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1991

# EPA Superfund
# Record of Decision:

**G&H LANDFILL**
**EPA ID: MID980410823**
**OU 01**
**UTICA, MI**
**12/21/1990**

12/21/90
REGIONAL ADMINISTRATOR

**#SLD**
**SITE LOCATION AND DESCRIPTION**

THE G&H INDUSTRIAL LANDFILL (G&H) SITE IS LOCATED SOUTHWEST OF THE INTERSECTION OF RYAN ROAD AND 23-MILE ROAD IN SHELBY TOWNSHIP, MACOMB COUNTY, MICHIGAN. THE G&H SITE IS APPROXIMATELY 3 MILES NORTHWEST OF UTICA AND APPROXIMATELY 20 MILES NORTH OF DETROIT. THE 70-ACRE G&H LANDFILL IS SITUATED TO THE NORTH AND EAST OF THE NEARBY CLINTON RIVER (SEE FIGURE 1). THE RIVER PROVIDES A HABITAT FOR SEVERAL IMPORTANT FISH SPECIES AND OTHER AQUATIC LIFE. A PORTION OF THE ROCHESTER-UTICA STATE RECREATIONAL AREA (RECREATIONAL AREA), WHICH IS LOCATED SOUTH OF THE SITE, HAS BEEN IMPACTED BY PAST LANDFILL OPERATIONS. THE RECREATIONAL AREA, WHICH IS USED FOR HIKING, FISHING (IN THE CLINTON RIVER), AND FOR OTHER RECREATIONAL PURPOSES BY AREA RESIDENTS AND VISITORS, INCLUDES WETLANDS AND WOODLAND HABITATS WHICH SUPPORT NUMEROUS SPECIES OF MIGRATING BIRDS AND OTHER WILDLIFE.

THE SURROUNDING AREA IS GENERALLY SUBURBAN; RESIDENTIAL NEIGHBORHOODS ARE LOCATED TO THE NORTH AND TO THE EAST WITHIN SEVERAL HUNDRED FEET OF THE LANDFILL. A SUBDIVISION OF ABOUT 80 HOMES IS LOCATED IN THE EASTERN AREA, AND A NEWER SUBDIVISION OF ABOUT 25 HOMES IS LOCATED IN THE NORTHERN AREA. SEVERAL LIGHT INDUSTRIAL FACILITIES ARE LOCATED TO THE SOUTHEAST, DIRECTLY ADJACENT TO THE LANDFILL. THE UPPER SAND AND GRAVEL AQUIFER IS THE SOURCE OF DRINKING WATER FOR SOME OF THE EASTERN AREA RESIDENCES AND THESE INDUSTRIES. THE REMAINDER OF THE AREA IS SERVED BY THE MUNICIPAL WATER SUPPLY.

PROMINENT SITE FEATURES INCLUDE THE THREE PHASES OF THE LANDFILL (PHASES I, II, AND III), AS SHOWN IN FIGURE 1. THE 44-ACRE PHASE I LANDFILL AREA, BOUNDED BY A 10-ACRE AUTOMOBILE SALVAGE YARD (JUNKYARD) TO THE NORTHEAST, THE ABANDONED CONRAIL RIGHT-OF-WAY TO THE SOUTH, THE LIGHT INDUSTRIAL AREA TO THE SOUTHEAST, AND THE RESIDENTIAL AREA NORTH OF 23-MILE ROAD, IS CHARACTERIZED BY FAIRLY FLAT BUT UNEVEN TERRAIN AND SCRUB VEGETATION. THE 17-ACRE PHASE II LANDFILL AREA, WHICH WAS BEGUN AFTER PHASE I HAD BEEN FILLED IN, IS ALSO CHARACTERIZED BY UNEVEN TERRAIN AND SCRUB VEGETATION. PHASE II IS BOUNDED BY THE CONRAIL RIGHT-OF-WAY TO THE NORTH AND A PIPELINE EASEMENT FOR THE DETROIT WATER AND SEWERAGE DEPARTMENT (DWSD) TO THE WEST. PHASE II HAS A STEEP SOUTHERN SLOPE THAT TERMINATES IN THE WOODLANDS IN THE RECREATIONAL AREA. THE 8-ACRE PHASE III LANDFILL AREA, WHICH REPRESENTS THE FINAL PHASE OF LANDFILL OPERATIONS, HAS LITTLE SURFACE VEGETATION AND IS BOUNDED BY THE DWSD PIPELINE EASEMENT ON THE EAST. PHASE III HAS A STEEP SOUTHERN AND WESTERN SLOPE THAT TERMINATES IN THE WOODLANDS ADJACENT TO THE CLINTON RIVER AND IN A PORTION OF THE RIVER'S 100-YEAR FLOODPLAIN.

THE DWSD EASEMENT CONTAINS A 96-INCH (DIAMETER) WATER SUPPLY PIPELINE AND A 24-INCH INTERCEPTOR SEWER. THE WATER SUPPLY LINE WAS CONSTRUCTED IN 1967 AND SERVES AS THE MAIN DISTRIBUTION LINE FROM LAKE HURON TO THE DETROIT MUNICIPAL WATER SYSTEM. THE 24-INCH INTERCEPTOR SEWER, WHICH SERVES SHELBY TOWNSHIP, IS CONNECTED TO A 96-INCH REGIONAL INTERCEPTOR SEWER WHICH RUNS BENEATH PORTIONS OF THE PHASE II AND PHASE III LANDFILL AREAS (SEE FIGURE 2). THE REGIONAL INTERCEPTOR SEWER SERVES OAKLAND COUNTY AND CONNECTS TO THE DWSD MAIN SEWAGE TREATMENT PLANT.

THE CLINTON-KALAMAZOO CANAL, AN ABANDONED NAVIGATIONAL PROJECT, RUNS THROUGH THE RECREATIONAL AREA TO THE SOUTH AND WEST OF THE SITE. THE CANAL, AN INTERMITTENT, 20-FOOT WIDE DITCH, IS FILLED WITH DEBRIS IN SOME SPOTS AND OTHERWISE CONTAINS STANDING WATER. THE PHASE III LANDFILL AREA WAS BUILT OVER A PORTION OF THE CANAL; REPORTEDLY, THE LANDFILL OPERATORS INTENDED TO REROUTE THE CANAL AFTERWARDS, BUT THIS DID NOT OCCUR.

THE JUNKYARD DOES NOT APPEAR TO HAVE BEEN USED FOR THE DISPOSAL OF MUNICIPAL TRASH, BUT IT MAY HAVE BEEN USED AS A SOLVENT DISPOSAL AREA. THE SURFACE IS LITTERED WITH THE REMAINS OF AUTOMOBILES, TRUCKS, CONSTRUCTION EQUIPMENT, AND MISCELLANEOUS DEBRIS.

**#SH**
**SITE HISTORY**

A SAND AND GRAVEL QUARRY EXISTED AT THE G&H SITE UP TO THE EARLY 1950S. IN MID 1950, AFTER QUARRY OPERATIONS HAD CEASED, THE LANDOWNER LEASED THE PROPERTY TO THE G&H INDUSTRIAL FILL COMPANY. LANDFILL OPERATIONS BEGAN

IN 1955 AND ENDED IN 1973, WHEN THE FINAL PHASE HAD BEEN FILLED TO CAPACITY. THE LANDFILL OPERATORS ACCEPTED MUNICIPAL REFUSE, SOLID INDUSTRIAL WASTES, AND LIQUID INDUSTRIAL WASTES INCLUDING SOLVENTS, PAINTS, VARNISHES, LACQUERS, AND WASTE OILS, FOR DISPOSAL AT THE SITE.

WASTE OIL AND WATER MIXTURES, DELIVERED TO THE SITE BY RAIL AND BY TANK TRUCK, WERE DISPOSED OF AT THE LANDFILL FROM APPROXIMATELY 1955 TO 1967. INITIALLY, THE OPERATORS ATTEMPTED TO RECLAIM THE OIL BY PUMPING THE OIL AND WATER MIXTURES TO SETTLING PONDS LOCATED IN THE PHASE I LANDFILL AREA (SEE FIGURE 2) AND SKIMMING OFF THE RECOVERABLE OIL FOR RESALE. SEVERAL ATTEMPTS WERE MADE TO RECLAIM THE OIL, BUT NONE WERE REPORTED TO BE SUCCESSFUL. THEREAFTER, THE OIL WAS REPORTEDLY ALLOWED TO SETTLE AND THE VOLATILE COMPONENTS WERE ALLOWED TO EVAPORATE. THE RESULTING SLUDGE WAS PERIODICALLY REMOVED AND BURIED IN THE LANDFILL.

IN THE EARLY 1960S, LOCAL RESIDENTS LODGED COMPLAINTS WITH THE MACOMB COUNTY HEALTH BOARD (MCHB) REGARDING SEWAGE ODORS EMANATING FROM THE CLINTON-KALAMAZOO CANAL SOUTH OF THE LANDFILL. AN INITIAL SITE INSPECTION BY THE MCHB DID NOT LOCATE THE SOURCE OF THE ODORS; HOWEVER, A JOINT SITE SURVEILLANCE BY THE MCHB AND THE MICHIGAN WATER RESOURCE COMMISSION (MWRC) DISCOVERED THAT GROUNDWATER SEEPS SOUTH OF THE RAILROAD TRACKS EMITTED A STRONG CHEMICAL ODOR. AS A RESULT, THE MWRC CONDUCTED A GROUNDWATER AND SURFACE WATER INVESTIGATION IN JULY 1965. AT THAT TIME, THE MWRC NOTED THAT THE LANDFILL OPERATION ACCEPTED WASTE OILS AND MUNICIPAL TRASH, ALONG WITH SOLVENTS, PAINTS, ETC., WHICH WERE DELIVERED IN 55-GALLON DRUMS, AND IDENTIFIED THREE AREAS IN THE PHASE I LANDFILL INTO WHICH THE CONTENTS OF THE DRUMS WERE DUMPED (SEE FIGURE 2). (SUBSEQUENTLY, THE LANDFILL OPERATORS HAVE INDICATED THAT SOLVENT DISPOSAL PONDS WERE LOCATED THROUGHOUT THE PHASE I LANDFILL AREA AND THE JUNKYARD.)

THE MWRC INVESTIGATION DETERMINED THAT GROUNDWATER (IN THE UPPER AQUIFER) FLOWED GENERALLY TO THE SOUTH AND CONCLUDED THAT LIQUID WASTE DISPOSAL OPERATIONS WERE RESPONSIBLE FOR CONTAMINATION OF THE GROUNDWATER SEEPS SOUTH OF THE RAILROAD TRACKS. AS A RESULT OF THIS INVESTIGATION, A CONSENT ORDER WAS ISSUED BY THE MACOMB COUNTY CIRCUIT COURT IN MAY 1966 PROHIBITING THE DISPOSAL OF PAINTS, VARNISHES, PAINT THINNERS, AND LACQUERS IN THE G&H LANDFILL. WASTE OILS WERE NOT ADDRESSED BY THIS CONSENT ORDER.

A SECOND MWRC INVESTIGATION IN NOVEMBER 1966 CONCLUDED THAT THE WASTE OIL DISPOSAL/RECLAMATION ACTIVITIES AT THE LANDFILL WERE ALSO CONTRIBUTING TO GROUNDWATER CONTAMINATION. BASED UPON THESE FINDINGS, THE MACOMB COUNTY CIRCUIT COURT ISSUED A CONSENT ORDER IN 1967 BANNING THE DISPOSAL OF ANY LIQUID INDUSTRIAL WASTES AT THE LANDFILL.

AFTER LIQUID INDUSTRIAL WASTE DISPOSAL ALLEGEDLY CEASED, THE G&H SITE CONTINUED TO OPERATE AS A SANITARY LANDFILL FROM 1967 UNTIL OPERATIONS CEASED IN 1973. THE G&H LANDFILL WAS ALSO KNOWN AS THE SHELBY TOWNSHIP DUMP, OPERATING UNDER VARIOUS STATE OF MICHIGAN PERMITS FROM 1967 TO 1973. ALTHOUGH LANDFILL OPERATIONS CEASED IN 1973, FOR EACH PHASE HAD BEEN FILLED TO CAPACITY, NO FINAL CLOSURE PLAN WAS PREPARED OR IMPLEMENTED.

THE STATE INVESTIGATED THE SITE SEVERAL MORE TIMES BETWEEN 1973 AND 1979. THESE SAMPLING EVENTS DOCUMENTED POTENTIAL CONTAMINATION OF THE CLINTON RIVER BY LEACHATE SEEPS WEST OF THE PHASE III LANDFILL AREA AND BY OIL SEEPS SOUTH OF THE PHASE I LANDFILL AREA.

PURSUANT TO THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA), THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (US EPA) INSPECTED THE SITE IN 1982. SUBSEQUENT TO THE SUBMITTAL OF THE SITE INSPECTION REPORT IN AUGUST 1982, THE US EPA PLACED THE SITE ON THE NATIONAL PRIORITIES LIST (NPL) IN SEPTEMBER 1983.

THE US EPA HAS INITIATED FOUR REMOVAL ACTIONS AT THE G&H LANDFILL PURSUANT TO ITS AUTHORITY UNDER CERCLA. THE FIRST REMOVAL ACTION BEGAN IN JULY 1982. ITS PURPOSE WAS TO PREVENT PUBLIC ACCESS TO THE CONTAMINATED GROUNDWATER AND OIL SEEPS SOUTH OF THE PHASE I LANDFILL AREA AND TO PREVENT THE MIGRATION OF OIL CONTAMINATED WITH POLYCHLORINATED BIPHENYLS (PCBS). A FENCE WAS CONSTRUCTED AROUND THE OIL SEEP AREA, AND DAMS WERE BUILT TO DIRECT SURFACE WATER FLOW AROUND THE SEEPS. BY THE WINTER OF 1982/83, THE OIL HAD MIGRATED BEYOND THE FENCED AREA. THE SECOND REMOVAL ACTION, WHICH BEGAN IN JULY 1983, WAS INITIATED TO ALLEVIATE THE SITUATION. THE FENCE WAS EXTENDED AROUND THE PERIMETER OF THE NEW OIL SEEPS, AND AN OIL SKIMMER WAS INSTALLED TO PREVENT THE MIGRATION OF FLOATING OIL. CLAY BARRIERS WERE PLACED IN THE PATH OF THE NEW OIL SEEPS AS WELL.

IN APRIL 1986 THE MICHIGAN DEPARTMENT OF NATURAL RESOURCES (MDNR) NOTED THAT THE CLAY BARRIERS AND SITE FENCES WERE NO LONGER SUCCESSFUL AT PREVENTING THE MIGRATION OF THE OIL OR PUBLIC ACCESS TO THE OIL. THE THIRD REMOVAL ACTION, INITIATED IN MAY 1986, INCLUDED THE FOLLOWING ACTIVITIES:

- RECREATIONAL AREA TRAILS WERE BLOCKED WITH EARTHEN BERMS, AND A GATE WAS INSTALLED TO RESTRICT PUBLIC ACCESS TO THE AREA.

- A COLLECTOR TRENCH WAS EXCAVATED, CONNECTING ISOLATED OIL SEEPS, AND A STEEL SHEETPILE BARRIER WAS INSTALLED TO PREVENT OIL FROM MIGRATING BEYOND THE COLLECTOR TRENCH. THE TRENCH AND THE BARRIER DIRECTED THE OIL FLOW TO A SINGLE DISCHARGE POINT FOR PERIODIC RECOVERY OF THE OIL. OIL COLLECTED DURING THIS REMOVAL ACTION WAS STORED IN A METAL STORAGE BUILDING CONSTRUCTED TO STORE PCB-CONTAMINATED WASTES UNTIL THEY COULD BE PROPERLY DISPOSED OF.

AS THE REMEDIAL INVESTIGATION (RI), THEN IN PROGRESS (SEE SECTION F, BELOW) CONTINUED, IT BECAME APPARENT THAT THE SURFACE SOILS ON THE LANDFILL WERE CONTAMINATED AND THAT PUBLIC ACCESS TO THE ENTIRE SITE COULD BE CREATING A HEALTH HAZARD. A FOURTH REMOVAL ACTION WAS INITIATED IN JULY 1987. AT THIS TIME, A CHAIN-LINK FENCE WAS INSTALLED AROUND THE PERIMETER OF THE ENTIRE SITE, INCLUDING THE PORTIONS OF THE RECREATIONAL AREA AFFECTED BY THE OIL SEEPS. OILS WERE RECOVERED PERIODICALLY AND STORED IN THE BUILDING. IN APRIL 1989, APPROXIMATELY 2,400 GALLONS OF A PCB-CONTAMINATED OIL AND WATER MIXTURE WERE TRANSPORTED TO AN OFF-SITE THERMAL DESTRUCTION FACILITY FOR PROPER DISPOSAL.

**#EH**
**ENFORCEMENT HISTORY**

MOST OF THE G&H LANDFILL BUSINESS RECORDS WERE DESTROYED IN AN OFFICE FIRE IN DECEMBER 1974. THE US EPA HAS OBTAINED INFORMATION REGARDING POTENTIALLY RESPONSIBLE PARTIES (PRPS) FROM RESPONSES TO INFORMATION REQUEST LETTERS SENT TO ALLEGED LANDFILL USERS, DEPOSITIONS OBTAINED FROM THE LANDFILL OPERATOR, AND DEPOSITIONS TAKEN FROM ALLEGED TRANSPORTERS TO THE SITE. USING RESPONSES TO INFORMATION REQUESTS RECEIVED IN 1986-1987, THE US EPA IDENTIFIED AN INITIAL GROUP OF 12 PRPS, INCLUDING ALLEGED GENERATORS, THE OWNER OF THE PROPERTY, AND THE OPERATORS OF THE G&H LANDFILL.

INFORMATION REGARDING ADDITIONAL PRPS WAS OBTAINED BY THE CORE GROUP OF PRPS AND PRESENTED TO THE US EPA FOR FOLLOW-UP. SINCE 1989, THE NUMBER OF PRPS AT THE G&H SITE HAS GROWN TO ABOUT 44, BASED UPON DEPOSITIONS TAKEN IN MID-1990 FROM ALLEGED TRANSPORTERS AND UPON RESPONSES TO FOLLOW-UP INFORMATION REQUEST LETTERS SENT TO ALLEGED GENERATORS. SEVERAL OF THE ADDITIONAL ALLEGED GENERATORS HAVE JOINED THE PRP GROUP IN PREPARATION FOR THE RECEIPT OF SPECIAL NOTICE LETTERS, WHICH THE US EPA INTENDS TO ISSUE IN JANUARY 1991.

THE ALLEGED GENERATORS HAVE BEEN CLOSELY FOLLOWING THE RI SINCE ITS INCEPTION, OFFERING COMMENTS ON THE US EPA'S DATA-GATHERING EFFORTS AND DATA INTERPRETATIONS. IN 1985, A SMALL PRP GROUP HAD OFFERED TO ASSIST THE US EPA AND THE MDNR IN COMPLETING THE RI AND THE FEASIBILITY STUDY (FS). HOWEVER, THE US EPA, IN CONSULTATION WITH THE MDNR, DECIDED THAT THIS WOULD NOT BE EFFICIENT AND LIMITED THE PRP INVOLVEMENT TO PROVISION OF COMMENTS ON THE SCOPE OF THE RI WORK PLAN AND TO INDEPENDENT DATA REVIEWS. THE PRP GROUP HAS PROVIDED COMMENTS, ON THE FS AND THE PROPOSED PLAN FOR REMEDIAL ACTION, WHICH ARE ADDRESSED IN THE ATTACHED RESPONSIVENESS SUMMARY.

**#CP**
**COMMUNITY PARTICIPATION**

PURSUANT TO SECTIONS 113(K)(2)(B)(I-V) AND 117 OF CERCLA, THE SHELBY TOWNSHIP COMMUNITY HAS PARTICIPATED IN THE REMEDY SELECTION PROCESS, IN THAT:

- **!** PRIOR TO ANY PUBLIC MEETING, A PRESS RELEASE WAS SENT OUT TO THE LOCAL MEDIA AND AN ADVERTISEMENT ANNOUNCING THE MEETING WAS PLACED IN THE CLINTON ADVISOR, A LOCAL PAPER OF GENERAL CIRCULATION;

- **!** PUBLIC MEETINGS WERE HELD IN MAY 1984, SEPTEMBER 1984, AND OCTOBER 1988, ANNOUNCING THE

SCOPE OF THE DIFFERENT STAGES OF THE RI;

- A PUBLIC MEETING WAS HELD IN MARCH 1990, ANNOUNCING SOME OF THE FINDINGS OF THE RI;
- THE G&H LANDFILL INFORMATION REPOSITORY HAS BEEN KEPT UP TO DATE WITH SITE DOCUMENTS. AN ADMINISTRATIVE RECORD CONTAINING THE RI AND FS REPORTS AND OTHER DOCUMENTS WAS PLACED IN THE SITE INFORMATION REPOSITORY, WHICH IS LOCATED AT THE SHELBY TOWNSHIP LIBRARY;
- THE PROPOSED PLAN WAS RELEASED FOR PUBLIC COMMENT AND WAS PLACED INTO THE ADMINISTRATIVE RECORD ON AUGUST 20, 1990, WITH THE 30-DAY PUBLIC COMMENT PERIOD SCHEDULED TO END ON SEPTEMBER 18, 1990. A NOTICE OF AVAILABILITY OF THE PROPOSED PLAN WAS PUBLISHED, IN A LOCAL PAPER OF GENERAL CIRCULATION, PRIOR TO THE RELEASE OF THE PROPOSED PLAN;
- A PUBLIC MEETING WAS HELD ON AUGUST 28, 1990, PROXIMATE TO THE SITE, AT WHICH THE US EPA AND THE MDNR PRESENTED THE RESULTS OF THE RI/FS AND THE PROPOSED PLAN TO THE COMMUNITY AND RECEIVED ORAL COMMENTS (WHICH ARE ADDRESSED IN THE RESPONSIVENESS SUMMARY). A TRANSCRIPT OF THE PUBLIC MEETING WAS RECORDED AND PLACED IN THE ADMINISTRATIVE RECORD AND SITE INFORMATION REPOSITORY;
- THE US EPA RECEIVED A TIMELY REQUEST TO EXTEND THE PUBLIC COMMENT PERIOD BY 30 DAYS. SUBSEQUENTLY, THE PUBLIC COMMENT PERIOD WAS EXTENDED UNTIL OCTOBER 18, 1990; AND
- THE US EPA HAS RECEIVED WRITTEN COMMENTS REGARDING THE PROPOSED PLAN, WHICH ARE ADDRESSED IN THE ATTACHED RESPONSIVENESS SUMMARY.

**#SSR**
**SCOPE OF THE SELECTED REMEDY**

THE US EPA HAS IDENTIFIED THE PRINCIPAL THREATS TO HUMAN HEALTH AND THE ENVIRONMENT AT THE G&H LANDFILL SITE TO BE THE GROUNDWATER CONTAMINANT PLUME AND THE SOLVENT/OIL-CONTAMINATED SOIL AND LANDFILL DEBRIS IN THE PHASE I LANDFILL AREA. THE SOLVENT/OIL-CONTAMINATED SOIL AND LANDFILL DEBRIS ARE THE MAJOR SOURCES OF GROUNDWATER CONTAMINATION. THE PHASE II AND PHASE III LANDFILL AREAS ARE CONSIDERED TO BE A LOWER-LEVEL, LONG-TERM THREAT, PRIMARILY AS A FURTHER SOURCE OF GROUNDWATER CONTAMINATION.

AS DISCUSSED HEREIN, THE SELECTED REMEDY IS ANTICIPATED TO BE THE FINAL REMEDIAL ALTERNATIVE TO BE IMPLEMENTED AT THE SITE; THEREFORE, NO FURTHER RI IS PLANNED. THE GROUNDWATER PLUME, A PRINCIPAL THREAT, WILL BE TREATED IN ACCORDANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS OF FEDERAL AND STATE LAW. IN ADDITION, THE US EPA CONSIDERS CONTAINMENT OF THE SOLVENT/OIL-CONTAMINATED SOIL AND LANDFILL DEBRIS, WHICH IS THE SOURCE OF GROUNDWATER CONTAMINATION AND IS ALSO A PRINCIPAL THREAT, TO BE THE MOST PRACTICABLE REMEDY AT THIS TIME. HOWEVER, A PERIODIC (5 YEARS) REVIEW OF EMERGING TREATMENT TECHNOLOGIES WILL BE PERFORMED TO DETERMINE IF ANY SUCH TECHNOLOGIES COULD BE EFFECTIVELY APPLIED TO TREAT THE SOLVENT/OIL WASTES.

