ROD

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

SITE: Tybouts Corner Landfill, New Castle County, Delaware.

Documents Reviewed:

Documents which describe the analysis of cost-effectiveness and feasibility of remedial alternatives for the Tybouts Corner Landfill have been reviewed. Meetings to discuss these remedial alternatives have also been conducted with the State, responsible parties and the general public. I have been briefed by my staff on the documents and the meetings and they form the principal basis for my decision.

- Remedial Investigation/Feasibility Study Report, Volumes I-V, Tybouts Corner Landfill, New Castle County, Delaware, June - 1985, prepared by NUS Corporation.

- Work Plan for Remedial Investigation/Feasibility Study of Alternatives, Tybouts Corner Landfill, New Castle County, Delaware, August - 1983, prepared by NUS Corporation.

- Remedial Action Master Plan and Project Work Statements for Tybouts Corner Landfill, New Castle County, Delaware, December - 1982, prepared by R.E. Wright Associates, Inc.

- Meetings with Delaware Department of Natural Resources and Environmental Control.

- Meetings with technical and legal staff representing the group of potentially responsible parties.

- Public meetings to discuss the alternatives

- Letter, dated Nov. 21, 1985, to Judith A. Dorsey from George J. Weiner, and attached "Preliminary Agreement for Tybouts Corner Remedial Action Plan".

Description of the Selected Remedy:

1) The west fill will be excavated and consolidated with the main fill. Excavation will include all municipal and industrial wastes as well as contaminated subsoils. The amount of contaminated subsoil to be removed will be based on a site-specific chemical fate and transport analysis. This analysis will be conducted to ensure that no soil remains in place which could cause ground water contamination to exceed the standards

established in this Record of Decision. The excavated area will be backfilled with suitable clean fill material.

2) A multi-layered cap that complies with RCRA will be placed over the consolidated main fill area to significantly reduce or eliminate the vertical infiltration of precipitation.

3) A subsurface drain or trench system will be installed to prohibit continued lateral migration of ground water through the fill and to collect existing leachate from the fill. The multi-layered cap and the subsurface drain/trench system together are intended to dewater the consolidated fill. This ground water diversion system and multi-layered cap will be maintained until they are no longer needed.

4) The offsite plume of contaminated ground water in the Upper Hydrologic Zone (UHZ) of the Potomac will be pumped and treated or otherwise disposed of, either onsite or offsite. During the pumping, institutional controls will be utilized to prevent use of contaminated ground water.

The goal of the offsite ground water treatment will be to reduce the level of contaminants to 100 ppb of total volatile organics with separate standards for cancer-causing contaminants. The levels for these specific substances are listed in the body of the Recommended Alternative and are selected to meet a 10^{-4} cancer risk level at the boundary of the landfill property. A 10^{-4} level was selected because it is not technically feasible to attain the 10^{-6} risk level. EPA will evaluate ground water contamination levels after three, six and ten years of pumping and treating. If the standards are met at any of the evaluation points, pumping will be discontinued. If, after a ten-year pumping period, standards have still not been met, EPA will evaluate the technical feasibility of meeting the standards and set new ones if necessary. Pumping may be terminated if it is shown that no reasonable modification of the pumping system would produce significant improvement. EPA will then examine the need for additional monitoring locations to assure that the influence of any offsite production well will not cause the remaining contaminated ground water from Tybouts Corner Landfill to migrate away from the site.

5) Contaminated water generated by excavation, construction, subsurface drainage system collection and ground water pumping will either be sent to a local sewage treatment plant offsite, or treated onsite. It is possible that a combination of these two treatment systems and locations will be used. All treated water will meet NPDES standards before disposal to surface waters, including any pretreatment requirements if the sewage treatment is utilized. All waters will be disposed of in compliance with local, state and federal law.

6) A health and safety plan will be implemented for all activities described in this Record of Decision. During excavation and construction activities, air monitoring will be conducted to ensure the safety of the onsite workers as well as to protect the residents living nearby the excavated areas.

7) A monitoring program will be established to ensure that ground water quality, surface water quality, the multi-layer cap and air quality are maintained.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) (42 U.S.C. §§ 9601-9657) and the National Contingency Plan (40 CFR Part 300), I have determined that the remedial action described above, together with proper operation and maintenance, constitute a cost-effective remedy which mitigates and minimizes damage to public health, welfare, and the environment. The remedial action minimizes or eliminates the threat of further contamination to the ground water and the environment. The Delaware Department of Natural Resources and Environmental Control has been consulted and agrees with the approved remedy. These activities will be considered the approved action and eligible for Trust Fund monies.

I have determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

3/6/86
Date

James M. Seif
Regional Administrator
EPA Region III

Summary of Remedial Alternative Selection
Tybouts Corner Landfill

Site Location and Description

The Tybouts Corner Landfill site is located in northern Delaware, New Castle County, approximately ten miles south of Wilmington and a few miles west of the Delaware River.

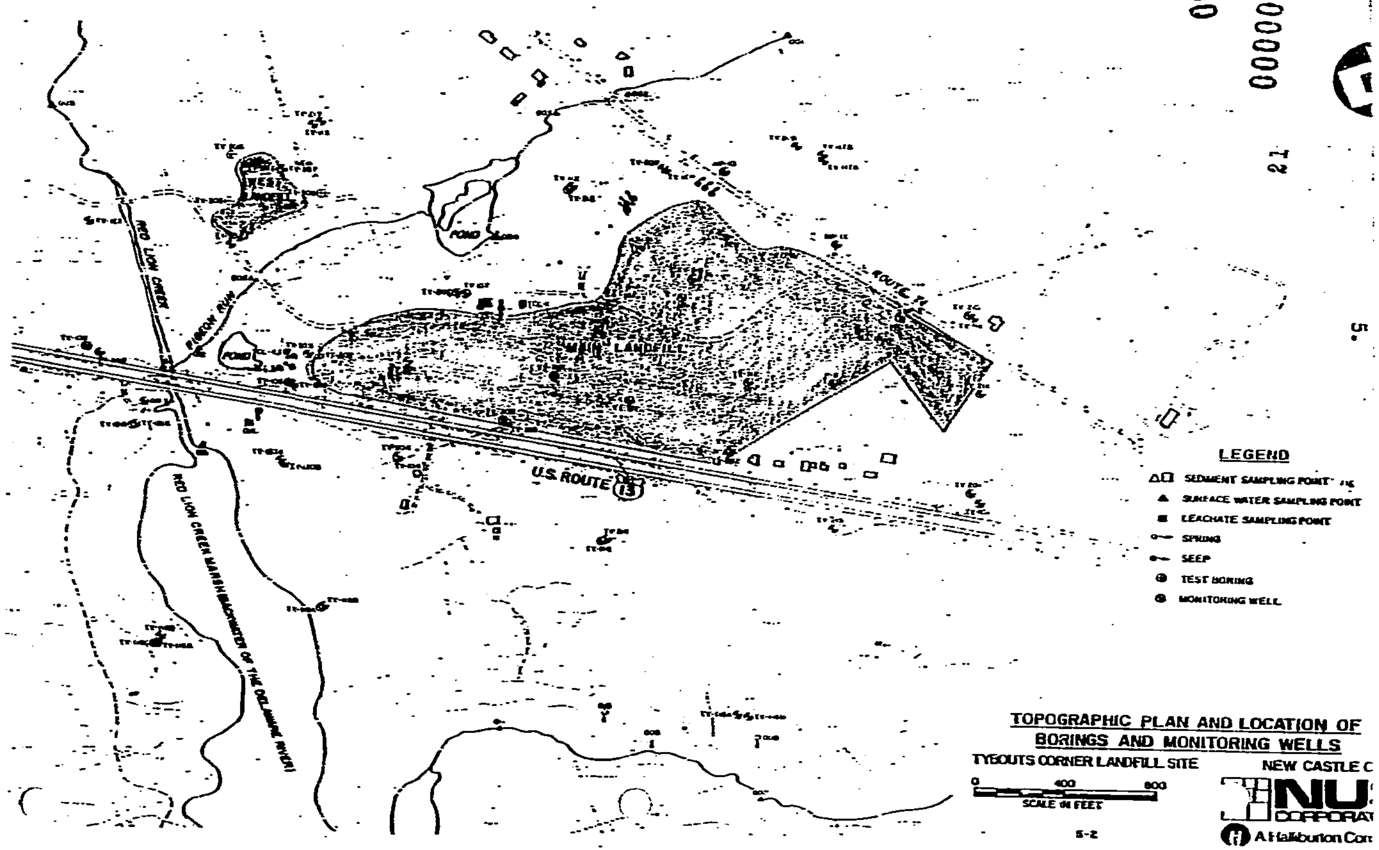
The site was originally a sand and gravel pit. When the landfill began to operate, plans indicate that no clay liner or other impervious material was placed below the fill and no impervious cap was placed on top of the fill following abandonment. The thickness of the fill ranges from approximately 5 to 40 feet.

The landfill consists of two fill areas. The main fill is about 47 acres in size and is located near the confluence of Pigeon Run and Red Lion Creek, in a triangular area northeast of Pigeon Run, between U.S. Route 13 and State Route 71. A smaller fill area, estimated to be about four acres, is located just west of Pigeon Run. Figure 1 shows the approximate limits of the two fill areas.

The main landfill surface is relatively flat, and slopes to the south toward Red Lion Creek. The smaller landfill, located west of Pigeon Run (referred to as the "west landfill" in this document) is very flat and also drains to Red Lion Creek.

Pigeon Run is a small stream that is a tributary to Red Lion Creek. Pigeon Run flows along the western perimeter of the main landfill and intermittently receives surface runoff and leachate from the landfill. Red Lion Creek is located about 500 feet south of both the main and western fills and flows from west to east. Red Lion Creek widens immediately downstream from the main landfill, forming a broad marsh and backwater area of the Delaware River. The creek enters the Delaware River approximately 2 miles downstream from the site. Red Lion Creek receives surface runoff and leachate from the main landfill.

The entire site property is surrounded by privately owned, residential property and industry-owned property. Six private homes are located directly adjacent to the site property line along the northeast boundary of the main landfill. There are two residences on the east side of Route 13, about 300 to 500 feet from the eastern edge of the site, as shown in Figure 2. The well for these residences is contaminated. One residence is located about 150 feet northeast of the site. The well for this residence is also contaminated. There are approximately 34 other residences within one-half mile of the site.


RED LION CREEK
PIGEON RUN
POND
POND
MAIN LANDFILL
U.S. ROUTE 13
ROUTE 71
RED LION CREEK MARSH (BACKWATER OF THE DELAWARE RIVER)
LEGEND
SEDIMENT SAMPLING POINT
SURFACE WATER SAMPLING POINT
LEACHATE SAMPLING POINT
SPRING
SEEP
TEST BORING
MONITORING WELL
TOPOGRAPHIC PLAN AND LOCATION OF
BORINGS AND MONITORING WELLS
TYBOUTS CORNER LANDFILL SITE
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SCALE IN FEET
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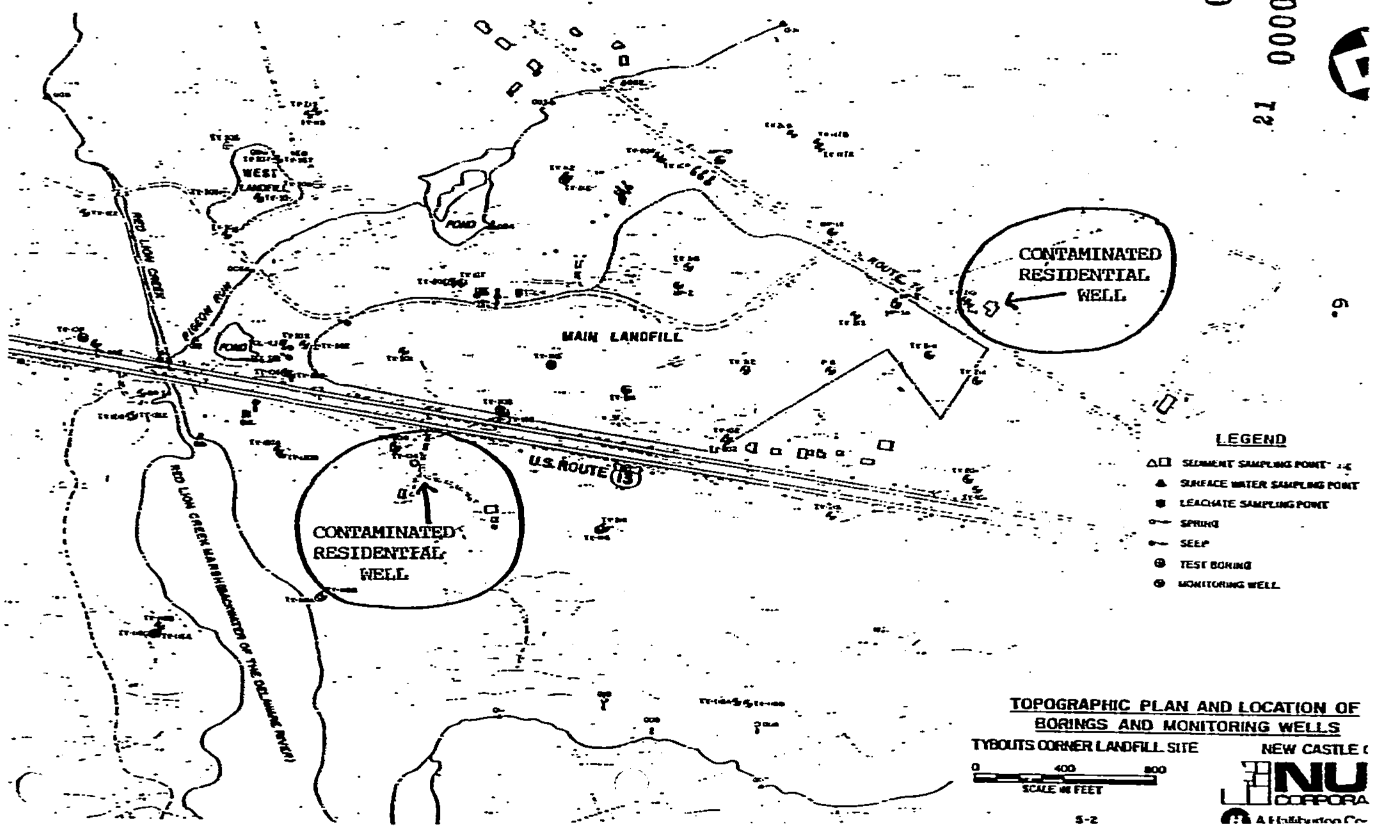
Figure 1



TOPOGRAPHIC PLAN AND LOCATION OF BORINGS AND MONITORING WELLS

TYBOUTS CORNER LANDFILL SITE NEW CASTLE (

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Figure 2

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6.

The landfill is located in an area where extensive development of ground water resources has occurred for both municipal use and for large industrial facilities (see Figure 3). The site is located in Red Lion Creek drainage basin, and the Delaware River is about two miles downstream from the site. The area along the Delaware River has been developed by the oil and chemical industries. Facilities include those operated by Texaco (formerly Getty) Oil, Diamond Shamrock, Formosa Plastics, Stauffer Chemical, and Standard Chlorine, all of which are located within two miles of the site to the east and southeast. A tract of property on the east side of Route 13, directly east of the landfill, is owned by Texaco. The tract is currently leased for farming.

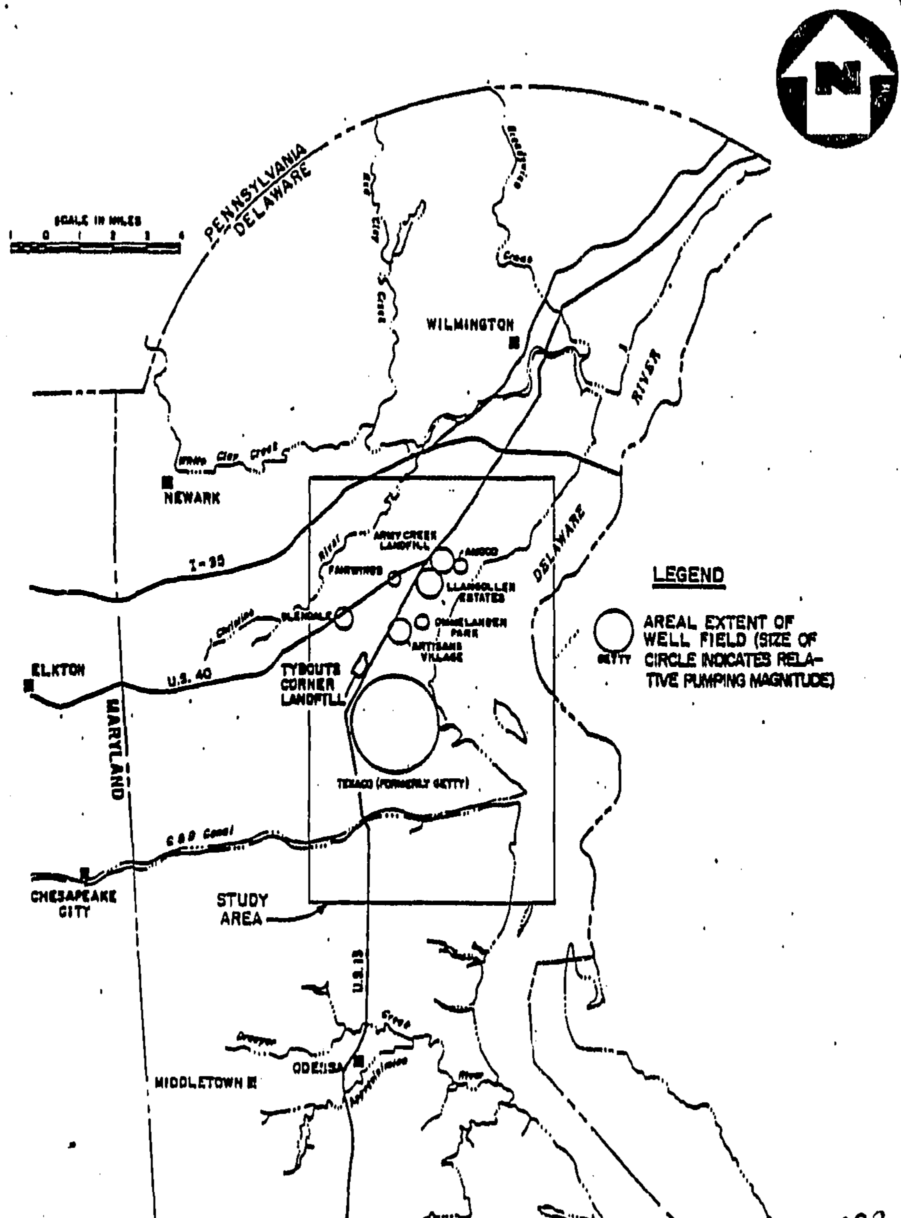
Site History

Tybouts Corner Landfill was used by the New Castle County Department of Public Works as a municipal sanitary landfill for the disposal of municipal and domestic refuse from December 1968 until July of 1971. In addition, industrial wastes were disposed there during the active life of the landfill. These industrial wastes included trichloroethylene, vinyl chloride, 1.2-dichloroethane, benzene, and various other organic and inorganic chemicals.

The Tybouts Corner Landfill Site is ranked as the Number 2 site on the U.S. Environmental Protection Agency (EPA) National Priorities List, and is designated by Delaware as its top priority site. The site achieved its ranking because of the threat of contamination of the regional aquifer, which is the primary source of water in this region of Delaware.

The first occurrence of contamination of a water well was reported by the Delaware Department of Natural Resources and Environmental Control (DNREC) in May 1976 when a private, domestic water well owned by Sarah Wagner was tested and found to be contaminated by organic compounds. The Wagner well was located about 400 feet east of the main landfill perimeter as shown on Figure 2. A second private, domestic water well, located 150 feet north of the landfill and owned by Leo Woytko, was also found to be contaminated, as indicated by testing performed by EPA in 1983 and 1984. The Wagner well was abandoned and has since collapsed. The Woytko well water was treated by the owner at his own expense prior to its abandonment. No other water supply wells have been contaminated by the site to date.

The Remedial Investigation (RI) for the Tybouts Corner Landfill Site was initiated to determine the impact of the landfill on public health and the environment, focusing on the local and regional ground water systems. The main concern was that hazardous substances that were disposed in the landfill were contaminating the ground water system.



FROM: HYDROGEOLOGICAL REPORT, R.E. WRIGHT ASSOCIATES, 1981

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PUMPING WELLS
TYBOUTS CORNER LANDFILL SITE, NEW CASTLE CO., DE

Figure 3

NUS CORPORATION
A Halliburton Company

The geologic and ground water investigations of the RI were performed in three phases. The initial phase was to determine the general character of the geology and ground water at the site and to determine if contamination could be reaching the regional aquifer. The second phase was to determine the detailed geology and potential for ground water contamination in the shallower aquifers that lie above the regional aquifer in the immediate vicinity of the landfill. The third phase was to determine the character of ground water contamination, the extent of contamination, and the potential for the contaminants to spread further in the regional aquifer.

In the summer of 1984, EPA initiated a Focused Feasibility Study to evaluate possible water supply alternatives for the residences near the Tybouts Corner Landfill. By July 1984, the alternatives were presented to the public for comment. On September 13, 1984, the Regional Administrator signed a Record of Decision to install a public water supply line for the residences that had contaminated wells, as well as for the residences whose wells were potentially threatened.

Enforcement History

In October of 1980, the United States filed suit against New Castle County, Stauffer Chemical Company and William Ward under section 7003 of RCRA, seeking injunctive relief to abate an endangerment presented by disposal of wastes at Tybouts Corner Landfill. In March of 1982, the United States amended its complaint to include a request for injunctive action under section 106 of CERCLA. The site was listed on EPA's National Priorities List, and the Remedial Investigation/Feasibility Study (RI/FS) process was begun in early 1983.

Having expended considerable investigative funds on the site by April of 1984, the United States once again amended its complaint, to include a cost recovery count under section 107 of CERCLA. At the same time, it joined ICI Americas as an additional defendant.

Two partial consent decrees have been signed in the litigation to date. The first was a consent decree between William Ward and EPA regarding payment by Ward of money and services to EPA for performance of the RI/FS. The second was between EPA and three of the defendants (New Castle County, Stauffer and Ward) for installation of public water for residences in the vicinity of the landfill. (Because the wells on two private properties had already been contaminated and were unusable, a Focus Feasibility Study was completed and implemented prior to completion of the remainder of the RI/FS).

In June of 1984, a third-party complaint was filed by Stauffer against the State of Delaware and two corporations. In April and May of 1985, ICI, New Castle County and Stauffer filed third-party complaints against over twenty additional corporations. The third-party complaints seek contribution for cleanup costs.

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As the third-party search and joinder by defendants was progressing, EPA and three of the defendants conducted negotiations on a cleanup remedy for the landfill. In December of 1985, a preferred alternative for cleanup was put out for comment by the public. A preliminary agreement between EPA and the defendants on implementation of EPA's preferred alternative was provided to the court. Once the Record of Decision selecting the final cleanup remedy is signed, negotiations for a private cleanup by defendants/third-party defendants will begin.

