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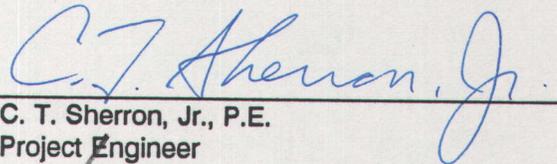
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*Carmen Johnson*

**CONCEPTUAL DESIGN  
FOR THE NEW LANDFILL**

**WEYERHAEUSER PAPER COMPANY  
PLYMOUTH, NORTH CAROLINA**

March 1991

  
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**Section 1**  
**INTRODUCTION**

Options for the conceptual design of a new solid waste landfill at the Weyerhaeuser Company Plymouth Mill have been compiled and evaluated using a value engineering approach. A full list of options was prepared by RMT. These were ranked on the basis of 1) satisfying Weyerhaeuser project objectives, 2) cost, and 3) satisfying regulatory agency requirements. The initial ranking was evaluated by Weyerhaeuser and RMT. The conceptual design features that were jointly selected by Weyerhaeuser and RMT are presented in this report. Illustrations showing these design features are included in the Appendix.

**1.1 Background**

The Weyerhaeuser facility in Plymouth, North Carolina, consists of an integrated kraft process pulp and paper mill and a wood products plant. The solid waste generated by the Plymouth mill is currently disposed of in a state permitted solid waste landfill. Ash is the primary waste disposed of in the landfill. Paper wastes, plastics, metal, and construction debris are also placed in the landfill.

RMT has been working with Weyerhaeuser since 1987 to upgrade the solid waste management facilities at the Mill. The existing landfill was repermited under a five-year vertical expansion and closure plan. The concept for the new landfill includes a single facility, designed to contain ash and other mill wastes. The design includes capacity for dewatered sludge, should land disposal be necessary due to complications with burning the dewatered sludge in the hog fuel boiler system.

**1.2 Purpose**

The purpose of this report is to present the selected design features for NC DEHNR review.

**Section 2**  
**FINDINGS AND CONCLUSIONS**

**2.1 Background Data**

The following findings and conclusions from previous RMT investigations are relative to the preliminary design and the estimates presented in this report.

- The shallow water table generally mimics topography across the site. Depth to water ranges from less than three feet to greater than 20 feet below ground surface.
- Ground water on the site is naturally high in iron content. Minor amounts of metals have been detected in ground water in monitoring wells downgradient of the existing landfill.
- The wastes that will be placed in the landfill are not hazardous. However, they do release minor amounts of metals when leached with acid (Toxicity Characteristic Leaching Procedure, TCLP) and water in the laboratory, and would be expected to release minor amounts of metals under natural conditions.
- The rate of methane gas generated by wastes that are placed in the landfill is expected to be slow, and will vary as a function of the quantity of dewatered sludge or other organic materials disposed.
- The shear strength, bearing capacity, and settlement properties of both the ash and a mixture of ash plus dewatered sludge are favorable for the construction of a large landfill.
- Certain on-site soil types are suitable for use as final cap and liner construction materials. The lateral discontinuity of these soil units has precluded volume estimates.
- The subgrade on which the landfill will be constructed will provide tolerable settlement in response to the weight of the landfill.

2.2 Design

- Preliminary design criteria presented in this report were based on (1) draft RCRA Subtitle D Regulations, (2) North Carolina solid waste regulations, and (3) typical modern landfill design features.
  
- Significant design criteria include:
  - 84 acre footprint,
  - 7,000,000 cubic yard (cy) airspace,
  - 25 year life at 750 cy/day of waste generation,
  - four to six year phases of construction/operation,
  - 300 foot buffer to property line, with one variance to 50 feet at one inside property corner,
  - four foot separation between waste and water table,
  - approximately 10 foot deep excavation,
  - french drain dewatering system to control water table elevation,
  - single composite liner (24 inches clay with High Density Polyethylene (HDPE) membrane),
  - ground water monitoring for leak detection,
  - piping network for leachate collection,
  - two pump stations with one force main to the selected wastewater treatment system,
  - cap composed of multi-layer natural and waste materials - total cap thickness approximately three feet.

**Section 3**  
**RECOMMENDATIONS**

The following recommendations are based on the findings and conclusions presented in this report.