**#SSC**
**SUMMARY OF SITE CHARACTERISTICS**

PURSUANT TO ITS AUTHORITY UNDER CERCLA, AND BASED UPON PREVIOUS INVESTIGATIONS BY THE STATE AND THE US EPA, AVAILABLE SITE RECORDS, AND SITE CHARACTERISTICS (I.E., A LARGE MUNICIPAL LANDFILL), THE US EPA CONDUCTED AN RI/FS AT THE G&H SITE. THE RI, WHICH WAS CONDUCTED IN THREE STAGES, WAS DIRECTED AT THE FOLLOWING:

- DELINEATING THE AREAL EXTENT, DIRECTION AND RATE OF FLOW, AND CHEMICAL COMPOSITION OF THE GROUNDWATER CONTAMINANT PLUME AT THE LANDFILL;
- DETERMINING THE LOCATION(S), NUMBER, AND CONDITION OF BURIED 55-GALLON DISPOSAL DRUMS WITHIN THE LANDFILL;
- DETERMINING AREAL EXTENT AND LEVELS OF SOIL CONTAMINATION WITHIN AND AROUND THE LANDFILL;

- DETERMINING THE CONDITION OF THE CURRENT CAP; AND

- DETERMINING THE IMPACT OF THE GROUNDWATER, LANDFILL DEBRIS, AND SOIL CONTAMINATION ON HUMAN HEALTH AND THE ENVIRONMENT.

THE RI GOALS WERE MET THROUGH THE MULTISTAGE PROGRAM OF GROUNDWATER MONITOR-WELL INSTALLATIONS AND SAMPLING, SOIL BORINGS AND SAMPLING, GEOPHYSICAL INVESTIGATIONS (ELECTROCONDUCTIVITY AND MAGNETOMETER SURVEYS), TRENCH EXCAVATION IN THE LANDFILL (TEST PITS), LANDFILL GAS SAMPLING, AIR MONITORING, CAP INVESTIGATIONS, AND SURFACE WATER AND SEDIMENT SAMPLING IN THE WETLANDS ENVIRONMENT. IN ADDITION, THE MDNR CONDUCTED A SUPPLEMENTAL INVESTIGATION (SI), DURING THE STAGE III RI, TO AID IN THE EVALUATION OF THE SITE. ADDITIONAL MONITOR WELL, LANDFILL GAS, SURFACE WATER, AND SURFACE SOIL AND SEDIMENT SAMPLES WERE TAKEN TO AUGMENT THE RI.

THE FOLLOWING CONDITIONS WERE OBSERVED AT THE G&H SITE:

1. HYDROGEOLOGY

THERE ARE TWO GROUNDWATER AQUIFERS BENEATH THE LANDFILL; THESE ARE DESIGNATED AS THE "UPPER" AND "LOWER" AQUIFERS. THE UPPER AQUIFER IS UNCONFINED AND CONSISTS OF FINE TO GRAVELLY SAND THAT RANGES FROM 7 FEET TO 46 FEET IN THICKNESS. THE SAND UNIT IS GENERALLY THICKER TO THE NORTH AND NORTHWEST AND THINS OUT TOWARDS THE SOUTHWEST. THE GROUNDWATER IN THIS AQUIFER GENERALLY FLOWS IN A SOUTH-SOUTHWESTERLY DIRECTION, TOWARDS THE WETLANDS AND THE CLINTON RIVER, AT AN AVERAGE RATE OF FLOW OF 60 FEET PER YEAR, WITH A RANGE OF 30 FEET PER YEAR TO 300 FEET PER YEAR. ON THE WESTERN SIDE (PHASE III LANDFILL AREA) THE FLOW DIRECTION IS WESTERLY, TOWARDS THE CLINTON RIVER (SEE FIGURE 3A). A NUMBER OF THE RESIDENCES EAST OF RYAN ROAD UTILIZE THE UPPER AQUIFER AS A WATER SUPPLY.

AN AQUITARD SEPARATES THE UPPER AQUIFER FROM THE LOWER AQUIFER. THE AQUITARD CONSISTS OF A LACUSTRINE AND GLACIAL TILL UNIT RANGING FROM 20 FEET TO 110 FEET IN THICKNESS. THE LACUSTRINE SEDIMENTS CONSIST OF THINLY LAMINATED FINE SANDS, SILTS, AND CLAYS, WHICH WERE DEPOSITED ON TOP OF THE GLACIAL TILL. THE TILL IS HETEROGENEOUS; IT CONTAINS THIN, DISCONTINUOUS SAND AND GRAVEL SEAMS IN THE GENERALLY CLAYEY AND SILTY DEPOSITS, ALTHOUGH A 4-FOOT-THICK GRAVEL SEAM WAS ENCOUNTERED IN ONE SOIL BORING ALONG THE SOUTHERN BOUNDARY OF THE SITE. BASED ON THE RESULTS OF THE RI AND THE MDNR SI, THE TILL IS PROJECTED TO BE CONTINUOUS BENEATH THE LANDFILL AREAS.

THE LOWER AQUIFER CONSISTS OF FINE TO MEDIUM SANDS, WITH SOME SILT. THIS UNIT IS MOSTLY CONTINUOUS BENEATH THE LACUSTRINE/TILL UNITS AND RANGES IN THICKNESS FROM 50 FEET TO 250 FEET, WHERE PRESENT. THE GROUNDWATER FLOW IN THIS AQUIFER IS GENERALLY TO THE NORTHWEST AT AN AVERAGE RATE OF FLOW OF 1.2 FEET PER YEAR, WITH AN ESTIMATED RANGE OF 0.2 FEET PER YEAR TO 2.0 FEET PER YEAR. DOWNWARD VERTICAL GRADIENTS (AVERAGING 0.49 FEET PER FOOT) BETWEEN THE AQUIFERS WERE OBSERVED AT MONITOR WELL NESTS ON SITE. A SLIGHT UPWARD VERTICAL GRADIENT WAS NOTED SOUTH OF THE LANDFILL.

THE LOWER SAND AQUIFER WAS DEPOSITED UPON BEDROCK CONSISTING OF SANDSTONE AND, IN SOME AREAS, SHALE. DEPTH TO BEDROCK RANGES FROM 140 FEET, NEAR THE CLINTON RIVER ON THE WEST SIDE OF THE SITE, TO APPROXIMATELY 250 FEET ON THE NORTHEASTERN PERIMETER OF THE PHASE I LANDFILL AREA.

2. LANDFILL

OPERATIONS AT THE G&H LANDFILL RESULTED IN THREE PHASES OF FILL. THE LARGEST PHASE, THE PHASE I LANDFILL AREA, IS APPROXIMATELY 44 ACRES IN SIZE. GENERALLY, PHASE I CONTAINS 5 FEET TO 10 FEET OF RESIDENTIAL TRASH OVERLYING 5 FEET TO 10 FEET OF INDUSTRIAL SOLID WASTES. BECAUSE OF THE OIL AND SOLVENT DISPOSAL OPERATIONS, THERE IS A LAYER OF OIL FLOATING ON THE WATER TABLE. THE OIL IS INTERMIXED WITH THE INDUSTRIAL SOLID WASTE, AND APPROXIMATELY 2 FEET TO 10 FEET OF OILY SOIL LIES BENEATH THE INDUSTRIAL REFUSE.

THE PHASE II AND PHASE III LANDFILL AREAS CONSIST MAINLY OF RESIDENTIAL TRASH. PHASE II CONTAINS APPROXIMATELY 15 FEET TO 20 FEET OF REFUSE AND PHASE III CONTAINS APPROXIMATELY 30 FEET TO 40 FEET OF REFUSE.

3. CONTAMINATION

A. SOURCE AREAS

BASED ON THE RESULTS OF SOIL BORINGS AND TEST PITS, IT HAS BEEN DETERMINED THAT THE PHASE I LANDFILL AREA HAS BEEN, AND CONTINUES TO BE, A MASSIVE SOURCE OF GROUNDWATER CONTAMINATION. ORGANIC CONTAMINANTS, CONSISTING OF (IN GENERAL) BENZENE, ETHYLBENZENE, TOLUENE, AND XYLENE (BETX) COMPOUNDS, POLYNUCLEAR AROMATIC (PNA) COMPOUNDS, AND CHLORINATED VOLATILE ORGANIC COMPOUNDS (VOCS), ARE FOUND WITHIN THE LANDFILL REFUSE AND IN THE SOIL JUST BELOW THE REFUSE. ORGANIC CONTAMINATION IS VERY WIDESPREAD IN THE PHASE I LANDFILL AREA (SEE FIGURES 3B-3D). BASED ON THE LIMITED SAMPLING IN THE PHASE II AND PHASE III LANDFILL AREAS, ORGANIC CONTAMINATION IS NOT AS PREVALENT IN THESE AREAS.

THE HIGHEST BETX CONCENTRATIONS IN THE PHASE I LANDFILL AREA SOIL/DEBRIS WERE ABOVE 10,000 MG/KG. A LARGE PORTION OF PHASE I HAD SOIL/DEBRIS BETX CONCENTRATIONS IN THE 100 MG/KG TO 10,000 MG/KG RANGE (SEE FIGURE 3B). PNA CONCENTRATIONS RANGED UP TO 880 MG/KG IN THE PHASE I LANDFILL AREA (SEE FIGURE 3C), AND CHLORINATED VOC CONCENTRATIONS REACHED 4,030 MG/KG IN A SMALL AREA OF PHASE I (SEE FIGURE 3D). GENERALLY, THE BETX CONTAMINATION IS MOST WIDESPREAD, FOLLOWED BY THE LESS MOBILE PNA CONTAMINATION. CHLORINATED VOC CONTAMINATION IS MORE PREVALENT IN THE SOUTHEASTERN PORTION OF PHASE I, WHERE SOLVENT DISPOSAL PITS APPARENTLY WERE CONCENTRATED. BETX CONTAMINATION WAS FOUND IN THE SOILS BELOW THE WATER TABLE IN THE INDUSTRIAL AREA TO THE EAST OF THE LANDFILL. SINCE NO SUCH CONTAMINANTS WERE FOUND ABOVE THE WATER TABLE IN THIS AREA, THE BETX CONTAMINATION APPEARS TO BE RELATED TO THE G&H LANDFILL.

OTHER CHEMICAL COMPOUND GROUPS OF CONCERN INCLUDE INORGANICS (METALS) AND PCBS. IN GENERAL, THE PHASE I LANDFILL AREA IS THE LARGEST SOURCE OF INORGANIC CONTAMINATION AT THE SITE. METALS SUCH AS BARIUM, NICKEL, CHROMIUM, LEAD, ARSENIC, CADMIUM, AND MERCURY ARE PRESENT AT LEVELS ABOVE THEIR BACKGROUND (NATURALLY OCCURRING) LEVELS. PCBS WERE DETECTED IN A NUMBER OF TEST PIT SAMPLES FROM THE PHASE I LANDFILL AREA; CONCENTRATIONS RANGED FROM 0.4 MG/KG TO 180 MG/KG. GENERALLY, THE HIGHEST PCB CONCENTRATIONS WERE FOUND IN THE AREAS WITH HIGH BETX, PNA, AND CHLORINATED-VOC LEVELS.

THE ESTIMATED VOLUME OF "HOT SPOTS" WITHIN THE PHASE I LANDFILL AREA IS 800,000 CUBIC YARDS, BASED ON THE EXTENT OF SIGNIFICANT ORGANIC CHEMICAL (I.E., BETX, PNA, VOCS) CONTAMINATION (SEE FIGURE 3E).

B. GROUNDWATER

A GROUNDWATER CONTAMINANT PLUME, CONSISTING OF BOTH ORGANIC AND INORGANIC COMPOUNDS, IS PRESENT IN THE UPPER AQUIFER UNDER NEARLY THE ENTIRE G&H LANDFILL. THE PLUME HAS MIGRATED AT LEAST 1000 FEET FROM THE SOUTHERN EDGE OF THE PHASE I LANDFILL AREA. THE LEADING EDGE OF THE CONTAMINANT PLUME APPARENTLY IS DISCHARGING INTO THE WETLANDS (SEE FIGURE 3F). THE HIGHEST CONCENTRATION OF CONTAMINANTS IS LOCATED IN THE SOUTHEASTERN PORTION OF THE SITE NEAR THE OIL SEEPS, WHICH CORRELATES WITH THE INDUSTRIAL SOLVENT DISPOSAL PITS IN THE LANDFILL. THE TOP OF THE UPPER AQUIFER CONTAINS THE HIGHEST LEVELS OF CONTAMINANTS, WITH LOWER CONCENTRATIONS FOUND AT DEPTH. NO CONTAMINATION WAS FOUND IN THE LACUSTRINE/TILL UNIT OR IN THE LOWER AQUIFER, EXCEPT AT A SINGLE GROUNDWATER SAMPLING POINT IN THE LOWER AQUIFER, IN A LOCATION NORTH OF THE LANDFILL, THAT INTERMITTENTLY SHOWED TRACES OF XYLENE AND ETHYLBENZENE.

I. ORGANIC CONTAMINANTS

THE PREDOMINANT ORGANIC COMPOUNDS OF CONCERN INCLUDE THE BETX COMPOUNDS, VINYL CHLORIDE, AND TRICHLOROETHENE (TCE), BASED UPON POTENTIAL IMPACTS TO HUMAN HEALTH AND THE ENVIRONMENT. THE MAXIMUM EXTENT OF BETX AND CHLORINATED VOC CONTAMINATION IN THE UPPER AQUIFER IS SHOWN IN FIGURE 3F. THE MAXIMUM CONCENTRATION OF BETX IN GROUNDWATER IN THE UPPER AQUIFER RANGED UP TO 8,600 UG/L* AND THE MAXIMUM CONCENTRATION OF CHLORINATED HYDROCARBONS IN THE UPPER AQUIFER WAS FOUND TO BE 10,400 UG/L (PPB) IN A SEPARATE MONITOR WELL.

II. INORGANIC CONTAMINANTS

THE PRIMARY INORGANIC COMPOUNDS OF CONCERN, IN RELATION TO HUMAN HEALTH AND ENVIRONMENTAL CONCERNS, ARE BARIUM (MAXIMUM CONCENTRATION OF 5,990 PPB) AND ARSENIC (MAXIMUM CONCENTRATION OF 316 PPB). IN GENERAL, ADVERSE LEVELS OF INORGANIC CONTAMINANTS ARE FOUND IN THE SAME AREA AS THE ORGANIC COMPOUNDS.

C. OIL SEEP

A NATURAL GROUNDWATER SEEP IS LOCATED NEAR THE RAILROAD RIGHT-OF-WAY SOUTH OF THE PHASE I LANDFILL AREA AND EAST OF THE PHASE II LANDFILL AREA. THE WASTE OIL WHICH WAS DISPOSED OF IN THE PHASE I LANDFILL AREA IS ALSO SEEPING OUT AND HAS BEEN THE SUBJECT OF THREE OF THE FOUR REMOVAL ACTIONS. SAMPLES SHOWED BETX (UP TO 9.0 MG/KG), PCB (UP TO 526 MG/KG), AND PNA (UP TO 138 MG/KG) COMPOUNDS TO BE IN THE OIL LAYER. SEDIMENTS IN THE OIL SEEP AREA WERE ALSO CONTAMINATED WITH THESE COMPOUNDS, WITH THE HIGHER CONCENTRATIONS FOUND CLOSEST TO THE SEEP AREA. THE SURFACE WATERS AT THE SEEP AREA WERE ANALYZED FOR THESE

! "MICROGRAMS PER LITER" OR, APPROXIMATELY, "PARTS PER BILLION."

COMPOUNDS, BUT AT HIGHER DETECTION LIMITS DUE TO THE PRESENCE OF THE FLOATING OIL. DUE TO THE HIGH DETECTION LIMITS, ONLY ONE SAMPLE WAS FOUND TO CONTAIN XYLENE (AT 1 MG/KG). HOWEVER, LESSER VALUES OF BETX AND CHLORINATED VOC- CONTAMINANTS WERE FOUND IN PONDS SOUTH AND EAST OF THE SEEP AREA, ALONG THE CLINTON-KALAMAZOO CANAL, AND IN THE CLINTON RIVER.

D. SURFACE SOIL/SEDIMENTS

A TOTAL OF 61 SURFACE SOIL SAMPLES (0 FEET TO 3 FEET) WAS COLLECTED DURING STAGE II AND STAGE III OF THE RI AND THE MDNR SI. PCBS WERE DETECTED IN 12 SAMPLES, ALL BUT ONE OF WHICH WERE ON SITE. THE HIGHEST CONCENTRATION DETECTED WAS AT 2.2 MG/KG. THE OFF-SITE SAMPLE, WHICH HAD A PCB VALUE OF 0.38 MG/KG, WAS TAKEN FROM NEAR 23-MILE ROAD.

PCBS, BETX, PNA, AND INORGANIC CONTAMINANTS WERE DETECTED IN SEDIMENT SAMPLES TAKEN IN AND AROUND THE OIL SEEP AREA. GENERALLY, CONCENTRATIONS DECREASED WITH INCREASING DISTANCE FROM THE SEEP AREA. CONCENTRATIONS OF PCBS RANGED FROM NON-DETECTION TO AS HIGH AS 74 MG/KG IN THE SEEP AREA.

E. LEACHATE

LEACHATE FROM THE PHASE III LANDFILL AREA IS CONTAMINATED WITH BETX (UP TO 65 UG/L), METALS, AND SEVERAL SEMI-VOLATILE ORGANIC COMPOUNDS. THE LEACHATE IS FLOWING TOWARDS THE CLINTON RIVER.

4. LANDFILL CAP

THE SOIL COVERS ON EACH OF THE LANDFILL AREAS DO NOT CONFORM TO CURRENT LANDFILL CLOSURE REQUIREMENTS. THE SOIL COVER ON THE PHASE I LANDFILL AREA CONSISTS OF 0.5 FEET TO 3.0 FEET OF MAINLY SILTY SAND OR SILTY SAND WITH GRAVEL. THE PHASE I LANDFILL AREA HAS MANY SURFACE DEPRESSIONS WHICH HOLD PONDED WATER FOR SHORT PERIODS OF TIME UNTIL THE STANDING WATER PERCOLATES INTO THE UNDERLYING SOIL AND GROUNDWATER. THE POTENTIAL FOR PRECIPITATION INFILTRATION THROUGH THE REST OF THE PHASE I SOIL COVER IS HIGH, BASED ON OBSERVED SURFACE CONDITIONS.

THE POTENTIAL FOR PRECIPITATION INFILTRATION THROUGH THE PHASE II AND PHASE III LANDFILL AREAS IS LOW TO MODERATE, BASED ON OBSERVED CONDITIONS. GENERALLY, THE SOIL COVERS ARE 1.0-FOOT TO 3.0-FEET THICK OVER EACH AREA. THE PHASE II LANDFILL AREA COVER SOIL CONSISTS MAINLY OF SILT WITH SAND OR SILTY CLAY, AND THE PHASE III LANDFILL AREA SOIL COVER CONSISTS MAINLY OF SANDY SILTY CLAY. BOTH SOIL COVERS HAVE SURFACE DEPRESSIONS, WHICH TEND TO HOLD PONDED WATER UNTIL IT INFILTRATES THROUGH THE COVER SOILS, IN SOME AREAS OF THE SITE.

5. TEST PITS

FORMER LANDFILL EMPLOYEES HAVE INDICATED THAT SOLVENT WASTES WERE USUALLY TRANSPORTED TO THE SITE IN 55-GALLON DRUMS AND THAT THE DRUMS WERE USUALLY EMPTIED INTO THE SOLVENT PITS AND KEPT FOR REUSE OR RESALE. ONCE IN A WHILE A FULL DRUM WOULD FALL INTO A SOLVENT PIT AND THESE DRUMS WERE NOT RECOVERED. BASED ON THE TEST PIT RESULTS, 55-GALLON DRUMS ARE SCATTERED THROUGHOUT THE PHASE I LANDFILL AREA, BUT NO DISCRETE DRUM DISPOSAL AREA COULD BE FOUND. MOST OF THE DRUMS FOUND WERE OBSERVED TO BE EITHER CRUSHED OR PARTIALLY CRUSHED, SEVERELY RUSTED, OR LEAKING, ALTHOUGH SOME WERE OBSERVED TO BE INTACT.

6. WASTE DEPTH

THE AVERAGE DEPTH TO THE WATER TABLE AND OF WASTE DISPOSAL IS 15 FEET TO 20 FEET IN THE PHASE I LANDFILL AREA. AS A RESULT, REFUSE AND WASTE OIL ARE IN DIRECT CONTACT WITH GROUNDWATER OVER MUCH OF THE AREA (FIGURE 3G).

7. LANDFILL GAS

GAS PROBES INSTALLED BY THE MDNR INDICATE THAT LANDFILL GAS (METHANE) IS PRESENT IN SUFFICIENT QUANTITIES IN THE LANDFILL SO THAT IT WILL NEED TO BE ADDRESSED DURING THE IMPLEMENTATION OF ANY REMEDIAL ACTION AT THE SITE. AIR SAMPLING DID NOT DETECT PCBS, PESTICIDES, OR SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCS) IN THE AMBIENT AIR. GENERALLY, THE EXCAVATION OF TEST PITS IN THE PHASE I LANDFILL AREA HAD THE GREATEST EFFECT ON VOC CONCENTRATIONS IN THE ATMOSPHERE DOWNWIND OF THE TEST PITS, MOST NOTABLY THAT OF METHYLENE CHLORIDE AND THE BETX COMPOUNDS. HOWEVER, THE LIMITED NUMBER OF SAMPLES AND THE VARIED RESULTS DO NOT SHOW A WIDE ENOUGH VARIANCE TO DETERMINE THE EFFECT OF THE LANDFILL CONTAMINANTS ON AMBIENT AIR QUALITY, ABSENT EXCAVATION OF THE LANDFILL CONTENTS.

**#SSR**
**SUMMARY OF SITE RISKS**

PURSUANT TO THE NATIONAL CONTINGENCY PLAN (NCP), A BASELINE RISK ASSESSMENT WAS PERFORMED BASED ON UNALTERED CONDITIONS AT THE SITE, AS CONTEMPLATED BY THE NO ACTION ALTERNATIVE (SEE SECTION 5 OF THE RI REPORT). THE NO ACTION ALTERNATIVE ASSUMES THAT NO CORRECTIVE ACTION WILL TAKE PLACE AND THAT NO SITE USE RESTRICTIONS, SUCH AS FENCING, ZONING, AND DRINKING WATER RESTRICTIONS, WILL BE IMPOSED. THE RISK ASSESSMENT THEN DETERMINES ACTUAL OR POTENTIAL RISKS OR TOXIC EFFECTS THE CHEMICAL CONTAMINANTS AT THE SITE POSE UNDER CURRENT AND FEASIBLE FUTURE LAND-USE ASSUMPTIONS. AS DETAILED IN THE RI REPORT, THE FOLLOWING ASSUMPTIONS WERE MADE:

- NO REMEDIAL ACTIONS WILL BE TAKEN;
- NO OFF-SITE GROUNDWATER USE RESTRICTIONS WILL BE ENFORCED;
- THE UPPER AQUIFER IN THE RECREATIONAL AREA SOUTH OF THE LANDFILL MAY BE UTILIZED AS A DRINKING WATER SOURCE;
- ADJACENT OFF-SITE DEVELOPMENT MAY CONTINUE TO OCCUR; AND
- GROUNDWATER CONTAMINANT CONCENTRATIONS WILL NOT DECREASE OVER A FORESEEABLE PERIOD DUE TO THE PRESENCE OF THE MASSIVE CONTAMINANT SOURCE IN THE LANDFILL.

