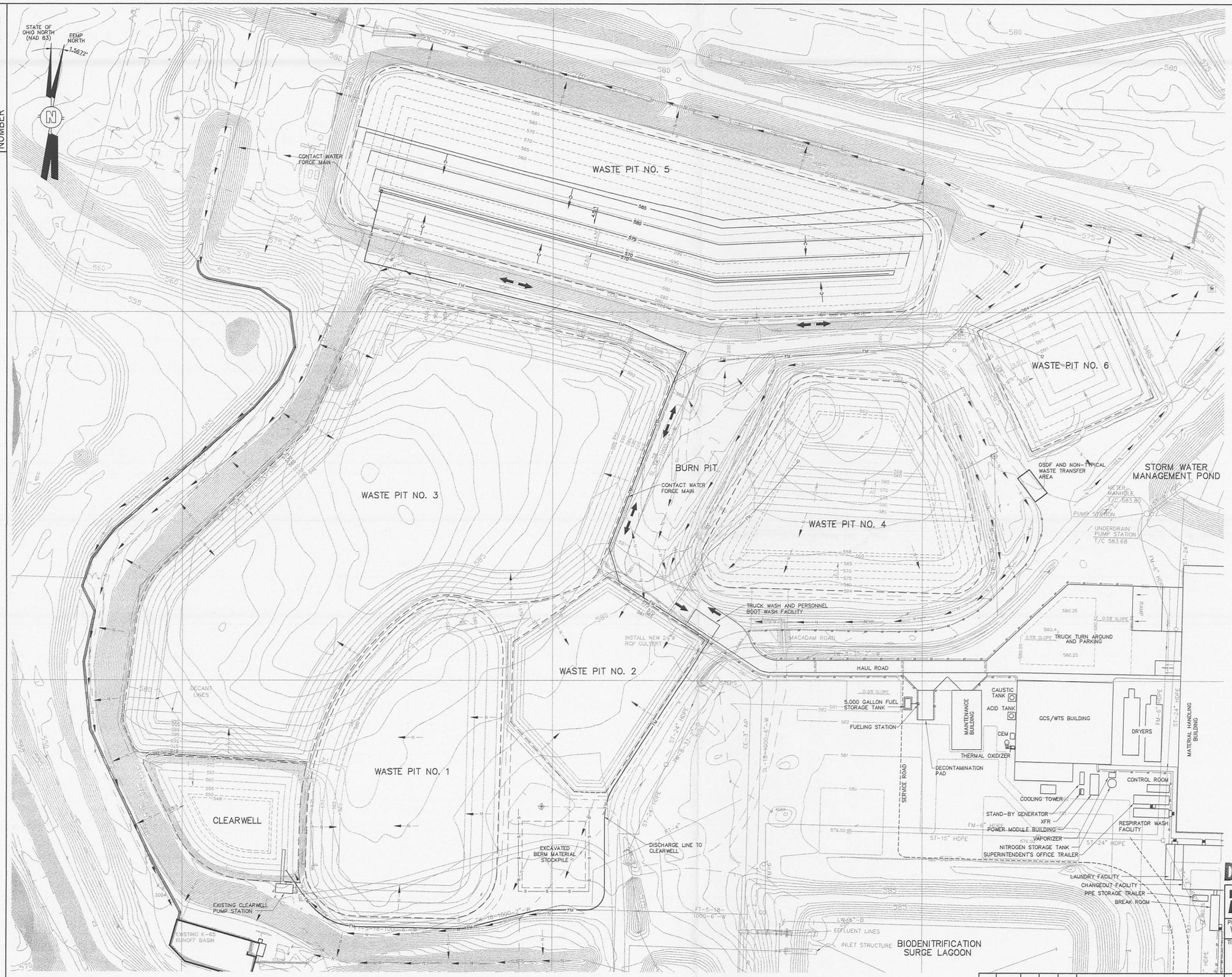
000102

5/28/98 0950

246294-12

DRAWING NUMBER 773481-M42

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 10 44% WASTE PIT NO. 5

INTERNATIONAL TECHNOLOGY CORPORATION

... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-109		

000103

5/28/98 0800

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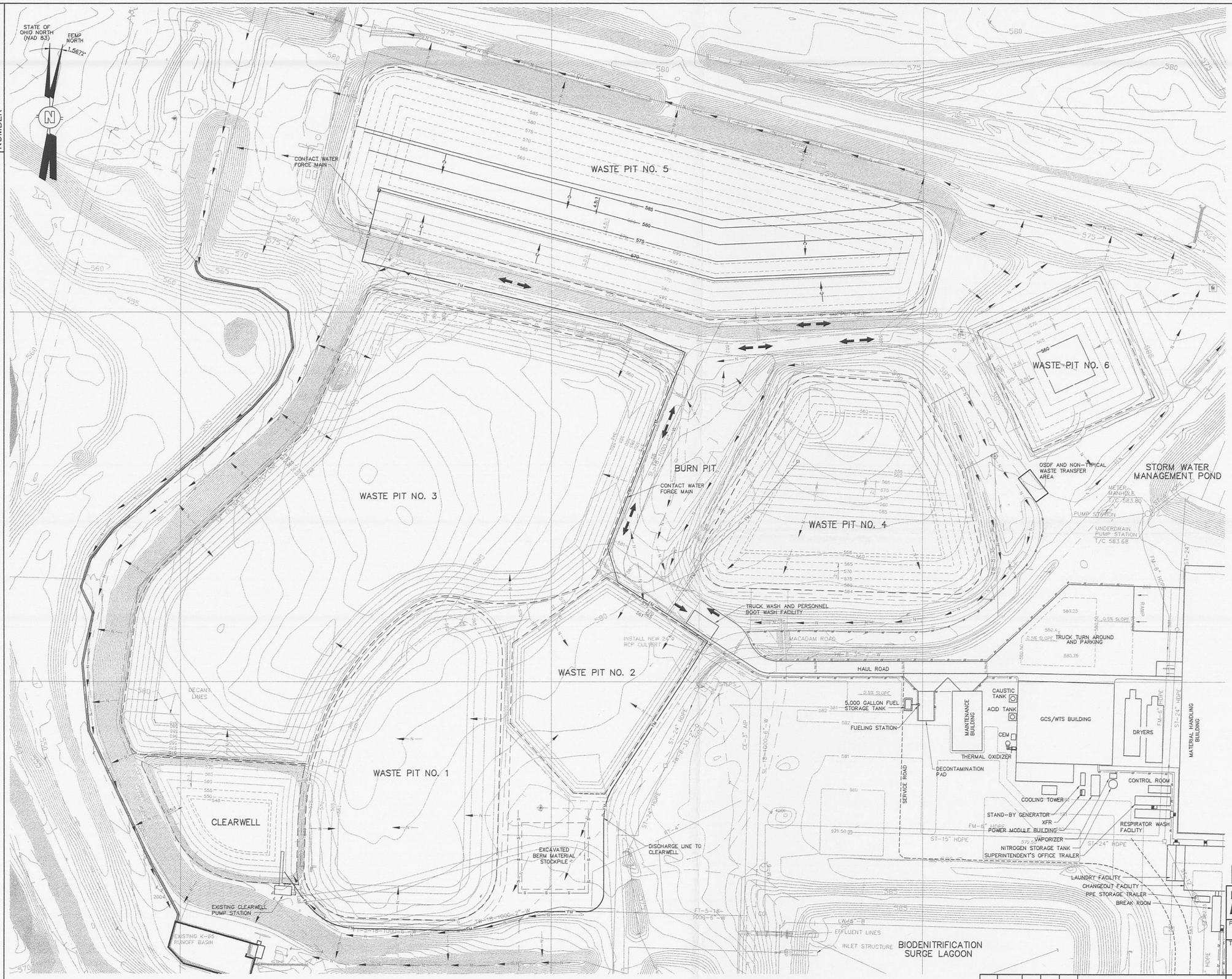
DRAWING NUMBER 773481-M43

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- WASTE PIT BOTTOM ELEVATION
- EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 11
48% WASTE PIT NO. 5,
SUBSOILS WASTE PIT NO. 6

INTERNATIONAL TECHNOLOGY CORPORATION

... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO	773481	DRAWING NO.	M-05-82-110		

