United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-91/172
September 1991

EPA

Superfund Record of Decision:

Motor Wheel, MI

50272-101

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Motor Wheel, MI
First Remedial Action - Final

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16. Abstract (Limit: 200 words)

The 24-acre Motor Wheel site is an inactive industrial waste disposal site in Lansing, Ingham County, Michigan. Land use in the area is predominantly industrial. The site overlies a glacial till and a glacial aquifer. From 1938 to 1978, the Motor Wheel Corporation used the site for the disposal of solid and liquid industrial wastes including paints, solvents, liquid acids and caustics, and sludge. Wastes were disposed of in tanks, barrels, seepage ponds, and open fill operations. An estimated 210,000 cubic yards of waste fill is in place onsite. As a result of disposal practices, contaminants have leached through the soil and into the underlying glacial aquifer and perched zone. Between 1970 and 1982, at least three onsite clean-up actions were initiated. In 1970, the State required the removal and offsite disposal of solid wastes, paint sludge, and oils from seepage ponds and backfilling of excavated pond areas. In 1978, industrial wastes and degraded soil were excavated and stockpiled onsite under a clay cover. In 1982, the site owners removed three 10,000-gallon tanks, their contents, and surrounding contaminated soil, along with contaminated fill material containing an unknown quantity of drums. This Record of Decision (ROD) addresses the waste mass and ground water contamination in

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Motor Wheel, MI
First Remedial Action - Final
Contaminated Media: soil, debris, gw
Key Contaminants: VOCs (benzene, PCE, TCE, toluene, xylenes), organics (PAHs, PCBs, pesticides), metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

Availability Statement	19. Security Class (This Report) None	21. No. of Pages 60
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

Abstract (Continued)

the perched zone and the glacial aquifer. The primary contaminants of concern affecting the soil, debris, and ground water are VOCs including benzene, PCE, TCE, toluene, and xylenes; organics including PAHs, PCBs, and pesticides; and metals including arsenic, chromium, and lead.

The selected remedial action for this site includes backfilling the northern portion of the fill area with 125,000 cubic yards of fill; capping the disposal area with a 14.9-acre multi-media cap; installing a slurry wall at the western and southern boundary of the disposal area; installing ground water recovery wells or trenches downgradient, and a collection transfer system to deliver water to an onsite treatment facility; pretreating ground water onsite to remove iron and manganese using aeration, clarification, and filtration if needed, followed by onsite treatment using air stripping and carbon adsorption; using activated alumina to remove fluoride from ground water, followed by offsite discharge of the treated water to a publicly owned treatment works (POTW); monitoring ground water; and implementing institutional controls including deed and ground water use restrictions, and site access restrictions such as fencing. The estimated present worth cost for this remedial action is $30,720,300, which includes a capital cost of $11,083,300 and an annual O&M cost of $1,277,400 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Ground water clean-up goals are based on State health-based standards or method detection limits (MDL), whichever is higher. Chemical-specific goals include benzene 1 ug/l (State), PCE 1 ug/l (MDL), TCE 3 ug/l (State), toluene 800 ug/l (State), xylenes 300 ug/l (State), and lead 5 ug/l (State).

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Motor Wheel Disposal Site
Lansing, Michigan

Statement of Basis and Purpose

This decision document represents the selected remedial action for the Motor Wheel Disposal site, Lansing, Michigan, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based upon the contents of the administrative record for the Motor Wheel Disposal site.

The State of Michigan concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of Remedy

This operable unit addresses remediation of ground water and source control by reducing the potential for continuing ground water contamination from the on-site waste mass and reducing the threat from contaminated ground water through treatment.

The major elements of the selected remedy include:

* Installation of an approximately 11.3 acre Michigan Act 64 cap over the disposal area;

* Back-filling to cover exposed fill areas and to establish an acceptable slope in the excavated area of the site for extension of the cap;

* Extraction of contaminated ground water from the perched zone and the glacial aquifer and treatment of the ground water by air stripping, granular activated carbon, and alumina

reaction on-site and treatment of the off gases;

* Site deed restrictions to limit development and land use and to prevent installation of drinking water wells or other intrusive activity at the site; and

* Ground water monitoring to assess the state of the remediation.

* A slurry wall will be installed to facilitate the dewatering of the perched zone aquifer.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. As this remedy will result in containment of waste on-site and initially result in hazardous substances remaining on-site above health-based levels during the remediation of ground water, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

FOR Valdas V. Adamkus
Regional Administrator
U.S. EPA - Region V

9/30/91
Date

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
MOTOR WHEEL DISPOSAL SITE
LANSING, MICHIGAN

I. SITE NAME, LOCATION AND DESCRIPTION

Motor Wheel is a 24 acre site located on the northeast edge of the City of Lansing within the NE ¼, SW ¼, Section 3 of Lansing Township (T.4N.,R.2W.), Ingham County, Michigan (Figure 1). The site is bordered by abandoned Michigan Central Railroad tracks to the west and north, by the W.R. Grace & Co. plant (formerly Michigan Fertilizer Company) to the south, and by the Lansing/ Lansing Township boundary to the east. The Granger/North Lansing Sanitary Landfill is located to the northeast of the site, Paulson Street Landfill (currently a park) is located to the north, the Friedland Iron and Metal Company lies to the northwest, and the North Lansing Fill No. 2 Board of Water and Light is located to the southwest. Figure 2 shows the bordering properties and the current land usage near Motor Wheel. No use of perched zone or glacial aquifer ground water has been identified in the vicinity of the site.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The property was used by Motor Wheel Corporation as a disposal site for industrial wastes from 1938 until about 1978. The types of disposed wastes included, solid and liquid industrial wastes, including paints, solvents, liquid acids and caustics, sludges and other wastes. Wastes were disposed of on the property in tanks, barrels, seepage ponds and open fill operations.

Between 1964 and 1986 Motor Wheel Corporation was a wholly owned subsidiary of Goodyear Tire and Rubber Company. Because of this ownership, Goodyear Tire and Rubber Company is associated with the site and is a respondent to the Motor Wheel Consent Order.

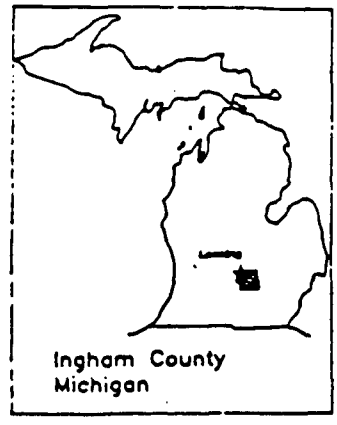
Between 1970 and 1982 at least three cleanup actions were initiated which resulted in the excavation of and off-site disposal of waste materials. In 1970 the Michigan Department of Natural Resources (MDNR) requested that the Motor Wheel Corporation remove solid wastes, paint sludges, and oils from seepage pond areas for disposal off-site. Some of the excavated materials were disposed of off-site and the former pond areas were backfilled.

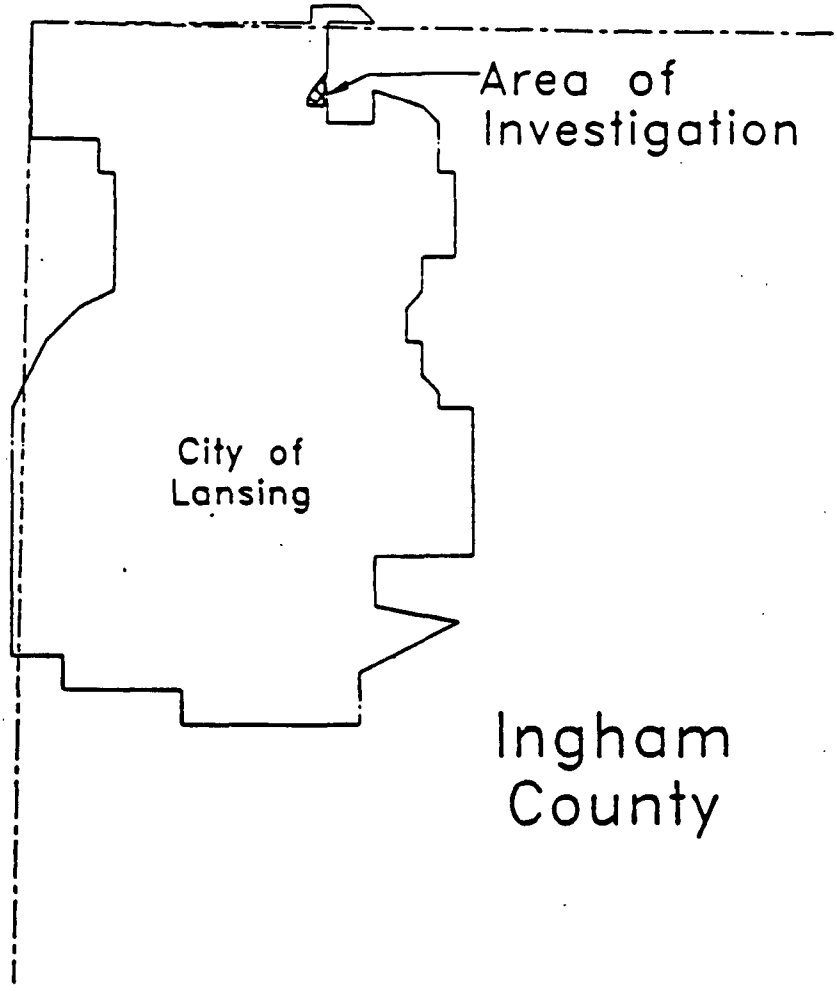
In 1978, following acquisition of the property by MSV Associates, while stripping overburden from the on-site sand and gravel deposits, industrial wastes and degraded soils were exposed. The exposed materials were excavated, stockpiled on the western part of the site and covered with clay.

In December of 1982 there was a removal of three 10,000 gallon tanks and their contents, and degraded fill material from several

FIGURE1

Area of Investigation
Motor Wheel Disposal Site
T.4N., R.2W.
Lansing Township
Ingham County
Lansing, Michigan





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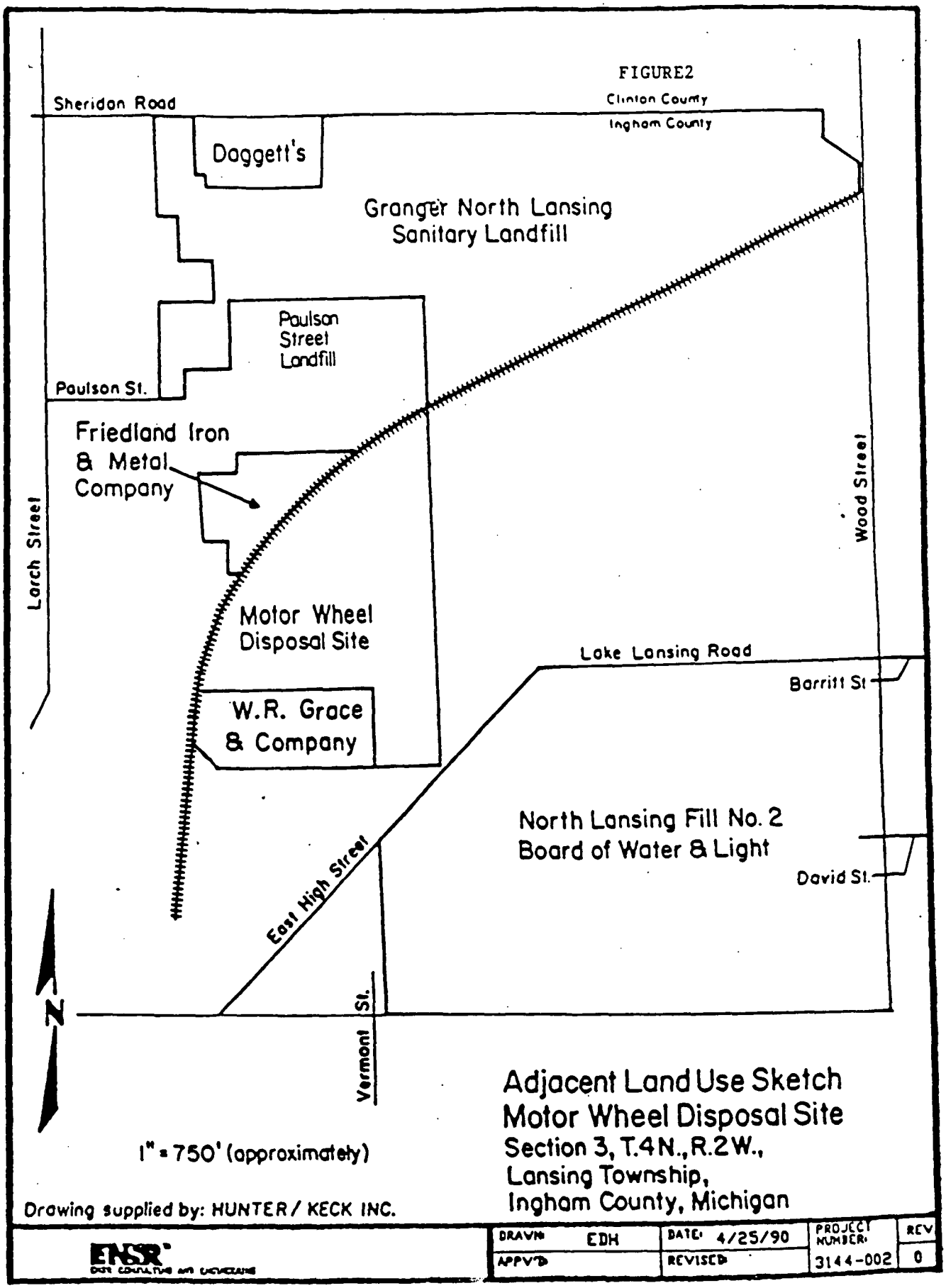
FIGURE2
Sheridan Road
Clinton County
Ingham County
Daggett's
Granger North Lansing
Sanitary Landfill
Paulson
Street
Landfill
Paulson St.
Friedland Iron
& Metal
Company
Larch Street
Wood Street
Motor Wheel
Disposal Site
Lake Lansing Road
Barritt St
W.R. Grace
& Company
North Lansing Fill No. 2
Board of Water & Light
David St.
East High Street
N
St.
Vermont
1" = 750' (approximately)
Adjacent Land Use Sketch
Motor Wheel Disposal Site
Section 3, T.4N., R.2W.,
Lansing Township,
Ingham County, Michigan
Drawing supplied by: HUNTER / KECK INC.
ENSR
DRAWN EDH
DATE 4/25/90
PROJECT NUMBER 3144-002
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locations on the site. The three tanks and approximately 800 cubic yards of contaminated soil and fill surrounding them, and approximately 350 cubic yards of fill material containing an unknown number of drums were disposed of off site.

All operations at the site were discontinued in 1987. The entire site is currently inactive.

MSV Associates, which purchased the site in 1978 and mined sand and gravel in the northeast portion of the property until 1987, is the current owner of the property.

The key surface feature of the site, the sand and gravel pit extending over the northern portion of the site, is the result of earlier quarrying activities. The pit area, excavated to a depth of 50 feet, has relatively steep sided walls and a slope ranging from 2:1 (horizontal:vertical) to near vertical. There are several small ponds in the eastern part of the pit bottom. The remainder of the site has been covered with fill from stripping and gravel washing operations.

The unmined portion of the site is relatively flat, with occasional abrupt changes in topography resulting from the filling operations that took place during overburden stripping. Vegetation on the unmined portion of the site consists mainly of small trees, brush, and dense indiscriminate ground cover growth. The site contains no structures.

The site was placed on the National Priorities List (NPL) on October 4, 1986 (50 FR 41015). On June 26, 1987 Motor Wheel Corporation, W.R. Grace & Co., and Goodyear Tire and Rubber Company signed an Administrative Order by Consent agreeing to conduct a Remedial Investigation (RI) and Feasibility Study (FS) at the Motor Wheel site.

III. COMMUNITY RELATIONS HISTORY

An RI kick-off meeting was held June 16, 1988. At the meeting the U.S. EPA and MDNR discussed the activities which would take place during the RI. The RI Report for the Motor Wheel site was released to the public on May 15, 1990. A public meeting was held May 22, 1991 at which U.S. EPA and MDNR discussed the findings of the RI.

The FS and the Proposed Plan were released July 18, 1991. A fact sheet summarizing the Proposed Plan and remedial alternatives was released to the public at that time. These documents and other supporting documents were made available to the public in the administrative record maintained in the U. S. EPA Docket Room in Region 5 and the information repository at the Lansing Public Library in Lansing, Michigan. The notice of availability for the RI/FS Report and the Proposed Plan was published in the Lansing Journal on July 17, 1991. A thirty day public comment period was

held from July 18, 1991 through August 19, 1991. In addition, a public meeting was held on July 24, 1991. At this meeting, representatives of the U.S. EPA and MDNR answered questions about problems at the site, the remedial alternatives under consideration, and accepted formal comments from the Public regarding the proposed alternative and other alternatives analyzed in the FS. A response to these comments and to written comments received during the comment period is included in the Responsiveness Summary, which is part of this Record of Decision. No request for an extension of the public comment period was received and the public comment period ended August 19, 1991.

