EPA Region 5 Records Ctr.
298120

THIRD FIVE-YEAR REVIEW REPORT

WASTE DISPOSAL ENGINEERING LANDFILL SUPERFUND SITE

City of Andover
Anoka County, Minnesota

PREPARED BY:

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List of Acronyms

Agencies	MPCA and U.S. EPA
ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cfm	Cubic feet per minute
CFR	Code of Federal Regulations
FS	Feasibility Study
GCL	Geosynthetic Clay Liner
gpm	gallons per minute
HRL	Health Risk Limit
ICs	Institutional Controls
LFGTE	Landfill Gas-To-Energy
LUP	Land Use Plan
MCES	Metropolitan Council Environmental Services
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
MDH	Minnesota Department of Health
MPCA	Minnesota Pollution Control Agency
NCP	National Contingency Plan
NOC	Notice of Compliance
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O.U.	Operable Unit
O&M	Operation and Maintenance
PCOR	Preliminary Closeout Report
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
Site	Waste Disposal Engineering Landfill Superfund Site
The State	The State of Minnesota
U.S. EPA	United States Environmental Protection Agency
UU/UE	Unrestricted Use/ Unlimited Exposure
μg/L	micrograms per Liter, or parts per billion
VOCs	Volatile Organic Compounds
WDE	Waste Disposal Engineering

Executive Summary

The Waste Disposal Engineering Landfill Superfund Site is a 114 acre property that includes a 73 acre landfill which accepted approximately 2.5 million cubic yards of municipal, commercial and industrial wastes. The selected remedial alternative for the WDE Landfill Site consists of: a cover that meets Resource Conservation and Recovery Act (RCRA) technical performance standards to limit infiltration; groundwater extraction wells in the upper sand aquifer between Coon Creek and the landfill to control off-site migration of contaminated groundwater from the landfill; a clay slurry wall around an on-site former hazardous waste pit with extraction wells inside the wall; institutional controls (ICs) to prohibit installation of wells in the upper sand aquifer to prevent usage of contaminated groundwater and reversal of the upward gradient between the lower and upper sand aquifers; replacement of a wetland area affected by the Site; treatment and disposal of extracted groundwater by aeration in a retention pond and discharge to the local POTW system, and; monitoring of the Site including geophysical analyses to locate heavier-than-water non-aqueous phase liquids in groundwater. The State of Minnesota operates and maintains the systems at the Site including monitoring of groundwater and for landfill gas migration.

The remedy at the WDE Landfill Site currently protects human health and the environment in the short term because: the remedy has been constructed in accordance with the requirements of the Record of Decision (ROD); the remedy is functioning as designed; source control measures are significantly reducing leachate production and providing containment of contaminated groundwater; and, a reduction in contaminant concentrations in groundwater has been observed. The remedy is expected to be protective of human health and the environment in the long-term upon attainment of groundwater cleanup levels, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Monitoring has demonstrated that concentrations of many contaminants have declined to levels that are close to or below Health Risk Limits (HRLs). Long-term trends show significant and adequate improvements in groundwater quality.

Based upon the review of annual groundwater monitoring data, Annual Reports compiled by the MPCA, and the January 29, 2008, site inspection conducted for this five-year review, there are no current exposures to human health and the environment. The landfill cover, groundwater extraction and treatment, and gas collection and flare systems are in place and operating properly. There is no evidence of a cover breach and the existing use of the WDE Landfill Site property is consistent with the objectives of the landfill cover and land use restrictions. There is no evidence of unacceptable levels of groundwater contaminants away from the Site property or unacceptable groundwater use in the area of the plume. Data demonstrates the containment effectiveness of the groundwater extraction system. The ICs required to assure the protectiveness of the remedy have been reviewed and determined to be in-place and effective. Long-term protectiveness requires continued compliance with effective ICs. Long-term stewardship will assure that effective ICs will be maintained and monitored.

The Site achieved construction completion with the signing of the Preliminary Close Out Report on September 27, 1995. The trigger for this five-year review is the signature date for the second five-year review completed on April 30, 2003. This is the third five-year review for the Site.

Five-Year Review Summary Form

Site name ***(from WasteLAN)***: Waste Disposal Engineering		
EPA ID ***(from WasteLAN):*** MND 980 609 119		
Region: 5	**State:** MN	**City/County:** City of Andover, Anoka County
SITE STATUS		
NPL status: ☐ Final ☒ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ☒ Complete		
Multiple OUs?* ☐ YES ☒ NO	**Construction completion date: 9/27/1995**	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☐ EPA ☒ State** ☐ Tribe ☐ Other Federal Agency _____		
Author name: John V. Fagiolo		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA	
Review period: November 1, 2007 to April 30, 2008 ***		
Date(s) of site inspection: January 29, 2008		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify) _____		
Triggering action: ☐ Actual RA Onsite Construction ☐ Actual RA Start ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date ***(from WasteLAN)***: April 30, 2003		
Due date ***(five years after triggering action date)***: April 30, 2008		

* "O.U." refers to Operable Unit. For the WDE Landfill Site, the Record of Decision did not specifically designate individual O.U.s. Site work was executed as two Operable Units for individual Remedial Designs and Remedial Actions for the different contaminated Site media. Since the time of NPL Deletion, no O.U. designations have been needed at the Site and all Site remedy activity has been addressed as one O.U. that encompasses the entire Site.

** The Minnesota Pollution Control Agency is the lead agency for the Site, but U.S. EPA compiles the Five-Year Review Reports.

*** Review period should correspond to the actual start and end dates of the five-year review in WasteLAN.

Five-Year Review Summary Form, cont'd.

Issues:

a. Contaminant levels in groundwater at and near the Hazardous Waste Pit are still above Site cleanup standards.
b. Waste fill material at and near the Hazardous Waste Pit continues to supply contaminants to groundwater.
c. Benzene, vinyl chloride and tetrahydrofuran are still present at unacceptable concentrations at and near the Site, especially at the Pit.
d. Arsenic is still present at unacceptable concentrations at and near the Site.

Recommendations and Follow-up Actions:

a. Complete the site study that is currently underway to identify recommendations to expedite the cleanup.
b. Re-start EW-9. Consider other remedy alternatives in the area to address contamination below the Pit.
c. Monitor VOCs on a quarterly basis. Monitor general parameters on an annual basis. Monitor any new extraction wells that may be installed at the Pit monthly.
d. Collect oxidation-reduction data at wells with elevated arsenic concentration.

Protectiveness Statement:

The remedy at the WDE Landfill Site currently protects human health and the environment in the short term because: the remedy has been constructed in accordance with the requirements of the Record of Decision (ROD); the remedy is functioning as designed; source control measures are significantly reducing leachate production and providing containment of contaminated groundwater; and, a reduction in contaminant concentrations in groundwater has been observed. The remedy is expected to be protective of human health and the environment in the long-term upon attainment of groundwater cleanup levels, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Monitoring has demonstrated that concentrations of many contaminants have declined to levels that are close to or below Health Risk Limits (HRLs). Long-term trends show significant and adequate improvements in groundwater quality.

Other Comments:

None.

1.0 INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) with consultation from the Minnesota Pollution Control Agency (MPCA) has conducted a five-year review of the remedial actions implemented at the Waste Disposal Engineering Landfill Superfund Site in Andover, Minnesota. The review was conducted between November 2007 and April 2008, with the results documented in this report. The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. Methods, findings, and conclusions of the review are documented in five-year review reports. In addition, five-year review reports identify any issues or problems found during the review and make recommendations to address them.

This review is required by statute. Five-year reviews must be implemented consistently with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA 121(c), as amended, states:

> If a remedial action is selected that results in any hazardous substances, pollutants, or contaminants remaining at the site, the remedial action shall be reviewed no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP Section 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the third five-year review for the WDE Landfill Site, triggered by the second five-year review of April 30, 2003. Due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure, this five-year review is required.

2.0 SITE CHRONOLOGY

Table 1 - RHL Site Chronology

Date	Event
1963 to 1971	The Site operated as an open dump.
1971 to 1983	Landfill operations occurred at the Site.
6/19/82	Removal Assessment performed.
12/30/82	Proposal for listing on the NPL.
9/8/83	Listing on the NPL.
Feb. 1984	MPCA revocation of operating permit.
Mar. 1984 - Apr. 1984	Administrative Consent Order for RI/FS entered into by U.S. EPA, MPCA, and 9 PRPs (3/84), plus 3 PRPs (4/84).
9/30/84	NPL Search completed.
12/31/87	RI/FS completed.
12/31/87	Record of Decision signature date.
8/23/91	Unilateral Administrative Order for RD/RA issued.
8/31/91	Remedial Design started.
11/26/91	Consent Decree entered.
Oct. 1992	O.U. #1 RD Completed (Groundwater Containment)
10/8/92	Actual Remedial Action start date.
Oct. 1992 - Sept. 1993	O.U. #1 Construction (Groundwater Containment)
12/7/92	O.U. #2 RD Completed (Multi-layer Cover)
10/26/93	Consent Decree entered for payment of past costs.
August 1994	O.U. #2 Construction Complete achieved.
8/9/94	U.S. EPA / MPCA Final Inspection date.
March 1995	Approval of Air Stripping Treatment Technology for Groundwater.
June 1995	Air Stripping System Construction Complete achieved.
8/10/95	Certification of Completion of Remedial Construction issued.
9/27/95	Preliminary Close Out Report issued.
3/26/96	Notice of Intent to Delete published: Federal Register, 61 FR 13131
6/5/96	NPL Update published: Federal Register, Vol. 61, No. 109, Pg. 28511
6/5/96	Deletion from NPL.
3/25/99	First Five-Year Review Report signature date.

3.0 BACKGROUND

3.1 Physical Characteristics

The WDE Landfill Site is located at T32N, R24W, Section 27, at 14437 Crosstown Boulevard in the City of Andover (formerly Grow Township), Anoka County, Minnesota. The Site property is in a portion of Andover that contains residential, commercial, and industrial land use, approximately 15 miles north of the City of Minneapolis. The Site is situated on the south side of Coon Creek, which discharges into the Mississippi River approximately 11 river miles downstream from the Site (see Figures 1 and 2). Two related drainage channels were also located at the Site. One of these channels was eventually buried by the landfill while the other was abandoned when Coon Creek was straightened. In addition, by 1964, three field ditches had been constructed on the northeast portion of the present landfill. These ditches are partially buried and at one

point drained to the north into Coon Creek. The current Site landfill cover controls Site run-off to adequately prevent threats to wetland areas at or near the Site.

The WDE Landfill Site is situated within the Anoka Sand Plain. The area consists of a glacial outwash plain characterized by low relief, poor external drainage, and fine, sandy soil. The topography is gently rolling to flat, with shallow water tables (less than 20 feet) and numerous wetlands.

3.2 Land and Resource Use

The Site is bounded on the north by Coon Creek, which flows in a west-northwesterly direction at this location. To the west, the Site is bounded by Anoka County Road 18 (Crosstown Boulevard). Hanson Boulevard borders the eastern edge of the WDE Landfill Site. Along the eastern edge of the Site are two overlapping easements, United Power Association (45 feet wide) and Northern States Power Company (150 feet wide). The area surrounding the WDE Landfill historically was comprised of small farms and small residential developments. Property immediately south of the Site formerly contained a series of scrapyards.

Prior to development of the WDE Landfill Site in the early 1960s, land use consisted of cropland and pastureland, and open deciduous woodland with scattered wetland pockets. The original dump was established in 1963 by a Mr. Leonard Johnson. Disposal of wastes took place by burial or burning in pits or trenches. WDE purchased the facility in 1968 and was licensed by Grow Township to operate as a sanitary landfill. In 1970, WDE submitted a solid waste permit application to the MPCA, including a proposal to build a specially constructed pit for disposal of hazardous waste. The permit (SW-28) was issued on March 30, 1971 to operate the WDE Landfill Site as a sanitary landfill. The Site operating permit was revoked by the MPCA in February 1984.

The WDE facility ceased operations in February 1984 and has remained abandoned and inactive. The property of the Site has gone through tax forfeiture so that it is currently property of the State of Minnesota with administration by Anoka County.

3.3 History of Contamination

The landfill (dump) was established in the early 1960s by Leonard E. Johnson. The Site operated as an open dump from 1963 to 1971, and as a landfill from 1971 until 1983. By 1964, the dump covered only three acres. In 1970, the landfill had expanded to cover 41 acres, and by 1983 to its present day size of 114 acres. The dump was purchased by WDE in 1968. In 1971, construction of the WDE Hazardous Waste Pit (the "Pit") began. The Pit was completed in 1972 and was operated until January 1974. The landfill operated until 1984.

The WDE Hazardous Waste Pit received hazardous wastes from November 1972 to January 1974. The base of the Pit was specified to be an 18-inch layer of clay overlain by a six-inch bituminous layer and six inches of crushed limestone. Approximately

6,600 containers (ranging from 1 gallon pail to 55 gallon drums) holding a wide variety of wastes (acids, caustics, waste paints, spent solvents, plating sludges, cyanides) are thought to have been disposed in the Pit. An undetermined quantity of hazardous waste, much of it as bulk loads, was disposed throughout the landfill. Based on interviews and government files, approximately 3.2 million gallons of hazardous waste are thought to have been disposed at the WDE Landfill Site. Using these estimates, only 10 percent of the waste expected to be at the Site would have been disposed in the Pit.

The area used for actual refuse disposal covers approximately 73 acres. The maximum thickness of waste is 40 feet. The landfill contains nearly 2.5 million cubic yards of waste. Much of the landfill was covered by lime sludge obtained from the Minneapolis Drinking Water Treatment Plant. The lime sludge consists of very fine particles of lime that yields a clay-like substance. The sludge thickness ranges from three to six feet (average of four feet). Additional lime sludge was stockpiled on ten acres immediately southeast of the area of refuse disposal.

3.4 Initial Response

The MPCA ordered the WDE Hazardous Waste Pit closed effective February 1, 1974 due to changes in regulations and because the MPCA determined that a high potential for groundwater pollution existed at the WDE Landfill Site. Throughout 1982, MPCA and U.S. EPA made requests to the owner/operator of the WDE landfill to undertake a remedial investigation and propose appropriate remedial measures for the WDE Landfill Site. No investigations or proposals for appropriate remedial measures were received. The Site was proposed for the NPL on December 30, 1982.

In January 1983, the Minnesota Department of Health (MDH) issued a drinking water well advisory in portions of the City of Andover due in part to the hazardous substances disposed of at the WDE Landfill Site. In addition, when the landfill closed in January 1983, MPCA made requests to the owner/operator that final sanitary landfill closure be addressed. Listing on the NPL of the Site was finalized on September 8, 1983 (Fed. Reg. No. 175, Vol. No. 48, Pages 40658-40682). Operation of the current remedy ensures that residents living near the Site are not exposed to contaminants in groundwater or contaminant vapors.

MPCA revoked the site operating permit in February 1984 and thereafter issued a Closure Order on Consent. In March 1984, U.S. EPA and MPCA entered into a Consent Order with nine PRPs requiring the PRPs to complete a Remedial Investigation and Feasibility Study (RI/FS). Three more PRPs joined the Consent Order on April 4, 1984. A Remedial Investigation/Feasibility Study was conducted at the Site from 1984 through 1987 and identified a number of volatile organic compounds in groundwater at concentrations well above Maximum Contaminant Levels. Contaminants of concern identified at the Site include 1,1,1-trichloroethane, trichloroethene, and vinyl chloride. The RI/FS concluded that contaminants at the Site posed potential threats to human health and the environment through: direct contact

with wastes, soils, and leachate seeps; ingestion of ground or surface water impacted by the Site; and possible off-site migration of landfill gas that contains hazardous constituents. On December 31, 1987, a Record of Decision was signed that required implementation of the current remedy.

3.5 Enforcement History

Beginning in July 1983, the MPCA sent inquiry letters to Potentially Responsible Parties (PRPs) identified in MPCA and Anoka County files as having some potential involvement at the WDE Landfill Site. A Consent Order was issued on April 4, 1984, requiring twelve PRPs to perform the RI/FS, which was completed in late 1987. On July 12, 1989, U.S. EPA mailed Special Notice letters pursuant to Section 122 (e) of CERCLA to the identified PRPs for the Site. After attempts at negotiating a Consent Decree with the PRPs failed, U.S. EPA issued a CERCLA 106 Unilateral Administrative Order (UAO) on August 23, 1991 that required the PRPs to complete a Remedial Design/Remedial Action (RD/RA). Also in 1991, MPCA issued a Request for Response Action (RFRA) that required compliance with the U.S. EPA UAO. In late August 1991, most of the PRPs unequivocally agreed to comply with the UAO and RFRA. The PRPs completed the RD for O.U. #1 (the groundwater containment system) in October 1992. O.U. #1 construction was initiated that month and completed in September 1993. The RD for O.U. #2 (the multilayer cover) was completed in December 1992, with O.U. #2 construction completed in August 1994.

On November 30, 1992, the United States entered into negotiations with the PRPs for recovery of past and oversight costs related to the WDE Landfill Site. Negotiations resulted in a monetary settlement agreed to in a Consent Decree dated October 26, 1993. The PRP group (known as the "WDE Group") constructed, operated, and maintained the Remedial Actions required under the 1991 UAO and the MPCA RFRA using funds contributed by PRPs. The State provided oversight of all the PRPs' RD/RA activity under a Cooperative Agreement with U.S. EPA. U.S. EPA and the State conducted a final inspection of the site remedy on August 9, 1994.

On October 27, 1995, the WDE Group and the MPCA entered into a Closed Landfill Program Binding Agreement (the "Landfill Agreement") signed between the Commissioner of the MPCA, Anoka County, and the Waste Disposal Engineering Group. A Notice of Compliance was issued on October 30, 1995. The WDE Landfill Site was removed from the Federal Superfund National Priorities List in June 1996.

3.6 Basis for Taking Action

A qualitative risk assessment was completed in 1987 and identified human health hazards posed by current as well as future potential exposures to Site related contamination. If not controlled, contaminants at the WDE Landfill Site have a variety of potential exposure pathways for the release of hazardous substances. Potential pathways include ingestion of contaminated groundwater from leakage into the lower sand aquifer or migration beneath Coon Creek within the upper sand aquifer, ingestion

or dermal exposure of contaminants in Coon Creek or the upper sand groundwater, and direct contact with exposed wastes and leachate on-site. Controls are necessary to protect public health, welfare, or the environment from the continuing releases of hazardous substances.

MPCA assesses and classifies closed landfills in Minnesota, and the WDE Sanitary Landfill was given a ranking of Class D with a Priority Score of 116. Additional information regarding the Closed Landfill Assessment can be found in the Closed Landfill Assessment Report dated January 1995. Subsequent annual examinations of the Site by MPCA revised this score and resulted in improvements to the remediation system. The most recent rescoring and reclassification occurred in December 2006 and resulted in the Site's current classification and score of B 236. This information is available in greater detail at MPCA's Closed Landfill Program web page: "http://www.pca.state.mn.us/cleanup/landfill-metro.html#WDE."

The standards used for selecting contaminants of concern are the State of Minnesota Health Risk Limits, Federal Maximum Contaminant Levels, and landfill gas explosive limits. Hazardous substances that were found in sampling and analysis of in soil and groundwater in 1987 include: 1,1-Dichloroethane, 1,2-Dichloroethene, 1,1,2-Trichlorotrifluoroethane, 1,1,1-Trichloroethane, Methyl ethyl ketone, Methyl isobutylketone, Dichloroethane, Toluene, Xylene, Methylene chloride, Acetone, Tetrahydrofuran, 1,1-Dichloropropene, Benzene, Dibromochloromethane, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Trichloroethene, 1,3-Dichloropropene, Ethylbenzene, Cumene, and Ethyl ether. Sampling and analysis for other contaminants is regularly performed and is summarized in the WDE Sanitary Landfill Annual Reports developed by the MPCA's Closed Landfill Program.

