



Superfund Record of Decision:

Lipari Landfill, NJ



TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO. EPA/ROD/RO2-82/006	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE SUPERFUND RECORD OF DECISION Lipari Landfill, NJ	5. REPORT DATE 08/03/82	6. PERFORMING ORGANIZATION CODE
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2. SPONSORING AGENCY NAME AND ADDRESS J.S. Environmental Protection Agency 01 M Street, S.W. Washington, D.C. 20460	13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report	
	14. SPONSORING AGENCY CODE 800/00	
SUPPLEMENTARY NOTES		
<p>ABSTRACT</p> <p>The Lipari Landfill occupies approximately six acres in the Township of Mantua, Gloucester County, New Jersey. Between 1958 and 1971, the landfill has been used for the disposal of household waste, liquid and semi-solid chemical wastes, and other industrial materials. Best estimates indicate that approximately 3 million gallons of liquid wastes have been disposed at the site. Ground water and surface water contamination has been the primary concern at the site.</p> <p>The selected cost-effective alternative involves a 360° cutoff wall with a cap over a 16-acre area during the first operable unit; the second operable unit will involve installation of ground water collection wells and treatment of the ground water within the slurry wall. The total cost for design and implementation of the cutoff wall and cap in addition to further evaluation related to the collection and treatment of leachate is estimated to be \$1,769,150.</p>		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Lipari Landfill, NJ Contaminated media: gw, sw, soil Key contaminants: phenols, benzene, toluene methylene chloride		
18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report) None	21. NO OF PAGES 26
	20. SECURITY CLASS (This page) None	22. PRICE

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ABSTRACT

The Lipari Landfill occupies approximately six acres in the Township of Mantua, Gloucester County, New Jersey. Between 1958 and 1971, the landfill has been used for the disposal of household waste, liquid and semi-solid chemical wastes, and other industrial materials. Best estimates indicate that approximately 3 million gallons of liquid wastes have been disposed at the site. Ground water and surface water contamination has been the primary concern at the site.

The selected cost-effective alternative involves a 360° cutoff wall with a cap over a 16-acre area during the first operable unit; the second operable unit will involve installation of ground water collection wells and treatment of the ground water within the slurry wall. The total cost for design and implementation of the cutoff wall and cap in addition to further evaluation related to the collection and treatment of leachate is estimated to be \$1,769,150.

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Record of Decision
Remedial Alternative Selection

Site: LiPari Landfill Site, Pitman, New Jersey

Analysis Reviewed: I have reviewed the following documents describing the analysis of cost-effectiveness of remedial alternative at the LiPari Landfill Site:

- Draft Cost-Effectiveness Assessment of Remedial Action Alternatives LiPari Landfill, Radian Corporation, July 1982
- Draft Environmental Information Document for Remedial Actions at the LiPari Landfill, Pitman, New Jersey, Radian Corporation, July 1982
- Preliminary Engineering Study, LiPari Landfill, Pitman, New Jersey, Betz, Converse, Murdoch, Inc., May 1982
- Abatement Alternatives - Uncontrolled Chemical Leachate Discharge from the LiPari Landfill, Pitman, New Jersey, R.E. Wright Associates, Inc. October 1980 revised December 1980
- Technical considerations For The Selection Of An Abatement System At The LiPari Landfill, Pitman, New Jersey, R.E. Wright Associates, September 1981
- Staff summaries and recommendations

Description of Selected Option:

- Phase I:

Emplacement of a 360° cutoff wall with cap over 16 acres (enclosed area would include the six acre landfill and the 10 acre contaminated area between the landfill and Chestnut Branch).

- Phase II:

Installation of ground water collection wells (located both within the contaminated zone and waste body itself)
Treatment of the ground water contained within the slurry wall.

Declarations: Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Contingency Plan, I have determined that the containment and treatment strategy for the LiPari Landfill site is a cost-effective remedy, and that it effectively mitigates and minimizes damage to, and provides adequate protection of public health, welfare and the environment. I have also determined that the action being taken is appropriate when balanced against the need to use Trust Fund money at other sites.