This decision document presents the selected remedial action for the Motor Wheel site, in Lansing, Michigan, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for the selected remedial action is based on the administrative record.

IV. SCOPE AND ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

This ROD addresses remedies for the waste mass and the ground water contamination in the perched zone and the glacial aquifer at the Motor Wheel site. The waste mass represents a principal threat as a source for contamination of ground water in the perched zone and the glacial aquifer. The ground water represents a primary threat to human health and the environment due to ingestion of and contact with water from the contaminated portions of the perched zone and the glacial aquifer that contains contaminants at concentrations above the Maximum Contaminant Levels (MCLs) established by the Safe Drinking Water Act and/or Michigan Act 307 standards.

U.S. EPA and MDNR will evaluate risks posed by the Motor Wheel site to the Saginaw bedrock aquifer in a second operable unit. The signatories to the 1987 Administrative Order by Consent are currently conducting an investigation to evaluate the impact of the site on the Saginaw aquifer which is the source for the Lansing public water supply. The signatories have agreed to install monitoring wells to determine water quality in the Saginaw aquifer below the site and to evaluate the integrity of the shale unit of the Saginaw which may act as an aquitard between the glacial aquifer and the bedrock. These data will be used to determine the need for remediation of the bedrock aquifer through a subsequent operable unit.

V. SUMMARY OF SITE CHARACTERISTICS

Site Geology and Hydrology

The Motor Wheel site lies in level to gently rolling topography produced by depositional processes associated with the continental glaciation during the Pleistocene epoch. The glacial deposits rest unconformably on the Pennsylvanian sediments of the Grand River and

Saginaw formations. The Grand River and Saginaw formations are the uppermost members in the Michigan Basin.

The Grand River formation is composed principally of sandstone and red and black shale. The formation occurs mainly as remnants in surface structures of the Saginaw. The Grand River formation is known to be present approximately one mile north of the site where it is 125 feet thick in some areas but is not present beneath the Motor Wheel site.

The Saginaw, in places more than 300 feet thick, underlies most of the Lansing area. It is composed mainly of sandstone and shale with thin beds of coal and limestone of limited lateral extent. Immediately below the Motor Wheel site the Saginaw consists of alternating stream channel sands, river flood plain silts and clays, shallow water marine or tidal swamp shales and limestones, and coal seams. Thickness of this complex varies in the region, but is projected to be approximately 450 feet thick in the vicinity of the site. Regionally, the top of the Saginaw dips northward and may consist of sandstone, shale, coal or limestone, with sandstone and shale being most common.

Where present the thickness of the shale across the area varies between 4 feet and more than 140 feet. The shale layer appears to have extreme undulation of the top and bottom surfaces, and demonstrates dramatic changes in thickness over short distances.

The Motor Wheel site is located on the western flank of the Mason esker. The glacial deposits range between clay, silt, sand, and gravel, and include various mixtures of these size fractions. The predominant sediments and their generic classification are: clay and silt (lacustrine); silty-clay and sandy-clay containing pebbles, cobbles, and boulders (till); and stratified, fine to medium, buff-tan sands containing beds of gravel (esker). The sediments are quite variable laterally. The site is beyond the floodplain of the Grand River. No wetlands have been identified at the site.

An upper till unit, ranging in thickness from 10 to 45 feet, underlies most of the site south and west of the excavated area. The till generally thickens to the southwest however, in one area the till is absent and the waste and soil fill rest directly on clayey sand and gravel. The Mason esker sand and gravel underlies till or lacustrine clay beneath the entire site, with the exception of the excavated area.

The Saginaw formation contains an aquifer which is the principal source of water for the region. This generally confined aquifer is recharged mainly in places where it is directly overlain by glacial aquifers. Wherever the Saginaw shale, a Quaternary clay, or glacial till occurs on the top of the Saginaw sandstone, the local recharge is limited or non-existent.

Transmissivities of the Saginaw aquifer in the Lansing area, as shown in the RI/FS, range from 535 square feet per day (ft^2/d) to 10,628 ft^2/d with the average value 3128 ft^2/d. Storage coefficients range from $2.5X10^{-5}$ to $4.3X10^{-3}$ with the average value of $3.8X10^{-4}$.

At the Motor Wheel site and vicinity there are two water bearing zones in the glacial deposits. There is a perched zone and an unconfined aquifer in the sediments of the Mason esker.

The perched zone, although limited in the northeast portion of the site and interrupted by a local discontinuity in the south central part of the site, appears to be continuous over the site to the south and west (Figure 3). The vertical hydraulic conductivity of the perching bed ranges from $3.2X10^{-8}$ centimeters/second (cm/s) to $1.0X10^{-7}$ cm/s. The direction of ground water flow in the perched zone under the site is controlled by the excavated area which intercepts the perching layer. A ground water divide is present in the southwest part of the site. North of this divide ground water flow is to the northeast toward the excavation. South of the divide the flow direction is toward the southwest, which is the direction of regional flow in the glacial aquifer (Figure 4). This interpretation of flow direction is confirmed by the presence of intermittent seeps in the south and west walls of the excavation at the approximate elevation of the perching clay.

Ground water in the glacial aquifer flows toward the south-southwest across the site. The average horizontal hydraulic gradient across the site is 0.001 (Figure 5). There is variation in the central part of the site because of the influence of the excavated area. Vertical gradients across the site vary from 0.037 to 0.035. The glacial aquifer is recharged from the perched zone and through the bottom of the gravel pit where it intercepts the water table.

Nature and Extent of Contamination

Waste Mass and Soil

A significant waste fill mass has been identified in the non-mined portion of the site (Figure 6). The waste fill is in the upper glacial drift in a mass up to 25 feet thick covering nearly 10 acres, and is covered by a layer of silty-clay soil derived at least in part as a byproduct of the sand and gravel washing operation.

An estimated 210,000 cubic yards of waste fill is in place at the site. Materials identified in the fill matrix are soils, railroad ties, tires, vesicular and glassy slag, demolition debris, asphalt, plastic, and glass fragments. Along with the solid wastes, liquid wastes are known to have been disposed of on the site. The upper