Actual or threatened releases of hazardous substances from this Site, if not addressed by the response action selected in the 1987 ROD and the requirements of the 1995 Landfill Agreement, may present an imminent and substantial endangerment to public health, welfare, or the environment. Controls are necessary to protect public health, welfare, or the environment from the continuing releases of hazardous substances.

Each environmental exposure pathway is summarized below, with the current status as influenced by the operating remedy.

a. Air. Landfill gas (consisting primarily of methane) has the potential to migrate from the Site and is a potential explosive hazard to persons living and/or working in buildings near the Site. Other toxic substances such as VOCs have the potential to co-migrate with landfill gas. Before installation of the current remedy, both methane gas from the landfill and individual volatile organics from landfill waste were detected on-site and to the west of the landfill. The distance of the nearest buildings from the landfill and the continued operation of the groundwater extraction, gas collection, and flare systems ensure that groundwater vapor intrusion is not a new or ongoing risk pathway to buildings at or near the Site. The potential for inhalation of dust, any chemicals, or soil

gas coming from the Site has been eliminated with the successful installation of landfill cover upgrades.

The State of Minnesota operates and maintains the systems at the Site and monitors for landfill gas migration under authority of legislation enacted in 1992, (Minn. Laws 1992, Ch. 513, Art. 2, Sec. 2, Subd. 3). Monitoring for landfill gas is conducted every 1 to 3 months at 20 gas monitoring sampling locations around and outside of the landfill. There have been no reports of landfill gas or odors from any nearby residents. Personnel from the MPCA's Air Quality Permits Section reviewed the design and operation of the flare system at the WDE Landfill and determined that Site emissions are below MPCA's Pollutant Thresholds for air emission permit requirements. No air emissions permit is required for the Site. It is documented annually that the landfill gas collection and flare system successfully collects landfill gas and reduces the level of toxic or explosive compounds. Similarly, U.S. EPA approved the design and construction of the groundwater aeration system and determined that its operation does not pose any threat of exposure to harmful pollutants.

The air pathway has been addressed with the installation and operation of the site landfill cover, landfill gas collection and ground flare systems, and groundwater extraction and treatment system. Through visual observation, conversations with MPCA, and information supplied by the operations contractor, this five-year review confirmed that there is no degradation of remedy components that eliminate the air pathway.

b. Groundwater. Potential pathways identified in the 1987 risk assessment and ROD for unacceptable exposure from contaminated groundwater include:

- Discharge of contaminated groundwater into Coon Creek from the upper sand aquifer (particularly from the Pit) that exceeds federal and State safe drinking and surface water quality criteria.

- Leachate seeps from the landfill. If not contained, leachate seeps ultimately drain into Coon Creek via interflow or overland flow.

- Discharge of contaminated groundwater from the upper sand aquifer into the lower sand aquifer. Although the lower sand aquifer does not show any adverse impact from contaminants at this time, it is an important drinking water source that must be protected. A possibility for future contamination exists if the existing upgradient is reversed or heavier than water non-aqueous phase liquids (NAPL) accumulate on the till surface and reach sufficient depth to push through the till against the upgradient. The lower sand aquifer is protected by the groundwater extraction wells by controlling the Site groundwater vertical gradients and NAPL accumulation.

Residents using untreated contaminated groundwater could ingest contaminants when drinking water, inhale contamination released from the water during domestic uses (cooking, showering, etc.) and absorb contaminants through their skin while bathing and

washing in contaminated water. If not controlled, trespassers and on-site investigators or workers could ingest exposed leachate.

The standards used for selecting contaminants of concern for groundwater is the State of Minnesota Health Risk Limits (HRLs) and Federal Maximum Contaminant Levels (MCLs). HRLs are health-based standards developed for each of a list of contaminants in groundwater by the Minnesota Department of Health (MDH). The MDH has adopted permanent rules defining health risk limits for 120 contaminants that have been found in Minnesota groundwater. Health Risk Limits are calculated using the same methodology as for the "Recommended Allowable Limits" (RALs), which were advisory levels MDH used before the HRL rules were promulgated. Health Risk Limits are developed and updated using risk assessment methods and toxicological data from U.S. EPA and used by most states. These risk assessment methods undergo extensive review by U.S. EPA scientists and a public review process. The MDH regularly reviews and applies to HRLs any methods and data that are updated and issued by U.S. EPA. If the concentration of a contaminant or mixture of contaminants in groundwater is at or below the HRL, that groundwater can be safely consumed daily for a lifetime.

Although contaminants are still being detected in groundwater samples taken at the Site, sampling and analysis from 2003 to 2007 shows a reduction of contaminants in groundwater. Residents living near the Site no longer rely on groundwater for their drinking water and other domestic uses. Homes in the area are connected to the potable drinking water supply provided by the Metropolitan Council Environmental Services (MCES). Under MCES oversight, the City of Andover uses six groundwater wells located approximately one mile north of the Site. Water is extracted and treated before it is distributed throughout the City of Andover. Because any contaminated groundwater from the Site is captured by the on-site extraction wells, there is no contamination threat to the City of Andover drinking water supply. Pumping by the City of Andover's drinking water wells does not affect the groundwater containment system at the WDE Landfill Site. The site groundwater extraction and treatment system has been shown to be effective in capturing contaminated groundwater and leachate that has traveled from the waste into groundwater. To date, no contamination has been detected in private wells.

Consistent with the Landfill Cleanup Act, Minnesota Statutes 115B.39 to 115B.46 (1996) and the WDE Site Landfill Agreement, MPCA established a special requirement for any drinking water supply well. This requirement compels well drillers proposing to drill a new water supply well within the area around the Site to contact MPCA for specific well design and location requirements. This ensures that any new well will avoid the zone of potentially contaminated groundwater.

This five-year review confirmed that there is no unacceptable use of contaminated groundwater occurring at and near the Site, and the groundwater extraction wells successfully capture contaminated groundwater before reaching Coon Creek. Through visual observation, conversations with MPCA, and information supplied by the

operations contractor, this five-year review confirmed that there is no degradation of remedy components that eliminate the groundwater pathway.

c. Surface Water/Sediment Pathway. Except for designated wetlands, there is no unique agricultural land or wildlife habitat around the Site. Potentially impacted water resources consist of the groundwater in the upper and lower sand aquifers and surface waters in Coon Creek and the Mississippi River. Coon Creek and the Mississippi River are important to wildlife in the area and contain fish and other aquatic organisms. Migrating waterfowl may utilize these wetlands. Although it is not an attractive water sport stream, residents and trespassers may access Coon Creek. A potential pathway is ingestion of matter and fish from Coon Creek. The Aquatic Life Standards for a Class 2B Water were not exceeded for any of the VOCs or metals in samples taken from 2003 to 2007. A Class 2B Water is defined as a water of the state which supports or may support fish, other aquatic life, bathing, boating, or other recreational purposes, and where quality control is or may be necessary to protect aquatic or terrestrial life or their habitats or the public health, safety, or welfare. Water use classifications can be found at the following Internet web site:
http://www.epa.gov/waterscience/standards/wqslibrary/mn/mn_5_0200.html.

The Site groundwater flow regime is such that groundwater contaminants could discharge into Coon Creek if not intercepted. Contaminants were detected in surface water on-site before the landfill clay cover and groundwater extraction system were in place. The groundwater extraction and treatment system prevents surface water from becoming contaminated. No VOCs were detected in surface water samples collected at 4 locations along Coon Creek in 2007 near the Site. There have been no changes to Site topography over the past 5 years and the landfill gas and groundwater collection systems are effectively operating. Surface water and sediment are therefore not currently pathways of concern.

This five-year review confirmed that there is no unacceptable exposure to contaminated surface water or sediments at and near the Site, and the groundwater extraction wells successfully capture contaminated groundwater before reaching Coon Creek. Through visual observation, conversations with MPCA, and information supplied by the operations contractor, this five-year review confirmed that there is no degradation of remedy components that eliminate the surface water and sediments pathways.

d. Ecological Risk. The risk posed to environmental receptors from the Site is low. There are no known endangered or threatened species or critical habitats on or near the Site, as confirmed through visual site inspections performed monthly by the operations contractor. Performance of this remedy has and will be accomplished by avoiding impacts to fish and wildlife habitats. If any fish or wildlife habitat is negatively affected, the damage will be restored or replaced by MPCA to the extent practicable. Continued operation of the extraction well system is such that groundwater contaminants are not discharging into Coon Creek. Sampling of Coon Creek and the ditch west-northwest of the landfill found no unacceptable contaminants. This eliminated sediment as a pathway of concern. The design of the current Site landfill cover included adequate

measures for control of Site run-off to adequately prevent threats to wetland areas at or near the Site. For this five-year review, it was confirmed through visual observation, conversations with MPCA, and information supplied by the operations contractor that there is no indication of degradation in the wetland areas at and around the Site.

This five-year review confirmed that there is no unacceptable exposure to contaminated surface water or sediments at and near the Site, and the groundwater extraction wells successfully capture contaminated groundwater before reaching Coon Creek. Through visual observation, conversations with MPCA, and information supplied by the operations contractor, this five-year review confirmed that there is no degradation of remedy components that address ecological risk.

e. Contaminated Soil/ Waste Fill Material. Access to the Site is restricted, prohibiting trespassing by local residents. If access restrictions fail or are otherwise rendered ineffective, the current landfill cover will prevent contaminated soil from being tracked off-site or inhaled as dust. Regular site inspection and maintenance ensures the integrity of this landfill cover and prevents unacceptable erosion, cracking, or slides. In turn, this prevents the potential for direct contact exposure to wastes or leachate. Through visual observation, conversations with MPCA, and information supplied by the operations contractor, this five-year review confirmed that there are no indications of degradation of the landfill cover.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

The 1987 Record of Decision does not designate separate Operable Units. Site work was separated into two Operable Units for the individual Remedial Designs and Remedial Actions for the different Site media. Remedial Actions executed at the WDE Landfill Site were originally implemented as two separate Operable Units (O.U.): O.U. #1 addressed the groundwater extraction and treatment system, and O.U. #2 addressed the multi-layer landfill cover. Since the time of NPL Deletion, no O.U. designations have been needed or used at the Site. All remedy activity has been addressed as one operable unit that encompasses the entire Site.

The ROD for the WDE Sanitary Landfill Site was signed on December 31, 1987. Remedial Action Objectives (RAOs) were developed as a result of data collected during the Remedial Investigation to aid in the development and screening of remedial alternative to be considered for the ROD. The required remedy for the WDE Landfill Site is listed as follows:

- Lime sludge cap meeting Resource Conservation and Recovery Act (RCRA) technical performance standards (subsequently modified to include a compacted clay barrier layer and a geosynthetic clay liner);
- Groundwater extraction wells in the upper sand aquifer between Coon Creek and the landfill;

- Clay slurry wall around the Pit with extraction wells pumping inside the wall;
- Institutional controls to prohibit upper sand aquifer wells at the Site and just north of Coon Creek, and to prohibit lower sand aquifer wells near the landfill;
- Carbon adsorption treatment of extracted groundwater or a combination is possible based on design (subsequently modified to aeration treatment);
- Discharge of treated extracted groundwater to Coon Creek (subsequently modified to discharge to the MCES system);
- Passive landfill gas extraction and treatment (subsequently modified to active gas extraction); and,
- Monitoring, including geophysical work around the Site to locate heavier-than-water nonaqueous phase liquid monitoring, to assure the effectiveness of the remedy.

The RAOs shown in the 1987 ROD are as follows:

- Control of potential dust and/or volatilized chemical emissions that may be inhaled;
- Control of contact with the lime sludge cover that may be inhaled or ingested as dust;
- Control of contact with exposed waste/leachate;
- Minimization of contaminant releases to the upper sand aquifer;
- Elimination or minimization of contaminant releases to Coon Creek;
- Reduction of the probability of incompatible waste reactions; control of the effects of possible reactions that may occur;
- Control of future exposure to the contaminated upper sand aquifer;
- Protection of the lower sand aquifer by controlling the vertical gradient and the impact of heavier than water non-aqueous phase liquid (NAPL) accumulation; and
- - Control of soil gas migration.
-
- The ROD remedy selected to achieve these remedial objectives include the following:
- Control contact with wastes, and eliminate or minimize contaminant releases to the groundwater and surface water, by enhancing the lime sludge cover with a hazardous waste cover over the landfill;
- Contain contaminated groundwater on the *landfill* property through a groundwater extraction system;
- Contain wastes within the Pit through a slurry wall and contain contaminated groundwater within the Pit through a groundwater extraction system;
- Control contact with contaminated landfill groundwater and prevent reversal of the upward gradient between the Lower and upper sand aquifers through ICs that limit wells and groundwater extraction on the landfill and on adjacent properties;
- Control landfill gas migration through a passive landfill gas collection and treatment system;
- Fill in and replace a wetland area affected by contamination from the landfill; and
- Treat and dispose of extracted groundwater

The standards used for selecting contaminants of concern for groundwater are the State of Minnesota Health Risk Limits (HRLs) and Federal Maximum Contaminant Levels (MCLs). Health Risk Limits are health-based standards developed for each of a list of contaminants in groundwater by the MPCA. The Minnesota Department of Health (MDH) has adopted permanent rules defining health risk limits for 120 contaminants that have been found in Minnesota groundwater. Health Risk Limits are calculated using the same methodology as for the "recommended allowable limits" (RALs), which were advisory levels MDH used before the HRL rules were promulgated. Health Risk Limits were developed using risk assessment methods and toxicological data from U.S. EPA, which are used by most states. These risk assessment methods undergo extensive review by U.S. EPA scientists and a public review process. If the concentration of a contaminant or mixture of contaminants in groundwater is at or below the HRL, that groundwater can be safely consumed daily for a lifetime. These State groundwater goals are consistent with the NCP Section 300.430(a) (1) (iii) (F) which states that U.S. EPA expects to return groundwater at the Site to beneficial use wherever practicable, within a time frame that is reasonable given particular circumstances of the Site.

The ROD requires deed restrictions and zoning modifications to prohibit: (1) excavation of soil, (2) construction on-site, (3) groundwater extraction, and (4) interference with the remedy. From 1995 to 2001, ICs have been implemented (development and recording) that run with the land. Section 4.3 of this Five-Year Review Report discusses the details of these ICs.

As required by the 1987 ROD and 1995 Landfill Agreement, the State of Minnesota (through MPCA) is successfully implementing all components of this remedy. Reviews every 5 years of remedy performance are necessary, and are required by CERCLA, in order to evaluate all remedial actions undertaken at the Site compared to the cleanup objectives. These reviews provide recommendations regarding improvements, additions, or adjustments to implemented remedial actions and examine a remedy's progress toward achieving cleanup objectives.

4.2 Remedy Implementation

The 1987 Record of Decision does not designate separate Operable Units. Site work was separated into two Operable Units for the individual Remedial Designs and Remedial Actions for the different Site media. Operable Unit #1 addressed the groundwater extraction and treatment system and O.U. #2 addressed the multi-layer landfill cover. Since the time of NPL Deletion, no O.U. designations have been needed or used at the Site. All Site remedy activity has been addressed as one O.U. that encompasses the entire Site.

a. Groundwater Response Action. Since June 1995, a series of ten extraction wells have been present at the WDE Landfill Site. Wells extract contaminated groundwater flowing from the Site before it reaches Coon Creek. Extraction wells were located based on the natural groundwater flow patterns at the Site and can be adjusted on a 7

to 15 day frequency by MPCA and the operations contractor, as needed. In order to provide optimal capture of the contaminants present in Site groundwater, extraction flow rates at each individual well are adjusted based on the most current Site analytical information. Extracted groundwater is pumped to the bottom of an on-site retention basin and is retained to allow for treatment. Extracted groundwater is sampled at several points throughout its flow path to determine its eventual fate. Groundwater that is within acceptable drinking water standards is re-directed to an on-site infiltration basin and allowed to infiltrate back into Site groundwater. Groundwater that contains contaminants at levels between drinking water and MCES standards is retained in the treatment basin and treated by aeration until acceptable MCES standards are achieved. Once acceptable MCES standards are achieved, treated groundwater is pumped from the retention basin to an MCES station adjacent to the Site and travels through an MCES pipeline to the public wastewater treatment system.

At the time of its design and construction, U.S. EPA approved the design and construction of this aeration system and determined that its operation does not pose any threat of exposure to harmful pollutants. Site contractors are familiar with operation of the groundwater collection and treatment system and implement appropriate safety procedures where needed (including the use of protective equipment) to prevent any exposure of workers to harmful pollutants.

The WDE Landfill Site does not have a leachate collection system. The landfill does not have a liner, and leachate travels from the waste into the groundwater. Groundwater contaminated by leachate is monitored within the Site's groundwater monitoring system and a majority of the leachate generated is captured by the extraction wells. Leachate generated by the landfill is not collected or monitored except as combined with groundwater.

Site groundwater monitoring evaluates the presence of contaminants, the effectiveness of the groundwater extraction system, and the progress of attenuation of site contaminants. The groundwater extraction system is successfully capturing groundwater and its contaminants, making them unavailable for migration from the landfill and preventing further expansion of the Site's contamination plume. The landfill gas collection and ground flare systems have also significantly contributed to reducing the migration of contaminants from the landfill by removing volatile contaminants coming from waste fill material that would otherwise be available to groundwater. Based on recent years' groundwater data, with continued operation of the extraction system, the groundwater plume should not move beyond its present boundaries and contaminant concentrations are expected to continue to slowly decline. The definite length of time it will take to clean up the contaminated aquifer has not been determined. MPCA is currently undertaking a study at the Site to consider the reduction to date of contaminant concentrations, the scope and role of the existing groundwater extraction system, the presence and migration of contaminants located at and near the Pit, and potential recommendations to optimize and expedite remediation at the Site. This study will assist with estimating when groundwater contaminants will consistently meet the Record of Decision's and the State's Remedial Action Objectives.

Table 2 provides a brief summary of data from some wells located downstream of the extraction system. Although it is not a thorough analysis of Site data, Table 2 may suggest the effectiveness of the containment provided by the groundwater extraction system over time. In some wells there appears to be some reduction of contaminant concentrations in groundwater as an effect of extraction. A discussion of the ongoing groundwater monitoring and O&M of the groundwater extraction and treatment systems is included in Section 4.4.a of this report. Operational issues with the groundwater extraction and treatment systems are discussed in Section 8.0 of this report.

b. Source Control Action

i. Landfill Cover and Slurry Wall. Landfill covers reduce contaminant loading to the soil and groundwater beneath the landfill by preventing precipitation from leaching into waste fill material, thereby reducing consequent contamination of groundwater. The integrity of the landfill cover also affects the extraction efficiency of the landfill gas collection system. If the cover becomes too permeable, air can enter the landfill and reduce landfill gas extraction efficiency. Throughout the life of a landfill, settlement may take place due to consolidation and decomposition of wastes and the removal of leachate. Landfill covers are vegetated (usually with a grass cover) to help prevent erosion. At this time, the WDE Landfill Site has a fairly good vegetative cover and no unacceptable settling or erosion was noted during the Site inspection.

The slurry wall is located around the Pit and is intended to contain or otherwise affect the flow of groundwater that may have higher concentrations of contaminants. Operation of groundwater extraction wells within the area surrounded by the slurry wall has been implemented by MPCA and may be something that may be re-considered, re-implemented, or otherwise augmented in the future.