The collection and treatment of the contained contaminated ground water is desirable in order to improve the reliability of the containment. The associated costs are based upon utilization of a local publicly owned treatment works (POTW) without significant

pretreatment. The proper evaluation of the treatment system is being conducted by a consultant to the U.S. Environmental Protection Agency (USEPA). I have determined that it is necessary to proceed with the installation of the slurry wall and cap concurrent with the final treatability evaluation of the leachate with the existing treatment process at the POTW. I will make a future decision on the necessary groundwater pretreatment processes after completion of the technical analysis and evaluation which will determine the compatibility of the leachate with the existing treatment processes of the local POTW.



Rita M. Lavelle
Assistant Administrator
Office of Solid Waste and Emergency Response

AUG 3 1982

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Rita M. Lavelle
Assistant Administrator
Office of Solid Waste and Emergency Response

AG 3 1992

LiPari Landfill Remedy Approval
Briefing Sheet

- Purpose of this briefing is to obtain AA approval for the remedy recommended by the Region and the State for the LiPari Landfill site. A "Record of Decision" has been prepared to document the approval.
- LiPari Landfill occupies approximately six acres. Between the period 1958 and 1971, the Landfill received household waste as well as liquid and semi-solid chemical wastes and other industrial wastes and materials for disposal. Best estimates indicate approximately 3 million gallons of liquid wastes have been disposed at the site.
- Groundwater and surface water contamination is the primary concern at LiPari Landfill. Rabbit Run, Chestnut Branch and Alcyon Lake are shown to be contaminated. Strong volatile chemical odors are evident at the on-site leachate seeps.
- In March 1980, a feasibility study was initiated by R.E. Wright Associates through Clean Water Act, Section 311 funding. R.E. Wright Associates completed a second report in September 1981 wherein the previous conclusion was revised, and a two phase approach was recommended.
 - Phase I: Slurry wall containment with cap
 - Phase II: Further evaluation to collect and treat encapsulated contents.
- EPA held a Public Meeting in November 1981 wherein the Agency made an announcement of the consultant's recommendations, EPA's Region II concurrence and possible schedule for construction initiation by Spring of 1982.
- In January 1982, the consultant to the responsible parties (Betz, Converse and Murdoch), submitted a new alternative clean-up plan to the EPA proposal. EPA Region II, EPA/ORD, and Radian, Inc. subsequently initiated a cost-effective analysis of alternatives, including the responsible party's alternative and the preparation of an Environmental Information Document to comply with CERCLA requirements.

The Radian Corporation completed their cost-effectiveness evaluation on remedial alternatives studied previously by R.E. Wright, 1980; 1981; and Betz, Converse and Murdoch 1982 as well as a no action alternative. Nine alternatives were initially considered highly/cost-effective and were evaluated further in the Environmental Information Document (July 1982):

	<u>Million \$</u>
- 360° Cutoff wall with Cap (16 acres)/Collect with wells/Treat at POTW	2.0
- Upgradient Deflection wall with Cap (6 acres)	1.2
- Upgradient Deflection wall with Cap (6 acres)/Collect with wells/Treat at POTW	1.7
- 360° Cutoff wall with Cap (6 acres)	1.0
- 360° Cutoff wall with Cap (16 acres)	1.5
- 360° Cutoff wall with Cap (6 acres)/ Collect with wells/Treat at POTW	1.4
- Collect with wells/Treat at POTW	0.4
- Deflection wall/Upgradient Drain/Cap (22 acres)	2.1
- Deflection wall/Upgradient Drain/Cap (22 acres)/Collect with Wells/Treat at POTW	2.5

Further evaluation of these alternatives by EPA staff at both the Region and Headquarters level, with technical assistance provided by the zone contractor (Camp, Dresser, & McKee) and information contained in the Environmental Information Document, has led to the further elimination of alternatives as environmentally unacceptable except for the following three:

	<u>Million</u>
- 360° Cutoff wall with Cap (16 acres)/ Collect with wells/treat at POTW	2.0
- 360° Cutoff wall with Cap (16 acres)	1.5
- Deflection wall/Upgradient Drain/Cap 22 acres/ Collect with wells/Treat at POTW	2.5