- Weyerhaeuser staff should continue to collect routine ground water elevation data from all monitoring points, at the proposed landfill site to document ground water table trends. This data will provide the basis for the four foot separation between waste and ground water required by North Carolina regulations.
- The final design criteria should be reviewed by the Solid Waste Section of the NC DEHNR. Following this review, NC DEHNR has agreed to provide a letter outlining the State's expectations for the Construction Plan Application.
- After receipt of NC DEHNR comments, a Construction Plan Application should be prepared for submittal.

**Section 4**  
**PRELIMINARY DESIGN CRITERIA**

The following criteria for the preliminary design were developed to meet Weyerhaeuser objectives and regulatory requirements. These criteria are presented in Tables 4-1 and 4-2.

**TABLE 4-1**  
**GENERAL CRITERIA**

|   |  |
|---|--|
| <p><b>Landfill Waste Capacity</b></p> <p>Design Life</p> <p>Phases</p> <p>Generation Rate</p> <p>Air Space</p> <p>Acreage Used</p>  | <p>25 years at 750 cy/day</p> <p>4 @ 6.3/year capacity</p> <p>365 days per year @ 750 day cy/day solid waste</p> <p>7,000,000 cy</p> <p>84 acres</p>   |
| <p><b>Landfill Siting Factor/Location Restrictions</b></p> <p>Setback from Property Line</p> <p>Wells</p> <p>Housing</p> <p>Airports</p> <p>Streams, Rivers, Ponds</p> <p>Wetlands/Floodplains</p> <p>Water Table</p> | <p>300 ft (with one variance to 50 ft at inside property corner)</p> <p>500 feet</p> <p>500 feet</p> <p>5,000 ft Piston Driven<br/>10,000 ft Jet</p> <p>50 feet</p> <p>No filling, reduction of storage</p> <p>4 ft separation minimum between waste and water table</p> |
| <p><b>Geotechnical Factors</b></p> <p>Stability of Substrata</p> <p>Bedrock</p> <p>Water Table<br/>(Prevent Pumping/Unstable Subgrade)</p>  | <p>Suitable (preconsolidated)</p> <p>&gt;50 ft beneath site</p> <p>2 feet below deepest excavation</p>   |

**TABLE 4-2  
SPECIFIC CRITERIA**

|                            |   |
|----------------------------|---|
| <b>Excavation</b>          |   |
| Depth                      | Varies from 10 ft below to 6 ft above existing grade  |
| Slopes                     | 3:1 internal & external   |
| Perimeter Berm             | Average height 5 ft, top width 15 ft  |
| <b>Dewatering</b>          |   |
| Drains                     | Buried french drain trenches sloped to east & west along natural slopes   |
| Level                      | Set to maintain water table $\leq$ 4 ft below waste   |
| <b>Liner</b>               |   |
| Construction               | Composite: 24 in. clay (off-site) with HDPE membrane  |
| Slope                      | Cross-sectional - 2% min<br>Longitudinal - 0.5% min   |
| <b>Leak Detection</b>      | Ground water monitoring wells   |
| <b>Leachate Collection</b> |   |
| Drainage Blanket           | Geonet system with bonded geotextiles   |
| Piping                     | Perforated HDPE pipe<br>- 6 in. min.<br>- 8 in. max.<br>0.5% min. slope<br>200 ft. max. spacing                           |
| Leachate head level        | 1 foot  |
| Protection zone            | 12 in. of washed sand   |
| Force Main                 | HDPE (double wall)  |
| <b>Leachate Handling</b>   |   |
| Treatment System           | On-site package system, Mill WWTP, or other options to be defined.  |
| Collection System          | 8 in. HDPE with 4 ft. dia. HDPE manholes  |
| Pumping System             | 2-Duplex pump stations, common force main   |
| Force Main                 | HDPE (double wall)  |
| <b>Fill</b>                | 4 - 6.3 year phases   |
| <b>Cap</b>                 |   |
| Construction               | Ash leveling course<br>6 in. gas collection layer (optional)<br>18 in. select clay cap<br>12 in. subsoil<br>6 in. topsoil |
| Shape                      | 3:1 maximum slope<br>Terraces at 20 ft vertically, 15 ft wide with drainage   |
| <b>Erosion Control</b>     | As prescribed by North Carolina law   |