A discussion of O&M of the landfill cover and slurry wall systems is included in Section 4.4.b of this report. Operational issues with the landfill cover and slurry wall are discussed in Section 8.0 of this report.

ii. Landfill Gas Collection and Ground Flare Operations. The gas extraction system consists of a network of 54 gas extraction wells placed in the landfill, connected to common header pipes and a blower which draws landfill gas from the gas extraction wells. This system is designed to remove volatile compounds from the waste and combust them with the methane in an enclosed flare. This active gas extraction system was installed and started up on August 27, 1998 and replaced the passive gas vents that were previously on-site. MPCA is exploring development of this renewable energy resource and has installed a Landfill Gas-To-Energy (LFGTE) project at the WDE Landfill Site. The gas to energy equipment achieved full operational status in 2007 and is expected to make use of approximately 1.5 million pounds of methane gas each year. Landfill gas migration is currently monitored with 20 landfill gas monitoring probes to monitor how much landfill gas is being generated by the landfill waste material and whether gas is migrating off-site. Liquid level monitoring of the gas extraction wells also

occurs to measure the amount of condensate that collects in the system. Condensate flows by gravity to a central low point and then is pumped as needed to the on-site groundwater treatment basin. Landfill gas monitoring data has been assessed. Migration off-site of landfill gas is being controlled in accordance with Minnesota Rule Chapter 7035.2815 Subpart 11. This five-year review confirmed that there is no unacceptable migration of landfill gas off the WDE Landfill Site.

A discussion of O&M of the landfill gas collection and ground flare systems is included in Section 4.4.b of this report. Operational issues with landfill gas collection and the ground flare are discussed in Section 8.0 of this report.

4.3 Institutional Controls

Institutional controls (ICs) are required to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and legal controls that help to minimize the potential for human exposure to contamination and that protect the integrity of the remedy. ICs are required to assure the long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure (UU/UE), and are required also to maintain the integrity of the remedy.

To ensure the integrity of the Remedial Action, the 1987 ROD requires deed restrictions and zoning modifications to prohibit: excavation of soils, construction on-site, groundwater extraction, and any other interference with the remedy. From 1995 to 2001, ICs were implemented at the WDE Landfill Site (development and recording) that run with the land. ICs for the WDE Landfill Site are protective, effective and in good standing with the integrity of the remedy. The following ICs specified in the ROD that are maintained for this Site include: (1) precluding upper sand aquifer wells on, and groundwater extraction from, the Site and from a small specified area of property northeast of the Site where contaminated groundwater exists (except as specified in the remedy), and (2) precluding lower sand aquifer extraction wells on the Site, on the property northeast of the Site, and on the property south of the Site (to protect the lower sand aquifer from contaminants in the upper sand aquifer). Control of the Site is overseen by the MPCA under the 1995 Landfill Agreement that ensures that there shall be no use of the groundwater, no residential or commercial use of the Site, and no installation or construction of structures, wells, or pipes unless approved by MPCA. Compliance with these restrictions is necessary for the remedy to remain protective of human health and the environment. Properties around the Site are currently zoned R-1 (Single Family Rural), with additional areas zoned R-3 (Family-Suburban), R-4 (Family-Urban) and GB (General Business). The Site property was recently re-zoned as Closed Landfill Restricted (CLR). Future zoning and land use will be guided by the City of Andover Comprehensive Plan. Tables 5A and 5B and Figures 6 through 10 summarize the areas covered by ICs recorded as required by the ROD.

a. Land Use Plan. Under the authority of the Landfill Cleanup Act (Minnesota Statute chapters 115B.39 to 115B.445) enacted in 1994, the MPCA has developed a Land Use Plan for the WDE Landfill Site (the "Land Use Plan"). A land use plan assists local units

of government to prudently manage land use and development around landfills throughout the State of Minnesota. Essentially, the purpose of the Land Use Plan is as follows: to protect the integrity of the landfill's remediation systems; to protect human health and the environment at and around the landfill; to ensure that the cleanup and future operation and maintenance of the remediation systems at the landfill are successful; and to accommodate the local government's needs and desires for land use where health and safety requirements can be met. MPCA issued the Land Use Plan for the WDE Landfill Site on March 30, 2006.

The WDE Land Use Plan includes a Site boundary map that outlines the Site land and groundwater use restriction boundaries for the Site. Groundwater use restrictions include existing or potential new off-site users of groundwater. Also long-term stewardship procedures are included and required in general terms by the Land Use Plan (LUP). Long-term stewardship to ensure effective ICs are maintained and monitored will be performed by Anoka County and the City of Andover under the oversight of the MPCA. MPCA will also explore the use of a communications plan and one-call system, which might increase the reliability of existing ICs and enhance the protectiveness of the remedy. As needed, updated ICs (such as zoning and/or conditional use changes) will be reviewed by the MPCA Planner/Project Leader and MPCA management and by the City of Andover Planners and City Attorney. Requested changes, if approved by the MPCA, will be presented at City Council meetings with public participation. If changes occur to the IC/LUP they will be identified in the MPCA's annual site report and on the City of Andover's web page. Updates on the status of the WDE Landfill ICs will be referenced in the annual reports for the Site and notification provided to U.S. EPA Region 5. Restrictions will be appropriately communicated to the public as part of IC implementation.

b. Land Use Restrictions. The Site is completely fenced and the gate remains locked at all times. The fence is not required by ICs in the Record of Decision but has been implemented for Site security and to minimize trespasser damage to the Site's cover. The gate is checked as part of the Site operations contractor's weekly duties. Site boundary maps that outline the Site land and groundwater use restriction boundaries for the WDE Landfill Site are included in the Land Use Plan issued by MPCA and dated March 30, 2006. These maps depict and describe areas where use restrictions are appropriate until the Site remedy performance standards are met. The 3/30/06 Land Use Plan lists all controls, easements, and other restrictions that place controls on the Site property and adjacent properties. Restrictions for the Site prevent development and use of site real estate without MPCA approval and prevent use of groundwater on and near the Site property. Restrictions in place assure the integrity of the landfill and other components of the remedial action. There are no recorded encumbrances that may allow potential uses of the Site inconsistent with the recorded restrictions and a title search or commitment was performed and confirmed these findings.

c. Groundwater Use and Restrictions. The ROD states that groundwater use restrictions are necessary to prohibit use of the groundwater that may interfere with the remedy. Consistent with the Site inspection made by MPCA and U.S. EPA, there is no

current groundwater use at the Site. Restrictions in place for the Site property prohibit: use of the property that may cause exposure to contaminated groundwater that may present: a health risk; interference with the remedy, and; residential or commercial use on Site unless otherwise approved by the MPCA. According to the Site inspection made by MPCA and U.S. EPA, the uses of the Site are currently consistent with these restrictions.

d. Current Status of ICs. The required ICs for the Site have been found to be in-place and effective. U.S. EPA Region 5 staff analyzed the ICs over the last few years and prepared a summary memo, the findings of which are also included in this Five Year Review Report. In summary, IC evaluation activities have determined that all non-UU/UE areas are effectively addressed. Institutional Controls are more effective if they are layered or implemented in series. Layering of ICs means using different types of ICs at the same time to enhance the protectiveness of the remedy. Using ICs in series ensures the short-and long-term protection of human health and the environment. It has been found that for the WDE Landfill Site, multiple or layered ICs have been implemented.

The ICs that have been implemented prohibit interfering with the landfill cover and landfill remedy components through the following mechanisms: Minnesota owns the Site through tax forfeiture; MPCA controls the Site pursuant to the Landfill Cleanup Act, Minn. Stat. §115B.39-115B.46 (1996); the MPCA's WDE Land Use Plan (March 30, 2006) and the City of Andover's Comprehensive Plan identify the landfill as open space; and, Andover's Ordinance 19P specifies land use plans and zoning, on-site prohibitions and restrictions. Ordinance 19P prohibits, inter alia, erection of structures on or within 200 feet of the Site. Pursuant to Minn. Stat. §115B.412, Subd.9, MPCA developed a Land Use Plan, protecting the landfill's remediation systems, human health and the environment, and accommodating local government land use needs and desires. Minn. Stat. §115B.412, Subd.9 states that all local land use plans must be consistent with the MPCA Land Use Plan. The local land use zoning for the landfill has recently been revised to the appropriate zoning district of "Closed Landfill Restricted", that provides for "open space with no public use or development." Tables 5A and 5B summarize these ICs that run with the land.

Though not required by the ROD, 110 acres south of the Site are subject to landfill gas ICs, precluding residential construction, and imposing other setback and construction standards. The ICs' areal extent, restrictions and standards vary based on mechanism. The 1993 Roth Entities Memorandum of Institutional Controls applies to 110 acres. Within this 110 acres, the State acquired through tax forfeiture 80 acres, (1) retaining control over and incorporating into the landfill 3.3 acres abutting the Site; (2) recording in 1999 on the remaining 77 acres Deed Conditions and Restrictions; (3) transferring the 77 acres to the City of Andover, which (4) retained a small unspecified area and conveyed the remainder to a private developer through subsequent transfers. The City of Andover also imposed landfill gas ICs on this (and other) property pursuant to Ordinance 19P, and other land use plans, zoning, and prohibitions. Since monitoring

data demonstrates no landfill gas ARAR exceedance throughout the Roth Entities properties, U.S. EPA released its landfill gas IC restrictions in 2007.

The ROD-required IC northeast of the landfill precludes upper aquifer extraction and is being implemented through a 2001 recorded Declaration of Restrictive Covenants on the Hupp property, running from the landfill's northeast boundary to just north of Coon Creek. The ROD recommended IC precluding lower aquifer extraction is being implemented: (1) northeast of the landfill, through the Hupp Declaration of Restrictive Covenants, co-extensive with the upper aquifer IC, and (2) on up to 110 acres south of the landfill by three mechanisms: (a) The 1993 Roth Entities' Memorandum of Institutional Controls applicable to all 110 acres; (b) Minnesota's 1999 recorded Deed Conditions and Restrictions, precluding lower aquifer extraction within 500 feet of the landfill, and; (c) the City of Andover's Ordinance 19P, precluding constructing and operating lower aquifer groundwater extraction wells within 200 feet of the landfill. In 2007, EPA assigned to the State all rights to restrict aquifer use through the 1993 Roth Entity Memorandum, consistent with the provisions of CERCLA Section 104(j).

Table 5A - Institutional Controls Summary Table
Waste Disposal Engineering Landfill; Andover, Minnesota

Media, Engineered Controls and Areas that do not support UU/UE* for Current Conditions	IC Objective	IC Instrument Implemented **
Landfill waste area (see Fig. 7). Engineered controls for the landfill waste area consist of a constructed hazardous waste landfill cover, fencing around the Site and posted warnings.	ICs to prohibit interfering with the landfill cover integrity and on-site remedy components, including components of the extraction and treatment systems for the hazardous waste Pit, contaminated groundwater, and landfill gas.	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR Zoning) ***
Hazardous waste pit within the landfill area (generally depicted by the box on Fig. 5). Engineered controls for the hazardous waste pit within the landfill consist of a clay slurry wall around the Pit, operation of interior gradient extraction wells, and treatment of extracted groundwater.	ICs to prohibit interfering with the landfill cover integrity and on-site remedy components, including components of the extraction and treatment systems for the hazardous waste Pit, contaminated groundwater, and landfill gas.	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR zoning) ***
Contaminated groundwater throughout the landfill area. Engineered controls consist of an on-site upper aquifer groundwater extraction and treatment system between the northeast corner of the landfill waste and Coon Creek (off-site).	ICs to prohibit interfering with the landfill cover integrity and on-site remedy components, including components of the extraction and treatment systems for the hazardous waste Pit, contaminated groundwater, and landfill gas	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR zoning) ***
Landfill gas throughout the landfill area. Engineered controls consist of an on-site passive landfill gas collection and treatment system. Active landfill gas controls were added after construction was completed. Monitoring demonstrates that ARARs are achieved at the site boundary.	ICs to prohibit interfering with the landfill cover integrity and on-site remedy components, including components of the extraction and treatment systems for the hazardous waste Pit, contaminated groundwater, and landfill gas.	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR Zoning) ***
Landfill gases at the boundary of the landfill and on adjacent property. Based on post-construction monitoring data, landfill gas levels achieve ARARs at and beyond the landfill boundary; therefore, no ROD-specified landfill gas remedy components are applicable to adjacent properties.	No ROD-specified IC objective/mechanism on adjacent properties since the areas adjacent to the landfill were not expected to be adversely affected by landfill gas.	Implemented: - Roth Entities Memorandum of Institutional Controls - 1999 Deed Conditions and Restrictions - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - 2006 WDE Land Use Plan.

Table 5A - Institutional Controls Summary Table Waste Disposal Engineering Landfill; Andover, Minnesota		
Media, Engineered Controls and Areas that do not support UU/UE* for Current Conditions	**IC Objective**	**IC Instrument Implemented ****
Upper aquifer: contamination extends from the northeast edge of the Site, crossing Coon Creek on the Hupp property (see Fig. 6). The landfill remedy will reduce the source of upper aquifer contamination.	IC prohibits using the upper aquifer and constructing extraction wells in this aquifer, on the northeast adjacent property to and beyond Coon Creek.	Implemented: - Declaration of Restrictive Covenants
Lower aquifer: No significant contamination found extending both northeast from the Site onto the Hupp Property and south from the Site onto the Roth Entities Properties. The lower aquifer adjacent to the landfill is protected from contamination by prohibiting lower aquifer extraction on the landfill and on adjacent near-by properties. This preserves the lower aquifer's artesian qualities, isolating it from landfill contaminants.	ROD recommends "considering" ICs to prohibit lower aquifer extraction wells in areas that may impact the flow of contaminants in the upper aquifer.	Implemented: -Roth Entities Memorandum of Institutional Controls. - Ordinance 19P - Minn. Stat. §115B.412, Subd.9. - 2006 WDE Land Use Plan.

* Unlimited Use / Unlimited Exposure

**** Current Compliance**: Based on inspections and interviews, EPA is not aware of any Site uses on the landfill or wells installed within the groundwater restricted area. The ICs appear to be functioning as intended.

*** A current zoning map for the City of Andover can be found at the following Internet web site:
http://www.ci.andover.mn.us/index.asp?Type=B_BASIC&SEC=%7BF205FD14-F591-474D-A9F2-B3A9A06DA5BB%7D&DE=%7BD6E9FFB0-BE57-4C95-B63F-E24FFB162FD2%7D

Table 5B - Institutional Controls Summarized By Areal Extent
Waste Disposal Engineering Landfill; Andover, Minnesota

Institutional Control Name	Date(s) Implemented	Type of Control	Total Acres
Roth Entities Memorandum of Institutional Controls.	November 16, 1993	Proprietary Control: Recorded by property owner, Roth Entities on property.	110 acres, south of the site. See Figure 9.
Tax Forfeiture.	Approximately 1995	Governmental Control: Through tax forfeiture, the landfill is owned by, and 110 acres south of the landfill were owned by Minnesota.	224 acres, consisting of 114 acres for the landfill and 110 acres south of the landfill. See Figures 6 and 9.
Landfill Cleanup Agreement Document # 1203355.	October 1995	Governmental Control: Anoka County administers the landfill while MPCA controls the site pursuant to the Landfill Cleanup Act, Minn. Stat. '115B.39-115B.46 (1996). The Landfill Cleanup Act authorized the MPCA to enter into the Landfill Cleanup Agreement with U.S. EPA whereby MPCA assumed all future responsibility for the landfill, except for CERCLA mandated provisions.	100 acres. See Figure 6.
City of Andover Municipal Code, Ordinances 19P, 19N.	January 16, 1996	Governmental Control.	250 acres on and surrounding the landfill. See Figure 8.
MPCA's WDE Land Use Plan.	March 30, 1996	Governmental Control: Developed under authority granted through Minn. Stat. §115B.412, Subd.9. The statute requires local zoning to conform to the plan. MPCA's WDE Land Use Plan designates the landfill as "Closed Landfill Restricted" providing for "open space with no public use or development," while allowing development of adjacent lands.	114 acres. See Figures 6, 8, and 9.
Deed Conditions and Restrictions.	January 20, 1999	Proprietary Control: Filed by the State prior to transferring ownership for development, of 107 acres south of the landfill.	107 acres. The State retained 3.3 acres. See Figure 9.
Declaration of Restrictive Covenants; entered into by property owner(s) William G. Hupp and Kathleen M. Hupp with Nature Properties, LLC.	November 27, 2001	Proprietary Control: Restricting ground and surface water use.	13.8 acres, northeast of and adjacent to the northern border of the landfill. See Figure 6.
Amended zoning map.	Current Version: March 2007	Governmental Control.	114 acres. See Figure 10.

4.4 System Operations/Operation and Maintenance (O&M)

MPCA oversees an environmental contractor that performs remedy repair, upkeep, and O&M of the landfill gas, flare, groundwater extraction/treatment systems, and the landfill cover. Activities being performed at the Site include (but are not limited to) operation, inspection, repair, and maintenance of the following: blower/flare control panel station, landfill gas monitoring stations, flare inlet pipe, blower inlet pipe, gas extraction wells, gas probes, extraction well pumps/controls, monitoring stations, control valves, compressors (oil change, etc.), pneumatic systems, blower drive belts, landfill surface (including fencing), landfill gas valves, extraction well valves, groundwater aeration (treatment) system, compressor valves, ground flare valve, compressed air filter, blower, extracted groundwater lines, condensate driplegs, system cleanouts, site padlocks, mowing of the landfill cover, grass and brush trimming around wells, fence repair/maintenance, access road maintenance, snow plowing, and litter control. Long-term maintenance of the Site landfill cover is ongoing and ensures containment of Site waste material. The landfill gas and flare system removes VOCs from the waste fill material that would otherwise be available for migration from the landfill and to groundwater. During the five year reporting period for this review, regular repairs and improvements were made on an as needed basis as per the direction of MPCA. The remedy systems continue to be operable. Appendix F is a list of selected events that occurred during the operation and maintenance of the Site remedy components from 2004 to 2007.

a. Groundwater Extraction, Treatment, and Monitoring Operations

Contaminated groundwater is extracted by a series of 10 wells and pumped to the bottom of an on-site retention basin to allow for treatment. Extracted groundwater is sampled at several points throughout its flow path to determine its eventual fate. Flow data is analyzed weekly to determine well pumping rates and achieve optimal flow to (and groundwater capture by) the extraction wells. Groundwater that is within acceptable drinking water standards is re-directed to an on-site infiltration basin and allowed to infiltrate back into site groundwater. Groundwater that contains contaminants at levels between drinking water and MCES standards is retained in the treatment basin and treated by two aerators until acceptable MCES standards are achieved. Once acceptable MCES standards are achieved, treated groundwater is pumped from the retention basin to an MCES station adjacent to the Site and travels through an MCES pipeline to the public wastewater treatment system. MDH Well Maintenance Permits are completed annually. A MCES Industrial Discharge Permit is required for disposal of the treated groundwater into the sanitary sewer. This MCES permit was renewed in the fall of 2001, and must be amended each time any modification is proposed to the WDE groundwater extraction system. The water discharging to the MCES station must be monitored monthly, and quarterly reports are filed with the MCES. The MCES strictly adheres to National Pollutant Discharge Elimination System (NPDES) requirements. In addition, there is a Minnesota Department of Natural Resources (MDNR) Water Appropriation Permit for the groundwater extraction and treatment system, and MPCA files a Water Use Report

annually with MDNR. There have been no problems noted with any of the permit procedures for the Site.