- ° This has led to the selection of one alternative as the most cost-effective, environmentally sound remedial action. It is: The 360° cutoff wall with Cap (16 acres).
- ° The recommended alternative action, however, includes in addition to the encapsulation of the 16 acre site, active groundwater control through collection and treatment at a local POTW to enhance the reliability of the encapsulation. Additional evaluation to assure the compatibility of the leachate with the existing treatment processes of the local POTW need to be conducted prior to proceeding with the second phase (collection and treatment). The total cost for design and implementation of the cutoff wall and cap in addition to further evaluation related to the collection and treatment of leachate has been estimated at \$1,769,150.
- ° Another public meeting was held on July 23, 1982. The Region described the remedy and addressed concerns raised by the public.
- ° The "Record of Decision" certifies that:
 - The selected remedy is the cost-effective remedy for the site.
 - Off-site disposal of the leachate is under investigation as a cost-effective approach for that portion of the project.
 - Monies are available in the Fund to finance the remedy.

Remedial Implementation Alternative Selection
LiPari Landfill Superfund Site
Township of Mantua
Gloucester County, New Jersey
July 30, 1982

History

The LiPari Landfill occupies approximately six acres in the Township of Mantua, Gloucester County, New Jersey. A stream known as Chestnut Branch flows in a north-westerly direction along the northern and northeastern borders of the landfill. Another stream, Rabbit Run, flows in a northwesterly direction and borders the western area of the landfill. Rabbit Run enters Chestnut Branch at a point on the northern border of the landfill. Chestnut Branch flows into Alcyon Lake approximately 1000 feet downstream from the landfill.

For 13 years running from 1958 to 1971, the owner, Mr. Nicholas LiPari, began accepting and disposing of waste at the LiPari Landfill. The landfill has been inactive since 1971, and a portion has been and is now used for a fruit orchard. The top of the landfill rises approximately 40 feet above the Chestnut Branch. The land surface slopes from an elevation of 134 mean sea level ("msl") down towards both Rabbit run and Chestnut Branch where the elevation of this northern border is 120 feet msl.

Occupied homes are located just across the edge of the northeastern border of the landfill site on the opposite side of Chestnut Branch.

During the years between 1958 and 1971, the owner, Mr. LiPari, accepted and disposed of household waste as well as liquid and semi-solid chemical wastes, and other industrial wastes and materials.

The hazardous wastes dumped at LiPari Landfill were generated by Rohm and Hass Company from its Bristol, Pennsylvania plant; Owens-Illinois, Inc. from its Pitman, New Jersey plant and Owens-Corning Fiberglas, Inc. from its Barrington, New Jersey plant.

The hazardous wastes dumped at the landfill by the generators and haulers have percolated into the groundwaters under the landfill. The wastes have leached out the embankments of Rabbit Run and Chestnut Branch further contaminating the surface waters which run into these respective streams. Hazardous wastes leaching from the landfill have contaminated the Chestnut Branch, Rabbit Run and Alcyon Lake and continue to contaminate these bodies of water.

Current Status

The LiPari Landfill has been inactive since 1971. The main routes for contaminant migration from the landfill are ground water and surface water. Leachate seeps are visible along the landfill escrapement adjacent to Chestnut Branch, east of the landfill area and along Rabbit Run. Ground water and surface water contamination has been documented. The presence of BCCE in fish from Alcyon Lake has also been reported. Local residents have complained about the presence of odors they attribute to the landfill.

The cost-effectiveness evaluation prepared by Radian Corporation (July 1982) reviewed the previous feasibility studies of R.E. Wright (1980, 1981) and Betz, Converse and Murdoch (1982). Radian evaluated 32 possible alternative remedial actions, of which 9 were determined to be highly cost-effective options:

	<u>Estimated Cost</u>	
	<u>Capital</u>	<u>Total O&M</u>
- 360° Cutoff wall with Cap (16 acres)/ Collect with wells/Treat at POTW	1.8m	180k
- Upgradient Deflection wall with Cap (6 acres)	1.2m	---
- Upgradient Deflection wall with Cap (6 acres)/Collect with wells/ Treat at POTW	1.4m	273k
- 360° Cutoff wall with Cap (6 acres	985k	---
- 360° Cutoff wall with Cap (16 acres)	1.5m	---
- 360° Cutoff wall with Cap (6 acres)/ Collect with wells/Treat at POTW	1.2m	180k
- Collect with wells/ Treat at POTW	210k	180k
- Deflection wall/Upgradient Drain/ Cap (22 acres)	2.1m	---
- Deflection wall/Upgradient Drain/ Cap (22 acres)/Collect with Wells/ Treat at POTW	2.3m	273k