1. CHEMICALS OF CONCERN AND TOXICITY ASSESSMENT

APPROXIMATELY 108 DIFFERENT CHEMICALS ON THE US EPA TARGET COMPOUND LIST (TCL) WERE DETECTED IN WATER OR SOIL SAMPLES AT THE SITE. AS DISCUSSED IN THE RI REPORT, THE SITE ASSESSMENT PROCESS ALLOWS FOR THIS MASSIVE LIST OF COMPOUNDS TO BE PARED DOWN TO A MORE MANAGEABLE LIST OF REPRESENTATIVE COMPOUNDS (TABLE 1). THE INCLUSION OF EACH INDICATOR CHEMICAL IN TABLE 1 WAS BASED ON ITS RELATIVE CONCENTRATION, FREQUENCY OF DETECTION, AND TOXIC EFFECTS, AS WELL AS WHETHER AN ENVIRONMENTAL STANDARD OR CRITERION (SUCH AS A FEDERAL DRINKING-WATER STANDARD) EXISTS FOR THE CHEMICAL. INCLUSION OF A COMPOUND ON THE LIST OF REPRESENTATIVE COMPOUNDS INDICATES THAT REMEDIAL CONTROLS THAT MAY BE APPLIED TO A SITE SHOULD MITIGATE EXPOSURE TO THE COMPOUND(S) IN GROUNDWATER, SOILS, SURFACE WATER, OR THE WETLANDS.

THE RISK ASSESSMENT CONSIDERED THE CUMULATIVE EFFECTS OF 69 OF THE 108 CHEMICALS FOUND IN SAMPLES OBTAINED FROM THE SITE. AFTER TAKING INTO ACCOUNT THE RELATIVE ABUNDANCE, CONCENTRATIONS, AND TOXIC EFFECTS OF THESE CHEMICALS, THE LIST OF 11 REPRESENTATIVE COMPOUNDS IN TABLE 1 WAS GENERATED TO FOCUS ON THE DERIVATION OF CLEANUP STANDARDS FOR THE SITE.

FOUR OF THE REPRESENTATIVE COMPOUNDS ARE NONCARCINOGENS, AND THE REMAINDER ARE POTENTIAL OR KNOWN HUMAN CARCINOGENS (CANCER-CAUSING AGENTS). ACUTE (SHORT TERM AT HIGH CONCENTRATIONS) OR CHRONIC (LONG TERM AT LOW CONCENTRATIONS) EXPOSURE TO EACH OF THESE CHEMICALS LEADS TO VARIOUS TOXIC EFFECTS (DOCUMENTED IN TABLE 5-3

OF THE RI REPORT).

2. HUMAN HEALTH EXPOSURE PATHWAYS

THE FOLLOWING EXPOSURE PATHWAYS HAVE BEEN IDENTIFIED AS BEING POTENTIAL OR ACTUAL EXPOSURE PATHWAYS OF PRIMARY CONCERN FOR PROTECTION OF HUMAN HEALTH AT THE G&H SITE:

- POTENTIAL CURRENT AND FUTURE USE OF CONTAMINATED GROUNDWATER FOR DRINKING, BATHING, AND OTHER HOUSEHOLD USES;
- POTENTIAL FUTURE INGESTION OF AND/OR DERMAL CONTACT WITH ON-SITE SOILS CONTAINING CHEMICALS OF CONCERN; AND
- POTENTIAL FUTURE DIRECT CONTACT WITH CONTAMINATED SURFACE WATERS OR SEDIMENTS DUE TO RECREATIONAL USE OF THE WETLANDS AREA.

THE ONLY EXPOSURE PATHWAY DETERMINED TO BE OF SIGNIFICANCE TO THE ENVIRONMENTAL RISK ANALYSIS WAS GROUNDWATER DISCHARGE OF CONTAMINANTS TO THE WETLANDS AND THE OIL SEEP AREA. BOTH AQUATIC LIFE AND ANY CONSUMERS OF THE AFFECTED AQUATIC LIFE, INCLUDING HUMANS, COULD BE EXPOSED TO SITE CHEMICALS VIA THIS PATHWAY.

A. GROUNDWATER USE

THE INDUSTRIAL FACILITIES TO THE SOUTHEAST OF THE LANDFILL HAVE WELLS WHICH COULD WITHDRAW CONTAMINATED WATER FROM THE SAND AND GRAVEL AQUIFER AT THIS TIME. THESE WELLS ARE CURRENTLY NOT UTILIZED FOR DRINKING (THE STATE HAS BEEN SUPPLYING BOTTLED WATER TO THESE FACILITIES FOR SEVERAL YEARS). SOME OF THE RESIDENTIAL WELLS EAST OF RYAN ROAD HAD DETECTABLE (TRACE) LEVELS OF CHEMICALS IN THE WATER, BUT, CURRENTLY, THE CONCENTRATIONS ARE AT ACCEPTABLE LEVELS (BELOW MAXIMUM CONTAMINANT LEVELS UNDER THE FEDERAL SAFE DRINKING WATER ACT).

THE UPPER SAND AND GRAVEL AQUIFER, INCLUDING THE PORTION THAT LIES BENEATH THE LANDFILL, IS A CLASS IIA WATER SOURCE, AS DEFINED IN US EPA'S GUIDELINES FOR GROUNDWATER CLASSIFICATION UNDER THE EPA GROUNDWATER PROTECTION STRATEGY (DECEMBER 1986). A CLASS IIA AQUIFER IS AN AQUIFER WHICH IS CURRENTLY IN USE BUT WHICH DOES NOT MEET THE CRITERIA TO CATEGORIZE IT AS A CLASS I AQUIFER (E.G., AN IRREPLACEABLE SOURCE). THE UPPER AQUIFER IS CURRENTLY BEING UTILIZED AS A DRINKING-WATER SOURCE CROSS-GRADIENT (EAST) OF THE LANDFILL AND COULD BE USED AS A DRINKING-WATER SOURCE DOWNGRADIENT (SOUTH) OF THE LANDFILL.

B. LANDFILL WASTE MATERIALS

THE COMPOSITION OF THE LANDFILL SOIL COVERS AND SURFACE CONDITIONS AID IN THE CONTAMINATION OF GROUNDWATER BY NOT PREVENTING PRECIPITATION INFILTRATION. SURFACE WATER INFILTRATES THROUGH THE LANDFILL COVERS INTO THE WASTE MATERIALS AND LEACH CONTAMINANTS OUT OF THE WASTE TOWARDS THE GROUNDWATER. THE STEEP SIDESLOPES OF THE PHASE II AND PHASE III LANDFILL AREAS LEND THEMSELVES TO EROSIONAL FORCES, WHICH MAY EXPOSE FUTURE SITE USERS TO LANDFILLED WASTES.

C. SURFACE CONDITIONS

THE PRESENCE OF CONTAMINANTS SUCH AS PCBS ON THE SURFACE OF THE LANDFILL COVERS AND IN THE OIL SEEP AREA MAY EXPOSE SITE USERS TO UNACCEPTABLE AMOUNTS OF CONTAMINANTS, EITHER BY INGESTION OR DERMAL CONTACT.

3. RISK PATHWAYS AND CALCULATIONS FOR HUMAN HEALTH EXPOSURE

USING DATA GENERATED DURING THE RI, THE US EPA CONDUCTS A SITE-SPECIFIC BASELINE RISK ASSESSMENT TO CHARACTERIZE THE CURRENT AND POTENTIAL THREATS TO HUMAN HEALTH AND THE ENVIRONMENT POSED BY SITE CONTAMINANTS. THE INDIVIDUAL AND CUMULATIVE THREATS POSED BY CONTAMINANT MIGRATION INTO GROUNDWATER, AIR, SOILS, SURFACE WATER, OR BIOACCUMULATING IN THE FOOD CHAIN ARE EVALUATED IN THE RISK ASSESSMENT USING US EPA'S RISK ASSESSMENT GUIDANCE FOR SUPERFUND SITES. THE RESULTS OF THE RISK ASSESSMENT ESTABLISH ACCEPTABLE EXPOSURE LEVELS FOR THE REPRESENTATIVE COMPOUNDS, WHICH ARE THEN USED TO DEVELOP REMEDIAL ALTERNATIVES IN THE FEASIBILITY STUDY.

TOXIC SUBSTANCES MAY POSE CERTAIN TYPES OF HAZARDS TO HUMAN AND/OR ANIMAL POPULATIONS. TYPICALLY, HAZARDS TO HUMAN HEALTH ARE EXPRESSED AS CARCINOGENIC RISKS AND NONCARCINOGENIC TOXIC EFFECTS. CARCINOGENIC RISK, NUMERICALLY PRESENTED AS AN EXPONENTIAL FACTOR E.G., 1 X (10-6), IS THE INCREASED CHANCE A PERSON MAY HAVE IN CONTRACTING CANCER IN HIS OR HER LIFETIME DUE TO EXPOSURE TO A CARCINOGEN OVER HIS OR HER LIFETIME. FOR EXAMPLE, A 1 X (10-6) EXCESS LIFETIME CANCER RISK, CALCULATED TO ACCOUNT FOR A LIFETIME OF DRINKING WATER WITH A CARCINOGEN IN IT, MEANS THAT A PERSON'S CHANCE OF CONTRACTING CANCER DUE TO DRINKING THE WATER OVER HIS/HER LIFETIME IS INCREASED BY 1 IN 1 MILLION. THE US EPA GENERALLY ATTEMPTS TO REDUCE THE EXCESS LIFETIME CANCER RISK AT SUPERFUND SITES TO A RANGE OF 1 X (10-4) TO 1 X (10-6) (1 IN 10,000 TO 1 IN 1 MILLION), WITH AN EMPHASIS ON THE LOWER END 1 X (10-6) OF THE SCALE.

THE HAZARD INDEX, AN EXPRESSION OF NONCARCINOGENIC TOXIC EFFECTS, MEASURES WHETHER A PERSON IS BEING EXPOSED TO ADVERSE LEVELS OF NON-CARCINOGENS. ANY HAZARD INDEX VALUE GREATER THAN 1.0 SUGGESTS THAT A NONCARCINOGEN POTENTIALLY PRESENTS AN UNACCEPTABLE TOXIC EFFECT.

A. GROUNDWATER

EACH REPRESENTATIVE COMPOUND IN TABLE 1 EXCEEDS EITHER STATE GROUNDWATER-CLEANUP CRITERIA OR FEDERAL DRINKING-WATER STANDARDS. FIGURE 4 SHOWS SELECTED SITE AREAS AND THE ASSOCIATED RISKS DUE TO THE POTENTIAL INGESTION OF CONTAMINATED GROUNDWATER FROM THESE AREAS. THE STANDARD RISK ASSESSMENT ASSUMPTION (THAT AN INDIVIDUAL WEIGHING 70 KILOGRAMS (154 POUNDS) INGESTS 2 LITERS OF WATER PER DAY FOR HIS OR HER 70-YEAR LIFETIME) WAS USED TO DETERMINE THE POTENTIAL RISKS. THE RESULTS OF THE CALCULATION OF RISKS USING CHEMICAL DATA FROM INDIVIDUAL MONITOR WELLS REPRESENT A RANGE OF POTENTIAL RISKS DUE TO INGESTION AND DERMAL ABSORPTION OF CONTAMINANTS IN THE GROUNDWATER. THE HIGHEST CHEMICAL CONCENTRATIONS IN INDIVIDUAL WELLS WOULD REPRESENT A "WORST-CASE" SCENARIO RISK DUE TO POTENTIAL GROUNDWATER USE.

AS SHOWN IN FIGURE 4, AT THE G&H SITE, THE TARGET CARCINOGENIC RISK RANGE IS EXCEEDED IN AREAS 2, 4, AND 5 (AREAS OF PLAUSIBLE GROUNDWATER USE). THUS, THE GROUNDWATER CONTAMINANT PLUME IS A PRINCIPAL THREAT SINCE THE POTENTIAL EXCESS LIFETIME CARCINOGENIC RISK AT THE SITE (MAXIMUM OF 6 X (10-3)) EXCEEDS THE TARGET CARCINOGENIC RISK RANGE THAT THE US EPA CONSIDERS TO BE ADEQUATELY PROTECTIVE (1 X (10-4) TO 1 X (10-6).

B. SOILS AND LANDFILL WASTE MATERIALS

THE RISKS POSED BY EXPOSURE TO THE CONTAMINATED SOILS OR THE LANDFILL WASTE MATERIALS WERE CALCULATED BASED ON US EPA'S STANDARD INGESTION RATES FOR SOILS: OVER A 5-YEAR TIME PERIOD, AN INDIVIDUAL WEIGHING 70 KG MAY VISIT THE SITE ONCE A WEEK AND ACCIDENTALLY INGEST 0.1 GRAMS OF SOIL PER VISIT. DERMAL ABSORPTION OF CONTAMINANTS FROM SOILS WAS ASSUMED TO PRESENT A MUCH LOWER RISK IN COMPARISON TO INGESTION AND, THEREFORE, NO QUANTITATIVE CALCULATIONS WERE MADE. THE MAXIMUM EXCESS LIFETIME CANCER RISK WAS CALCULATED TO BE APPROXIMATELY 4 X (10-6) FOR INGESTION OF THE SURFACE SOILS IN THE PHASE I LANDFILL AREA. (THE MICHIGAN ENVIRONMENTAL RESPONSE ACT 307 OF 1982, AS AMENDED (MICHIGAN ACT 307), UNDER THE EXPOSURE SCENARIO LISTED THEREIN, CONSIDERS SOILS OR SEDIMENTS THAT CONTAIN GREATER THAN 1.0 MG/KG (PARTS PER MILLION OR PPM) OF PCBS TO PRESENT AN UNACCEPTABLE RISK (GREATER THAN 1 X (10-6) EXCESS LIFETIME CANCER RISK) TO POTENTIAL RECEPTORS, USING TYPE B CRITERIA. SEE SECTION L(2).)

ADDITIONALLY, THE CONTAMINATED PHASE I LANDFILL AREA DEBRIS IS CONSIDERED TO BE A PRINCIPAL THREAT AT THE SITE. THE OILS AND SOLVENTS ARE A CONTINUAL SOURCE OF CONTAMINATION FOR THE GROUNDWATER. DUE TO THE UNCERTAINTIES ASSOCIATED WITH THE PHASE II AND PHASE III LANDFILL AREA INVESTIGATIONS, THE US EPA HAS DETERMINED THAT THESE PORTIONS OF THE LANDFILL POSE A LOWER-LEVEL, LONG-TERM THREAT. THE RI CANNOT INVESTIGATE THE ENTIRE LANDFILL WITH TEST PITS OR SURFACE SAMPLING POINTS. ALSO, FUTURE CAP EROSION COULD EXPOSE WASTE MATERIALS IN THESE AREAS WHICH WOULD POSE UNACCEPTABLE HAZARDS TO HUMAN HEALTH OR THE ENVIRONMENT.

C. SURFACE WATER AND SEDIMENTS

THE GROUNDWATER CONTAMINANT PLUME IS APPARENTLY DISCHARGING INTO THE OIL SEEPS AREA AND TOWARDS THE CLINTON RIVER WETLANDS, AS SITE-DERIVED ORGANIC CHEMICALS HAVE BEEN DETECTED IN A NUMBER OF SURFACE WATER AND SEDIMENT SAMPLES TAKEN DURING THE RI. EXCEPT FOR THE OIL SEEP AREA AND PCB-CONTAMINATED SEDIMENTS, THE PRESENT HUMAN HEALTH RISKS ASSOCIATED WITH THIS PATHWAY APPARENTLY ARE AT PROTECTIVE LEVELS. SHOULD THE

GROUNDWATER CONTAMINANT PLUME GO UNCHECKED, UNDER FUTURE CONDITIONS, GROUNDWATER MODELLING ESTIMATES THAT CONTAMINANT DISCHARGE LEVELS MAY INCREASE. UNACCEPTABLE RISKS TO HUMAN HEALTH DUE TO EXPOSURE TO CONTAMINANTS ARE PROJECTED ALTHOUGH A QUANTITATIVE RISK VALUE FOR FUTURE USE WAS NOT CALCULATED. IMPACTS OF ORGANIC CHEMICALS ON AQUATIC LIFE WERE EVALUATED IN THE ENVIRONMENTAL ASSESSMENT SECTION OF THE RISK ASSESSMENT (SEE BELOW).

THE OIL SEEP AREA PRESENTS A HAZARD INDEX OF 153, WHICH EXCEEDS THE TARGET PROTECTIVE LEVEL (1.0) SET FOR NONCARCINOGENIC TOXIC EFFECTS. THE VALUE WAS DERIVED USING THE ASSUMPTION OF AN ACCIDENTAL EXPOSURE TO THE CONTAMINANTS (E.G., FALLING INTO THE WATER).

PCBS HAVE BEEN DETECTED IN SOILS OR SEDIMENTS (SEE FIGURE 9) OTHER THAN OVER THE LANDFILL AREAS. AS ABOVE, SOILS OR SEDIMENTS CONTAINING GREATER THAN 1.0 MG/KG OF PCBS PRESENT AN UNACCEPTABLE RISK TO POTENTIAL RECEPTORS. THE HIGHEST PCB CONCENTRATION DETECTED WAS 74 MG/KG, WHICH PRESENTS A POTENTIAL EXCESS LIFETIME CARCINOGENIC RISK OF APPROXIMATELY 1.3 X (10-4).

INORGANIC COMPOUNDS (E.G., HEAVY METALS SUCH AS BARIUM), HOWEVER, WOULD TEND TO ACCUMULATE IN SEDIMENTS ONCE THEY HAVE REACHED SURFACE WATERS. CHANGES IN PH AND OXIDATION POTENTIAL WOULD TEND TO PRECIPITATE METALS AS INSOLUBLE HYDROXIDES OR CARBONATES, MAKING THEM AVAILABLE FOR BIOACCUMULATION BY PLANT OR AQUATIC SPECIES. INORGANIC COMPOUNDS ARE APPARENTLY DISCHARGING TO THE WETLANDS AT THIS TIME. OVER THE LONG TERM, UNACCEPTABLE HUMAN EXPOSURE, DUE TO CONSUMPTION BY HUMANS OF AFFECTED AQUATIC OR TERRESTRIAL SPECIES, MAY BE LIKELY.

4. ENVIRONMENTAL ANALYSIS

DETECTABLE LEVELS OF PCBS, PESTICIDES, AND INORGANIC WASTES IN THE SURFACE SOILS AND SEDIMENTS PRESENT THE RISK OF BIOACCUMULATION OF THESE CONTAMINANTS BY TERRESTRIAL, AVIAN, AND AQUATIC SPECIES. THE SITE IS FREQUENTED BY NUMEROUS SPECIES OF MAMMALS AND BIRDS AS OBSERVED BY FIELDWORK CREWS DURING THE RI. MUSKRAT, OPOSSUM, AND RACCOON SAMPLES TAKEN FROM NEAR THE SITE IN 1983 SHOWED EVIDENCE OF PCBS, DDT, AND BIS(2-ETHYLHEXYL)PHTHALATE IN THEIR FATTY TISSUES. WHILE THE SOURCE(S) OF THE CONTAMINANTS COULD BE THE SITE, IT CANNOT BE CONCLUSIVELY SHOWN THAT THE SITE IS THE EXCLUSIVE SOURCE SINCE SIMILAR CONTAMINANTS ARE FOUND AT A NEARBY SUPERFUND SITE (LIQUID DISPOSAL, INC.). HOWEVER, IT IS VERY LIKELY THAT SMALL MAMMALS FORAGE IN THE LANDFILL AREAS AND BECOME EXPOSED TO HAZARDOUS SUBSTANCES. THE OIL SEEP AREA PRESENTS A MORE IMMEDIATE THREAT TO WILDLIFE, AS WELL AS A LONG-TERM THREAT OF BIOACCUMULATION, DUE TO THE HIGHER CONCENTRATIONS OF CONTAMINANTS (E.G., PCBS) IN THIS AREA.

LEACHATE FROM THE PHASE III LANDFILL AREA IS DISCHARGING TOWARDS THE CLINTON RIVER. THE RIVER PROVIDES A HABITAT FOR FISH SPECIES INCLUDING NORTHERN PIKE, WALLEYE PIKE, GIZZARD SHAD, AND ROCK BASS. FISH SAMPLES TAKEN IN 1983/1984 INDICATED THAT PESTICIDES, PCBS, AND HEAVY METALS ARE CONTAMINATING FISH SPECIES IN THE RIVER. AGAIN, OTHER AREAS BESIDES THE G&H SITE COULD PLAUSIBLY BE A SOURCE OF THESE CONTAMINANTS AND HUMANS COULD ALSO BE AT RISK IF THEY CONSUME AFFECTED SPECIES.

**#RFA**
**RATIONALE FOR ACTION**

THE US EPA CONSIDERS SEVERAL SOURCES OF INFORMATION IN DETERMINING WHETHER TO TAKE ACTION AT A SITE. BASED ON THE DATA GATHERED IN THE RI, THE US EPA PERFORMS A RISK ASSESSMENT TO DETERMINE IF ADVERSE CONDITIONS CURRENTLY OR POTENTIALLY THREATEN HUMAN HEALTH AND/OR THE ENVIRONMENT. THE US EPA ALSO EVALUATES SITE CONDITIONS IN RELATION TO FEDERAL AND STATE ENVIRONMENTAL STATUTES AND POLICIES, IN ADDITION TO THE STATUTORY MANDATES PROMULGATED IN CERCLA AND THE GOALS AND EXPECTATIONS IDENTIFIED IN THE NCP. THE PRIMARY CRITERIA WITH RESPECT TO THE G&H LANDFILL SITE ARE PRESENTED BELOW:

1. RISK SUMMARY

ADDITIVE EXCESS LIFETIME CANCER RISKS CALCULATED FOR INGESTION OF CONTAMINATED GROUNDWATER RANGED FROM 5 X (10-4) IN AREA 5 TO 6 X (10-3) IN AREA 2. THE POTENTIAL EXCESS LIFETIME CANCER RISK POSED BY INGESTION OF THE GROUNDWATER CONTAMINANTS EXCEEDS THE ACCEPTABLE RISK RANGE OF 1 X (10-4) TO 1 X (10-6), AND THUS PRESENTS UNACCEPTABLE POTENTIAL RISKS TO HUMAN HEALTH.

HAZARD INDICES ABOVE 1.0 REPRESENT AN UNACCEPTABLE EXPOSURE TO NONCARCINOGENS. MOST NOTABLY, THE OIL SEEP AREA HAS AN ADDITIVE HAZARD INDEX CALCULATED TO BE 77 (153 FOR A CHILD), WHICH WOULD BE DUE TO THE INGESTION AND DERMAL ABSORPTION OF CONTAMINANTS IF ONE WERE TO ACCIDENTALLY FALL INTO THE OILY WATERS. ADDITIVE HAZARD INDICES EXCEED 1.0 IN AREA 1, WHICH IS UPGRADIENT OF AREAS 4 AND 5. TABLE 2 SUMMARIZES THE RISKS POSED BY SITE CONTAMINANTS.

2. ENVIRONMENTAL STANDARDS NOT MET AT THE SITE

IN ADDITION TO POSING UNACCEPTABLE RISKS TO RECEPTORS, THE G&H LANDFILL SITE DOES NOT MEET CERTAIN APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL OR STATE ENVIRONMENTAL STANDARDS AT THIS TIME.

A. CAP

THE EXISTING LANDFILL CAP DOES NOT MEET THE REQUIREMENTS OF MICHIGAN STATE HAZARDOUS WASTE RULES (MSHWR) 299.6919 AND MICHIGAN ACT 64, THE CURRENT STATE LANDFILL CLOSURE REGULATIONS WHICH HAVE BEEN DETERMINED TO BE RELEVANT AND APPROPRIATE FOR THIS SITE. IN PART, A MSHWR 299.6919 CAP MUST BE COMPOSED OF A 3-FOOT LAYER OF COMPACTED CLAY OVERLAIN BY A PROTECTIVE SOIL LAYER (SEE SECTION L(2)).

B. GROUNDWATER

TABLE 3 LISTS THE REPRESENTATIVE COMPOUNDS AND THE CORRESPONDING FEDERAL DRINKING-WATER STANDARDS AND THE STATE GROUNDWATER-CLEANUP CRITERIA WHICH THE US EPA BELIEVES TO BE ADEQUATELY PROTECTIVE (SEE SECTION L(2)). THE GROUNDWATER CONTAMINANT PLUME CONTAINS CONCENTRATIONS OF HAZARDOUS SUBSTANCES WHICH EXCEED ALL OR MOST OF THESE GROUNDWATER STANDARDS AND CLEANUP CRITERIA. TABLE 3, THEREFORE, PRESENTS THE PRELIMINARY GROUNDWATER CLEANUP STANDARDS FOR INDICATOR CHEMICALS AT THE G&H SITE.