Regular maintenance on the groundwater extraction and treatment system includes: jetting wells, lines, and force mains (including the force mains out to the treatment pond and the MCES station to the northwest) to maintain adequate flow; replacing pumps, pump motors, back flow preventers and flow meters; and collection of data from the extraction wells. MPCA is considering installation of new extraction wells to capture flow beneath the Hazardous Waste Pit. Monitoring of groundwater on and around the WDE Landfill Site occurs once every 3 to 4 months. The current monitoring program represents an optimized program that continues Quality Assurance / Quality Control requirements that have been established for this Site. Sampling frequency and the number of data points in the current monitoring program have been optimized based on frequent and immediate data review by MPCA personnel. There still remains an appreciable level of contamination on-site, particularly near the Hazardous Waste Pit area. Residential wells were sampled from 1995 through 2005 and shown to contain no unacceptable contaminants. In future, residential wells will be sampled every 3 to 5 years because of this information and because of the effectiveness of the remedy components at the Site. A review of groundwater monitoring data collected since 2003 found that the current operation of the remedy at the WDE Landfill Site effectively prevents migration of unacceptable levels of contaminants.

MPCA is currently in the midst of a site study that is analyzing historical data and reviewing remedy work performed to date on the Site. The results of this study should provide conclusions and recommendations as to the reduction of contaminant concentrations, the scope and role of the existing groundwater extraction system, the presence and migration of contaminants located at and near the Pit, and potential recommendations to optimize and expedite remediation at the Site. In the annual report for the Site, MPCA recommends: continuing quarterly monitoring for VOCs and specific metals; continuing annual monitoring for general parameters; collecting oxidation reduction data around monitoring wells that show elevated arsenic concentrations; and monthly sampling of new extraction wells installed to capture flow beneath the hazardous waste pit. In addition it is recommended that monitoring wells installed into and through waste fill material should be sealed.

b. Source Area Response Operations

i. Landfill Cover and Slurry Wall. The clay and soil cover is inspected throughout the year for areas of erosion and stressed vegetation. Generally, the cover is well vegetated with no significant cracking or erosion. The cover is typically mowed on an annual basis, or more frequently if necessary. Mowing and trimming activity insures that no deep rooted species establish themselves on the landfill cover. In 1994 and 1998, improvements to areas of the landfill cover were implemented. No stressed vegetation has been observed at the WDE Landfill Site.

A slurry wall was constructed around the Hazardous Waste Pit in 1994. Extraction well EW-9 is located within the perimeter of the slurry wall area and is intended to extract highly contaminated groundwater to expedite the removal of contaminants. As the slurry wall is a below grade containment structure, there is minimal maintenance required. Maintenance of EW-9 is done as part of the groundwater extraction system.

Common maintenance activities on and around the landfill cover and slurry wall include: annual mowing of landfill cover; grass and brush trimming around wells; fence repair and maintenance; access road maintenance; snow plowing; and litter control. The operation and maintenance contractor Willow Brook Engineering conducts, on average, weekly inspections.

ii. Landfill Gas Collection and Ground Flare Operations. MPCA has installed a landfill gas-to-energy project at the WDE Landfill Site. The gas to energy equipment achieved full operational status in 2007 and is expected to make use of approximately 1.5 million pounds of methane gas each year. From May 2006 to January 2007, contractors installed the gas to energy system, modified the enclosed ground flare, and constructed a building to house the system. Four Stirling type engines with electrical generators have been installed. A Stirling type engine is a heat engine where a gas (hydrogen) at high pressure in a closed chamber is heated with heat exchanger tubes and expands, pushing a piston. The high pressure gas then travels to the other side of the engine where it is cooled. Gas travels back and forth between the hot and cold portions of the engine and is expanded and compressed by the movement of the pistons in the engine. The pistons' motion drives an electrical generator. Heat for the heat exchange is created by burning methane from the decomposing landfill waste material.

Twenty landfill gas monitoring probes are found at 18 locations at the Site, and monitoring occurs on a monthly to quarterly basis. Generally, methane is explosive at levels between 5 and 15 percent. Recent (2007) data suggests that the landfill gas collection system is effectively operating. With the removal of landfill gas, the gas collection and flare system also removes organic contaminants from the waste fill material that would otherwise be available for migration from the landfill. Table 3 summarizes 2007 data from the landfill gas monitoring program.

In addition to routine sampling at gas probes around the perimeter of the Site property, an analyzer is used at the ground flare location to measure influent and effluent gases. Since its installation and start-up, the ground flare has been operating adequately. Personnel from the MPCA's Air Quality Permits Section reviewed the design and operation of the flare system at the WDE Landfill and determined that Site emissions are below MPCA's Pollutant Thresholds for air emission permit requirements. No air emissions permit is required for the Site.

Common maintenance activities on and around the landfill gas collection and ground flare systems include (but are not limited to) operation, inspection, repair, and maintenance of the following: blower/flare control panel station, landfill gas monitoring stations, flare inlet pipe, blower inlet pipe, gas extraction wells, gas probes, monitoring

stations, flare inlet pipe, control valves, compressors (oil change, etc.), pneumatic systems, blower drive belts, compressor valves, ground flare valve, blower, condensate driplegs, and system cleanouts. Operational issues with landfill gas collection piping and the ground flare are discussed in Section 8.0 of this report.

c. Remedy Costs

Current annual O&M and groundwater monitoring costs for the WDE Landfill Site reflect work for operation, maintenance, repair, and management of the Site remedy systems, and for groundwater and landfill gas sampling and analysis. Site annual costs over the past 4 years averaged approximately $400,000 but can fluctuate depending on the degree of repair/upgrade to remedy components implemented throughout the year. Site cost information is as follows:

- July 1, 2003 to June 30, 2004: $370,000
- July 1, 2004 to June 30, 2005: $346,000
- July 1, 2005 to June 30, 2006: $259,000
- July 1, 2006 to June 30, 2007: $702,000
- July 1, 2007 to June 30, 2008: $397,000 (Estimated)

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

On March 25, 1999, a Type I review was conducted for this site, developed by MPCA and signed by U.S. EPA Region 5. It was determined that because there was an on-going response action, the most basic Five-Year Review Report that provided a minimum protectiveness evaluation was appropriate.

On April 30, 2003, U.S. EPA, using MPCA's annual reports for the Site, completed a second five-year review. That five-year review noted that groundwater treatment issues were still unsettled and the ground flare was in the final stages of completion and testing. The second five-year review certified that:

> "The remedy is protective in the short-term of human health and the environment. All immediate threats at the Site have been addressed. All threats at the Site have been addressed with a vented cap, to contain contaminated groundwater discharges from the landfill through downgradient groundwater extraction wells, to avoid usage of contaminated groundwater and reversal of the upward gradient between the lower and upper sand aquifers through institutional controls to limit wells on and near the Site.
>
> Long-term protectiveness of human health and environment will be achieved upon attainment of groundwater cleanup goals, through treatment and disposal of extracted groundwater, which is expected to be accomplished by carbon adsorption and discharge to Coon Creek, and to monitor the Site.

Long-term protectiveness of the remedial action will be verified by conducting geophysical work around the Site to locate heavier-than-water nonaqueous phase liquid, to assure the effectiveness of the remedy."

Table 6 summarizes the issues identified in the 2003 (second) five-year review and the actions taken that successfully addressed those issues.

TABLE 6 - ISSUES IDENTIFIED IN 2003 (SECOND) FIVE YEAR REVIEW

Issues from Previous Review	Recommendations/ Follow-up Actions	Responsible Organization	Milestone Date	Action Taken (Y/N) and Outcome	Date of Action
The gas system will have a stack test in 2003.		MPCA	Not specified in 2003 Report.	Y Flare destroys 99.9% of contaminants.	11/2003
An additional well will be added and monitoring continued.		MPCA	Not specified in 2003 Report.	Y Monitoring wells have been decommissioned with new replacements and monitoring continues on a 3-4 month frequency.	Every 3-4 months since 2003.
Continue to remove contaminants through the gas system.	The active gas system will continue to operate 99 percent of time.	MPCA	Continuous	Y On-site flare operates from 74% to 99% of the time.	Daily since 2003.
Continue with routine site maintenance.	Groundwater and methane monitoring, inspections, erosion repair and mowing will be continued.	MPCA	Weekly	Y Monitoring is done on a 3-4 month frequency and maintenance is performed every 7-10 days.	Every 7-10 days since 2003.
Reduce the amount of cleaning needed for the air stripper.	Evaluate the benefits of collecting condensate in a separate tank and disposal at a plant.	MPCA	2003	Y Air stripper has been replaced by a retention basin and 2 aerators.	5/2005

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

The WDE Landfill Site five-year review was prepared by John V. Fagiolo, Remedial Project Manager with the U.S. EPA Region 5 Superfund Division. Ingrid Verhagen, Senior Hydrogeologist and Jean Hanson, Senior Project Manager for the Minnesota

Pollution Control Agency also assisted in the review. The five-year review consisted of a Site inspection and review of relevant documents. The completed report will be made available in the Site information repository for public view.

6.2 Community Notification and Involvement

The completed five-year review report will be available in the Site information repository and the U.S. EPA website for public view. An advertisement notice regarding the five-year review process was placed in the Anoka County Union newspaper for public review on February 25, 2008, and is included as an attachment to this report. No public comments regarding the five-year review have been received.

Community relations ongoing at the Site include participation by MPCA in meetings held by residential developers and local government officials to discuss development near the Site. MPCA receives telephone calls and e-mails on occasion from private citizens requesting information on the Site. As part of weekly Site operations, the contractor performing the work for MPCA regularly observes the Site and surrounding areas and communicates regularly to MPCA regarding any potential problems.

6.3 Document Review

A list of WDE Landfill Site documents reviewed in preparation of this five-year review report is included in this report as Appendix A.

6.4 Data Review

The operation and maintenance program that is implemented at the WDE Landfill Site assesses the operational effectiveness of the groundwater extraction and treatment, landfill gas collection, and ground flare systems. Minnesota Pollution Control Agency staff review monthly contractor reports on Site inspections and O&M monitoring activities. Monthly and annual reports indicate that the groundwater and landfill gas remedies operate almost 100% of each year, the exceptions being times for repairs.

The MDH Chemical Laboratory analyzes Site groundwater samples for inorganic and organic parameters. Regular groundwater monitoring data was compared against historical contaminant data. Site contamination is not migrating (or is decreasing) as long as the groundwater extraction wells continue operating. Concentrations of some VOC compounds are still present at unacceptable levels at and near the Site, especially at the Pit. There are contaminants at concentrations that exceed standards at the compliance boundary. These compounds include arsenic, benzene, vinyl chloride and tetrahydrofuran. North of Coon Creek, however, there were no violations of the groundwater standards in 2007. Volatile organic compounds continue to be removed each year, predominantly by the groundwater extraction system. Data on precipitation at the Site, annual groundwater contaminant trends, trends in groundwater elevation and hydraulic gradients, and the direction of groundwater flow is available in each

MPCA annual report. The Aquatic Life Standards for a Class 2B Water were not exceeded for any of the VOCs or metals in samples taken from 2003 to 2007.

The groundwater extraction system captures contaminated groundwater moving north from the WDE Landfill towards Coon Creek and the adjacent residential wells. Although the pumpout system is operating as designed, substantial improvements in groundwater quality have not been noted at the hazardous waste pit. The pumpout system removed approximately 400 pounds of VOCs in 2003, 505 pounds in 2004, 476 pounds in 2005, 771 pounds in 2006, and 572 pounds in 2007. The groundwater containment system has operated without interruption since June 1995 and has been upgraded and repaired on an "as needed" basis since then. Appendix F summarizes the upgrades and some of the repair to the groundwater extraction and treatment system undertaken since 2004. In general, with continued operation of the extraction and treatment system, groundwater samples collected from monitoring wells and groundwater extraction wells have shown no impacts to off-site water quality due to the landfill.

Table 2 provides a summary of data for monitoring wells downstream of the extraction well system. Table 4 provides a chronological summary of Site data that shows contaminants exceeding cleanup standards on the north side of the Site for 2005 through 2007.

Operation & Maintenance data indicates that the landfill continues to produce landfill gas amounts adequate to keep the LFGTE system operating between 70% and 100% of each year. The typical gas generation rate is 175 cubic feet of gas per minute (cfm). Monitoring at the ground flare is performed on a continuous basis and is monitored regularly for the LFGTE system. Refinement of LFGTE system operations will continue through 2008. Long-term maintenance and regular inspection of the landfill cover that was completed in 1993 (and upgraded in 1998) is required and implemented to ensure that the remedy remains effective, and ensures containment of Site waste material. Landfill cover maintenance involves inspection and repair of any soil burrowing or erosion locations, and mowing of the landfill surface once a year or as needed. No cover maintenance has been needed since 2003 to control erosion and improve surface drainage.

Table 3 summarizes 2007 data from the landfill gas monitoring program. As shown in Table 3, the operation and maintenance of the landfill gas collection and ground flare systems ensures that there is no unacceptable migration of landfill gas off-site.

6.5 Site Inspection

The WDE Landfill Site is visited by the operations contractor managed by MPCA (Willow Brook Engineering) weekly, the MPCA project manager or hydrogeologist at least once every 1 to 3 months, and the U.S. EPA Remedial Project Manager once every few years. In addition to the weekly inspections by the operations contractor, MPCA staff is at the Site several times each month to check on site conditions, equipment performance, and site security.

A Site inspection for this five-year review was completed by U.S. EPA and MPCA on January 29, 2008. Ingrid Verhagen of MPCA and John Fagiolo of U.S. EPA performed the Site inspection. Site access is available only through a locked gate that encloses the Site landfill, treatment and infiltration basins, ground flare, and extraction well control and pump building. The five-year review Site inspection checklist was used as a guideline for the WDE Landfill Site inspection and is included as Appendix C of this report. The covered landfill surface, as well as extraction and monitoring well heads located at the Site were visually inspected. The Site perimeter (fence line) was also visually inspected. Representatives of the Agencies traveled by automobile around the Site and exited the vehicle at selected points to visually inspect remedy components. Before and after the Site inspection, MPCA and U.S. EPA consulted by electronic mail and telephone to clarify any issues for the Site.

The landfill was found to be in good condition during the inspection with adequate grassy vegetation on the cover. There were no signs of excessive erosion or cracking. Site access roads were in good condition. The Site showed no signs of any vandalism or other disturbances. The access fence was properly in place, with the ground flare operating properly. All Site areas were clean and free of debris. All extraction and monitoring well locations appeared intact, including vehicular barriers and padlocks.

The completed Site Inspection Checklist is included as Appendix C. Issues discovered during the five-year review inspection are included in Section 8.0 of this report.

7.0 TECHNICAL ASSESSMENT

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. Including ICs, components of the remedy selected by the 1987 ROD that were certified operational in 1995 and upgraded from 1998 to 2005 have been constructed and remain functional, operational, and effective. The implemented remedy does not yet achieve the Remedial Action Objectives because long-term achievement of MDH groundwater standards within the site boundary is not yet accomplished. The remedy is considered protective in the short term, however, because: there is no evidence that there is current exposure; there is no cracking, sliding, settlement of the cover or other indicators of cover breaches; and landfill gas, Site groundwater, and leachate that reaches groundwater are successfully being collected and adequately treated or disposed of. However, in order for the remedy to remain protective in the long-term, ICs that prevent disturbance of the cover, landfill gas/groundwater collection systems, and ground flare and groundwater treatment systems must be maintained. The City of Andover and Anoka County work with MPCA on IC maintenance, which ensures long term protectiveness of the remedy and prevention of exposure to existing contaminant levels. Site access and use is restricted by weekly inspections, adequate security perimeter fencing, and a locked gate.

With continued maintenance and monitoring of the Site landfill cover, landfill gas collection, groundwater extraction and treatment, and ground flare systems inside the security perimeter fences, the source area remedies should contain any contamination and ensure that no excess human health risks develop. Groundwater monitoring data was reviewed; indications from the data are that the source control systems (gas and groundwater systems and the landfill cover) are effective in controlling contaminants that are in the groundwater. The downward and lateral extent of the plume of contaminants is controlled by the extraction wells. Volatile organic compound concentrations on-site remain above HRLs. Monitoring wells on and around the Site have been decommissioned and replaced on an "as needed" basis, depending on the quality of samples and data obtained. Regular maintenance of the groundwater monitoring well network helps to better define the concentration and location of groundwater contaminants on and near the Site.

Early Indicators of Potential Remedy Failure. No early indicators of potential remedy failure were noted during the review. Maintenance activities have been consistent with expectations, and groundwater monitoring adequately assesses the groundwater plume at the Site.

Implementation of Institutional Controls and Other Measures. The 1987 ROD required implementation of deed/access restrictions and/or other Institutional Controls to prevent future development of the Site, and assures the integrity of the remedial action. In order for the remedy to remain protective in the long term, ICs that prevent disturbance of the cover, landfill gas/groundwater collection systems, the ground flare, and the groundwater treatment system as envisioned in the 1987 ROD are in place. Institutional control monitoring continues and is performed by the City of Andover and Anoka County under the oversight of the MPCA. Institutional control maintenance ensures the long term protectiveness of the remedy and prevents exposure to existing contaminant levels.

As summarized in Tables 5A and 5B, ICs in place include: MPCA's Site control as authorized by the 1995 Landfill Agreement and Minnesota Statutes §115B.39 through §115B.46; the City of Andover Ordinance 19P; Minnesota Statute §115B.412, Subdivision 9; the WDE Land Use Plan dated March 30, 2006; the Roth Entities Memorandum of Institutional Controls; and, the 1999 Deed Conditions and Restrictions (Declaration of Restrictive Covenants).

Unless otherwise approved by the MPCA, these ICs:
- prevent development and use of land within the Site property;
- prevent use of groundwater on-site;
- prevent unacceptable use of groundwater off-site within 500 feet of the Site boundary;
- assure the integrity of the landfill and other components of the remedial action; and,
- restrict any land use that will interfere with the remedial action.

These restrictions are best efforts and will remain in place to prevent property access and groundwater use in relation to the remedial action. Through the efforts of the City

of Andover, Anoka County, and the MPCA, the objectives of the ICs are being met. No inappropriate Site or media uses have been noted via the Site inspection or interviews.

Current Use Compatibility with Land and Groundwater Use Restriction. Any use that interferes with any remedy components would not be protective of human health and the environment. According to inspections, there is no current use of the Site landfill, which has access restricted by a locked gate and fencing. Land use on adjacent parcels are not anticipated to impact the Site landfill. The landfill cover must remain in place indefinitely to prevent exposure to underlying waste. The Site property is currently zoned as Closed Landfill Restricted (CLR). Neighboring parcels to the north, east, and west are currently zoned as Residential (R-1, R-2, and M-1) and to the south as General Business (GB). Re-zoning near the Site property may be required in future to be consistent with IC requirements.

7.2 Question B: Are the assumptions used at the time of remedy selection still valid?

Yes. Standards outlined in the 1987 ROD are still valid at the WDE Landfill Site. Site ICs are effective as required by the 1995 Landfill Agreement (as authorized by Minn. Stat. §115B.39 through §115B.46 and §115B.412, Subd.9), and as executed in the 2006 WDE Land Use Plan, City of Andover Ordinance 19P, the Roth Entities Memorandum of Institutional Controls, and the 1999 Deed Conditions and Restrictions.

Changes in Exposure Pathways: No changes in the Site conditions that affect exposure pathways were identified as part of the five-year review. There are no current or known planned changes in the Site land use. The groundwater monitoring program adequately assesses the Site groundwater plume.

Changes in Risk Assessment Methodologies: Methodologies used to establish State of Minnesota health-based standards and assess risk at the WDE Landfill Site since the 1987 Record of Decision have not changed, and do not call into question the protectiveness of the remedy.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No.