After giving careful consideration to the cost-effectiveness and Environmental Assessment of each alternative and evaluating comments we have received, the Region recommends that the containment, active groundwater control alternative be implemented at the site (Attachment A). A letter from the State of New Jersey concurring with the approach is enclosed as Attachment B.

Considerations leading to the need for collection and treatment of the encapsulated leachate include:

1. Undefined long term integrity of the slurry wall.
2. Collection of the leachate contents will lower the internal head, minimizing infiltration through the underlying clay and the potential for contamination of the Kirkwood Aquifer, a drinking water supply.
3. Current cost estimates indicate that the reliability of the encapsulation action can be enhanced at a reasonable cost, thereby providing additional assurance for protection of public health and the environment.

Recommended Alternative

Section 300.68(j) of the National Contingency Plan (NCP) (FR 31180; July 16, 1982) states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare or the environment. Based on our evaluation of the cost-effectiveness of each of the proposed alternatives, the comments received from the public, our technical consultants, and information/comments from the State, we have determined that the two phase: Phase I, 360° cutoff wall with Cap (16 acres) encapsulation, in conjunction with Phase II, collection wells and treatment at the local POTW strategy identified in the cost-effectiveness report meets the NCP criteria.

The encapsulation, collection and treatment option entails the specific activities identified in Attachment C. The cost breakdown for this remedial alternative is listed below.

<u>Activity</u>	<u>Estimated Costs</u>
<u>Phase I:</u>	
Preparation of Detailed Design	\$ 100,000
Cutoff wall and cap Construction	\$1,589,150
Treatment Feasibility Study	\$ 80,000
TOTAL	<u>\$1,769,150</u>
<u>Phase II:</u>	
Collection and treatment construction	\$ 209,120
POTW disposal and operation and maintenance	\$ 91,250 per year

Proposed Action

We request your approval of the Encapsulation, Collection and Treatment option as the remedial action alternative for LiPari Landfill. In addition, we request the allocation of \$1,769,150 for the Phase I project activities as indicated above which includes associated engineering costs.

Tentative Schedule

1982

- Final opportunity for private party clean-up mid August
- State/EPA sign Superfund State Contract late August
- Complete design of slurry wall and cap October

- Receive bids, award contract,
and begin construction (Phase I) November
- Complete treatability study
(Phase II) December

If you have any questions, please contact Robert Ogg at (212) 264-2647.

Remedial Implementation Alternative Selection
LiPari Landfill Superfund Site
Township of Mantua
Gloucester County, New Jersey

EPA has completed the following remedial Superfund activities at the LiPari Landfill site located in Gloucester County, New Jersey:

<u>Activities</u>	<u>Date Completed</u>
Remedial Investigation/ Feasibility Study	October 1980, December 1980 revised
Remedial Investigation/ Feasibility Study	September 1981
Public Meeting	November 1981
Cost-Effectiveness Analysis of Alternatives	July 1982
Fence Isolation of the Site	July 1982
Draft Environmental Information Document	July 1982
Public Meeting	July 23, 1982

Region II has reviewed the information presented in each of these reports and given careful consideration to the comments received from the State of New Jersey, our technical consultants and the public. Based on our review, Region II has determined that the following actions at the site are cost-effective, environmentally sound, and effectively mitigate and minimize damage to and provide adequate protection of public health, welfare or the environment.