FIGURE3

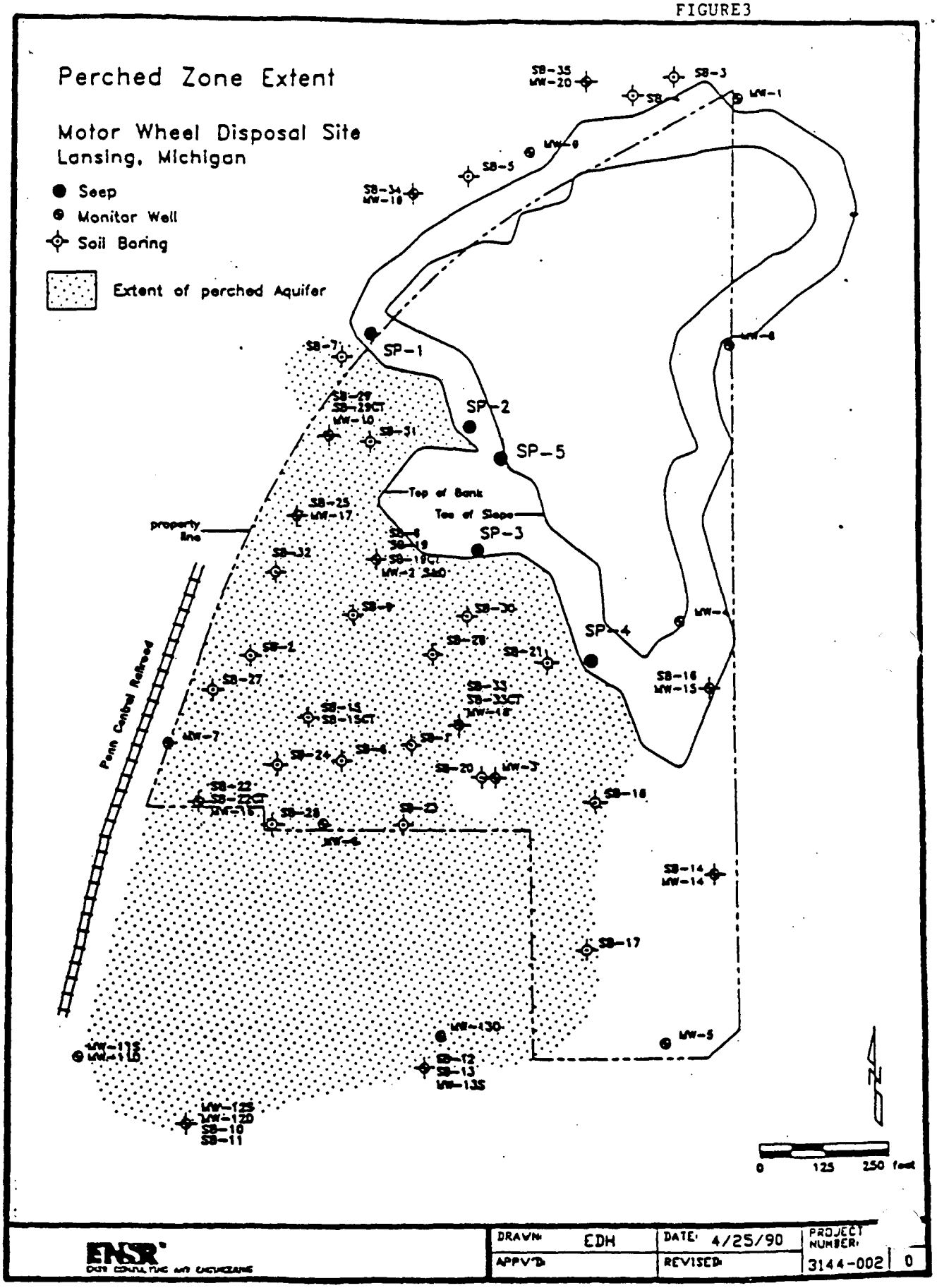

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FIGURE 4

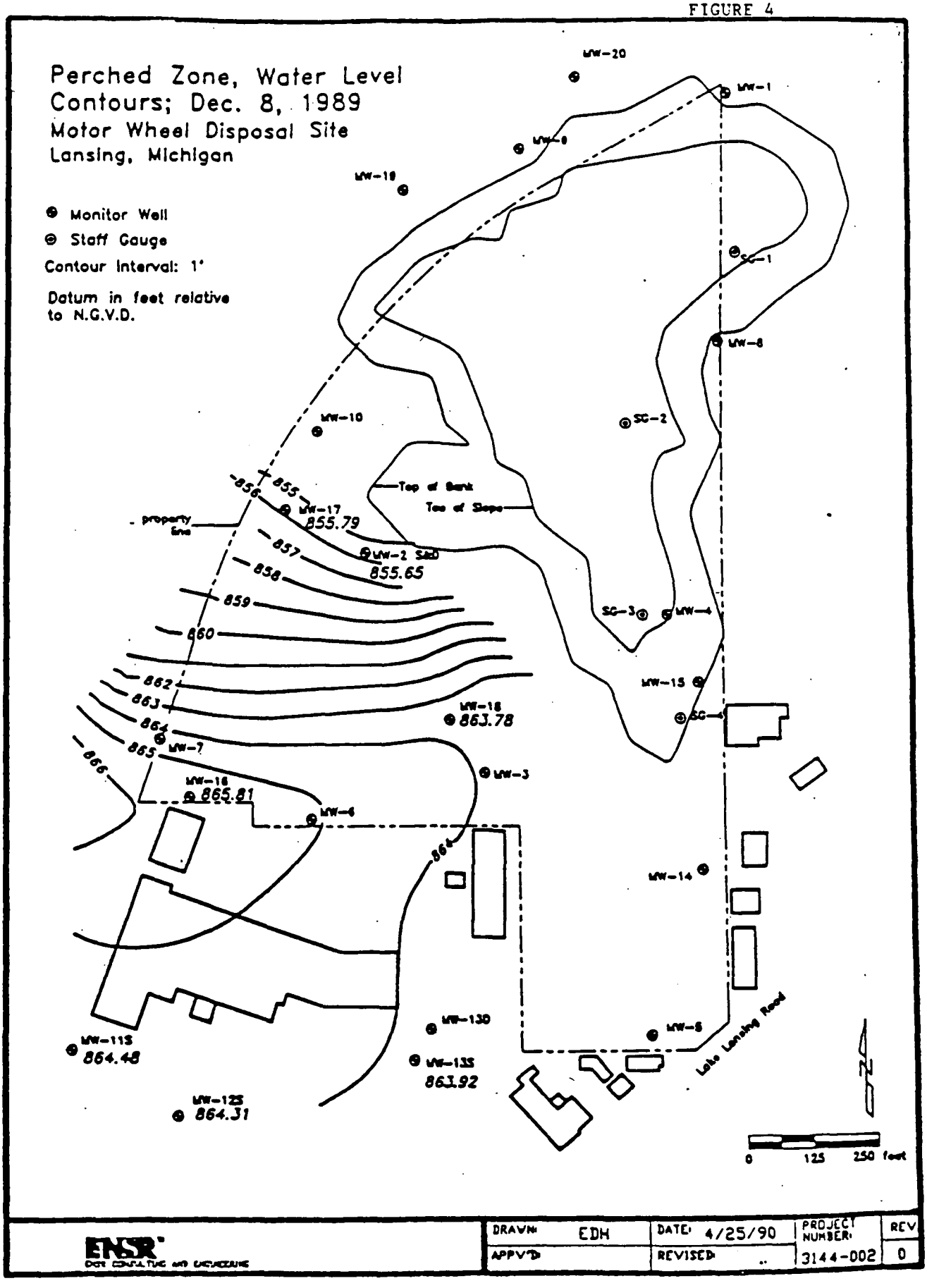

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FIGURE 5

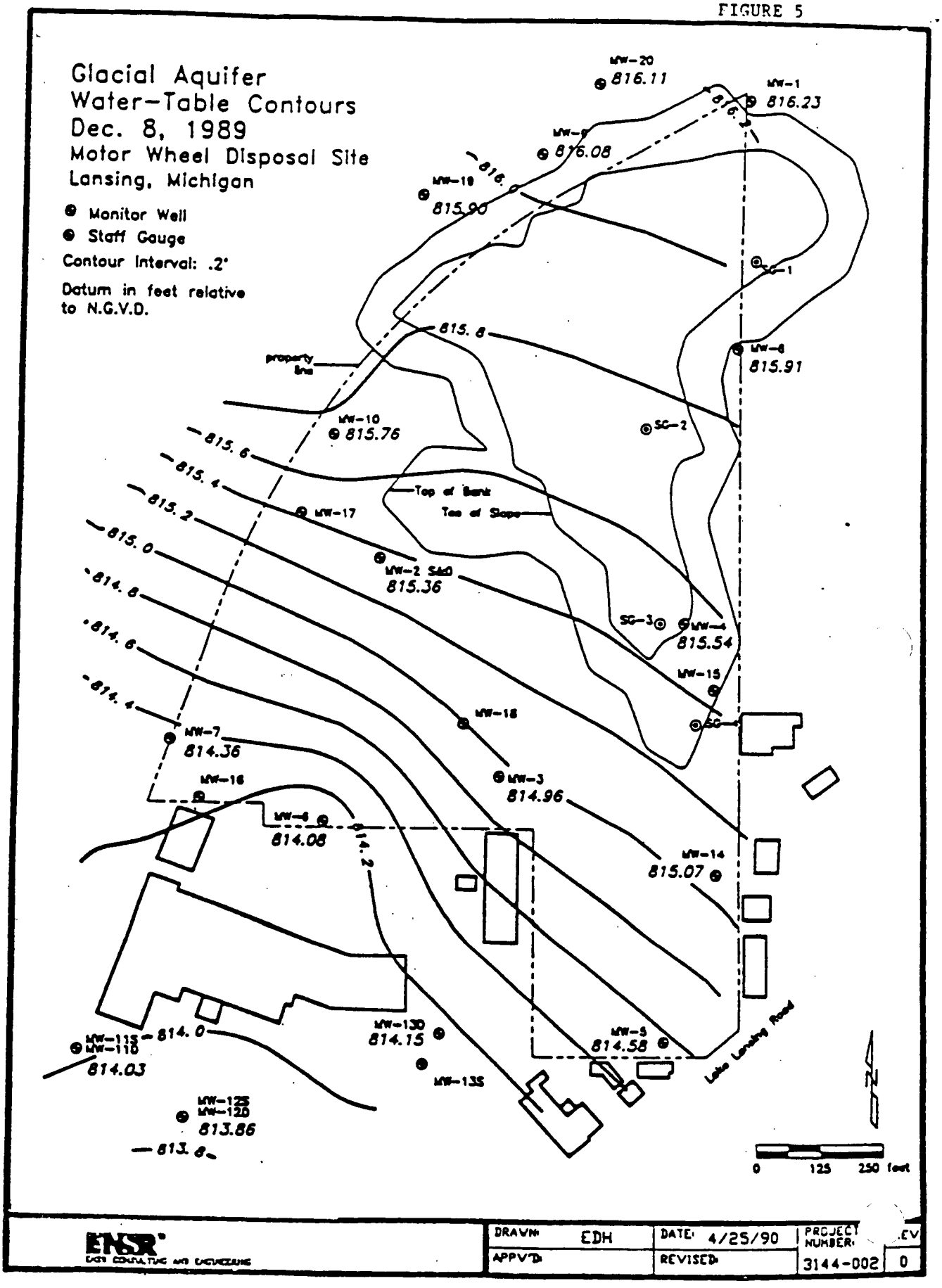

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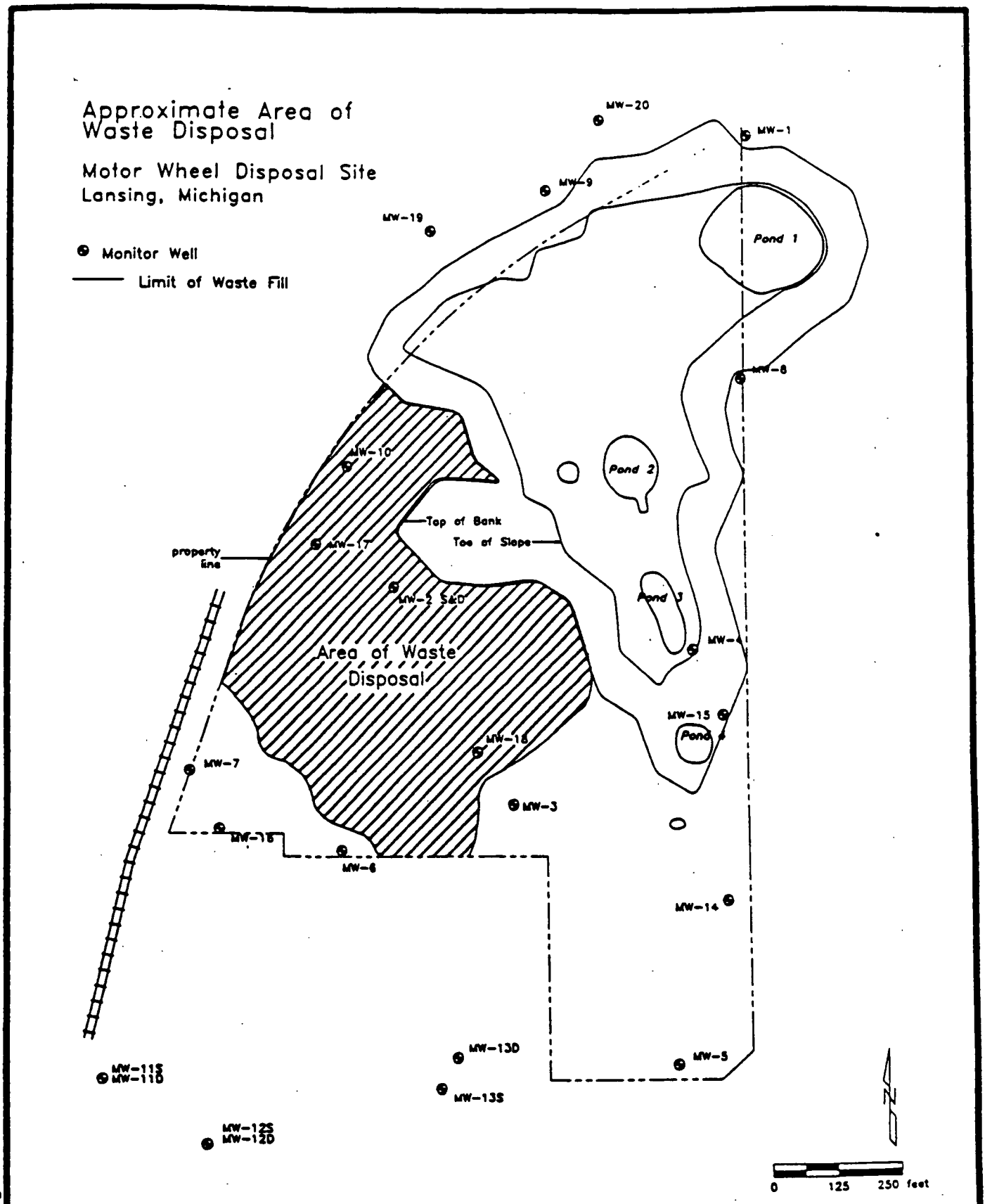
FIGURE 6



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portions of the waste mass are unsaturated. The lower portion is saturated with leachate produced by infiltration from the surface due to the proximity of the perching layer. Analyses of waste mass material and soil are summarized in Tables 1, 2, 3, 4, and 5. Saturated waste fill material and soils at depths greater than 4 feet contain significant levels of 1,2-dichloroethane, trichloroethene, toluene, ethylbenezene, and xylenes. Pesticides and PCBs are present sporadically across the site. Semivolatile compounds are present in soils in the waste mass area at depths generally greater than 10 feet and sporadically in the interval shallower than 10 feet.

Ground Water

Results from analysis of ground water from the perched zone are summarized in Table 6. 1,2-dichloroethene and bis(2-ethylhexyl) phthalate were commonly detected in concentrations ranging from 26 ppb to 330 ppb and from 11.1 ppb to 19.5 ppb respectively. Secondary water quality standards for nitrate, chloride, fluoride, and sulfate are exceeded in samples from several of the perched zone and glacial aquifer wells.

Results of analysis of ground water from the glacial aquifer are summarized in Table 7. Detections of trichloroethene, vinyl chloride, 1,2-dichloroethene, and benzene are centered in the south central part of the site.

The primary route of movement of contaminants detected on-site is with the ground water. Constituents have been identified in the glacial aquifer and extending off the site generally in a south-southwest direction. Infiltration of precipitation through the unsaturated zone to the waste mass forms leachate which has migrated into the glacial aquifer even though the rate of migration may be somewhat reduced by the presence of the perching clay in some locations. The potential also exists for contaminants in the perched zone ground water to move laterally as evidenced by the presence of seeps along the south and west walls of the sand and gravel pit.

VI. SUMMARY OF SITE RISKS

During the course of an RI/FS the U.S. EPA requires that a risk assessment be prepared according to U.S. EPA policy and guidelines. At Motor Wheel, PRP contractors prepared a risk assessment under the 1988 Administrative Order for the RI and FS. This risk assessment provides U.S. EPA with a basis for selection of a remedy which would be protective of public health, welfare, and the environment. The risk assessment, prepared by the PRP contractor, utilizing available information is consistent with the U.S. EPA policy and guidance. It provides an estimate of the health or environmental problems that could result if the waste mass, contaminated soil and sediments and the contaminated ground water

TABLE 1

Summary of Metals Analysis in Soils at MWDS

SURFACE SEDIMENT SAMPLES MG/KG (ppm) DRY WT.

Location	Depth	Sb	As	Be	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Tl	Zn
L- 1	Surf.	--	--	3.4	5.9	124.6	163.8	188.0	0.25	--	0.6	1.9	0.8	11266.3
L- 2	Surf.	--	--	--	--	--	--	--	0.41	--	--	--	0.1	--
L- 3	Surf.	--	--	--	--	122.0	171.9	85.6	--	--	0.3	1.9	0.2	1087.9
L- 4	Surf.	--	--	--	--	--	36.3	--	--	--	--	--	0.1	306.5
L- 5	Surf.	14.2	--	3.8	--	190.5	254.6	118.4	0.15	71.5	0.5	3.8	--	203.7

DASH (--) indicates analysis was below the selected cut-off value listed from Table 4.1

SOIL BORING SAMPLES 0'-2' MG/KG (ppm) DRY WT.

Location	Depth	Sb	As	Be	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Tl	Zn
SB- 1	0'-2'	--	--	--	--	99.7	92.0	125.6	0.45	--	0.9	--	--	244.0
SB-24	0'-2'	--	--	--	--	--	--	--	0.53	--	--	--	0.1	--
SB-26	0'-2'	--	--	--	--	--	57.2	--	0.18	--	0.3	1.0	0.3	124.6

DASH (--) indicates analysis was below the selected cut-off value listed from Table 4.1

SOIL BORING SAMPLES 2'-4' MG/KG (ppm) DRY WT.

Location	Depth	Sb	As	Be	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Tl	Zn
SB- 7	2'-4'	--	46.2	--	--	--	64.5	70.8	0.22	--	1.0	--	--	66.9
SB- 9	2'-4'	--	--	--	--	194.8	302.5	320.1	0.28	90.1	0.6	4.1	--	106.5
SB-19	2'-4'	--	--	--	--	215.0	228.0	299.3	0.20	50.0	0.7	--	--	214.0
SB-23	2'-4'	--	--	--	--	132.1	173.0	144.7	0.21	66.6	--	--	--	396.2
SB-28	2'-4'	--	--	--	--	--	--	--	--	--	--	--	0.3	435.8
SB-30	2'-4'	--	--	--	--	--	--	--	--	--	--	--	--	45.6
SB-33	2'-4'	--	--	--	--	--	--	--	--	--	--	1.0	--	--

DASH (--) indicates analysis was below the selected cut-off value listed from Table 4.1

SOIL BORING SAMPLES 4'-10' MG/KG (ppm) DRY WT.

Location	Depth	Sb	As	Be	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Tl	Zn
SB-15	4'-6'	--	--	--	9.1	130.0	150.0	294.0	0.50	--	0.4	--	--	447.0
SB-19	6'-8'	--	--	--	--	164.0	308.0	107.9	--	92.0	0.4	--	--	217.0
SB-21	8'-10'	--	33.6	9.0	--	153.0	528.0	4090.0	--	157.0	--	--	--	189.0
SB-22	6'-8'	--	--	--	--	--	--	--	--	--	--	--	0.1	--
SB-23	8'-10'	--	--	--	--	106.3	197.1	141.6	0.65	54.7	0.6	--	0.1	154.1
SB-25	6'-8'	--	--	--	--	--	--	--	--	--	--	0.9	--	--
SB-31	6'-8'	--	--	--	--	--	--	--	--	--	--	--	0.1	--
SB-33	6'-8'	--	--	--	--	--	--	--	--	--	--	--	0.1	--

DASH (--) indicates analysis was below the selected cut-off value listed from Table 4.1

SOIL BORING SAMPLES > 10' MG/KG (ppm) DRY WT.

Location	Depth	Sb	As	Be	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Tl	Zn
SB- 1	13'-15'	7.1	--	--	19.3	--	1125.7	5019.1	0.6	--	--	--	--	7102.9
SB- 2	16'-18'	--	--	--	--	427.0	360.4	206.7	--	73.4	1.7	--	--	130.4
SB- 2	22'-24'	14.0	--	--	--	169.7	144.7	92.2	--	--	1.7	--	--	--
SB- 4	9'-11'	8.6	--	--	--	--	--	--	--	--	--	--	--	--
SB- 6	11'-13'	--	--	--	--	--	53.4	48.3	--	--	0.6	--	--	62.8
SB- 8	13'-15'	--	41.5	--	1.7	397.1	547.0	180.1	0.5	173.8	1.1	4.4	--	112.9
SB- 9	9'-12'	--	59.8	--	5.2	316.7	508.9	572.0	0.6	106.4	1.4	2.3	--	1200.3
SB- 9	16'-18'	--	--	--	39.3	366.7	1038.7	495.6	2.1	146.1	23.6	1.1	--	1753.9
SB-15	10'-12'	--	141.0	--	5.0	--	175.0	113.0	0.2	--	--	--	0.2	284.0
SB-15	36'-38'	--	--	--	--	--	--	--	--	--	--	1.2	0.2	--
SB-20	10'-12'	--	--	--	--	--	--	--	--	--	--	--	0.1	--
SB-22	30'-32'	--	--	--	--	--	--	--	--	--	--	--	0.2	--
SB-26	10'-12'	--	--	--	--	139.9	1538.9	403.0	1.1	85.2	0.8	2.0	--	189.8
SB-27	12'-14'	--	--	--	--	--	--	--	--	--	--	--	0.2	54.9
SB-29	10'-12'	--	--	--	--	--	226.8	--	0.3	--	--	--	0.1	241.2
SB-29	22'-24'	--	--	--	--	--	--	273.5	--	--	0.7	--	--	61.6
SB-30	20'-22'	--	--	--	--	--	90.8	443.3	--	--	--	--	0.1	81.9
SB-32	14'-16'	--	--	--	--	263.2	484.9	--	--	--	--	2.0	0.1	123.1

DASH (--) indicates analysis was below the selected cut-off value listed from Table 4.1

TABLE 2

Summary of Pesticides and PCB Analysis in Soils at MWDS

SURFACE SEDIMENT SAMPLES Micrograms/KG (ppb) DRY WT.

Location	Depth	PCB-1254	PCB-1260	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	DIELDRIN	ENDRIN	ENDOSULFAN SULFATE	HEPTACHLOR	LINDANE
L- 1	Surf.	U	U	U	U	U	116.04	520.31	U	U	5.07	U
L- 2	Surf.	U	U	U	3.10	2.43	U	U	U	U	U	U
L- 3	Surf.	U	U	U	U	U	12.19	129.22	U	U	U	U
L- 4	Surf.	U	U	31.93	U	39.08	216.35	737.14	U	U	59.04	U
L- 5	Surf.	U	U	U	U	U	U	15.66	U	U	U	U

U = Below detection limit

SOILS 0'-2' Micrograms/KG (ppb) DRY WT.

Location	Depth	PCB-1254	PCB-1260	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	DIELDRIN	ENDRIN	ENDOSULFAN SULFATE	HEPTACHLOR	LINDANE
SB- 1	0'-2'	U	U	U	U	U	U	6.38	U	U	U	U
SB-26	0'-2'	U	U	26.78	71.54	50.14	U	60.16	U	U	U	U

U = Below detection limit

SOILS 2'-4' Micrograms/KG (ppb) DRY WT.

Location	Depth	PCB-1254	PCB-1260	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	DIELDRIN	ENDRIN	ENDOSULFAN SULFATE	HEPTACHLOR	LINDANE
SB- 7	2'-4'	402.8	U	U	U	U	U	U	U	319.0	U	U
SB- 9	2'-4'	172.5	U	U	U	U	U	21.4	U	U	U	U
SB-19	2'-4'	U	193.2	U	U	U	U	U	U	U	31.2	U
SB-23	2'-4'	U	U	U	U	U	U	U	U	U	53.4	U
SB-30	2'-4'	U	U	U	U	U	U	1563.65	U	U	U	U
SB-33	2'-4'	U	U	U	U	U	U	0.85	U	U	U	U

U = Below detection limit

SOILS 4'-10' Micrograms/KG (ppb) DRY WT.

Location	Depth	PCB-1254	PCB-1260	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	DIELDRIN	ENDRIN	ENDOSULFAN SULFATE	HEPTACHLOR	LINDANE
SB-15	4'-6'	U	U	378.0	277.0	U	U	U	U	U	U	U
SB-18	8'-10'	U	457.7	U	U	U	U	U	U	U	U	U
SB-19	6'-8'	U	104.9	U	U	U	U	U	U	U	U	U
SB-25	6'-8'	U	U	U	0.8	2.4	U	U	U	U	5.9	U
SB-28	8'-10'	U	U	U	U	U	27.4	U	U	U	U	U
SB-31	6'-8'	U	U	U	U	U	U	11.8	U	U	U	U
SB-32	6'-8'	U	U	1.4	7.9	U	U	U	U	U	U	U
SB-33	6'-8'	U	U	1.2	U	U	U	7.1	U	U	U	U

U = Below detection limit

SOILS > 10' Micrograms/KG (ppb) DRY WT.

Location	Depth	PCB-1254	PCB-1260	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	DIELDRIN	ENDRIN	ENDOSULFAN SULFATE	HEPTACHLOR	LINDANE
SB- 4	9'-11'	U	U	U	U	U	0.26	0.87	0.71	U	0.33	0.28
SB- 5	14'-16'	U	U	U	U	U	U	U	U	U	0.67	U
SB- 9	9'-12'	4563.0	U	U	U	U	U	U	U	U	U	U
SB- 9	16'-18'	9444.5	U	U	U	U	U	U	U	U	U	U
SB-15	10'-12'	U	U	308.0	U	426.0	U	U	U	U	U	U
SB-21	19'-21'	U	U	U	U	U	U	U	U	U	1.70	U
SB-24	12'-14'	U	U	U	U	U	U	U	U	U	U	2.0
SB-26	10'-12'	U	U	U	U	U	U	13324.9	U	U	U	U
SB-29	10'-12'	U	U	4.9	U	2.2	U	7.4	U	U	U	U
SB-29	22'-24'	U	U	U	U	U	U	U	U	U	U	U
SB-30	20'-22'	U	U	U	9.5	3.4	U	U	U	U	U	U
SB-32	14'-16'	U	U	4.3	2.7	U	U	U	U	U	U	U

U = Below detection limit

POLYNUCLEAR AROMATIC HYDROCARBONS GROUPED BY RING STRUCTURE (PAH Compounds Detected in Soils at MWDS)

Two Ring PAHs
Acenaphthene
Naphthalene
2-Methylnaphthalene

Three Ring PAHs
Phenanthrene
Anthracene
Fluorene
Dibenzofuran

Four Ring PAHs
Benzo(a)anthracene
Chrysene
Fluoranthene
Pyrene

Five Ring PAHs
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Dibenzo(a,h)anthracene

Six Ring PAHs
Benzo(g,h,i)perylene
Indeno(1,2,3-cd)pyrene

Summary of Semivolatiles Analysis in Soils at MWDS

SURFACE SEDIMENT SAMPLES Micrograms/KG (ppb) DRY WT.