**APPENDIX  
ILLUSTRATIONS**

**LANDFILL ISOMETRIC  
LANDFILL PHASING PLAN  
LANDFILL ISOMETRIC CUT-AWAY  
LANDFILL PARTIAL CROSS SECTION  
ENLARGED LINER SYSTEM DETAIL  
ENLARGED CAP SYSTEM DETAIL  
ADDITIONAL LANDFILL VOLUME WITH 50 FOOT BUFFER  
ZONE VARIANCE AT ONE INSIDE PROPERTY CORNER**

 Weyerhaeuser



FINISHED LANDFILL

**RMJ.**<sup>INC.</sup>

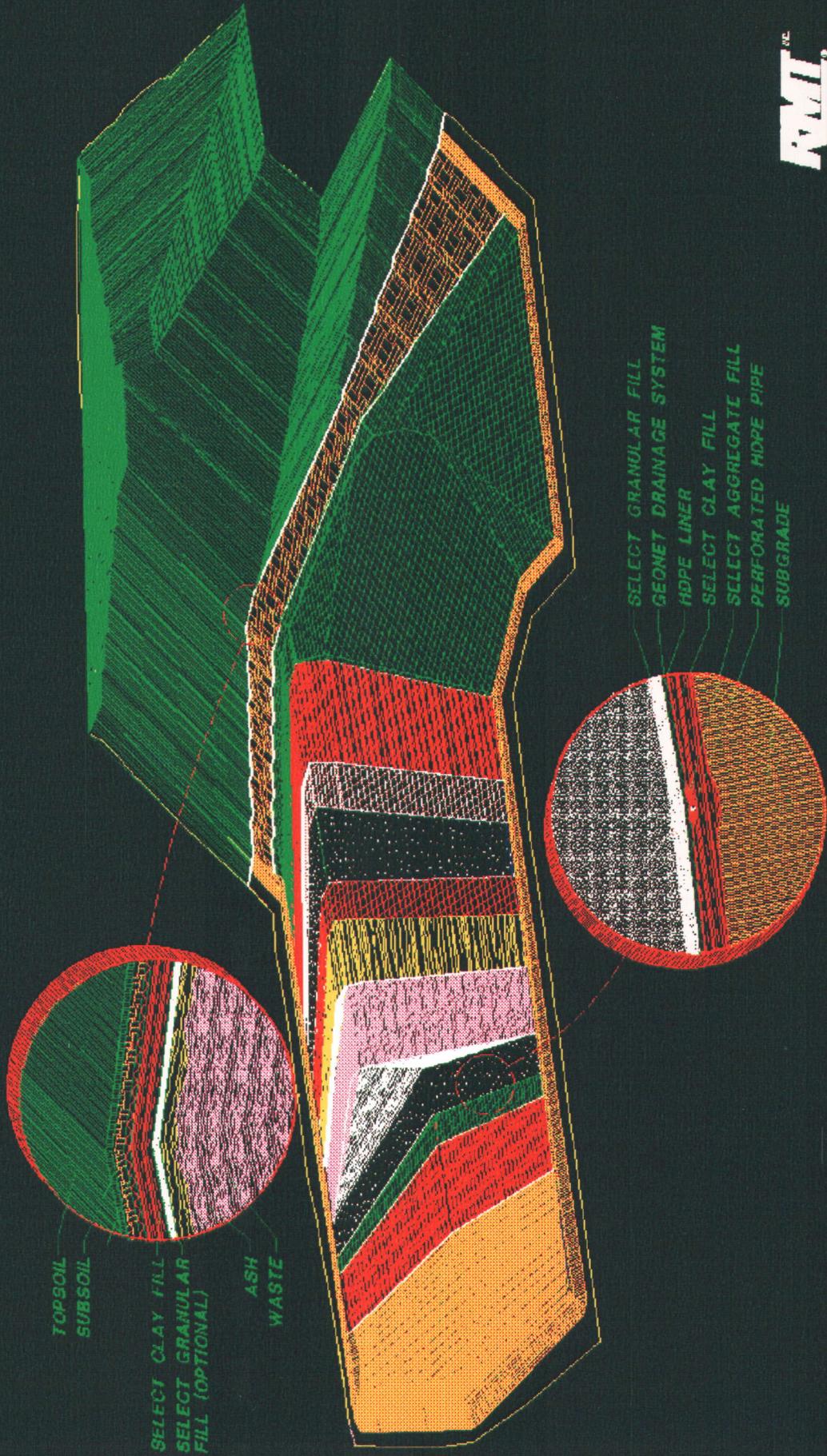
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PHASING PLAN