<u>Action</u>	<u>Estimated Cost</u>
<u>Phase I</u>	
Containment Design	\$ 100,000
Waste Containment Construction	\$1,589,150
Collection and Treatment Feasibility Study	\$ 80,000
	<u>\$1,769,150</u>

Date

Jacqueline E. Schafer
Regional Administrator



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARD MANAGEMENT
OFFICE OF THE DIRECTOR
CN 028
TRENTON, NEW JERSEY 08623
(609) 292-4022

July 16, 1982

Mr. Robert Ogg
USEPA - Region II
26 Federal Plaza
New York City, New York
10007

Dear Robert:

As you requested during your July 15, 1982, meeting with Anthony Farro of this Division, we have reviewed your general concept for the final remedial action plan for the Lipari Landfill. According to your representation to Mr. Farro, EPA's conceptual plan includes:

- 1) The construction of a 360 degree cutoff wall with clay cap over 16 acres (the enclosed area would include the six acre landfill and the 10 acre contaminated area between the Landfill and Chestnut Branch).
- 2) The installation of groundwater collection wells (located both within the contaminated zone and the waste body itself).
- 3) The transport of contaminated groundwater, collected under #2 above after primary treatment on site if necessary, to a public owned treatment works (POTW) for final treatment and discharge.

After requesting the review of this plan by the appropriate, interested Divisions within the Department, I can report to you that the Department is in general agreement with the conceptual plan stated above; provided, of course, the POTW involved is satisfied that it has the capacity to receive and satisfactorily treat, as necessary, the contaminated groundwater transported to it under item #3 above. Consequently, if we find that the POTW is not a satisfactory treatment facility for the contaminated groundwater, another treatment method will be utilized.

continued . . .

Mr. Robert Ogg
RE: Lipari Landfill

Page 2
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As you know, we expect to execute a Superfund Agreement to implement this remedial action by mid-August. Recent discussions between DEP and EPA have convinced me that this is also your agency's intention. I am confident that, with continued cooperation, we can refine this conceptual plan into a detailed remedial action expeditiously and accomplish our goal.

Sincerely,


JACK STANTON
Director

ejs

cc: G. Tyler, Asst. Commissioner
J. Vernam
T. Farro
D. Mack
G. King

360° CUTOFF WALL WITH CLAY CAP [SIXTEEN (16) ACRES];
COLLECT WITH WELLS; TREAT AT POTW

Phase I

Deflection/Encapsulation System

A 360° cutoff wall with clay cap over the landfill area (6-acres) and the contaminated area (10-acres) between the landfill and Chestnut Branch to isolate the source of leachate as proposed in the Wright report (November 1980) involves:

- installation of an impermeable slurry wall around the entire affected 16-acre area, and
- installation of an impermeable cap over the 16-acre area.

360° Cutoff Wall Over 16-Acres Area. A 360° slurry wall as shown in Figure 1 will completely isolate the entire area (16-acres) from the groundwater flow system. The cutoff wall would be installed vertically from the ground surface downward to a location 2 to 3 feet into the Kirkwood clay. It was estimated that an average slurry wall depth of 30 feet would be required throughout most of the affected area, with as much as 50 feet in depth along western perimeter of the disposal area. The slurry trench would be installed to achieve a maximum permeability of 1.0×10^{-7} to 1.0×10^{-8} centimeters per second.

Bentonite Clay Cap Over the Landfill. A bentonite clay cap over the entire area (16-acres) will minimize infiltration of rainwater into the area. The installation of a cap would include regrading the 16-acre area, disking bentonite SG-40 at 1.5 lb/ft^2 , compaction, 12 inches cover and seeding.

Phase II

Collection System

The well design for this option is based on the following assumption.

- The cutoff wall and clay cap completely isolate the system from ground water and surface recharge; and
- The cutoff wall is able to withstand a significant gradient between the ground-water system and the enclosed area, which is subject to pumping.

The well field needed to remove the contaminated ground water from within the 16 acre enclosed area is located throughout the waste and plume areas.

Ten wells, spaced as shown in Figure 1 could theoretically remove all of the enclosed ground water within 1 year. This assumes a pumping rate of 10 gpm/well continuously. Since there is no recharge, however, the wells will dewater before the entire volume can be pumped out. It will be necessary, at some point, to reduce the pumping rate and maintain maximum yield. The ability to remove all contaminated fluid and the associated pumping time needed are exponential functions. It will be cost-effective to remove only a portion of the total fluid volume, perhaps 80%. Based on this, the following pumping rates are suggested:

First Year: All wells @ 10 gpm/well until drawdown is near maximum. (Estimate 6-8 months)

Reduce all wells as needed to maintain maximum yield. (2-3 gpm or less)

Second Year: Continue pumping at reduced rates until a satisfactory amount of fluid has been removed.