Technical Assessment Summary. The remedy is substantially functioning as intended by the 1987 ROD and the 1995 Landfill Agreement. Institutional controls have been successfully implemented and are successfully maintained. The ICs required to assure the protectiveness of the remedy have been reviewed and determined to be in-place and effective. Long-term protectiveness requires continued compliance with effective ICs. Long-term stewardship will assure that effective ICs will be maintained and monitored. At the time of its design and construction, U.S. EPA reviewed the design and construction of this aeration system and determined that its operation does not

pose any threat of exposure to harmful pollutants. Site contractors are familiar with operation of the groundwater collection and treatment system and implement appropriate safety procedures where needed (including the use of protective equipment) to prevent any exposure of workers to harmful pollutants. Except for achievement of MCLs and/or HRLs, according to data reviewed and the Site inspection, there have been no changes in the physical conditions at the Site, standards, contaminant toxicity or exposure pathways that would affect the protectiveness of the remedy. Because MDH regularly reviews and applies to HRLs new risk assessment methods and data updated and issued by U.S. EPA, using HRLs for Remedial Action Objectives ensures a currently protective remedy. There is no additional information has been identified that would call into question the protectiveness of the remedy.

8.0 ISSUES

Because of all operation, maintenance, repair, replacement, and improvement activity that takes place on a weekly basis, there are few technical issues at the WDE Landfill Site. The following issues at the WDE Landfill Site have been identified from discussions with MPCA, weekly/monthly reports from 2003 to 2007, and the January 29, 2008 Site inspection:

a. Contaminant levels in groundwater at and near the Hazardous Waste Pit are still above Site cleanup standards.

b. Waste fill material at and near the Hazardous Waste Pit continue to supply contaminants to groundwater.

c. Some compounds are still present at unacceptable concentrations at and near the Site, especially at the Pit. There are contaminants at concentrations that exceed standards at the compliance boundary. These compounds include: benzene, vinyl chloride and tetrahydrofuran.

d. Concentrations of arsenic are still at unacceptable levels at and near the Site.

e. Some wells and piezometers have gone dry and some can not be redeveloped.

f. In late 2007, the Stirling engines used in the LFGTE system experienced some operational problems during their initial start-up.

g. Nominal maintenance issues such as plugged well screens, sluggish flow in groundwater piping, high grass, growth of brush and weeds around wells, fencing in disrepair, minor access road erosion, and snow and litter accumulation continue regularly.

Items a. through d. are the only ones that may impact the protectiveness of the remedy. Table 7 summarizes the issues identified in this five-year review that may impact protectiveness.

Table 7- Issues that Impact Protectiveness Waste Disposal Engineering Landfill Site; Andover, Minnesota		
Issue	**Currently Affects Protectiveness (Y/N)** **Y=Yes; N=No**	**Affects Future Protectiveness (Y/N)** **Y=Yes; N=No**
1. Contaminant levels in groundwater at and near the Hazardous Waste Pit are still above Site cleanup standards.	**N**	**Y**
2. Waste fill material at and near the Hazardous Waste Pit continues to supply contaminants to groundwater.	**N**	**Y**
3. Benzene, vinyl chloride and tetrahydrofuran are still present at unacceptable concentrations at and near the Site, especially at the Pit.	**N**	**Y**
4. Arsenic is still present at unacceptable concentrations at and near the Site.	**N**	**Y**

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

a. The site study currently underway should discuss the contaminant levels in groundwater at and near the Hazardous Waste Pit that are still above Site cleanup standards. This study should be completed soon and should better define: the reduction to date of contaminant concentrations, the scope and role of the existing groundwater extraction system, the presence and migration of contaminants located at and near the Pit, and potential recommendations to optimize and expedite remediation at the Site.

b. In order to address waste fill material at and near the Hazardous Waste Pit that continues to supply contaminants to groundwater, extraction well EW-9 should be brought back on line to remove contaminants from the Pit. Alternatively, other means should be considered and used to address contamination below the Pit.

c. Benzene, vinyl chloride, tetrahydrofuran, and VOCs that are at unacceptable concentrations at and near the Site (especially at the Pit) should be continued to be monitored on a quarterly basis. Monitoring for general parameters in Site groundwater should be continued on an annual basis. In addition, conditional upon the results and recommendations of the site study that is underway, new extraction wells that may be installed to capture flow beneath the Hazardous Waste Pit should be tested monthly.

d. Oxidation-reduction data should be collected around monitoring wells with elevated arsenic concentrations.

e. Wells and piezometers that have gone dry and/or can not be redeveloped should be sealed, especially monitoring wells that were installed through the waste.

f. Optimization and refinement of the LFGTE system (including the Stirling engines and electric generators) should be continued throughout 2008, as needed.

g. To ensure effectiveness of the Site remedy components, weekly maintenance should be continued. This should address the nominal maintenance issues such as plugged well screens, sluggish flow in groundwater piping, high grass, growth of brush/weeds, fencing in disrepair, minor road erosion, and snow and litter that may accumulate.

Table 8 summarizes the Recommendations and Follow-Up Actions needed to adequately address the issues shown in Table 7 as affecting the protectiveness of the Site remedy, with a schedule for implementation.

Table 8 - Recommendations and Follow-up Actions
Waste Disposal Engineering Landfill Site; Andover, Minnesota

Issue	Recommendations & Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N) Y=Yes; N=No	
					Current	Future
1. Contaminant levels in groundwater at and near the Hazardous Waste Pit are still above Site cleanup standards.	Complete the site study that is currently underway to identify recommendations to expedite the cleanup.	MPCA	U.S. EPA	September 2008	N	Y
2. Waste fill material at and near the Hazardous Waste Pit continues to supply contaminants to groundwater.	Re-start EW-9. Consider other remedy alternatives in the area to address contamination below the Pit.	MPCA	U.S. EPA	September 2008	N	Y
3. Benzene, vinyl chloride and tetrahydrofuran are still present at unacceptable concentrations at and near the Site, especially at the Pit.	Monitor VOCs on a quarterly basis. Monitor general parameters on an annual basis. Monitor any new extraction wells that may be installed at the Pit monthly.	MPCA	U.S. EPA	Quarterly 2008 to 2012 Annually 2008 to 2013 Monthly 2008 to 2010	N	Y
4. Arsenic is still present at unacceptable concentration at and near the Site.	Collect oxidation-reduction data at wells with elevated arsenic concentration.	MPCA	U.S. EPA	Quarterly 2008 to 2012	N	Y

10.0 PROTECTIVENESS STATEMENT(S)

The remedy at the WDE Landfill Site currently protects human health and the environment in the short term because: the remedy has been constructed in accordance with the requirements of the Record of Decision (ROD); the remedy is functioning as designed; source control measures are significantly reducing leachate production and providing containment of contaminated groundwater; and, a reduction in contaminant concentrations in groundwater has been observed. The remedy is expected to be protective of human health and the environment in the long-term upon attainment of groundwater cleanup levels, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Monitoring has demonstrated that concentrations of many contaminants have declined to levels that are close to or below Health Risk Limits (HRLs). Long-term trends show significant and adequate improvements in groundwater quality.

Based upon the review of annual reports, site groundwater monitoring data, other data reviews, and the January 29, 2008, Site inspection conducted for this five-year review, there are no current exposures to human health and the environment. In order for the remedy to remain protective, the remedy must continue to operate as designed and continue to comply with land and groundwater use restrictions that: (1) prohibit interference with the Site landfill cover; (2) prohibit residential, commercial, or any other use on-site that would allow human exposure; and (3) restrict use of groundwater until groundwater cleanup standards are achieved throughout the plume area. The ICs required to assure the protectiveness of the remedy have been reviewed and it has been determined they are in-place and effective. Long-term protectiveness requires continued compliance with effective ICs. Long-term stewardship will assure that effective ICs will be maintained and monitored.

11.0 NEXT REVIEW

U.S. EPA performs statutory reviews on remedies selected that result in hazardous substances, pollutants or contaminants remaining at sites above levels that allow for unlimited use and unrestricted exposure. Since hazardous substances, pollutants or contaminants are contained and will potentially remain above State of Minnesota and U.S. EPA regulatory standards in the future, the WDE Landfill Site will require ongoing five-year reviews. Therefore, another report is scheduled to be completed five years after the signature date of this five-year review, in 2013.

FIGURE 1 - SITE LOCATION MAP - STATE OF MINNESOTA

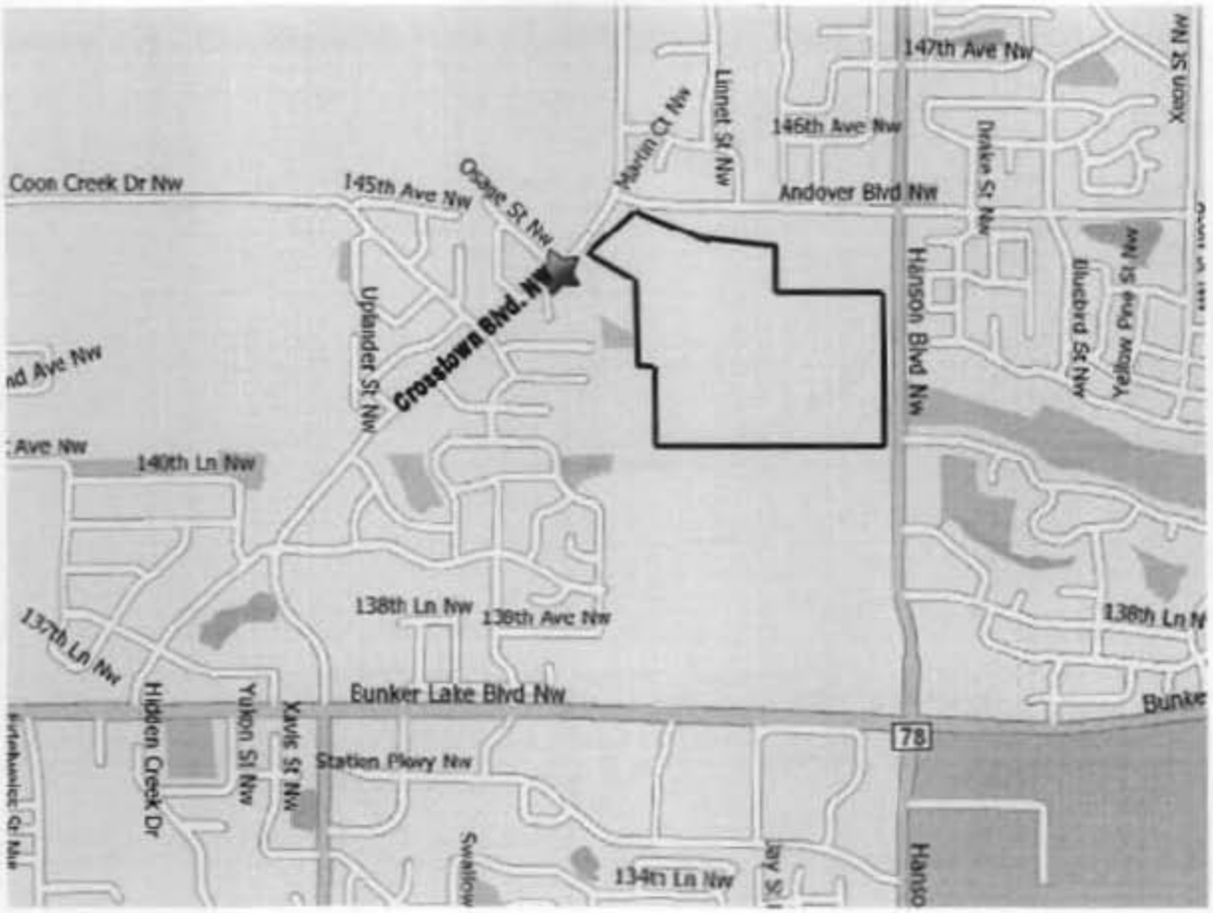
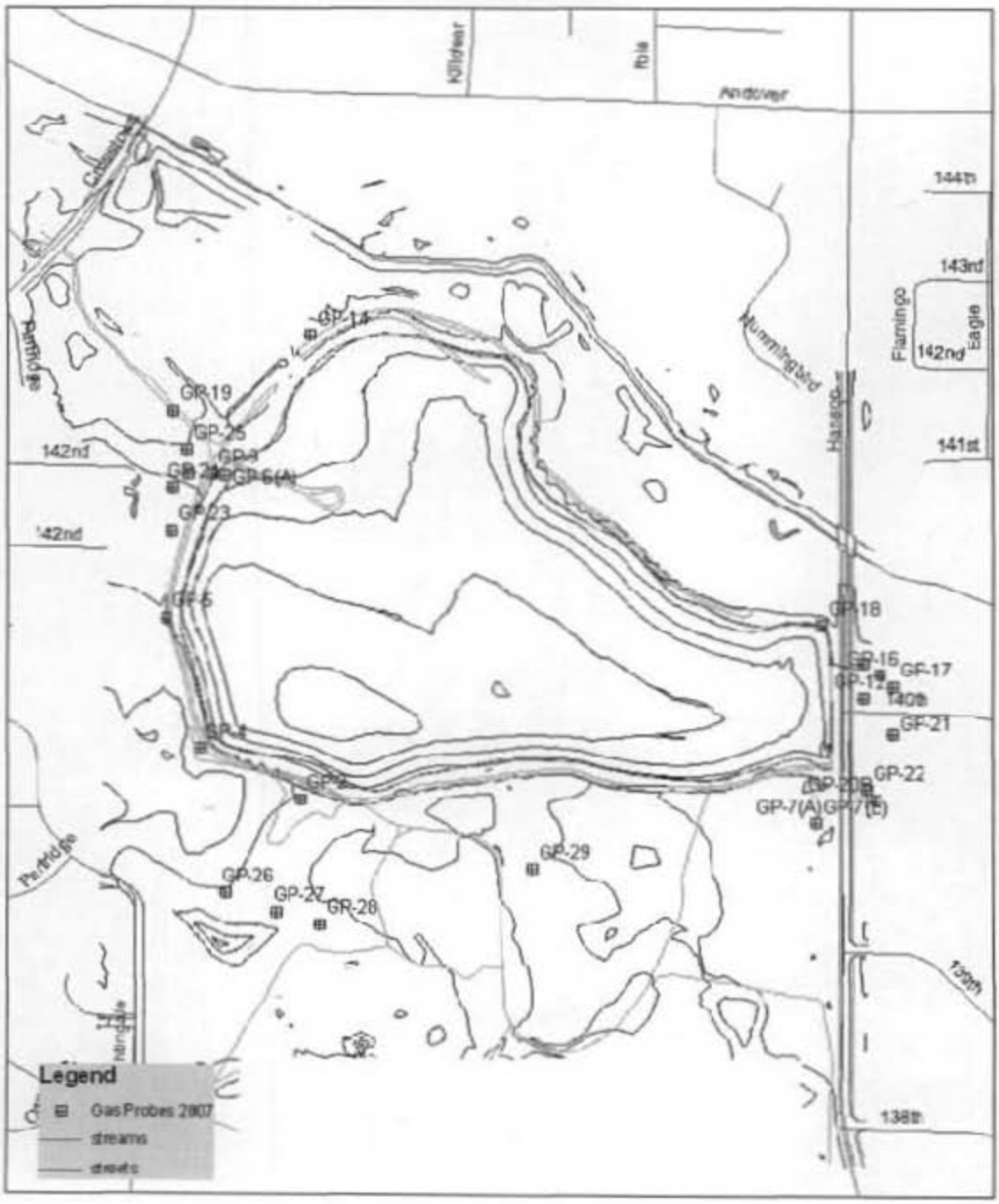


FIGURE 2 - SITE LOCATION MAP (LOCAL)

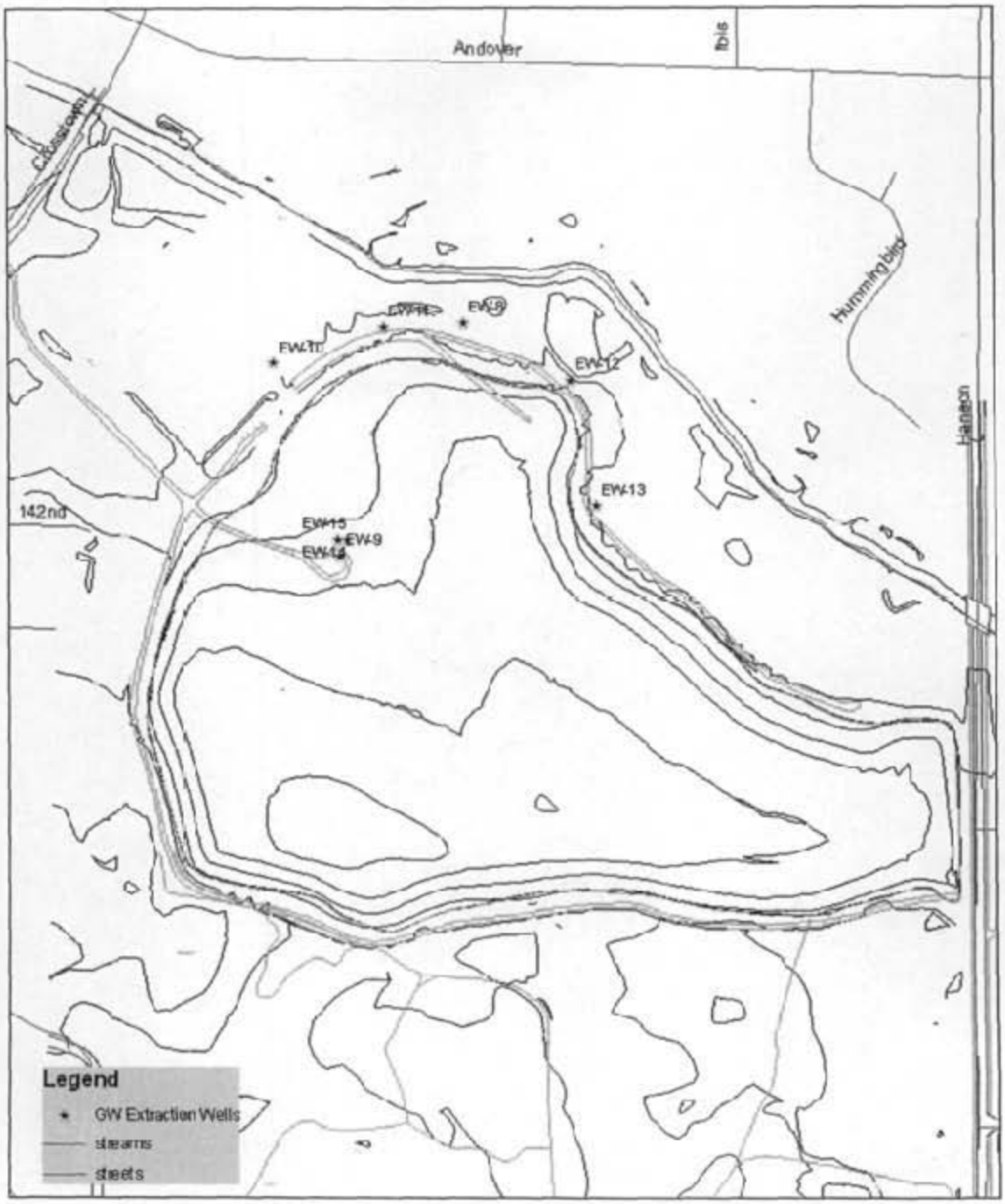
FIGURE 3: Location of Gas Probes around WDE Landfill