3. GROUNDWATER PROTECTION GOALS

A. THE NATIONAL CONTINGENCY PLAN

THE US EPA'S GROUNDWATER PROTECTION GOAL HAS BEEN SET FORTH IN THE NCP AS FOLLOWS:

THE NATIONAL GOAL OF THE REMEDY SELECTION PROCESS IS TO SELECT REMEDIES THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, THAT MAINTAIN PROTECTION OVER TIME, AND THAT MINIMIZE UNTREATED WASTE. (SECTION 300.430(A)(1)(I)).

THE NCP STATES THAT THE US EPA EXPECTS TO RETURN USABLE GROUNDWATERS TO THEIR BENEFICIAL USES WHEREVER PRACTICABLE, WITHIN A TIME FRAME THAT IS REASONABLE GIVEN THE PARTICULAR CIRCUMSTANCES OF THE SITE. WHENEVER RESTORATION OF GROUND WATERS IS NOT PRACTICABLE, EPA EXPECTS TO PREVENT FURTHER MIGRATION OF THE PLUME, PREVENT EXPOSURE TO THE CONTAMINATED GROUNDWATER, AND EVALUATE FURTHER RISK REDUCTION. (SECTION 300.430(A)(1)(III)(F)).

ALSO, THE NCP CONSIDERS THE USE OF INSTITUTIONAL CONTROLS TO LIMIT EXPOSURES TO HAZARDOUS SUBSTANCES IN THE GROUNDWATER:

EPA EXPECTS TO USE INSTITUTIONAL CONTROLS SUCH AS WATER USE AND DEED RESTRICTIONS TO SUPPLEMENT ENGINEERING CONTROLS AS APPROPRIATE FOR SHORT- AND LONG-TERM MANAGEMENT TO PREVENT OR LIMIT EXPOSURE TO HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS.... THE USE OF INSTITUTIONAL CONTROLS SHALL NOT SUBSTITUTE FOR ACTIVE RESPONSE MEASURES AS THE SOLE REMEDY UNLESS SUCH RESPONSE MEASURES ARE DETERMINED NOT TO BE PRACTICABLE... (SECTION 300.430(A)(1)(III)(D))

B. STATE OF MICHIGAN

MICHIGAN ACT 307 PROVIDES FOR REMEDIAL ACTION, AT CONTAMINATED SITES WITHIN THE STATE, WHICH "SHALL BE PROTECTIVE OF THE PUBLIC HEALTH, SAFETY, AND WELFARE AND THE ENVIRONMENT AND NATURAL RESOURCES." ADDITIONALLY, ALL "REMEDIAL ACTIONS WHICH ADDRESS THE REMEDIATION OF AN AQUIFER SHALL PROVIDE FOR REMOVAL OF THE HAZARDOUS SUBSTANCE OR SUBSTANCES FROM THE AQUIFER...." MICHIGAN ACT 307 ALSO PROVIDES FOR THE

DETERMINATION OF ACCEPTABLE CRITERIA FOR GROUNDWATER REMEDIATION AT THE SITE. THE MICHIGAN SAFE DRINKING WATER ACT (ACT 399) PROVIDES FOR THE DETERMINATION OF ACCEPTABLE GROUNDWATER CLEANUP STANDARDS AT THE SITE. (SEE PAGE 48 FOR A MORE COMPLETE DISCUSSION OF THESE STATUTES.)

C. CLEANUP STANDARDS

TABLE 3 PRESENTS THE PRELIMINARY CLEANUP STANDARDS FOR THE SITE GROUNDWATER, BASED ON THE CONSIDERATION OF THE POTENTIAL RISKS TO CONSUMERS OF CONTAMINATED GROUNDWATER AND ON THE CONSIDERATION OF FEDERAL AND STATE GROUNDWATER PROTECTION GOALS, CLEANUP STANDARDS, AND CRITERIA.

US EPA'S GROUNDWATER CLEANUP POLICY IS TO ATTAIN MAXIMUM CONTAMINANT LEVELS (MCLS) UNDER THE FEDERAL SAFE DRINKING WATER ACT (SDWA); HOWEVER, IF CLEANUP TO MCLS CAUSES THE RESIDUAL RISK LEVELS TO EXCEED THE 1 X (10-4) TO 1 X (10-6) RISK RANGE WHICH THE US EPA CONSIDERS TO BE PROTECTIVE (SEE PAGE 21), THEN THE AGENCY MUST APPLY RISK-BASED CLEANUP LEVELS TO REACH THE GOAL OF PROTECTIVENESS (A 1 X (10-6) EXCESS LIFETIME CANCER RISK).

MICHIGAN ACT 307, TYPE B CLEANUP CRITERIA (SEE SECTION L(2)) PROVIDE FOR THE CALCULATION OF RISK-BASED CLEANUP STANDARDS AT THE 1 X (10-6) EXCESS LIFETIME CANCER RISK LEVEL FOR EACH CARCINOGENIC COMPOUND. THESE STANDARDS ARE MORE STRINGENT THAN THE CORRESPONDING MCLS OR NON-ZERO MCLGS. THE US EPA HAS DETERMINED THAT MICHIGAN ACT 307, TYPE B CRITERIA ARE PROTECTIVE AND MAY BE APPLICABLE OR RELEVANT AND APPROPRIATE TO THE G&H SITE CLEANUP (SEE SECTION L(2)).

TABLE 4 LISTS THE GROUNDWATER CLEANUP STANDARDS FOR THE G&H SITE.

4. SUMMARY

ACTUAL OR THREATENED RELEASES OF HAZARDOUS SUBSTANCES FROM THIS SITE, IF NOT ADDRESSED BY IMPLEMENTATION OF THE RESPONSE ACTION SELECTED BY THIS RECORD OF DECISION, PRESENT AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT. THEREFORE, BASED ON THE FINDINGS IN THE RI REPORT AND THE DISCUSSION ABOVE, A FEASIBILITY STUDY (FS) WAS PERFORMED TO FOCUS THE DEVELOPMENT OF ALTERNATIVES TO ADDRESS THE PRINCIPAL AND LOWER-LEVEL THREATS AT THE SITE. THE FS REPORT DOCUMENTS THE EVALUATION OF THE MAGNITUDE OF SITE RISKS, SITE-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS), AND THE REQUIREMENTS OF CERCLA AND THE NCP, ESPECIALLY THE GROUNDWATER PROTECTION POLICY, IN THE DERIVATION OF REMEDIAL ALTERNATIVES FOR THE G&H SITE.

**#DA**
**DESCRIPTION OF ALTERNATIVES**

THE FS DIVIDED THE G&H SITE INTO TWO PARTS, OR "OPERABLE UNITS," FOR EFFECTIVE EVALUATION OF REMEDIAL ALTERNATIVES DESIGNED TO REDUCE SITE RISKS TO ACCEPTABLE LEVELS. THE FIRST OPERABLE UNIT DEALT WITH THE LAND-FILL CONTENTS, SOILS, AND SEDIMENTS; THE SECOND OPERABLE UNIT DEALT WITH THE GROUNDWATER CONTAMINANT PLUME, LANDFILL LEACHATE, AND THE OIL SEEP. THE TWO OPERABLE UNITS WERE ADDRESSED SEPARATELY DURING THE EVALUATION OF POTENTIAL REMEDIAL ALTERNATIVES, BUT THEY WERE INTENDED TO BE ADDRESSED IN CONJUNCTION WITH EACH OTHER BY THE SELECTED REMEDIAL ACTION.

DIFFERENT REMEDIAL ALTERNATIVES WERE EVALUATED TO ADDRESS THE PRINCIPAL AND LOWER-LEVEL THREATS POSED BY EACH OPERABLE UNIT, AS DETAILED BELOW:

1. LANDFILL OPERABLE UNIT

ALTHOUGH THE NCP REAFFIRMS US EPA'S PREFERENCE FOR PERMANENT SOLUTIONS TO SUPERFUND SITE PROBLEMS THROUGH THE USE OF TREATMENT TECHNOLOGIES, THE PREAMBLE TO THE NCP CONTEMPLATES THAT MANY REMEDIAL ALTERNATIVES MAY BE IMPRACTICAL FOR CERTAIN SITES DUE TO SEVERE IMPLEMENTABILITY PROBLEMS OR PROHIBITIVE COSTS (E.G., TREATMENT OF THE ENTIRE CONTENTS OF A LARGE MUNICIPAL LANDFILL). THUS, THE FS WAS DIRECTED AT THE EVALUATION OF THE CONTAINMENT RATHER THAN THE TREATMENT OF THE LANDFILL OPERABLE UNIT, DUE TO THE SIZE OF THE LANDFILL AREAS AND OF THE "HOT SPOTS" WITHIN THE PHASE I LANDFILL AREA AS DETERMINED DURING THE RI. A TREATMENT REMEDY WAS RETAINED FOR CONSIDERATION, HOWEVER.

## 2. GROUNDWATER OPERABLE UNIT

THE OBJECTIVE OF THE GROUNDWATER OPERABLE UNIT IS TO ACHIEVE FEDERAL DRINKING-WATER STANDARDS UNDER THE SAFE DRINKING WATER ACT AND STATE GROUNDWATER-CLEANUP CRITERIA UNDER MICHIGAN ACT 307 (THE GROUNDWATER CLEANUP STANDARDS IN TABLE 4). GROUNDWATER OPERABLE UNIT ALTERNATIVES ANALYZED TO ADDRESS THE PRINCIPAL THREAT AT THE SITE RANGED FROM NO ACTION TO GROUNDWATER EXTRACTION AND TREATMENT.

## 3. REMEDIAL ALTERNATIVES

THE ALTERNATIVES PASSING INITIAL SCREENING AND CONSIDERED FOR DETAILED ANALYSIS IN THE FS ARE:

1: NO ACTION
2: LIMITED ACTION
3A: LANDFILL CAP
3B: SLURRY WALL
4A: GROUNDWATER EXTRACTION AND TREATMENT
6A: EXCAVATION AND TREATMENT OF HOT SPOTS

(NOTE: ALTERNATIVES 4B, 5A, 5B, AND 6B WERE NOT DETERMINED TO BE PRACTICABLE AT THIS SITE AND WERE NOT EVALUATED IN DETAIL IN THE FS.)

EACH SUCCEEDING ALTERNATIVE IS BUILT UPON THE PRECEDING ALTERNATIVES. FOR EXAMPLE, ALTERNATIVE 3B (SLURRY WALL) INCLUDES ALL THE PROVISIONS OF ALTERNATIVE 3A (LANDFILL CAP), AND ALTERNATIVE 3A INCLUDES ALL THE PROVISIONS OF ALTERNATIVE 2 (LIMITED ACTION). EACH ALTERNATIVE IS DISCUSSED BELOW:

### ALTERNATIVE 1: NO ACTION

THE NCP REQUIRES THAT THE US EPA EVALUATE THE NO-ACTION ALTERNATIVE TO PROVIDE A BASELINE FOR COMPARISON OF THE EFFECTIVENESS OF THE REMEDIAL ALTERNATIVES.

UNDER THE NO-ACTION ALTERNATIVE, NO ACTIVE RESPONSE MEASURES WOULD OCCUR, OTHER THAN PERIODIC SITE INSPECTION. NO REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT OR OF THE RATE OF LEACHING OF CONTAMINANTS TO THE GROUNDWATER WOULD BE PROVIDED BY THIS ALTERNATIVE; THEREFORE, NO RISK REDUCTION WOULD RESULT FROM THIS ACTION. THE NO-ACTION ALTERNATIVE WOULD NOT MEET APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR GROUNDWATER AND LANDFILL CLOSURE AT THE SITE AND IS NOT PROTECTIVE. ALTERNATIVE 1 HAS NO COST.

### ALTERNATIVE 2: LIMITED ACTION

UNDER ALTERNATIVE 2, LIMITED ACTION WOULD BE TAKEN TO PREVENT DIRECT CONTACT WITH ON-SITE CONTAMINANTS. THE PRESENT SITE FENCE WOULD BE MAINTAINED, AND GROUNDWATER MONITORING WOULD CONTINUE TO TRACK THE MOVEMENT OF THE GROUNDWATER CONTAMINANT PLUME. DEED AND GROUNDWATER USE RESTRICTIONS WOULD BE PLACED ON THE SITE PROPERTY TO PREVENT THE DEVELOPMENT OF THE LANDFILL AREAS, TO PREVENT ACCESS TO CONTAMINATED PORTIONS OF THE SITE AND TO PREVENT THE CONSUMPTION OF CONTAMINATED GROUNDWATER. RESIDENCES AND BUSINESSES ALONG RYAN ROAD (SEE FIGURE 5) WOULD BE CONNECTED TO THE MUNICIPAL WATER SUPPLY TO REPLACE THE WATER SUPPLY CONTAMINATED BY THE SITE (ON THE WEST SIDE OF RYAN ROAD) AND AS A PREVENTIVE MEASURE TO PROTECT THE PUBLIC FROM THE EFFECTS OF ANY FUTURE CONTAMINATION OF WATER SUPPLIES. PROVISION OF MUNICIPAL WATER IS A COST-EFFECTIVE MEASURE SINCE LONG-TERM MONITORING OF THE RESIDENTIAL WELLS IS PROJECTED TO BE MORE COSTLY THAN THE WATER SUPPLY CONNECTIONS.

WHILE ALTERNATIVE 2 WOULD PROVIDE LIMITED PUBLIC HEALTH PROTECTION BY CONTROLLING ACCESS TO THE SITE AND BY REPLACING CONTAMINATED OR POTENTIALLY CONTAMINATED WATER SUPPLIES WITH MUNICIPAL WATER, IT WOULD NOT PREVENT THE MOVEMENT OF CONTAMINANTS OFF SITE. RELIANCE UPON INSTITUTIONAL CONTROLS DOES NOT PROVIDE FOR A REDUCTION IN THE TOXICITY, MOBILITY, OR VOLUME OF CONTAMINATION THROUGH TREATMENT. INSTITUTIONAL CONTROLS ALSO PROVIDE NO LONG-TERM EFFECTIVENESS IN THE PREVENTION OF PUBLIC ACCESS TO THE SITE. THUS, ALTERNATIVE 2 PROVIDES NO RISK REDUCTION. ALTERNATIVE 2 WOULD NOT MEET GROUNDWATER OR LANDFILL CLOSURE ARARS.

ALTERNATIVE 2 WOULD HAVE A CAPITAL COST OF $350,000 AND AN ANNUAL OPERATIONS AND MAINTENANCE COST OF $210,000, FOR A PRESENT WORTH COST OF $3.6 MILLION. GROUNDWATER WOULD BE MONITORED FOR MORE THAN 30 YEARS.

ALTERNATIVE 3A: LANDFILL CAP

ALTERNATIVE 3A INCLUDES THE COMPONENTS OF ALTERNATIVE 2. IN ADDITION, ALTERNATIVE 3A COVERS THE PHASE I, PHASE II, AND PHASE III LANDFILL AREAS WITH A SOIL-CLAY CAP, WHICH MEETS THE REQUIREMENTS OF MSHWR 299.6919. THE CAP WOULD CONSIST OF A 3-FOOT COMPACTED CLAY BARRIER LAYER OVERLAIN BY A 3.5-FOOT GRAVEL AND SOIL LAYER. THE GRAVEL AND SOIL LAYER WOULD PROVIDE FROST-DAMAGE PROTECTION FOR THE CLAY BARRIER LAYER AND HELPS TO PREVENT PRECIPITATION CONTACT WITH THE CLAY LAYER. PRAIRIE GRASSES WOULD BE PLANTED ON THE TOPSOIL LAYER OF THE CAP TO PROVIDE A NATURAL HABITAT FOR AREA WILDLIFE.

LEACHATE FROM THE PHASE III LANDFILL AREA WOULD BE COLLECTED AND TREATED AT AN OFF-SITE INDUSTRIAL WASTEWATER FACILITY. LANDFILL GAS (METHANE) VENTS WOULD BE PLACED IN THE CAP TO PREVENT DAMAGING GAS BUILD-UP BENEATH THE CAP AND TO PREVENT THE MIGRATION OF METHANE OFF SITE.

THE LANDFILL COVER WOULD HELP PREVENT THE DIRECT CONTACT WITH LANDFILL WASTES AND WOULD ALSO REDUCE THE AMOUNT OF PRECIPITATION INFILTRATION THROUGH THE LANDFILL DEBRIS TOWARDS THE GROUNDWATER. HOWEVER, THE CAP WOULD NOT PREVENT GROUNDWATER CONTAMINANTS FROM MIGRATING OFF SITE. SINCE THE OILY WASTES ARE IN CONTACT WITH THE GROUNDWATER TABLE, THE CAP WOULD NOT PREVENT THE CONTINUAL DEGRADATION OF GROUNDWATER QUALITY AND NO RISK REDUCTION WOULD OCCUR. ALTERNATIVE 3A WOULD BE IN COMPLIANCE WITH MOST LANDFILL CLOSURE REQUIREMENTS BUT NOT WITH GROUNDWATER ARARS. ALTERNATIVE 3A WOULD HAVE A CAPITAL COST OF $22 MILLION AND AN ANNUAL OPERATION AND MAINTENANCE COST OF $450,000, FOR A PRESENT WORTH COST OF $29 MILLION. IT WOULD TAKE UP TO 4 YEARS TO CONSTRUCT THE LANDFILL CAP, DURING WHICH TIME LOCAL TRUCK TRAFFIC WOULD INCREASE. NOISE AND DUST LEVELS WOULD HAVE TO BE MITIGATED DURING THIS TIME AS WELL.

ALTERNATIVE 3B: SLURRY WALL

ALTERNATIVE 3B INCLUDES THE COMPONENTS OF ALTERNATIVE 3A. IN ADDITION, ALTERNATIVE 3B WOULD CONSTRUCT A SUBSURFACE, VERTICAL BARRIER WALL (SLURRY WALL) AROUND THE PERIMETER OF THE LANDFILL AREAS AND THE OIL SEEPS, EXCEPT FOR THE WEST SIDE OF THE PHASE III LANDFILL AREA. THE SLURRY WALL WOULD EXTEND AN AVERAGE OF 34 FEET BELOW GROUND SURFACE AT A MINIMUM OF 3 FEET INTO THE CONFINING TILL LAYER BENEATH THE UPPER AQUIFER. COUPLED WITH THE CAP, THE SLURRY WALL WOULD CONTAIN THE MOBILE WASTES WITHIN THE LANDFILL AREAS TO PREVENT THE FURTHER MIGRATION OF CONTAMINANTS OFF SITE.

- PRESENT WORTH CALCULATIONS ARE BASED ON A 5 PERCENT DISCOUNT RATE AND A 30-YEAR OPERATIONS AND MAINTENANCE PERIOD.

GROUNDWATER WITHIN THE AREA CONTAINED BY THE SLURRY WALL WOULD BE EXTRACTED AND TREATED TO PREVENT THE OVERTOPPING OF THE CONTAINMENT SYSTEM BY RISING GROUNDWATER LEVELS DUE TO RESIDUAL PRECIPITATION INFILTRATION THROUGH THE CAP. AN INWARD HYDRAULIC GRADIENT WOULD BE ESTABLISHED BY THE EXTRACTION OF THE GROUNDWATER, WHICH WOULD HELP TO MAKE THE CONTAINMENT SYSTEM MORE EFFECTIVE (SINCE GROUNDWATER WOULD TEND TO FLOW INTO THE AREA CONTAINED BY THE SLURRY WALL RATHER THAN OUT OF THE AREA).

THE EXTRACTED GROUNDWATER WOULD BE TREATED TO REMOVE OIL (USING OIL/WATER PHASE SEPARATION), HEAVY METALS (BY CHEMICAL PRECIPITATION AND FILTRATION), VOCS (BY AIR STRIPPING), AND RESIDUAL VOCS, PESTICIDES, AND PCBS (WITH ACTIVATED CARBON). THE TREATED WATER WOULD BE DISCHARGED TO THE CLINTON RIVER IN CONFORMANCE WITH THE SUBSTANTIVE REQUIREMENTS OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT. PART 21 OF THE WATER RESOURCES COMMISSION ACT 245 OF 1929, AS AMENDED (MICHIGAN ACT 245), ESTABLISHES SURFACE WATER DISCHARGE CRITERIA AND PERMITTING RULES WHICH WERE PROMULGATED BY THE STATE UNDER ITS DELEGATED AUTHORITY TO ADMINISTER THE NPDES PROGRAM. ALTERNATIVELY, THE TREATED WATER MAY BE DISCHARGED TO THE DWSD TREATMENT PLANT IF PRETREATMENT CRITERIA ARE MET.

ALTHOUGH THE SLURRY WALL AND CAP SYSTEM WOULD CONTAIN CONTAMINANTS WITHIN THE LANDFILL AREAS, ALTERNATIVE 3B WOULD DO NOTHING TO PREVENT THE CONTINUED MIGRATION OF GROUNDWATER CONTAMINANTS ON THE OUTSIDE OF THE SLURRY WALL. NATURAL ATTENUATION IS EXPECTED TO REDUCE CONTAMINANT LEVELS WITHIN THE UPPER AQUIFER OUTSIDE OF THE AREA CONTAINED BY THE SLURRY WALL TO LEVELS WHICH WILL MEET GROUNDWATER STANDARDS; HOWEVER, THE PROTECTIVE

LEVELS ARE NOT EXPECTED TO BE MET FOR MUCH GREATER THAN 30 YEARS. ALTERNATIVE 3B WOULD MEET MOST LANDFILL CLOSURE REQUIREMENTS BUT WOULD NOT MEET GROUNDWATER ARARS FOR WELL OVER 30 YEARS.

ALTERNATIVE 3B IS PROJECTED TO HAVE A CAPITAL COST OF $28 MILLION AND AN ANNUAL OPERATION AND MAINTENANCE COST OF $630,000, FOR A PRESENT WORTH COST OF $38 MILLION. CONSTRUCTION OF THE SLURRY WALL AND CAP IS EXPECTED TO TAKE UP TO 4 YEARS, CREATING THE SAME TRAFFIC, NOISE, AND DUST PROBLEMS AS CREATED BY ALTERNATIVE 3A. EXTRACTION AND TREATMENT OF GROUNDWATER FROM WITHIN THE AREA CONTAINED BY THE SLURRY WALL, AND GROUNDWATER MONITORING OF THE CONTAMINANT PLUME OUTSIDE OF THE SLURRY WALL, ARE EXPECTED TO LAST FOR MORE THAN 30 YEARS.

IF, AND WHEN, GROUNDWATER ARARS ARE MET, THE UNACCEPTABLE RISKS CURRENTLY POSED BY GROUNDWATER CONTAMINATION WOULD BE REDUCED TO A MAXIMUM RISK FOR INDIVIDUAL CARCINOGENIC CHEMICALS OF APPROXIMATELY 1 X (10-6). ASSUMING THAT ALL CARCINOGENS WERE ONLY TREATED TO THE 1 X (10-6) LEVEL (A HIGHLY UNLIKELY SCENARIO, SINCE SOME CHEMICALS ARE MORE EASILY REMOVED FROM THE AQUIFER THAN OTHERS), THE MAXIMUM CUMULATIVE RISK WOULD BE APPROXIMATELY 1 X (10-5), WHICH IS AN ACCEPTABLE LEVEL. THE HAZARD INDEX WOULD BE REDUCED TO 1.0, WHICH IS AN ACCEPTABLE LEVEL.

ALTERNATIVE 4A: GROUNDWATER EXTRACTION AND TREATMENT

ALTERNATIVE 4A WOULD INCLUDE ALL OF THE COMPONENTS OF ALTERNATIVE 3B. IN ADDITION, ALTERNATIVE 4A WOULD EXTRACT AND TREAT CONTAMINATED GROUNDWATER IN THE UPPER AQUIFER NOT CONTAINED BY THE SLURRY WALL TO MEET GROUNDWATER CLEANUP STANDARDS. A NETWORK OF APPROXIMATELY 20 WELLS WOULD EXTRACT THE WATER FOR TREATMENT IN THE SAME TREATMENT SYSTEM USED IN ALTERNATIVE 3B FOR TREATMENT OF THE EXTRACTED WATER FROM WITHIN THE SLURRY WALL. ONCE THE GROUNDWATER CLEANUP STANDARDS HAVE BEEN MET, IN AN ESTIMATED 30 YEARS, THE POTENTIAL EXCESS LIFETIME CANCER RISK DUE TO INGESTION OF CONTAMINATED GROUNDWATER WOULD DECREASE FROM THE UNACCEPTABLE RISKS CURRENTLY POSED (E.G., 6 X (10-3) IN AREA 2) BY GROUNDWATER CONTAMINATION TO A MAXIMUM RISK FOR INDIVIDUAL CARCINOGENIC CHEMICALS OF APPROXIMATELY 1 X (10-6) IN AREA 2, AREA 4, AND AREA 5. AS ABOVE, ASSUMING THAT ALL CARCINOGENS WERE ONLY TREATED TO THE 1 X (10-6) LEVEL (A HIGHLY UNLIKELY SCENARIO), THE MAXIMUM CUMULATIVE RISK WOULD BE APPROXIMATELY 1 X (10-5), WHICH IS AN ACCEPTABLE LEVEL. THE HAZARD INDEX WOULD BE REDUCED TO 1.0, WHICH IS ALSO AN ACCEPTABLE LEVEL.