At 10 gpm/well for 6 months and 3 gpm/well for an additional year, approximately 86% of the contaminated fluid would be recovered.

Treatment Systems

The collected leachate is currently planned to be routed to the Gloucester County Utilities Authority (GCUA) wastewater treatment plant. This is a 16.5 MGD modified contract stabilization plant. Average flows currently run at approximately 14-14.5 MGD with peak flows of 18-19 MGD (GCUA, May 18, 1981). The predicted leachate pumping rates are relatively low (28,000 - 144,000 gal/day). The hydraulic capacity of the plant and the collection system are adequate for treatment of the leachate. The main trunk line is designed for 24.1 MGD. In addition, GCUA is planning to expand plant capacity in the near future (GCUA, May 17, 1981). Operational parameters and performance data for the GCUA are summarized in Table 3-6. A sewer line tie-in across Chestnut Branch would be necessary.

Approximately 10-12% of the wastewater flow at GCUA is from industrial contribution with 8% contributed by Shell Chemical Company (GCUA, May 18, 1981). Preliminary contacts with the plant general manager and operations manager indicate that the plant can handle this waste stream; however, GCUA will require a certified laboratory report characterizing the leachate and will perform their own laboratory tests to determine the potential effects of the wastes on the plant.

The predicted performance of the GCUA plant in treating LiPari leachate is presented in Table 3-7. Influent concentrations are based on combining the GCUA average flow of 14.5 MGD with the predicted high leachate pumping rate. Removal efficiencies were estimated from plant data for the conventional pollutants and a review of the literature for organic species. A full scale treatability study is currently underway to assure the compatibility of the leachate to the treatment system.

TABLE 3-6. OPERATIONAL PARAMETERS AND PERFORMANCE DATA FOR THE
 GLOUCESTER COUNTY MUNICIPAL UTILITIES AUTHORITY
 WASTEWATER TREATMENT PLANT

Operational Parameters

Average flow = 14.5 MGD

Total aeration tank volume = 2.76×10^6 gallons

Total Mixed Liquor Volatile Suspended Solids (MLVSS) under aeration =
 42,000 - 63,000 lb

Sludge age = 5-7 days

Performance Data

	<u>Influent (mg/L)</u>	<u>Effluent (mg/L)</u>
D ₁	160 - 200	8 - 15
D	350 - 400	20 - 50
	200 - 220	6 - 12

Parameter	Influent ^{1/}	Effluent		X Removal	Reference ^{2/}
	(mg/L)	(mg/L)	(lb/day)		
BOD	203 - 228	10.2 - 11.4	--	95	4
COD	381 - 411	38.1 - 41.1	--	90	4
Phenol	0.02 - 0.13	0.001 - 0.006	0.12 - 0.73	95	1, 2, 3
1,2-(chloro-ethyl) ether	0.13 - 0.07	0.027 - 0.174	3.27 - 21.05	80	2, 3
1,2-(chloro-ethoxy) methane	0.23 - 1.50	0.230 - 1.50	27.8 - 181	0	2, 3
Benzene	0.02 - 0.04	0.00 - 0.011	0.73 - 1.33	70	2, 3
Toluene	0.22 - 0.42	0.043 - 0.083	5.2 - 10.04	80	3
ethyl Benzene	0.01 - 0.06	0.003 - 0.011	0.36 - 1.33	80	2, 3
ethylene Chloride	0.07 - 0.36	0.007 - 0.036	0.85 - 4.36	90	2
1,2-Dichloroethane	0.08 - 0.33	0.025 - 0.099	3.02 - 11.98	70	2

Based on mass balance: $(14.5 \text{ MGD}) (x \text{ GCMVA}) + 0.144 \text{ MGD} (x \text{ leachate})$
 14.644 MGD
 Concentration of organic species in GCUA influent was assumed to be 0 mg/L.