Location	Depth	DEHP	DNBP	DIBENZO-FURAN	2-RING PAH's	3-RING PAH's	4-RING PAH's	5-RING PAH's	6-RING PAH's
L- 2	Surf.	270.21	U	U	U	U	U	U	U
L- 3	Surf.	U	U	U	U	U	323.39	U	U

U = Below detection limit

SOILS 0'-2' Micrograms/KG (ppb) DRY WT.

Location	Depth	DEHP	DNBP	DIBENZO-FURAN	2-RING PAH's	3-RING PAH's	4-RING PAH's	5-RING PAH's	6-RING PAH's
SB- 1	0'-2'	1308.40	U	U	U	U	U	U	U

U = Below detection limit

SOILS 2'-4' Micrograms/KG (ppb) DRY WT.

Location	Depth	DEHP	DNBP	DIBENZO-FURAN	2-RING PAH's	3-RING PAH's	4-RING PAH's	5-RING PAH's	6-RING PAH's
SB- 7	2'-4'	U	U	U	1370.38	2788.78	53886.09	24424.31	U
SB- 9	2'-4'	372.21	U	U	U	U	514.74	211.28	U
SB-19	2'-4'	U	U	U	270.54	225.39	2471.40	2937.13	1952.37

U = Below detection limit

SOILS 4'-10' Micrograms/KG (ppb) DRY WT.

Location	Depth	DEHP	DNBP	DIBENZO-FURAN	2-RING PAH's	3-RING PAH's	4-RING PAH's	5-RING PAH's	6-RING PAH's
SB-15	4'-6'	U	U	U	U	339.00	3836.00	U	U
SB-23	8'-10'	U	U	U	U	12311.36	24743.93	U	U

U = Below detection limit

SOILS > 10' Micrograms/KG (ppb) DRY WT.

Location	Depth	DEHP	DNBP	DIBENZO-FURAN	2-RING PAH's	3-RING PAH's	4-RING PAH's	5-RING PAH's	6-RING PAH's
SB- 1	13'-15'	1046.46	419.84	U	1452.03	7398.96	18290.55	3829.94	1386.22
SB- 2	16'-18'	U	U	U	1867.12	2117.92	U	U	U
SB- 2	22'-24'	U	U	18261.47	46604.50	170180.04	194036.18	19690.91	3310.04
SB- 3	16'-18'	978.23	U	U	U	U	U	U	U
SB- 4	9'-11'	305.36	U	U	U	U	U	U	U
SB- 5	14'-16'	657.25	U	U	U	U	U	U	U
SB- 6	11'-13'	U	U	U	U	U	978.02	U	U
SB- 7	10'-12'	608.08	U	U	U	U	U	U	U
SB- 8	13'-15'	1229.53	U	U	958.17	5874.97	13058.65	U	U
SB- 9	9'-12'	U	U	U	U	U	111656.69	64764.34	16706.56
SB-15	10'-12'	U	U	678.00	715.00	4802.00	U	U	U
SB-26	10'-12'	U	U	U	1752.41	U	U	U	U
SB-29	10'-12'	620.68	U	U	U	272.39	372.72	U	U
SB-29	22'-24'	381.62	U	U	285.81	1325.32	3202.52	3172.69	1207.70

U = Below detection limit

TABLE 5

Summary of Volatile Organic Compound Analysis in Soils at MWDS

VOLATILE ORGANIC COMPOUNDS

SOILS 2'-4' Micrograms/KG (ppb) DRY WT.

Location	Depth	1,2-DCE (Ttl)	TCE	VINYL Cl-	PENTA-CHLORO-PHENOL	2-BUTA-NONE	2-HEXA-NONE	2-PENTA-NONE	ACE-TONE	CARBON DI-S=	BENZENE	ETHYL-BENZENE	TOLUENE	m,p,o-XYLENES
SB-23	2'-4'	U	6.3	U	U	U	U	U	U	U	U	U	U	U
SB-30	2'-4'	5.6	U	U	U	U	U	U	U	U	U	U	U	U

U = Below detection limit

SOILS 4'-10' Micrograms/KG (ppb) DRY WT.

Location	Depth	1,2-DCE (Ttl)	TCE	VINYL Cl-	PENTA-CHLORO-PHENOL	2-BUTA-NONE	2-HEXA-NONE	4-M, 2-PENTA-NONE	ACE-TONE	CARBON DI-S=	BENZENE	ETHYL-BENZENE	TOLUENE	m,p,o-XYLENES
SB-15	2'-4'	U	U	U	U	6.0	U	22.0	49.0	U	10.0	7.0	36.0	24.0
SB-21	2'-4'	1080.0	1030.0	U	U	U	U	U	U	U	U	U	U	U
SB-23	2'-4'	35.3	U	U	U	U	U	U	U	U	U	U	U	U
SB-25	2'-4'	180.3	U	U	U	U	U	36.1	U	U	U	27.6	8.3	43.5
SB-28	2'-4'	U	U	U	U	U	U	U	U	U	U	U	8.0	U
SB-31	2'-4'	25.1	U	U	U	U	U	U	U	U	U	U	U	U

U = Below detection limit

SOILS > 10' Micrograms/KG (ppb) DRY WT.

Location	Depth	1,2-DCE (Ttl)	TCE	VINYL Cl-	PENTA-CHLORO-PHENOL	2-BUTA-NONE	2-HEXA-NONE	4-M, 2-PENTA-NONE	ACE-TONE	CARBON DI-S=	BENZENE	ETHYL-BENZENE	TOLUENE	m,p,o-XYLENES
SB- 1	13'-15'	1274.1	295.0	U	U	U	U	U	U	U	U	U	U	1703.7
SB- 2	16'-18'	U	U	U	U	U	U	U	U	U	U	U	U	26.1
SB- 2	22'-24'	U	U	U	U	U	U	U	U	U	U	U	U	15.5
SB- 6	11'-13'	29.8	U	U	U	U	U	28.6	U	9.8	U	19.9	13.7	31.1
SB- 8	13'-15'	10.3	U	U	U	U	U	U	U	U	U	215.7	39.6	305.6
SB- 9	9'-12'	116.3	U	11.2	19775.0	U	42.9	8.3	190.4	U	U	72.0	94.2	193.9
SB- 9	16'-18'	8047.1	U	U	U	U	U	968.9	U	U	U	U	139.592	229.917
SB-15	10'-12'	U	U	U	U	U	U	U	U	U	U	U	U	29.0
SB-15	36'-38'	70.5	284.6	U	U	U	U	U	U	U	U	42.1	35.9	21.0
SB-19	28'-30'	119.6	30.4	U	U	U	U	U	U	U	U	20.6	5.9	32.6
SB-19	33'-35'	24.0	U	U	U	U	U	U	U	U	U	16.9	U	11.6
SB-20	20'-22'	U	50.0	U	U	U	U	U	U	U	U	U	U	U
SB-21	10'-12'	60.0	7.0	U	U	U	U	U	U	U	U	U	U	U
SB-21	19'-21'	76.0	746.0	U	U	U	U	U	U	U	U	U	U	U
SB-26	10'-12'	1287.4	8.4	18.0	U	U	U	U	U	U	U	1267.1	20.6	1226.4
SB-27	18'-20'	U	U	U	U	U	U	U	U	U	U	U	16.4	U
SB-29	10'-12'	U	U	U	U	U	U	U	U	U	U	U	U	U
SB-30	20'-22'	917.6	52.5	U	U	69.7	U	U	U	123.3	U	176.9	154.5	444.9
SB-31	31'-34'	1.67E+6	6.5E+4	U	U	U	U	U	U	U	U	1.1E+6	4.16E+6	1.9E+6

U = Below detection limit

Summary of Analysis of Perched Zone Ground Water at MWDS

ORGANIC COMPOUNDS

WATER SAMPLING PHASE 1
PARTS PER BILLION (ppb)
(Perched Zone)

COMPOUND	MW-2S
1,1-DICHLOROETHANE	U
1,1-DICHLOROETHENE	U
1,2-DICHLOROETHANE	U
1,2-DICHLOROETHENE (TOTAL)	900.0
2-BUTANONE	U
2-HEXANONE	43.0
2,4,5-TRICHLOROPHENOL	9.0
4-METHYL-2-PENTANONE	100.0
CHLOROETHANE	U
CHLOROFORM	U
BENZENE	U
BIS(2-ETHYLHEXYL) PHTHALATE	12.7
ETHYLBENZENE	U
NAPHTHALENE	12.8
TETRACHLOROETHENE	U
TRICHLOROETHENE	U
TOLUENE	U
VINYL CHLORIDE	90.0
m,p,o-XYLENES	65.0
METHYLENE CHLORIDE	U

U = Below detection limit

INORGANIC COMPOUNDS

WATER SAMPLING PHASE 1
PARTS PER MILLION (ppm)
(Perched Zone)

Parameter	MW-2S
ZINC	--
NITRITE, (NO2)	--
NITRATE, (NO3)	--
CHLORIDE, (Cl)	482.0
FLUORIDE, (F)	65.2
SULFATE, (SO4)	376.0

(--) = Below USEPA's Minimum Acceptable Concentration

INORGANIC COMPOUNDS

WATER SAMPLING PHASE 2
PARTS PER MILLION (ppm)
(Perched Zone)

Parameter	MW-2S	MW-11S	MW-12S	MW-13S	MW-15	MW-16	MW-17	MW-18
ZINC	--	1.5	7.8	--	--	--	--	--
NITRITE, (NO2)	--	--	--	--	--	--	--	--
NITRATE, (NO3)	--	28.3	--	11.4	--	1250.0	--	--
CHLORIDE, (Cl)	424.0	120.0	--	633.0	--	1280.0	107.0	378.0
FLUORIDE, (F)	85.2	0.4	--	--	--	67.2	18.3	6.8
SULFATE, (SO4)	328.0	165.0	--	--	--	1700.0	--	--

(--) = Below USEPA's Minimum Acceptable Concentration

ORGANIC COMPOUNDS

WATER SAMPLING PHASE 2
PARTS PER BILLION (ppb)
(Perched Zone)

COMPOUND	MW-2S	MW-11S	MW-12S	MW-13S	MW-15	MW-16	MW-17	MW-18
1,1-DICHLOROETHANE	U	U	U	U	U	U	U	U
1,1-DICHLOROETHENE	6.6	U	U	U	U	U	U	U
1,2-DICHLOROETHANE	U	U	U	U	U	U	U	U
1,2-DICHLOROETHENE (TOTAL)	330.0	U	U	U	U	U	63.0	26.0
2-BUTANONE	U	U	U	U	U	U	11.0	U
2-HEXANONE	U	U	U	U	U	U	U	U
4-METHYL-2-PENTANONE	U	U	U	U	U	U	41.0	U
4,4'-DDT	U	U	U	U	U	U	U	U
BENZENE	12.0	U	U	U	U	U	28.0	U
BIS(2-ETHYLHEXYL) PHTHALATE	11.1	U	U	15.0	19.4	U	14.6	U
CHLOROETHANE	U	U	U	U	U	U	U	U
CHLOROFORM	U	U	U	U	U	U	U	U
ETHYLBENZENE	170.0	U	U	U	U	U	86.0	U
NAPHTHALENE	15.9	U	U	U	U	U	U	U
TETRACHLOROETHENE	U	U	U	U	U	U	5.3	U
TRICHLOROETHENE	U	U	U	U	U	U	U	8.9
TOLUENE	27.0	U	U	U	U	U	300.0	U
VINYL CHLORIDE	48.0	U	U	U	U	U	10.0	U
m,p,o-XYLENES	140.0	U	U	U	U	U	150.0	U
METHYLENE CHLORIDE	5.9							

U = Below detection limit

TABLE 7

Summary of Analysis of Glacial Aquifer Ground Water at MWDS

ORGANIC COMPOUNDS

WATER SAMPLING PHASE 2
PARTS PER BILLION (ppb)
(Glacial Aquifer)

COMPOUND	MW-1	MW-2D	Dp-2D	Av-2D	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
1.1-DICHLOROETHANE	97.0	U	U	U	U	U	U	U	U	U
1.1-DICHLOROETHENE	U	U	U	U	6.3	U	U	U	U	U
1.2-DICHLOROETHANE	U	7.8	5.6	6.1	U	6.3	U	5.2	5.4	U
1.2-DICHLOROETHENE (TOTAL)	U	1400	980	1193	1700	U	U	160	U	U
2-BUTANONE	U	U	U	U	U	U	U	U	U	U
2-HEXANONE	U	U	U	U	U	U	U	U	U	5.3
4-METHYL-2-PENTANONE	U	U	U	U	U	U	U	U	U	U
BENZENE	U	5.2	U	5.1	8.5	U	U	U	U	U
BIS(2-ETHYLHEXYL) PHTHALATE	U	9.3	41.7	25.5	29.5	13.7	17.5	U	16.3	64.0
CHLOROETHANE	230	U	U	U	U	U	U	U	U	U
CHLOROFORM	U	U	U	U	U	U	9.7	U	U	U
ETHYLBENZENE	U	U	U	U	U	U	U	U	U	U
NAPHTHALENE	U	U	U	U	U	U	U	U	U	U
TETRACHLOROETHENE	U	U	U	U	U	U	U	U	U	U
TRICHLOROETHENE	U	100	98.0	98.0	380	12.0	12.0	7.1	U	U
TOLUENE	U	U	U	U	U	U	U	U	U	U
VINYL CHLORIDE	U	290	300	283	790	U	U	150	U	U
m,p,o-XYLENES	U	U	U	U	U	U	U	U	U	U
METHYLENE CHLORIDE	U	U	U	U	U	12.0	U	U	U	U

U = Below Detection Limit

COMPOUND	MW-9	MW-10	MW-11D	MW-12D	MW-13D	Dp-13D	Av-13D	MW-14	MW-19	MW-20
1.1-DICHLOROETHANE	U	U	U	U	U	U	U	U	U	U
1.1-DICHLOROETHENE	U	U	U	U	U	U	U	U	U	U
1.2-DICHLOROETHANE	U	U	U	U	U	U	U	U	U	U
1.2-DICHLOROETHENE (TOTAL)	U	18.0	U	U	500	440	470	U	U	U
2-BUTANONE	U	U	U	U	U	U	U	U	U	U
2-HEXANONE	U	U	U	U	U	U	U	U	U	U
4-METHYL-2-PENTANONE	U	U	U	U	U	U	U	U	U	U
BENZENE	U	U	U	U	5.0	5.0	5.0	U	U	U
BIS(2-ETHYLHEXYL) PHTHALATE	9.7	67.1	84.3	122	11.4	44.9	28.2	10.4	26.2	12.1
CHLOROETHANE	U	U	U	U	U	U	U	U	U	U
CHLOROFORM	U	U	U	U	U	U	U	U	U	U
ETHYLBENZENE	U	U	U	U	U	U	U	U	U	U
NAPHTHALENE	U	U	U	U	U	U	U	U	U	U
TETRACHLOROETHENE	U	8.7	U	7.7	7.9	U	6.5	U	U	U
TRICHLOROETHENE	U	U	U	U	30.0	29.0	29.5	5.1	28.7	U
TOLUENE	U	U	U	U	U	U	U	U	U	U
VINYL CHLORIDE	U	U	U	U	180	160	170	U	U	U
m,p,o-XYLENES	U	U	U	U	U	U	U	U	U	U
METHYLENE CHLORIDE	U	10.0	U	U	U	13	9	U	U	U

U = Below Detection Limit

INORGANIC COMPOUNDS

WATER SAMPLING PHASE 2
PARTS PER MILLION (ppm)
(Glacial Aquifer)

Parameter	MW-1	MW-2D	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
ZINC	--	--	--	--	--	--	10.0	--
NITRITE, (NO2)	--	--	--	--	--	--	--	--
NITRATE, (NO3)	--	--	678.0	--	--	--	--	--
CHLORIDE, (Cl)	--	609.0	462.0	--	--	1380.0	--	--
FLUORIDE, (F)	--	101.0	46.6	--	--	86.0	--	--
SULFATE, (SO4)	--	414.0	--	--	--	1510.0	--	--

(--) = Below USEPA's Minimum Acceptable Concentration

Parameter	MW-9	MW-10	MW-11D	MW-12D	MW-13D	MW-14	MW-19	MW-20
ZINC	--	--	--	8.4	--	--	4.1	3.3
NITRITE, (NO2)	--	--	--	--	--	--	--	--
NITRATE, (NO3)	--	--	--	--	--	--	--	--
CHLORIDE, (Cl)	--	--	--	--	274.0	--	--	--
FLUORIDE, (F)	--	--	--	4.6	7.2	--	--	--
SULFATE, (SO4)	311.0	467.0	291.0	370.0	435.5	--	392.0	403.0

(--) = Below USEPA's Minimum Acceptable Concentration

were left untreated. This analysis, commonly referred to as a baseline risk assessment, is documented in the draft Risk Assessment for the Motor Wheel Disposal Site, October 1990 and the Technical Memorandum dated December 21, 1990.