ALTERNATIVE 4A WOULD HAVE A CAPITAL COST OF $29 MILLION AND AN ANNUAL OPERATION AND MAINTENANCE COST OF $720,000, FOR A PRESENT WORTH COST OF $40 MILLION. AS IN ALTERNATIVES 3A AND 3B, CONSTRUCTION OF THE CONTAINMENT SYSTEM IS PROJECTED TO TAKE UP TO 4 YEARS. GROUNDWATER MONITORING WOULD LAST FOR AT LEAST 30 YEARS. ALTERNATIVE 4A WOULD MEET BOTH LANDFILL CLOSURE AND GROUNDWATER ARARS.

ALTERNATIVE 6A: EXCAVATION AND TREATMENT OF "HOT SPOTS"

ALTERNATIVE 6A WOULD EXCAVATE AND INCINERATE (ON SITE) THE "HOT SPOTS" (FIGURE 3E) IDENTIFIED IN THE PHASE I LANDFILL AND OIL SEEP AREAS. THE EXCAVATED WASTES WOULD BE PROCESSED ON SITE IN AN ENCLOSED BUILDING TO MINIMIZE EMISSION OF VOCS TO THE SURROUNDING NEIGHBORHOODS. AFTER PROCESSING, THE WASTES WOULD BE INCINERATED ON SITE IN TWO MOBILE INCINERATORS. A 10-ACRE LANDFILL WOULD BE CONSTRUCTED TO CONTAIN THE RESULTING ASH AND (INCINERATOR AIR POLLUTION CONTROL) SLUDGES. THE NEW LANDFILL WOULD BE CONSTRUCTED TO THE SOUTH OF THE PHASE II LANDFILL AREA. THE EXCAVATED AREAS WOULD BE FILLED WITH CLEAN SOIL, GRADED, AND THEN CAPPED AS UNDER ALTERNATIVE 3A. EXCAVATION AND INCINERATION OF THE HOT SPOT WASTES IS PROJECTED TO LAST FOR 15 YEARS TO 20 YEARS.

ALTERNATIVE 6A WOULD ALSO INCLUDE THE COMPONENTS OF ALTERNATIVE 4A. SINCE ONLY THE HOT SPOTS WOULD BE TREATED UNDER ALTERNATIVE 6A, THE CONTAINMENT SYSTEM WOULD STILL BE NEEDED TO CONTROL THE MIGRATION OF RESIDUAL CONTAMINATION LEFT UNTREATED IN THE PHASE I LANDFILL AREA AND TO ADDRESS THE LONG-TERM, LOW-LEVEL THREAT POSED BY THE DEBRIS IN THE PHASE II AND PHASE III LANDFILL AREAS.

AS IN ALTERNATIVE 4A, ONCE THE GROUNDWATER CLEANUP STANDARDS HAVE BEEN MET IN THE AQUIFER OUTSIDE OF THE SLURRY WALL, IN AN ESTIMATED 30 YEARS, THE POTENTIAL EXCESS LIFETIME CANCER RISK DUE TO INGESTION OF CONTAMINATED GROUNDWATER WOULD DECREASE FROM THE UNACCEPTABLE RISKS CURRENTLY POSED (E.G., 6 X (10-3) IN AREA 2) BY GROUNDWATER CONTAMINATION TO A MAXIMUM RISK FOR INDIVIDUAL CARCINOGENIC CHEMICALS OF APPROXIMATELY 1 X (10-6) IN AREA 2, AREA 4, AND AREA 5. AS ABOVE, ASSUMING THAT ALL CARCINOGENS WERE ONLY TREATED TO THE 1 X

(10-6) LEVEL (A HIGHLY UNLIKELY SCENARIO), THE MAXIMUM CUMULATIVE RISK WOULD BE APPROXIMATELY 1 X (10-5), WHICH IS AN ACCEPTABLE LEVEL. THE HAZARD INDEX WOULD BE REDUCED TO 1.0, WHICH IS ALSO AN ACCEPTABLE LEVEL.

ALTERNATIVE 6A WOULD MEET LANDFILL CLOSURE AND GROUNDWATER ARARS.

ALTERNATIVE 6A WOULD HAVE A CAPITAL COST OF $460 MILLION AND AN ANNUAL OPERATION AND MAINTENANCE COST OF $720,000, FOR A PRESENT WORTH COST OF $470 MILLION. CONSTRUCTION OF THE CAP AND SLURRY WALL SYSTEM WOULD LAST UP TO FOUR YEARS FOLLOWING COMPLETION OF THE INCINERATION OF THE HOT SPOTS. GROUNDWATER EXTRACTION, TREATMENT, AND MONITORING IS PROJECTED TO LAST FOR AT LEAST 30 YEARS.

#CAA
COMPARATIVE ANALYSIS OF ALTERNATIVES: THE NINE CRITERIA IN ACCORDANCE WITH THE NCP, THE RELATIVE PERFORMANCE OF EACH ALTERNATIVE IS EVALUATED USING THE NINE CRITERIA (SECTION 300.430(E)(9)(III)) AS A BASIS FOR COMPARISON. AN ALTERNATIVE PROVIDING THE "BEST BALANCE" OF TRADEOFFS WITH RESPECT TO THE NINE CRITERIA IS DETERMINED FROM THIS EVALUATION.

THRESHOLD CRITERIA

1. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT ADDRESSES WHETHER A REMEDY ELIMINATES, REDUCES, OR CONTROLS THREATS TO HUMAN HEALTH AND TO THE ENVIRONMENT.

THE MAJOR EXPOSURE PATHWAYS OF CONCERN AT THE G&H LANDFILL SITE ARE THE POTENTIAL INGESTION OF CONTAMINATED GROUNDWATER AND THE EXPOSURE TO, OR INGESTION OF, CONTAMINATED SURFACE WATER AND/OR SEDIMENTS IN THE RECREATIONAL AREA AND WETLANDS ADJACENT TO THE SITE. BASED UPON THESE PATHWAYS OF CONCERN, THE ALTERNATIVES WERE EVALUATED ON THEIR ABILITY TO REDUCE PRECIPITATION INFILTRATION THROUGH THE LANDFILL AND TO ACHIEVE THE GROUNDWATER CLEANUP STANDARDS. REDUCTION OF PRECIPITATION INFILTRATION RATES REDUCES THE CONCENTRATION OF CONTAMINANTS LEACHING INTO THE GROUNDWATER, WHICH CONTRIBUTES TO THE RETURN OF THE USABLE AQUIFER TO ITS BENEFICIAL USES WITHIN A REASONABLE TIME FRAME. THE REMEDIAL ALTERNATIVES WERE ALSO EVALUATED ON THE BASIS OF THEIR ABILITY TO REMOVE CONTAMINANTS FROM THE UPPER AQUIFER TO REDUCE THE LEVELS OF HAZARDOUS SUBSTANCES DISCHARGING INTO THE WETLANDS.

OVER THE LONG TERM, ALTERNATIVES 1 (NO ACTION) AND 2 (LIMITED ACTION) DO NOT PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT SINCE NO PROTECTION OF THE GROUNDWATER AQUIFER IS PROVIDED EITHER THROUGH EXTRACTION AND TREATMENT OF GROUNDWATER CONTAMINANTS OR THROUGH MINIMIZATION OF PRECIPITATION INFILTRATION THROUGH THE LANDFILL. ALTERNATIVES 1 AND 2 DO NOT PREVENT DIRECT CONTACT EXPOSURE TO CONTAMINANTS BY HUMAN AND ENVIRONMENTAL RECEPTORS. WITH AN INADEQUATE CAP, ORGANICS, HEAVY METALS, AND PESTICIDE CONTAMINANTS DETECTED IN THE LANDFILL WASTES WOULD CONTINUE LEACHING INTO THE GROUNDWATER IN EXCESS OF STANDARDS.

ALTERNATIVES 3A-6A PROVIDE FOR A CAP WHICH MEETS STATE AND FEDERAL LANDFILL CLOSURE CRITERIA AND WOULD DECREASE THE RATE OF PRECIPITATION INFILTRATION THROUGH THE LANDFILL WASTES BY APPROXIMATELY 80 PERCENT. AN ADEQUATE CAP WOULD ALSO PROVIDE A SUPERIOR BARRIER TO DIRECT CONTACT EXPOSURE TO LANDFILL WASTES. HOWEVER, ALTERNATIVE 3A CANNOT PREVENT THE MIGRATION OF GROUNDWATER CONTAMINANTS OFF SITE AND WOULD NOT RESTORE THE USABLE AQUIFER TO ITS BENEFICIAL USES.

ALTERNATIVE 3B WOULD CONTROL THE MIGRATION OF CONTAMINANTS IN THE GROUNDWATER BUT WOULD NOT ADDRESS THE GROUNDWATER CONTAMINATION WHICH OCCURS OUTSIDE OF THE SLURRY WALL. ALTERNATIVES 4A AND 6A, WHICH UTILIZE GROUNDWATER EXTRACTION AND TREATMENT, WOULD RESTORE THE AQUIFER BEYOND THE SLURRY WALL TO ITS BENEFICIAL USES. THUS, ALTERNATIVES 4A AND 6A ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT OVER THE LONG TERM.

2. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

THIS CRITERION EVALUATES WHETHER AN ALTERNATIVE MEETS APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SET FORTH IN FEDERAL, OR MORE STRINGENT STATE, ENVIRONMENTAL STANDARDS PERTAINING TO THE SITE OR PROPOSED ACTIONS. (NOTE: THIS SECTION NOTES ONLY THOSE ARARS (IF ANY) NOT ADDRESSED BY AN ALTERNATIVE. SECTION L DISCUSSES ARARS FOR THE SITE.)

THE MAJOR GROUNDWATER ARARS INCLUDE THE REQUIREMENTS OF THE FEDERAL SAFE DRINKING WATER AND CLEAN WATER ACTS AND THE STATE SAFE DRINKING WATER (ACT 399) AND ENVIRONMENTAL RESPONSE ACTS (ACT 307 OF 1982, AS AMENDED). LANDFILL CLOSURE ARARS INCLUDE THE FEDERAL RESOURCE CONSERVATION AND RECOVERY ACT (RCRA), SUBTITLE C PROVISIONS, AND MICHIGAN ACT 64, INCLUDING THE LANDFILL CAP SPECIFICATIONS LISTED UNDER MSHWR 299.6919.

ALTERNATIVES 1 AND 2 WOULD NOT MEET THE REQUIREMENTS FOR LANDFILL-CLOSURE ARARS SINCE NO CAP WOULD BE CONSTRUCTED ON THE LANDFILLED AREAS OF THE SITE. ALTERNATIVES 1 AND 2 WOULD NOT MEET THE REQUIREMENTS OF THE GROUNDWATER ARARS AS WELL.

WHILE ALTERNATIVES 3A AND 3B WOULD MEET SOME OF THE REQUIREMENTS FOR LANDFILL CLOSURE, THEY WOULD NOT MEET GROUNDWATER ARARS.

ALTERNATIVES 4A AND 6A WOULD MEET LANDFILL-CLOSURE REQUIREMENTS AND WOULD ALSO COMPLY WITH THE GROUNDWATER ARARS BY ACHIEVING THE GROUNDWATER CLEANUP STANDARDS WITHIN A REASONABLE TIME FRAME.

PRIMARY BALANCING CRITERIA

3. LONG-TERM EFFECTIVENESS/PERMANENCE

THIS CRITERION REFERS TO THE ABILITY OF AN ALTERNATIVE TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME, ONCE CLEANUP GOALS HAVE BEEN MET.

ALTERNATIVES 1 AND 2 DO NOT PROVIDE LONG-TERM EFFECTIVENESS OR PERMANENCE SINCE THEY PROVIDE NO RESPONSE MEASURE TO ADDRESS THE WASTES THROUGH EITHER CONTAINMENT OR TREATMENT. ALTERNATIVES 3A AND 3B PROVIDE SOME LONG-TERM EFFECTIVENESS THROUGH THE CONTAINMENT OF THE LANDFILL WASTES; AS THE CAP WOULD REDUCE THE RATE OF LEACHING OF CONTAMINANTS FROM THE LANDFILL DEBRIS. ALTERNATIVE 3B WOULD BE MORE EFFECTIVE THAN ALTERNATIVE 3A, SINCE THE SLURRY WALL WOULD HELP PREVENT THE CONTINUED MIGRATION OF THE GROUNDWATER CONTAMINANT PLUME OUT OF THE LANDFILL.

ALTERNATIVES 4A AND 6A PROVIDE A HIGH DEGREE OF LONG-TERM EFFECTIVENESS SINCE EACH ALTERNATIVE PROVIDES FOR THE EXTRACTION AND TREATMENT OF THE GROUNDWATER CONTAMINANT PLUME OUTSIDE OF THE SLURRY WALL. ALTERNATIVE 6A WOULD PROVIDE THE HIGHEST DEGREE OF PERMANENCE, ONCE THE HOT SPOTS WITHIN THE PHASE I LANDFILL AREA HAVE BEEN ADDRESSED. AFTER THE HOT SPOTS ARE TREATED, THE POTENTIAL FOR THE CONTAINMENT SYSTEM (ESPECIALLY THE SLURRY WALL) TO FAIL WOULD BE REDUCED.

4. REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

THIS CRITERION EVALUATES TREATMENT TECHNOLOGY PERFORMANCE IN THE REDUCTION OF CHEMICAL TOXICITY, MOBILITY, OR VOLUME.

AS DETAILED ABOVE, THE STATED PROGRAMMATIC GOAL OF THE US EPA, AS EXPRESSED IN THE NCP, IS TO SELECT REMEDIES THAT ARE PROTECTIVE OVER TIME AND "MINIMIZE UNTREATED WASTE" (SECTION 300.430(A)(1)(I)). THE NCP CONTEMPLATES THAT THE US EPA WILL USE "TREATMENT TO ADDRESS THE PRINCIPAL THREATS AT A SITE, WHEREVER PRACTICABLE" (SECTION 300.430(A)(1)(III)(A)).

ALTERNATIVE 6A IS THE ONLY ALTERNATIVE THAT WOULD RESULT IN THE REDUCTION IN THE TOXICITY, MOBILITY, OR VOLUME OF CONTAMINANTS IN THE SOIL AND WASTES THROUGH TREATMENT. INCINERATION WOULD DESTROY ORGANIC COMPOUNDS IN THE OIL-CONTAMINATED HOT SPOTS WITHIN THE PHASE I LANDFILL AREA. UP TO 800,000 CUBIC YARDS OF SOIL/DEBRIS WOULD BE TREATED; HOWEVER, LOWER CONCENTRATIONS OF CONTAMINANTS WOULD STILL REMAIN WITHIN THE PHASE I LANDFILL AREA DEBRIS.

THE GROUNDWATER EXTRACTION AND TREATMENT PROGRAMS UNDER ALTERNATIVES 3B THROUGH 6A WOULD COMPLY WITH THIS CRITERIA SINCE THE CONTAMINANTS WOULD BE CAPTURED AND DESTROYED (AS IN THE CASE OF ORGANIC WASTES) OR IMMOBILIZED (AS IN THE CASE OF HEAVY METALS) DURING THE TREATMENT PROCESS, RATHER THAN BEING TRANSFERRED TO THE ATMOSPHERE (ORGANICS) OR DISCHARGED INTO THE CLINTON RIVER (INORGANICS).

5. SHORT-TERM EFFECTIVENESS

SHORT-TERM EFFECTIVENESS CONSIDERS THE TIME TO REACH CLEANUP OBJECTIVES AND THE RISKS AN ALTERNATIVE MAY POSE TO SITE WORKERS, THE COMMUNITY, AND THE ENVIRONMENT DURING REMEDY IMPLEMENTATION. THIS CRITERION ALSO CONSIDERS THE RELIABILITY AND EFFECTIVENESS OF ANY MITIGATIVE MEASURES TAKEN DURING REMEDY IMPLEMENTATION TO CONTROL THOSE SHORT-TERM RISKS.

ALTERNATIVE 6A IMPOSES THE MOST SIGNIFICANT SHORT-TERM EFFECTS ON THE COMMUNITY DURING IMPLEMENTATION, DUE TO THE PROJECTED LEVEL OF EXCAVATION AND INCINERATION/CONSTRUCTION ACTIVITY. DURING THE 15-YEAR TO 20-YEAR TREATMENT TIME FRAME FOR INCINERATION, WASTE AND DEBRIS EXCAVATION COULD CAUSE VOC AND DUST LEVELS IN THE AMBIENT AIR TO EXCEED PROTECTIVE STANDARDS. PROTECTIVE CONTROLS WOULD NEED TO BE IN PLACE DURING EXCAVATION TO MITIGATE THE IMPACT OF VOC EMISSIONS. TRUCK TRAFFIC DURING CAP CONSTRUCTION MAY INCREASE NOISE, DUST, AND VEHICULAR ACCIDENT LEVELS.

ALTERNATIVES 3A, 3B, AND 4A WOULD PROVIDE A LESS SIGNIFICANT IMPACT IN COMPARISON TO THE IMPACT OF ALTERNATIVE 6A, DUE TO THE REDUCED LEVEL OF ACTIVITY (SLURRY WALL AND/OR CAP CONSTRUCTION). NOISE, DUST, VOC EMISSIONS, AND CONSTRUCTION AND VEHICULAR ACCIDENT RATES MAY POSE SHORT-TERM THREATS TO SITE WORKERS AND/OR THE COMMUNITY DURING CAP CONSTRUCTION. CAPPING IS A STANDARD ENGINEERING PROCESS AND STANDARD SAFETY PRECAUTIONS WOULD BE UNDERTAKEN TO REDUCE THE LIKELIHOOD OF ACCIDENTS. DUST AND VOC EMISSION CONTROLS WOULD REDUCE SHORT-TERM IMPACTS TO SITE WORKERS AND LOCAL RESIDENTS. THE USE OF EROSION CONTROLS WOULD MITIGATE ANY SHORT-TERM EFFECTS POSED BY POTENTIAL SILTATION PROBLEMS TO THE WETLANDS OR THE CLINTON RIVER DURING CAP CONSTRUCTION.

ALTERNATIVES 4A AND 6A MAY DISCHARGE CONTAMINANTS TO THE ATMOSPHERE VIA AERATION DURING THE WATER TREATMENT PROCESS. IF VOC EMISSIONS EXCEED STATE OR FEDERAL AIR-QUALITY STANDARDS, EMISSION CONTROLS MAY BE ADDED TO THE TREATMENT SYSTEM(S) TO ENSURE THAT CHEMICAL EMISSIONS ARE AT PROTECTIVE LEVELS. STANDARD HEALTH AND SAFETY REQUIREMENTS WOULD PROTECT SITE WORKERS AND THE COMMUNITY FROM SHORT-TERM EXPOSURE TO HAZARDOUS SUBSTANCES. THE DISCHARGE OF TREATED WATER TO THE CLINTON RIVER OR TO THE DWSD TREATMENT PLANT WILL BE IN ACCORDANCE WITH THE SUBSTANTIVE REQUIREMENTS OF NPDES DISCHARGE CRITERIA (AS ADMINISTERED BY THE STATE UNDER PART 21 OF MICHIGAN ACT 245), WHICH ARE SET AT PROTECTIVE LEVELS.

THE SLURRY WALL AND THE GROUNDWATER EXTRACTION SYSTEM COULD IMPACT THE WETLANDS TO THE SOUTH OF THE LANDFILL AREAS AND THE RESIDENTIAL AREAS TO THE NORTH OF 23-MILE ROAD. GROUNDWATER EXTRACTION COULD LOWER THE WATER TABLE IN THE WETLANDS AREA, BUT THE WETLANDS ARE NOT EXPECTED TO BE SIGNIFICANTLY AFFECTED. GROUNDWATER MOUNDING MAY TAKE PLACE NORTH OF 23-MILE ROAD DUE TO THE PRESENCE OF THE SLURRY WALL. EXTRACTION OF GROUNDWATER IN THIS AREA WILL LESSEN THE IMPACT OF THE SLURRY WALL ON THE GROUNDWATER REGIME.

WHILE ALTERNATIVES 1 AND 2 TAKE THE LEAST AMOUNT OF TIME TO ACHIEVE THE OBJECTIVES OF THE REMEDIAL ALTERNATIVE AND MAY HAVE NO NEGATIVE IMPACTS IN TERMS OF SHORT-TERM EFFECTIVENESS, THEY ALSO DO NOT MEET GROUNDWATER CLEANUP STANDARDS IN A REASONABLE TIME FRAME. UNDER ALTERNATIVES 3A AND 3B, CONSTRUCTION ACTIVITY WOULD TAKE UP TO 4 YEARS TO COMPLETE AND GROUNDWATER CLEANUP STANDARDS WOULD NOT BE PROJECTED TO BE ACHIEVED WITHIN 30 YEARS. UNDER ALTERNATIVE 4A, IT WOULD TAKE UP TO 4 YEARS TO COMPLETE CONSTRUCTION ACTIVITY AND IT IS PROJECTED THAT GROUNDWATER CLEANUP STANDARDS COULD BE MET WITHIN 30 YEARS. IT WOULD TAKE UP TO 20 YEARS TO COMPLETE TREATMENT OF THE HOT SPOTS UNDER ALTERNATIVE 6A, AND GROUNDWATER CLEANUP STANDARDS COULD BE ACHIEVED WITHIN 30 YEARS.

6. IMPLEMENTABILITY

THIS CRITERION CONSIDERS THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF IMPLEMENTING AN ALTERNATIVE.

NO SIGNIFICANT IMPLEMENTATION PROBLEMS ARE PROJECTED FOR ALTERNATIVES 1 THROUGH 4A. CAP MATERIALS ARE EXPECTED TO BE OBTAINABLE FROM NEARBY SOURCES, AND CONSTRUCTION METHODS ARE RATHER STRAIGHTFORWARD, ALTHOUGH A LARGE-SCALE EFFORT WILL BE NEEDED DUE TO THE SIZE OF THE LANDFILL AREAS. THE MASSIVE EFFORT NEEDED TO HAUL CAP MATERIALS TO THE SITE MAY INCREASE THE DAMAGE TO LOCAL ROADS.

IMPLEMENTATION OF THE SLURRY WALL (ALTERNATIVES 3B-6A) IS DEPENDENT UPON THE COMPATIBILITY OF CONSTRUCTION MATERIALS WITH THE WASTE SOLVENTS/OILS. COMPATIBILITY TESTING WILL BE PERFORMED TO DETERMINE THE MOST

SUITABLE MATERIALS FOR SLURRY WALL CONSTRUCTION. LEACHATE EXTRACTION WELLS MAY NEED TO BE INSTALLED WITHIN THE PHASE I LANDFILL AREA TO HELP PREVENT THE WASTE OIL AND/OR HIGHLY CONTAMINATED GROUNDWATER FROM CONTACTING THE SLURRY WALL AND REDUCING ITS EFFECTIVENESS.

IMPLEMENTATION OF ALTERNATIVE 6A (ON-SITE INCINERATION) DEPENDS UPON EXCAVATION TECHNIQUES WHICH ARE GENERALLY WELL PROVEN. HOWEVER, ENVIRONMENTAL CONTROLS WILL BE NEEDED TO PREVENT EMISSIONS OF VOCS TO THE ATMOSPHERE DURING EXCAVATION AND DURING THE INCINERATION PROCESS. MATERIALS HANDLING PROBLEMS AND MECHANICAL BREAKDOWNS COULD SLOW THE TREATMENT PROGRESS. PUBLIC ACCEPTANCE OF ON-SITE INCINERATION MAY BE A HINDRANCE TO THE IMPLEMENTATION OF THIS ALTERNATIVE.