Current Status

The following points summarize the findings of the Remedial Investigation (RI) regarding geology, hydrogeology, and contamination levels in the landfill, ground water, surface water, sediments and wild life.

Findings of the RI

1) The main threat posed by Tybouts Corner Landfill is contamination of local and regional aquifers that are a main source of water for the region.

2) The uppermost zone of ground water in the vicinity of the landfill is called the Columbia Aquifer; the base of the main fill (the landfill is unlined) sits in this aquifer.

3) The zone of ground water below the Columbia is called the Upper Hydrological Zone (UHZ) of the Potomac. In the area of the main fill, there is a silt layer which separates the base of the fill from the UHZ of the Potomac, but this silt layer has some "windows" and the silt layer "pinches out" to the north/northeast. The west fill area sits directly in the UHZ of the Potomac.

4) Ground water passing laterally through the fill areas creates a hazardous leachate which enters the ground water aquifers and also creates surface seeps which enter the surface waters around the site.

5) In addition, the surface capping on the landfill does not prevent rainfall from entering the landfill vertically; the rainfall picks up landfill contaminants as it passes through the fill and combines with the ground water that is passing through the landfill.

6) The plume in the Columbia Aquifer flows to the southeast, with a small flow towards the north. The southeast portion flows under US Route 13 and eventually outcrops and seeps into a limited area of the Red Lion Creek Swamp.

7) The contamination in the UHZ of the Potomac flows southeast under US Route 13. The plume has not yet crossed under Red Lion Creek.

8) The contaminated ground water plumes have migrated between 400-800 ft. from the site.

9) The UHZ of the Potomac Aquifer is a discontinuous layer of sandy lenses, separated by clay, that are interconnected. There are two sand layers within the UHZ, the P1 Sand and the P2 Sand. The thickness of the P1 Sand varies, being very thin under the main fill and opening up and getting thicker toward the southeast. As the P1 Sand thickens, its potential for water production increases, making it an increasingly valuable resource at greater distances from the landfill.

10) It is the P1 Sand of the UHZ that the landfill has contaminated. The P1 Sands are the major pathway of environmental concern because of the potential to reach or become a public water supply in the future.

11) The P2 Sand is the major water resource in the region. The fact that the P2 Sand is hydraulically connected to the contaminated P1 Sand makes the P2 Sand a pathway of environmental concern as well.

Geology

The geology at the site is described by three formations; the Columbia, the Merchantville and the Potomac. The Columbia Formation is the uppermost geological unit, which generally lies about 20 feet mean sea level (MSL). This formation consists of a brown to yellow-brown silty sand, and sand and gravel. The Columbia was mined for sand and gravel at Tybouts Corner Landfill and municipal and industrial wastes were placed in the mined area. The Merchantville Formation beneath the site consists of a dark gray, micaceous, glauconitic sandy silt. The Merchantville Formation and underlying silt "pinches out" north northeast, and west of the landfill. The Merchantville Formation is also missing in the vicininty of well TY-311, where it was removed either naturally, or by excavation. The extent of the removal at well location TY-311 is unknown, and was estimated for the RI/FS ground water modeling. The Potomac consists of variegated, red, gray and white clay containing yellow-brown silty sand beds that vary in thickness and lateral extent. The top of the Potomac Formation is a sand bed designated as the Potomac No. 1 sand which ranges from less than 10 feet to about 20 feet thick beneath the main fill and becomes significantly thicker to the southeast. The Potomac No. 2 Sand lies beneath the No. 1 Sand with a clay bed, designated the A clay, which separates the two sand beds. However, the A clay is not continuous and the Potomac No. 1 sand merges with the No. 2 sand where the A clay "pinches out." This type of interconnection of the sand beds is common within the Potomac Formation.

Hydrogeology

The ground water flow systems beneath and around the Tybouts Corner Landfill site include those in the Columbia and the Potomac Formations, which are distinct, but at the same time, interrelated. The ground water 004433 flow system in the Columbia Formation is the uppermost system and intersects the landfill. The Columbia Aquifer is sometimes referred to as the "water table" aquifer. The ground water flow system in the Potomac Formation is often separated from the Columbia Aquifer by a low permeability sandy silt, the Merchantville Formation which, impedes but does not totally eliminate downward migration of ground water. In some areas, the intervening Merchantville "pinches out" and two separate aquifers combine to form one hydraulically continuous aquifer. However, where the Merchantville is present, ground water in the Columbia Formation tends to be perched and flows laterally. Ground water flow directions in the Columbia Aquifer were determined from the ground water elevations. The contours on Figure 4 show that ground water moves laterally from the Columbia Formation into the landfill from the northeastern side of the fill. Ground water flow also moves from the landfill into the Columbia Formation in the northern and southeastern directions.

The Potomac Formation aquifer consists of discontinuous sand beds within a silt and clay matrix. The first two sand beds encountered in the Upper Hydrogeologic Zone of the Potomac Formation, beneath and around the site, were evaluated during this investigation, and are referred to as the Potomac No. 1 Sand and the Potomac No. 2 Sand.

The Potomac No. 1 Sand (P1) exists in a confined or semi-confined ground water condition depending upon the location at and around the site. The P1 Sands occur immediately below and in contact with the Merchantville where the Merchantville exists, or in contact with the Columbia where the Merchantville is absent.

Figure 5 shows the ground water elevations in the P1 Sand. The ground water flow in the P1 Sand is different from that in the overlying Columbia Formation where the Merchantville separates the two aquifers. In areas where the Merchantville is absent, the P1 Sand and the Columbia Formation merge, and the Columbia ground water flow becomes the same as the P1 ground water flow. Ground water in the P1 Sand flows to the southeast beneath the main landfill. The west landfill is located within the P1 Sand and ground water flows generally to the south and southeast from the west fill.

Vertical ground water flow occurs from the Columbia Formation to the P1 Sand body along the northern edge of the landfill where the Merchantville Formation is absent. Ground water flowing to the north from the landfill flows downward beneath the edge of the Merchantville and reverses flow directions so that it flows southeast beneath the landfill.

The Potomac Formation A clay, as referred to in the RI, is a tight clay that acts as a confining zone between the Potomac No. 1 sand (P1) and the Potomac No. 2 Sand (P2). The A clay occurs beneath the entire main landfill area, and beneath the areas to the west, north and east of the site. The A clay is absent at the southern end of the site, where it pinches out. This is shown on Figure 6. Where the A clay is absent the P1 Sands and the P2 Sands merge and are hydraulically connected.

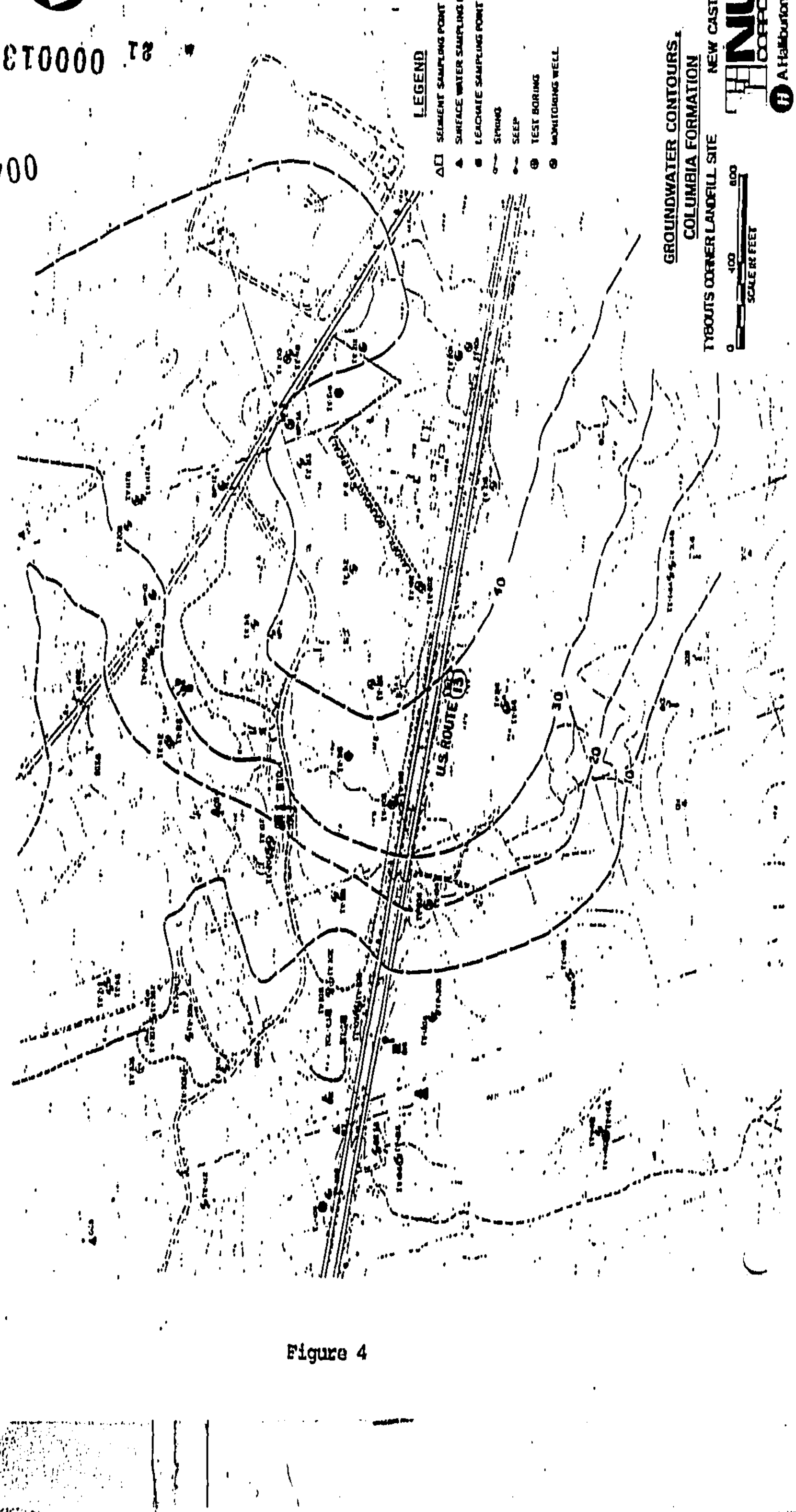
LEGEND
SEDIMENT SAMPLING POINT
SURFACE WATER SAMPLING POINT
LEACHATE SAMPLING POINT
SPRING
SEEP
TEST BORING
MONITORING WELL
GROUNDWATER CONTOURS
COLUMBIA FORMATION
TYBOUTS CORNER LANDFILL SITE
NEW CASTLE
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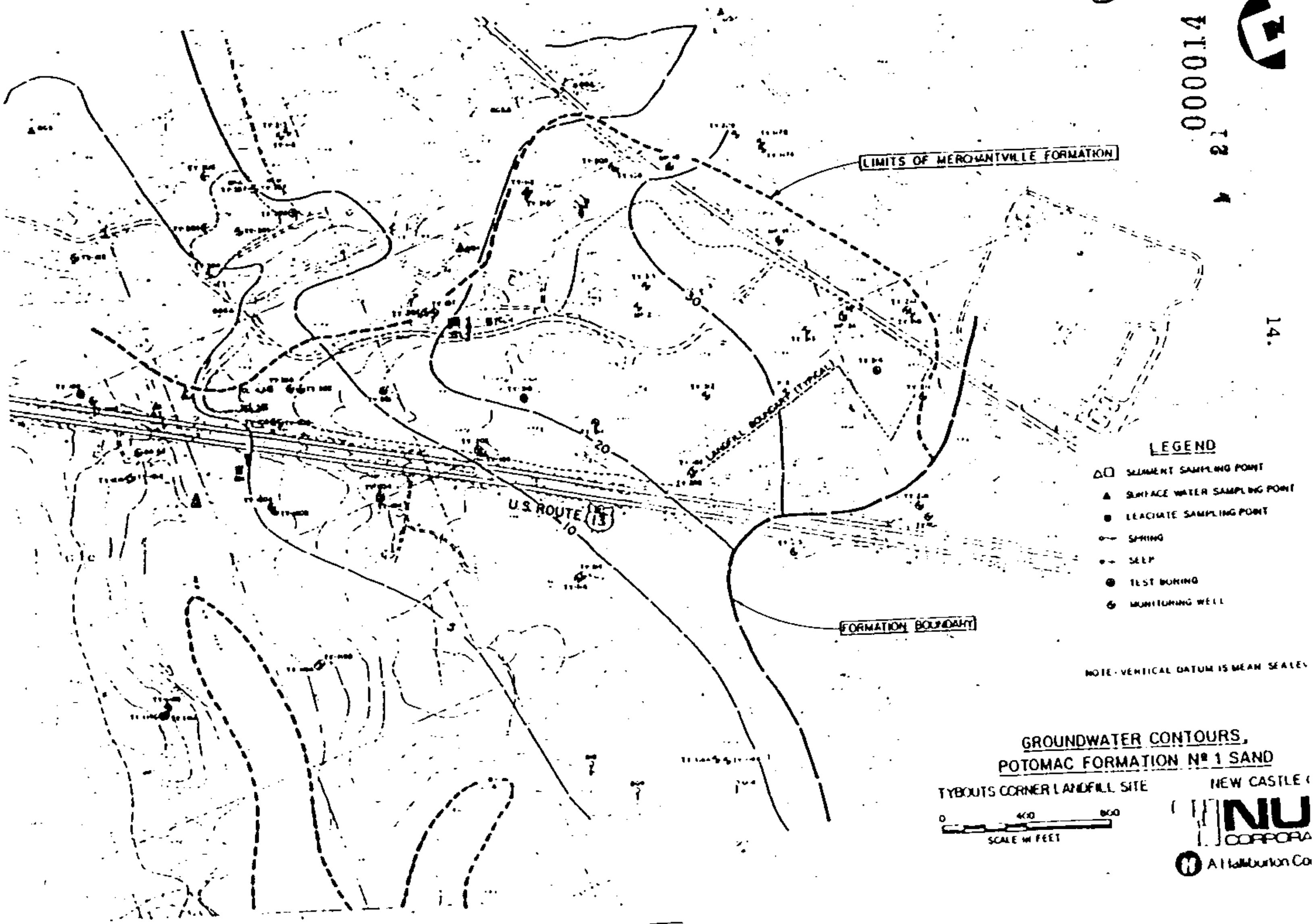
Figure 4

Figure 5



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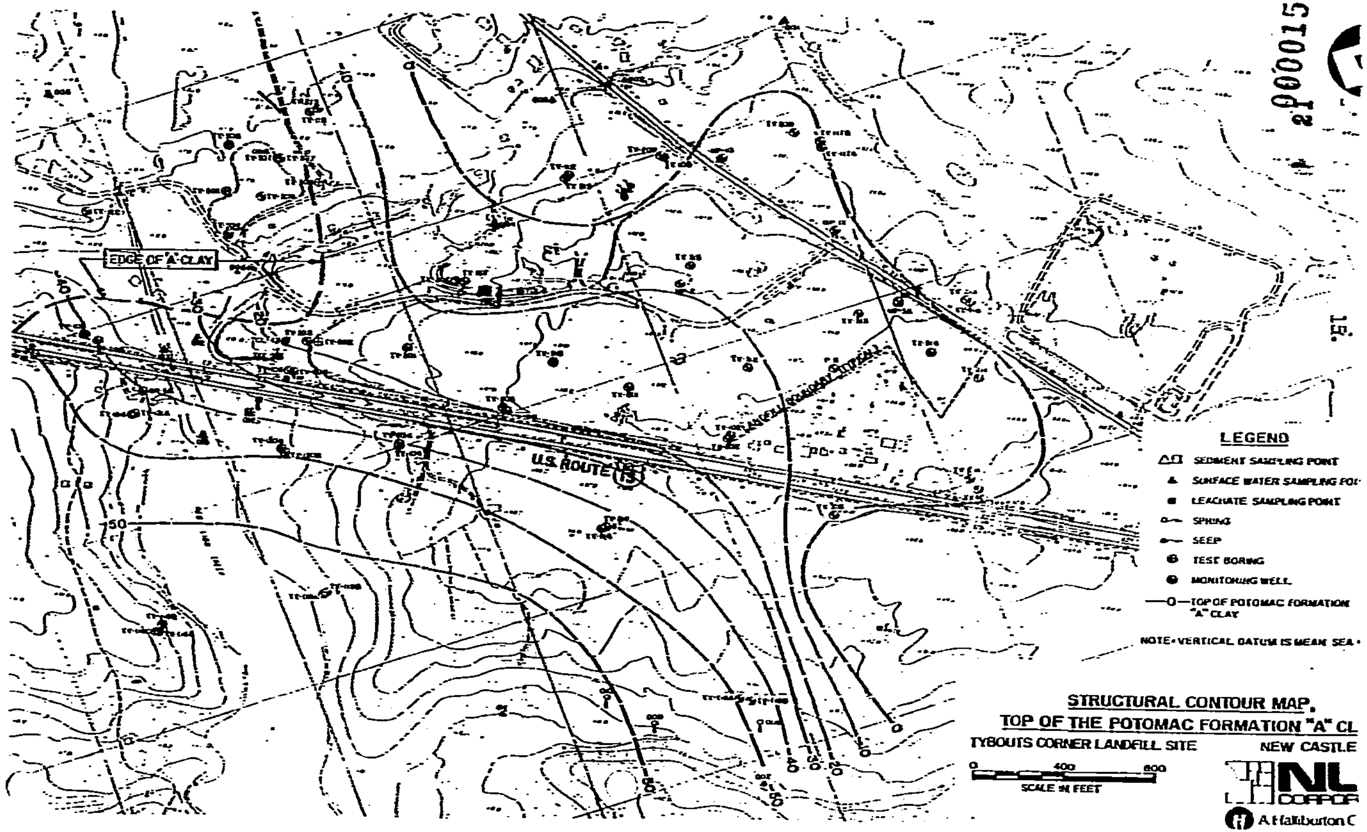

Figure 6

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The P2 Sand is almost non-existent directly beneath the site, but as it increases in thickness toward the southeast it has more potential for ground water production.

Ground water flow in the P2 Sand is towards the southeast as indicated by the ground water contour map shown in Figure 7. The general southeast flow is similar to the P1 Sand and appears to be the predominant direction of flow in the UHZ beneath and around the site.

Ground Water Chemistry and Contamination

Chemical analyses of ground water from monitoring wells were performed three times: January-February 1984, May 1984 and January 1985. The chemical analysis included EPA priority pollutants and hazardous substance list (HSL) organic and inorganic compounds. The analyses were performed to determine the nature and extent of contamination of ground water from the site.

The analyses detected volatile organic compounds in all three sand beds (Columbia Formation, Potomac Formation No. 1 Sand and Potomac Formation No. 2 Sand). The volatile organic compounds detected in offsite monitoring wells are consistent with the compounds detected within the fill. The organic contaminants most common to both the landfill monitoring wells and the offsite monitoring wells within the three sand beds include benzene, 1,2-dichloroethane, chloroethane, 1,2-transdichloroethane, toluene, vinyl chloride, acetone and o-xylene or total xylenes. Complete monitoring well analytical data are provided in the RI report Volume IV; Tables 1-7 summarize these results.

Surface Water, Sediment and Leachate Seep Chemistry and Contamination

Two surface streams receive drainage from Tybouts Corner Landfill. Red Lion Creek is located about 400 feet south of both landfill areas. Pigeon Run flows through the site and separates the main and west landfill areas. Pigeon Run enters Red Lion Creek 400 feet south of the "toe" of the main landfill and Red Lion Creek enters the Delaware River about two miles downstream from the site.

Surface water and sediment samples were obtained from Pigeon Run and Red Lion Creek. Sampling was conducted both upgradient and downgradient from the main and west landfills. Leachate samples were also collected.

Chemical analyses for surface water samples indicate very little, if any, significant contamination of surface water from organic compounds from the site. Only one positive detection -- of 8 ug/l of 1,2-dichloroethane -- occurred at a point downgradient from a leachate discharge.

Sediments also showed little if any detectable organic compounds except at one point where the leachate visibly pools before it dissipates into the swamp. Table 8 summarizes the organic compounds found in the sediments.