The baseline risk assessment for the Motor Wheel site evaluated the risk from different areas or units independently. The following units were evaluated:

* Surface soil and potentially eroded waste mass material
* Surface water sediments
* Surface water
* Perched zone ground water
* Glacial aquifer ground water
* Glacial aquifer phthalates

Although the fugitive dust pathway was not evaluated in the Risk Assessment the selected remedy will reduce the potential exposure through this pathway by capping the unexcavated areas of the site.

Toxicity Assessment

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen in mg/kg-day and the expected duration of chronic exposure, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. Values for these parameters are included in Table 8 for the chemicals used in the Risk Assessment. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by U.S. EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can

Summary of U.S. EPA Dose-Response Data Used in the MWDS Risk Assessment

Chemical	Reference Dose (mg/kg/day) Oral	Slope Factor (mg/kg/day)$^{-1}$ Oral
Arsenic	1E-3(a)	
Copper		
Chromium (VI)	5E-3(a)	
Nickel	2E-2(a)	
Lead		
Potentially Carcinogenic PAH		11.5(c)
Noncarcinogenic PAH	0.004(b)	
4,4-DDD		
4,4-DDE		
4,4-DDT	5E-4(a)	3.4E-1(a)
Aldrin	3E-5(a)	1.7E+1(a)
Dieldrin	5E-5(a)	1.6E+1(a)
Heptachlor	5E-4(a)	4.5E+0(a)
Bis-(2-ethylhexyl)phthalate	2E-2(a)	1.4E-2(a)
1,2-dichloroethene		
1,2-dichloroethane		9.1E-2(a)
Benzene		2.9E-2(a)
Tetrachloroethene		5.1E-2(a)
Trichloroethene		1.1E-2(a)
Vinyl Chloride		2.3E+0(a)
2-butanone	5E-2	
2-hexanone	5E-2	
4-methyl-2-pentanone	5E-2(a)	
Ethylbenzene	1E-1(a)	
Toluene	3E-1(a)	
Xylenes	2E+0(a)	
1,1-dichloroethane	1E-1(a)	9.1E-2(a)
Naphthalene	4E-3(a)	

(a) U.S. EPA HEAST, 4th quarter, 1989.
(b) The value for naphthalene was used.
(c) The value for benzo(a)pyrene was used.

be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. Values for these parameters are included in Table 8 for the chemicals used in the Risk Assessment.

Pathway and Risk Assessment

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site related exposure to a carcinogen over a 70 year lifetime under the specific exposure conditions at the site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposure within a single medium or across media.

Soil

The soil concentrations used to evaluate baseline risk were those considered accessible or potentially accessible to a transient visitor to the site. Surface soil samples, soil borings to a depth of 2 feet, and waste mass samples from banked areas with the potential for erosion were considered. Exposure routes were dermal contact and inadvertent ingestion. The following chemicals were selected based on their toxicity and frequency of occurrence:

* arsenic
* PAHs
* dieldrin
* heptachlor
* 4,4-DDT
* zinc
* bis(2-ethylhexyl)phthalate

Potential adverse human health effects were estimated for two types of chemicals: those with noncarcinogenic effects and those with

carcinogenic effects. Risks from potential carcinogens are expressed as a probability, e.g., 1 in 1 million (1×10^{-6}). The hazard index (HI) risk from noncarcinogenic chemicals is expressed as a fraction of the estimated dose divided by a regulated acceptable dose. An HI greater than 1 is considered unacceptable.

The sum of the dermal contact and ingestion pathways excess lifetime cancer risk (ELCR) was 1.46×10^{-6} for soil. The HI risks for adults and children are 1.44×10^{-3} and 6.91×10^{-3} respectively.

Sediments and Surface Water

Concentrations of contaminants in the four on-site ponds were used to determine risk due to exposure to sediments and surface water. A scenario in which an adult may swim in the pond seven times and a child four times per year was assumed to provide the visitation rate at the site. Both ingestion and dermal contact were the assumed exposure routes. The following compounds were selected for evaluation based on their toxicity and frequency of detection:

* 4,4-DDE
* 4,4-DDT

The ELCR from contact with sediment via dermal contact and ingestion at the pond was 1.50×10^{-8}. The HIs for adults and children was 1.92×10^{-5} and 6.07×10^{-4}, respectively. The ELCR from surface water by dermal contact and ingestion was 6.59×10^{-11}. Summed HIs were 4.79×10^{-7} for an adult and 9.1×10^{-7} for a child.

Perched Zone Ground Water

For the purposes of this risk assessment it was assumed that the perched zone ground water may flow into the glacial aquifer and be consumed. Two exposure routes were considered: the ingestion of drinking water and dermal contact while bathing. Both adults and children were considered. The following chemicals were selected based on their toxicity and frequency of detection in the perched zone:

* 1,2-dichloroethene
* 1,1-dichloroethene
* 1,2-dichloroethane
* 4-methyl-2-pentanone
* benzene
* ethylbenzene
* tetrachloroethene
* toluene
* trichloroethene
* methylene chloride
* 2,4,6-trichlorophenol
* di-n-octylphthalate

* fluoranthene
* naphthalene
* pyrene
* 2-methyl naphthalene
* vinyl chloride
* xylenes
* bi(2-ethylhexyl)phthalate
* nitrate
* 2-butanone
* sulfate
* chloromethane

The ELCR from dermal contact with and ingestion of water from the perched zone is 7.16×10^{-4}. The summed HIs for the same exposure routes for adults and children are 3.85×10^{-1} and 6.28×10^{-1} respectively. The majority of the risk from the perched zone ground water is via ingestion. Vinyl chloride makes up the majority of the risk, 92%, or a risk of 6.61×10^{-4}.

Glacial Aquifer Ground Water

For the purpose of risk assessment, theoretical exposure routes were assumed since the glacial aquifer is not currently a source of drinking water in the vicinity of the site. Ingestion and dermal contact while bathing were considered in this analysis. Both adults and children were considered. The following chemicals were selected for use in the analysis based on their toxicity and frequency of detection:

* 1,1-dichloroethene
* chloroethene
* bromomethane
* 1,2-dichloroethane
* chloroform
* bis(2-ethlyhexly)phthalate
* 1,2-dichloroethene
* vinyl chloride
* benzene
* 1,1-dichloroethane
* 2-hexanone
* trichloroethene
* tetrachloroethene
* methylene chloride
* nitrate
* sulfate

The ELCR from dermal contact with and ingestion of glacial aquifer ground water is 5.47×10^{-3}. The summed HIs for the same exposure routes for adults and children are 9.60×10^{-1} and 1.56×10^{0}, respectively. The majority of the risk associated with the glacial aquifer is due to ingestion. Vinyl chloride makes up 98.7 % of the risk.

Risks for the pathways considered in the assessment are summarized in Table 9.

Ecological Impacts

The site consists of the excavated pit area, which has some vegetative cover that offers only minimal habitat for wildlife, and the unexcavated area, which contains sparse grasses, indiscriminate scrub vegetation, and bushes. The Motor Wheel site is a small animal habitat. Transient deer, geese, ducks, and domestic animals have been noted on and in the vicinity during site visits. No evidence of adverse environmental effects, in the form of damaged or killed vegetation, loss of habitat, loss of food sources, and toxic effects to terrestrial and/or aquatic ecosystems were documented during site investigations. A U.S. Department of the Interior Fish and Wildlife Service conducted species/sensitive environment search did not indicate the presence of endangered species in the vicinity of the Motor Wheel site.

Bis(2-ethylhexyl)phthalate, the chemical of potential concern in surface water, was reported at a concentration of 5 µg/liter in surface water at the site based on the detection limit for the compound.

The acute and chronic ambient water quality criteria (AWQC) for the protection of aquatic life for bis(2-ethylhexyl)phthalate are 11 µg/liter and 3 µg/liter respectively. The present concentration of this compound is above the chronic AWQC. Since the chronic AWQC for phthalate is determined for sensitive species living in streams and rivers and since none of these species have been identified on site no environmental risk is assigned for surface water.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or, the environment.

VII. DESCRIPTION OF ALTERNATIVES

The alternatives analyzed for the remedial action at the Motor Wheel Disposal site are presented below. These are numbered to correspond with the numbers in the RI/FS Report. The alternatives which have been assembled to include remedial activities which address both the ground water contamination and waste mass area are as follows:

Risk Summary Table

Exposure Pathway	Excess Lifetime Cancer Risk	HI Adult	HI Child
Soil			
- Dermal Contact	5.79×10^{-7}	1.95×10^{-4}	6.58×10^{-4}
- Ingestion	8.90×10^{-7}	1.25×10^{-3}	6.26×10^{-3}
Sediment			
- Dermal Contact	1.48×10^{-8}	1.89×10^{-5}	1.87×10^{-5}
- Ingestion	4.57×10^{-10}	3.62×10^{-7}	5.89×10^{-4}
Surface Water			
- Dermal Contact	1.26×10^{-11}	1.08×10^{-7}	9.34×10^{-8}
- Ingestion	5.33×10^{-11}	3.71×10^{-7}	8.12×10^{-7}
Summed Risk for Surface Exposure	1.48×10^{-6}	1.46×10^{-3}	7.52×10^{-3}
Groundwater Perched Zone			
- Dermal Contact	2.20×10^{-7}	7.24×10^{-3}	1.26×10^{-2}
- Ingestion	7.67×10^{-4}	$2.37 \times 10^{+1}$	$3.86 \times 10^{+1}$
Groundwater Glacial Aquifer			
- Dermal Contact	4.12×10^{-7}	2.16×10^{-3}	3.75×10^{-3}
- Ingestion	5.86×10^{-3}	$1.79 \times 10^{+1}$	$2.91 \times 10^{+1}$
Glacial Groundwater Phthalate			
- Dermal Contact	5.45×10^{-10}	4.05×10^{-6}	7.00×10^{-6}
- Ingestion	8.87×10^{-6}	2.96×10^{-2}	1.09×10^{-1}

* **Alternative 1:** No Action
* **Alternative 2:** Access Restrictions and Ground Water Monitoring
* **Alternative 3:** Capping of Disposal Area and Natural Attenuation of Ground Water
* **Alternative 4:** Capping of Disposal Area with Collection and Treatment of Ground Water from the Glacial Aquifer
* **Alternative 5:** Capping of Disposal Area with Collection and Treatment of the Ground Water from the Perched Zone and Glacial Aquifer
* **Alternative 6:** Removal of VOCs in the Fill Mass by Soil Vapor Extraction, Capping of the Disposal Area, and Extraction and Treatment of the Ground Water from the Perched Zone and Glacial Aquifer
* **Alternative 7:** Excavation and Disposal of Fill Material with Extraction and Treatment of Ground Water from the Perched Zone and Glacial Aquifer
* **Alternative 8:** Excavation and Incineration On-site of the Fill Mass with Extraction and Treatment of the Ground Water from the Perched Zone and Glacial Aquifer

ALTERNATIVE 1:
NO ACTION

Capital Cost: $5,000
Annual Operation and Maintenance (O&M) Costs: $125,950
Net Present Worth (PW): $1,941,200

The Superfund program requires that the "No Action" alternative be evaluated at every site to establish a baseline for comparison. Under this alternative no further action would be undertaken to prevent exposure to the soil, sediment, or groundwater at the site or to prevent migration of the contamination off site.

Although no further remedial activities would be required a quarterly ground water monitoring program would be established for at least nine of the existing wells to evaluate ground water migration from the site. This ground water monitoring program would be implemented as a part of all alternatives.

ALTERNATIVE 2:
ACCESS RESTRICTIONS AND GROUND WATER MONITORING

Capital Costs: $140,600
Annual O&M Costs: $154,950
Net PW: $2,522,600

The limited action alternative provides institutional controls, access restriction and ground water monitoring in the perched zone and the glacial aquifer. Components of the alternative are:

* Necessary improvements in the current fencing and additional fencing around the perimeter of the unexcavated waste disposal area to restrict access, thereby reducing potential exposure and risk to human health and safety,

* Use of deed restrictions to limit the development and use of land and groundwater on the Motor Wheel Site,

* Installation of additional monitoring wells in the glacial aquifer, and

* Monitoring at selected perched zone and glacial aquifer wells.

ALTERNATIVE 3:
CAPPING OF DISPOSAL AREA AND NATURAL ATTENUATION OF GROUND WATER

Capital Costs: $7,207,700
Annual O&M Costs: $168,900
Net PW: $9,804,100

This alternative would include placing a multi-media cap over the entire fill area. Cost for the cap in this description and in the following alternative descriptions is based on the specifications of Michigan Act 64 as presented in the FS. This cap also meets and exceeds the requirements of the RCRA Subtitle C cap. It may be appropriate to modify the FS cap design and still meet the performance standards of Michigan Act 64 and RCRA Subtitle C.The cap over the fill area would cover about 11.3 acres. To ensure proper design and installation of the cap, it may be necessary to extend the cap past the landfill property boundaries. Access to adjacent property may be required.

Backfilling would be necessary where the northern portion of the fill area is exposed in the excavation. A 4 to 1 slope would be established and the cap extended over the slope. Approximately 125,000 cubic yards of backfill material would be needed. In order to maintain the integrity of the cap, the backfilled portion will also be included under the cap. The cap area would therefore be expanded to about 14.9 acres. The landfill boundary as well as the

backfill area and pit would be fenced to restrict access. Design and construction of the cap would take approximately 1 year.

No ground water treatment would be required for this alternative. Natural attenuation and degradation of contaminants would be relied upon to remediate the ground water. Although a time within which ground water standards would be achieved by natural attenuation can not be determined, it would be a very long time. Ground water monitoring as described in Alternative 2 would be implemented as part of this alternative and for the purpose of cost estimation will continue for at least thirty years.

The fencing and ground water monitoring elements of Alternative 2 would also be implemented for this alternative.

Site maintenance would consist of mowing and regular inspections of the cap for signs of damage or deterioration. Depending on the magnitude of the damage or deterioration excavation of the cover soil and repair of the barrier may be necessary.

ALTERNATIVE 4:
CAPPING OF DISPOSAL AREA WITH COLLECTION AND TREATMENT OF THE GLACIAL AQUIFER

Capital Costs: $10,127,000
Annual O&M Costs: $1,055,500
Net PW: $26,352,600

This alternative combines the capping of the disposal area and backfilled area as in Alternative 3 with extraction and treatment of ground water from the glacial aquifer. As with alternative 3 an Act 64 cap is used for cost estimation.

The ground water from the glacial aquifer will be extracted by installing recovery wells or trenches downgradient of the disposal site where compounds of concern were detected in ground water. It is estimated that approximately 1.66×10^9 gallons of water will have to be recovered and treated by air stripping to meet the objectives of the ground water cleanup. The time to meet these objectives is estimated to be 9 years assuming a linear removal rate from an extraction well system. In practice however, there is substantial doubt that cleanup goals could be achieved within this time. Costs included here assume 30 years of treatment.

The glacial aquifer extraction system would include four 6 inch extraction wells screened at a depth of 55 to 75 feet. A buried collection and transfer system would carry the extracted ground water to the on-site treatment facility. The exact number of wells, and their location, depths, and pumping rates, would be determined based on ground water flow and transport modeling and aquifer pump tests. An option to install ground water collection

trenches could be investigated during the detailed design phase.

Pre-treatment of ground water to remove iron and manganese by aeration, clarification and filtration may be necessary. This system would reduce iron and manganese to acceptable concentrations and also remove sufficient total suspended solids to meet discharge requirements.

Removal of organics from the ground water would be accomplished by air stripping and carbon adsorption. Air stripping would be used to remove the volatile organics from the ground water through mass transfer to the gaseous phase and collection by carbon adsorption for subsequent destruction. Aqueous phase carbon adsorption would be used for removal of non-volatile organic compounds from the ground water. Fluoride would be removed from the ground water by reaction with activated alumina. The process yields calcium fluoride which can be disposed as solid waste. The treated ground water will be discharged to the Lansing wastewater treatment plant (POTW). Monitoring would be implemented to ensure compliance with POTW pretreatment requirements and other State and Federal water quality criteria.

ALTERNATIVE 5:
ACT 64 CAP AND COLLECTION AND TREATMENT OF THE PERCHED AND GLACIAL AQUIFERS

Capital Costs: $11,083,300
Annual O&M Costs: $1,277,400
Net PW: $30,720,300

This alternative consists of capping the disposal area with an Act 64 cap as described in Alternative 3 and extracting and treating the perched zone and the glacial aquifer ground water. The capping would significantly reduce leachate generation due to surface water infiltration through the landfill. A slurry wall would be installed at the western and southern boundary of the disposal area to act as a barrier to block the movement of off-site ground water toward the disposal area, thus shortening the time for dewatering of the perched zone.

The slurry wall would be installed to a depth below the fill material. The slurry wall would be approximately 2,000 feet long and 35 to 40 feet deep depending on the depth to the clay layer supporting the perched zone.

Ground water would be collected from both the perched zone and the glacial aquifer and treated as described for Alternative 4.