GROUNDWATER DISCHARGE AFTER TREATMENT WOULD NEED TO MEET THE SUBSTANTIVE REQUIREMENTS OF AN NPDES GROUNDWATER DISCHARGE PERMIT AS ADMINISTERED BY THE STATE UNDER PART 21 OF MICHIGAN ACT 245 (SEE SECTION L(2)).

7. COST

TABLE 5 COMPARES THE CAPITAL, OPERATION AND MAINTENANCE, AND PRESENT WORTH COSTS OF IMPLEMENTING THE VARIOUS ALTERNATIVES AT THE SITE.

MODIFYING CRITERIA

8. STATE ACCEPTANCE

THE STATE OF MICHIGAN IS IN AGREEMENT WITH THE US EPA'S ANALYSES AND RECOMMENDATIONS PRESENTED IN THE RI/FS AND THE PROPOSED PLAN. THE STATE CONCURS WITH THE SELECTED ALTERNATIVE (PRESENTED IN SECTION K, BELOW).

9. COMMUNITY ACCEPTANCE

COMMUNITY CONCERNS ARE ADDRESSED IN THE ATTACHED RESPONSIVENESS SUMMARY.

**#SR**
**K. SELECTED REMEDY**

AS PROVIDED IN CERCLA AND THE NCP, AND BASED UPON THE EVALUATION OF THE RI/FS AND THE NINE CRITERIA, THE US EPA HAS SELECTED ALTERNATIVE 4A AS THE METHOD PROVIDING OVERALL EFFECTIVENESS PROPORTIONAL TO ITS COSTS TO ADEQUATELY PROTECT HUMAN HEALTH AND THE ENVIRONMENT AGAINST EXPOSURES TO HAZARDOUS SUBSTANCES AT THE G&H SITE.

1. CAP

UNDER ALTERNATIVE 4A, A CAP SHALL BE PLACED ON THE LANDFILL (SEE FIGURES 6 AND 7) IN COMPLIANCE WITH THE CURRENT REQUIREMENTS OF MSHWR 299.6919 CONCERNING CAP SPECIFICATIONS FOR CLOSURE OF HAZARDOUS WASTE DISPOSAL FACILITIES. THE CAP SHALL CONSIST OF A GRADING LAYER, A MINIMUM 3-FOOT CLAY LAYER (COMPACTED TO A HYDRAULIC CONDUCTIVITY OF 1X10-7 CM/S OR LESS), A GRAVEL DRAINAGE LAYER, A FROST PROTECTIVE SOIL LAYER, AND A MINIMUM 6-INCH TOPSOIL LAYER. A METHANE GAS VENTING SYSTEM SHALL BE CONSTRUCTED WITHIN THE CAP AS WELL (SEE FIGURE 7). THE VENTING SYSTEM SHALL BE MONITORED TO DETERMINE IF THE LEVELS OF EMISSIONS MAY CAUSE POTENTIAL HEALTH EFFECTS. IF POTENTIAL HEALTH EFFECTS ARE INDICATED, AN EMISSION TREATMENT SYSTEM SHALL BE PLACED IN THE VENTING SYSTEM TO REDUCE EMISSIONS TO ACCEPTABLE LEVELS.

2. SLURRY WALL

IN CONJUNCTION WITH THE CAP, A SLURRY WALL SHALL BE INSTALLED AROUND THE PERIMETER OF THE LANDFILL AREAS AND THE OIL SEEP AREA (SEE FIGURE 6 AND FIGURE 8). THE SLURRY WALL SHALL BE CONSTRUCTED TO ACHIEVE A PERMEABILITY OF 1 X (10-7) CM/S OR LESS AND SHALL BE KEYED AT LEAST 3 FEET INTO THE LOW PERMEABILITY (TILL) UNIT BENEATH THE UPPER AQUIFER.

THE EXTENT AS TO WHICH THE SLURRY WALL IS PLACED IN THE JUNKYARD AREA WILL BE DETERMINED DURING THE REMEDIAL DESIGN PHASE. OIL-SATURATED SOIL MAY EXTEND FROM THE PHASE I LANDFILL AREA INTO THE JUNKYARD AREA AND MAY

HAVE TO BE CONTAINED BY THE SLURRY WALL AND CAP SYSTEM. ADDITIONAL SOIL BORINGS IN THIS AREA WOULD ESTABLISH THE EASTERN EDGE OF THE CONTAINMENT SYSTEM IN THE VICINITY OF THE JUNKYARD.

THE SLURRY WALL WOULD CONSTRUCTED ON BOTH THE EASTERN AND WESTERN SIDES OF THE DWSD WATER MAIN TO ISOLATE THE PIPELINE FROM SITE CONTAMINANTS SEE FIGURE 6). THE SLURRY WALL WILL BE BUILT AS TO MINIMIZE THE IMPACT ON ALL OF THE DWSD PIPELINES CROSSING THE SITE AREA. THE SLURRY WALL WOULD NOT BE CONSTRUCTED AROUND THE WESTERN EDGE OF THE PHASE III LANDFILL AREA; HOWEVER, A LEACHATE COLLECTION SYSTEM WOULD BE INSTALLED INSTEAD. IF THE LEACHATE TESTS CHARACTERISTIC VIA THE TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP) TEST, THEN IT SHALL BE MANAGED AS A HAZARDOUS WASTE. IT IS PROJECTED THAT COLLECTED LEACHATE WOULD BE HAULED TO A NEARBY INDUSTRIAL WASTEWATER FACILITY FOR TREATMENT.

GROUNDWATER EXTRACTION WELLS WOULD BE PLACED INSIDE THE CAP AND SLURRY WALL CONTAINMENT SYSTEM TO CREATE AN INWARD HYDRAULIC GRADIENT (SEE FIGURE 6). EXTRACTED WATER WOULD BE TREATED ON SITE AND DISCHARGED TO THE CLINTON RIVER IN ACCORDANCE WITH THE SUBSTANTIVE REQUIREMENTS OF AN NPDES DISCHARGE PERMIT, AS ADMINISTERED BY THE STATE UNDER PART 21 OF MICHIGAN ACT 245. ALTERNATIVELY, THE TREATED WATER MAY BE DISCHARGED TO THE DWSD TREATMENT PLANT IF PRETREATMENT CRITERIA ARE MET.

3. GROUNDWATER

UNDER ALTERNATIVE 4A, GROUNDWATER SHALL BE EXTRACTED (SEE FIGURE 6 FOR APPROXIMATE LOCATIONS OF EXTRACTION WELLS) UNTIL FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLS) OR NON-ZERO MAXIMUM CONTAMINANT LEVEL GOALS (MCLGS), PROMULGATED UNDER THE SAFE DRINKING WATER ACT, AND THE GROUNDWATER CLEANUP STANDARDS DERIVED UNDER MICHIGAN ACT 307, TYPE B CRITERIA ARE MET IN THE GROUNDWATER CONTAMINANT PLUME OUTSIDE OF THE LANDFILL CONTAINMENT SYSTEM. (SEE TABLE 4 FOR GROUNDWATER CLEANUP STANDARDS.) THE EXTRACTED GROUNDWATER SHALL BE TREATED ON SITE AND DISCHARGED TO THE CLINTON RIVER, IN COMPLIANCE WITH THE SUBSTANTIVE REQUIREMENTS OF A NPDES DISCHARGE PERMIT, AS ADMINISTERED BY THE STATE UNDER PART 21 OF MICHIGAN ACT 245. ALTERNATIVELY, THE TREATED WATER MAY BE DISCHARGED TO THE DWSD TREATMENT PLANT IF PRETREATMENT CRITERIA ARE MET.

THE GOAL OF THIS REMEDIAL ACTION IS TO RESTORE THE GROUNDWATER TO ITS BENEFICIAL USE, WHICH IS, AT THIS SITE, AN ACTUAL DRINKING WATER SOURCE EAST OF THE LANDFILL AND A POTENTIAL DRINKING WATER SOURCE SOUTH OF THE LANDFILL. BASED ON INFORMATION OBTAINED DURING THE RI AND ON A CAREFUL ANALYSIS OF THE REMEDIAL ALTERNATIVES, THE US EPA BELIEVES THAT THE SELECTED REMEDY WILL ATTAIN THIS GOAL. IT MAY BECOME APPARENT, DURING IMPLEMENTATION OR OPERATION OF THE GROUNDWATER EXTRACTION SYSTEM, THAT CONTAMINANT LEVELS HAVE CEASED TO DECLINE AND ARE REMAINING CONSTANT AT LEVELS HIGHER THAN THE GROUNDWATER CLEANUP STANDARDS OVER SOME PORTION OF THE CONTAMINANT PLUME. IN SUCH A CASE, THE SYSTEM PERFORMANCE STANDARDS, THE SYSTEM DESIGN, AND/OR THE REMEDY MAY BE REEVALUATED. AND, IF SUCH A REEVALUATION RESULTS IN A DETERMINATION THAT GROUNDWATER CLEANUP STANDARDS SHOULD BE CHANGED, A NEW PROPOSED PLAN WILL BE RELEASED FOR PUBLIC COMMENT AND AN AMENDED RECORD OF DECISION WILL BE ISSUED.

IT IS PROJECTED THAT THE GROUNDWATER EXTRACTION AND TREATMENT SYSTEM MAY ATTAIN THE GROUNDWATER CLEANUP STANDARDS IN THE GROUNDWATER WITHIN 30 YEARS. SYSTEM PERFORMANCE MONITORING WILL BE PERFORMED ON A REGULAR BASIS. IF WARRANTED, THE SYSTEM MAY BE MODIFIED IN ORDER TO ACHIEVE THE GOAL AS FOLLOWS:

(A) PUMPING MAY BE DISCONTINUED AT INDIVIDUAL WELLS WHERE GROUNDWATER CLEANUP STANDARDS HAVE BEEN ATTAINED;

(B) WELLS MAY BE PUMPED ON AN ALTERNATE BASIS TO ELIMINATE STAGNATION POINTS;

(C) "PULSE PUMPING" MAY BE PERFORMED TO ALLOW THE AQUIFER TO EQUILIBRATE AND ALLOW ADSORBED CONTAMINANTS TO PARTITION INTO THE GROUNDWATER FOR EXTRACTION; AND

(D) ADDITIONAL EXTRACTION WELLS MAY BE INSTALLED TO FACILITATE OR ACCELERATE CLEANUP OF THE CONTAMINANT PLUME.

GROUNDWATER WILL BE MONITORED PERIODICALLY AT ANY WELL WHERE PUMPING HAS CEASED TO ENSURE THAT GROUNDWATER CLEANUP STANDARDS CONTINUE TO BE MET.

4. FENCE

A FENCE SHALL BE MAINTAINED AROUND THE CONTAINMENT SYSTEM AND THE GROUNDWATER TREATMENT SYSTEM TO PREVENT ACCESS TO THE SITE. THE PORTIONS OF THE RECREATIONAL AREA THAT ARE CURRENTLY FENCED AND WHICH WILL NOT BE AFFECTED BY SITE REMEDIATION MAY BE REOPENED TO PUBLIC ACCESS IN ACCORDANCE WITH STATE LAW. THIS WILL REQUIRE REMOVAL AND RELOCATION OF PORTIONS OF THE EXISTING FENCE TO ENCIRCLE THE CONTAINMENT AND GROUNDWATER TREATMENT SYSTEMS.

5. OTHER PROVISIONS

THOSE RESIDENCES AND BUSINESSES LOCATED IN THE VICINITY OF THE SITE (SEE FIGURE 5) THAT ARE UTILIZING THE UPPER AQUIFER AS A POTABLE WATER SOURCE SHALL BE CONNECTED TO THE MUNICIPAL WATER SYSTEM. THE PRIVATE WELLS SHALL THEN BE PROPERLY ABANDONED IN ACCORDANCE WITH STATE LAW.

THE AQUIFERS AND SURFACE WATERS IN THE SITE VICINITY SHALL BE SAMPLED PERIODICALLY TO MONITOR CHEMICAL CONTAMINANT LEVELS DURING SITE REMEDIATION. GROUNDWATER AND SURFACE WATER MONITORING SHALL BE IMPLEMENTED FOR UP TO 30 YEARS FOLLOWING THE ACHIEVEMENT OF THE GROUNDWATER CLEANUP STANDARDS (TABLE 4).

MITIGATIVE MEASURES WILL BE TAKEN DURING REMEDY CONSTRUCTION ACTIVITIES TO MINIMIZE THE NOISE AND DUST IMPACTS OF CONSTRUCTION UPON THE SURROUNDING COMMUNITY. SUCH MITIGATIVE MEASURES MAY INCLUDE THE PLACEMENT OF EARTHEN BERMS AND/OR PLANT MATERIALS (SUCH AS TREES AND SHRUBS) AROUND THE LANDFILL PERIMETER, AND OTHER NECESSARY DESIGN ELEMENTS, TO EFFECTIVELY CONTROL THE NOISE AND DUST IMPACTS. FUGITIVE DUST EMISSIONS SHALL NOT VIOLATE THE NATIONAL AMBIENT AIR QUALITY STANDARD FOR PARTICULATE MATTER SMALLER THAN 10 MICRONS (PM10)). THE (PM10) STANDARD IS 150 UG/M3 (24-HOUR AVERAGE NOT EXPECTED TO BE EXCEEDED MORE THAN ONE DAY PER YEAR) AND 50 UG/M3 (ANNUAL ARITHMETIC MEAN NOT TO BE EXCEEDED).

INSTITUTIONAL CONTROLS WILL BE RELIED UPON TO PROVIDE ADDITIONAL EFFECTIVENESS TO THE REMEDY. DEED RESTRICTIONS SHALL BE PLACED ON THE LANDFILL AREA PROPERTY TO REGULATE THE DEVELOPMENT OF THE LANDFILL. GROUNDWATER-USE RESTRICTIONS SHALL BE MAINTAINED IN THE OFF-SITE AREAS TO THE EAST OF RYAN ROAD UNTIL GROUNDWATER CLEANUP STANDARDS ARE MET.

THE LEONARD FORSTER ESTATE, THE PRESENT OWNER OF THE G&H PROPERTY, HAS BEEN ORDERED BY A STATE COURT TO REMOVE THE SURFACE DEBRIS IN THE JUNKYARD. ADDITIONAL SURFACE SOIL INVESTIGATIONS MAY BE NEEDED TO DETERMINE THE EFFECTIVENESS OF THE IMPENDING REMOVALS. SHOULD CONTAMINANTS LEVELS, WHICH POTENTIALLY POSE A LIFETIME EXCESS CANCER RISK OF GREATER THAN 1 X (10-6) AND/OR A HAZARD INDEX OF GREATER THAN 1.0, REMAIN AFTER THE DEBRIS REMOVAL, SUITABLE ACTION SHALL BE TAKEN TO MITIGATE THE SITUATION. RESPONSE ACTIVITY SHALL INCLUDE SOME OR ALL OF THE FOLLOWING: (1) EXCAVATE THE SURFACE SOIL/DEBRIS IN THE JUNKYARD AREA AND UTILIZE IT AS FILL BENEATH THE CAP IN THE PHASE I LANDFILL AREA OR (2) EXTEND THE SLURRY WALL AND CAP TO INCLUDE THE ENTIRE JUNKYARD AREA.

THE OIL SEEP AREA IS WITHIN A WETLANDS RESOURCE THAT WILL BE LOST TO THE LANDFILL CONTAINMENT SYSTEM. APPROXIMATELY 8 ACRES OF THE WETLANDS WOULD BE FILLED AND CAPPED. ACCORDINGLY, THE OIL SEEP AREA, AND ANY OTHER WETLANDS AREA IMPACTED OR THAT MAY BE IMPACTED BY IMPLEMENTATION OF THE SITE REMEDY (SUCH AS BY LOWERING THE WATER TABLE DURING AQUIFER RESTORATION) SHALL BE REPLACED IN ACCORDANCE WITH THE STATE OF MICHIGAN GOEMAERE-ANDERSON WETLAND PROTECTION ACT (ACT 203 OF 1979) AND ITS ADMINISTRATIVE RULES. IDEALLY, WETLANDS REPLACEMENT WOULD OCCUR WITHIN THE RECREATIONAL AREA SYSTEM ALONG THE CLINTON RIVER. AT A MINIMUM, THE US EPA WILL REQUIRE THAT THE WETLANDS WOULD BE REPLACED AT PAR, UNLESS THE STATE, UNDER ACT 203, REQUIRES A HIGHER REPLACEMENT RATIO.

IN ACCORDANCE WITH THE PREFERENCE FOR TREATMENT OF PRINCIPAL THREATS AT SUPERFUND SITES, IN ADDITION TO AND DURING THE 5-YEAR REVIEW FOR REMEDY PROTECTIVENESS REQUIRED BY SECTION 121(B) OF CERCLA, EMERGING IN SITU TREATMENT TECHNOLOGIES SHALL BE EVALUATED AS TO THEIR EFFECTIVENESS AT TREATING THE PHASE I LANDFILL AREA CONTAMINANTS. THE EVALUATION WILL SEEK TO DETERMINE WHETHER ANY SUCH TECHNOLOGIES WOULD EFFECTIVELY DECREASE THE LEVELS OF CONTAMINATION WITHIN THE CONTAINMENT SYSTEM SO AS TO (1) REDUCE THE LONG-TERM RISKS ASSOCIATED WITH THE CONTAMINANTS, (2) REDUCE THE RISK OF FAILURE OF THE CONTAINMENT REMEDY DUE TO THE HIGH CONCENTRATIONS OF CONTAMINANTS, AND (3) REDUCE THE RISK OF EXPOSURE TO CONTAMINANTS DUE TO A FAILURE OF THE CONTAINMENT SYSTEM. SUCH TECHNOLOGIES WOULD BE REVIEWED IN CONFORMITY WITH THE REMEDY SELECTION CRITERIA OF CERCLA AND THE NCP.

6. SIGNIFICANT CHANGE: PCBS IN SOILS AND SEDIMENTS

THE CLEANUP OF PCBS WAS NOT DIRECTLY ADDRESSED IN THE REMEDIAL ALTERNATIVES EVALUATED IN THE FS OR IN THE PROPOSED PLAN. HOWEVER, UNDER THE US EPA'S NEW PCB CLEANUP POLICY AND UNDER TYPE B CRITERIA OF THE MICHIGAN ENVIRONMENTAL RESPONSE ACT 307 OF 1982, AS AMENDED (ACT 307), SOILS AND SEDIMENTS LOCATED OUTSIDE OF THE SLURRY WALL AND CONTAINING PCBS AT 1.0 MG/KG (PPM) OR GREATER SHALL BE EXCAVATED AND PROPERLY MANAGED. EXCAVATED SOILS AND SEDIMENTS CONTAINING LESS THAN 500 PPM PCBS WILL BE CONSOLIDATED UNDER THE LANDFILL CAP IN A MANNER SIMILAR TO THE JUNKYARD SOILS (SEE ABOVE). ALTHOUGH IT IS NOT ANTICIPATED THAT SOILS AND SEDIMENTS WILL BE FOUND TO CONTAIN PCBS AT A CONCENTRATION OF 500 PPM OR GREATER, ANY SUCH SOILS AND SEDIMENTS SHALL BE TREATED TO DESTROY THE PCBS. TREATMENT SHALL CONSIST OF EITHER OFF-SITE INCINERATION, VITRIFICATION, OR ANY OTHER DESTRUCTIVE TECHNOLOGY APPROVED BY THE US EPA FOR THE DESTRUCTION OF PCBS. FIGURE 9 DISPLAYS THE APPROXIMATE AREAS TO BE ADDRESSED.

THIS CHANGE IN THE REMEDY IS A LOGICAL OUTGROWTH OF THE RI/FS AT THE G&H SITE. SOIL AND SEDIMENT PCB CONCENTRATIONS WERE EVALUATED AND DISCUSSED IN THE RI REPORT, BUT A FINAL CLEANUP LEVEL WAS NOT IDENTIFIABLE UNTIL THE ACT 307 BECAME EFFECTIVE IN JULY 1990 AND UNTIL US EPA'S NEW PCB GUIDANCE BECAME EFFECTIVE IN AUGUST 1990. THE CLEANUP LEVEL FOR PCBS IN RESIDENTIAL AREAS HAS BEEN 10 PPM IN ACCORDANCE WITH THE FEDERAL TOXIC SUBSTANCE CONTROL ACT (TSCA). UNDER THE NEW (US EPA) PCB GUIDANCE, A 1.0 PPM CLEANUP LEVEL OF PCBS IS NOW THE CLEANUP STANDARD CONSIDERED TO BE PROTECTIVE IN RESIDENTIAL NEIGHBORHOODS. THE US EPA HAS DETERMINED THAT PROTECTION OF THE WETLANDS NEAR THE G&H SITE NECESSITATES A PCB CLEANUP LEVEL OF 1.0 PPM, AS A PRECAUTION AGAINST BIOACCUMULATION OF HAZARDOUS LEVELS OF PCBS IN AQUATIC SPECIES AND THEIR PREDATORS. THIS CLEANUP STANDARD COMPLIES WITH MICHIGAN ACT 307 UNDER TYPE B CRITERIA.

THE TREATMENT TRIGGER LEVEL IS BASED UPON THE NEW PCB GUIDANCE AND IS CONSISTENT WITH THE NCP'S EXPECTATION THAT THE US EPA WILL TREAT ONLY PRINCIPAL THREATS AND CONTAIN LOWER-LEVEL THREATS. 500 PPM IS THE LEVEL AT WHICH PCBS ARE CONSIDERED TO BE A PRINCIPAL THREAT IN AN INDUSTRIAL SETTING, THEREFORE, TREATMENT OF SOILS AND SEDIMENTS CONTAINING 500 PPM OR GREATER PCBS WOULD SATISFY THE STATUTORY PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT. THE PHASE I LANDFILL AREA WOULD BE CONSIDERED TO BE AN INDUSTRIAL SETTING, SO THAT THE REMAINDER OF THE SOIL AND SEDIMENT, WITH PCB LEVELS AT LESS THAN 500 PPM, WOULD NOT BE CONSIDERED TO BE A PRINCIPAL THREAT IN ITSELF. THUS, CONTAINMENT OF SOILS AND SEDIMENTS CONTAINING LESS THAN 500 PPM PCBS WOULD BE CONSISTENT WITH THE NCP.

THE US EPA ESTIMATES THAT NO EXTRA TIME MAY BE NEEDED TO COMPLETE THIS PORTION OF THE REMEDY, AS THE JUNKYARD AREA MAY BE SUBJECTED TO A SIMILAR CLEANUP RESPONSE ACTION (SOILS EXCAVATION) WHICH CAN BE IMPLEMENTED CONCURRENTLY. SINCE MUCH OF THE PCB CONTAMINATION WAS FOUND WITHIN THE AREA TO BE CONTAINED BY THE SLURRY WALL AND LANDFILL COVER, THE COST OF THE ENTIRE REMEDY MAY INCREASE SLIGHTLY, BUT NO COST ESTIMATE CAN BE CALCULATED AT THIS TIME.

**#SD**
**STATUTORY DETERMINATIONS**

THE SELECTED REMEDY MUST SATISFY THE REQUIREMENTS OF SECTION 121(A-E) OF CERCLA TO:

1. PROTECT HUMAN HEALTH AND THE ENVIRONMENT;
2. COMPLY WITH ARARS;
3. BE COST-EFFECTIVE;
4. UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE; AND
5. SATISFY A PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT OF THE REMEDY.

THE IMPLEMENTATION OF ALTERNATIVE 4A AT THE G&H LANDFILL SITE SATISFIES THE REQUIREMENTS OF CERCLA AS DETAILED BELOW:

1. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT IMPLEMENTATION OF THE SELECTED ALTERNATIVE WILL REDUCE AND CONTROL POTENTIAL RISKS TO HUMAN HEALTH POSED BY EXPOSURE TO CONTAMINATED GROUNDWATER. EXTRACTION AND TREATMENT OF CONTAMINATED GROUNDWATER TO MEET GROUNDWATER CLEANUP STANDARDS WILL REDUCE THE POTENTIAL EXCESS LIFETIME CANCER RISK DUE TO INGESTION OF CONTAMINATED GROUNDWATER FROM THE UNACCEPTABLE RISKS CURRENTLY POSED

(E.G., 6 X (10-3) IN AREA 2) BY GROUNDWATER CONTAMINANTS TO A MAXIMUM RISK FOR INDIVIDUAL CARCINOGENIC CHEMICALS OF APPROXIMATELY 1 X (10-6) IN AREA 2, AREA 4, AND AREA 5. AS ABOVE, ASSUMING THAT ALL CARCINOGENS WERE ONLY TREATED TO THE 1 X (10-6) LEVEL (A HIGHLY UNLIKELY SCENARIO), THE MAXIMUM CUMULATIVE RISK WOULD BE APPROXIMATELY 1 X (10-5), WHICH IS AN ACCEPTABLE LEVEL. THE HAZARD INDEX WOULD BE REDUCED TO 1.0, WHICH IS ALSO AN ACCEPTABLE LEVEL.