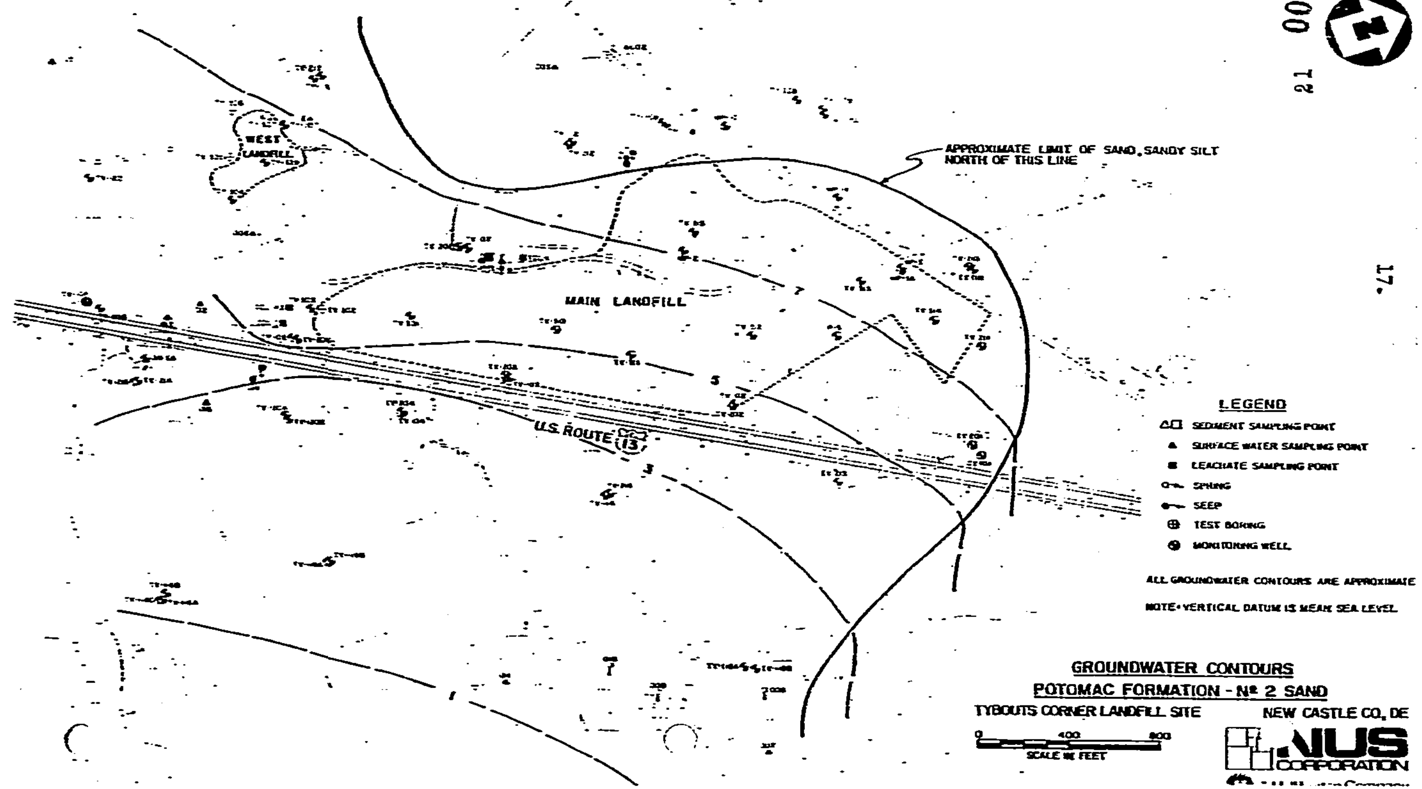

Figure 7

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VOLATILE ORGANIC COMPOUNDS DETECTED IN MAIN LANDFILL WELLS
(CONCENTRATIONS IN MICROGRAMS/LITER)
TYBOUTS CORNER LANDFILL SITE

Volatile Organic Compounds	Location Well No. (Date)	Columbia Formation – (Screen at Base of Main Landfill, Within the Fill Material)									
		311		313		MP-2		MP-3		P-5	
		(1/84)	(5/84)	(2/84)	(5/84)	(1/84)	(5/84)	(2/84)	(5/84)	(1/85)	(5/84)
Benzene				78	53.6		128.0	34		44	35.4
Chlorobenzene				10	9.7					LT	
1,2-Dichloroethane		460000	316000 (11219)	68	16.6	38000	3080				
1,1-Dichloroethane			4			21	33.6	7			
Chloroethane						32	31.7			11	9.3
Chloroform						LT	6.0				
1,2-trans-Dichloroethane				880	71.0	42					
Ethylbenzene				59	43.8	110	165			37	26.8
Chloromethane						32	4.7				
Fluorotrichloromethane						1,600	1610				
Tetrachloroethane (PCE)						30					
Toluene			55	920	420.0	720	835			12	482
Trichloroethane (TCE)					18.6						
Vinyl chloride				680	48.2	240	616				
Acetone				3200	104.5C	3,000	993C	27			276C
2-Butanone (MEK)				4720	629.6C						480C
4-Methyl-2-pentanone (MIBK)				216	111.6	130	395				8.8
o-Xylene or total				203	164.6	20	132.7	27		28	61.1
2-Hexanone				91	38.1	10	19.5				
1,2 Dichloropropane							7.3				
Dichlorodifluormethane							314				
Styrene							34.1				

Note: C-Corrected for Blank

Table 1

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VOLATILE ORGANIC COMPOUNDS DETECTED IN MAIN LANDFILL WELLS
(CONCENTRATIONS IN MICROGRAMS/LITER)
TYBOUTS CORNER LANDFILL SITE
PAGE TWO

Volatile Organic Compounds	Location Well No. (Date)	Columbia formation– (Screen Below Base of Main Landfill, Above Merchantville)				Potomac, No. 1 Sand– (Screen Below Base of Main Landfill, Below Merchantville)							
		314		315		303		310		312		MP-3A	
		(2/84)	(5/84)	(1/84)	(5/84)	(1/84)	(5/84)	(2/84)	(5/84)	(2/84)	(5/84)	(5/84)	(5/84)
Benzene		35	14	17	24.1			17		7			
Chlorobenzene				8.6	10.7								
1,2-Dichloroethane		2240	847	LT									
1,1-Dichloroethane										21	3.2		
Chloroethane			6.8			LT	4.6						
Chloroform						15	9.8						
1,2-Trans-dichloroethane		144	36.4			LT		11					
Ethylbenzene		181	16.1	220	385			16	4.8				
Chloromethane													
Fluorotrichloromethane													
Tetrachloroethane (PCE)													
Toluene		2220	84	20	6.7			680	479				9.6K
Trichloroethane (TCE)		0											
Vinyl chloride		82	26.4					16					
Acetone		2060	38.6C		LT				4180		244		
2-Butanone (MEK)		2040	122C					8460		265			
4-Methyl-2-pentanone (MIBK)		78	15.1		4.2			640	112	6			
o-Xylene or total		1460	30.6	43	164			31	10.8				
2-Hexanone					5.1								

NOTE:

LT – Less than detection limit, but greater than 1/2 detection limit.
K – Value is less than value given.

Table 2

VOLATILE ORGANIC COMPOUNDS DETECTED IN WEST LANDFILL WELLS, POTOMAC FORMATION, NO. 1 SAND
(Concentrations in Micrograms/Liter)
TYBOUTS CORNER LANDFILL SITE

Volatile Organic Compounds	Location Well No. (Dates)	Upgradient 213 (1/84)	Upgradient 213 (5/84)	Upgradient Edge 307 (1/84)	Upgradient Edge 307 (5/84)	Within Fill 309 (1/84)	Within Fill 309 (5/84)	Downgradient Edge 304 (1/84)	Downgradient Edge 304 (5/84)
		Potomac Formation, No. 1 Sand							
Benzene		Non				36	17(16)	LT	28(32)
Chlorobenzene						60	47(38)		4K
12-Dichlorethane							3K	63	31(14)
11-Dichloroethane						LT	4K		
Chloroethane									4K
Chloroform									
12-trans-Dichloroethane						23			
Ethylbenzene						12	28	280	327(306)
Chloromethane									
Fluorotrichloromethane									
Tetrachloromethane (PCE)									
Toluene					4K	430	840(870)	1100	832(1186)
Trichloroethene (TCE)									8K
Vinyl chloride						9			
Acetone						100	187	1100	1068(1170)
Styrene								60	
2-Butanone (MEK)							49	LT	724(847)
4-methyl-2-pentanone (MIBK)							6K		116(121)
o-Xylene or total						62	68	230	836(950)
Dichlorofluoromethane							4K		
Styrene									40(47)

NOTE: LT = Less than detection limit but greater than 1/2 detection limit
K = Value is less than value given
( ) = indicates Laboratory Replicate

Table 3

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VOLATILE ORGANIC COMPOUNDS DETECTED IN THE
COLUMBIA FORMATION AND POTOMAC FORMATION, NO. 2 SAND AND BELOW THE NO. 2 SAND
(Concentrations in Micrograms/Liter)
TYBOUTS CORNER LANDFILL SITE

Volatile Organic Compounds	Location Well TY	Columbia Formation – (Downgradient from Main Fill)										No. 2 Sand Potomac Formation			Potomac Formation below the No 2 Sand	
		202	202	203	203	214	214	MP-10	MP-10	MP-11	MP-11	105	106	105	104	104
	(Date)	(1/84)	(5/84)	(1/84)	(5/84)	(2/84)	(5/84)	(2/84)	(5/84)	(1/26)	(5/84)	(1/84)	(5/84)	(5/85)	(2/84)	(5/84)
Benzene		74	53					6		26	19.8	23		82		
Chlorobenzene										6	4.4			2.1		
1,2-Dichloroethane		4800	2578	16000	8418	232					8					
1,1 Dichloroethane		21	11			695	2.2K			6	4.9					
Chloroethane		45	46							50	28.4	8	11.8	9.1		
Chloroform																
1,2-Trans-dichloroethene			604							8	7.6					
Ethylbenzene												LT		45		
Chloromethane																
Fluorotrichloromethane																
Tetrachloroethene		160	58			49	4.6K									
Toluene		19	3K									LT	6.2C	5.6	8	
Trichloroethene		140	57			21	11.2									
Vinylchloride		81									6.4					
Acetone		16										LT				
2-butanone (MEK)					10548								16.6C			
4-methyl-2 pentanone (MIBK)																
o-xylene or total										8	7.8	16	61	250	15	

(NOTE: LT – Less than detection limit, but greater than 1/2 detection limit)
C – Corrected for blank
K – Value is less than value given

Table 4

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VOLATILE ORGANIC COMPOUNDS DETECTED IN THE POTOMAC FORMATION NO. 1 SAND (CONCENTRATIONS IN MICROGRAMS PER LITER) TYBOUTS CORNER LANDFILL SITE

Volatile Organic Compounds	Location Well No. (Date)	102 (1/84)	102 (5/84)	103 (1/84)	103 (Dup) (1/84)	103 5/84	204 (1/84)	204 (5/84)	114 (2/84)	114 (5/84)	114 (1/85)
		Potomac Formation, No. 1 Sand (Downgradient From Main Fill)									
Benzene							12	12.0			
Chlorobenzene		LT									
1,2-Dichloroethane											
1,1-Dichloroethane			2K			1K					
Chloroethane				10	8.4	12		6.5		422	165
Chloroform											
1,2-trans-Dichloroethene											
Ethylbenzene							45		6		22
Chloromethane											
Fluorotrichloromethane											
Tetrachloroethene (PCE)			6K				18	14.7			
Toluene									7		2.2
Trichloroethene (TCE)											4
Vinyl chloride											
Acetone							48		31		5
2-Butanone (MEK)											
4-Methyl-2-pentanone (MIBK)							200	6.6	6		
o-Xylene or Total							81	123.2	17		
Dichlorodifluoromethane											

Table 5

VOLATILE ORGANIC COMPOUNDS DETECTED IN THE POTOMAC FORMATION NO. 1 SAND
(CONCENTRATIONS IN MICROGRAMS PER LITER)
TYBOUTS CORNER LANDFILL SITE
PAGE TWO

Volatile Organic Compounds	Location Well (Date)	206 (1/84)	205 (Dup) (1/84)	206 (6/84)	206 (Dup) (6/84)	205 (1/85)	207 (1/84)	207 (5/84)	208 (1/84)	208 (5/84)	209 (2/84)	209 (5/84)	209 (Dup) (5/84)
		Potomac Formation, No. 1 Sand (Downgradient From Main Fill)											
Benzene		68	64			66			12				
Chlorobenzene						4			LT				
1,2 Dichloroethane		85	63	88.4	72.8	13	6	7.8	LT	586	9		
1,1 Dichloroethane		8	8.7	12.1	8.1	6.0							
Chloroethane		11	12	6.8	6.1	7.6			350	284			
Chloroform													
1,2-trans-Dichloroethene		12	8.8	24.7	16.6	2.3			14	6			
Ethylbenzene						28							
Chloromethane													
Fluorotrichloromethane													
Tetrachloroethene (PCE)													
Toluene		10	12			8.8					11		
Trichloroethene (TCE)													
Vinyl chloride		LT	LT	18.2	18.3				LT				
Acetone													
2-Butanone (MEK)						3					8		
4-Methyl-2-pentanone (MIBK)													
o-Xylene or Total		28	26	11.2	11.6	120			LT				
Dichlorodifluoromethane						60		48					

Table 6

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21

VOLATILE ORGANIC COMPOUNDS DETECTED IN THE POTOMAC FORMATION NO. 1 SAND
(CONCENTRATIONS IN MICROGRAMS PER LITER)
TYBOUTS CORNER LANDFILL SITE
PAGE THREE

Volatile Organic Compounds	Location Well (Date)	Potomac Formation, No. 1 Sand (Downgradient From Main Fill)										
		210 (1/84)	210 (5/84)	210 (Dup) (5/84)	211 (1/84)	211 (5/84)	212 (1/84)	212 (5/84)	214 (2/84)	214 (5/84)	1198 (1/85)	1198 (Dup) (1/86)
Benzene		7	2.6K	3								
Chlorobenzene		6										
1,2-Dichloroethane		18			6.5			6.6	232			
1,1-Dichloroethane		12	7.8						6	2.2K		
Chloroethane												
Chloroform												
1,2-trans-Dichloroethane		6	14.3	8	32							
Ethylbenzene		4										
Chloromethane												
Fluorotrichloromethane												
Tetrachloroethene (PCE)					18	4K			49	4.8K		
Toluene		17		6K								
Trichloroethene (TCE)		6	4.6K	8					21	11.2	4	4
Vinyl chloride					12							
Acetone		190	66.5	82								
2-Butanone (MEK)		230	13.6	28								
4-Methyl-2-pentanone (MIBK)												
o-Xylene or total		6										
Dichlorodifluoromethane												

NOTES:

LT = Less than detection limit, but greater than 1/2 of detection limit.
K - Value is less than value given

Table 7

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SUMMARY OF ORGANIC COMPOUNDS(1) IN SEDIMENTS

	Pigeon Run								Red Lion Creek		
	Upgradient		Downgradient					Upgradient	Downgradient		
	001	002	003	004	006	012	TCL-6	005	013	015	014
Benzene											LT [42.5]
Ethylbenzene											LT [42.5]
Fluorotrichloromethane									50	LT [43](2)	51
Toluene											190
Acetone									LT [252]		9700
2-butanone (MEK)											51,000
2-hexanone											LT [850]
4-methyl-2-pentanone											1200
1,2-dichloroethane									17		
Phenol											LT [14000]
4-methyl phenol											31,000

(1) Includes all organic compounds detected, except methylene chloride. All values in µg/l.
(2) LT [4.3] = less than detection limit, but greater than 1/2 detection limit. Number in brackets [ ] is the detection limit.

Table 8

Table 9 shows the results of chemical analyses for organic compounds conducted on leachate samples. The results show numerous organic compounds in the leachate, including benzene, chlorobenzene, 1,2-dichloroethane, chloroethane, 1,2-trans-dichloroethane, ethylbenzene, toluene, vinyl chloride, acetone, 2-butanone (MEK), o-xylene, 2-hexanone, and 4-methyl-2-pentanone.

Endangerment and Wetlands Assessments

The major potential impact from the landfill on the ecology of the area is the impact of leachate contamination on Red Lion Creek Marsh and on Pigeon Run wetlands. Analyses conducted for the RI indicate that organic contaminants in the creeks and wetlands at and downgradient from the leachate seeps are not at levels considered harmful to the ecology. Table 10 lists the range of concentrations for chemicals detected in the leachate discharges and surface waters of Pigeon Run, Red Lion Creek, and the unnamed tributary to Red Lion Creek, as compared to the acute and chronic toxicity concentrations for freshwater aquatic life.

The discharge to Pigeon Run contains some organics that may be toxic but the discharge has not degraded Pigeon Run to the point where metals and organics are toxic to aquatic life.

The unnamed tributary does not receive visable leachate and contained no metals or organics that are either acutely or chronically toxic to aquatic life.

The leachate discharge to Red Lion Creek enters near the Route 13 bridge in an area of marsh vegetation covered by several inches of marsh water. Some of the vegetation is stressed directly from the reddish brown leachate seeps. The leachate contains metals (cadmium, iron, lead, manganese) that may be acutely or chronically toxic to aquatic life. The discharge also contains some organic compounds at elevated concentrations, but none exceed the level for acute or chronic toxicity where values are available.

The sediments collected at the leachate discharge have a higher concentration of organic compounds than the leachate itself, but the levels were below reported toxicity values.

The main potential impacts on ecological biota may be degradation of water quality due to biological oxygen demand (BOD_5) and chemical oxygen demand (COD) loadings, and not from the organic or inorganic contaminants detected onsite. The main source of BOD_5 and COD, in some leachates and ground water, would be the leachate discharged from the site. In addition, excess nutrients in the leachates may enhance the production of algae

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LEACHATE CONTAMINANTS
TYBOUTS CORNER LANDFILL SITE

PP#	CAS No.	Contaminant	No. of Positive Detections/ No. of Observations	Range of Concentration (µg/l)
4V	71-43-2	*benzene	4/6	13.0 – 80
7V	108-90-7	chlorobenzene	4/6	6.3 – 615
10V	107-06-2	*1,2-dichloroethane	1/6	29
16V	75-00-3	chloroethane	4/6	7.2 – 34
30V	156-60-5	1,2-trans-dichloroethene	3/6	8 – 160
38V	100-41-4	*ethylbenzene	4/6	20 – 81
44V	75-09-2	*methylene chloride	3/6†	29 – 280
86V	108-88-3	*toluene	6/6	10 – 380
	67-64-1	acetone	5/6	160 – 3,500
	78-93-3	*2-butanone (MEK)	5/6	580 – 11,000
	95-47-6	o-xylene	4/6	18 – 73

* Critical Contaminant
† Found in blank @ 60 µg/l

Table 9

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TABLE 7-7

LEACHATE DISCHARGE AND SURFACE WATER ANALYSES AND FRESHWATER AQUATIC LIFE TOXICITY TYBOUTS CORNER LANDFILL SITE

Chemical Constituent	Leachate Discharge to Ditch Flowing to Pigeon Run (µg/l)	Pigeon Run (µg/l)	Unnamed Tributary (µg/l)	Red Lion Creek (µg/l)	Leachate Discharge to Red Lion Creek (µg/l)	Freshwater Aquatic Life Toxicity (µg/l) Acute	Chronic
aluminum	ND – 1,000	ND – 181	109 – 134	ND – 86	1,280		
arsenic	ND – 18	—	—	—	14	440	40
barium	200 – 2,950	ND – 129	101 – 102	ND – 111	3,000		60,000
cadmium	ND – 6	—	—	—	26	1.5 – 6.3	0.01 – 0.05
chromium (total)	ND – 19	—	—	—	20	2,200 – 9,800	44
iron	800 – 673,000	ND – 549	109 – 282	178 – 240	409,000		1,000
lead	ND – 10	—	—	—	15	74 – 400	0.76 – 20
manganese	450 – 5,840	118 – 338	57 – 102	131 – 486	4,080		1,000
nickel	ND – 40	—	—	—	—	1,100 – 3,100	56 – 160
tin	—	ND – 114	—	—	—		
zinc	ND – 400	ND – 38	18	19 – 34	20	180 – 570	47
4-methylphenol	—	—	ND – 30	—	—		
acetone	ND – 3,500	—	—	—	2,400		
benzene	ND – 45	—	—	—	80	5,300	212 est.
2-butanone	ND – 8,400	—	—	—	11,000		
chlorobenzene	ND – 15	—	—	—	—	250	10 est.
chloroethane	ND – 34	—	—	—	—	118,000	20,000
1,2-dichloroethane	ND – 28	ND – 8	—	—	—	118,000	20,000
trans-1,2-dichloroethene	ND – 240	—	—	—	—	11,600	464 est.
ethylbenzene	20 – <100	—	—	—	—	32,000	1,280 est.
2-hexanone	ND – 280	—	—	—	—		
methylene chloride	ND – 280	ND – 61	—	ND – 8	—	11,000	440 est.
styrene	ND – <5	—	—	—	—		

28.

Table 10

LEACHATE DISCHARGE AND SURFACE WATER ANALYSES AND
FRESHWATER AQUATIC LIFE TOXICITY
TYBOUTS CORNER LANDFILL SITE
PAGE TWO

Chemical Constituent	Leachate Discharge to Ditch Flowing to Pigeon Run (ug/l)	Pigeon Run (ug/l)	Unnamed Tributary (ug/l)	Red Lion Creek (ug/l)	Leachate Discharge to Red Lion Creek (ug/l)	Freshwater Aquatic Life Toxicity (ug/l) Acute	Chronic
toluene	10 – 300	—	—	—	380	17,500	700 est.
trichloroethene	ND – 8	—	—	—	—	45,000	1,600 est.
vinyl chloride	ND – <100	—	—	—	—		
xylene	ND – 73	—	—	—	<50		

Note: For sampling locations, see Figure 4-1 in Section 4.0.
Sources: EPA. 1980. Water Quality Criteria. Federal Register 45:79318-79379. November 28, 1980.
EPA. 1976. Quality Criteria for Water.
—, ND: Not detected.
(+6): Hexavalent chromium.
est: No chronic toxicity data available. Chronic toxicity value was estimated.

Table 10 continued

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with concomitant enhancement of the eutrophication process in the Red Lion Marsh. Dissolved oxygen deficiency can limit the ecological community in a marsh. Reconnaissance assessment of Red Lion Creek Marsh indicates that the landfill has not had a significant, visible, ecological impact on the marsh. The reconnaissance assessment reports by aquatic and terrestrial ecologists are provided in Appendix N of the RI/FS.

A draft Site Inspection Report (U.S. EPA TDD No. F3-8212-09) prepared by the NUS Region III Field Investigation Team (FIT) for EPA was reviewed for this RI because the report contained information and data from samples of the leachate discharge into Red Lion Creek that were taken in October, 1982, prior to the RI/FS Investigation. The report mentions bioassay tests were performed in the leachate and Red Lion Creek using Fathead minnows and Daphnia ("leachate...presumably from the Tybouts Corner Landfill..." and from a "free-flowing section of Red Lion Creek adjacent to Route 13 bridge..."). The report indicates the results of testing were inconclusive since mortality rates of test animals may have been caused by low levels of dissolved oxygen, by presence of toxic pollutants, or by abnormally high levels of naturally-occurring chemicals. The chemical analytical results from leachate at this location indicates no significant input of priority pollutants near the Route 13 bridge, although significant levels of lead and iron were found in sediment samples near the landfill leachate, paralleling results in the RI. The sediment data near the leachate indicate that chromium, cadmium, lead and zinc concentrations do not exceed the reported toxicity values.

The State of Delaware performed chemical analysis on fish from the Route 13 bridge area on Red Lion Creek on May 31, 1983. The location of sampling is presumed to be upstream from the point where the leachate discharge in Red Lion Creek is located. Twelve white perch and three brown bullhead were collected at the Route 13 bridge. The analysis reports 1.3 micrograms per gram PCB and 0.1 micrograms per gram chlorobenzene in the composite white perch samples. The composite brown bullhead samples yielded 0.35 micrograms per gram PCBs, and no chlorobenzenes were detected. The levels detected are below the FDA standards for consumption of fish. The analysis indicated no evidence of other purgable organics, although the data sheets note that all data is qualitative or semiquantitative. Since PCBs are not a contaminant detected at Tybouts Landfill, and chlorobenzene is not detected in Red Lion Creek near Tybouts Landfill, the origin of these chemicals in the fish is not considered to be Tybouts. The origin of these contaminants could be other industrial facilities which border Red Lion Creek downstream closer to the Delaware River.

ALTERNATIVE EVALUATION

Objectives

The objectives to be achieved by the selected remedial action are:

1. to eliminate or appreciably reduce vertical infiltration of rainfall through the main and west fill areas;

2. to eliminate or control lateral migration of ground water into the main and west fill areas; and

3. to eliminate or control the contaminated ground water presently in the Columbia Aquifer and the UHZ of the Potomac.

Accomplishment of the first two objectives of remedial action at Tybouts, in combination, will severely reduce or completely eliminate the production of contaminated leachate coming from the fill materials and entering the ground water aquifers (source control).

This source control is accomplished in two ways. A cap over the landfill will prevent rainfall from entering the fill vertically and generating leachate. A ground water diversion system will prevent lateral flow of ground water through the fill.

The third objective will be accomplished by installing and operating a system of wells to pump out the existing contaminated ground water plume in the Potomac No. 1 sand. The contaminated water will be treated, either onsite or offsite, to remove the hazardous materials. Monitoring of ground water quality will ensure that contamination does not migrate into usable portions of the aquifer.

Review of Alternatives

The following section describes the alternatives reviewed in the Feasibility Study, which are divided into four groups:

A. No Action Alternative
B. West Fill Alternatives
C. Main Fill Alternatives (includes surface cap, ground water diversion and excavation)
D. Offsite ground water Alternatives

A. No Action Alternative

The FS examined the no-action alternative for both landfills, surface waters, sediment, the Columbia Aquifer, and the Potomac Aquifer. A monitoring program would be implemented to detect further migration of contaminants.