175 87.5 0 175 Meters

Minnesota Pollution Control Agency

FIGURE 4: Location of Ground Water Extraction Wells around WDE Landfill

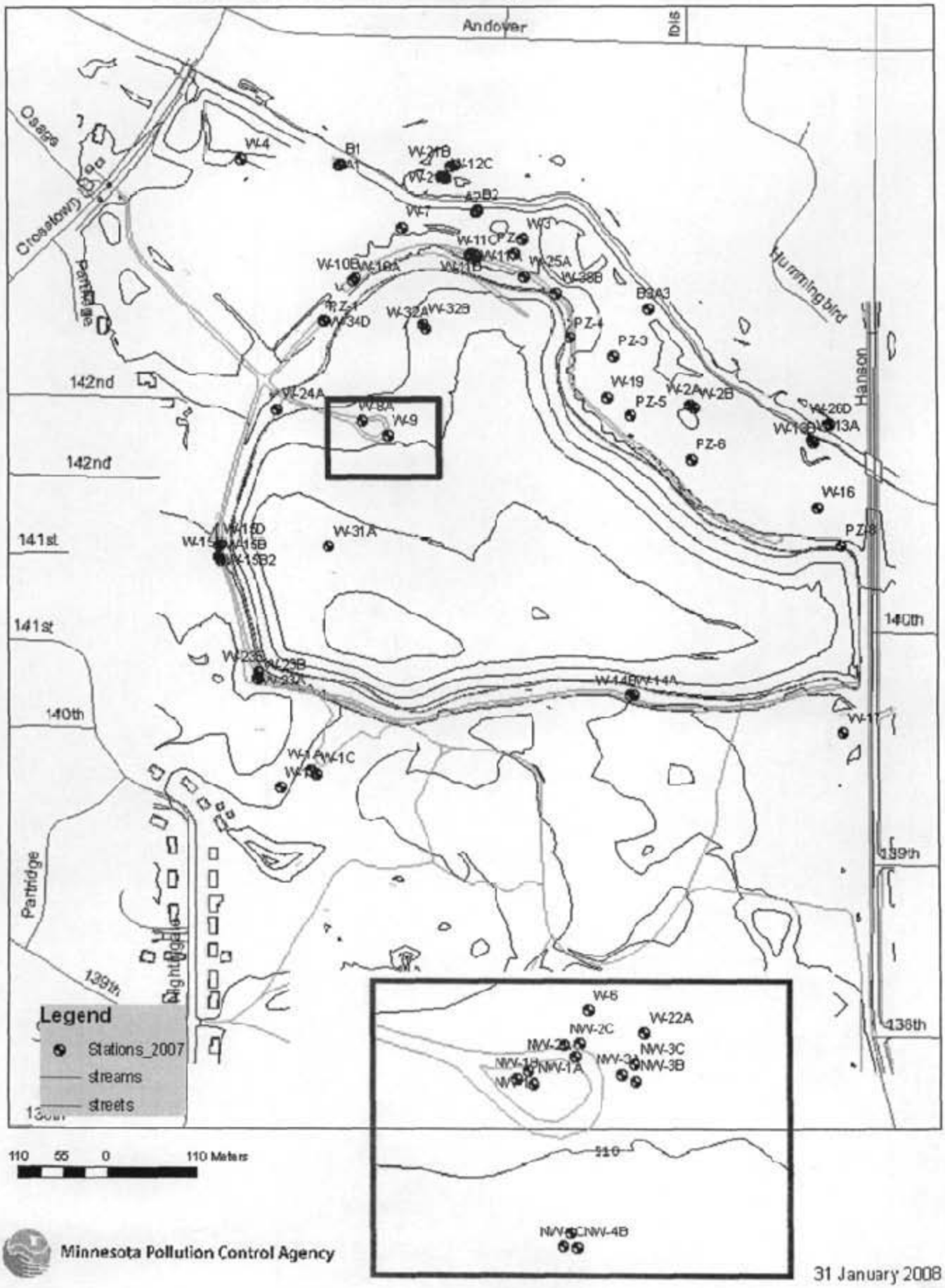


140 70 0 140 Meters

Minnesota Pollution Control Agency

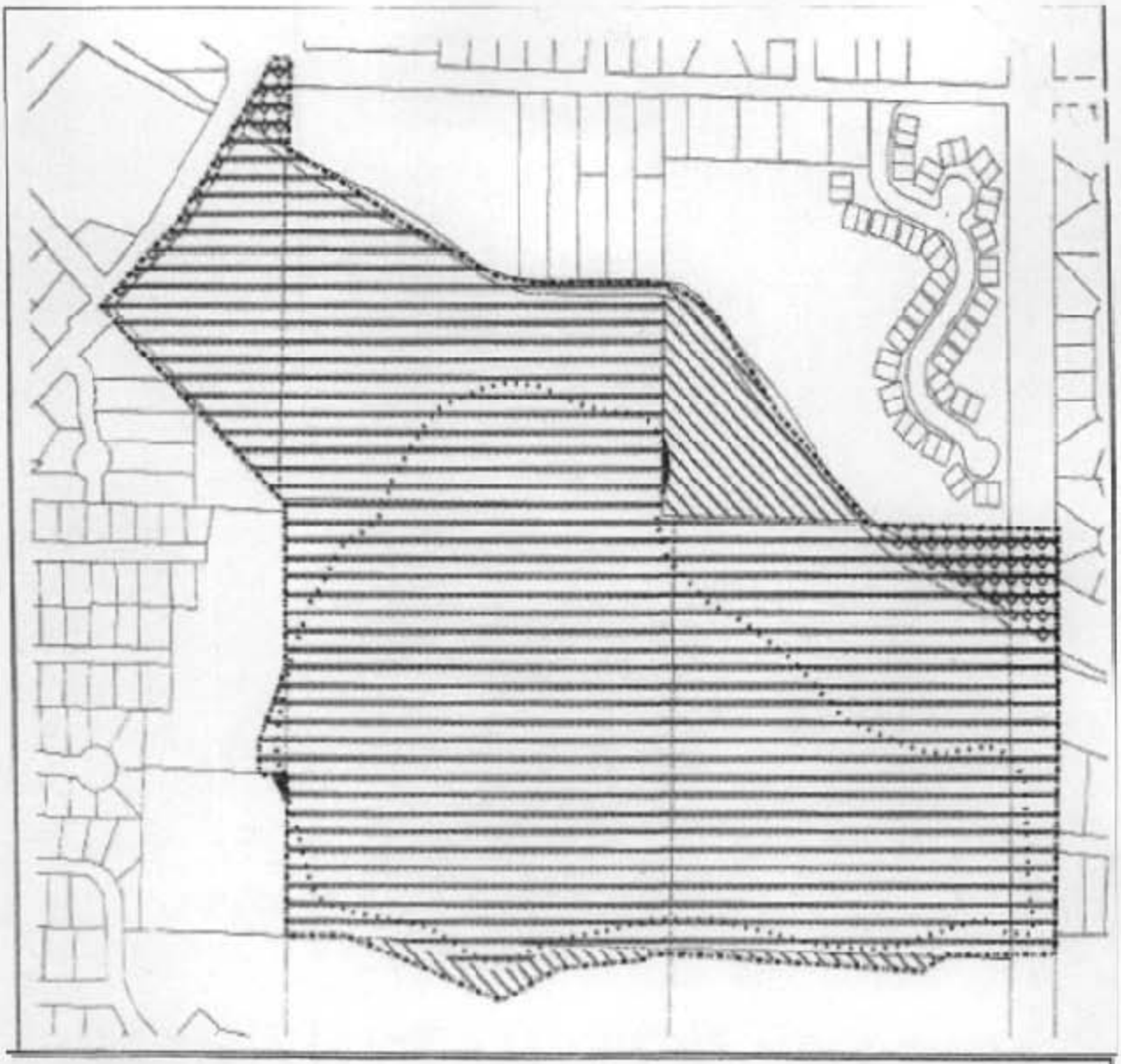
FIGURE 5: Active Monitoring Wells and Piezometers at WDE Landfill

Inset show detail of piezometers and monitoring wells around Hazardous Waste Pit



Minnesota Pollution Control Agency

31 January 2008



Landfill Cleanup Agreement: Document # 1203355

Site boundary
Refuse boundary
Parcel boundaries

500 0 500 Feet

Landfill Cleanup Agreement

"Tax-Forfeited Property": No structures without MPCA approval. Any structure must protect from infiltration of landfill gas. No equipment or materials placed without MPCA approval, except outside fence in Hanson Blvd ROW. No public access or development except in Hanson Blvd ROW (except for existing easements.) No groundwater extraction other than remediation (does not apply to existing wells.) Dewatering for public works must have MPCA approval. No installation of drinking water wells without MPCA approval. No installation of utilities west of Hanson Blvd without MPCA approval. Expansion or reconstruction of Hanson Blvd needs MPCA approval. All restrictions must pass to future owners.

"WDE Qualified Facility": County shall not plant trees or shrubs that might disturb the landfill cap.

"Excluded Property": Land that is part of the WDE facility property but is excluded from most of the restrictions of the Landfill Cleanup Agreement.

Land defined in Landfill Cleanup Agreement as "WDE Qualified Facility", but not included in descriptions of "Tax-Forfeited Property" or "Excluded Property".

WDE lands (according to URS survey, 2003), but not included in Landfill Cleanup Agreement's legal description of "WDE Qualified Facility"

FIGURE 6

Refuse Limits, with 200' and 500' zones

Site boundary

Parcel boundaries

200' from refuse limit, and additional property as shown in City of Andover Ordinance 19, Exhibit A.

500' from refuse limit, and additional property as shown in City of Andover Ordinance 19, Exhibit A.

Waste boundary

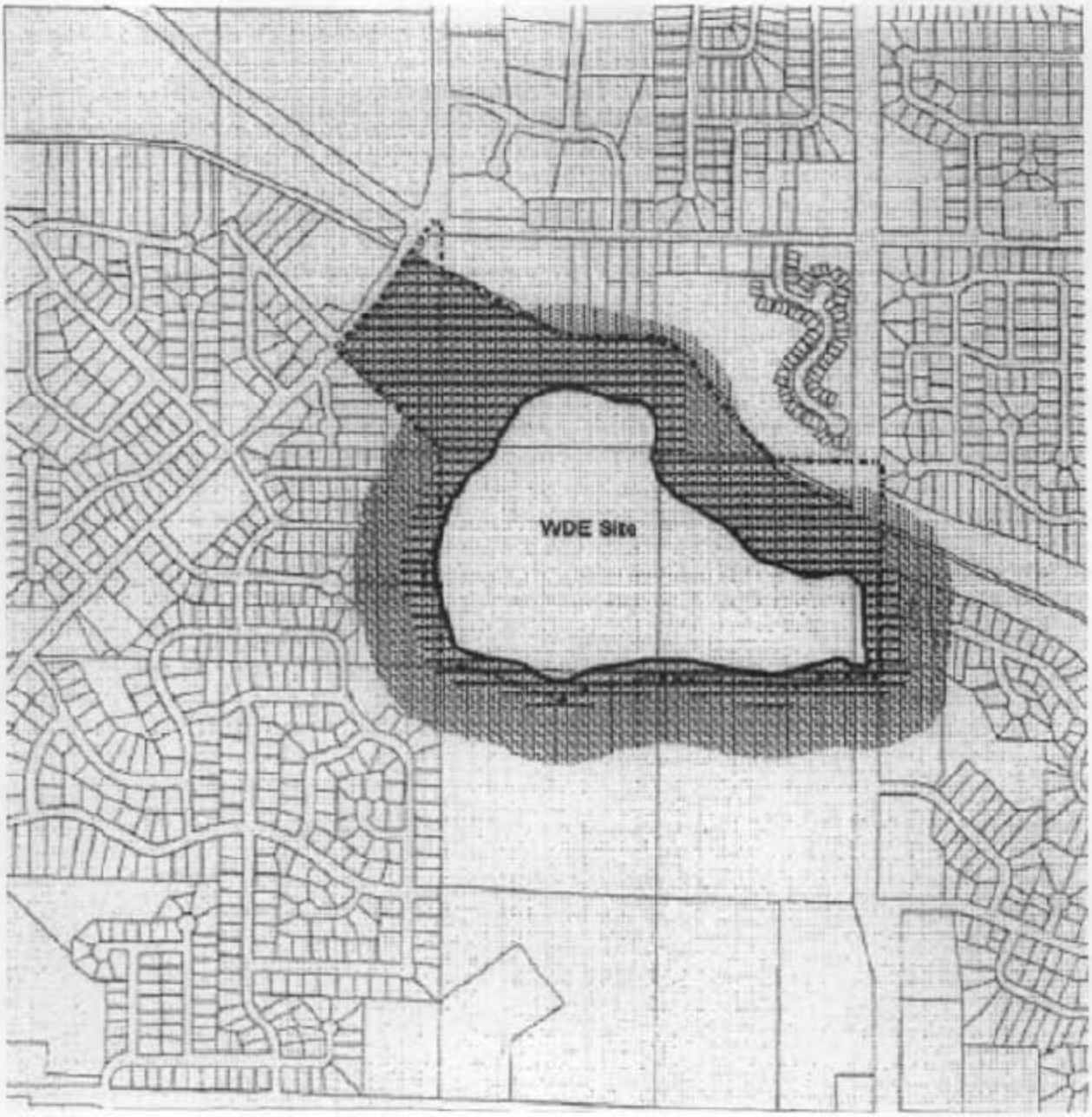
Wetland

800 0 800 Feet

N W E S

Source: City of Andover, URS Corporation survey, 2003

FIGURE 7



Andover City Ordinance 19

Site boundary

Refuse boundary

300' Buffer from refuse boundary, and additional property as shown in Ordinance 19 Exhibit A. No enclosed structures.

200-500' Buffer from refuse boundary, and additional property as shown in Ordinance 19, Exhibit A, excluding areas north of Coon Creek. Enclosed structures must include soil gas monitoring probe and explosive gas monitor.

500' Buffer from refuse boundary, and additional property as shown in Ordinance 19, Exhibit A. No groundwater extraction from Upper Sand Aquifer. Does not apply to existing wells, as long as no material increase in water extracted and drinking water meets standards.

No groundwater extraction from the Lower Sand Aquifer without prior written approval of Commissioner. Does not apply to repair/replacement of existing wells if no material increase in water extracted and drinking water meets standards.

Parcel boundaries

1200 0 1200 Feet

Source: City of Andover

N W E S

FIGURE 8

Memorandum of Institutional Controls (Document #1079894)

800 0 800 Feet

Site boundary

Refuse boundary

200' Buffer from refuse boundary, south of WDE. No development until remedial construction completed.

500' Buffer from refuse boundary, south of WDE. No groundwater extraction from Upper Sand Aquifer.

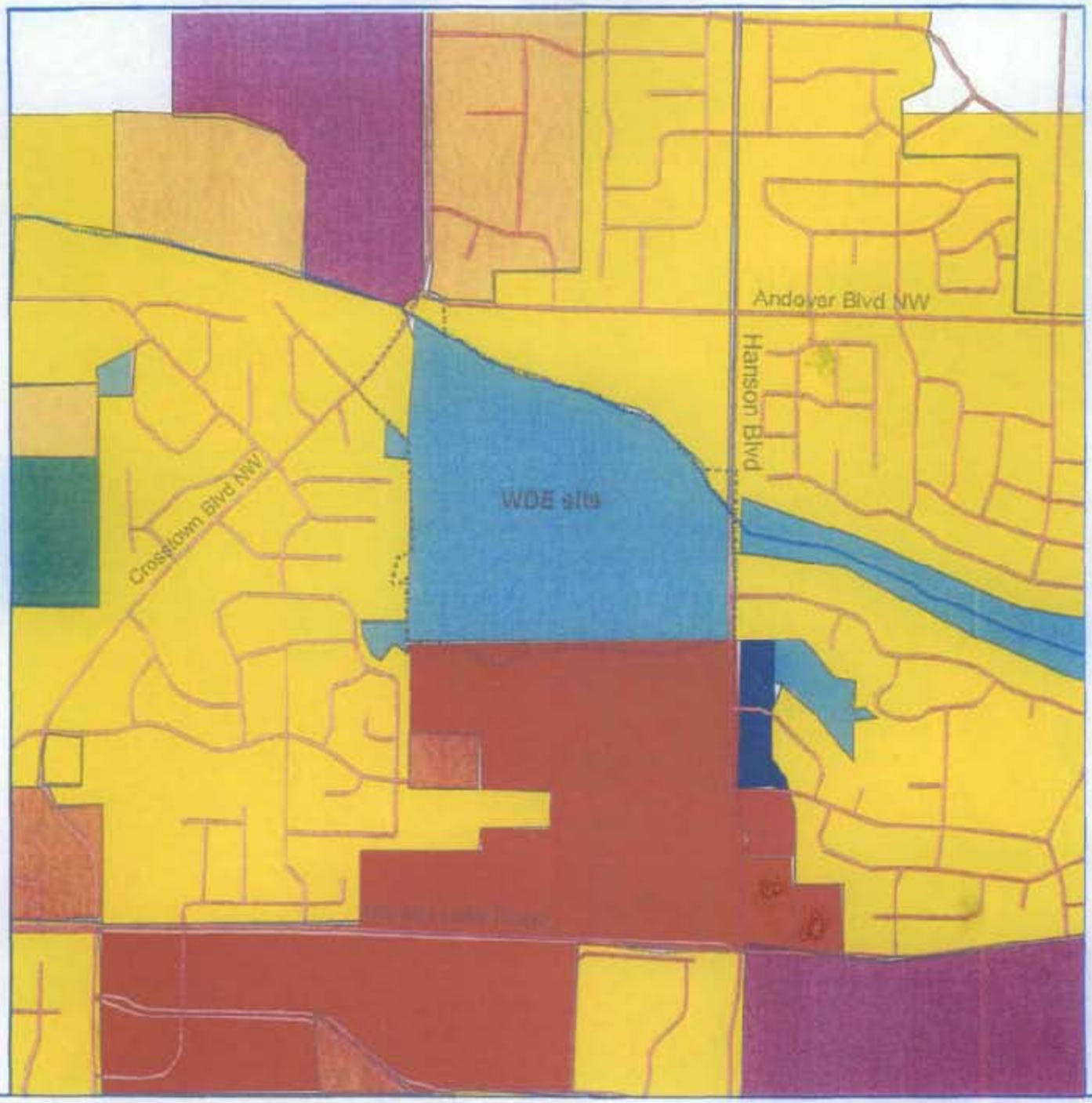
Only non-residential development permitted. No planting of trees or shrubs that may breach portions of cap. No groundwater extraction from Lower Sand Aquifer within this boundary.