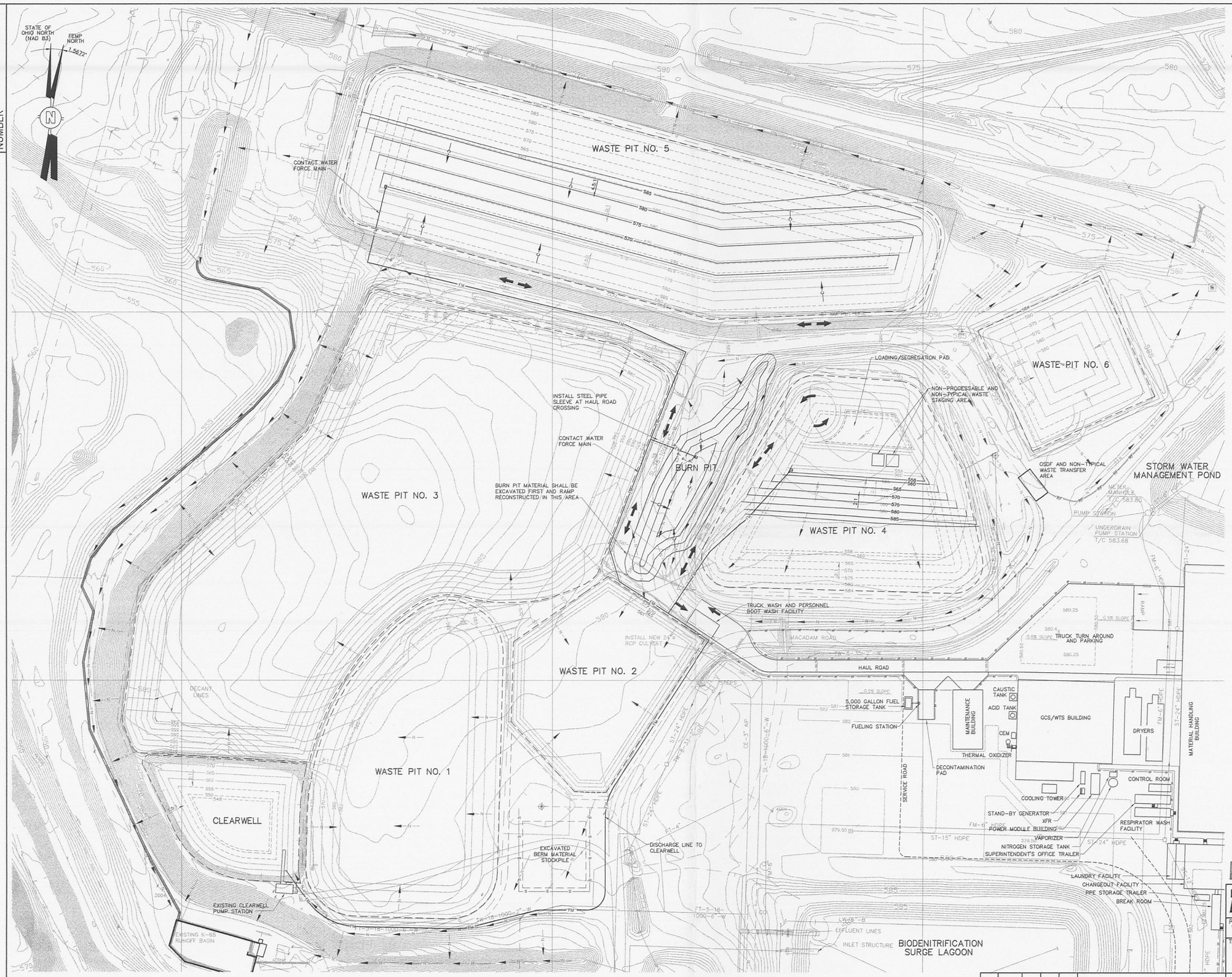
000104

05/28/98 GMD

24V291-14

DRAWING NUMBER 773481-M44

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 12
48% WASTE PIT NO. 4, 59% WASTE PIT NO. 5, 100% BURN PIT

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO	773481	DRAWING NO.	M-05-82-111	

REVISION: E

000105

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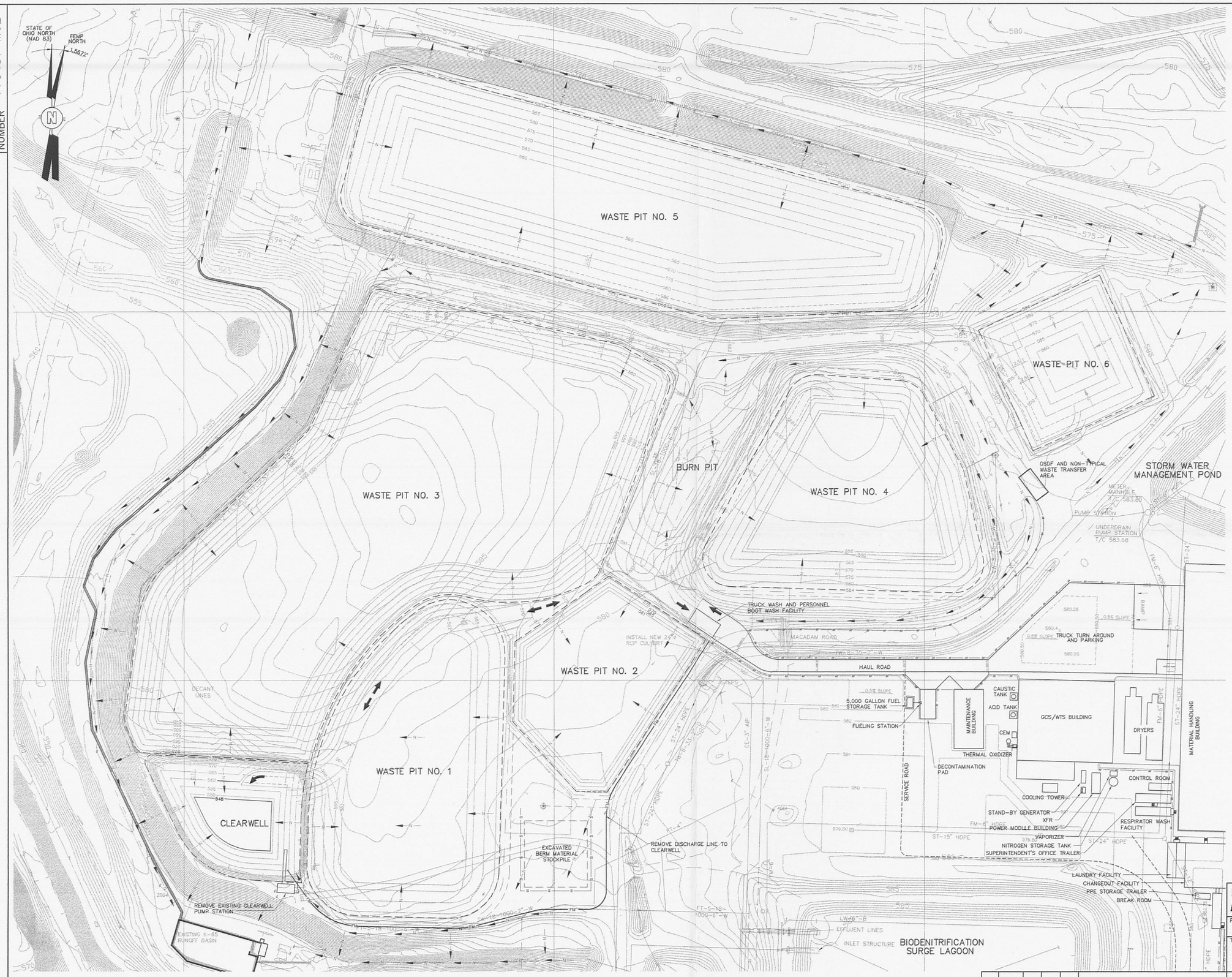
05/28/98 09:52