The no-action alternative for the main and west landfill sources of contamination would result in continued uncontrolled releases of hazardous chemical compounds to the major, regional aquifer; and in continued discharges of leachate to the streams and wetlands around the site.

This alternative is unacceptable because it would not meet the goals of CERCLA and would not comply with other environmental regulations.

B. West Fill Alternatives

B1) West Fill Surface Cap, Ground Water Barrier, Pump, and Treat (Encapsulation)

This alternative involves surrounding the site with a ground water barrier, such as a slurry wall or sheet pile wall, to prevent lateral ground water flow through the landfill, and installing a surface cap and gas venting system to prevent surface water infiltration. These two actions will essentially isolate the landfill; however, since there may be some leakage through the barrier and the cap, a pump will be installed in the fill to pump out excess water. This water will have to be treated onsite or disposed of properly offsite. Figure 8 is a conceptual diagram of the cap, barrier, pump and treatment alternative as applied to the west landfill.

B2) Excavate West Fill, Place on Main Landfill

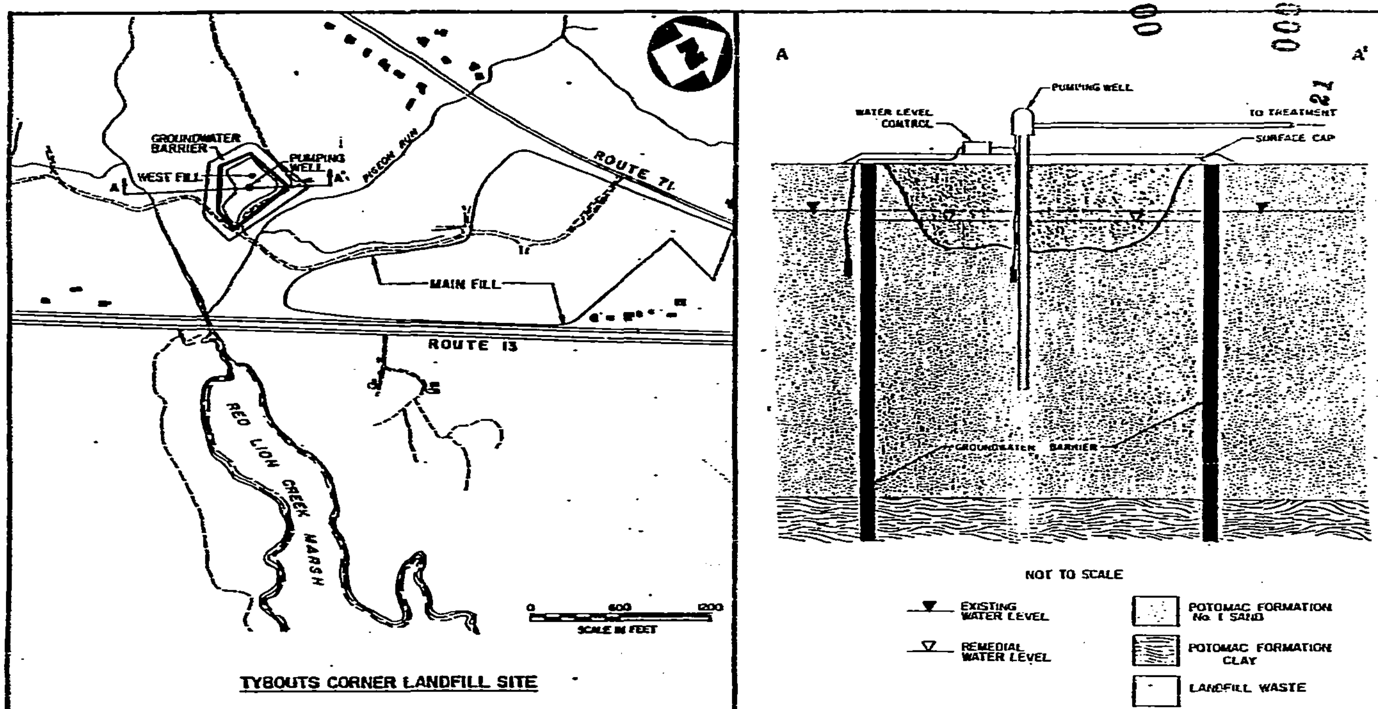
Excavation and removal of the contaminated waste of the west landfill is proposed as a method to mitigate the source of ground water contamination. The depth of excavation required for this landfill is 30-35 feet, and the volume to be excavated is approximately 63,000 cubic yards. The exact vertical and horizontal boundaries of the excavation will be determined in the design stage and will be based on a site-specific chemical fate and transport analysis. Backfilling with clean soils will be required for all excavate west fill options.

B3) Excavate West Fill, place in RCRA Landfill Onsite

This alternative conisders excavation of the west landfill and disposal in a RCRA landfill constructed onsite. If only the west fill were placed in a RCRA fill the dimensions of the required fill are 300 feet x 340 feet x 20 feet high. If the main landfill is excavated and placed in an onsite RCRA fill, a much larger landfill is necessary and of course the west landfill will be placed in the same RCRA landfill.

A preliminary design of an onsite RCRA landfill was prepared for the proposed excavation. Landfill design criteria used are the Resources Conservation and Recovery Act (RCRA) Subtitle C (40 CFR Part 265)

Figure 8



CONCEPTUAL DIAGRAM - WEST LANDFILL
SURFACE CAP, GROUNDWATE ?ARRIER, PUMP, AND TREAT
TYBOUTS CORNER LANDFI.. SITE, NEW CASTLE CO., DE

NUS CORPORATION
A Halliburton Com

regulations and the 1984 RCRA reauthorization amendments for caps and double liners. An example of RCRA landfill construction is shown on Figure 9.

B4) Excavate West Fill, Offsite Disposal

This alternative considers excavation and offsite disposal west landfill excavated wastes. Hauling waste to some existing offsite disposal area is technically feasible, provided that a facility can be found to accept the waste. The offsite disposal facility would comply with EPA RCRA regulations, including the proposed amendment for the RCRA cap and double liner. Unfortunately, there are very few such facilities operating at this time, and the cost for disposal at such a facility is very high.

B5) Excavate West Fill, Onsite Incineration

This alternative considers excavation and onsite incineration of excavated west landfill wastes. This disposal method involves construction of one or more rotary kiln incineration units onsite. Mobile incinerators are not being considered due to their limited capacity and limited availability. Incinerator residues will require either onsite or offsite disposal.

B6) Excavate West Fill, Offsite Incineration

This alternative involves transporting the waste to an existing, permitted incineration facility for treatment. The use of an offsite commercial facility is unlikely at this time. Potential facilities have only limited treatment capacities and presently have a large backlog of wastes. The estimated 63,000 cubic yards volume of waste in the west landfill at Tybouts greatly exceeds the annual capacity of the typical commercial facility.

SUMMARY TABLE
WEST FILL ALTERNATIVES

Alternative	Cost (Million) $
Surface Cap, Ground Water Barrier, Pump	5.2 to 11.7
Excavate, Place on Main Fill	2.5 to 3.8
Excavate, RCRA Fill Onsite	6.5
Excavate, Offsite Disposal	15.2 to 16.5
Excavate, Incinerate Onsite	20.4 to 21.9
Excavate, Incinerate Offsite	40.8 to 45.8

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C. Main Fill Alternatives

Source Control Capping

Several types of surface caps were evaluated in the initial screening to determine which cap was most effective in reducing surface infiltration, and subsequent leachate generation, in the main and west landfills. Each of the caps analyzed would required a gas venting system, a surface drainage layer, and topsoil layer. The types of surface caps analyzed include:

C1) 10^{-6} Surface Cap

° A surface cap with a thickness of two feet and a permeability of 10^{-6} centimeters per second (cm/sec). Soil materials

that typically have compacted permeability of 10^{-6} cm/sec would include silt, clayey silt, and sandy clay.

C2) 10^{-7} Surface Cap

° A surface cap with a thickness of two feet and a permeability of 10^{-7} cm/sec. Materials for construction would include clay, silty clay, and clayey silt.

C3) Multi-layer Surfaced Cap

° A surface cap designed to RCRA closure requirements so that a minimum amount of infiltration occurs.

The multi-layer cap design is considered to be the best design to minimize surface infiltration into the landfills. One possible design incorporates a double liner system consisting of a 30 mil PVC membrane over a two foot thick soil layer, which will be compacted to a permeability no greater than 10^{-6} cm/sec. The design also provides for a gas-venting layer beneath the double liner and a protective vegetative cover above the double liner. A typical cross-section of this proposed cap design is shown in Figure 10.

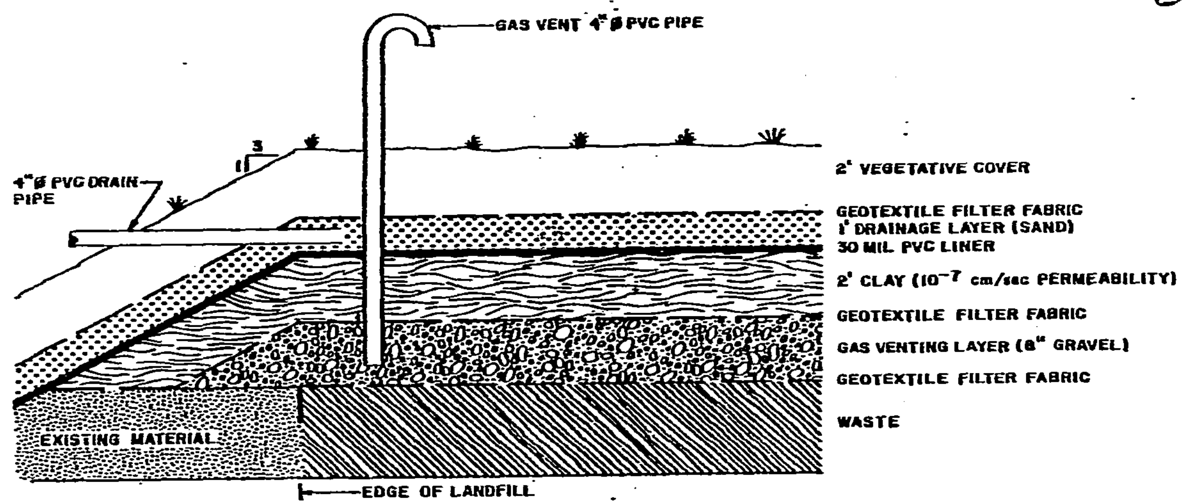
Source Control Ground Water Diversion

C4) Main Fill Surface Cap and Subsurface Drain in the Columbia Formation (with or without Ground Water Barrier)

The surface cap and subsurface drain alternative involves placing an impermeable multi-layer surface cap over the main landfill to eliminate or appreciably reduce the vertical infiltration of precipitation through the fill, and construction of a subsurface drain that would intercept ground water that moves laterally from the Columbia Formation into the

004513

Figure 10



PROPOSED RCRA CAP

TYBOUTS CORNER LANDFILL, NEW CASTLE CO., DE

NOT TO SCALE

NUS CORPORATION
A Halliburton Company

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fill. A ground water barrier, used in conjunction with the drain, could be used to increase the efficiency of the drain. Figure 11 shows the surface cap/subsurface drain (with or without ground water barrier) alternative, as applied to the main landfill.

The subsurface drain considered for this feasibility study includes a perforated pipe system constructed in the Columbia Formation along the eastern and northern boundaries of the landfill as shown on Figure 11. The subsurface drain would be constructed in the natural sand and gravel materials along the perimeter of the landfill and would extend below the elevation of the base of the fill, into the Merchantville Formation. The subsurface drain functions as a ground water sink that collects the ground water and lowers the water table on either side of the drain.

The reliability and efficiency of the drain would be increased by a ground water barrier on the landfill side of the drain. There will always be a possibility that clogging of the drain may occur by siltation or leachate. There should be a monitoring well system in the drain to determine effectiveness and repair zones. During construction, methane and other gases would enter the trench. Forced air ventilation is needed to prevent explosions.

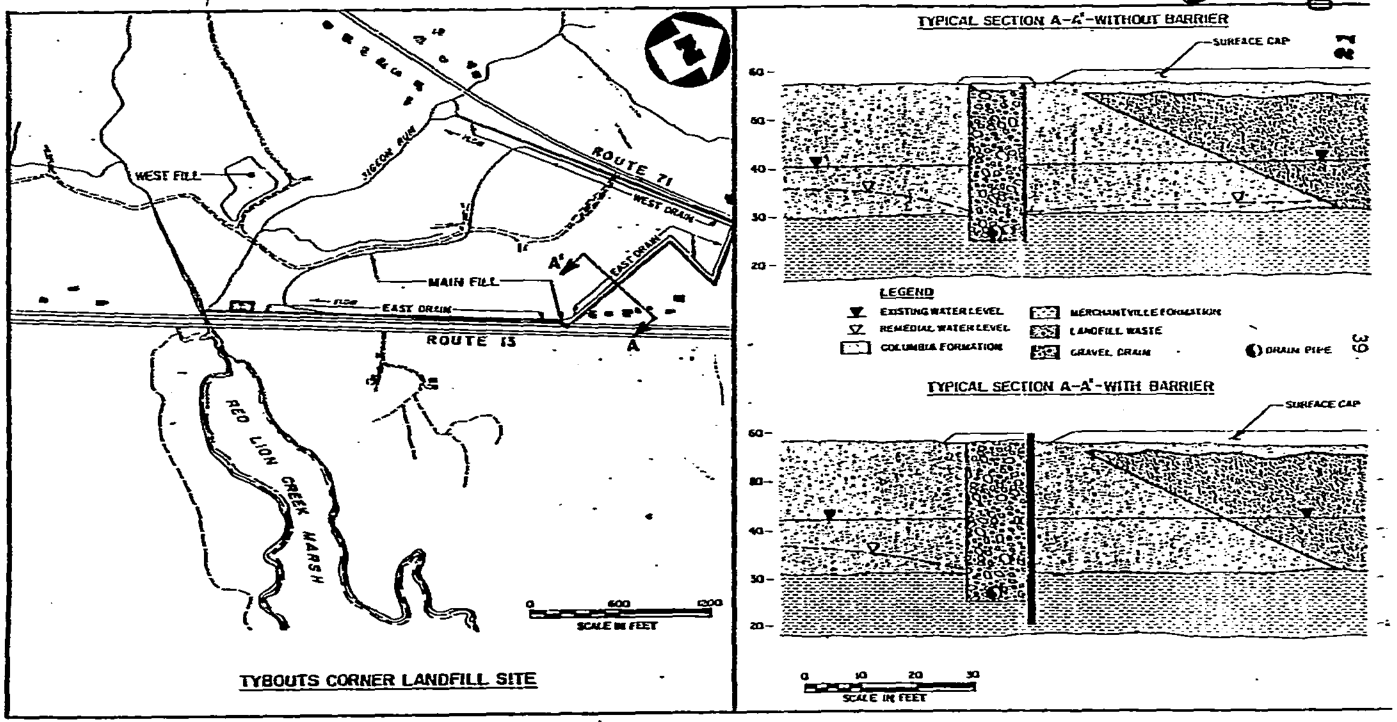
Ground water that enters the drain then enters a perforated pipe near the base of the drain, and the water is transmitted by gravity flow, to the discharge point. Since the ground water collected in the drain originates in either the landfill or contaminant plume of the Columbia Formation, the discharge from the drains will require treatment until acceptable levels are obtained at the end of the drain. Any discharge would comply with NPDES standards.

C5) <u>Main Fill Surface Cap and Ground Water Pumping in the Columbia Formation (with or without Ground Water Barrier)</u>

The surface cap/ground water pumping alternative is very similar to the surface cap/subsurface drain alternative, except ground water pumping is used to lower the water table and prevent ground water from migrating laterally into the main landfill. Figure 12 is a conceptual diagram showing the surface cap/ground water pumping (with or without ground water barrier) alternative.

The multi-layer surface cap and ground water barrier and treatment portions of this alternative are described in the previous sections.

The ground water pumping portion of this alternative is to continuously maintain the water table at or below the base of the landfill. The ground water pumping system would require a water collection and treatment system before discharging to the local drainage.



CONCEPTUAL DIAGRAM-MAIN LANDFILL
SURFACE CAP, SUBSURFACE DF (WITH AND WITHOUT BARRIER)
TYBOUTS CORNER LANDFILL SITE, NEW CASTLE CO., DE

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Figure 11

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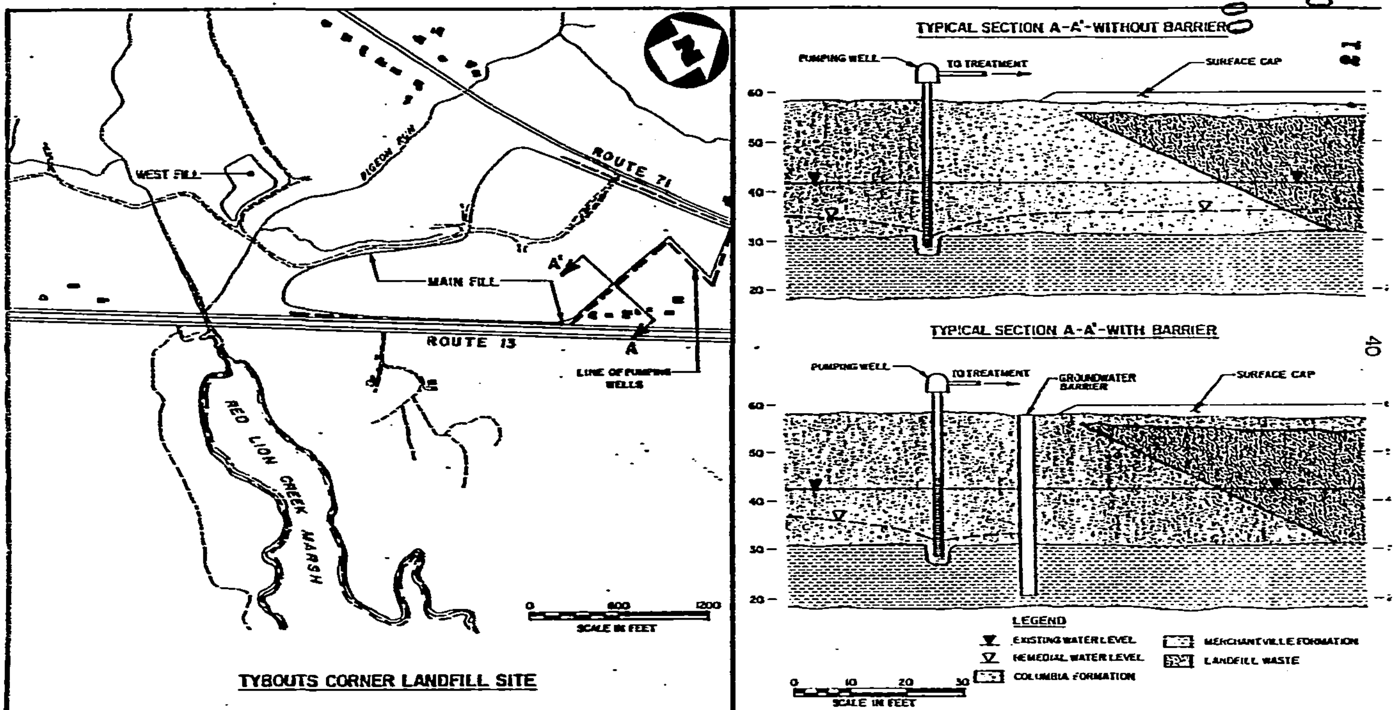
Figure 12



CONCEPTUAL DIAGRAM
SURFACE CAP, GROUNDWATER PL NG (WITH AND WITHOUT BARRIER)
TYBOUTS CORNER LANDFILL SITE, NEW CASTLE CO., DE

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Pumping in conjunction with the ground water barrier significantly increases the capability and the reliability of the system.

This alternative may not be feasible for remediation of Tybouts Corner Landfill site because the reliability of this system is directly related to the operation and maintenance of the pumping system since a failure of a pump or well would lead to resumption of lateral ground water flow through the landfill. The water level in the fill material will be immediately affected by a breakdown in the system and leachate production would resume.

Engineering design of a ground water pumping system to dewater the landfill and prevent lateral ground water flow from entering the landfill would require a more detailed design-investigation consisting of several test and observation wells along the eastern and northern perimeters of the fill.

C6) Main Fill Surface Cap/Diversion Trench

The surface cap and diversion trench alternative involves excavating a diversion trench along the eastern and northern borders of the landfill that isolates the landfill from the surrounding ground and ground water system and placing a surface cap over the main fill and side-slopes of the trench. Figure 13 is a conceptual diagram showing the surface cap/diversion trench alternative, as applied to the main landfill.

The diversion trench would be excavated in the landfill materials to a depth either below the base of the landfill or the depth required to maintain grade for drainage, as shown on Figure 13.

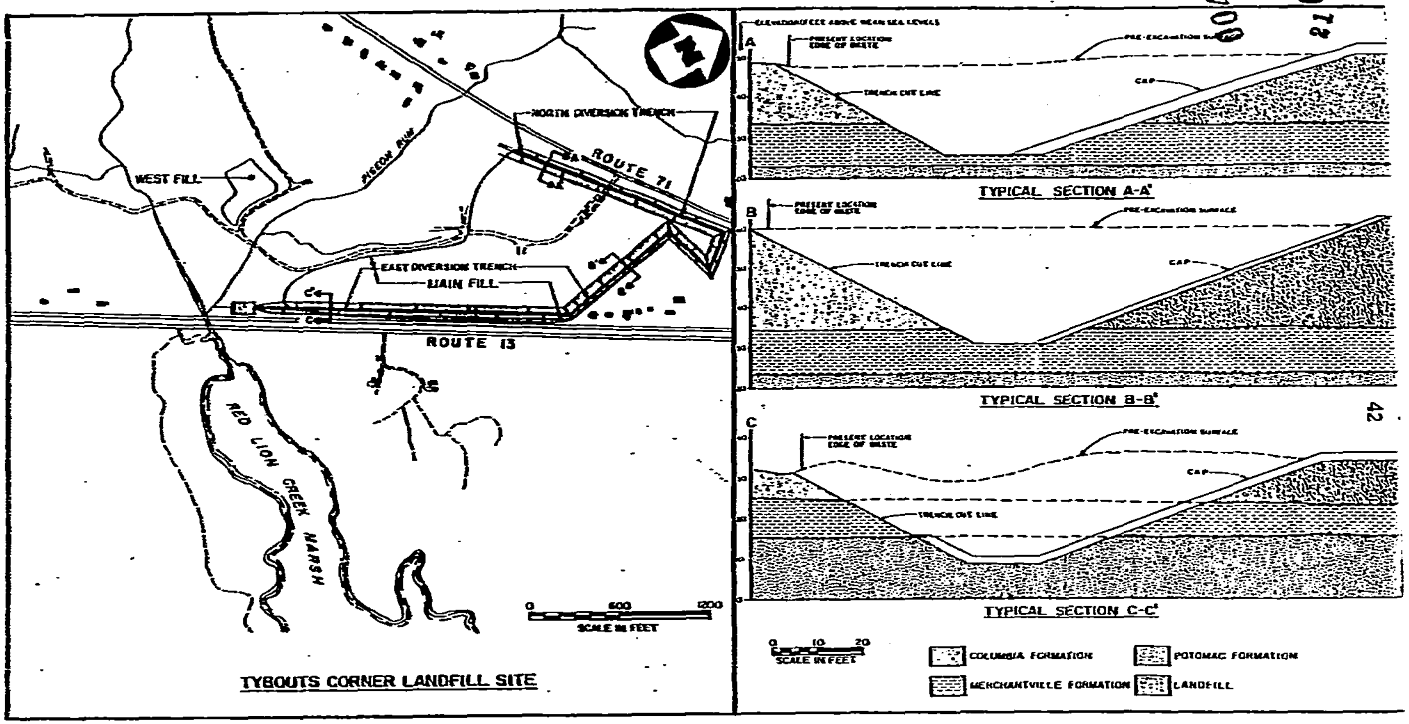
The diversion trench can be excavated using conventional methods. The main health and safety concerns are those individuals associated with excavation of the landfill to construct the open trenches. Excavation may require respiratory and dermal protection.