Parcel boundaries

N W E S

Source: Anoka County

FIGURE 9



Comprehensive Plan: Guided Land Use

1200 0 1200 Feet

Coon Creek
Site boundary
Local street
Open Space
Agricultural
Limited Commercial/ Medium Density
Neighborhood Commercial
Urban Residential High Density
Transitional Residential
Urban Residential Low Density
Public
General Commercial

Source: City of Andover
January 2003

N
W E
S

FIGURE 10

TABLE 2 - GROUNDWATER SUMMARY [1]; WDE Landfill Site

CONTAMINANT	U.S. EPA MCL (ppb)	PROPOSED MDPH HRL [2] (ppb)	SAMPLE LOCATION (see Fig. 5)	1998 [3] CONC. (ppb)	2007 [3] CONC. (ppb)
Acetone		700	W-3	N/A [4]	< 20
			W-7	N/A	< 20 (May 07)
			W-10A	N/A	< 20
			W-13B	20 (Mar 98)	< 20 (Nov 07)
			W-19	N/A	< 20 (Nov 07)
Benzene	5	5	W-3	15 (Oct 98)	14 (May 07)
			W-7	49 (Dec 98)	< 1 (May 07)
			W-10A	1.8 (Mar 98)	< 1 (May 07)
			W-13B	21 (Mar 98)	15 (Nov 07)
			W-19	2 (Oct 98)	< 1 (Nov 07)
Cumene	N/A	300	W-3	0.9 (Oct 98)	< 1 (May 07)
(a.k.a Isopropylbenzene)			W-7	N/A	< 1 (May 07)
			W-10A	1.3	< 1 (May 07)
			W-13B	3.2 (Mar 98)	< 1 (May 07)
			W-19	0.6 (Mar 98)	< 1 (Nov 07)
1,1-Dichloroethene	7	6	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (Aug 07)
			W-13B	N/A	< 1 (Aug 07)
			W-19	N/A	< 1 (Nov 07)
1,1-Dichloroethane	N/A	70	W-3	0.2 (Jul 98)	< 1 (Nov 07)
			W-7	170 (Dec 98)	1.6 (Aug 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	82 (Oct 98)	22 (May 07)
			W-19	N/A	< 1 ((Nov 07)
1,1-Dichloropropene	N/A	N/A	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (Aug 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	N/A
1,3-Dichloropropene	N/A	2	W-3	N/A	< 1 (Aug 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (Aug 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
Dibromochloromethane	N/A	10	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (Aug 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	N/A	< 1 (May 07)

TABLE 2 - GROUNDWATER SUMMARY [1]; WDE Landfill Site

CONTAMINANT	U.S. EPA MCL (ppb)	PROPOSED MDPH HRL [2] (ppb)	SAMPLE LOCATION (see Fig. 5)	1998 [3] CONC. (ppb)	2007 [3] CONC. (ppb)
			W-19	N/A	< 1 (Nov 07)
1,2-Dichloroethane	5	5	W-3	0.2 (Dec 98)	< 1 (May 07)
			W-7	170 (Dec 98)	< 1 (May 07)
			W-10A	N/A	< 1 (Aug 07)
			W-13B	82 (Oct 98)	< 1 (Aug 07)
			W-19	N/A	< 1 (Nov 07)
Ethylbenzene	700	700	W-3	5 (Oct 98)	< 1 (May 07)
			W-7	41 (Dec 98)	< 1 (May 07)
			W-10A	18 (Jul 98)	< 1 (May 07)
			W-13B	9.4 (Mar 98)	< 1 (Aug 07)
			W-19	0.2 (Mar 98)	N/A
Ethyl ether	N/A	1000	W-3	19 (Oct 98)	14 (May 07)
			W-7	110 (Dec 98)	2 (May 07)
			W-10A	N/A	1.6 (Aug 07)
			W-13B	70 (Mar 98)	29 (May 07)
			W-19	N/A	< 1 (Nov 07)
Methyl ethyl ketone	N/A	4000	W-3	N/A	< 10 (May 07)
			W-7	50 (Oct 98)	< 10 (May 07)
			W-10A	N/A	< 10 (Aug 07)
			W-13B	N/A	< 10 (May 07)
			W-19	N/A	< 10 (Nov 07)
Methyl isobutyl ketone	N/A	300	W-3	N/A	< 5 (Nov 07)
			W-7	N/A	< 5 (Nov 07)
			W-10A	N/A	< 5 (Aug 07)
			W-13B	N/A	< 5 (Nov 07)
			W-19	N/A	< 5 (Nov 07)
Methylene chloride	5	5	W-3	N/A	< 2 (Aug 07)
			W-7	N/A	< 2 (May 07)
			W-10A	N/A	< 2 (Aug 07)
			W-13B	2.6 (Mar 98)	< 2 (Nov 07)
			W-19	N/A	< 2 (Nov 07)
Tetrachloroethene	5	5	W-3	N/A	< 1 (Nov 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
Tetrahydrofuran	N/A	N/A	W-3	80 (Oct 98)	111 (May 07)
			W-7	150 (Oct 98)	9.2 (May 07)
			W-10A	12 (Oct 98)	< 10 (May 07)

TABLE 2 - GROUNDWATER SUMMARY [1]; WDE Landfill Site

CONTAMINANT	U.S. EPA MCL (ppb)	PROPOSED MDPH HRL [2] (ppb)	SAMPLE LOCATION (see Fig. 5)	1998 [3] CONC. (ppb)	2007 [3] CONC. (ppb)
			W-13B	69 (Oct 98)	18 (May 07)
			W-19	N/A	< 10 (Nov 07)
1,1,1-Trichloroethane	200	200	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
1,1,2-Trichloroethane	5	3	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
1,1,2,2-Tetrachloroethane	N/A	2	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
Trichloroethene	5	5	W-3	0.4 (Jul 98)	< 1 (May 07)
			W-7	3 (Dec 98)	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	0.8 (Mar 98)	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
Toluene	1000	1000	W-3	0.8 (Oct 98)	< 1 (May 07)
			W-7	5.1 (Dec 98)	< 1 (May 07)
			W-10A	0.3 (Jul 98)	< 1 (May 07)
			W-13B	0.4 (Dec 98)	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
1,1,2-Trichlorotrifluoroethane	N/A	200000	W-3	N/A	< 1 (May 07)
			W-7	N/A	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	N/A	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)
Vinyl Chloride	2	0.2	W-3	4 (Dec 98)	1.4 (May 07)
			W-7	110 (Dec 98)	< 1 (May 07)
			W-10A	N/A	< 1 (May 07)
			W-13B	7.1 (Dec 98)	0.82 (May 07)
			W-19	N/A	< 1 (Nov 07)
Xylenes	10000	10000	W-3	5.4 (Jul 98)	1.7 (May 07)
			W-7	55 (Jul 98)	< 1 (May 07)

TABLE 2 - GROUNDWATER SUMMARY [1]; WDE Landfill Site

CONTAMINANT	U.S. EPA MCL (ppb)	PROPOSED MDPH HRL [2] (ppb)	SAMPLE LOCATION (see Fig. 5)	1998 [3] CONC. (ppb)	2007 [3] CONC. (ppb)
			W-10A	4.9 (Jul 98)	< 1 (May 07)
			W-13B	2 (Mar 98)	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)

FOOTNOTES FOR TABLE 2

1 This is only a limited summary. Data shown is provided only to suggest the containment effectiveness of the groundwater extraction system. There is some reduction in contaminant concentrations suggesting that operation of the system removes contaminants from groundwater. All values shown are in µg/L or parts per billion (ppb).

2 Health Risk Limit. HRLs are health-based standards developed for each of a list of contaminants in groundwater by the Minnesota Department of Health (MDPH). As of the date of this Five Year Review Report, the MDPH is considering updating HRLs. HRL values in this Table were taken from the following Internet web site: "http://www.health.state.mn.us/divs/eh/groundwater/hrltable.html"

3 Data was obtained from the documents entitled: "WDE Sanitary Landfill; SW-028; 1999 Annual Report" dated March 31, 2000, and the draft Annual Report for 2007~~; not yet released.~~

4 N/A - Not available or not analyzed.

TABLE 2 - GROUNDWATER SUMMARY [1]; WDE Landfill Site

CONTAMINANT	U.S. EPA MCL (ppb)	PROPOSED MDPH HRL [2] (ppb)	SAMPLE LOCATION (see Fig. 5)	1998 [3] CONC. (ppb)	2007 [3] CONC. (ppb)
			W-10A	4.9 (Jul 98)	< 1 (May 07)
			W-13B	2 (Mar 98)	< 1 (May 07)
			W-19	N/A	< 1 (Nov 07)

FOOTNOTES FOR TABLE 2

1 This is only a limited summary. Data shown is provided only to suggest the containment effectiveness of the groundwater extraction system. There is some reduction in contaminant concentrations suggesting that operation of the system removes contaminants from groundwater. All values shown are in µg/L or parts per billion (ppb).

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3 Data was obtained from the documents entitled: "WDE Sanitary Landfill; SW-028; 1999 Annual Report" dated March 31, 2000, and the draft Annual Report for 2007.

4 N/A - Not available or not analyzed.

TABLE 3 - 2007 LANDFILL GAS SAMPLING DATA SUMMARY [1]; WDE Landfill Site

Sample Location (see Figure 3)	Time Period Over Which Data was Collected	Average Methane (Percent)
Ground Flare	Jan. 2007	54.93
Ground Flare	Feb. 2007	52.56
Ground Flare	Mar. 2007	52.15
Ground Flare	Apr. 2007	49.73
Ground Flare	May 2007	Unavailable
Ground Flare	June 2007	45.3
Ground Flare	July 2007	44.33
Ground Flare	Aug. 2007	43.88
Ground Flare	Sept. 2007	44.83
Ground Flare	Oct. 2007	47.75
Ground Flare	Nov. 2007	49.58
Ground Flare	Dec. 2007	50.05
Gas Probe 2	Feb. to Dec. 2007	0
Gas Probe 4	Feb. to Dec. 2007	0
Gas Probe 5	Jan. 2007	0.2
Gas Probe 5	Feb. to Dec. 2007	0
Gas Probe 6(A)	Feb. to Dec. 2007	0
Gas Probe 6(B)	Feb. to Dec. 2007	0
Gas Probe 7(A)	Feb. to Dec. 2007	0
Gas Probe 7(B)	Feb. to Dec. 2007	0
Gas Probe 9	Jan. 2007	0.15
Gas Probe 9	Feb. to Dec. 2007	0
Gas Probe 10	Jan. to Dec. 2007	0.023
Gas Probe 11	Feb. to Dec. 2007	0
Gas Probe 12	Feb. to Dec. 2007	0
Gas Probe 13	Feb. to Dec. 2007	0

TABLE 3 - 2007 LANDFILL GAS SAMPLING DATA SUMMARY [1]; WDE Landfill Site

Sampling Point (see Figure 3)	Date Sample was Collected	Average Methane [2] (Percent)
Gas Probe 14	Feb. to Dec. 2007	0.05
Gas Probe 16	Feb. to Dec. 2007	0
Gas Probe 17	Feb. to Dec. 2007	0
Gas Probe 18	Feb. to Dec. 2007	0
Gas Probe 19	Jan. to Dec. 2007	0.01
Gas Probe 20B	Feb. to Dec. 2007	0
Gas Probe 21	Feb. to Dec. 2007	0
Gas Probe 22	Jan. to Dec. 2007	0.27
Gas Probe 23	Jan. to Dec. 2007	0.36
Gas Probe 24	Jan. to Dec. 2007	0.22
Gas Probe 25	Jan.-Feb. 2007	0.526
Gas Probe 25	Mar. to Dec. 2007	0.02
Gas Probe 26	Sept. & Dec. 2007	0
Gas Probe 27	Sept. & Dec. 2007	0
Gas Probe 28	Sept. & Dec. 2007	0
Gas Probe 29	Sept. & Dec. 2007	0

TABLE 3 - 2007 LANDFILL GAS SAMPLING DATA SUMMARY [1]; WDE Landfill Site

NOTES FOR TABLE 3

1 Data was obtained from the draft MPCA CLP Annual Report for 2007.

2 Data shown is provided only to suggest the effectiveness of the landfill gas collection system and its protectiveness against off Site accumulation of methane to potentially explosive levels. Generally, methane is explosive at levels between 5 and 15 percent.

TABLE 4 - CHRONOLOGICAL GROUNDWATER SUMMARY [1]; WDE Landfill Site

SAMPLE LOCATION (see Fig. 5)	CONTAMINANT	U.S. EPA MCL (ppb)	MDPH PROPOSED HRL or HBV [2] (ppb)	CONCENTRATION (ppb)	DATE COLLECTED
W-2A	Arsenic [3]	10	10	17	Aug-07
W-2A	Benzene	5	5	13	Jul-05
W-2A	Benzene	5	5	8.8	Aug-07
W-2A	Vinyl chloride	2	0.2	7.7	Jul-05
W-2A	Vinyl chloride	2	0.2	20	Oct-05
W-2A	Vinyl chloride	2	0.2	16	Jun-06
W-2A	Vinyl chloride	2	0.2	6.2	Aug-06
W-2A	Vinyl chloride	2	0.2	11	Oct-06
W-2A	Vinyl chloride	2	0.2	9.6	May-07
W-2A	Vinyl chloride	2	0.2	9.2	Aug-07
W-2A	Vinyl chloride	2	0.2	6.4	Nov-07
W-3	Benzene	5	5	13	Apr-05
W-3	Benzene	5	5	11	Jul-05
W-3	Benzene	5	5	17	Oct-05
W-3	Benzene	5	5	13	Jun-06
W-3	Benzene	5	5	18	Aug-06
W-3	Benzene	5	5	17	Oct-06
W-3	Benzene	5	5	14	May-07
W-3	Benzene	5	5	13	Aug-07
W-3	Benzene	5	5	16	Nov-07
W-3	Tetrahydrofuran		100	142	Oct-05
W-3	Tetrahydrofuran		100	111	May-07
W-3	Vinyl chloride	2	0.2	4.9	Jul-05
W-3	Vinyl chloride	2	0.2	1.4	Oct-05
W-3	Vinyl chloride	2	0.2	30	Jun-06
W-3	Vinyl chloride	2	0.2	5	Aug-06
W-3	Vinyl chloride	2	0.2	7.5	Oct-06
W-3	Vinyl chloride	2	0.2	1.4	May-07
W-3	Vinyl chloride	2	0.2	9.2	Aug-07
W-3	Vinyl chloride	2	0.2	12	Nov-07
W-4	Vinyl chloride	2	0.2	12	Oct-05
W-4	Vinyl chloride	2	0.2	0.84	Jun-06
W-4	Vinyl chloride	2	0.2	12	Aug-06
W-4	Vinyl chloride	2	0.2	7	Oct-06
W-4	Vinyl chloride	2	0.2	6.2	May-07
W-4	Vinyl chloride	2	0.2	9.8	Aug-07

TABLE 4 - CHRONOLOGICAL GROUNDWATER SUMMARY [1]; WDE Landfill Site

SAMPLE LOCATION (see Fig. 5)	CONTAMINANT	U.S. EPA MCL (ppb)	MDPH PROPOSED HRL or HBV [2] (ppb)	CONCENTRATION [3] (ppb)	DATE COLLECTED
W-7	Arsenic	10	10	24	Apr-05
W-7	Arsenic	10	10	23	Jul-05
W-7	Arsenic	10	10	20	Oct-05
W-7	Arsenic	10	10	23	Jun-06
W-7	Arsenic	10	10	20	Aug-06
W-7	Arsenic	10	10	20	Oct-06
W-7	Arsenic	10	10	15	May-07
W-7	Arsenic	10	10	16	Aug-07
W-7	Arsenic	10	10	16	Nov-07
W-10B	Arsenic	10	10	23	Apr-05
W-10B	Arsenic	10	10	22	Jul-05
W-10B	Arsenic	10	10	17	Jun-06
W-10B	Arsenic	10	10	17	Aug-06
W-10B	Arsenic	10	10	17	Oct-06
W-10B	Arsenic	10	10	16	May-07
W-10B	Arsenic	10	10	18	Aug-07
W-10B	Tetrahydrofuran		100	160	Apr-05
W-10B	Tetrahydrofuran		100	138	Jul-05
W-10B	Tetrahydrofuran		100	430	Oct-05
W-10B	Tetrahydrofuran		100	320	Jun-06
W-10B	Vinyl chloride	2	0.2	7.5	Jun-06
W-10B	Vinyl chloride	2	0.2	12	Aug-06
W-10B	Vinyl chloride	2	0.2	29	Oct-06
W-10B	Vinyl chloride	2	0.2	1.2	May-07
W-10B	Vinyl chloride	2	0.2	1.6	Aug-07
W-11A	Arsenic	10	10	18	Oct-05
W-11A	Arsenic	10	10	12	Jun-06
W-11A	Arsenic	10	10	34	Jul-05
W-11A	Benzene	5	5	28	Apr-05
W-11A	Benzene	5	5	45	Jul-05
W-11A	Benzene	5	5	36	Jun-06
W-11A	Chloroethane [4]		280 [4]	820	Apr-05
W-11A	Chloroethane		280	2500	Jul-05
W-11A	Ethylbenzene	700	700	950	Jul-05
W-11A	Tetrahydrofuran		100	320	Apr-05
W-11A	Tetrahydrofuran		100	190	Jul-05
W-11A	Tetrahydrofuran		100	540	Jun-06

TABLE 4 - CHRONOLOGICAL GROUNDWATER SUMMARY [1]; WDE Landfill Site

SAMPLE LOCATION (see Fig. 5)	CONTAMINANT	U.S. EPA MCL (ppb)	MDPH PROPOSED HRL or HBV [2] (ppb)	CONCENTRATION (ppb)	DATE COLLECTED
W-11B	Arsenic	10	10	12	Jul-05
W-11B	Benzene	5	5	25	Apr-05
W-11B	Benzene	5	5	20	Jul-05
W-11B	Benzene	5	5	29	Oct-05
W-11B	Chloroethane		280*	1300	Apr-05
W-11B	Chloroethane		280	1020	Jul-05
W-11B	Chloroethane		280	1620	Oct-05
W-11B	Tetrahydrofuran		100	220	Jul-05
W-11B	Tetrahydrofuran		100	290	Oct-05
W-12B	Tetrachloroethene	5	5	10	Apr-05
W-12B	Tetrachloroethene	5	5	12	Jul-05
W-12B	Tetrachloroethene	5	5	12	Oct-05
A1	Tetrahydrofuran		100	360	Jun-06
A1	Tetrahydrofuran		100	360	Aug-06
A1	Tetrahydrofuran		100	290	Oct-06
A1	Vinyl chloride	2	0.2	2.5	Aug-06
A1	Vinyl chloride	2	0.2	4.4	Oct-06
A1	Vinyl chloride	2	0.2	2.2	May-07
A1	Vinyl chloride	2	0.2	1.4	Aug-07
A1	Vinyl chloride	2	0.2	0.96	Nov-07
B2	Arsenic	10	10	16	Aug-06
B2	Arsenic	10	10	12	Oct-06
B2	Arsenic	10	10	12	Aug-07
B2	Benzene	5	5	15	Aug-06
B2	Tetrahydrofuran		100	140	Aug-06
B2	Tetrahydrofuran		100	103	Oct-06
B2	Vinyl chloride	2	0.2	0.76	Nov-07

TABLE 4 - CHRONOLOGICAL GROUNDWATER SUMMARY [1]; WDE Landfill Site

NOTES FOR TABLE 4

1 This is only a limited summary and shows contaminants that exceed cleanup standards on the north side of the Site for 2005 through 2007. All values shown are in µg/L or parts per billion (ppb).

2 HBV are Health Based Values. An HBV is the concentration of a groundwater contaminant, or a mixture of contaminants, that poses little or no risk to health, even if consumed daily over a lifetime. The MDH develops HBVs in response to requests from other Minnesota agencies that have found a contaminant in Minnesota groundwater. HBVs are developed using the same methods and assumptions utilized to develop Health Risk Limits (HRLs). HBVs are therefore similar to HRLs with one significant exception: HRLs have been promulgated as rules; HBVs have not. HBVs shown in this table were taken from the following Internet web site: "http://www.health.state.mn.us/divs/eh/groundwater/hrlgw/chemicals.html."

3 The cleanup standard for Arsenic is taken from the following Internet web sites: "http://www.health.state.mn.us/divs/eh/wells/waterquality/arsenic.html", and: "http://www.epa.gov/safewater/arsenic/index.html."

4 Chloroethane has no HBV yet. The standard shown was obtained from MPCA personnel assigned to the WDE Site. Data for a standard is insufficient for any value as explained in the following Internet web site: http://www.health.state.mn.us/divs/eh/groundwater/hrlgw/chemicals.html#rv.

Appendix A - List of Documents Reviewed

Five Year Review Report

Waste Disposal Engineering Landfill Superfund Site
Andover, Minnesota

Site documents reviewed in preparation of this Five Year Review Report include the following:

1. "Remedial Investigation; WDE Sanitary Landfill; Andover, Minnesota," dated March 1986.

2. Record of Decision signed December 31, 1987.

3. "Remedial Design Report; WDE Sanitary Landfill; Andover, Minnesota," dated February 1994.

4. Preliminary Closeout Report, dated September 27, 1995.

5. "Landfill Cleanup Agreement 269791 Between Anoka County and the Waste Disposal Engineering (WDE) Group and the Commissioner of the Minnesota Pollution Control Agency Pursuant To Minn. Stat. §§ 115b.39-LI5b.46 and 282.019," dated October 27, 1995.