DRAWING NUMBER 773481-M62

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 19 SUBSOILS CLEARWELL

INTERNATIONAL TECHNOLOGY CORPORATION

... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/6/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-118	

REVISION: E

000106

296291-16

5/28/98 1002

DRAWING NUMBER 773481-M50

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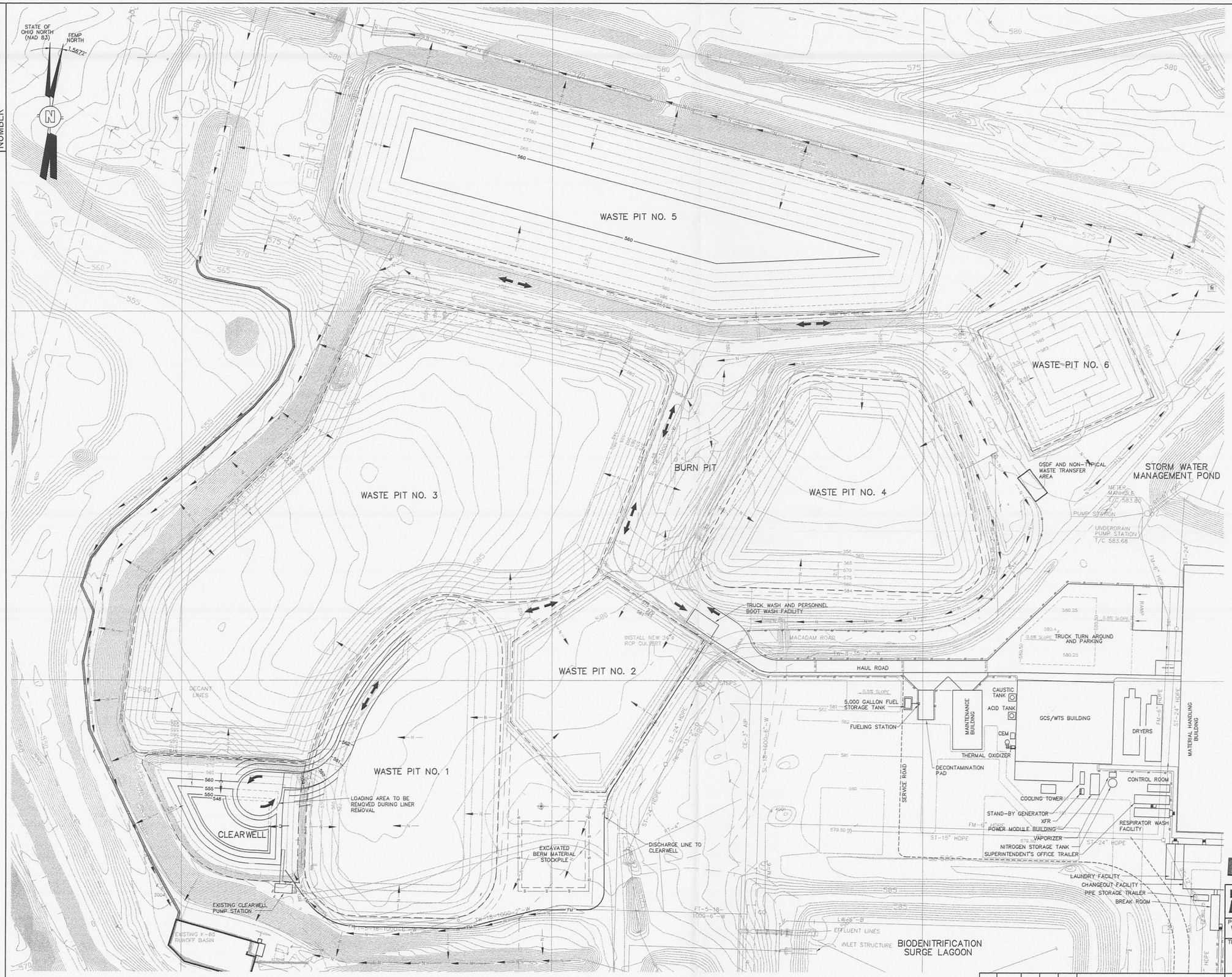

LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:
TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME
WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE
PHASE 18
SUBSOILS WASTE PIT NO. 5, 100% CLEARWELL

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-117	

REVISION E

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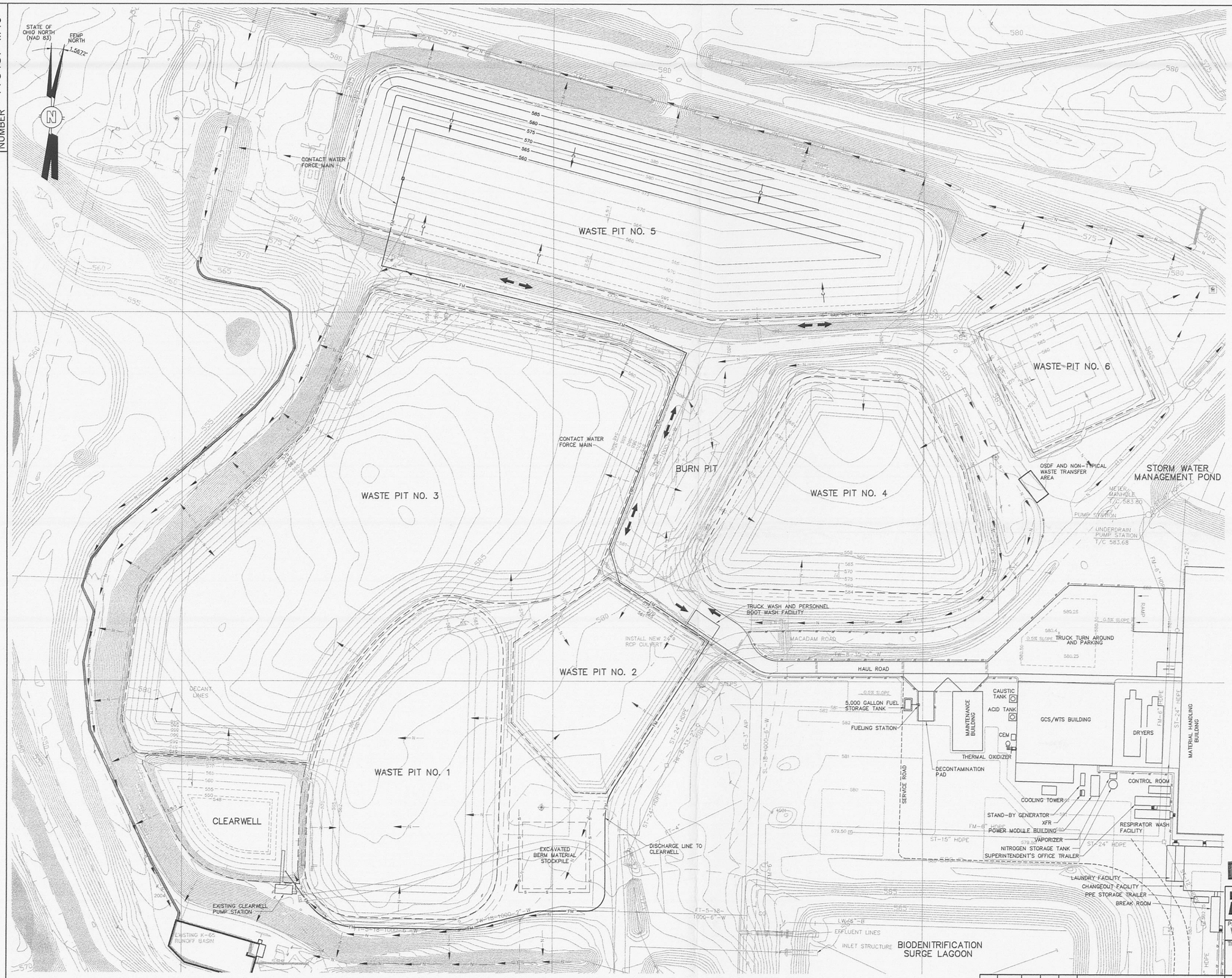
2462AL-17