Construction of the trench will require provisions for controlling, collecting, and treating contaminated ground water that will enter the trench. Wastewater characteristics and the treatment required are expected to be the same for all main landfill alternatives.

Source Control Excavation

C7) Excavate Main Fill, RCRA Landfill Onsite

Excavation and removal of the contaminated waste of the main landfill is proposed as a method to mitigate the source of ground water contamination. Excavation depths are expected to be up to 36 feet in some areas of the



CONCEPTUAL DIAGRAM-MAIN LANDFI_ _URFACE CAP, DIVERSION TRENCH
TYBOUTS CORNER LANDFIL_ _ITE, NEW CASTLE CO., DE

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Figure 13

main landfill. Volume of excavation for the main landfill is nearly 1.5 million cubic yards; it will be assumed that, if the main landfill is excavated, the west landfill also will be excavated and disposed of in the RCRA landfill.

Excavation can be completed using conventional methods. However, large volumes of water will be generated by the excavation, and this water will require treatment. Wastewater characteristics and the treatment required are expected to be the same for the previous main landfill alternatives. Also, safety requirements will increase the time and cost for excavation. The wastes will be compacted before disposal.

Once the excavation of the waste is completed, the main landfill will be regraded to avoid ponding water. The west landfill will require a deep excavation to remove the waste, and regrading will not be possible. The west landfill will require backfill with clean soils. Both areas will be revegetated when work has been completed. The location of the proposed RCRA landfill, and a typical cross-section are shown previously in Figure 9.

C8) <u>Excavate Main Fill, Offsite Disposal</u>

This alternative is similar to Excavate Onsite Disposal since it involves excavation of the main and west landfill but presents another option for disposal. Here the excavated waste material would be loaded into trucks and hauled to a permitted hazardous waste landfill for disposal.

C9) <u>Excavate Main Fill, Onsite Incineration</u>

This alternative would involve excavation of both the main and west landfills, with onsite incineration as an option for disposal.

This disposal method involves construction of one or more rotary kiln incineration units onsite. Mobile incineration is not being considered due to limited capacity and limited availability.

A rotary kiln incinerator would decontaminate the wastes by burning at a temperature in excess of 2,000°F. By-products of incineration are gases and noncombustible particulate matter (which is removed by an air pollution control device) and bottom ash and fly ash. The bottom ash and fly ash, approximately 20 percent of the original volume of waste, will probably be considered hazardous, and will have to be disposed in a secure RCRA landfill.

The large volume of waste makes this a very costly and time-consuming alternative. It is estimated that a large capacity rotary kiln (50 million BTU/hr) can incinerate approximately 7,000 lb/hr. At this rate it would take 65 years to incinerate the entire landfill using only one incinerator. In order to maintain a reasonable time frame, the number of incinerators must be increased.

C10) Excavate Main Fill, Offsite Incineration

This disposal method involves hauling the excavated wastes to an offsite permitted incineration facility. Since this is such an unlikely possibility, no costs have been calculated.

SUMMARY TABLE
MAIN FILL ALTERNATIVE

Alternative	*Cost (Millions) &
Surface Cap, Subsurface Drainage (with and without a ground water barrier)	35.8 to 69.0 with barrier 32.9 to 64.4 without barrier
Surface Cap, Ground Water Pumping (with and without a ground water barrier)	18.1 to 54.9
Surface Cap, Diversion Trench	34.2 to 70.9 (both fills)
Excavate, RCRA Landfill Onsite	53.6 (both fills)
Excavate, Offsite Disposal	246.7 (both fills)
Excavate, Onsite Incineration	370.7 (both fills)
Excavate, Offsite Incineration	---

* The costs of these alternatives includes the multi-layer cap over the main fill area after consolidation of the west and main fills. Also, the treatment system is included for an onsite facility which will remove contaminants from the ground water and will discharge water in technical compliance with NPDES standards.

D. Offsite Ground Water Management Alternatives

D1) One Pumping Well at OR-6A

This aquifer remediation alternative involves establishing a production well for water supply use by Texaco Marketing and Refining Company using the present well at the location of well OR-6A. The location is approximately 3000 feet away and on the southern side of Red Lion Creek from the site. Texaco would use the water for their operations.

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Pumping of a production well at location OR-6A would draw contaminants to the well where Texaco would mix the water with water from other wells for use in their facilities.

This alternative will cause accelerated degradation of water quality further and deeper in the UHZ than currently exists. Ground water use restrictions will be imposed between Well OR-6A and the contaminant plume.

Also, because of the layering of sand and clay lenses in the UHZ, there may be areas of the plume which will not be drawn to the production well.

Ground water contamination could reach this production well within five years and will require continuous pumping for an extended period of time, possibly 20 to 30 years.

A long term monitoring program consisting of periodic sampling and analysis for organic compounds should be implemented if the well is used for production. Monitoring on a quarterly basis should be sufficient to detect plume interception.

D2) <u>Two Pumping Wells for Contaminant Plume Remediation and Water Resource Recovery (West and Main Landfills)</u>

This alternative involves installation of two new production wells that will be used to collect the contaminant plumes migrating from the west and main landfills. One well will be located immediately downgradient from, and slightly beyond the contaminant plume migrating from the main landfill; and the other within the contaminant plume immediately downgradient from the west landfill. Both wells will be be located to optimize contaminant plume collection and aquifer remediation. The location and a conceptual diagram of these wells is shown on Figure 14.

An estimate of the pumping rates and effectiveness in remediating the contaminant plumes was made using ground water modeling described in Appendix M of the RI/FS Report. Simulated pumping rates of 110,000 gallons per day for the main landfill well and about 6,000 gallons per day for the west landfill were estimated for the pumping. The actual pumping rates required may be different from these simulated rates, and actual pumping rates should be determined by a design investigation (pump test) prior to final design of a treatment system. Solute transport model simulation indicates these rates are sufficient to stop further migration of the plumes, and to collect the plume for remediation. The simulation indicates that remediation of the plume from the main landfill may take from 20 to 35 years of fairly continuous pumping.

Ground water pumped from the contaminant plume will have to be collected and treated before discharge to local surface waters. Technical compliance with all environmental laws will be maintained.

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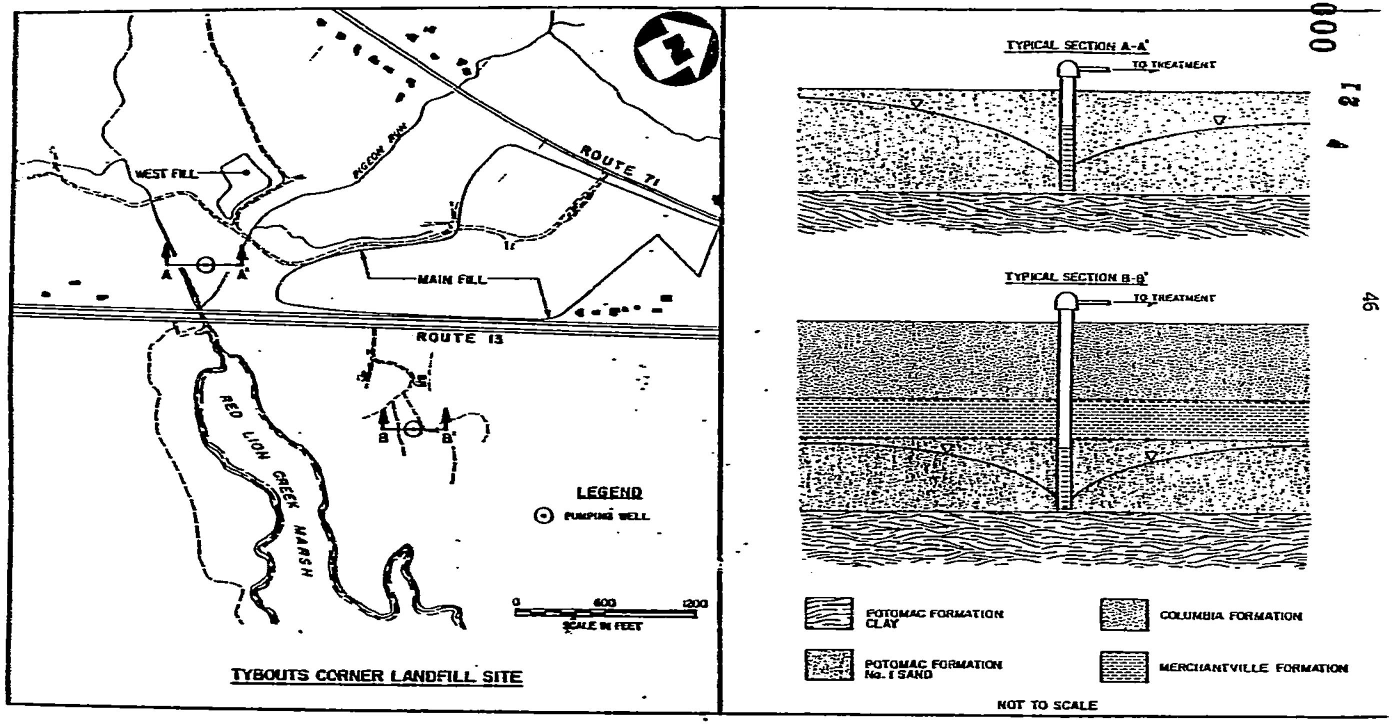
Figure 14



CONCEPTUAL DIAGRAM-M[illegible] AND WEST LANDFILLS
CONTAMINANT PLUME INTE[illegible]EPTION AND REMEDIATION
TYBOUTS CORNER LANDFILL SITE, NEW CASTLE CO., DE

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D3) Three pumping wells for the Main Landfill Plume: One Pumping Well for the West Landfill Plume.

The three well system for the main landfill consists of placing three wells close to the landfill, within the contaminant plume. The three well alternative was evaluated for comparison to the installation of one well to collect the plume from the main landfill.

The three-well system involves pumping and treating the aquifer until contaminants derived from the landfill are removed to levels that are acceptable. Pumping wells are located in the plume so that only contaminated water is removed for treatment. Contaminanted ground water pumped from the wells must be treated and discharged as previously discussed.

The pumping rates for the three wells were estimated by using the ground water model discussed in Appendix M of the RI/FS report. The simulated, combined pumping rate was 33,800 gallons per day. The estimated computer simulated time required for aquifer remediation is between 40 and 100 years.

The one pumping well to intercept and remediate the west fill plume is the same well described for the west fill in Section D2.

Figure 15 shows the estimated location and a conceptual diagram for the three-well system alternative.

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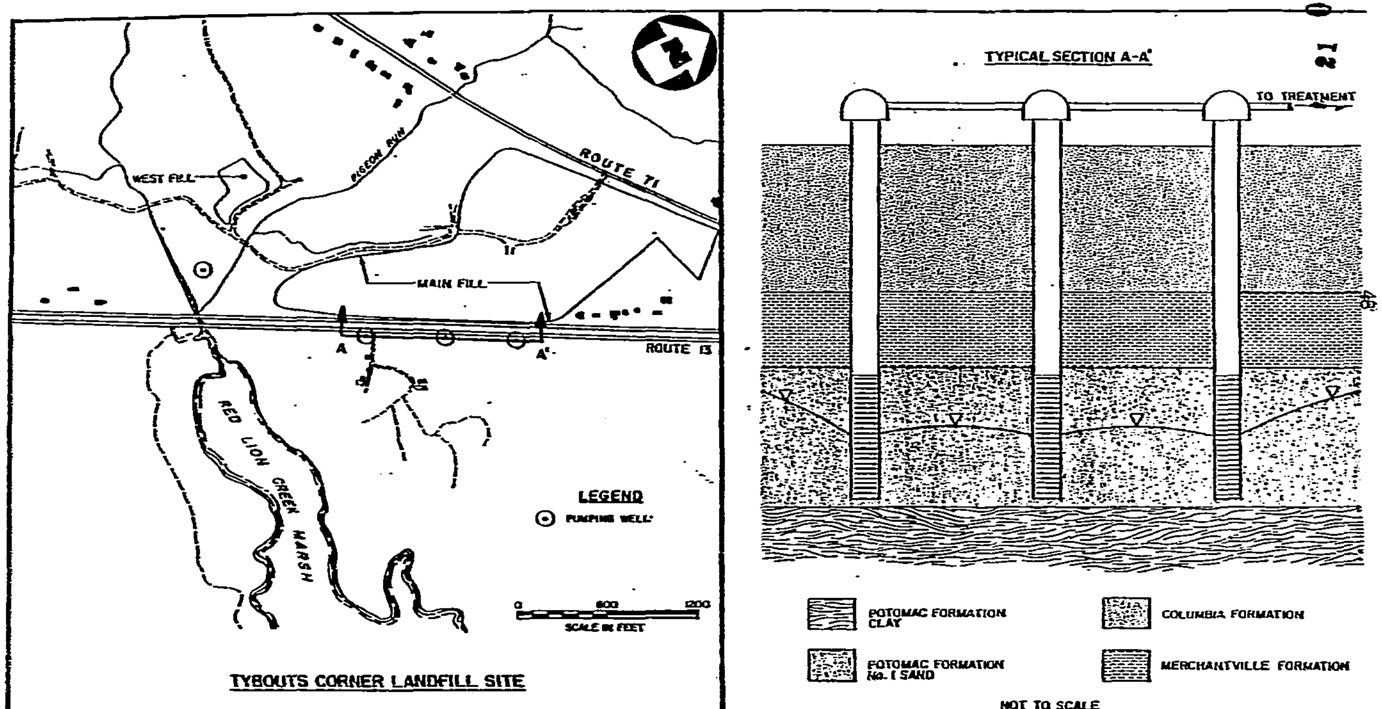
Figure 15



CONCEPTUAL DIAGRAM – MAIN LANDFILL
CONTAMINANT PLUME INTE EPTION AND REMEDIATION
TYBOUTS CORNER LANDFIL SITE, NEW CASTLE CO., DE

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RECOMMENDED ALTERNATIVE

Section 300.68(j) of the National Contingency Plan (NCP) 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 (i.e., the lowest cost alternative that is technologically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare and the environment. In selecting a remedial alternative EPA considers all environmental laws that are applicable and relevant. Based of our evaluation of the proposed alternatives, the responsible party evaluation of alternatives, the public comments and the information received from the Delaware Department of Environmental Control, we recommend the following.

The alternative for source control selected here is B2 in combination with a variation of Alternative C4, the Main Fill Surface Cap and Subsurface Drain in the Columbia Formation. The multi-layer cap which complies with RCRA standards will be used. The difference from the alternative described in the FS is the location and length of the subsurface drains.

The basis for acceptance of the alternative is how effectively it can lower the water table in the fill. As part of the Feasibility Study, the U.S. Geological Survey (USGS) three-dimensional, finite-difference model developed by McDonald & Harbaugh was used to represent what the three-dimensional effects would be. The proposed conceptual design of the subsurface drains consists of an upgradient interceptor subsurface drain and a downgradient contaminated ground water control subsurface drain as shown on Figure 16. Design modeling showed that it could effectively lower the water table within the landfill. More detailed information about the ground water modeling can be obtained in Volume V of the RI/FS report.

The alternative selected for the offsite ground water contamination is some variation of D2 or D3, pumping wells for the main landfill and for the west landfill. However the exact number of wells, location and pumping rates will be determined by a design investigation. Figure 17 shows possible locations of the ground water recovery wells.

The specifics of the recommended alternative are:

1) The west fill will be excavated and consolidated with the main fill. Excavation will include all municipal and industrial wastes as well as contaminated subsoils. The amount of contaminated subsoil to be removed will be based on a site specific chemical fate and transport analysis. This analysis will be conducted to ensure that no soil remains in place which could cause ground water contamination to exceed the standards established in this Record of Decision. The excavated area will be backfilled with suitable clean fill material.

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Figure 16

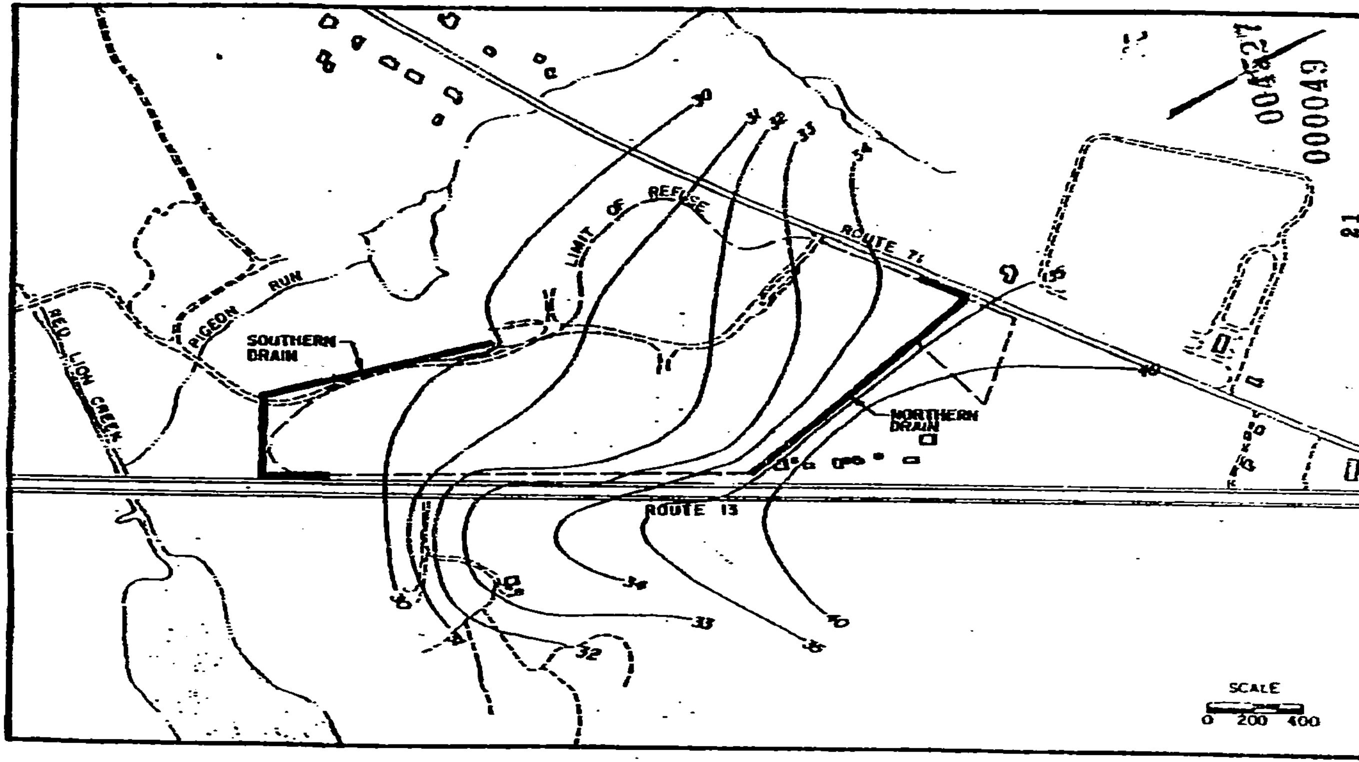

DIAGRAM 2

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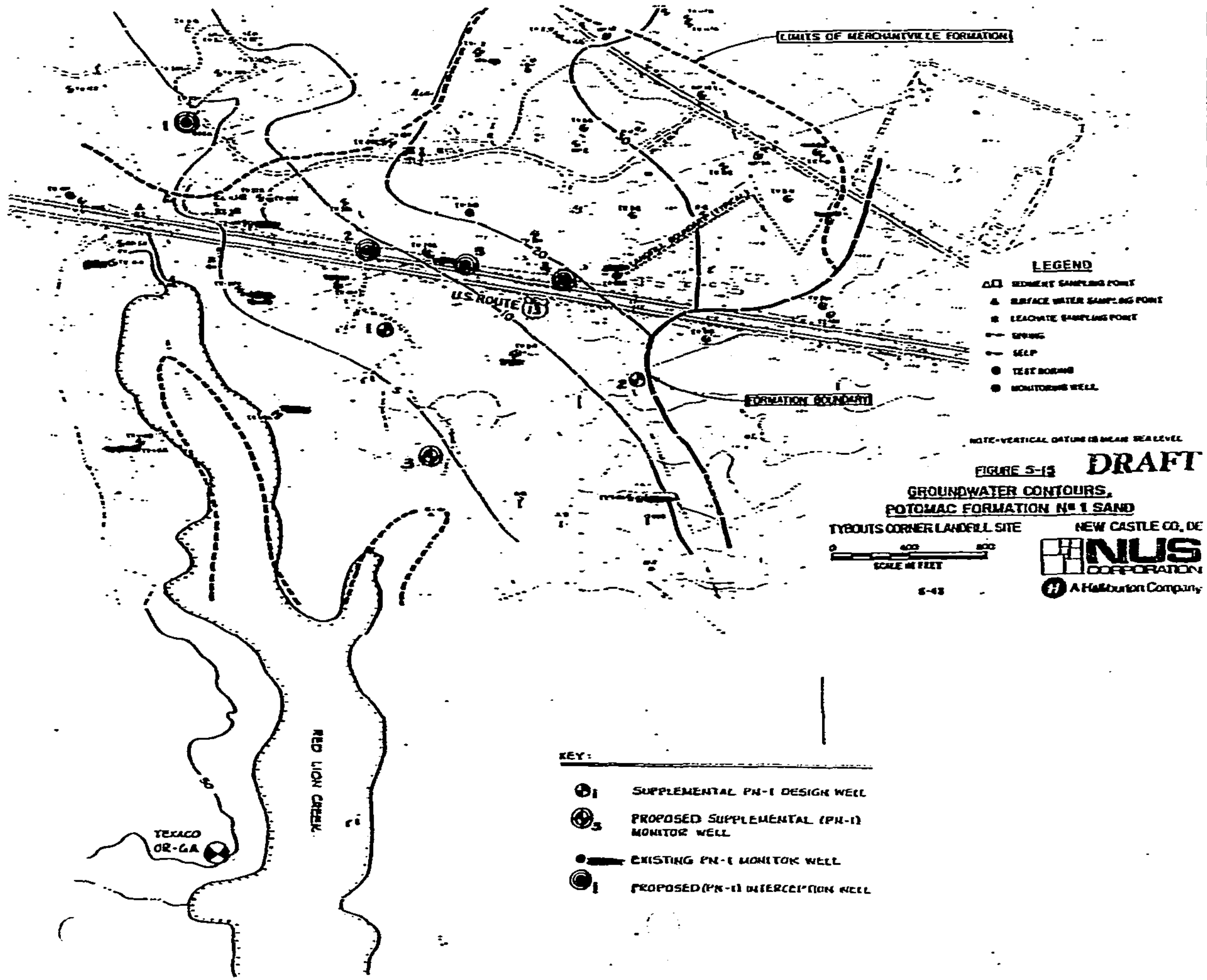

FIGURE 5-15 **DRAFT**

GROUNDWATER CONTOURS, POTOMAC FORMATION No 1 SAND

TYBOUTS CORNER LANDFILL SITE — NEW CASTLE CO., DE

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Figure 17

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2) A multi-layered cap that complies with RCRA will be placed over the consolidated main fill area to significantly reduce or eliminate the vertical infiltration of precipitation.