- References:
- 1) Stmoudis, 1979
 - 2) Patterson, 1981
 - 3) Tabak, 1981
 - 4) GCMVA, May 18, 1981

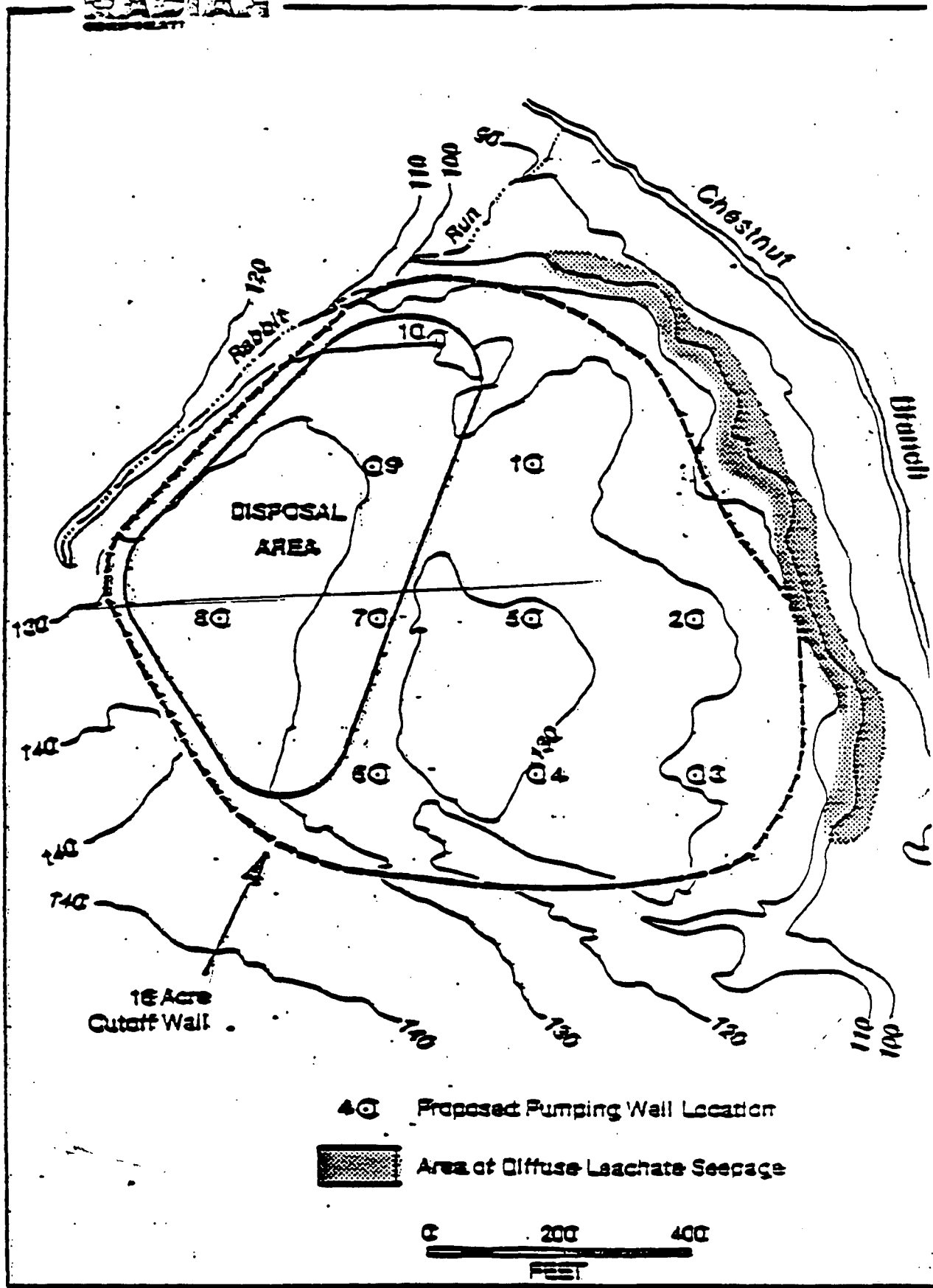


Figure 15 - The Preferred Alternative
360° Cutoff Wall with Cap (16 acres) /
Collect with Wells/ Treat at POUT