5/29/98 0630

DRAWING NUMBER 773481-M49

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 17 100% WASTE PIT NO. 5

INTERNATIONAL TECHNOLOGY CORPORATION

... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-116		

000108

2/26/98 0930

24 of 18

DRAWING NUMBER 773481-M48

1484

STATE OF OHIO NORTH (NAD 83)
FEMP NORTH
1.5672°

WASTE PIT NO. 5
WASTE PIT NO. 6
WASTE PIT NO. 4
WASTE PIT NO. 3
WASTE PIT NO. 2
WASTE PIT NO. 1
BURN PIT
CONTACT WATER FORCE MAIN
TRUCK WASH AND PERSONNEL BOOT WASH FACILITY
MACADAM ROAD
INSTALL NEW 24" RCP CULVERT
HAUL ROAD
TRUCK TURN AROUND AND PARKING
OSDF AND NON-TYPICAL WASTE TRANSFER AREA
STORM WATER MANAGEMENT POND
METER MANHOLE T/C 583.80
PUMP STATION
UNDERDRAIN PUMP STATION T/C 583.68
RAMP
0.5% SLOPE
DECANT LINES
CLEARWELL
EXISTING CLEARWELL PUMP STATION
EXISTING K-65 RUNOFF BASIN
EXCAVATED BERM MATERIAL STOCKPILE
DISCHARGE LINE TO CLEARWELL
5,000 GALLON FUEL STORAGE TANK
FUELING STATION
MAINTENANCE BUILDING
CAUSTIC TANK
ACID TANK
CEM
THERMAL OXIDIZER
GCS/WTS BUILDING
DRYERS
MATERIAL HANDLING BUILDING
DECONTAMINATION PAD
SERVICE ROAD
CONTROL ROOM
COOLING TOWER
STAND-BY GENERATOR
XFR
POWER MODULE BUILDING
VAPORIZER
NITROGEN STORAGE TANK
SUPERINTENDENT'S OFFICE TRAILER
RESPIRATOR WASH FACILITY
LAUNDRY FACILITY
CHANGEOUT FACILITY
PPE STORAGE TRAILER
BREAK ROOM
EFFLUENT LINES
INLET STRUCTURE
BIODENITRIFICATION SURGE LAGOON

LEGEND:
- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:
TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 16
85% WASTE PIT NO. 5,
SUBSOILS WASTE PIT NO. 4

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-115	

REVISION: E

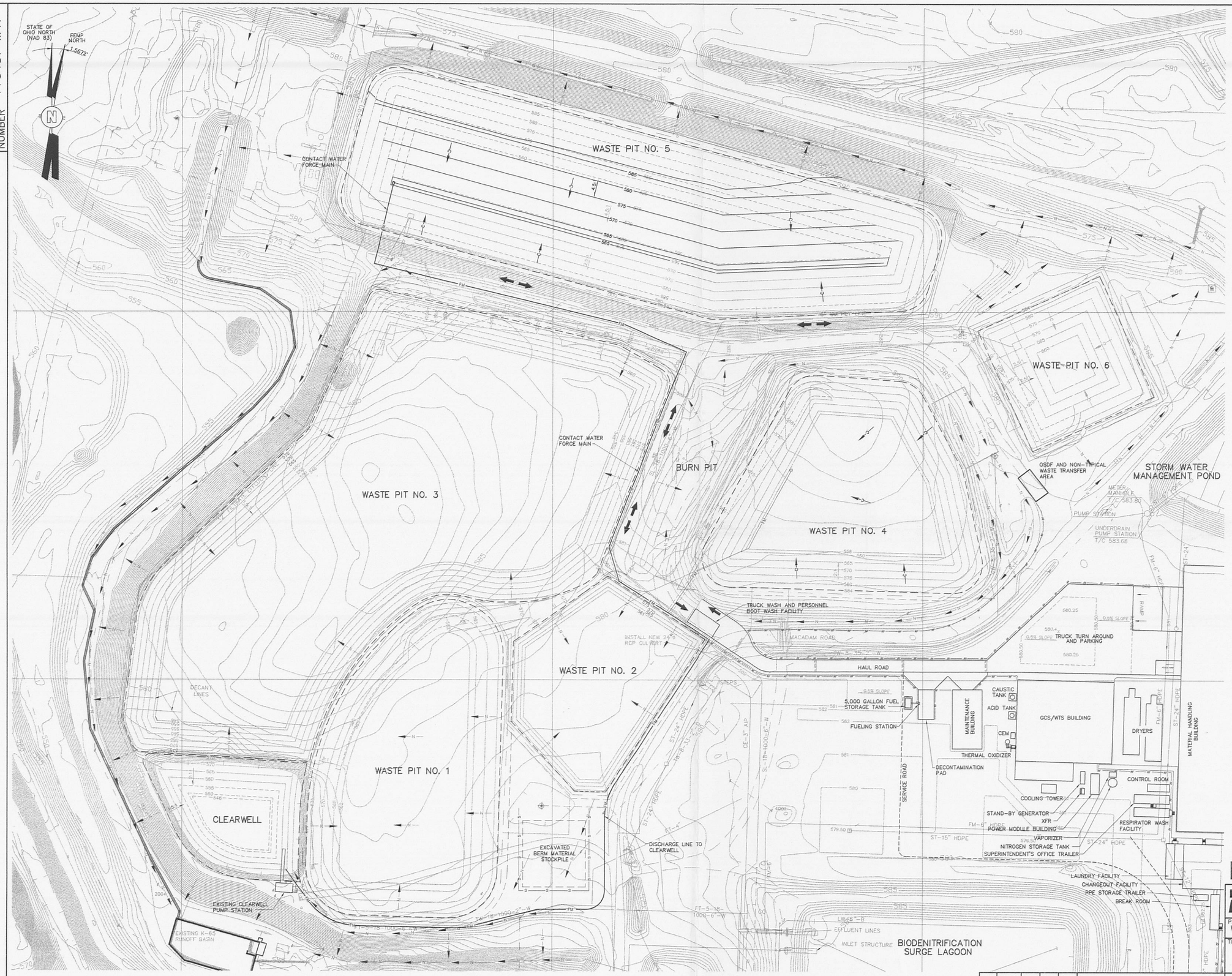
000109

5/28/98 1:00

244281_19

DRAWING NUMBER 773481-M47

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 15
77% WASTE PIT NO. 5

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REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-114		