INSTITUTIONAL CONTROLS WILL PROVIDE SHORT-TERM EFFECTIVENESS FOR THE PREVENTION OF DRINKING CONTAMINATED GROUNDWATER UNTIL THE GROUNDWATER CLEANUP STANDARDS ARE MET. THE SELECTED REMEDY ALSO PROTECTS THE ENVIRONMENT BY REDUCING THE POTENTIAL RISKS POSED BY SITE CHEMICALS DISCHARGING TO THE WETLANDS AND TO SURFACE WATER (THE CLINTON RIVER).

CAPPING THE LANDFILL, IN ADDITION TO REDUCING ANY POTENTIAL FURTHER RISK POSED BY EXPOSURE TO LANDFILL CONTAMINANTS, WILL REDUCE PRECIPITATION INFILTRATION THROUGH THE CAP BY AN ESTIMATED 80 PERCENT, AND MAINTAIN THAT RATE OF REDUCTION OVER TIME. IMPLEMENTATION OF THE CAP AND SLURRY WALL WILL REDUCE GROUNDWATER CONTAMINANT LOADING TO THE USABLE AQUIFER OUTSIDE OF THE SLURRY WALL, ALLOWING THE RESTORATION OF THE AQUIFER WITHIN A REASONABLE TIME FRAME.

NO UNACCEPTABLE SHORT-TERM RISKS WILL BE CAUSED BY IMPLEMENTATION OF THE REMEDY. THE COMMUNITY AND SITE WORKERS MAY BE EXPOSED TO NOISE AND DUST NUISANCES DURING CONSTRUCTION OF THE CAP AND SLURRY WALL. AS ABOVE, MITIGATIVE MEASURES WILL BE TAKEN DURING REMEDY CONSTRUCTION ACTIVITIES TO MINIMIZE THE NOISE AND DUST IMPACTS OF CONSTRUCTION UPON THE SURROUNDING COMMUNITY. SUCH MITIGATIVE MEASURES MAY INCLUDE THE PLACEMENT OF EARTHEN BERMS AND/OR PLANT MATERIALS (SUCH AS TREES AND SHRUBS) AROUND THE LANDFILL PERIMETER, AND OTHER NECESSARY DESIGN ELEMENTS, TO EFFECTIVELY CONTROL THE NOISE AND DUST IMPACTS.

THE CHANCES OF VEHICULAR ACCIDENTS MAY RISE DUE TO THE PROJECTED INCREASE IN THE VOLUME OF TRUCK TRAFFIC IN HAULING CAPPING MATERIALS TO THE LANDFILL. AIR STRIPPING SHOULD NOT PRESENT SHORT-TERM RISKS DUE TO VOC AIR EMISSIONS IF PROPERLY DESIGNED AND MONITORED. STANDARD SAFETY PROGRAMS SHOULD MANAGE ANY SHORT-TERM RISK OF ACCIDENTS.

2. COMPLIANCE WITH ARARS

THE SELECTED REMEDY WILL COMPLY WITH THE FEDERAL AND/OR STATE, WHERE MORE STRINGENT, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) LISTED BELOW:

A. CHEMICAL-SPECIFIC ARARS

CHEMICAL-SPECIFIC ARARS REGULATE THE RELEASE TO THE ENVIRONMENT OF SPECIFIC SUBSTANCES HAVING CERTAIN CHEMICAL CHARACTERISTICS. CHEMICAL-SPECIFIC ARARS TYPICALLY DETERMINE THE EXTENT OF CLEANUP AT A SITE.

I. SOILS/SEDIMENTS

NO FEDERAL CHEMICAL-SPECIFIC STANDARDS EXIST FOR SOILS AND SEDIMENTS.

THE MICHIGAN ENVIRONMENTAL RESPONSE ACT 307 OF 1982, AS AMENDED (ACT 307), PROVIDES FOR THE IDENTIFICATION, RISK ASSESSMENT, AND EVALUATION OF CONTAMINATED SITES WITHIN THE STATE; THEREFORE, ACT 307 IS APPLICABLE OR RELEVANT AND APPROPRIATE TO THE G&H SITE. THE US EPA CONSIDERS THE SUBSTANTIVE PORTIONS OF PARTS 6 AND 7 OF THE ACT 307 RULES TO BE ARARS FOR THE REMEDIAL ACTION AT THIS SITE. THESE RULES PROVIDE, INTER ALIA, THAT REMEDIAL ACTIONS SHALL BE PROTECTIVE OF HUMAN HEALTH, SAFETY, THE ENVIRONMENT, AND THE NATURAL RESOURCES OF THE STATE. TO ACHIEVE THE STANDARD OF PROTECTIVENESS, ACT 307 RULES SPECIFY THAT A REMEDIAL ACTION SHALL ACHIEVE A DEGREE OF CLEANUP UNDER EITHER TYPE A (CLEANUP TO BACKGROUND LEVELS), TYPE B (CLEANUP TO RISK-BASED LEVELS), OR TYPE C (CLEANUP TO RISK-BASED LEVELS UNDER SITE-SPECIFIC CONSIDERATIONS) CRITERIA.

THE STATE, UNDER ACT 307, HAS ESTABLISHED WHAT IT CONSIDERS TO BE ACCEPTABLE CLEANUP CRITERIA FOR GROUNDWATER, SOILS, SURFACE WATER, AND AIR AT THE G&H SITE. THE US EPA HAS DETERMINED THAT THE APPROPRIATE CLEANUP STANDARDS FOR SOILS AND SEDIMENTS LOCATED OUTSIDE OF THE SLURRY WALL WOULD BE DERIVED UNDER TYPE B CRITERIA. THIS DETERMINATION IS BASED UPON THE CONSIDERATION OF PROJECTED LAND USE IN THE RECREATIONAL AREA, OF PROTECTION OF THE ENVIRONMENT, AND OF THE NEW (US EPA) PCB GUIDANCE. TYPE A CRITERIA ARE NOT NECESSARY TO

ACHIEVE THE PROTECTIVENESS STANDARD SINCE LAND USE WILL BE MORE INTERMITTENT THAN RESIDENTIAL USE, AND TYPE A CRITERIA MAY NOT BE PROJECTED TO PROVIDE A GREATER MEASURABLE DEGREE OF RISK REDUCTION VERSUS TYPE B CRITERIA. (THE TYPE B CRITERIA FOR CARCINOGENS ARE BASED ON THE REDUCTION OF THE CONCENTRATIONS OF HAZARDOUS SUBSTANCES TO LEVELS WHICH POSE AN INDIVIDUAL EXCESS LIFETIME CANCER RISK OF 1 X (10-6), USING THE STANDARDIZED EXPOSURE ASSUMPTIONS IN THE RULES. TYPE B CRITERIA WOULD COMPLY WITH US EPA GUIDANCE ON CLEANUP LEVELS FOR PCBS (1.0 PPM) IN SOILS OUTSIDE OF THE SLURRY WALL.)

WITHIN THE CONTAINMENT SYSTEM, THE US EPA HAS DETERMINED THAT ACT 307, TYPE C CRITERIA WOULD BE APPROPRIATE. THE ONLY FORESEEABLE USE OF THE SITE IS A LANDFILL, AND TYPE A OR TYPE B CRITERIA WOULD NOT PROVIDE FOR THE DERIVATION OF CLEANUP STANDARDS WHICH COULD BE MET UNLESS THE SOURCE MATERIALS WERE REMOVED. THEREFORE, TYPE C CRITERIA WOULD PROVIDE FOR A COST-EFFECTIVE AND APPROPRIATE REMEDIAL ACTION FOR THE LANDFILL AREAS.

II. GROUNDWATER

FEDERAL ARARS

MAXIMUM CONTAMINANT LEVELS (MCLS) AND, TO A CERTAIN EXTENT, MAXIMUM CONTAMINANT LEVEL GOALS (MCLGS), THE FEDERAL DRINKING-WATER STANDARDS PROMULGATED UNDER THE SAFE DRINKING WATER ACT (SDWA), ARE APPLICABLE TO MUNICIPAL WATER SUPPLIES SERVICING 25 OR MORE PEOPLE. AT THE G&H LANDFILL SITE, MCLS AND MCLGS ARE NOT APPLICABLE BUT ARE RELEVANT AND APPROPRIATE, SINCE THE UPPER SAND AND GRAVEL AQUIFER IS A CLASS II SOURCE WHICH IS BEING, OR COULD POTENTIALLY BE, USED FOR DRINKING IN THE AREAS OF CONCERN (AREAS 2, 4, AND 5). MCLGS ARE RELEVANT AND APPROPRIATE WHEN THE STANDARD IS SET AT A LEVEL GREATER THAN ZERO (FOR NON-CARCINOGENS), OTHERWISE, MCLS ARE RELEVANT AND APPROPRIATE. THE POINT OF COMPLIANCE FOR FEDERAL DRINKING-WATER STANDARDS IS AT THE BOUNDARY OF THE LANDFILLED WASTES.

AT THE G&H SITE, THE US EPA HAS DETERMINED THAT CLEANUP TO MCLS AND NON-ZERO MCLGS (OUTSIDE OF THE SLURRY WALL) WOULD NOT BE PROTECTIVE, SINCE THE RESIDUAL RISK WOULD FALL OUTSIDE OF THE RANGE THE US EPA CONSIDERS TO BE PROTECTIVE. THUS, RISK-BASED CLEANUP STANDARDS ARE NECESSARY TO ACHIEVE PROTECTIVENESS.

STATE ARARS

THE STATE OF MICHIGAN IS AUTHORIZED TO ADMINISTER THE IMPLEMENTATION OF THE FEDERAL SDWA. THE STATE HAS ALSO PROMULGATED MCLS UNDER MICHIGAN ACT 399 (THE MICHIGAN SAFE DRINKING WATER ACT), WHICH WOULD BE APPLICABLE IF THE GROUNDWATER IS OR WILL BE USED FOR DRINKING, OR RELEVANT AND APPROPRIATE IF THE GROUNDWATER COULD BE USED FOR DRINKING. THE STATE MCLS ARE APPLICABLE TO THE SITE SINCE THE AQUIFER IS CURRENTLY BEING UTILIZED BY AREA RESIDENCES AND BUSINESSES. AFTER THE AFFECTED HOMES AND BUSINESSES ARE CONNECTED TO THE MUNICIPAL WATER SUPPLY, AND THE AQUIFER IS NO LONGER IN USE, THE STATE MCLS WOULD BE RELEVANT AND APPROPRIATE TO THE SITE.

AS ABOVE, MICHIGAN ACT 307 IS APPLICABLE OR RELEVANT AND APPROPRIATE TO THE G&H SITE. THE US EPA HAS DETERMINED THAT ACCEPTABLE STANDARDS FOR GROUNDWATER CLEANUP, THAT HAVE BEEN DERIVED UNDER TYPE B CRITERIA, WOULD BE PROTECTIVE IN THE AREAS OF THE PLUME OUTSIDE OF THE CONTAINMENT SYSTEM. CLEANUP LEVELS DERIVED UNDER TYPE B CRITERIA WOULD ALLOW THE AQUIFER TO BE RESTORED TO ITS BENEFICIAL USES BY ACHIEVING THE RISK-BASED CLEANUP STANDARDS THE US EPA HAS DETERMINED WILL ASSURE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

SINCE THE RECREATIONAL AREA WOULD NOT BE CONSIDERED FOR DEVELOPMENT AS A RESIDENTIAL SETTING, GROUNDWATER USE IN THE RECREATIONAL AREA IS PROJECTED TO BE INTERMITTENT. THE US EPA HAS DETERMINED THAT TYPE A CRITERIA WOULD THUS BE INAPPROPRIATE TO DETERMINE GROUNDWATER CLEANUP STANDARDS SINCE TYPE B CRITERIA WOULD YIELD PROTECTIVE CLEANUP STANDARDS.

THE US EPA ALSO CONSIDERS THE TYPE C CRITERIA TO BE INAPPROPRIATE TO DERIVE CLEANUP STANDARDS FOR THE UPPER AQUIFER, SINCE THE GROUNDWATER USE IN THE RESIDENTIAL AREA WOULD BE CONSIDERED TO BE CONTINUAL. IN THIS AREA, TYPE B CRITERIA WOULD YIELD PROTECTIVE GROUNDWATER STANDARDS AS WELL. FINALLY, THE UPPER AQUIFER DISCHARGES GROUNDWATER TO THE SURFACE IN PORTIONS OF THE RECREATIONAL AREA SOUTH OF THE LANDFILL AREA. THE US EPA HAS DETERMINED THAT TYPE B CRITERIA WOULD YIELD GROUNDWATER CLEANUP STANDARDS WHICH WOULD ALSO PROVIDE FOR THE PROTECTION OF SURFACE WATER QUALITY, IN TURN PROTECTING HUMAN HEALTH AND THE ENVIRONMENT.

THE US EPA HAS DETERMINED THAT APPLICATION OF TYPE C CRITERIA WOULD BE THE APPROPRIATE CLEANUP RESPONSE FOR THE PORTION OF THE AQUIFER TO BE CONTAINED BY THE SLURRY WALL. UNLESS THE LANDFILL DEBRIS IS REMOVED, WHICH IS NOT A FORESEEABLE EVENT, IT IS NOT PLAUSIBLE THAT THE GROUNDWATER WITHIN THE SLURRY WALL WOULD BE USED (ESPECIALLY FOR DRINKING) AND, THEREFORE, NEITHER TYPE A OR TYPE B CRITERIA WOULD BE APPROPRIATE OR EVEN ATTAINABLE. IN THIS AREA, GROUNDWATER WOULD BE EXTRACTED MAINLY TO CREATE AN INWARD HYDRAULIC GRADIENT ACROSS THE SLURRY WALL TO PREVENT THE MIGRATION OF CONTAMINANTS OUTSIDE OF THE CONTAINMENT SYSTEM.

III. SURFACE WATER

FEDERAL ARARS

SURFACE WATER QUALITY STANDARDS FOR THE PROTECTION OF HUMAN HEALTH AND AQUATIC LIFE WERE DEVELOPED UNDER SECTION 304 OF THE CLEAN WATER ACT (CWA). THE FEDERAL AMBIENT WATER QUALITY CRITERIA (AWQC) ARE NONENFORCEABLE GUIDELINES THAT SET POLLUTANT CONCENTRATION LIMITS TO PROTECT SURFACE WATERS THAT ARE APPLICABLE TO POINT SOURCE DISCHARGES, SUCH AS FROM INDUSTRIAL OR MUNICIPAL WASTEWATER STREAMS. AT A SUPERFUND SITE, THE FEDERAL AWQC WOULD NOT BE APPLICABLE EXCEPT FOR PRETREATMENT REQUIREMENTS FOR DISCHARGE OF TREATED WATER TO A PUBLICLY OWNED TREATMENT WORKS (POTW). CERCLA (SECTION 121(D)(1)) REQUIRES THE US EPA TO CONSIDER WHETHER AWQC WOULD BE RELEVANT AND APPROPRIATE UNDER THE CIRCUMSTANCES OF A RELEASE OR THREATENED RELEASE, DEPENDING ON THE DESIGNATED OR POTENTIAL USE OF GROUNDWATER OR SURFACE WATER, THE ENVIRONMENTAL MEDIA AFFECTED BY THE RELEASES OR POTENTIAL RELEASES, AND THE LATEST INFORMATION AVAILABLE. SINCE THE AQUIFER IS A CURRENT AND POTENTIAL SOURCE OF DRINKING WATER AND SINCE TREATED WATER MAY BE DISCHARGED TO THE CLINTON RIVER OR TO THE DWSD TREATMENT PLANT (IF PRETREATMENT CRITERIA ARE MET), AWQC ADOPTED FOR DRINKING WATER AND AWQC FOR PROTECTION OF FRESHWATER AQUATIC ORGANISMS ARE RELEVANT AND APPROPRIATE TO THE POINT SOURCE DISCHARGE OF THE TREATED WATER INTO THE CLINTON RIVER.

STATE ARARS

PORTIONS OF THE WATER RESOURCES COMMISSION ACT 245 (MICHIGAN ACT 245) OF 1929, AS AMENDED, ESTABLISH SURFACE WATER-QUALITY STANDARDS TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT. THE STATE ADMINISTERS THE NPDES PROGRAM UNDER PART 21 OF MICHIGAN ACT 245; THEREFORE, PART 21 OF ACT 245 WOULD BE APPLICABLE TO THE DIRECT DISCHARGE OF TREATED WATER TO THE CLINTON RIVER OR TO A CLEAN AQUIFER, TO THE INDIRECT DISCHARGE THROUGH GROUNDWATER MOVEMENT TO A SURFACE WATER BODY, OR TO DISCHARGE TO A POTW.

B. LOCATION-SPECIFIC ARARS

LOCATION-SPECIFIC ARARS ARE THOSE REQUIREMENTS THAT RELATE TO THE GEOGRAPHICAL POSITION OF A SITE. THESE INCLUDE:

FEDERAL ARARS

BOTH RCRA (40 CFR 264.18(B) - HAZARDOUS WASTE STORAGE - FLOOD PLAIN) AND EXECUTIVE ORDER 11988 - PROTECTION OF FLOOD PLAINS - ARE RELEVANT AND APPROPRIATE FOR THIS SITE, A PORTION OF WHICH IS LOCATED WITHIN THE MAPPED 100-YEAR FLOOD PLAIN OF THE CLINTON RIVER. THESE REGULATIONS WOULD REQUIRE THAT THE GROUNDWATER TREATMENT SYSTEM BE LOCATED ABOVE 100-YEAR FLOOD PLAIN ELEVATION AND BE PROTECTED FROM EROSIONAL DAMAGE. THE REGULATIONS ALSO REQUIRE THAT ANY PORTION OF THE CAP THAT IS CONSTRUCTED WITHIN THE 100-YEAR FLOOD PLAIN BE ADEQUATELY PROTECTED AGAINST A 100-YEAR FLOOD EVENT (E.G., GEOTEXTILES SHOULD BE USED TO SECURE TOPSOIL, ETC.)

SECTION 404 OF THE CWA REGULATES THE DISCHARGE OF DREDGED OR FILL MATERIAL TO WATERS OF THE UNITED STATES, INCLUDING WETLANDS. CAPPING OF WETLANDS IS REGULATED UNDER SECTION 404 OF THE CWA; THEREFORE, THE SUBSTANTIVE REQUIREMENTS OF SECTION 404 WOULD BE RELEVANT AND APPROPRIATE TO THE REMEDIAL ACTION AT THE SITE.

EXECUTIVE ORDER 11990 - PROTECTION OF WETLANDS - IS AN APPLICABLE REQUIREMENT TO PROTECT AGAINST THE LOSS OR DEGRADATION OF WETLANDS. AS PRESENTED ABOVE, IMPLEMENTATION OF THE SLURRY WALL, IN COMBINATION WITH THE ESTIMATED GROUNDWATER EXTRACTION RATE, IS ANTICIPATED TO HAVE A NEGATIVE IMPACT ON THE CLINTON RIVER WETLANDS. THE SCOPE OF THE IMPACT HAS NOT YET BEEN DETERMINED. MITIGATIVE EFFORTS MUST BE APPLIED TO THE CLEANUP IF AN IMPACT IS SEEN ON THE WETLANDS. IN ADDITION, APPROXIMATELY 8 ACRES OF WETLANDS ARE EXPECTED TO

BE LOST DUE TO THE CONTAINMENT OF THE OIL SEEP AREA, AND EXECUTIVE ORDER 11990 MAY REQUIRE THESE RESOURCES TO BE REPLACED.

STATE ARARS

THE GOEMAERE-ANDERSON WETLAND PROTECTION ACT 203 OF 1979 (ACT 203) REGULATES ANY ACTIVITY WHICH MAY TAKE PLACE WITHIN WETLANDS IN THE STATE OF MICHIGAN. ACT 203 IS APPLICABLE TO THE REMEDIAL ACTION AT THE G&H SITE; IT MAY ALSO REQUIRE THE REPLACEMENT OF ADVERSELY IMPACTED WETLANDS WITH COMPARABLE RESOURCES.

THE INLAND LAKES AND STREAMS ACT 346 OF 1972, AS AMENDED, REGULATES INLAND LAKES AND STREAMS IN THE STATE. ACT 346 WOULD BE APPLICABLE TO ANY DREDGING OR FILLING ACTIVITY ON THE CLINTON RIVER BOTTOMLANDS. THE SOIL EROSION AND SEDIMENTATION CONTROL ACT 347 OF 1972 REGULATES EARTH CHANGES, INCLUDING CUT AND FILL ACTIVITIES, WHICH MAY CONTRIBUTE TO SOIL EROSION AND SEDIMENTATION OF SURFACE WATERS OF THE STATE. ACT 347 WOULD APPLY TO ANY SUCH ACTIVITY WHERE MORE THAN 1 ACRE OF LAND IS AFFECTED OR THE REGULATED ACTION OCCURS WITHIN 500 FEET OF A LAKE OR STREAM. ACT 347 WOULD BE APPLICABLE TO THE CAP AND SLURRY WALL CONSTRUCTION ACTIVITIES SINCE THESE ACTIONS COULD IMPACT THE CLINTON RIVER, WHICH IS LESS THAN 500 FEET FROM THE PHASE III LANDFILL AREA.

C. ACTION-SPECIFIC ARARS

ACTION-SPECIFIC ARARS ARE REQUIREMENTS THAT DEFINE ACCEPTABLE TREATMENT AND DISPOSAL PROCEDURES FOR HAZARDOUS SUBSTANCES.

FEDERAL ARARS

SINCE THE G&H LANDFILL WAS CLOSED PRIOR TO NOVEMBER 1980 (IN DECEMBER 1974), RCRA REQUIREMENTS ARE NOT APPLICABLE UNLESS RCRA-LISTED OR CHARACTERISTIC HAZARDOUS WASTES ARE EXCAVATED AND MANAGED (TREATED, DISPOSED, OR STORED), AS DEFINED BY RCRA, DURING THE CLEANUP. RCRA LAND DISPOSAL RESTRICTIONS (LDR OR LAND BAN) WOULD NOT BE APPLICABLE SINCE NO "PLACEMENT" OF RCRA HAZARDOUS WASTE WOULD BE OCCURRING AT THIS SITE.

IN ITS PURE FORM, WASTE ORGANIC SOLVENT MAY BE A CHARACTERISTIC WASTE (IGNITIBILITY) AND, IN ITS PRESENT FORM (MIXED WITH SOIL AND DEBRIS), THE WASTE SOLVENTS WOULD BE EXPECTED TO FAIL THE TCLP TEST AND, THEREFORE, EXHIBIT A PROPERTY OF CHARACTERISTIC WASTE, ALTHOUGH NO TESTING WAS PERFORMED TO DETERMINE IF G&H WASTES EXHIBITED A PROPERTY OF CHARACTERISTIC WASTE AS DEFINED BY RCRA. THEREFORE, CERTAIN RCRA SUBTITLE C REQUIREMENTS, INCLUDING LDR, WOULD BE RELEVANT AND APPROPRIATE IF THE SOLVENT WASTES WERE TO BE EXCAVATED AND MANAGED.

THE ONLY MANNER IN WHICH THE SELECTED REMEDY MAY STORE OR DISPOSE OF HAZARDOUS WASTE IS WHEN OR IF THE GROUNDWATER TREATMENT SYSTEM REQUIRES EMISSION CONTROL UNITS TO CAPTURE OR CONTAIN VOLATILE ORGANICS DERIVED FROM AERATION OF THE CONTAMINATED GROUNDWATER. THE RCRA WASTE GENERATION AND TEMPORARY STORAGE REGULATIONS UNDER 40 CFR PART 262 WOULD THEN BE APPLICABLE TO THAT ACTION. FOR EXAMPLE, ACTIVATED CARBON CANISTERS UTILIZED AS EMISSION CONTROLS WOULD BE MANAGED, WHEN SPENT, AS A CHARACTERISTIC WASTE IF THE WASTE CANISTERS WERE TO FAIL THE TCLP TEST.