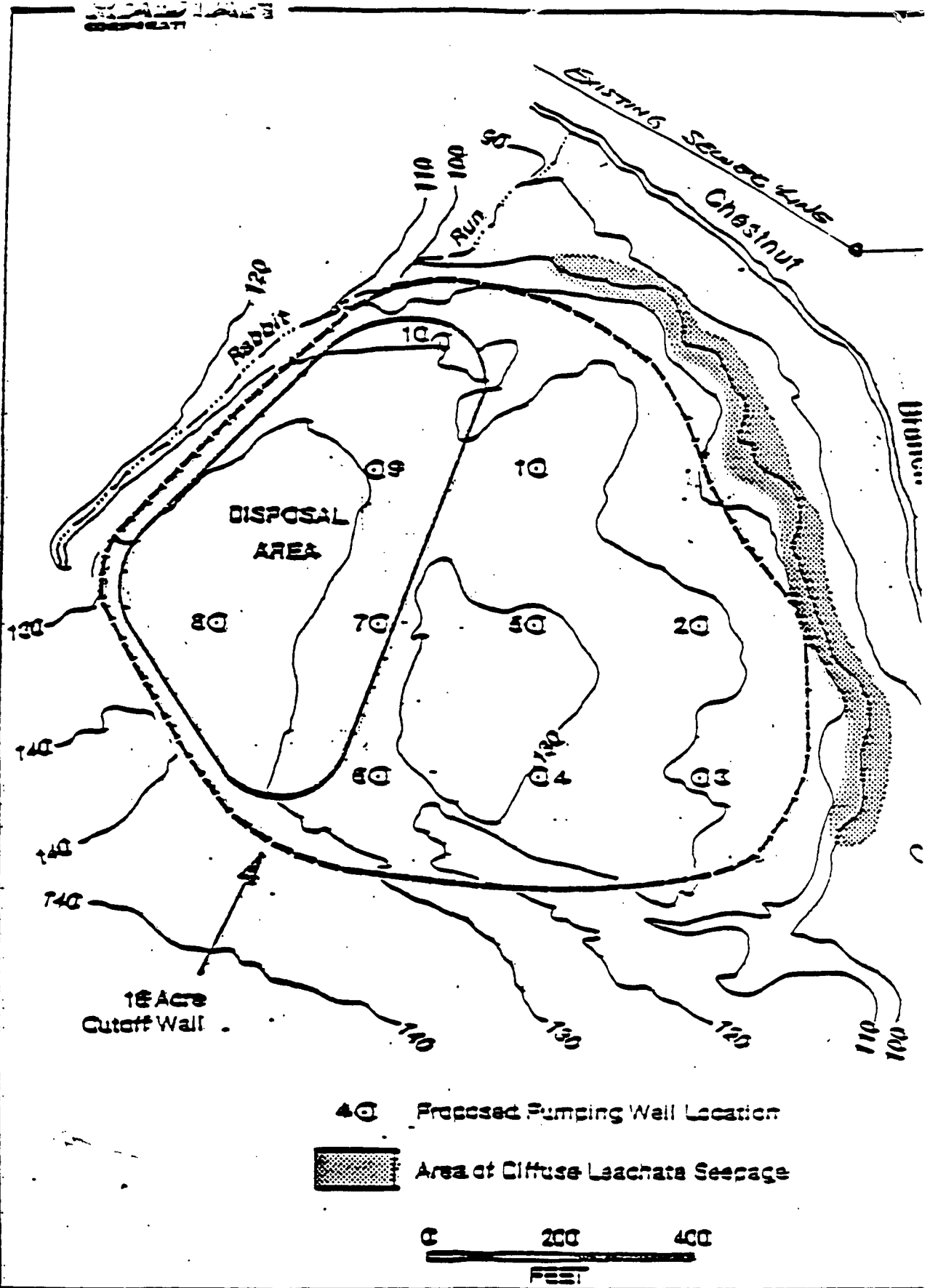


Figure 10 - The Preferred Alternative
 360' Cutoff Wall with Cap (16 acres) //
 Collect with Wells/ Treat at POTW