The contaminated ground water in the perched zone would be extracted by placing the collection wells into the fill. Essentially, the objective would be to dewater the landfill by applying a retroactive leachate recovery system. The conceptual

design would include five extraction wells screened at depths of 25 to 35 feet.

ALTERNATIVE 6
ACT 64 CAP, SOIL VAPOR EXTRACTION AND GROUND WATER TREATMENT OF PERCHED AND GLACIAL AQUIFERS

Capital Costs: $12,533,000
Annual O&M Costs: $1,277,400
Net PW: $32,169,800

This alternative provides the same elements for the capping of the waste mass and the collection and treatment of ground water from the perched zone and the glacial aquifer as Alternative 5. Alternative 6 adds a soil vapor extraction system (SVE). SVE removes VOCs from the subsurface through a series of extraction wells by application of vacuum on soil above the water table. The VOC vapors are collected and processed through a liquid-vapor separator. Collected liquids would be either: (1) treated in a vacuum assisted aeration unit, causing the VOCs to volatilize so that they can be processed through an activated carbon substrate, or; (2) transported to the ground water treatment system for processing with the ground water from the perched zone and the glacial aquifer. The objective of the SVE is to reduce the transfer of VOCs into the perched zone and glacial aquifer thereby shortening the time required to meet ground water cleanup goals. The SVE treatment system would be continued until a significant reduction in the amount of VOCs being recovered by the system was achieved. The time to reach this point of reduction is uncertain since development of quantitative monitoring procedures would have to be developed.

ALTERNATIVE 7A
EXCAVATION AND DISPOSAL OF FILL OFF-SITE AND GROUND WATER TREATMENT OF THE PERCHED AND GLACIAL AQUIFER

Capital Costs: $140,987,000
Annual O&M Costs: $1,292,400
Net PW: $160,854,400

This alternative consists of excavating and disposing of fill material at an off-site RCRA compliant facility and extracting and treating ground water from the perched zone and the glacial aquifer as described for Alternative 5.

Excavation of all fill material would result in 256,000 cubic yards requiring disposal. This total volume considers increase of the volume of 210,000 cubic yards of waste due to handling and addition of reagents. It is estimated that approximately 427 days would be required to complete the excavation and shipment of all waste. Waste would be treated at the facility if necessary to meet land disposal restrictions. This work would probably take 1.5-2.0 years

to accomplish. The excavated area would be backfilled following completion of the excavation and shipment of waste.

Ground water in the perched zone and in the glacial aquifer would be treated in the same manner as for Alternative 5.

ALTERNATIVE 7B
EXCAVATION AND DISPOSAL OF FILL ON-SITE IN RCRA CELL, GROUND WATER TREATMENT OF PERCHED AND GLACIAL AQUIFERS

Capital Costs: $21,466,000
Annual O&M Costs: $1,292,400
Net PW: $41,313,400

This alternative consists of excavation of the same volume of fill material as for Alternative 7A and extraction and treatment of the perched zone and glacial aquifer ground water as for Alternative 5.

Excavated waste will be disposed of on-site in a disposal cell which meets the requirements of RCRA Subtitle C/Act 64. Waste will be treated as needed to meet land disposal restrictions. Disposal cells of this nature are designed with double liners and double leachate collection systems. The cell will cover approximately 5.75 acres. Construction of the on-site cell is expected to take 3-4 years.

ALTERNATIVE 8
EXCAVATION AND INCINERATION OF FILL ON-SITE AND GROUND WATER TREATMENT OF PERCHED AND GLACIAL AQUIFERS

Capital Costs: $117,270,600
Annual O&M Costs: $3,567,400
Net PW: $154,590,100

This alternative consists of excavating fill material and treating it in an on-site incinerator, and extracting and treating ground water from the perched zone and the glacial aquifer as in Alternative 5.

Excavated waste would be incinerated on-site in a mobile rotary kiln incinerator. It is estimated to take approximately 10 years to incinerate the waste mass using a rotary kiln with a capacity of 120 tons/day. Disposal of some residue at an off-site disposal facility or in an on-site RCRA Subtitle C/Michigan Act 64 disposal cell might be required depending on the composition of the residue.

VIII. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES ANALYSIS

This section profiles the performance of the preferred alternative against the nine criteria, noting how it compares to the other options under consideration. The nine criteria are as follows:

* **Overall Protection of Human Health and Environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls or institutional controls.

* **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provide grounds for invoking a waiver.

* **Long-term Effectiveness and Permanence** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once the cleanup goals have been met.

* **Reduction of Toxicity, Mobility, or Volume Through Treatment** is the anticipated performance of the treatment technologies that may be employed in a remedy.

* **Short-term Effectiveness** refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

* **Implementability** is the technical and administrative feasibility of the remedy, including the availability of materials and services needed to implement the chosen solution.

* **Cost** includes capital and operation and maintenance costs.

* **State Acceptance** indicates whether, based on its review of the RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

* **Community Acceptance** is assessed in this Record of Decision following review of the public comments received on the RI/FS report and the Proposed Plan.

GROUND WATER

1. Overall Protection of Human Health and the Environment

The "No-Action" alternative (Alternative 1) does not provide overall protection of human health and the environment because it allows continued migration of the plume. Alternatives 2 and 3 will not provide overall protection of human health and the environment because these also allow continued ground water migration. The ground water component of Alternative 4 may not provide adequate protection since the contaminants in the perched zone will not be collected and treated. Alternatives 5 through 8 will be protective of human health and the environment because they completely address

the ground water threat by capturing and treating all of the ground water contamination.

2. Compliance with ARARs

Groundwater ARARs include the requirements of the federal Safe Drinking Water Act, 1929 Michigan Public Act (MPA) 245, as amended; 1979 MPA 399, as amended; and 1982 MPA 307, as amended. The cleanup standards for ground water are the Michigan Act 307 Type B standards, which treat each contaminant to the $1x10^{-6}$ level or the Human Lifecycle Safe Concentration (HLSC), and Federal Drinking Water Standards (MCLs).

Alternatives 5 through 8 would comply fully with the ground water ARARs. As Alternative 4 does not capture all of the ground water contamination plume, it does not meet ground water ARARs in the perched zone. Since Alternatives 1 through 3 do not actively restore the aquifer, and rely on natural attenuation, dispersion and degradation, these will not meet ARARs, within a reasonable time frame.

Air ARARs include the requirements of 1965 Michigan Act 348, as amended and the Federal Clean Air Act. All Alternatives which rely on the operation of the air stripper will comply with both of these ARARs.

Since the ground water components of Alternatives 1 through 3 are not considered protective of human health and the environment and are not expected to meet ARARs within a reasonable time frame, they are not available for selection and will not be discussed through the remainder of this analysis.

3. Long-term Effectiveness and Permanence

Alternatives 5 through 8 all provide a high degree of long-term effectiveness and permanence at the site by collecting and treating the contaminated ground water and assuring that the contaminated ground water does not impact the Saginaw Formation. Alternative 4 would only be capable of capturing most of the plume as opposed to the entire plume and therefore leaves the risk of contaminated ground water from the perched zone discharging to the glacial zone. All alternatives also include "institutional controls" which would restrict the use of groundwater in the site area until cleanup levels are met. Ground water monitoring would also be used for each alternative.

4. Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment

Alternatives 4 through 8 are all able to sufficiently reduce the ground water contamination through treatment, although

Alternative 4 relies on natural attenuation, dispersion and degradation for contaminants in the perched zone. The contaminants will be removed from the water by several methods including air stripping and granular activated carbon (GAC). The GAC would be thermally regenerated at a RCRA compliant facility, thus destroying the contaminants and reducing the contaminant's mobility, toxicity and volume.

5. Short-term effectiveness

Potential risk to remedial workers exists for the pump and treat alternatives because installation of extraction wells would be intrusive into the waste mass and could liberate volatile materials. Risks associated with the operation and maintenance of the treatment systems would also be present. These risks are expected to be mitigated through proper health and safety procedures and operational precautions.

The time required for achievement of remedial action objectives for groundwater is expected to be long for all alternatives. Alternatives 4 through 6 are expected to be close to meeting the groundwater cleanup objectives after 30 years; however, the asymptotic approach to the cleanup objectives may require greater remedial time frames or modification of the cleanup strategy for the site.

6. Implementability

Installation of the pump and treat systems is expected to consist of available technologies using known construction techniques. O&M requirements of such systems will require long-term attention on a daily or weekly basis and must be included in implementation plans.

Ability to obtain approvals from agencies may be difficult for Alternative 4, which has the potential for downgradient movement of the constituents from the perched zone while dispersion, attenuation, and degradation are proceeding. Additionally it may be difficult to monitor and enforce deed restrictions and ground water use restrictions during this period.

Effluent from the treatment process would flow to the Lansing POTW. Monitoring would be implemented to ensure compliance with POTW requirements. The regulated parameters, discharge standards and monitoring frequency will be determined during the remedial design.

7. Cost

Costs for each alternative are presented earlier in "The Summary of Alternatives". The present worth cost differential to treat the glacial aquifer (Alternative 4) as compared to merely monitoring the release (Alternative 3) is $16,548,500. The incremental present worth cost required to treat both the perched and the

glacial aquifer (Alternatives 5-8) as compared to Alternative 4 is $4,367,700.

SOURCE CONTROL

1. Overall Protection of Human Health and the Environment

Alternatives 1 and 2 for source control would not control exposure to the waste fill and would allow for continued migration of fill contaminants into ground water. These alternatives would therefore not be protective of human health and the environment. Since these alternatives do not provide adequate protection to human health and the environment, they are not available for selection and will not be discussed through the remainder of this source control analysis.

The source control component of Alternatives 3 through 6 is protective of human health and the environment because it reduces the migration of contaminants from the fill to groundwater. These alternatives also reduce direct human contact risks. Alternative 6 provides some additional benefit in that SVE will reduce the total mass of VOCs in the vadose zone of the landfill, thus potentially decreasing the time required to treat the glacial aquifer.

Alternatives 7A and 7B are protective of human health and the environment because these require the removal of contaminated soil which would minimize the risk of contaminant migration to ground water. The risk of human exposure would also be eliminated. The difference is that for Alternative 7A, disposal occurs off-site, while Alternative 7B involves construction of an on-site containment cell.

Alternative 8 is protective of human health and the environment, since the waste will be excavated and incinerated. The risk due to direct contact with the waste and migration to the ground water is eliminated.

2. Compliance with ARARs

The major source control ARARs are Michigan Acts 307 and 64. Alternatives 3 through 6 include an Act 64 hazardous waste cap. Alternatives 7A and 8 are expected to meet Act 307, Type B standards, since the source will be removed and disposed of off-site or incinerated on-site. These standards are based on the levels required to protect ground water from the migration of contaminants from the fill and levels required to protect against unacceptable risk through direct human contact with contaminants in the fill.

Alternative 7B is capable of complying with ARARs since the containment cell will be designed to meet the requirements of Act 64. Alternatives 3 through 6 and 7B would be considered

Type C cleanups under Act 307 because waste is being left on-site.

3. Long-Term Effectiveness and Permanence

Alternatives 7A and 8 will result in a low magnitude remaining risk and high degree of permanence once the treatment or off-site removal is completed. Each may leave some residual soil contamination but at levels which would be protective of human health and the environment.

Alternative 7B will result in a low magnitude residual risk since the waste is fully contained on-site. The RCRA-cell will provide a higher degree of control than capping alone due mainly to the underliner system and leachate collection system in the RCRA cell. Alternatives 3 through 6 will reduce the chance of direct human contact as long as the cap is maintained but because these only cover, not remove, the contamination, a moderate long term risk of continued impact on human health and the environment remains. Alternative 6 may provide slightly greater long-term effectiveness since the VOCs are treated. The long-term effectiveness of Alternatives 3 through 6 depends on maintenance of the cap.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 6 and 8 treat the contaminated fill and thereby reduce the toxicity, mobility and volume.

In Alternative 8, incineration is expected to provide the greatest degree of reduction of toxicity, mobility, and volume of the waste mass, since organic constituents present in the waste mass will be destroyed. The process is effective and irreversible. Residuals from the process will include gasses, ash, and water that require subsequent treatment. It is expected that the ash volume will roughly be equivalent to the volume of material incinerated. Such residuals may require disposal, possibly as hazardous waste.

In Alternative 6, SVE would be employed to remove VOC materials from the vadose zone in the fill mass. The amount of constituents that would be removed or destroyed is difficult to assess because the performance of the SVE system is dependent on many site-specific factors such as location of significant volume of VOCs in the fill mass, the heterogeneity of the fill mass, and other issues. The degree of reduction is not expected to be great, since the majority of the constituents to be removed were identified in groundwater beneath the fill mass. SVE will not be effective for removal of VOCs in the perched or glacial aquifers.

The source control component of Alternatives 3,4,5 and 7B do not involve treatment and therefore do not satisfy the criteria to reduce the toxicity, mobility, or volume of the contaminated fill. Alternative 7A removes the contaminated soil from the site but does not reduce toxicity, mobility, or volume of the soil if treatment

is not required prior to disposal at the off-site facility.

5. Short-Term Effectiveness

All of the alternatives involve construction and have a degree of risk associated with potential exposure to dust, vapors, and contaminated waste. This potential would be minimized, as much as possible, through good construction practices and engineering controls.

The short-term exposures associated with Alternatives 3 through 6, and 7B would come about during construction of the cap or RCRA-cell.

The greatest potential for short-term exposure is associated with Alternatives 7A, 7B and 8. These alternatives involve excavating the waste and either incinerating it or landfilling the waste on or off-site, which could result in increased dust, vapors, and the potential for direct contact with contaminated waste. Alternative 7A involves negative short-term impacts since contaminated material will be transported off-site. Alternative 6 poses some short-term risk due to extraction of VOCs from the fill.

For Alternatives 3 through 6, it is expected that construction will take approximately 1 year. The SVE portion of Alternative 6 is expected to operate approximately 3-5 years. Alternative 7A will take 2-3 years to off-site dispose all the waste. Alternative 7B will take 3-4 years to construct a RCRA-cell. It is expected to take over 10 years to incinerate the waste under Alternative 8.

6. Implementability

For Alternatives 3 through 5, the ease of construction, operation, and ability to undertake additional remedial actions (if necessary) are not expected to present constraints to implementation. The ability to monitor the effectiveness of the alternatives is also expected to be easily achieved. The implementability of cap installation may present some technical challenges due to the topography of the fill mass and the presence of the adjacent sand and gravel pit. These challenges can be overcome with available technologies. Installing a hanging slurry wall could be difficult due to topography and geology.

For Alternative 6, successful operation of installing an SVE system would be difficult due to the heterogeneous nature of the waste. Also, the success of SVE would be highly dependent on the degree to which distinct volumes of materials containing VOCs could be located within the waste mass. For Alternative 7B, implementation is more difficult. From a technical perspective, it is possible to excavate the waste mass and construct a RCRA cell on-site. Where excavation is concerned, the monitoring requirements will be extensive and will require that the excavation be halted and

engineering controls be implemented if VOC or dust concentrations exceed allowable criteria. The implementation of a RCRA cell on-site also provides some technical difficulties; for example, the cell will have to be over 30 feet deep with a bottom liner of clay that is 14 feet thick to be placed on-site.

Incineration capacity may limit the implementation of Alternative 8. In addition, there will be some difficulty in that the waste will be handled prior to incineration, and the ash will need to be properly disposed. The substantive permit requirements will also pose some difficulty.

7. Cost

Costs for each alternative are presented earlier in the "Summary of Alternatives". The PW cost differential to treat the VOCs via SVE in Alternative 6 over just capping in Alternative 5 is approximately $1.5 million. The incremental PW cost above Alternative 5 to off-site dispose of the fill material (Alternative 7A) is $130,134,100, to build an on-site cell (Alternative 7B) is $10,593,100, and to incinerate on-site (Alternative 8) is $123,864,800.

Ground Water and Source Control

8. State Acceptance

The State of Michigan has indicated that it concurs with the selected remedy for the Motor Wheel site. A letter from the Michigan Department of Natural Resources indicating this support is attached.

9. Community Acceptance

In general, the community accepts the selected remedy. Comments from both the residents of the local community and the regulated community are addressed in the Responsiveness Summary which is attached.

IX.

The FS examined eight alternatives, and evaluated them according to the evaluation criteria outlined in the NCP. From these alternatives, U.S. EPA has selected Alternative 5 for remediation of the Motor Wheel Site. The alternative includes collection of ground water from the perched zone and the glacial aquifer and treatment of the contaminated ground water by air stripping, granulated activated carbon and activated alumina. The ground water collection system will include a slurry wall to enhance the dewatering of the perched zone.

Ground water remediation will continue until the cleanup standards

shown in Table 10 are met. These standards were determined according to procedures set forth in Rule 299.5709 of the Michigan Environmental Response Act (Act 307), for compliance with type B criteria for ground water in aquifers, based on individual risk for each compound. The risk-based levels may be below the current analytical detection levels for these chemicals. Therefore, the cleanup levels for these indicator chemicals will be determined by the available analytical procedures or the risk-based levels defined above, which ever is higher. Method detection limits ("MDL") applied here are based on Analytical Detection Level Guidance for Environmental Contamination Response Activities under Act 307 Rules (memorandum of James G. Truchan, MDNR, April 1, 1991) using best practical judgement based on the capabilities of the reference method and capabilities of government and commercial labs.