 RMT<sup>INC.</sup>

 Weyerhaeuser



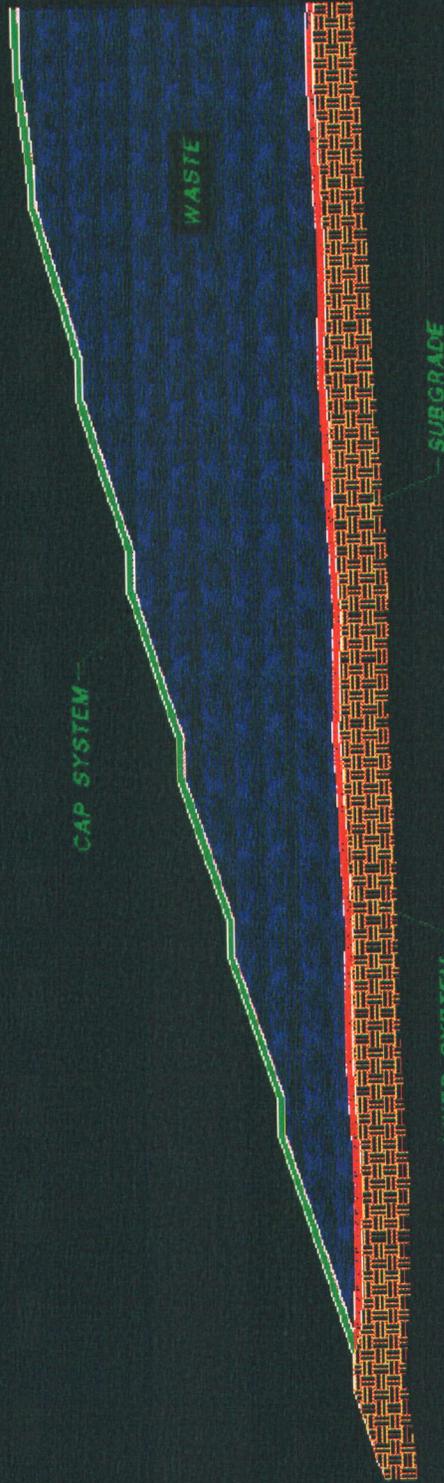
TOPSOIL  
SUBSOIL

SELECT CLAY FILL  
SELECT GRANULAR  
FILL (OPTIONAL)

ASH  
WASTE

SELECT GRANULAR FILL  
GEONET DRAINAGE SYSTEM  
HDPE LINER  
SELECT CLAY FILL  
SELECT AGGREGATE FILL  
PERFORATED HDPE PIPE  
SUBGRADE