3) A subsurface drain or trench system will be installed to prohibit continued lateral migration of ground water through the fill and to collect existing leachate from the fill. The multi-layered cap and the subsurface drain/trench system together are intended to dewater the consolidated fill. This ground water diversion system and multi-layered cap will be maintained until they are no longer needed.

4) The offsite plume of contaminated ground water in the Upper Hydrologic Zone (UHZ) of the Potomac will be pumped and treated or otherwise disposed of, either onsite or offsite. During the pumping institutional controls to restrict use of the ground water will be utilized.

The goal of the offsite ground water pumping will be to reduce the level of contaminants to 100 ppb of total volatile organics with separate standards for the following cancer-causing contaminants where MCL's are available. The levels for these specific substances are listed here.

Vinyl chloride	1.0 ppb
Benzene	5.0 ppb
1,2-Dichloroethane	5.0 ppb

These standards are anticipated to meet the goal of a 10^{-4} cancer risk at the boundary of the landfill property.

Ground water will be pumped for a minimum of three years, at which time pumping will be discontinued if contaminant levels have been reduced to standards set above. If the standards are not reached, pumping will continue for another three years. If after that time the standards have not been met but pumping has achieved substantial compliance with the standards and the levels of contaminants are constant in each well, pumping will be discontinued. If not, pumping will continue for another four years. If after the ten-year pumping period, standards have still not been met, EPA will evaluate the technical feasibility of meeting the standards and set new ones if necessary. Pumping may be terminated if it is shown that no reasonable modification of the pumping system or additional years of pumping would produce significant improvement.

EPA will then examine the need for additional monitoring locations to assure that the influence of any offsite production well will not affect the remaining contaminated ground water from Tybouts Corner Landfill.

The offsite contaminant plume in the Columbia Aquifer will be allowed to flush itself clean. Once the source control is in place, no further contamination will enter the Columbia Aquifer and we predict that it could take between 10 to 15 years for all of the water that is contaminated to pass through the aquifer and seep into the Red Lion Creek Marsh. In the area of contaminated ground water, the Columbia is not hydraulically connected to the Potomac and the pumping of the Potomac should not influence the path of the Columbia contaminant plume.

5) Contaminated water generated by excavation, construction, subsurface drainage system collection and ground water pumping will either be sent to a local sewage treatment plant offsite, or treated onsite. It is possible that a combination of these two treatment systems and locations will be used. All treated water will meet NPDES standards before disposal to surface waters, including any pre-treatment requirements id the local sewage treatment plant is utilized. All waters will be disposed of in compliance with local, state and federal law.

6) A health and safety plan will be implemented for all activities described in this Record of Decision. During excavation and construction activities, air monitoring will be conducted to ensure the safety of the onsite workers as well as to protect the residents living nearby the excavation areas.

7) A monitoring program will be established to ensure that ground water quality, surface water quality, the multi-layer cap and air quality are maintained.

Operation and Maintenance

Operation and maintainance will consist of maintaining the effectiveness of the RCRA cap, maintaining the subsurface drain system to prevent clogging up or overflow, and maintaining the pumps from the drains to the treatment system. If an onsite treatment plant is constructed operation and maintenance will include the treatment system and proper disposal of contaminants.

Long term monitoring of the offsite ground water plume will be necessary to ensure the following two things:

1. that levels at the boundary do not exceed the standards after the pumping is discontinued, and;

2. that monitoring wells which are used to ensure no further spread of contamination remain uncontaminated.

If standards are exceeded at the boundary or if previously clean monitoring wells become contaminated pumping and treating will be resumed.

Consistency With Other Environmental Laws

The west fill will be closed in accordance with the RCRA closure requirements of 40 CFR §264.228(1) by removing all wastes and contaminated subsoils as discussed in the description of the selected remedy.

The multi-layered surface cap will be designed and constructed in accordance with the RCRA requirements 40 CFR §264.310.

The ground water diversion system will be designed and constructed to effectively "dewater" the main landfill. During construction the contaminated water will be disposed of in compliance with all local, state and federal regulations.

The offsite ground water contaminant plume will be pumped and treated with the goal of compliance with RCRA through establishment of standards to be met at the boundary of the facility. The goal is to meet the corrective action requirements of 40 CFR §264.100.

EVALUATION OF ALTERNATIVES NOT SELECTED

Alternative A1 was rejected for reasons stated in the no action alternative description.

West Fill Alternatives

The Surface Cap, Ground Water Barrier and Pump alternative is technologically feasible but the costs are excessive, when we consider that the west fill is only the smallest portion of the entire site. In addition it is simply not as effective as removal. The west fill is presently in the Potomac No. 1 Sands where they are connected to the Potomac No. 2 Sands. Any breakdown in the barrier or the pumping system could allow continued migration of leachate from the west fill area.

Once the decision is made to excavate the cost effectiveness determined the choice to place the excavated material on the Main fill. The other alternatives (B3, B4, B5 and B6) were millions of dollars more.

Main Fill Alternatives

Source Control Capping Alternatives

Evaluation of the effectiveness of these three caps was based on the amount of rainfall that each cap would allow to enter the fill materials. The 10^{-6} cap (alternative C1) allows approximately 60% of the present amount of water to enter the fill (26,000 gallons per day). The 10^{-7} cap (alternative C2), allows 7% (3,000 gallons per day) and the multi-layer cap (alternative C3) allows 2% (800 gallons per day).

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of organic contaminants at the well are expected to be very low and possibly non-detectable, but levels between the production well and site will probably be high enough to pose a risk to human health if the water were used.

A specific treatment alternative is not selected in this Record of Decision because there are several options available for treatment which are equally effective. Offsite, a publicly owned sewage treatment plant may be available or an onsite treatment plant could be built. This Record of Decision simply establishes that treatment is necessary and that disposal will comply with local, state and federal law. Any onsite treatment system may require a treatability study prior to construction.

Responsiveness Summary

The Feasibility Study (FS) and the complete list of alternatives was presented at public meeting held July 23, 1985. Another FS meeting was held on December 18, 1985, at which EPA presented the Preferred Alternative. In response to the December meeting a petition was signed by 192 people and a response was prepared and sent out. Minutes from the meetings, the petition and response are included here.

Over all, community relations have been on going since the first meeting held in March 1983. During the course of this Remedial Investigation and Feasibility Study ten public meetings have been held. Occasionally, monthly news letters were prepared, other meetings were held with local citizens in private homes and during the water line construction an EPA representative was able to talk with most of the homeowners who were offered the connection to the public water supply.

Most of the discussion about the recommended alternative focused on the time period for remedial action. The remedial action includes maintainance of the surface cap and the ground water diversion system for as long as they are necessary and pumping related to the ground water diversion will be maintained. However, the pumping associated with the offsite ground water contaminant plume may be discontinued if the standards set by this ROD are met.

A SUMMARY OF
CITIZEN AND INTERESTED-PARTY COMMENTS AND CONCERNS
AND OF U.S. ENVIRONMENTAL PROTECTION AGENCY RESPONSES

TYBOUTS CORNER LANDFILL SITE
PUBLIC MEETING

TYBOUTS CORNER, NEW CASTLE COUNTY, DELAWARE
JULY 23, 1985

Public and Environmental Health

Issue: **The site is affecting the health of community residents and their children. A number of citizens believe the area has a high number of cancer victims; one person stated that 60 percent of the deaths in the county are from cancer. Another said he developed the disease "in 5 months." These people were certain the Tybouts Corner Landfill Site is responsible for illnesses in the area.**

Response: The air quality at the Tybouts Corner Landfill Site poses no risk to the community. Two local wells were affected by the site. The Wagner well has been abandoned, and a treatment system was connected to the Woytko well. These are the only wells affected to date. No municipal water supplies have been affected by the Tybouts Corner Landfill Site.

Issue: **Many people in the area hunt and fish near the site. Contaminated groundwater is known to be entering local surface waters. How does this contamination affect the wildlife that feeds in the area and does the contamination affect the food chain? Can people become ill from eating locally caught fish and game?**

Response: The Department of Health of the State of Delaware has sampled fish in areas proximal to the Tybouts Corner Landfill Site, and the Department of Health does not consider the fish to be a threat to human health.

Issue: **Shouldn't a health survey be conducted?**

Response: The purpose of the RI/FS is to remediate the landfill and the groundwater contamination, not to conduct a health survey.

Costs and Funding

Issue: **More importance is being given to remedial costs than to the effect the site is having on human health. No cost should be spared when human health is at stake.**

Response: All technically feasible alternatives that would utilize known and proven techniques to remediate the Tybouts Corner Landfill Site were examined without regard to costs. Costs were merely reported for each alternative. The cost effectiveness of each alternative is considered during selection of the final remedial alternative that will be implemented, but not at the expense of human health or of the environment.

Issue: **Will the potentially responsible parties (PRPs) be required to pay for cleanup? If not, where does Superfund get its money?**

Response: Yes, the PRPs are responsible for costs. Superfund money comes from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), passed by Congress in 1980.

Technical Questions

Issue: **What is the goal of the RI/FS? Is it total cleanup?**

Response: The stated objective is to find the most cost-effective method to protect the public health and the environment from current contamination and from potential contamination.

Issue: **Have any of the options proposed for cleanup been done anywhere else?**

Response: All of the technologies evaluated during the feasibility study have been successfully utilized at other sites. However, each site is unique, and technologies that work well at one site may not be applicable at other sites.

Issue: **When can we expect construction of the final remedial action alternative to begin?**

Response: Hopefully, construction will begin by December 1986.

Issue: **What impact is the site currently having on existing wells?**

Response: Currently, the site is not affecting any municipal water supply wells. Two private wells did become contaminated; one has been abandoned, and the other is now connected to a treatment system. In addition, all local well users have been connected to the municipal water supply.

Issue: **How great an area is currently contaminated? Is it measurable in square miles?**

Response: Presently, contamination of the regional aquifer extends 400 to 800 feet east to southeast of Route 13. Contamination has also spread several hundred feet north of Route 71.

Issue: **How do you know that the Columbia Aquifer and the Potomac Aquifer are connected?**

Response: Drilling samples and logs show that the Columbia formation lies directly on top of the Potomac formation sand north and northeast of the site. One boring, located within the main landfill, showed a small area where there was no intervening, low-permeability layer between contaminated landfill materials and the Potomac formation sand.

EPA Guidelines

Issue: **How does Superfund restrict future use of the site?**

Response: The EPA will ask the county and the property owner to restrict the property deed.

Issue: **No hazardous wastes are to be moved on or off the site; yet trucks have been seen hauling sand and gravel from the site. Why doesn't anyone stop this?**

Response: Sand and gravel are not hazardous wastes.

Remedial Action Alternatives

Issue: ***Isn't incineration considered to be the best way to handle hazardous waste?***

Response: Yes, it is one of the best methods, but the cost of incinerating wastes from the Tybouts Corner Landfill is estimated at $350 million.

Issue: **Wastes can be excavated and removed to offsite incinerators such as the incinerator referred to as the "Blue Goose." If this isn't possible, an incinerator can be built on site.**

Response: The use of an offsite commercial facility is not likely at this time. Approved facilities have limited treatment capacities and large backlogs of wastes. The volume of wastes at the Tybouts Corner Landfill Site is estimated to be 1.5 million cubic yards; this volume greatly exceeds the annual maximum capcity of a typical commercial facility.

Onsite incineration would be very costly and time consuming because of the large volume of wastes at this site. The estimated capacity of a large volume rotary kiln (50 million BTU/hr.) is 7,000 lb/hr. It would take 65 years, at this rate, to incinerate wastes at the Tybouts Corner Landfill Site. To achieve a reasonable schedule for remediation, several incinerators would have to be built, and the cost would be prohibitive.

Issue: **An onsite incinerator might be the best idea. When the onsite contaminated wastes are all processed, the incinerator could be used to burn waste from other sites. Using the incinerator to**

process wastes from other sites would provide much needed jobs and revenue for the community.

Response: See response which directly precedes this one.

Issue: **Does incineration create an air pollution problem?**

Response: Gases and vapors generated during the incineration process are destroyed in an afterburner chamber. Byproduct gases and noncombustible materials are removed from the gas stream by at least one of the numerous air pollution control devices available on the market.

Issue: **If an onsite landfill is chosen, will it be used to dispose of any wastes other than those from the site itself?**

Response: Possibly. Superfund money would only be used for existing materials.

Issue: **If EPA decides to pump the groundwater, how long will pumping be necessary?**

Response: Depending on the pumping scheme, tentative estimates indicate that between 10 years and 100 years would be needed to cleanse the groundwater.

Issue: **What is the volume of water moving through the site each day?**

Response: The volume of leachate generated by the infiltration of precipitation into the landfill is estimated to be 43,700 gal/day. The total volume of groundwater moving through the landfill each day is estimated to be 51,000 gallons.

Remedial Action Alternatives Suggested by Citizens

Issue: **There is no need to spend money on building incinerators when God has provided volcanoes that produce enough heat to burn anything that is put into them.**

Response: The nearest active volcano within the United States is Mount St. Helens. Transporting hazardous materials would involve interstate transport and the construction of transfer stations to handle the wastes at both the point of origin and the destination. Placing the wastes into the volacano would be hazardous to workers. These factors would greatly increase the risks to the public and to the environment. The technical aspects involved, as well as the health and safety aspects and the costs, make this option infeasible at this time.

Issue: **Contaminants can be frozen in the ground.**

Response: The freezing option is commonly used on small-scale projects of short duration to facilitate engineering activities for civil engineering works. It is not a proven option for hazardous waste disposal, and containing waste materials by this method would require maintenance in perpetuity. Cost would be extremely high.

Issue: **Why not dig a core into the [center of the] earth and force all of the waste into it?**

Response: Deep disposal options have been extensively investigated and considered for high-level nuclear wastes but, at present, there are no areas of this type available for storage of hazardous wastes.

Underground disposal is not viable at the Tybouts Corner Landfill Site because of the depths to which the aquifers extend. Since there are no approved offsite facilities, this option cannot be considered for the Tybouts Corner Landfill Site at this time.

Information Repositories

Issue: **The current information repositories are inconvenient; why not establish one at the Wilmington City Library?**

Response: Fine, we will place copies of the RI/FS in the Wilmington Library.

PRELIMINARY DRAFT

MEETING SUMMARY
TYBOUTS CORNER LANDFILL SITE
TYBOUTS CORNER, NEW CASTLE COUNTY, DELAWARE
DECEMBER 18, 1985

On December 18, 1985, the U. S. Environmental Protection Agency (EPA) and the Delaware Department of Natural Resources and Environmental Control (DNREC) held a public meeting at 7:30 pm in the Gunning-Bedford Junior High School. Representing the EPA at the meeting were Ed Skernolis, Site Response Section Chief, Ann Cardinal, Region III Community Relations Coordinator, and Roy Schrock, Regional Site Project Officer. The DNREC representatives were Mike Apgar, Supervisor of the Geohydrology Branch; Bob Pickert, Environmental Engineer, CERCLA Management Branch; Gus Merganthaler, Environmental Engineer, RCRA Management Branch; and Kathy Jamison, Information Officer. Carrie Deitzel, Community Relations Specialist, attended for NUS Corporation.

The meeting was opened by Kathy Jamison who explained that the purpose of the meeting was to discuss the preferred remedial alternative for the Tybouts Corner Landfill Site. Ms. Jamison stressed that the choice of remedial alternatives was not final. Before turning the meeting over to Mr. Schrock, she told the audience that DNREC technical personnel were present. Anyone wishing to discuss technical matters after the close of the meeting was instructed to contact Ms. Jamison for referral to the appropriate person.

When Mr. Schrock took the floor, he distributed copies of the fact sheet describing the preferred remedial alternative. The fact sheet had been mailed, earlier in the month, to persons on the EPA's interested parties mailing list. Mr. Schrock then proceeded to explain the EPA's purpose for holding the public meeting. He also outlined the steps of the Superfund process remaining to be taken for the Tybouts Corner Landfill Site and reviewed the preferred remedial alternative. Mr. Schrock then announced that the public meeting marked the opening of the public comment period which would be closed on January 8, 1986. During this time, interested parties' comments and concerns would be solicited by the EPA. Following his review of the preferred remedial alternative, Mr. Schrock addressed questions from the audience.

The preferred remedial alternative described by Mr. Schrock included excavation of the west fill and consolidation of the excavated materials with those in the main fill. The resulting pit in the west fill area would then be backfilled with clean fill materials, and the consolidated waste materials on the main fill would be covered with a multi-layered RCRA cap that would reduce or eliminate vertical infiltration of precipitation into the landfill. A subsurface drain system would be installed to prevent the lateral migration of groundwater through the landfill and also to collect leachate flowing from the fill. In addition, pumping wells would be installed offsite to remediate the contaminated groundwater plume in the Upper Hydrologic Zone (UHZ) of the Potomac aquifer. These wells would be pumped for a minimum of 3 years or until a level of 100 ppb of total volatile organics is reached. Groundwater quality will be monitored, and contaminated water generated dur construction of the remedial alternative will be disposed in compliance with Federal, state, and local laws. An agreement is being negotiated with the City of Wilmington, Delaware for disposal of any contaminated waters from the Tybouts Corner Landfill Site.

The question and answer period was dominated by repeated outbursts from one local resident who has a history of such behavior at several previous site-related meetings. Six other individuals also asked questions, while the other members of the audience sat quietly listening.

The most frequently expressed concern was about collected contaminated groundwater. There seemed to be confusion initially about whether the collected water would be stored or treated and, if treated, where it would be discharged. There was also concern about whether treated water could be safely discharged into local surface waters.

The subsurface drainage system also received a great deal of attention from people who wanted to know how it would be constructed, how deep it would be, and what would prevent it from overflowing during heavy rains.

Several alternative methods of handling hazardous wastes were mentioned including total excavation and offsite storage, waste recycling, and offshore incinerator ships. The latter technology was addressed by Mr. Skernolis, who informed the audience that these ships were in very limited operation in the United States and that, at this time, they were being used only for one hazardous substance, PCB. One citizen suggested that remediation technologies should not be chosen until the landfill materials were actually excavated. This would allow the technologies chosen for site remediation to be based more specifically on what was in the landfill than on what was expected to be there. This person felt that this practice would lead to more efficient and cost effective ways of dealing with wastes than the current proposed excavation, relocation, and reburial method.

Remedial expenses and who should pay them were also mentioned by several residents. More than one individual felt that the responsible parties should be required to pay not only the cost of site remediation and maintenance but also the expenses now being incurred by local citizens, such as the cost of water and a monthly assessment for fire hydrants.

Another question concerned water-treatment methods, and concern was voiced that volatile organics, volatilizing into the air during water treatment, might cause air pollution problems. Many people expressed displeasure that remedial alternative construction would not begin until late December 1986, and some people wondered if it would be necessary to evacuate residents during the construction. The length of remedial alternative maintenance was discussed, and one resident stated his lack of confidence that the proposed pumping wells could remediate the groundwater effectively. This person also asked about the interconnection of the aquifers and requested a letter from Mr. Schrock stating that there is such a connection.

Ann Cardinal called the meeting to a close when interest appeared to be flagging and questions were becoming repetitive. She stated that the EPA and DNREC representatives would remain available to discuss any additional questions with people individually. Ms. Cardinal also reminded the audience that the EPA public comment period would remain open until January [illegible].

Throughout the meeting a reporter for the Wilmington News-Journal took notes. WHYY-TV and WILM-Radio also covered the event and conducted interviews with Mr. Schrock immediately after the close of the meeting.

Mr. Leo Woytko
965 Red Lion Road
Route 71
New Castle, DE 19720

December 28, 1985

United States Environmental Protection Agency
Region III
Mr. Roy Schrock
6th and Walnut Streets
Philadelphia, Pennsylvania 19106

RE: TYBOUTS LANDFILL CLEAN-UP PROPOSAL

We, the undersigned, are located on Hamburg Road, North of the landfill and in back of Mr. Leo Woytko. We have our own ring wells which are approximately 20 feet deep.

By pumping approximately 5 million gallons per day from the landfill, leads us to be concerned about the drainage of our wells. We would like to know what can be done for us and if this plan even concerned or took into account some of the other residents like us who live near the landfill. We would like to hear from you in the very near future.

Name	Address
Mr. & Mrs. [illegible] Harrington	1043 Bear Road, N.C., DE.
Mr. & Mrs. [illegible] McCormick	1041 Bear Road, New Castle, Del.
[illegible]	[illegible] Bear Rd. [illegible]
[illegible] Swift	865 Reybold Dr., N.C. De.
[illegible] M. Swift	865 Reybold Dr. N.C. De
Charlotte L. Mitchell	1031 Bear Rd N.C. De
[illegible] Mitchell	1031 Bear Rd N.C. De.
[illegible]	[illegible]

[illegible] Morris

Sandra Morris

Mr. & Mrs. Francis McDowell
842 Reybold Dr., N.C., De.

[illegible]

Betty Bendler 1045 Bear Rd.

Respectfully yours,

Leo Woytko

Leo Woytko

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Laura M. Greenwel

Aaron Sounder
1078 Bear Rd, N.C. De

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U.S. Environmental Protection Agency
Region III
6th & Walnut Streets
Philadelphia, PA 19106

Attention: Mr. Roy Schrock

Sir:

We, the undersigned, as residents of New Castle County, DE, ____________, located near the Tybouts Corner Landfill, wish to go on record as being opposed to the "Preferred Remedial Alternative for that Landfill", also known as the "Remedial Investigation/Feasability Study", or "RI/FS", as presented by the U.S. Environmental Protection Agency recently.

The alternative, or dewatering, as listed above is not a practical or long range solution to the problem. By way of proving the above, in a similar situation, the Landfill at Llangollen, some two (2) miles north of the Tybouts Corner site, the dewatering process has been in progress for thirteen (13) years, having existed since 1972. This operation has not been successful, and is still pumping!