The goal of the ground water element of this remedial action is to restore ground water to its beneficial use, which is, at this site, use for residential purposes. Based on information obtained during the remedial investigation and on a careful analysis of all remedial alternatives, U.S. EPA and the State of Michigan believe that the selected remedy will achieve this goal. It may become apparent, during implementation or operation of the ground water extraction system, that contaminant levels have ceased to decline and are remaining constant at levels higher than their remediation goal. In such a case, the system performance standards and/or the remedy may be reevaluated.

The operating system may include:

a) discontinuing operation of extraction trenches in areas where cleanup goals have been attained;

b) alternating pumping at trenches to eliminate stagnation points; and

c) pulse pumping to allow aquifer equilibration and encourage adsorbed contaminants to partition into ground water.

A cap will be installed over the waste mass area to control infiltration through the waste and to reduce risk of exposure to the waste. The cap will be designed and constructed to meet the specifications of the Michigan Act 64. The cap will cover a total of about 14.9 acres including the slope of the mined out area.

The cost of the preferred remedy is estimated to be:

Capital Costs: $11,083,300
Annual O&M Costs: $1,277,400
Net PW: $30,720,300

CONTAMINANTS	MEAN CONC.	MAX. CONC.	MCL	MCLG	SMCL	Exceeded 1 x 10^{-5} Lifetime Incremental Cancer Risk	MI. Act 307 Type B	MDL
VOCs								
1,1-Dichloroethene	3.06	7	7	7	-	YES	7	1
1,2-Dichloroethane	2.6	7	5	0	-	YES	0.4	1
1,2-Dichloroethene	258.38	1,700	70	70	-	NA	70	1
2-Butanone	5.75	11	-	-	-	NA	400	5
2-Hexanone	-	43	-	-	-	NA	5	5
4-Methyl-2-pentanone	9.5	41	-	-	-	NA	400	5
Benzene	6.9	28	5	0	-	YES	1.0	1
Chloroethane	11.48	230	-	-	-	NA	9.0	1
Chloroform	-	9.7	-	-	-	NA	6.0	1
Chloromethane	4.9	5	-	-	-	NO	3.0	1
Ethylbenzene	33.9	170	-	-	-	NA	700**	1
Methylene Chloride	4.13	10	-	-	-	NA	5.0	1
Naphthalene	6.75	16	-	-	-	NA	40	5
Tetrachloroethene	2.81	5	-	-	-	YES	0.7	1
Trichloroethene	33.43	380	5	0	-	YES	3.0	1
Toluene	42.75	300	-	-	-	NA	800**	1
Vinyl Chloride	85.10	790	2	0	-	YES	0.02	1
Xylenes (total)	38.13	150	-	-	-	NA	300	1
Semi-VOCs								
Bis(2-ethylhexyl)phthalate	19.36	122	-	-	-	YES	2	5
2,4,5-Trichlorophenol	22.19	25	-	-	-	YES	700	5
Inorganics								
Ammonia	-	453,000	-	-	-	NA	34,000	-
Chloride	401,470	1,380,000	-	-	250,000	NA	250,000	-
Fluoride	22,286	101,000	4,000	4,000	2,000	NO*	2,000	-
Iron	3,190	-	-	-	300	NA	300	-
Lead	-	300	-	-	-	NA	5	3
Nitrate	161,851	1,249,600	10,000	10,000	-	NA	10,000	-
Sulfate	432,800	1,700,000	-	-	250,000	NA	250,000	-
Zinc	2,600	10,000	-	-	5,000	NA	1,000	20

All concentrations in µg/L MCL: Maximum Contaminant Level MCLG: Maximum Contaminant Levels Goals

SMCL: Secondary MCL MDL: Method Detction Limit (-) : Not established

NA: No slope factor available for these compounds, therefore cancer risk was not calculated.

*: Exceeded Hazard Index (HI) of 1 for noncarcinogenic effects in adult and child.

**: Michigan Act 307 Type B Secondary Maximum Contaminant Level or taste/odor threshold value, if lower than toxicologically-based standard.

Based on current information, this remedy appears to provide the best balance of trade-offs among the alternatives with respect to the nine criteria that EPA uses to evaluate alternatives.

X. STATUTORY DETERMINATIONS SUMMARY

1. Protection of Human Health and the Environment

The selected remedy provides adequate overall protection of human health and the environment, by capping the waste mass area and by pumping and treating the contaminated ground water in the perched zone and in the glacial aquifer. Institutional controls including deed and usage restrictions will be sought in addition to the engineered controls, to implement and maintain risk reduction due to the waste fill mass and during the period of active ground water remediation.

Short term risks associated with the installation of ground water recovery wells and collection system and the operation of the air stripper will be managed through the use of good engineering practice and monitoring of appropriate media.

No environmental impacts have been identified for the site. This is largely due to the fact that impacts from the site have been to the ground water, soil, and sediment in the site areas where disposal activities took place.

2. Attainment of ARARs

The selected remedy will be designed to meet all applicable or relevant and appropriate requirements (ARARs) of Federal and more stringent state environmental laws. The following discussion provides the details of the ARARs that will be met by the selected alternative.

Action-Specific ARARs:

Clean Water Act (CWA) of 1977, as amended [33 U.S.C. 1251]

40 CFR 122 and 40 CFR 125 - The National Pollutant Discharge Elimination System (NPDES), which specifies the scope and details of the NPDES permit applications, including limitations, standards, and other permit conditions which are applicable to all permits including specified categories of NPDES permits. Also specifies schedules of compliance and requirements for recording and reporting monitoring results. Administered by MDNR under 1929 Michigan Public Act 245, as amended, Part 21.

Michigan Act 348 of the Public Acts of 1965, as amended: Air Pollution Act

Part 2 - Air Use Approval, which specifies information required for a permit to install, construct, reconstruct, relocate, or alter any process, fuel burning or refuse burning equipment, or control equipment which may be a source of air contamination.

Parts 3, 7 and 9 - Emissions, which specifies emission limitations for particulates, fugitive dust, VOCs, and or contaminants which may be injurious to or adversely affect human health or welfare, animal life, vegetation, or property, or interfere with normal use and enjoyment.

Part 10 - Intermittent Testing and Sampling, requirements which may require performance of acceptable performance tests.

Resource Conservation and Recovery Act, Subtitle C (RCRA), 1976; U.S.C. 6901; 1979 Michigan Hazardous Waste Management Act, PA 64

40 C.F.R. 264 - Ground Water Protection Standards, which provide technical requirements for long-term monitoring while the ground water treatment element is active and for at least the first five year review period following completion of the ground water cleanup.

Chemical-Specific ARARs:

Clean Water Act (CWA) of 1977, as amended [33 U.S.C. 1251]

40 CFR 129 - Toxic Pollutant Effluent Standards, which establish toxic pollutant effluent standards and prohibitions of specific compounds for specified facilities discharging into navigable waters. 40 CFR 129.104 sets the ambient water criterion in navigable waters.

Public Health Service Act: Title XIV, as amended by the Safe Drinking Water Act [42 U.S.C. 300] and 1979 Michigan Safe Drinking Water Act, Act 399

40 CFR 141 - National Primary Drinking Water Regulations, which specify maximum chemical contaminant levels (MCLs) of public water systems for inorganic and organic chemicals, maximum contaminant goals (MCLGs) of public water systems for organic chemicals, and establishes national revised primary drinking water regulations of

MCLs for organic chemicals. Public Act 399 incorporates the MCLs for a public drinking water supply system, which includes ground water used as a drinking water supply.

Clean Air Act of 1963, as amended [42 U.S.C. 7401]

40 CFR 50 - National Primary and Secondary Ambient Air Quality Standards, which establish national primary and secondary ambient air quality standards. The appendices provide methods and procedures for measuring specific air pollutants.

40 CFR 61 - National Emission Standards for Hazardous Air Pollutants, which identifies substances that have been designated hazardous air pollutants, and for which a Federal Register notice has been published, and specifies prohibited activities, describes procedures for determining whether construction or modification is involved, prescribes methods of applying for approval, and covers the manner in which start-up notification is to be provided.

Act 245 of the Public Acts of 1929, as amended: Water Resources Commission Act

Part 4, Rule 57 - Water Quality Standards (Surface Water Quality Standards), which establishes limits for all waters of the State for the following components: dissolved solids, pH, taste and odor producing substances, toxic substances, total phosphorous and other nutrients, and dissolved oxygen.

Rule 98 - Antidegradation, requires maintenance and protection of existing waters when water quality is better than water quality standards.

Part 22 - The State has identified this rule as an ARAR. The State concurs with the remedy selected, and has stated that in applying Act 307 requirements to the ground water treatment, the remedy selected will satisfy the requirements of Act 245. The United States disagrees that Act 245, as interpreted and applied by the State in this matter, is an ARAR. This issue is the subject of litigation in U.S. v. Akzo Coatings of America, appellate case numbers 89-2902 and 80-2137, and may be reassessed after a decision has been rendered.

Act 348 of the Public Acts of 1965, as amended: Air Pollution Act

Part 3 - Emission Limitations and Prohibitions - Particulate Matter, which establishes standards for the

density of emissions and emission of particulate matter.

Act 307, Michigan Environmental Response Act. The rules promulgated pursuant to the Act set requirements for evaluating remediation of hazardous waste sites in Michigan. There are three types of remediation specified by this act; Type A, B, and C.

Act 347 of the Public Acts of 1972: Soil Erosion and Sedimentation Control Act

Part 17 - Soil Erosion and Sedimentation Control - Establishes general soil erosion and sedimentation control procedures and measures. Also, specifies earth change requirements and soil conservation district standards and specifications.

3. **Cost-Effectiveness**

The selected remedy provides overall cost-effectiveness. An adequate degree of permanence is achieved by containment of the waste fill mass by capping and by extraction and treatment of the contaminated ground water.

4. **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable**

The selected remedy provides the best balance with respect to the nine evaluation criteria as described in Section IX of this Record of Decision. Treatment technologies are utilized to the maximum extent practicable by treatment of contaminated ground water by pump and treat, which includes treatment of stripped volatiles. This alternative is further balanced with respect to the nine criteria because a permanent solution which utilizes treatment technologies for the ground water is being selected. The ground water monitoring component of the selected remedial action will assure that concentrations of contaminants do not increase during implementation.

5. **Preference for Treatment as a Principal Element**

By treating the contaminated ground water the selected remedy satisfies the statutory preference for remedies that employ treatment of primary threats and which permanently and significantly reduces toxicity, mobility, or volume of hazardous substances as a principal element.

The selected remedy reduces the primary threat at the site, direct contact with and ingestion of contaminated ground water. Because treatment of the threats due to the waste fill mass was not found to be practicable, this element of the remedy does not satisfy the

statutory preference for treatment as a principal element. Treatment is a principal element of the ground water remedy which reduces the risk of exposure through ingestion and direct contact with the contaminated ground water by use of pump and treat technology.

RESPONSIVENESS SUMMARY

MOTOR WHEEL DISPOSAL SITE

Overview

At the start of the public comment period which began July 15, 1991 the United States Environmental Protection Agency (EPA) proposed a remedial alternative which addressed both groundwater and soil contamination at the Motor Wheel Disposal site ("Motor Wheel"), Lansing, Michigan. The alternative, as specified in the proposed plan, called for capping of the on-site waste mass area and for the extraction of contaminated groundwater from the perched zone and the glacial aquifer with treatment via air stripping. Capping of the waste mass area is projected to take approximately one year and extraction and treatment of the groundwater was projected to last for at least 30 years. In addition, the Motor Wheel proposed plan required fencing of the site area, land use restrictions, groundwater monitoring and long-term maintenance of the air stripper. Comments received by the EPA and those voiced at the public meeting in Lansing expressed concern about some of the details of the proposal.

This Responsiveness Summary addresses the concerns expressed by the public and the potentially responsible parties (PRPs) in written and oral comments received by EPA at the public meeting and during the public comment period.

The responsiveness summary is divided into the following sections:

A. Background on community involvement;

B. Summary of comments received during the public comment period, including responses to the comments;

C. Other comments received by the EPA.

A. Background on Community Involvement

Community interest in the Motor Wheel site was strong at the start of the RI/FS but has been somewhat inconsistent since that time. There is no formal citizens' group specifically for Motor Wheel. However, the site has been included as a topic for attention by the north Lansing citizens information committee which meets periodically to discuss environmental problems associated with several sites in the north Lansing area. The Ingham County Department of Public Health (ICDPH) and the Michigan Department of Public Health (MDPH) participate in the citizen's information committee as well.

The most significant early community relations issue was the concern over the length of time that was required to begin clean up at the site.

B. Summary of Comments Received During the Comment Period

The public comment period on the proposed plan for the Motor Wheel site was held from July 18, 1991 to August 19, 1991. Comments received during this public comment period are listed below. Some of the comments have been paraphrased so they could be more effectively summarized in this document. For original comments in their entirety, the reader is referred to the public meeting transcript and written comments which are available for review at the public information repository at Lansing Public Library in Lansing, Michigan.

A response follows each comment. Comments and responses have been divided into three sections and are further categorized by topic within each section where appropriate. The three sections are:

1. Summary of comments from the local community, including written and oral comments submitted during the July 24, 1991 public meeting;

2. Comments of the Ingham County Health Department;

3. Comments from elected government officials; and

3. Summary of comments from the potentially responsible parties (PRPs).

1. Summary of Comments from Residents

COMMENT: A commenter expressed opposition to Alternative 8 of the Feasibility Study (FS) which included incineration of the waste mass material.

U.S. EPA Response: The U.S. EPA evaluated all alternatives described in the FS, including incineration, using appropriate guidance and the criteria for comparative analysis in the National Contingency Plan (NCP). The results of this analysis indicated that the proposed plan alternative is appropriate to meet the remedial objectives at the site. It is not the intention of U.S. EPA to incinerate any of the waste mass material from the Motor Wheel site.

Comment: A commenter at the public meeting expressed concern that the Risk Assessment was incomplete since it did not evaluate the

potential for contamination of the Saginaw aquifer in the vicinity of the site especially since the RI indicated that the shale aquitard may be discontinuous to the south and southwest of the site. Additionally the commenter was critical of the length of time that elapsed from the recognition of need for further investigation of the bedrock aquifer in the Remedial Investigation Report and the start of field work to evaluate the continuity and integrity of the shale aquitard and the water quality in the Saginaw aquifer near the site.

U.S. EPA Response: U.S. EPA recognizes the need to evaluate the potential for contamination of the Saginaw aquifer which is the source of the Lansing public water supply. At the direction of U.S. EPA and MDNR an investigation was designed to provide data for the evaluation of the current impact of the Motor Wheel site on this aquifer and the potential for future impact on the aquifer if no action is taken at the site. The study includes the installation of four wells into the sandstone member of the Saginaw formation. Core samples will be examined to determine the thickness and competence of the shale and the nature and permeability of the sandstone. Water samples will be collected and analyzed during well installation to evaluate water quality in all geologic horizons and to determine the optimum depth for well completion. Samples will then be analyzed to fully evaluate water quality in that portion of the Saginaw aquifer.

The planning and execution of an investigation of this significance required several months after all parties to the RI/FS Administrative Order recognized the need for the investigation. During this period of discussion and planning, monitoring of the ground water from the Lansing Board of Water and Light (BW&L) wells in the vicinity confirmed that water quality at those locations is currently not being impacted by constituents from the site. Monitoring of the BW&L water quality will continue until the investigation is complete.

COMMENT: A commenter was concerned that the proposed alternative for capping of the waste mass area would not adequately reduce the risk for continued contamination of the ground water and that because there could be drums present in the waste mass the threat to the ground water would continue unless treatment was perpetual. The commenter recommended Alternative 7B requiring excavation of the waste mass and containment on-site in a hazardous waste cell as the most appropriate remedy.

U.S. EPA Response: Capping is commonly selected at Superfund sites to reduce ground water degradation caused by infiltration of precipitation through heterogeneous waste. Analysis of the performance of these remedies indicate a high degree of long-term effectiveness in protecting human health and the environment by reducing the production of leachate caused by this infiltration.

Evaluation of alternatives indicates that a high degree of long-term effectiveness can also be expected at the Motor Wheel site by installation of an Act 64 cap and continuation of appropriate operation and maintenance.
At sites where there are many drums mixed with low-level heterogeneous waste it is beneficial to remove these drums prior to capping. Investigation has indicated that significant numbers of drums are not present at the Motor Wheel site. Since drums were not found during recent on-site test pitting in the vicinity of several geophysical anomalies it is not likely that the long-term effectiveness of the Act 64 cap will be reduced or that perpetual treatment of the ground water will be necessary.

Containment of the waste in an on-site cell offers only marginal increase in the long-term effectiveness over capping because of circumstances at the Motor Wheel site. Infiltration reduction is similar since the cap design is the same for both alternatives. Although some advantage in the restriction of movement of contaminants may be demonstrated for the liner, initially this advantage is reduced because the selected alternative also includes treatment of the perched zone ground water. Movement of contaminants from this zone will be essentially precluded after installation of the slurry wall and dewatering of the perched zone. Attainment of this marginal increase in long-term effectiveness is not cost-effective since it would cost $10.5 million more, while producing very limited additional benefit.