FOR LANDFILL CLOSURE, RCRA SUBTITLE C REQUIREMENTS ARE NOT APPLICABLE SINCE THE HAZARDOUS SUBSTANCES OF CONCERN WERE DISPOSED OF PRIOR TO NOVEMBER 1980, BUT WOULD BE RELEVANT AND APPROPRIATE AS CONSIDERED BY THE NCP (SECTION 300.400(G)(2)). AT THE G&H SITE, THE HAZARDOUS SUBSTANCES IN THE LANDFILL ARE SUFFICIENTLY SIMILAR TO LISTED AND/OR CHARACTERISTIC RCRA WASTES AND THEREFORE SUBTITLE C IS RELEVANT. A SUBTITLE C COVER IS WELL SUITED TO THE SITE SINCE THIS TYPE OF CAP WOULD AID IN THE REDUCTION OF PRECIPITATION INFILTRATION THROUGH THE LANDFILL CONTENTS, WHICH WOULD BE PROTECTIVE OF THE GROUNDWATER. THUS, A SUBTITLE C COVER IS APPROPRIATE.

THE LANDFILL CLOSURE REQUIREMENTS ARE LISTED IN 40 CFR 264.310(A)(1-5). IN PART, (40 CFR) 264.310(A)(1) REQUIRES THE FINAL COVER MUST BE DESIGNED AND CONSTRUCTED TO MINIMIZE THE MIGRATION OF LIQUIDS THROUGH THE LANDFILL. ALSO, 264.310(A)(5) REQUIRES THAT THE COVER MUST HAVE A PERMEABILITY LESS THAN OR EQUAL TO THE PERMEABILITY OF ANY BOTTOM LINER SYSTEM OR NATURAL SUBSOILS PRESENT. HOWEVER, IN SATISFYING 264.310(A)(5), A COVER AS REQUIRED BY THE REGULATIONS MIGHT NOT BE SUFFICIENTLY IMPERMEABLE TO MINIMIZE THE MIGRATION OF

LIQUIDS AS REQUIRED IN 264.310(A)(1). THEREFORE, THE POLICY OF THE OFFICE OF RCRA IS TO FOLLOW, WHENEVER POSSIBLE, THE DESIGN STANDARDS IN FINAL COVERS ON HAZARDOUS WASTE LANDFILLS AND SURFACE IMPOUNDMENTS, EPA/530-SW-89-047, JULY 1989, A RCRA TECHNICAL GUIDANCE DOCUMENT FOR THE DESIGN OF LANDFILL CAPS. A FLEXIBLE MEMBRANE LINER (FML) IS AN INTEGRAL COMPONENT OF SUCH A RCRA SUBTITLE C CAP. HOWEVER, GUIDANCE IS NOT AN ARAR; RATHER FACTORS "TO BE CONSIDERED" IN DESIGNING A PROTECTIVE REMEDY.

THE CAP PROPOSED FOR THE G&H SITE CONSISTS OF A GRADING LAYER, A MINIMUM 3-FOOT COMPACTED CLAY LAYER, A GRAVEL DRAINAGE LAYER, A FROST PROTECTIVE SOIL LAYER, AND A MINIMUM 6-INCH TOPSOIL LAYER. THESE COMPONENTS SATISFY THE REQUIREMENTS OF RCRA SUBTITLE C AND ALSO THE REQUIREMENTS FOR CAPPING A HAZARDOUS WASTE DISPOSAL FACILITY IN MSHWR 299.6919 (SEE BELOW). IN DESIGNING THE G&H CAP, THE HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE (HELP) MODEL WAS RUN TO DETERMINE THE ESTIMATED REDUCTION OF PRECIPITATION INFILTRATION THROUGH THE LANDFILL. THE ESTIMATED REDUCTION OF WATER INFILTRATION WITH THE CAP IS 80 PERCENT; THE RCRA SUBTITLE C GUIDANCE CAP IS ESTIMATED TO SHOW A 99.9 PERCENT REDUCTION OF INFILTRATION. EACH CAP DESIGN SATISFIES 264.310(A)(1) SINCE PRECIPITATION INFILTRATION IS SUFFICIENTLY MINIMIZED. HOWEVER, THE LANDFILL WASTE IS PERIODICALLY IN CONTACT WITH THE GROUNDWATER AT THE SITE AND GROUNDWATER/LEACHATE IS TO BE EXTRACTED OR COLLECTED (AND TREATED) FROM THE AREA CONTAINED BY THE SLURRY WALL. THUS, THE US EPA HAS DETERMINED THAT IT MAY NOT BE TECHNICALLY ADVANTAGEOUS AND, THEREFORE, NOT APPROPRIATE TO INSTALL A FML AT THIS SITE. MOREOVER, AN FML WOULD BE SUBJECT TO DAMAGE DUE TO DIFFERENTIAL SETTLING OF THE LANDFILL CONTENTS. REPAIR OF THE FML WOULD TEND TO BE MUCH MORE COSTLY AND DIFFICULT THAN REPAIR OF THE 3-FOOT CLAY LAYER ALONE.

THE TOXIC SUBSTANCES CONTROL ACT, 40 CFR 761, SETS SPECIFIC REQUIREMENTS FOR THE MANAGEMENT OF PCBS, AND WOULD BE APPLICABLE IF PCB CONTAMINATED SOILS AND SEDIMENTS ARE TREATED OR DISPOSED OF AT THE SITE.

ADDITIONAL FEDERAL ACTION-SPECIFIC ARARS ARE FOUND IN THE FS.

STATE ARARS

THE STATE OF MICHIGAN IS AUTHORIZED TO ADMINISTER RCRA WITHIN THE STATE. UNDER THE HAZARDOUS WASTE MANAGEMENT ACT 64 OF 1979, AS AMENDED, THE STATE REGULATES THE GENERATION, TRANSPORT, TREATMENT, STORAGE, AND DISPOSAL OF HAZARDOUS WASTE. ACT 64 ALSO REGULATES THE CLOSURE, AND THE POSTCLOSURE CARE, OF HAZARDOUS WASTE DISPOSAL FACILITIES IN THE STATE. AS WITH RCRA, ABOVE, ACT 64 IS NOT APPLICABLE TO CLOSURE OF THE LANDFILL SINCE DISPOSAL OPERATIONS CEASED BEFORE ACT 64 WAS PROMULGATED. ACT 64 MAY BE RELEVANT AND APPROPRIATE TO THE LANDFILL CLOSURE, SINCE THE WASTES ARE SUFFICIENTLY SIMILAR TO RCRA LISTED OR CHARACTERISTIC WASTES AND THE LANDFILL CLOSURE RULES WOULD BE WELL SUITED FOR THE CLOSURE OF THE G&H LANDFILL. ACT 64 WOULD BE APPLICABLE TO THE TREATMENT OR STORAGE OF HAZARDOUS LANDFILL CONTENTS AND/OR HAZARDOUS RESIDUALS FROM ON-SITE TREATMENT UNITS.

PARTS 4, 9, AND 21 OF THE WATER RESOURCES COMMISSION ACT 245 OF 1929, AS AMENDED, ESTABLISH RULES FOR WATER QUALITY BY PROHIBITING INJURIOUS DISCHARGES TO SURFACE WATER. THESE RULES WOULD BE APPLICABLE TO THE DISCHARGE OF TREATED GROUNDWATER TO THE CLINTON RIVER OR TO THE DWSD TREATMENT SYSTEM.

ACT 60 OF 1976, OF THE MICHIGAN COMPILED LAWS CONCERNING PCBS PROHIBITS THE DISPOSAL OF PCBS OR PCB CONTAMINATED MATERIALS IN SURFACE WATER, GROUNDWATER, OR AIR. ACT 60 ALSO PROVIDES FOR THE PROPER STORAGE, HANDLING, TRANSPORTATION, AND DISPOSAL OF PCBS OR PCB CONTAMINATED MATERIALS IN LANDFILLS OR THROUGH INCINERATION. ACT 60 WOULD BE APPLICABLE TO THE REMOVAL AND DISPOSAL OF PCB CONTAMINATED SOILS AND SEDIMENTS AT THE G&H SITE.

AS DESCRIBED EARLIER IN THIS DOCUMENT, THE MICHIGAN ENVIRONMENTAL RESPONSE ACT 307 OF 1982, AS AMENDED (ACT 307), PROVIDES FOR THE IDENTIFICATION, RISK ASSESSMENT, AND EVALUATION OF CONTAMINATED SITES WITHIN THE STATE. THE US EPA HAS DETERMINED THAT THE SUBSTANTIVE PROVISIONS OF PARTS 6 AND 7 OF ACT 307 ARE APPLICABLE OR RELEVANT AND APPROPRIATE TO THE G&H SITE. THE ACT 307 RULES REQUIRE THAT REMEDIAL ACTIONS SHALL BE PROTECTIVE OF HUMAN HEALTH, SAFETY, THE ENVIRONMENT, AND THE NATURAL RESOURCES OF THE STATE. TO ACHIEVE THIS STANDARD OF PROTECTIVENESS, THE ACT 307 RULES REQUIRE THAT A REMEDIAL ACTION ACHIEVES A DEGREE OF CLEANUP UNDER EITHER TYPE A (CLEANUP TO BACKGROUND LEVELS), TYPE B (CLEANUP TO RISK-BASED LEVELS), OR TYPE C (CLEANUP TO RISK-BASED LEVELS UNDER SITE-SPECIFIC CONSIDERATIONS) CRITERIA.

3. COST-EFFECTIVENESS

COST-EFFECTIVENESS COMPARES THE EFFECTIVENESS OF AN ALTERNATIVE IN PROPORTION TO ITS COST OF PROVIDING ITS ENVIRONMENTAL BENEFITS. TABLE 5 LISTS THE COSTS ASSOCIATED WITH THE IMPLEMENTATION OF THE REMEDIES.

ALTERNATIVE 1 AND ALTERNATIVE 2 ARE THE LEAST EXPENSIVE ALTERNATIVES, BUT THEY DO NOT PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OR EFFECTIVENESS OVER THE LONG TERM. THEY DO NOT MEET LANDFILL CLOSURE OR GROUNDWATER ARARS, EITHER. ALTERNATIVES 3A IS MUCH MORE EXPENSIVE THAN ALTERNATIVE 1 AND ALTERNATIVE 2, BUT IT PROVIDES NO GROUNDWATER PROTECTION. ALTERNATIVE 3B AND ALTERNATIVE 4A ARE SIMILAR IN COST, AND BOTH ADDRESS THE LANDFILL CLOSURE AND GROUNDWATER CONTAMINATION AT THE SITE. ALTERNATIVE 4A, FOR A RELATIVELY SLIGHT GREATER EXPENSE, WOULD ACHIEVE THE GROUNDWATER CLEANUP STANDARDS WITHIN A REASONABLE TIME FRAME. ALTERNATIVE 3B DOES NOT ACTIVELY ADDRESS THE GROUNDWATER CONTAMINATION; RATHER, IT IS ALLOWED TO NATURALLY ATTENUATE OVER A LONG TIME PERIOD (MORE THAN 30 YEARS).

ALTERNATIVE 6A, THE MOST EXPENSIVE ALTERNATIVE EVALUATED IN DETAIL IN THE FEASIBILITY STUDY, WOULD PERMANENTLY ADDRESS A PRINCIPAL THREAT AT THE SITE, WHEREAS ALTERNATIVE 3B AND ALTERNATIVE 4A ONLY CONTAIN THE WASTES. THEREFORE, DUE TO POTENTIAL SHORT-TERM RISKS ASSOCIATED WITH ON-SITE INCINERATION AT THIS SITE, PLUS THE FACT THAT NOT ALL OF THE PHASE I LANDFILL AREA CONTAMINANTS WOULD BE ADDRESSED UNDER ALTERNATIVE 6A, THE US EPA HAS DETERMINED THAT ALTERNATIVE 4A IS THE COST-EFFECTIVE REMEDY.

4. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

THE SELECTED REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE (MEP) AT THIS TIME. THIS FINDING WAS MADE AFTER EVALUATION OF THE PROTECTIVE AND ARAR-COMPLIANT ALTERNATIVES FOR THE G&H SITE REMEDIAL ACTION AND COMPARISON OF THE "TRADE-OFFS" (ADVANTAGES VERSUS DISADVANTAGES) AMONG THE REMEDIAL ALTERNATIVES WITH RESPECT TO THE FIVE BALANCING CRITERIA (SEE ABOVE).

THE NCP ESTABLISHED THE US EPA POLICY OF GIVING PRIORITY TO LONG-TERM EFFECTIVENESS AND TO REDUCTION OF TMV AT A SITE, STATING THAT LONG-TERM EFFECTIVENESS AND REDUCTION OF TMV THROUGH TREATMENT ARE GENERALLY THE KEY DECISIONAL FACTORS TO BE CONSIDERED AT SUPERFUND SITES. ONCE THE THRESHOLD CRITERIA OF PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AND ARARS-COMPLIANCE WERE SATISFIED, A KEY CRITERION USED IN REMEDY SELECTION FOR THE G&H SITE WAS SHORT-TERM EFFECTIVENESS, RATHER THAN AN EMPHASIS ON THE IMMEDIATE REDUCTION OF TOXICITY, MOBILITY, AND VOLUME (TMV) THROUGH TREATMENT. LONG-TERM EFFECTIVENESS WAS ALSO EMPHASIZED BY PROVIDING FOR ACCEPTABLE RESIDUAL RISK LEVELS IN THE GROUNDWATER AT THE SITE. HOWEVER, THE PROJECTED ADVERSE IMPACTS OF IMPLEMENTING ALTERNATIVE 6A OBLIGATED THE US EPA TO PLACE AN EMPHASIS ON A CONTAINMENT REMEDY AT THIS TIME.

ALTERNATIVE 1 DOES NOT PROVIDE ADEQUATE PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT, AS CONSIDERED BY THE NCP, AND IT DOES NOT ADDRESS THE PRINCIPAL THREATS. ALTERNATIVES 2, 3A AND 3B DO NOT ADDRESS AND/OR TREAT THE PRINCIPAL THREATS. ALTERNATIVE 3A AND ALTERNATIVE 3B MERELY CONTAIN THE LANDFILL CONTAMINANTS WITHOUT PERMANENTLY ADDRESSING OR TREATING THE PRINCIPAL THREAT POSED BY THE OIL-CONTAMINATED SOILS AND DEBRIS. THE GROUNDWATER CONTAMINANT PLUME IS NOT ADDRESSED AS WELL.

ALTERNATIVE 6A'S LONG-TERM EFFECTIVENESS AND ITS ABILITY TO REDUCE THE TMV OF HAZARDOUS SUBSTANCES WAS WEIGHED AGAINST ITS SHORT-TERM EFFECTIVENESS AND COST ASPECTS IN RELATION TO ALTERNATIVE 4A. IN GENERAL, ALTERNATIVE 6A WOULD PROVE TO PLACE A SIGNIFICANT DEGREE OF RISK TO SITE WORKERS AND TO THE COMMUNITY DURING THE EXCAVATION AND TREATMENT OF HAZARDOUS SUBSTANCES. IN ADDITION, THE EXTREME COST OF IMPLEMENTATION MAY NOT REDUCE THE SITE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT TO ACCEPTABLE LEVELS, SINCE THE RESIDUAL CONTAMINANTS IN THE PHASE I LANDFILL AREA MAY STILL BE PRESENT IN HAZARDOUS QUANTITIES. WHILE ALTERNATIVE 4A ONLY CONTAINS THE PRINCIPAL THREAT POSED BY THE CONTAMINANTS IN THE PHASE I LANDFILL AREA, IT DOES ADDRESS THE GROUNDWATER CONTAMINANT PLUME.

THERE MAY BE MINIMAL RISKS ASSOCIATED WITH THE HAULING OF MATERIALS FOR CAP CONSTRUCTION. ANY RISKS POSED BY SUCH ACTION WILL BE MITIGATED BY ATTEMPTING TO SECURE LOCAL MATERIALS TO CONSTRUCT THE CAP AND TO EMPLOY STANDARD DUST CONTROL MEASURES DURING CONSTRUCTION. WITH RESPECT TO VOC EMISSIONS DURING TREATMENT OF THE GROUNDWATER AND SOILS, EFFECTIVE AIR MONITORING WOULD ENSURE THAT AIR STANDARDS ESTABLISHED TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT ARE MET. EMISSION CONTROLS MAY BE UTILIZED, IF NECESSARY, TO MEET THOSE STANDARDS. SHORT-TERM RISKS DUE TO THE DISCHARGE OF TREATED GROUNDWATER TO THE CLINTON RIVER WOULD BE MINIMIZED BY ENSURING THAT THE TREATED WATER MEETS DISCHARGE CRITERIA, WHICH ARE ESTABLISHED TO PROTECT HUMAN

HEALTH AND THE ENVIRONMENT.

THE FS REPORT INDICATES THAT IT IS NOT PRACTICABLE TO UTILIZE A PERMANENT TREATMENT TECHNOLOGY ON THE LOWER-LEVEL, LONG-TERM THREAT POSED BY THE CONTENTS OF THE PHASE II AND PHASE III LANDFILL AREAS. AND, ALTHOUGH A CAP AND SLURRY WALL IS NOT A PERMANENT SOLUTION TO THE PRINCIPAL THREAT, IT DOES PROVIDE ADEQUATE PROTECTION FROM EXPOSURE TO THE WASTES IN THE LANDFILL AREAS. MORE IMPORTANTLY, THE CONTAINMENT SYSTEM PROVIDES ADEQUATE PROTECTION TO THE GROUNDWATER BY USING A BARRIER TO PRECIPITATION INFILTRATION THROUGH THE LANDFILL, WHICH REDUCES THE RATE OF CONTAMINANT LOADING INTO THE GROUNDWATER.

NEGATIVE SHORT-TERM IMPACTS DURING IMPLEMENTATION OF THE REMEDY WILL BE MINIMIZED BY HEALTH AND SAFETY MEASURES. THE STATE OF MICHIGAN HAS CONCURRED WITH THE SELECTION OF THE PREFERRED REMEDY. COMMUNITY ACCEPTANCE IS ADDRESSED IN THE ATTACHED RESPONSIVENESS SUMMARY.

5. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

THE PRINCIPAL THREATS AT THE G&H SITE ARE THE GROUNDWATER CONTAMINANT PLUME, DUE TO THE POTENTIAL USE OF THE CONTAMINATED WATER AS A DRINKING-WATER SOURCE, AND THE SOLVENT AND OIL-CONTAMINATED LANDFILL DEBRIS AND SOILS, SINCE THE CONTAMINANTS ARE HIGHLY CONCENTRATED AND WOULD CONTINUE TO LEACH INTO THE GROUNDWATER IF LEFT UNTREATED. ALTHOUGH ALTERNATIVE 4A TREATS THE GROUNDWATER PRINCIPAL THREAT, IT DOES NOT FULLY SATISFY THE STATUTORY PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT OF THE REMEDY SINCE THE LANDFILL "HOT SPOTS" ARE TO BE CONTAINED. AS ABOVE, TREATMENT OF THE "HOT SPOTS" WOULD CREATE ADVERSE SHORT-TERM RISKS TO THE COMMUNITY AND WOULD BE VERY COSTLY IN LIGHT OF THE BENEFITS RECEIVED. TREATMENT OF THE LANDFILL AREA PRINCIPAL THREAT WAS, THEREFORE, FOUND TO BE IMPRACTICABLE AT THIS TIME.

#TA

TABLE 1
REPRESENTATIVE COMPOUNDS
G & H INDUSTRIAL LANDFILL

| NONCARCINOGENS | CARCINOGENS |
|---|---|
| NAPHTHALENE | BENZENE |
| XYLENE | ARSENIC |
| ETHYLBENZENE | TRICHLOROETHENE (TCE) |
| LEAD | TETRACHLOROETHENE |
| | 1,2-DICHLOROETHENE(1,2-DEC) |
| | VINYL CHLORIDE |
| | PCBS |

TABLE 2
SUMMARY OF RISKS
G&H INDUSTRIAL LANDFILL

| MEDIA/LOCATION | HAZARD INDEX | RISK* |
|---|---|---|
| GROUNDWATER | | |
| AREA 2 | 0.74 | 6 X (10-3) |
| AREA 4 | 0.63 | 2 X (10-3) |
| AREA 5 | 0.74 | 5 X (10-4) |
| SURFACE SOIL/SEDIMENTS | | |
| PHASE I | | |
| LANDFILL AREA | 0.01 | 4 X (10-6) |
| SEEP AREA | 0.11 | 4 X (10-6) |
| SURFACE WATER | | |
| SEEP AREA | 153 | 9 X (10-5) |

* EXCESS LIFETIME CARCINOGENIC RISK.

TABLE 3
PRELIMINARY GROUNDWATER CLEANUP STANDARDS

G&H INDUSTRIAL LANDFILL

| COMPOUND | STATE STANDARD(1) | FEDERAL STANDARD(2) |
|---|---|---|
| BENZENE | 1 PPB | 5 PPB |
| XYLENE | 20 PPB | 10,000 PPB3 |
| TRICHLOROETHENE | 3 PPB | 5 PPB |
| 1,1-DICHLOROETHANE | 700 PPB | 0.4 PPB(4) |
| LEAD | 5 PPB | 50 PPB |
| ARSENIC | 0.02 PPB | 50 PPB |
| ETHYLBENZENE | 30 PPB | 680 PPB(3) |
| CIS-1,2-DICHLOROETHENE | 1 PPB | ----- |
| TRANS-1,2-DICHLOROETHENE | 100 PPB | ----- |
| VINYL CHLORIDE | 0.02 PPB | 2 PPB |
| TETRACHLOROETHENE | 0.7 PPB | 5 PPB |

NOTES: PPB DENOTES "PARTS PER BILLION" OR UG/L.

1: MICHIGAN ACT 307, TYPE B CLEANUP CRITERIA
2: MAXIMUM CONTAMINANT LEVELS UNDER THE SAFE DRINKING WATER ACT
3: NON-ZERO MAXIMUM CONTAMINANT LEVEL GOALS (PROPOSED)
4: HEALTH-BASED CLEANUP STANDARD CONSISTENT WITH CLEANUP OBJECTIVES

TABLE 4
GROUNDWATER CLEANUP STANDARDS
G&H INDUSTRIAL LANDFILL

| COMPOUND | STANDARD |
|---|---|
| BENZENE | 1 PPB |
| XYLENE | 20 PPB |
| ETHYLBENZENE | 30 PPB |
| ARSENIC | 0.02 PPB* |
| LEAD | 5 PPB |
| TRICHLOROETHENE | 3 PPB |
| TETRACHLOROETHENE | 0.7 PPB |
| CIS-1,2-DICHLOROETHENE | 1 PPB |
| TRANS-1,2-DICHLOROETHENE | 100 PPB |
| VINYL CHLORIDE | 0.02 PPB |
| 1,1-DICHLOROETHANE | 0.4 PPB |

* NATURALLY OCCURRING (BACKGROUND) LEVELS FOUND AT THE G&H SITE MAY BE HIGHER THAN THE CLEANUP STANDARD. IN THAT EVENT, BACKGROUND LEVELS WILL BECOME THE CLEANUP STANDARD.

TABLE 5
ESTIMATED COSTS OF REMEDIAL ALTERNATIVES

G & H INDUSTRIAL LANDFILL

| ALTERNATIVE | CAPITAL | O&M | PRESENT WORTH |
|---|---|---|---|
| 1 (NO ACTION) | $ 0 | $ 0 | $ 0 |
| 2 (LIMITED ACTION) | $ 390,000 | $350,000 | $ 3,900,000 |
| 3A (LANDFILL CAP) | $ 22,000,000 | $450,000 | $ 29,000,000 |
| 3B (SLURRY WALL) | $ 28,000,000 | $450,000 | $ 38,000,000 |
| 4A (GROUNDWATER) | $ 29,000,000 | $750,000 | $ 40,000,000 |
| 6A (THERMAL) | $460,000,000 | $750,000 | $470,000,000 |

NOTES: O&M = OPERATION AND MAINTENANCE

PRESENT WORTH IS BASED ON A 5 PERCENT DISCOUNT RATE.