We also oppose the dewatering as a solution to the contamination of the Potomac acquifer at this location because of the lowering of water tables in the area of this Landfill at Tybouts Corner.

In conclusion, we oppose the "RI/FS" as proposed by the U.S. Environmental Protection agency recently at a Public Hearing in Gunning Bedford School, Delaware City, Delaware.

It is neither practical, nor efficient as a solution in the long range context, is a waste financially to the U.S. Government, and the taxpayer as well as damaging individual residential water supplies.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Thank you for your interest in EPA's decision making process for the cleanup solution at the Tybouts Corner Landfill site.

I have reviewed your letter concerning the objections you have made to the Preferred Alternative presented to the public on December 18, 1985. The objections appear to be based on misunderstandings of the remedy and its effect on local ground water.

The first and most important concern is for those of you who have your own private wells and fear that ground water pumping will drain your wells.

The first misunderstanding is the amount of water to be pumped. The proposal is to place the wells along the landfill side of Route 13. At most, we are intending to pump 30,000 - 40,000 gallons per day at that location and not the 5 million gallons per day indicated in your December 28, 1985 letter. This pumping is intended to affect only the ground water within 300-400 feet east of the site. There are no private wells within this area, therefore the pumping of ground water can not affect existing local residential wells.

Secondly, the subsurface drains are part of the ground water diversion system. The upgradient drain will stop water from entering the landfill by collecting the water right before it enters the fill. The remaining ground water flow will go around the landfill. "Dewater" means to take the water from the landfill itself, not all the area around the landfill. The water elevation around the landfill will remain at the same levels while the water elevation in the landfill itself will drop 25 to 30 feet. This is how we can dry out the landfill material. The subsurface drains will not affect the ground water level in local residential wells.

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The third misunderstanding is the objection to EPA's preferred alternative because it is the same "solution" that was carried out at the Langollen, Army Creek Landfill site. There are several significant differences between the projects which make the comparison inappropriate. We are proposing an impermeable surface cap; only soil has been used at Army Creek. We are proposing to divert ground water around the landfill material to prevent further generation of leachate; no ground water diversion has been conducted at Army Creek. We are proposing to collect and treat the ground water contamination at the site; collection and treatment have not been carried out at Army Creek. The pumping wells at Army creek are intended only to prevent the contaminated ground water from moving any further in the ground water aquifer.

A final concern is that this project is a waste of U.S. Government funds. We expect a settlement with the group of responsible parties so that they can implement and pay for the cleanup alternative selected by EPA. It is true that your taxes will contribute to this cleanup fund because New Castle County was the operator of the facility and therefore one of the responsible parties. However, there are many other private companies which may have to share in the cleanup costs.

I have enclosed the preferred alternative for you to review once again. If there are further questions about what is written here, please feel free to call Roy Schrock at 215-597-0913 or Ann Cardinal at 215-597-9905. In addition we will plan to be available to discuss the preferred alternative with you at DNREC's new office on Grantham Lane at Route 9, south of New Castle on January 29th from 3:00 to 5:00 pm. and from 7:00 to 9:00 pm.

Sincerely,

Roy R. Schrock

Roy R. Schrock
EPA project manager

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(3HW21)

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DEC 27 1985

Hazardous Waste Management Division
EPA - Region III

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
89 KINGS HIGHWAY
P.O. BOX 1401
DOVER, DELAWARE 19903

OFFICE OF THE
SECRETARY

TELEPHONE: (302) 736 - 4403

December 13, 1985

Mr. James Seif, Regional Administrator
U. S. EPA - Region III
841 Chestnut Building
Philadelphia, PA 19107

Dear Mr. Seif:

The purpose of this letter is to inform you that the State of Delaware supports the proposed remedial alternative for the Tybouts Corner Landfill Superfund site, as described in a memorandum received by this Department on December 3, 1985.

I request that you keep me informed of your plans to hold a public meeting to explain the details of the proposed remedial alternative.

Finally, please keep me informed of your progress in negotiating the consent agreement for remedial cleanup with the responsible parties involved with the Tybouts Corner site.

If you have any questions concerning this letter, please do not hesitate to contact me directly.

Sincerely,

John E. Wilson, III
Secretary

JEW,III:PGR:lmw
cc: Robert W. Perkins
Robert J. Touhey
Phillip G. Retallick
Stephen Wassersug, EPA Region III

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DEC 18 1985

EPA, REGION III
OFFICE OF REGIONAL ADMINISTRATOR

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Alternative Components	Costs	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
A1) NO ACTION WITH MONITORING		Contamination from the landfills will continue to spread in the UHZ of the Potomac, which is a major water supply aquifer, and the Columbia aquifer.	Leachate generation will continue to discharge to surface water and ground water as a result of rainfall and ground water inflow from the Columbia aquifer.	Does not reduce vertical infiltration. Does not reduce lateral migration of Columbia through the landfill. Does not reduce contaminant plume in Columbia or Potomac aquifers.	Strict institutional controls must be applied to be sure no further well permits are issued in areas where contaminated ground water exists.
B1) WEST FILL SURFACE CAP, GROUND WATER BARRIER, PUMP AND TREAT	Capital $3.8 to $4.1 Million Present $5.2 to $11.7 Million	This alternative will effectively contain contaminated wastes and prevent further contamination of the Potomac UHZ aquifer.	Leaching of contaminated materials from the west fill will be eliminated.	Pump and treat system must maintain lower ground water level within the barrier than outside the barrier. Barrier to be be keyed into Potomac clay layer (approx. 55 ft. depth) and design investigation is needed. Treatability study should be performed. Onsite treatment will generate residuals which will require proper disposal.	To be most effective, this alternative should be used in conjunction with another main fill alternative.
B2) WEST FILL EXCAVATE, PLACE ON MAIN FILL	Capital $18 to 2.4 Million Present $2.4 to 3.7 Million	The source of hazardous waste will be removed from the Potomac formation. Some level of contaminated soils and ground water will remain.	Same as B1.	Approximately 63,000 cubic yards will be excavated. Backfilling with clean soils will be required.	Same as B1.
B3) WEST FILL EXCAVATE, RCRA FILL ONSITE	Capital $5 Million Present $6 Million	Same as B2.	Same as B1.	Same as B2.	Same as B1.
B4) WEST FILL EXCAVATE, OFF-SITE DISPOSAL	Capital $15 Million Present $16 Million	Same as B2.	Same as B1.	Same as B2.	Same as B1.

Alternative Components	Cost	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
B5) WEST FILL EXCAVATE, ON-SITE INCINERATION	Capital $7.7 to $8.3 Million Present $20.4 to 21.9	Same as B2.	Same as Bl.	Same as B2.	Same as Bl.
B6) WEST FILL EXCAVATE, OFF-SITE INCINERATION	Costs were not estimated.	Same as B2.	Same as Bl.	Same as Bl.	Same as Bl.
Cl) SURFACE CAP 2 FT. OF SLIT PERMEABILITY OF 10^{-6} cm/sec	This alternative was suggested by PRP's and costs were not provided.	The cap alone will not stop leachate generation; contaminant plume in the ground water will remain.	The cap will eliminate some surface seepage areas. Off-site leachate seeps will continue.	This cap will allow approximately 60% of the present amt. of water to enter the fill materials. This is approximately 26,000 gallons per day. (gpd)	Any cap must be used in conjunction with ground water control alternative. Present amount of water entering the fill is 44,00(gpd (avg. over the year)
C2) SURFACE CAP 2 FT. OF CLAY PERMEABILITY OF 10^{-7} cm/sec	Same as Cl.	Same as Cl.	Same as Cl.	This cap will allow approximately 7% of rainfall to enter the fill materials. This is approximately 3,000 gpd.	Same as Cl.
C3) SURFACE CAP Multi-Layer	Capital 15.7 Million	Same as Cl.	The cap will eliminate surface seepage areas onsite and will affect offsite seeps from the Columbia aquifer.	This cap will allow approximately 2% of the rainfall to enter the fill materials. This is approximately 800 gpd.	Same as Cl.
C4) SURFACE CAP MAIN FILL SUBSURFACE DRAINAGE IN THE COLUMBIA FORMATION (WITH AND WITHOUT A GROUND WATER BARRIER)	Capital 31.3 to 35.0 Million Present 32.8 to 69.0 Million	This alternative will significantly reduce the release of hazardous substances to the ground water beneath and around the site. It will also reduce surface discharges.	The existing landfill will remain in place; therefore, this alternative is to reduce or eliminate production of leachate coming from the landfills.	This alternative assumes the surface cap will meet RCRA standards. The subsurface drainage will be placed upgradient on the eastern and northern boundaries of the fill and will be constructed to allow gravity flow. Treatment should meet NPDES standards.	Space limitations between highways and fill materials will make the drain difficult to install. A design stage is necessary.

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Alternative Components	Cost	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
C5) MAIN FILL SURFACE CAP, GROUND WATER PUMPING IN THE COLUMBIA FORMATION	Capital 16.2 Million Present 18.1 to 20.0 Million	Same as C4.	Same as C4.	A RCRA cap is assumed. Ground water pumping will be done upgradient on the eastern and northern boundaries.	The reliability of this alternative for the long term is marginal.
C6) MAIN FILL SURFACE CAP, DIVERSION TRENCH	Capital 33 Million Present 39 to 71 Million	Same as C4.	Same as C4.	A RCRA cap is assumed and vented gases will be monitored. The diversion trench will be placed upgradient on the eastern and northern boundaries of the fill and will be constructed to allow gravity flow.	Same as C4.
C7) MAIN FILL EXCAVATE, RCRA LANDFILL ONSITE	Capital $61 Million Present $53 Million	Excavation will mitigate the source of ground water contamination and surface releases will be eliminated.	By removing the landfill, all environmental receptors will be protected when excavation is completed. Excavation will release gases from the landfill material.	The excavation can be done using conventional methods.	The estimated time for completion is 5 years
C8) MAIN FILL EXCAVTE, OFF-SITE DISPOSAL	Capital $61 Million Present $246 Million	Same as C7.	Same as C7.	Same as C7.	Implementability is highly questionable since there are very few facilities at this time and costs for hauling and disposal would be high.
C9) MAIN FILL EXCAVATE, ON-SITE INCINERATION	Capital $106 to $164 Million Present $327 to $370 Million	Same as C7.	Same as C7.	Technical compliance with RCRA regulation must be met.	The large volume of wastes make this very costly and time consuming.
C10) MAIN FILL EXCAVATE, OFF-SITE INCINERATION	Not calculated.	Same as C7.	Same as C7.	Same as C7.	Use of an offsite commercial facility is unlikely at this time due [illegible] limited capaciti[illegible] and large backlogs.

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Alternative Components	Costs	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
D1) MANAGEMENT OF GROUND WATER PLUME; ONE PUMPING WELL AT LOCATION OF TEXACO REFINING AND MARKETING COMPANY WELL OR-6A	None	This will cause the contamination to spread in the UHZ of the Potomac. Concentrations of organic contaminants at the well are anticipaged to be very low levels but levels between the well and the site will be higher; probably high enough to pose a risk to human health if the water were used.	This alternative will cause the contaminant plume to spread.	Remediation of the UHZ is not confirmed by the RI. How much of the plume which will not be drawn to the production well is unknown. This alternative will require continous pumping for an extended period of time, possibly 20 to 30 years. Ground water use restrictions must be implemented.	The production well could mix the water with water from other Texcaco wells for use in their facilities.
D2) MANAGEMENT OF GROUND WATER PLUME TWO PUMPING WELLS FOR CONTAMINANT PLUME REMEDIATION AND WATER RESOURCE RECOVERY	Capital $1,458,200 Present $3,673,000	This alternative will stop further migration of the plume; will collect the plume for remediation.	This alternative will protect the ground water resources.	This alternative will take 20 to 35 years of fairly continuous pumping, collecting and treating. A design investigation is needed. Institutional controls will be necessary until plume is remediated.	Aquifer remediation is contingent on source control.
D3) GROUND WATER PLUME MANAGEMENT THREE PUMPING WELLS FOR THE MAIN LANDFILL	Capital $1,033,500 Present $2,740,000	Same as D2.	Same as D2.	Same as 19 except this alternative will take 40 to 100 years.	Same as D2.

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RECORD OF DECISION

INITIAL REMEDIAL MEASURE SELECTION

Site: Tybouts Corner Landfill, New Castle County, Delaware

Documents Reviewed

I have reviewed the following documents describing the site and the need for Initial Remedial Measures for alternative water supplies for the residences and facilities at the Tybouts Corner Landfill site.

- "Hazard Ranking System Model of Tybouts Corner Landfill" dated July 15,1982
- "Remedial Action Master Plan and Project Work Statements for Tybouts Corner Landfill" dated December 30, 1982
- "Work Plan, Remedial Investigation/Feasibility Study of Alternatives, Tybouts Corner Landfill" dated August 1983
- "Health and Risk Assessment for Residential Water Wells, Tybouts Corner Landfill" dated September 1983
- "Focus Feasibility Study Water Supply Alternatives, Tybouts Corner Landfill" dated July 1984

Selected Action

This IRM will extend the existing public water lines to supply drinking water to the 42 residences/facilities in the expanded area surrounding Tybouts Corner Landfill. A request for allocation of $976,700.00 will be made following signature to this Record of Decision.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and the National Oil and Hazardous Substances Contingency Plan, I have determined that extending the public water supply to all residences surrounding the landfill is the appropriate Initial Remedial Measure for the water supply problems addressed in the Focus Feasibility Study for this site. The IRM described above is feasible and necessary to limit exposure or threat of exposure to the contaminated aquifers beneath the landfill, will provide the greatest protection to the public and is cost-effective.

September 13, 1984
date

Thomas P. Eichler
Thomas P. Eichler
Regional Administrator

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SUMMARY OF INITIAL REMEDIAL MEASURE
ALTERNATIVE SELECTION AT TYBOUTS CORNER LANDFILL

Site Location and Description

Tybouts Corner Landfill was constructed in a sand and gravel pit located in New Castle County, Delaware approximately ten miles south of Wilmington and four miles west of the Delaware River.

The main part of the Tybouts Corner Landfill is about 47 acres in size and is located near the confluence of Pigeon Run Creek and Red Lion Creek in a triangular area between U.S. Route 13 and State Route 71 (see figure 1). The thickness of the fill ranges from approximately five to thirty feet.

The landfill was constructed without a clay liner or other impervious material below the fill and no clay cap was placed on top of the fill following abandonment. The Remedial Investigation has shown that two shallow aquifers, beneath the landfill are contaminated with industrial wastes including: trichloroethylene, vinyl chloride, 1,2-dichloroethane, benzene and other organic and inorganic chemicals.

Some residences are less than a hundred feet from the landfill and have wells screened in the same aquifers affected by contamination from the site. Approximately 42 residences/facilities surround the entire landfill property and most of these also have wells screened in these same aquifers.

In addition to small individual wells, the landfill was placed in an area where extensive development of groundwater resources has occurred for both municipal supplies and large industrial facilities (see figure 2). The possibility for contamination in the Upper Hydrologic Zone (UHZ) of the Potomac Formation exists. Consequently, the Tybouts Corner Landfill was ranked as "number two" on the National Priorities List.

Site History

The landfill was operated by the New Castle County Department of Public Works from December, 1968 to July, 1971. Based on documents relating to operations at this site, industrial wastes were landfilled at this location in addition to the municipal and domestic refuse normally placed in a municipal sanitary landfill.

The first evidence of impact to water supplies occurred in April, 1976 when analyses of water from a domestic well several hundred feet east of the landfill showed contamination. The well, owned by Sara Wagner, revealed the presence of contamination directly related to the landfill.

Subsequent analysis in 1980 and 1981 from monitoring wells revealed the presence of high concentrations of numerous priority pollutants in the groundwater beneath the site and lower concentrations of these priority pollutants in off-site contaminated areas. A civil case was filed under RCRA 7003 in 1980.

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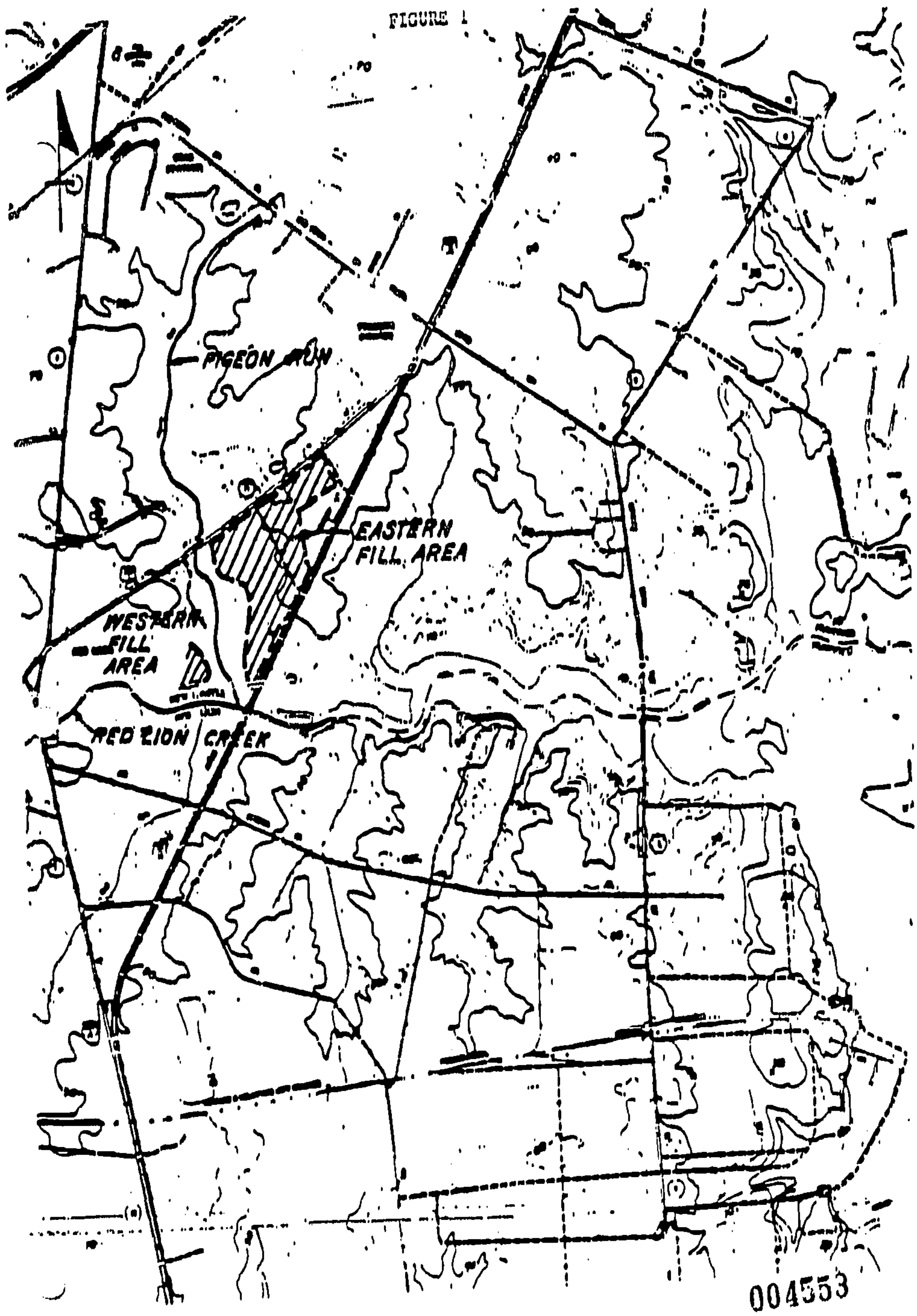
FIGURE 1



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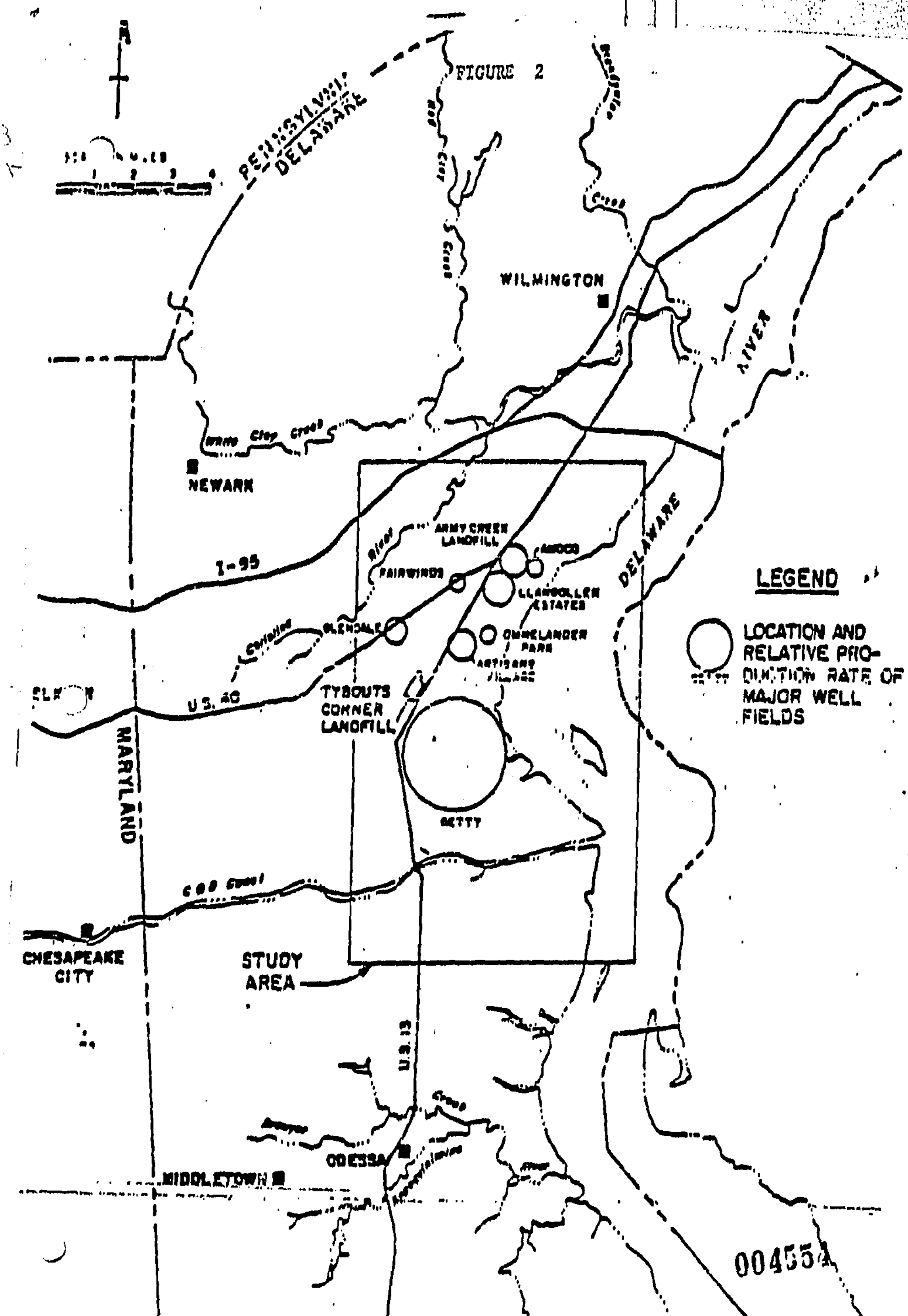

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In October, 1981 the site was placed on the Interim National Priority List under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of the United States. By December, 1982 a Remedial Action Master Plan was completed by R.E. Wright Associates for EPA Region III. By the Spring of 1983, NUS Corporation initiated the Remedial Investigation.