COMMENT: A comment suggested that U.S. EPA include monitoring of the local residents during any cleanup and consider a buy out of some of the residents. He also suggested that U.S. EPA consider recommendations in the recent Michigan State University report regarding risks.

U.S. EPA Response: Before U.S. EPA considers any action at a Superfund site a site specific risk assessment is completed following guidance developed by the Agency for that purpose. The assessment evaluates both the current and potential risk to human health and the environment associated with the site. The assessment examines all reasonable exposure scenarios. Because of the uncertainties involved, assumptions which must be made in this evaluation are very conservative. This assessment is used by U.S. EPA in making cleanup decisions including decisions regarding the need for long-term health monitoring or residential buyouts. Although U.S. EPA appreciates and understands the local residents concerns regarding their health and property values, assessment at the Motor Wheel site has not indicated risks of the nature that could require either long-term health monitoring or buyout of residential property.

The report referenced by the commenter discusses the need to address those environmental problems which represent the highest

risk in order to achieve the greatest benefit. Superfund sites, which are included on the National Priorities List, fit the category of environmental problems which represent a high degree of risk. Further, U.S. EPA agrees with the philosophy of getting the most from the funds which are available by choosing remedies at Superfund sites that are cost effective.

2. Comments from the Ingham County Health Department

Mary Hultin of the Ingham County Health Department (ICHD) presented comments at the July 24, 1991 meeting and submitted the same as written comments during the public comment period.

COMMENT: The ICHD expressed a preference for Alternative 6 since the soil vapor extraction (SVE) element may provide more long-term effectiveness than the selected alternative since it would potentially reduce the time required to treat the glacial aquifer, by reducing the total mass of VOCS.

U.S. EPA Response: U.S. EPA maintains that the selected remedy is appropriate for the site. Remedy selection involves balancing the trade-offs between alternatives as compared to criteria set forth in the National Contingency Plan. While U.S. EPA recognizes that Alternative 6 may provide advantage in short-term effectiveness by potentially shortening the time for attainment of ground water cleanup goals and provide some reduction of contaminant volume, the NCP requires comparative evaluation of alternatives against all criteria. Additionally the cost effectiveness of Alternative 6 is uncertain since it is doubtful that the volume reduction could be accurately determined. Implementation of Alternative 6 also may be questionable because of the heterogeneous nature of the waste at Motor Wheel.

COMMENT: Although use of indicator compounds may be appropriate if carefully chosen the commenter felt that it is important that the ground water be periodically monitored for all compounds detected in the glacial and perched aquifers.

U.S. EPA Response: Indicator compounds were selected for the Motor Wheel risk assessment using criteria described in Risk Assessment Guidance for Superfund (RAGS), December 1989. Indicator compounds were determined to be of greatest concern because of their toxicity, level of concentration, and wide spread occurrence. Some of these indicator compounds were subsequently used in the baseline risk assessment to determine need for remediation at the site.

U.S. EPA may periodically monitor for all compounds on the Hazardous Substance List and TCL. The frequency and parameters will be determined during design. It is understood that

determination of compliance with all cleanup standards will be required for completion of the ground water remedial action.

COMMENT: Fluoride is not considered in the risk assessment although it is listed as a primary noncarcinogenic concern.

U.S. EPA Response: Risk associated with fluoride was evaluated in a Technical Memorandum Addendum to the Risk Assessment. Risk associated with the presence of fluoride in the ground water is above acceptable levels. The selected remedy includes treatment with activated alumina for reduction of fluoride concentrations to Act 307 standards.

3. Comments from Elected Officials

Lynne Martinez, Ingham County Commissioner, District 20, submitted comments supporting Alternative 6 and the comments regarding long-term monitoring which were submitted by the Ingham County Health Department.

COMMENT: The commenter supports Alternative 6 for remediation at the site rather than Alternative 5. The uncertainty of implementability of SVE notwithstanding the commenter feels that the additional cost ($1.5 million) seems a relatively small additional expense and would offer some benefit in assuring a reduction in the level of VOCs.

U.S. EPA Response: U.S. EPA maintains that the selected remedy is appropriate for the site. Remedy selection involves balancing the trade-offs between alternatives as compared to criteria set forth in the National Contingency Plan. While U.S. EPA recognizes that Alternative 6 may provide advantage in short-term effectiveness by potentially shortening the time for attainment of ground water cleanup goals and provide some reduction of contaminant volume, the NCP requires comparative evaluation of alternatives against all criteria. Additionally the cost effectiveness of Alternative 6 is uncertain since it is doubtful that the volume reduction could be accurately determined. Implementation of Alternative 6 also may be questionable because of the heterogeneous nature of the waste at Motor Wheel.

COMMENT: The commenter agreed with the comment of the Ingham County Health Department regarding the inclusion of regular periodic screening for a broad spectrum of toxic compounds.

U.S. EPA Response: Indicator compounds were selected for the Motor Wheel risk assessment using criteria described in Risk Assessment Guidance for Superfund (RAGS), December 1989. Indicator compounds were determined to be of greatest concern because of their

toxicity, level of concentration, and wide spread occurrence. These indicator compounds were subsequently used in the baseline risk assessment to determine need for remediation at the site.

U.S. EPA may periodically monitor for all compounds on the Hazardous Substance List and TCL. The frequency and parameters will be determined during design. It is understood that determination of compliance with all cleanup standards will be required for completion of the ground water remedial action.

COMMENT: The commenter requested that the design specifications for the slurry wall and the clay cap should assure that the two are contiguous in such a way as to provide for the greatest enclosure possible of the contaminated mass.

U.S. EPA Response: U.S. EPA does not agree with the commenter that the slurry wall and the cap should provide contiguous enclosure of the waste mass since remedial objectives for the site do not include containment of the waste mass and the two components are not intended for that purpose. Containment could be provided by Alternative 7B of the FS which calls for excavation of the waste mass and containment in an on-site Michigan Act 64 hazardous waste cell, however, that alternative has not been determined to be appropriate to address the threat to human health and the environment at the Motor Wheel site.

4. Comments from Potentially Responsible Parties (PRPs)

Comments from PRPs express concerns in two general areas: concerns about the selection of the appropriate cap for the waste mass area and issues concerning collection and treatment of contaminated ground water.

Cap Requirements

COMMENT: The commenter asserts that Act 64 is neither applicable nor relevant and appropriate for the capping alternative at the site.

U.S. EPA Response: U.S. EPA has not identified Act 64 as applicable at the Motor Wheel site. However, the Agency has identified Act 64 as relevant and appropriate under the circumstances at the site. Act 64 is relevant since hazardous wastes, constituents, and substances are known to have been disposed of at the site and have been identified in the waste mass at the site in high concentrations. The types of disposed wastes identified on the property are primarily solid industrial wastes, including fly ash, paints, solvents, liquid acids and caustics, sludges and other wastes. Wastes were disposed of on the

property in tanks, barrels, seepage ponds and open fill operations. In identifying Act 64 as appropriate at the site U.S. EPA considered the remedial goals which include source control for the reduction of contamination of ground water in the perched zone and the glacial aquifer. Maximum reduction of infiltration is achieved by capping to meet the Act 64 design requirements.

It is not suitable to consider the circumstances at this site in the same manner as circumstances at large landfills or large mining waste sites. The Motor Wheel site can more favorably be compared to a regulated unit in that the waste mass area can be well defined both laterally and vertically and estimates of the effectiveness of the cap in reducing infiltration and generation of leachate can reasonably be made.

COMMENT: The commenter contends that even if Act 64 is determined to be an ARAR at the site, the circumstances warrant a waiver. The circumstances which support a waiver include the ability of an Act 641 cap or a RCRA cap to attain performance standards similar to an Act 64 cap and result in a significant reduction in the cost of the preferred remedy, the inconsistent application of the requirements of an Act 64 cap, and the potential for the Motor Wheel site to be a fund-financed site in order to preserve the fund.

U.S. EPA Response: U.S. EPA does not agree with the commenter's contention that a waiver of Act 64 is warranted. The MDNR has consistently applied Michigan Act 64 to landfills that have accepted hazardous substances and waste containing hazardous constituents which have been on the National Priorities List (NPL).

Solid industrial wastes, including fly ash, paints, solvents, liquid acids and caustics, sludges and other wastes have been disposed of at the site. These wastes were disposed of on the property in tanks, barrels, seepage ponds and open fill operations. Michigan Act 641 and Act 64 are not considered conflicting requirements but ones that are in succession to one another. For this site since hazardous substances were disposed of and ground water is contaminated by the wastes within the site, Act 64 should and does take precedence over Act 641 if the facility has accepted hazardous substances. If these hazardous materials were disposed of after 1980, then Act 64 is applicable; if these hazardous substances were disposed of prior to 1980, then Act 64 is relevant and appropriate. Act 64 is relevant and appropriate for the Motor Wheel site. This is consistent with the requirements of the NCP.

U.S. EPA disagrees that the performance of an Act 64 cap is equaled or exceeded by an Act 641 cap. Clearly, the Act 64 cap is designed to prevent infiltration to a significantly greater degree, as it

was designed to be used at sites or facilities that disposed of concentrated hazardous materials. There clearly is not a basis for waiving the ARAR based on equivalent standard of performance. Although less costly, U.S. EPA cannot select the 641 cap at this site, due to considerations including degree of effectiveness, reliability into the future and protection of human health and the environment.

COMMENT: The commenter contends that Act 64 should be waived to preserve the Fund because of the possibility the site may revert to a Fund financed remedy.

U.S. EPA Response: U.S. EPA considers the possibility of the Motor Wheel site requiring Fund financing remote since a viable group of PRPs has been identified that has performed the RI/FS and has subsequently indicated interest in participating in discussions regarding the performance of the remedy in their response to General Notice.

In addition, the fund-balancing waiver would not be considered at this site even if it were to be a fund-financed site. The fund-balancing waiver is considered at sites where the cost required to meet an ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of funds to respond to other sites that may present a threat to human health and the environment. The lowest cost where fund balancing is to be considered would be based on an amount significantly greater than the cost of remediating similar problems.

COMMENT: The commenter contends that a final design of a cap at the site can meet the requirements of Act 64 but not conform to the design criteria in the proposed plan and the Feasibility Study.

U.S. EPA Response: U.S. EPA agrees with the commenter that the design specifications in the FS exceed the requirements of Michigan Act 64 and RCRA Subtitle C for closure of a hazardous waste cell. The Agency would reasonably expect that a cap design different from the design shown in the FS could meet relevant and appropriate requirements of Michigan Act 64 and RCRA Subtitle C for closure and be protective of human health and the environment at the site since the FS design includes an additional liner not specified in the RCRA closure guidance of Act 64 regulations.

COMMENT: The commenter asserted that Alternatives 6 through 8 do not enhance the public health and the environment and are not cost-effective. Alternative 6 is not appropriate because SVE would not be effective based on the conditions at the site. Alternative 7A is inappropriate because excavation of the waste mass and off-site

disposal poses unreasonable short-term risks without any appreciable long-term benefit. Alternative 7B is inappropriate because excavation of the waste mass poses unreasonable short-term risks and an on-site Act 64 cell is not necessary for the protection of human health and the environment. Alternative 8 poses the same short-term concerns as Alternatives 7A and 7B, with the additional problems of the siting requirements and community acceptance of an incinerator, and the disposal of large quantities of ash.

U.S. EPA Response: U.S. EPA agrees with the commenter assessment of the merits of Alternatives 6 through 8. Comparative analysis of alternatives indicates that the selected remedy provides a better balance when compared against Alternatives 6 through 8 under the nine criteria. As the commenter correctly points out the implementability of Alternative 6 may be difficult because of the heterogeneous nature of the waste mass. Short-term effectiveness of Alternatives 7A and 7B is low because of the risks associated with excavation and handling of the waste. Other less costly alternatives provide a similar level of long-term effectiveness as Alternatives 7A and 7B. The high cost with limited benefit provided by Alternative 8 make it not cost-effective.

COMMENT: The point of compliance for attainment of ground water cleanup objectives should be the boundaries of the site.

U.S. EPA Response: Because of uncertainties about the level and source of contamination in the vicinity of the Motor Wheel site U.S. EPA disagrees that the point of compliance should be the boundaries of the site. The U.S. EPA's Superfund goal is to return usable ground waters to their beneficial uses and to protect against current and future exposure within a timeframe that is reasonable given the particular circumstances of the site. The NCP directs "that for ground water, remediation levels should generally be attained throughout the contaminant plume, or at and beyond the edge of the waste management area when waste is left in place". Further Michigan Act 307 requires that for Type B criteria "the point of exposure shall be presumed to be any point in the affected aquifer".

U.S. EPA recognizes that there are other sites in the vicinity of Motor Wheel which may be potential contributors of contaminants to the aquifer and that at a future time other strategies may be feasible and effective in addressing this wider contamination. However, until uncertainties about these sources have been reduced, the point of compliance shall be as indicated in the NCP And Michigan Act 307.

COMMENT: A term for operation for any ground water treatment system should not be specified since existing knowledge on ground water treatment indicates that the effectiveness of any ground

water treatment system varies over time and deviates dramatically based upon certain operational parameters.

U.S. EPA Response: U.S. EPA acknowledges that research into and experience with ground water pump and treat remedies have suggested that, in certain instances, low level cleanup goals cannot be achieved within the estimated time frame. Uncertainty in meeting cleanup objectives in a specified time is, however, an insufficient reason for not setting these goals. Progress toward cleanup will be evaluated after the ground water extraction system is implemented and, if it is determined that cleanup objectives cannot be achieved, consideration will be given to alternative methods to provide protection of human health and the environment.

However, until it is shown that the selected technologies cannot achieve cleanup goals for this site, the remedy must be designed to be protective of human health and the environment and comply with ARARs. Since the stated cleanup goals are based on protection and ARARs, U.S. EPA believes that this approach to evaluating effectiveness of ground water remediation is consistent with Section 300.430(e) of the NCP.

COMMENT: The commenter asserts that Michigan Act 307 Type B criteria for ground water cleanup are inappropriate since the remedial goals in the FS indicate that appropriate residual risk should be in the 10^{-4} to 10^{-6} range and further that the Type C standards identified in the FS are the proper ARAR for this site. The Type C cleanup standards are appropriate at this site because there is no known current (or foreseeable future) residential or commercial use of the glacial aquifer. The perched aquifer will be dewatered and, therefore, is not of concern for future human consumption.

U.S. EPA Response: In the Superfund process, cleanup remedies are selected that reduce the threat from carcinogenic contaminants at sites such that the excess risk from the medium (i.e., soil or ground water) to an individual exposed over a lifetime generally falls within a risk range from 10^{-4} to 10^{-6}. U.S. EPA's preference is to select remedies that are at the more protective end of the risk range. In fact the NCP suggests that the 10^{-6} risk level be used for determining remediation goals at sites with multiple contaminants or exposure pathways (NCP 300.430(e)(2)(i)(A)(2). Therefore, Michigan Act 307 rules, ARARs for this site, are consistent with cleanup objectives corresponding to 10^{-6} for ground water at Type B sites.

As specified in Act 307, the application of Type A, B, or C cleanup in the State of Michigan is made on a case-by-case basis, considering the site-specific information. The Type B cleanup objectives at the site are justified because of the potential future use of the ground water, the rate and direction of ground

water movement, and the overall mobility and toxicity of the contaminants. U.S. EPA has determined that Type C cleanup objectives are not appropriate for this site given the potential future use of the ground water migrating from the source area. The U.S. EPA policy under the Safe Drinking Water Act (SDWA) is to restore ground water resources to beneficial used where practicable. The target residual risk under the SDWA is consistent with a Type B cleanup.

COMMENT: Design flexibility should be included for the slurry wall installation due to concerns over the efficacy of slurry walls. Flexibility should allow for modification or abandonment of the slurry wall to account for implementability concerns that may arise during the design and construction phase of the remedial action.

U.S. EPA Response: The slurry wall was included in the Proposed Plan as a part of the ground water treatment system based on the engineering analysis provided in the Feasibility Study (FS) prepared by the PRPs' engineer. The FS is an essential data resource in remedy selection and a major document of record. U.S. EPA has relied on the FS, among other documents to support its remedy selection and comparative analysis of alternatives at the Motor Wheel site. U.S. EPA recognizes that new data may be presented during detailed design that suggests changes that may provide greater effectiveness in the implementation of the remedy. U.S. EPA maintains however, that available data indicates that a slurry wall is a desirable and necessary adjunct to that ground water collection system and will be included as part of the selected remedy.

COMMENT: The ground water treatment technologies and disposal options for treated water should not be specified.

U.S. EPA Response: Wherever possible remedial alternative processes are described as specifically as possible. U.S. EPA recognizes that uncertainty is present in these data that are the basis for selection of remedial alternatives at Superfund sites. This uncertainty regarding details of some of the alternatives is accepted as necessary so that progress toward cleanup can continue. U.S. EPA disagrees that this specific information should not be used in the selection of a remedial alternative. It does recognize however, that data, which become available during implementation, indicating that the selected technology may be inappropriate, should be considered.