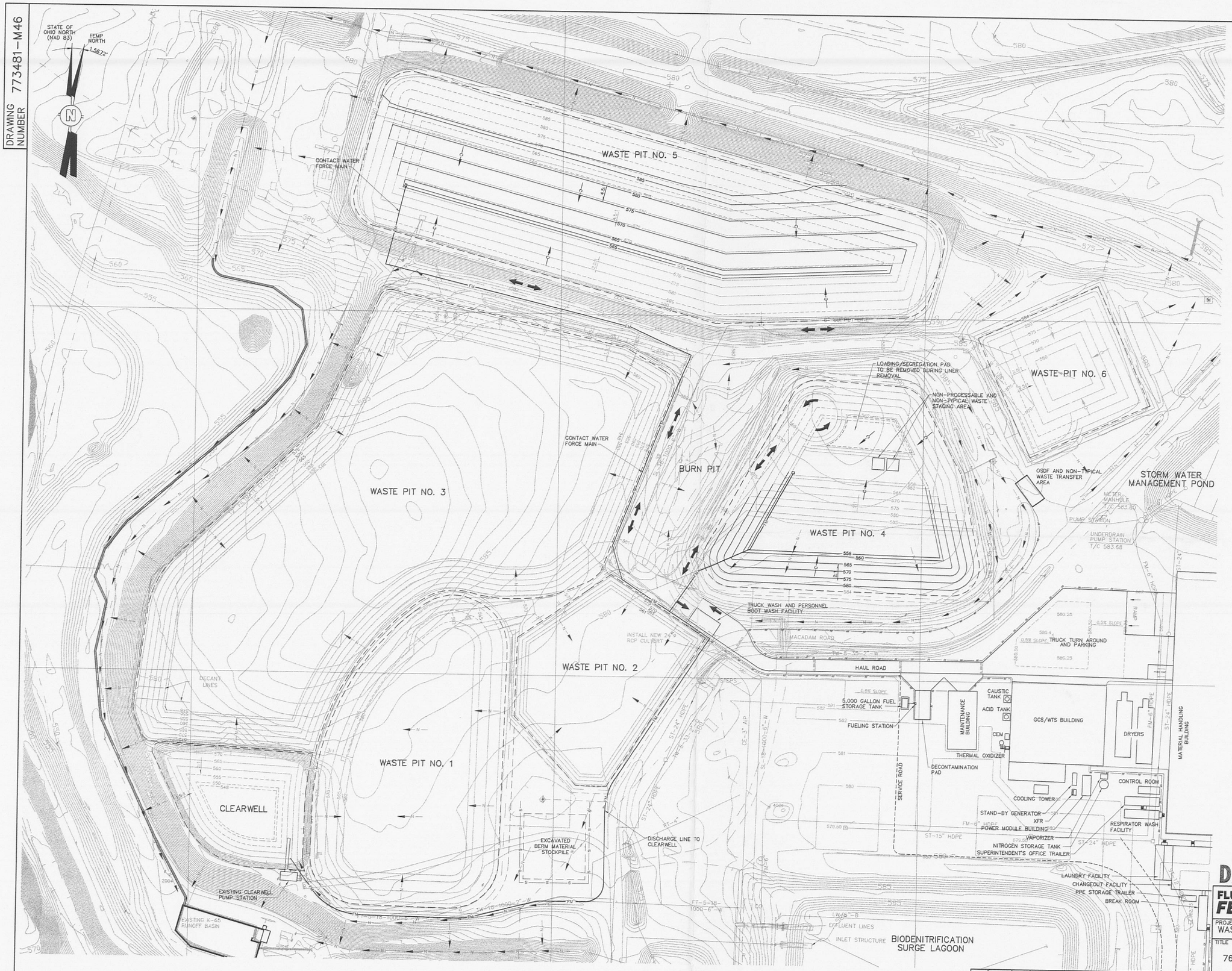
000110

2/8/97 0900

246291-20

DRAWING NUMBER 773481-M46

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 14
76% WASTE PIT NO. 5, 100% WASTE PIT NO. 4

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REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	LL/PJI	CHECKED BY	PJI	1/9/98
DRAWN BY	GSJ	APPROVED BY		
DATE	11-25-97	DWG. SCALE	1"=50'-0"	
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-113	