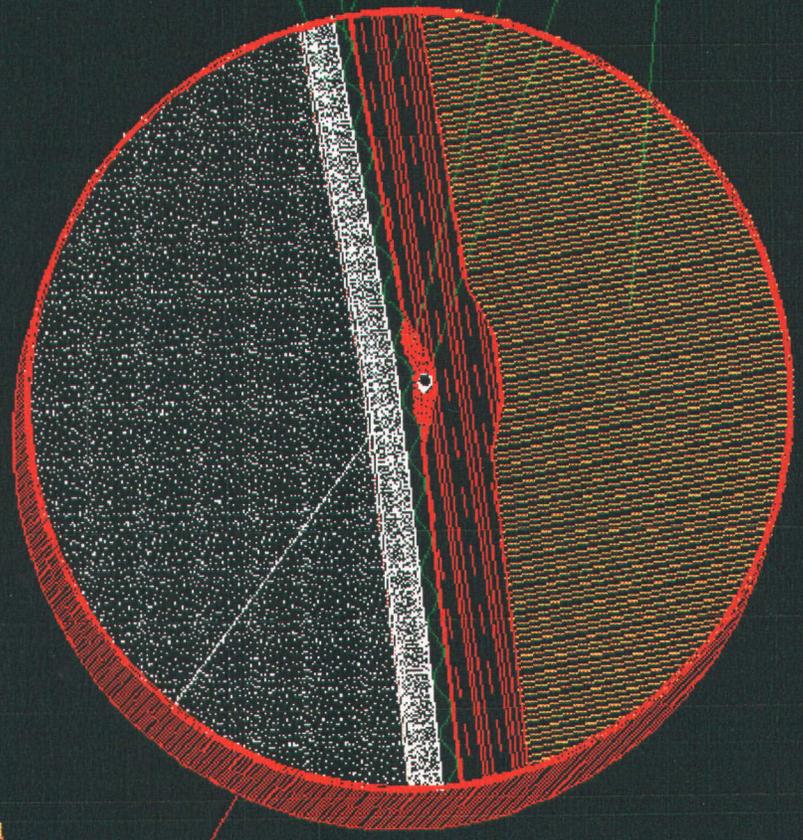
**WMT**<sup>®</sup>



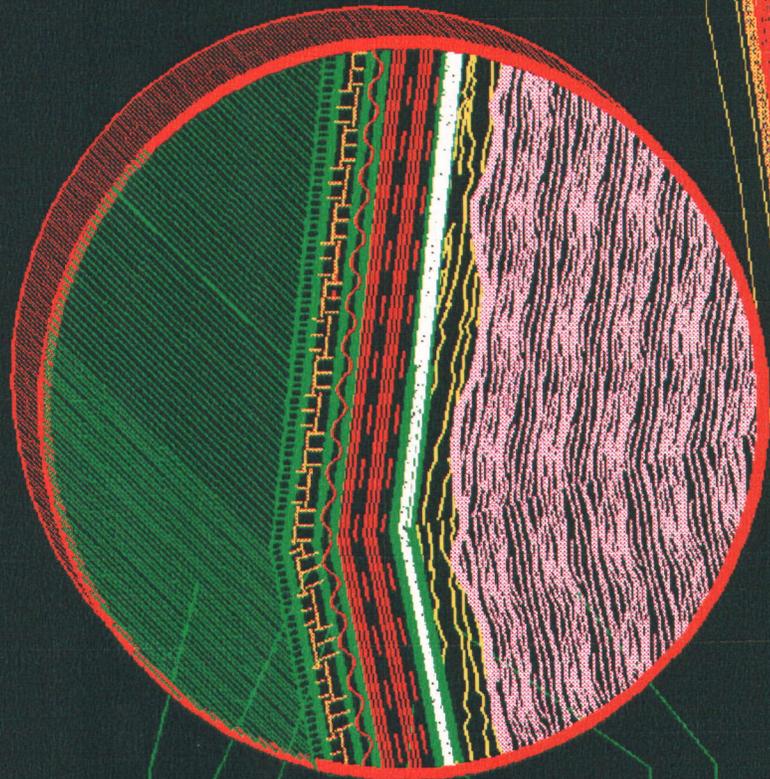
PARTIAL LANDFILL CROSS SECTION



SELECT GRANULAR FILL  
GEONET DRAINAGE SYSTEM  
HDPE LINER  
SELECT CLAY FILL  
SELECT AGGREGATE FILL  
PERFORATED HDPE PIPE  
SUBGRADE