The Remedial Investigation (RI) for Tybouts Corner Landfill was initiated to determine the impact of the landfill on the local and regional groundwater systems. The main concern is that hazardous substances that were disposed in the landfill are contaminating the groundwater system. Residences close to the site have wells screened in the aquifers potentially affected by contamination from the site. In addition, the landfill is situated over a major regional aquifer that is used for private/municipal/industrial water supply throughout New Castle County.

The geologic and groundwater investigation portions of the RI were divided into three phases of drilling activities in the scope of work (Work Plan) for the RI/FS. The initial Phase of drilling was to determine the general character of the geology and groundwater at the site for the regional aquifer (Potomac Formation) and to determine if contamination could be occurring in that aquifer. The Second Phase of drilling was to determine the detailed geology and potential for groundwater contamination in the shallower aquifers that lie above the regional aquifer in the immediate vicinity of the landfill. The Third Phase of drilling was to determine the exact character of groundwater contamination, or potential contamination, in the regional aquifer, if the results of the Initial and Second Phases indicated that the regional aquifer is, or could become, contaminated in the future.

The Initial and Second Phases of the RI have been completed. The Third Phase has not been implemented and is scheduled for September 1984. The results of the Initial and Second Phases of drilling and a health and risk assessment of the analytical results of samples from residential and monitoring wells indicate that there is a threat to the public health posed by groundwater contamination by the landfill.

Table 1 shows the contaminants found in the Wagner well in 1980 and the Woytko well in 1983. The data presented in the attached Table contains at least five organic substances listed as carcinogens by the EPA. These substances were in concentrations calculated to cause cancer in humans if consumed in the well water over an extended interval of time.

These organic carcinogens are not natural contaminants and could only be present in groundwater as the result of the activities of man. There appears to be little doubt that the origin of these carcinogenic substances is the nearby toxic dump. These substances can be expected to continue to move with the groundwater and will increase the cancer risk levels of persons who consume the water of contaminated wells.

Enforcement

A civil case was filed under RCRA 7003 in District Court in 1980 and in April of 1984 the complaint was amended to add a CERCLA count. Present defendants are New Castle County, William Ward, Stauffer Chemical Company and ICI Americas Incorporated. In addition to these, Stauffer has moved to add Kennecott Corporation and Ametek Incorporated. All six are considered potential responsible parties (PRPs). Currently the parties are conducting discovery.

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TABLE 1

Results of Chemical Analyses
February 25, 1980 Sampling

Wagner Well	(ug/1)
Acrolein	60
Benzene	41
1,2-dichloroethane	<10
1,1-dichloroethane	<10
1,2-transdichloroethylene	10
ethylbenzene	19
methylene chloride	39
methyl chloride	<10
toluene	35
vinyl chloride	32
2-nitrophenol	64
phenol	371
1,2-diphenylhydrazene	<10
naphthalene	<10
n-nitrosodi-n-propylamine	26
bis(2-ethylhexyl)phthalate	<10
di-n-butyl phthalate	<10
diethyl phthalate	<10
arsenic	< 2
selenium	< 2
cadmium	<50
chromium	< 1
lead	16
silver	< .2
barium	2390
titanium	.6
iron	40-400
copper	< .1
zinc	< .4
acenaphthylene	<10
butylbenzylphthachalate	<10

Woytko Well (untreated water)	(ug/1)
trichloroethene (TCE)	1.4
tetrachloroethene (PCE)	40
chloroform	8.0
cis-1,2-dichloroethene	10-100
dichlorofluoromethane	1-10
dichlorodifluoromethane	1-10
bromodichloromethane	6.8

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For purposes of this Record of Decision (ROD), the proposal for an alternative water supply has been documented in the Focused Feasibility Study. On August 13, 1984 Notice Letters, with a copy of the Focused Feasibility Study enclosed, were sent to the PRPs. In the Notice Letters EPA asked the PRPs to notify EPA in writing by September 5, 1984 if they would be willing to voluntarily design and implement any of the remedies described in the feasibility study.

To date, no PRP has made a commitment. Therefore, the Agency must select an alternative in this ROD and implement the alternative with the Hazardous Substances Response Fund. The Agency will seek recoupment for the expenditures from the Fund through the suit that has been filed.

Alternatives Evaluation

Analytical data collected to date demonstrates that contaminated groundwater has exposed some well owners to a significant health hazard and threatens others with exposure. Therefore, in accordance with § 300.68(e)(1) of the NCP, EPA has considered initial remedial measures (IRMs) to limit the exposures or threatened exposures.

Based on an evaluation of the existing water quality from wells in the shallow aquifer and the availability of other uncontaminated sources of potable water in the area, four schemes for alternate water supplies were considered for evaluation.

1. Extend the existing public waterlines
2. Install individual treatment units to each residence/facility
3. Install individual water supply wells into the Lower Hydrologic Zone
4. Install a central water supply well into the Lower Hydrologic Zone and construct a distribution system

In order to investigate the cost-effective methods for supplying alternate water supplies and to compare all alternatives on an equal basis, a Target Area was identified, which included the residences/facilities where the water quality is currently being affected by the landfill or where the potential for future contamination is significant. The Target area includes the Woytko residence, the Operating Engineers School, and the Meeting House along Route 71 (Red Lion Road) and the Martin, Webb, Baker, McCaffery, Outten, Andrews, and two Wagner residences along Route 13 (Dupont Highway). A total of eleven residences/facilities were identified in the Target Area as shown in figure 3.

In addition to the Target area, the costs were developed for providing an alternate water supply to all residents adjacent to the landfill property, should groundwater in these areas also be contaminated or should the potential for future contamination be significant. The additional areas include the residences along Route 71, west to Route 7; residences along Route 13, southwest to Dragon Neck Road; and residences and other facilities along Governor Lea Road, between Route 7 and Route 13. This area, which includes all residences adjacent to the landfill area has been termed the Expanded area.

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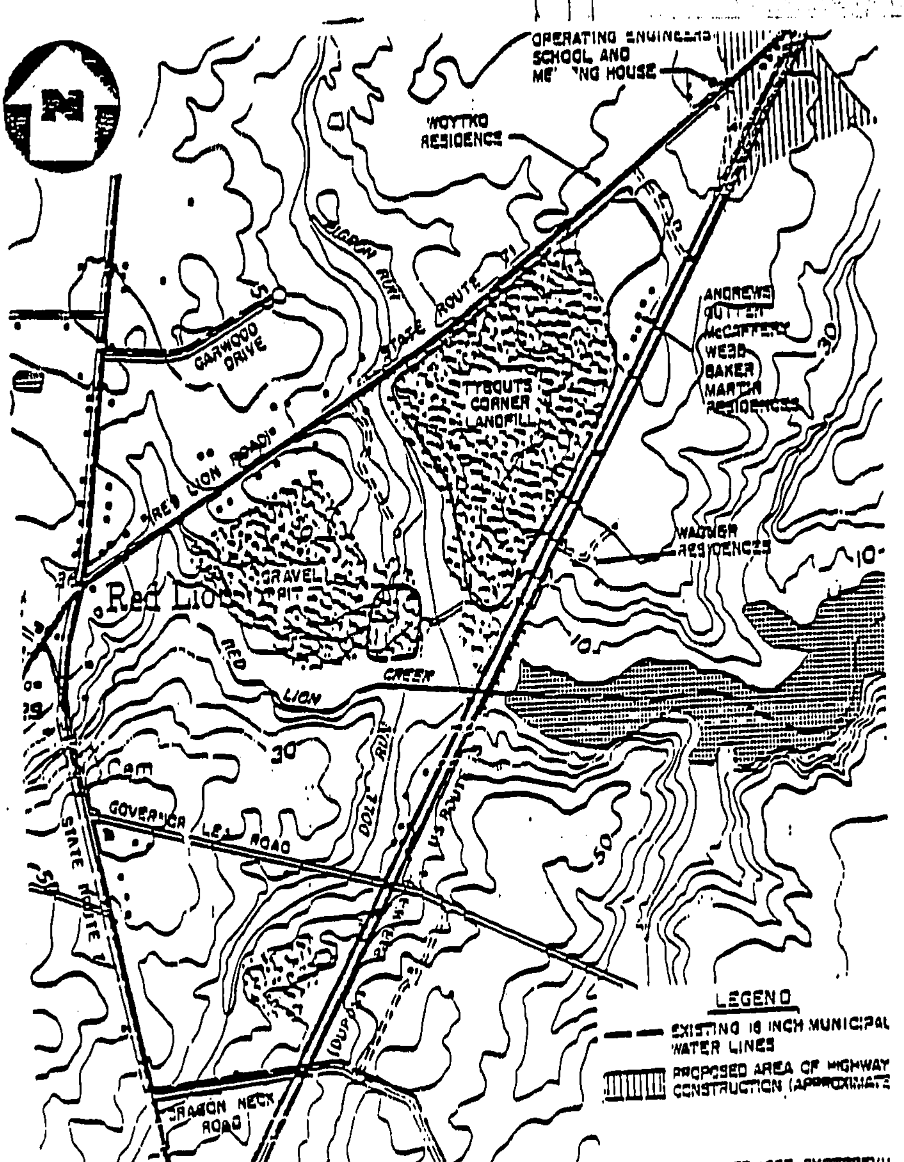

REFERENCE: SAINT GEORGES QUADRANGLE, DELAWARE-NEW CASTLE CO., 7.5 MINUTE SERIES, 1953, PHOTOREVISED 1970, U.S. GEOLOGICAL SURVEY.

1" = 1000'

FIGURE 3

Existing Conditions

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The first alternative, extension of the existing public waterlines, would include extending the 16-inch municipal waterlines from both the Route 7/Route 71 intersection and the Dragon Neck Road/Route 13 intersection to the Target Area. The main lines would be extended along Route 71 to the school/meeting house and along Route 13 to the Andrews residence. This option would entail about 12,500 lineal feet of waterline extension (see figure 4). If Governor Lea Road were included an additional 2,400 lineal feet would be needed. All access and rightof-ways for installation of the waterlines would be along existing highways. The water line may be suspended along the bridge to cross Red Lion Creek.

According to the Focus Feasibility Study, the cost for extension of the existing 16 inch public waterlines is estimated to be $795,800.00. If the additional 31 residences/facilities were included and the waterline extended through Governor Lea Road, the cost is estimated to be $976,700.00. No operation and maintenance costs are necessary since the water supply lines will be owned by a private water company, not the State agency.

The second alternative, installation of individual treatment units to each residence/facility, would consist of carbon filters for organics and synthetic resin filters for iron and manganese. The filter units would be installed on the main waterlines leading to the residence. The carbon would be replaced every six months and the synthetic resin every year. In addition, sampling would be performed quarterly for volatile organics, iron and manganese and once a year for a full Hazardous Substance List scan. There is one special circumstance to note. Since the well on the Wagner property has been collapsed and is no longer usable, this alternative includes drilling a new well into an uncontaminated aquifer to service these two residences. No water treatment would be required for these residences.

The total cost for treatment and maintenance over a 30 year period in the Target area is estimated to be $381,500.00. If the additional 31 residences were included, the total costs would be $1,260,500.00.

The third alternative, installation of individual water supply wells into the lower hydrologic zone, consists of drilling a 4 inch well to approximately 450 feet in depth with an outer steel casing in the upper 100 feet of the well to prevent cross contamination. A submersible pump would be installed in each well.

Iron treatment filters would also be provided for each well. Operation and maintenance would include water sample monitoring and replacement of the iron filters. Estimated costs for the Target area are $687,400.00. If the additional 31 residences were included, the total costs would be $2,623,600.00.

The fourth alternative, installation of a central water supply well and distribution system, consists of drilling one six inch well to a depth of approximately 500 feet. Again the upper 100 feet would be outer steel cased. The distribution system would consist of a 100,000 gallon storage tank and eight inch water lines. In addition to the deep well, a four inch observation well will be installed to monitor the Upper Hydrologic Zone of the Potomac. Operation and maintenance

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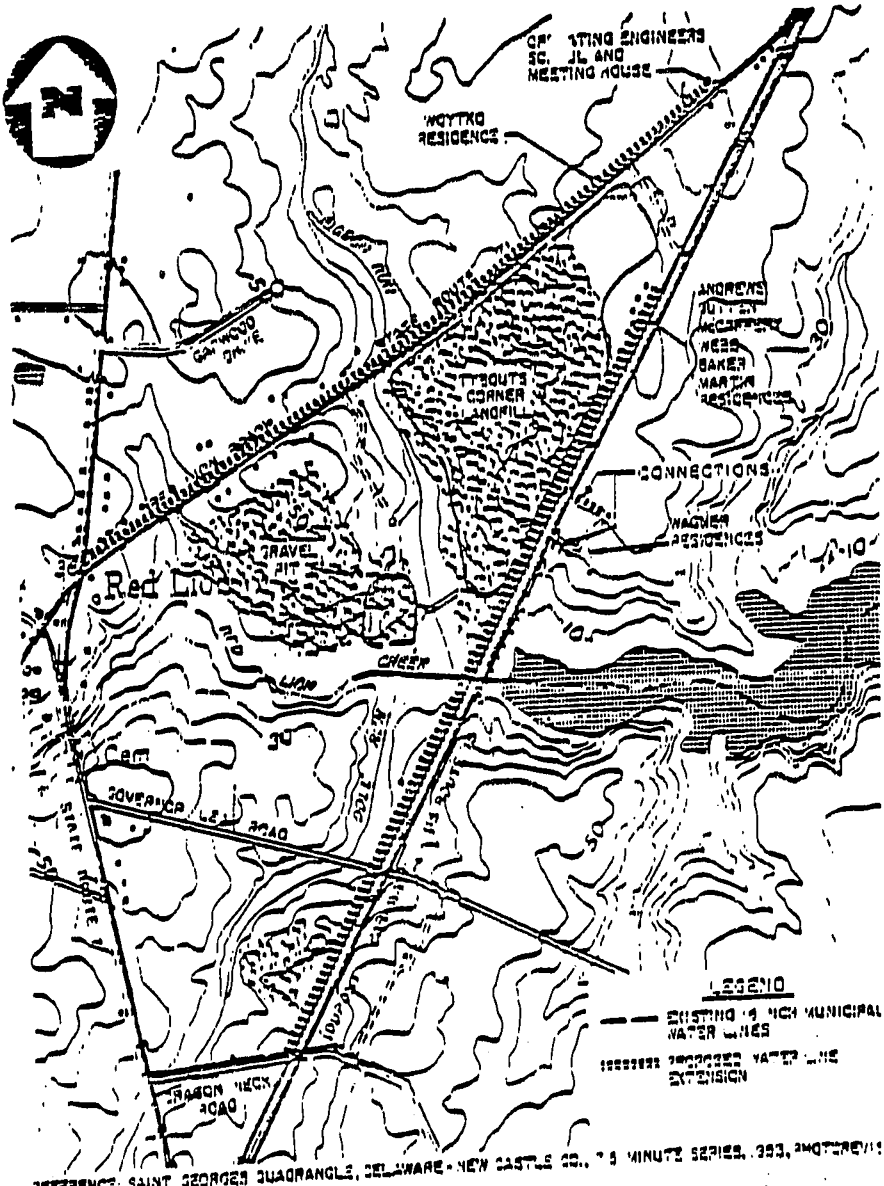

REFERENCE: SAINT GEORGES QUADRANGLE, DELAWARE - NEW CASTLE CO., 7.5 MINUTE SERIES, 393, PHOTOREVISED 1970, U.S. GEOLOGICAL SURVEY

1" = 1000'

FIGURE 4

Proposed Water Lines

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include water supply monitoring to insure quality of the water and general service and upkeep charges for maintenance of the system. Estimated costs for the Target Area are $1,024,900.00. If the additional 31 residences were included, the total costs would be $1,960,000.00. Table 2 shows the cost summary from the Focused Feasibility Study.

Community Relations/Responsiveness Summary

The Focused Feasibility Study of the four alternatives supplies for drinking water to residences near the Tybouts Corner Landfill was presented to the public on August 13, 1984 at a public meeting conducted by EPA. Prior to this public meeting, EPA Community Relation staff sent news releases announcing the meeting to all area media, public officials, and concerned residents. In addition, the Focused Feasibility Study document was placed in site information repositories located at the City of New Castle Library and the Delaware City Library.

The public meeting, held at the Gunning Bedford Junior High School, had representatives from both EPA and DNREC in attendance. Approximately 125 citizens attended the meeting. Copies of the Focused Feasibility Study were distributed. Project Officer, Roy Schrock, presented the alternatives as outlined in the study document. Many members of the audience had anticipated what the alternatives would be and had made their personal decisions. Therefore, following an explanation of the RI/FS process, and prior to a description of the four alternatives, the citizens voiced their opinions.

Throughout the entire two and a half hour meeting, continuous support for extension of existing Wilmington Suburban waterlines was obvious. In fact, the meeting came to a point where a show of hands was called for anyone who did not think public water lines should be extended. Out of approximately 125 people, only 2 raised their hands. It was very clear by the close of the meeting that these people feel very strongly that all homes in the expanded area should be connected to the Wilmington Suburban public water supply lines. To these people no other option was acceptable.

During the public comment period, which lasted from August 13th until August 27th, virtually every resident within the Expanded area wrote to support the extension of public water to the entire expanded area. The chief concerns voiced in these comments were: the stress and agony of daily reliance on bottled water; declining property values; and future uncertainty about the direction and flow of groundwater contamination.

Consistency With Other Environmental Laws

The installation of waterlines on properties off site from Tybouts Corner Landfill will be done in compliance with any State or local laws. Any permits required before or during construction will be obtained.

TOTAL PROJECT COST SUMMARY* FOR ALTERNATIVE WATER SUPPLIES
TYBOUTS CORNER LANDFILL
NEW CASTLE COUNTY, DE

ALTERNATIVES	TARGET AREA (11 RESIDENCES/ FACILITIES)	EXPANDED AREA (42 RESIDENCES/ FACILITIES)
Alternative I: Extend Existing Public Water Lines	$795,800	$976,700
Alternative II: Provide Treatment to Individual Wells	$381,500	$1,260,500
Alternative III: Install Individual Water Supply Wells	$687,400	$2,623,600
Alternative IV: Install Central Water Supply Well and Distribution System	$1,024,900	$1,960,000

* Total Project Cost includes Total Initial Capital Costs and Total Present Worth Operation and Maintenance Cost.

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Recommended Alternative

Section 300.68 (e)(1) of the National Contingency Plan (NCP) [40 CFR §300.68 (e)(1)] states that "initial remedial measures can and should begin before final selection of an appropriate remedial action if such measures are determined to be feasible and necessary to limit exposure or threat of exposure to a significant health or environmental hazard and if such measures are cost-effective."

Based on evaluation of each of the proposed alternatives, the comments received from the public and information from the Delaware Department of Natural Resources and Environmental Control (DNREC), we recommend the extension of existing public water lines to provide service to all 42 residences/facilities surrounding the landfill property. This alternative is feasible, effective in limiting the exposure or threatened exposure to contaminated drinking water, and is cost-effective.

First, extension of public water supplies is technologically feasible. No new source of water supply is needed due to the fact that water lines already exist within several hundered feet of the area.

Secondly, extension of the public water supply is more effective than the other alternatives. The water quality is consistent and complies with drinking ater standards that are monitored by the Delaware Department of Health. This availability of drinking water for the homes will be on a long-term basis. The public water supply will eliminate the day to day fears of drinking contaminated or potentially contaminated groundwater. Many letters received in the public comment period describe the confidence the public shows in the reliability of a public water supply.

Thirdly, the extension of public water supply is cost-effective, especially when considering the 42 homes/facilities surrounding the landfill. Since public water is the only long-term safe and realistic solution for all the 11 homes in the Target area, the benefits to expand the scope of work to include all 42 homes are tremendous. It is important to note that when extending the water lines to the target area the lines will already go by homes in the Expanded area. The only additional water lines needed to serve the Expanded area will be on Governor Lea Road. Also the operation and maintenance costs will be assumed by the public water supply company.

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The following is a list of benefits which clearly add to the effectiveness of the public water solution for all 42 residences/facilities.

a. The costs for additional hookups are minimal (approximately $600/home).

b. Since no assurance can be made that the landfill contamination will not affect the other 31 home owners in the Expanded area, anxiety of the residents will be eliminated.

c. There are obvious cost benefits to be realized in the future remedial actions at the site. No one will have to spend time and money to predict what the effects of further work at the site will be on residential water quality due to the landfill contaminant plume management. It allows maximum flexibility in managing the landfill and locally contaminated aquifers in the next phase of remedial action. If only a few were connected to public water, continuous monitoring would be needed for the expanded area. If further investigation revealed a need to hook up more residences, the cost for remobilizing would most likely be greater than hookups in the present effort.

d. Precedent exists in Delaware for pay-back by the water company for some portion of the initial investment in the water line if future expansion occurs in the area.

e. The nearby Getty refinery presently has wells capable of producing large volumes of water near the landfill and additional wells have been proposed by the Artesian Water Company within a few miles of the site. Providing public water to all residences around the landfill eliminates State concerns that use of existing or new wells could drastically alter groundwater flows and affect the residential wells.

f. The proposed extension of public water will be a part of the larger solution and the final remedial action. The waterlines will not have to be taken out in the future.

The following list summarizes the drawbacks which prevent any recommendation of the other alternatives in the Focused Feasibility Study.

a. All other alternatives proposed using local water supplies. Even when using a "clean" aquifer there is some degree of risk associated with local water. There is a potential, however small, for future water quality problems to arise.

b. Providing treatment to individual wells presents a major concern in terms of operation and maintenance responsibilities. Typically, home owners do not provide the constant attention that is required for these types of

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treatment systems. The time and money commitments necessary for proper operation and maintenance are beyond the average home owner.

c. DNREC does not have the resources to initiate an operation and maintenence program for the other alternatives.

State Recommendations

The DNREC comments on the Focused Feasibility Study state, "Alternative I is ... the only option which does provide a safe reliable solution to the situation. We therefore support Option 4 of Alternative I and believe that any other alternative is unsatisfactory."

In regard to the recommendation to serve only the Target area or include the Expanded area, DNREC was not definitive. Their letter did note that if only the Target area were served, the costs should include the resources necessary for additional monitoring of water supplies. "This adds to the cost of the alternative and presents an additional burden on state resources which must be considered in any cost analysis."

Proposed Action

We request your approval for the extension of existing public water lines to the 42 residences/facilities in the Expanded area surrounding the property where Tybouts Corner Landfill is located.

Project Schedule

- Receive Cooperative Agreement application from DNREC ——— October 1984
- Award Cooperative Agreement for design and construction —— November 1984
- Start construction ——— December 1984
- Complete construction ——— February 1985

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