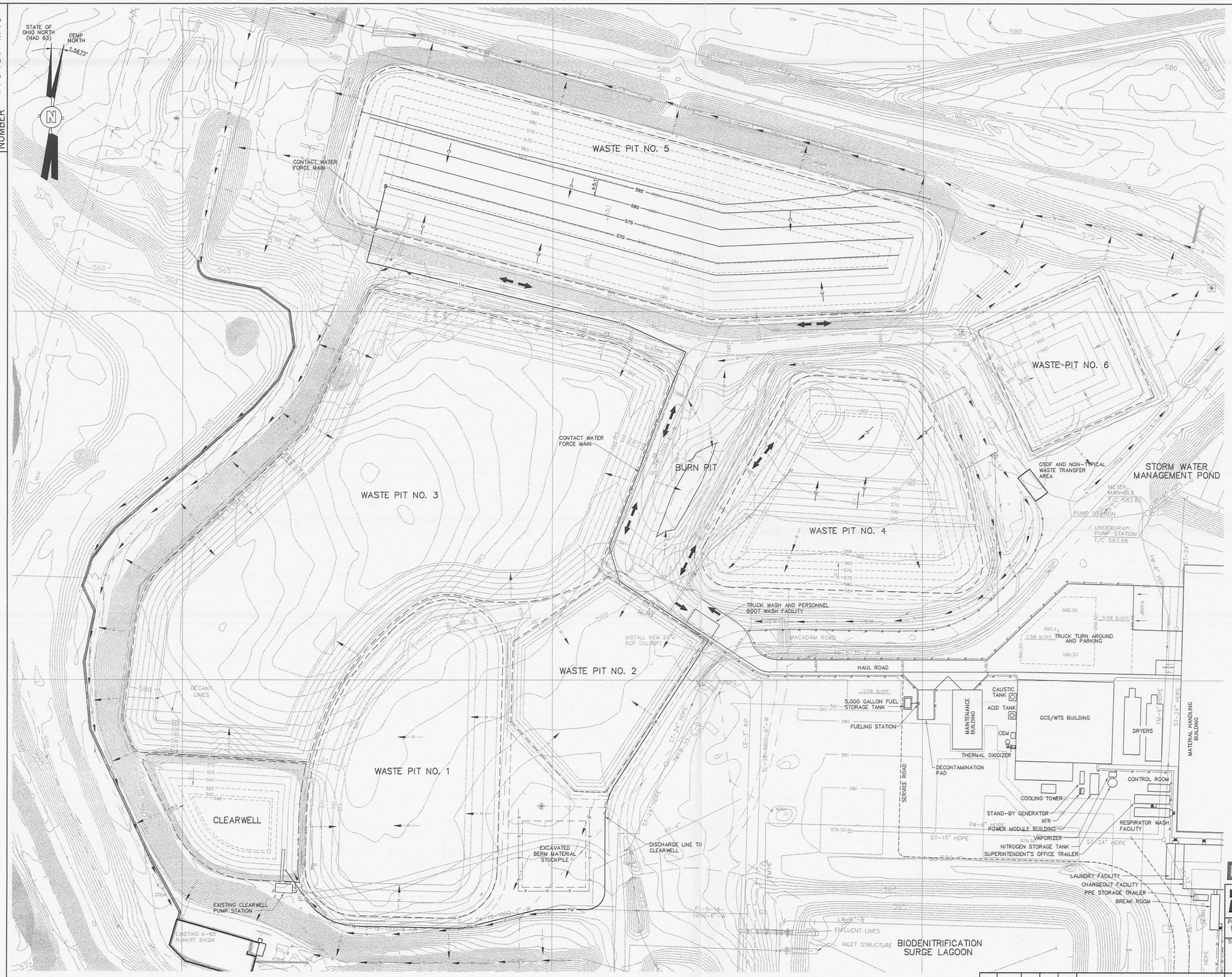
REVISION: E

000111

05/28/98 6950

DRAWING NUMBER 773481-M45

1484



LEGEND:

- NON-CONTACT STORM WATER
- CONTACT STORM WATER
- TRAFFIC ROUTING
- 570 WASTE PIT BOTTOM ELEVATION
- 570 EXCAVATED SURFACE ELEVATION DURING THIS PHASE
- 570 EXCAVATED SURFACE ELEVATION DURING PREVIOUS PHASES
- LIMIT OF WASTE PIT
- COLLECTION SUMP AND PUMP STATION
- SILT FENCE

NOTE:

TRUCK TURNAROUND AND LOADING/SEGREGATION PAD SHALL BE CONSTRUCTED OF COVER SOIL OBTAINED WITHIN THE LIMITS OF EXCAVATION DURING THIS PHASE.

SCALE 0 50 100 150

DRAFT

FLUOR DANIEL FERNALD

WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)
FERNALD, OHIO
FDF SUBCONTRACT NO. 98SC000001

PROJECT NAME: WASTE PITS REMEDIAL ACTION PROJECT (WPRAP)

TITLE: PHASE 13
62% WASTE PIT NO. 5, SUBSOILS BURN PIT

INTERNATIONAL TECHNOLOGY CORPORATION
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REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
E	6/5/98	GSJ	PJI		DRAFT FOR EPA REVIEW
C	3/27/98	GSJ	PJI		DRAFT ISSUE FOR FDF REVIEW
B	2/13/98	GSJ	PJI		DRAFT ISSUE FOR EPA REVIEW
A	1/9/98	GSJ	PJI		ORIGINAL ISSUE OF DRAFT

DESIGNED BY	TJL/PJI	CHECKED BY	PJI	1/9/98	REVISION
DRAWN BY	GSJ	APPROVED BY			E
DATE	11-25-97	DWG. SCALE	1"=50'-0"		
IT PROJECT NO.	773481	DRAWING NO.	M-05-82-112		

000112

24221-22

05/29/98 09:02