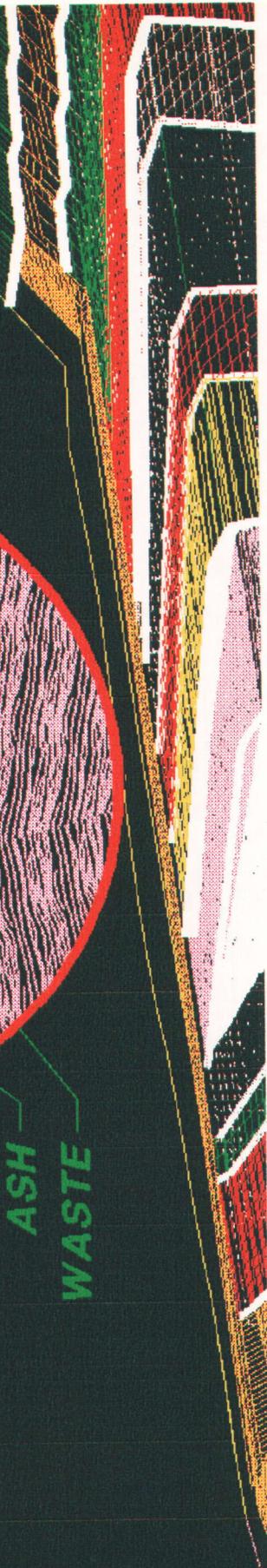
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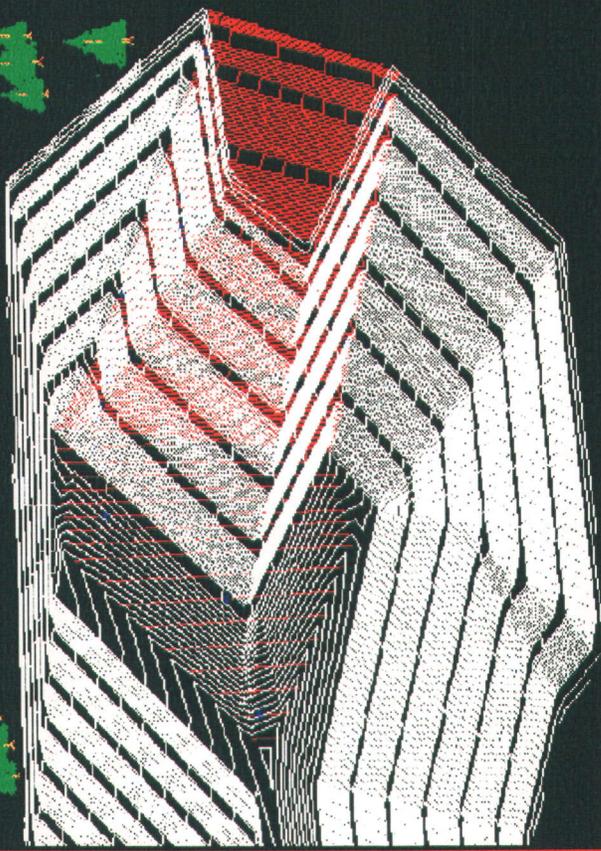
TOPSOIL  
SUBSOIL

SELECT CLAY FILL  
SELECT GRANULAR  
FILL (OPTIONAL)

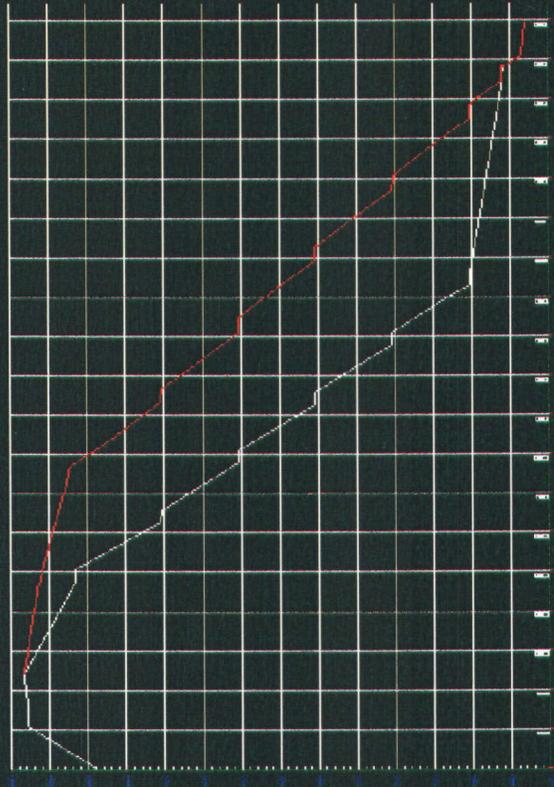
ASH  
WASTE



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ALTERNATE SECTION



ADDITIONAL LANDFILL VOLUME  
WITH 50 FOOT BUFFER ZONE  
VARIANCE AT ONE INSIDE  
PROPERTY CORNER

 RMT