6. "WDE Sanitary Landfill; SW-028; 1999 Annual Report" dated March 31, 2000.

7. "Minnesota Pollution Control Agency's Closed Landfill Program, Annual Report 2001-2002, WDE Sanitary Landfill, SW-028" dated December 10, 2002.

8. Second Five-Year Review Report for Waste Disposal Engineering; City of Andover; Anoka County, Minnesota; April, 2003, signed April 30, 2003.

9. "Minnesota Pollution Control Agency's Closed Landfill Program, Annual Report 2004, WDE Sanitary Landfill, SW-028" dated March 9, 2005.

10. "Minnesota Pollution Control Agency; Land Use Plan; Waste Disposal Engineering Landfill," dated March 30, 2006.

11. U.S. EPA Region 5 Memo to Project File entitled "Expedited Institutional Controls Review, Waste Disposal Engineering Site, Andover, Minnesota," dated June 2006.

12. City of Andover Zoning Map, dated March 2007. (http://www.ci.andover.mn.us/index.asp?Type=B_BASIC&SEC=%7BF205FD14-F591-474D-A9F2-B3A9A06DA5BB%7D&DE=%7BD6E9FFB0-BE57-4C95-B63F-E24FFB162FD2%7D)

13. "Minnesota Pollution Control Agency's Closed Landfill Program, Annual Report 2006, WDE Sanitary Landfill, SW-028" dated May 2, 2007.

APPENDIX B

EPA Reviewing Cleanup at Waste Disposal Engineering Landfill Site

Andover, Minnesota

U.S. Environmental Protection Agency is conducting a five-year review at the Waste Disposal Engineering Landfill Superfund site to determine if the cleanup has remained effective and no new problems have occurred. The Superfund law requires regular reviews (at least every five years) of sites where work on the cleanup is complete but hazardous waste remains managed on-site.

The site is a former waste disposal landfill. Improper disposal of waste contaminated the ground water under the site. A clay cover and ground water treatment system have been installed and landfill gas is collected and treated. Work on the cleanup system was finished in 1998. The first five-year review was completed in 2003.

EPA invites you to comment on the site cleanup. Written and oral comments must be submitted no later than March 28 to:

Cheryl Allen
Community Involvement Coordinator
U.S. Environmental Protection Agency
77 W. Jackson Blvd. (P-19J)
Chicago, IL 60604

allen.cheryl@epa.gov
312-886-7478, or 800-621-8431, Ext. 67478

APPENDIX C
Site Inspection Checklist

I. SITE INFORMATION	
Site name: WASTE DISPOSAL ENGINEERING LANDFILL	**Date of inspection:** TUESDAY, JANUARY 29, 2008
Location and Region: CITY OF ANDOVER, ANOKA COUNTY, MN. U.S. EPA REGION 5	**EPA ID:** MND980609119
Agency leading the five-year review: U.S. EPA * * Collaborative inspection with Minnesota Pollution Control Agency (MPCA)	**Weather/temperature:** OVERCAST, WINDY, NO PRECIPITATION. 0° F
Inspection Team: a. John V. Fagiolo, U.S. EPA Remedial Project Manager; b. Ingrid J. Verhagen , MPCA Senior Hydrogeologist.	

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☒ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager ***

Name	Title
a. Jean M. Hanson	Project Leader. MPCA Closed Landfill Unit, Remediation Division
b. Ingrid J. Verhagen	Senior Hydrogeologist. MPCA Closed Landfill Unit, Remediation Division

Date: 1/29/2008 **

Interviewed ** ☒ at site ☒ at office ☐ by phone ☒ e-mail ☐ Report attached

Phone no.: a. 651-296-7390; b. 651-296-7266

Problems, suggestions, other:

* Individuals listed here are MPCA project managers who operate and maintain the systems at the site and monitor for landfill gas migration under authority of legislation enacted in 1992, (Minn. Laws 1992, Ch. 513, Article 2, Section 2, Subdivision 3). There is no O&M manager present on-site on a full time basis. However, an O&M contractor under the supervision of MPCA visits the site every 7-10 days on average.

** Dates of "interviews" vary from November 2007 to April 2008 and consisted of a collaborative exchange of information between agencies.

2. **O&M staff**: **(MPCA Contractor): Steve Kollodge, P.E.** **Willow Brook Engineering, Site Engineer**
Name Title

Date: **Jan. 2007 to Dec. 2007***

Interviewed ☐ at site ☐ at office ☐ by phone ☒ other * Phone no.: **(763) 753-6038** ☐ Report attached

Problems, suggestions, other; *** Information has been provided in the form of Site Monthly Progress Reports with supplemental information from MPCA. Monthly Progress Reports are included in Appendix D of the Five Year Review Report.**

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

a. Agency: **Minnesota Pollution Control Agency (MPCA)**
Contact: **Jean M. Hanson** **Project Leader. MPCA Closed Landfill Unit, Remediation Division**
Name Title
1/29/2008 **651-296-7390**
Date Phone no.
Problems; suggestions; ☐ Report attached

a. Agency: **Minnesota Pollution Control Agency (MPCA)**
Contact: **Ingrid J. Verhagen** **Senior Hydrogeologist. MPCA Closed Landfill Unit, Remediation Div.**
Name Title
1/29/2008 **651-296-7266**
Date Phone no.
Problems; suggestions; ☐ Report attached

Other: **MPCA CONTACTS THE MINNEAPOLIS/ ST. PAUL METROPOLITAN COUNCIL ENVIRONMENTAL SERVICES (MCES) , MINNESOTA DEPARTMENT OF HEALTH (MDH), THE CITY OF ANDOVER, MINNESOTA DEPARTMENT OF NATURAL RESOURCES AND THE COUNTY OF ANOKA OCCASIONALLY REGARDING SITE RELATED ISSUES AS NEEDED.**

4. **Other interviews** (optional). ☐ Report attached.

NONE.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: **ALL SITE DOCUMENTS ARE UP TO DATE AND AVAILABLE AT MPCA ST. PAUL OFFICES. ON-SITE DOCUMENTS INCLUDE SITE SAFETY PLAN AND O&M MANUAL.**

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A

Remarks: **ALL SITE DOCUMENTS ARE UP TO DATE AND AVAILABLE AT MPCA ST. PAUL OFFICES. ON-SITE DOCUMENTS INCLUDE SITE SAFETY PLAN AND O&M MANUAL.**

3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: **ALL SITE DOCUMENTS ARE UP TO DATE AND AVAILABLE AT MPCA ST. PAUL OFFICES. O&M AND OSHA TRAINING RECORDS ARE ON FILE AT MPCA OFFICE AND WILLOW BROOK ENGINEERING OFFICE.**

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☒ Effluent discharge ☒ Readily available ☒ Up to date ☐ N/A
☒ Waste disposal, POTW ☒ Readily available ☒ Up to date ☐ N/A
☐ Other permits_____

Remarks: **COPIES OF PERMITS ARE AVAILABLE ON FILE IN THE MPCA ST. PAUL OFFICE.**

5. **Gas Generation Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: **THE VOLUMETRIC FLOW OF METHANE AVAILABLE TO THE GAS TO ENERGY PROCESS FROM THE LANDFILL IS RECORDED.**

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:_____

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: **GROUNDWATER MONITORING REPORTS ARE UP TO DATE AND READILY AVAILABLE AT THE MPCA ST. PAUL OFFICE IN ELECTRONIC FORMAT. HARD COPIES ARE ARCHIVED AND CAN BE RETRIEVED IN 2 DAYS.**

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:_____

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☒ Water (effluent) * ☒ Readily available ☒ Up to date ☐ N/A

Remarks *** SAMPLING DATA FROM BOTH THE ON-SITE TREATMENT RETENTION BASIN AND FROM GROUNDWATER MONITORING WELLS IS USED TO DETERMINE WHETHER TREATED WATER CAN BE DISCHARGED TO THE MCES PUBLIC SYSTEM.**

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: **THERE IS NO PUBLIC ACCESS TO SITE. SITE IS COMPLETELY FENCED AND LOCKED, AND REQUIRES MPCA PERMISSION FOR ACCESS. SITE KEYS ARE ONLY AVAILABLE TO MPCA STAFF AND CONTRACTOR PERSONNEL.**

IV. O&M COSTS

1. **O&M Organization**

☒ State in-house ☒ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☒ Readily available ☒ Up to date
☒ Funding mechanism/agreement in place: **MPCA CLOSED LANDFILL PROGRAM FUNDING**

Original O&M cost estimate: **1987 RECORD OF DECISION: APPROX. $202,000 ANNUALLY**
☐ Breakdown attached

Total annual cost by year for review period if available

APPROXIMATE:

JULY 1 2003 TO JUNE 30, 2004:	**$370,000**
JULY 1 2004 TO JUNE 30, 2005:	**$346,000**
JULY 1 2005 TO JUNE 30 2006:	**$259,000**
JULY 1 2006 TO JUNE 30, 2007:	**$702,000**
(ESTIMATED) JULY 1 2007 TO JUNE 30 2008:	**$397,000**

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: **ADDITIONAL GROUNDWATER INVESTIGATION AND MONITORING WELLS WERE INSTALLED USING O&M FUNDS DURING 2006.**

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☒ N/A

Remarks: **GATES AND FENCING ARE IN EXCELLENT CONDITION THROUGHOUT THE SITE.**

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) **O&M CONTRACTOR'S ON SITE OBSERVATIONS.**
Frequency **APPROXIMATELY EVERY 7 TO 10 DAYS WITH REPORTS TO MPCA AS NEEDED.**
Responsible party/agency **MPCA AND MPCA CONTRACTOR (WILLOW BROOK ENGINEERING).**

Contact: **Jean M. Hanson** (Name) **Project Leader. MPCA** (Title) **651-296-7390** (Telephone)

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A
Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: **NONE.** ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☐ N/A

Remarks: **RESIDENTIAL DEVELOPMENT HAS OCCURRED AROUND THE SITE BUT WITH INVOLVEMENT BY MPCA AND MDH. ALL DEVELOPMENT NEAR THE SITE IS IN COMPLIANCE WITH THE REQUIREMENTS OF THE IMPLEMENTED INSTITUTIONAL CONTROLS.**

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable G N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☒ Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☒ N/A or okay
   Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☒ N/A or okay
   Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☒ N/A or okay
   Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Areal extent_____ Depth_____
   Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
   Size_____
   Remarks_____

6. **Excessive Vegetative Growth** Type_____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Areal extent_____
   Remarks_____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
   Remarks: **NO GAS VENTS ARE PRESENT THROUGH THE COVER.**

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
   Remarks: **NO PROBES ARE PRESENT THROUGH THE COVER, ONLY AT SITE PERIMETER.**

3. **Monitoring Wells** (within surface area of landfill)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
   Remarks_____

4. **Leachate Extraction Wells**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
   Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A
   Remarks_____

E. Gas Collection and Treatment ☒ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☒ Thermal destruction ☒ Collection for reuse
☒ Good condition ☐ Needs Maintenance ☒ Other

Remarks: **ACTIVE LANDFILL GAS COLLECTION AND FLARE SYSTEM STARTED UP IN 1998. THE GAS TO ENERGY MODIFICATION WAS CONSTRUCTED IN 2006 AND STARTED UP IN MARCH 2007.**

2. **Gas Collection Wells, Manifolds and Piping**
☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☒ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☒ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☒ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☒ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____ ☐ N/A
☒ Erosion not evident
Remarks_____

3. **Outlet Works** ☒ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☒ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☒ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☒ Functioning ☐ N/A

   Remarks: **SITE DISCHARGE IS FROM A PIPELINE TO MCES MAN-HOLE / STRUCTURE TO THE MCES SEWER SYSTEM.**

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring**
   ☐ Performance not monitored ☐ Evidence of breaching ☒ N/A *
   Type of monitoring: **GROUNDWATER CHEMISTRY AND GROUND WATER ELEVATIONS.**
   Frequency: **QUARTERLY**
   Head differential: **N/A ***
   Remarks: *** SITE CONTAINMENT IS PRIMARILY PROVIDED BY THE GROUNDWATER EXTRACTION WELL SYSTEM. THE BARRIER WALL AROUND THE HAZARDOUS WASTE PIT IS NOT KEYED INTO A CONFINING LAYER. HYDRAULIC MONITORING WOULD NOT PROVIDE USEFUL INFORMATION. NW-A (IN PIT IN SLURRY WALL) TO NW-B (OUTSIDE PIT AND OUTSIDE SLURRY WALL) WELLS REVEALS WHETHER AN INNER GRADIENT IS MAINTAINED BY THE SLURRY WALL. AT NORTHEAST CORNER AN INWARD GRADIENT IS NOT MAINTAINED.**

IX. GROUNDWATER / SURFACE WATER REMEDIES ☒ **Applicable** ☐ **N/A**

A. Groundwater Extraction Wells, Pumps. and Pipelines ☒ **Applicable** ☐ **N/A**

1. Pumps, Wellhead Plumbing. and Electrical
   ☒ Good condition ☒ All required wells properly operating
   ☐ Needs Maintenance ☐ N/A
   Remarks: _____

2. Extraction System Pipelines. Valves, Valve Boxes, and Other Appurtenances
☒ Good condition ☒ All process equipment is properly operating
☐ Needs Maintenance ☐ N/A
Remarks: _____

3. Spare Parts and Equipment
☒ Readily available ☒ Good condition
☐ Requires upgrade ☐ Needs to be provided
Remarks: **O&M CONTRACTOR HAS LOCAL PARTS SUPPLIERS READILY AVAILABLE**

B. Surface Water Collection Structures, Pumps. and Pipelines ☐ **Applicable** ☒ **N/A**

1. Collection Structures, Pumps, and Electrical
☐ Good condition ☐ Needs Maintenance
Remarks: _____

2. Surface Water Collection System Pipelines, Valves, Valve Bolts, and Other Appurtenances
☐ Good condition ☐ Needs Maintenance
Remarks: _____

3. Spare Parts and Equipment
☐ Readily available ☐ Good condition
☐ Requires upgrade ☐ Needs to be provided
Remarks: _____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☒ *Air stripping*+ ☐ *Carbon adsorbers*
☐ Filters _____
☐ Additive (*e.g.*, chelation agent, flocculent) _____

☒ Others: **GROUNDWATER THAT IS SHOWN TO MEET DRINKING WATER HEALTH RISK LEVELS IS ALLOWED TO INFILTRATE BACK TO GROUNDWATER THROUGH AN INFILTRATION BASIN.**

☒ Good condition ☐ Needs Maintenance
☒ Sampling ports properly marked and functional
☒ Sampling/maintenance log displayed and up to date *
☒ Equipment properly identified
☒ Quantity of groundwater treated annually: **APPROX. 60,000,000 GALLONS**
☐ Quantity of surface water treated annually _____

Remarks: +**AIR STRIPPING TAKES PLACE IN LINED TREATMENT BASIN THROUGH THE USE OF AERATORS. * SAMPLING AND MAINTENANCE DOCUMENTATION IS READILY AVAILABLE AT MPCA OFFICE.**

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks _____

3. **Tanks, Vaults, Storage Vessels**
☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks_____

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks_____

5. **Treatment Building(s)**
☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☒ Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____

D. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☐ Applicable ☒ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

THE GOALS OF THE REMEDY IMPLEMENTED AT THE WDE LANDFILL SITE ARE TO: CONTROL POTENTIAL DUST AND/OR VOLATILIZED CHEMICAL EMISSIONS THAT MAY BE INHALED; CONTROL CONTACT WITH THE LIME SLUDGE COVER THAT MAY BE INHALED OR INGESTED AS DUST; CONTROL CONTACT WITH EXPOSED WASTE/ LEACHATE; MINIMIZE RELEASES OF CONTAMINANTS TO THE UPPER SAND AQUIFER; ELIMINATE OR MINIMIZE CONTAMINANT RELEASES TO COON CREEK; REDUCE THE PROBABILITY OF INCOMPATIBLE WASTE REACTIONS; CONTROL FUTURE EXPOSURE TO THE CONTAMINATED UPPER SAND AQUIFER; PROTECT THE LOWER SAND AQUIFER BY CONTROLLING THE VERTICAL GRADIENT AND THE IMPACT OF HEAVIER THAN WATER NON-AQUEOUS PHASE LIQUID (NAPL) ACCUMULATION; AND, CONTROL SOIL GAS MIGRATION. THE ACTIVE GAS COLLECTION AND TREATMENT SYSTEM IS OPERATING AS DESIGNED; GROUND WATER FLOW IS CONTROLLED BY THE

GROUND WATER EXTRACTION SYSTEM; AQUATIC LIFE STANDARDS WERE NOT EXCEEDED DURING 2007 SAMPLING EVENTS IN COON CREEK SAMPLES; THE GROUNDWATER TREATMENT POND IS MEETING MCES STANDARDS PRIOR TO DISCHARGE INTO THE SANITARY SEWER; AND, THE CONTAMINANT PLUME IS EFFECTIVELY BEING CAPTURED BY THE EXTRACTION SYSTEM PRIOR TO ENTERING THE CREEK.

THE RESULTS OF THE SITE INSPECTION, INFORMATION COLLECTION, AND DOCUMENT REVIEW TO DATE SUGGESTS THE REMEDY IS EFFECTIVE AND FUNCTIONING AS DESIGNED.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

THE RESULTS OF THE SITE INSPECTION, INFORMATION COLLECTION, AND DOCUMENT REVIEW TO DATE SHOWS NO ISSUES OR PROBLEMS WITH THE IMPLEMENTATION AND SCOPE OF O&M PROCEDURES.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

THE SITE INSPECTION, INFORMATION COLLECTION, AND DOCUMENT REVIEW TO DATE DOES NOT SUGGEST THAT THE PROTECTIVENESS OF THE REMEDY MAY BE COMPROMISED IN THE FUTURE.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

MPCA CLOSELY REVIEWS THE SITE'S MONITORING RESULTS AND THE REPORTS PROVIDED BY THE O&M CONTRACTOR. THE FREQUENCY OF SITE VISITS BY THE O&M CONTRACTOR AVERAGES APPROXIMATELY 7 TO 10 DAYS BETWEEN VISITS, AND THE CONTRACTOR'S SCOPE REQUIRES IDENTIFICATION AND IMPLEMENTATION (WITH MPCA APPROVAL) OF ANY POTENTIAL OPTIMIZATION OPPORTUNITY. THERE ARE NO OPTIMIZATION ISSUES CURRENTLY OUTSTANDING.

Appendix D

Land Use Plan
Minnesota Pollution Control Agency;
Waste Disposal Engineering Landfill (# SW-028)
March 30, 2006

Minnesota Pollution Control Agency

LAND USE PLAN

WASTE DISPOSAL ENGINEERING LANDFILL

MPCA produced this report with the assistance of Sanders Wacker Bergly, Inc.

March 30, 2006

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B – Fact Sheet: Waste Disposal Engineering Landfill – Closed Landfill issues
C – Potential Hazards at Closed Landfill Sites – WDE Landfill, Andover, Minnesota
D – District CLR – Closed Landfill Restricted

Land Use Plan
Waste Disposal Engineering Landfill

Introduction

In 1994, the Minnesota Legislature adopted the Landfill Cleanup Act (LCA) (currently codified at Minn. Stat. 115B.39 - 115B.445) which created the Closed Landfill Program (CLP). Under the CLP, the Legislature authorized the Minnesota Pollution Control Agency (MPCA) to take over the owner/operator's environmental response action obligations at over 100 closed mixed municipal solid waste landfills throughout the State and initiate cleanup actions, complete closures, and prepare annual evaluations.

As part of these responsibilities, the LCA (Minn. Stat. § 115B.412, subd. 9) requires that the MPCA develop a Land Use Plan for each of the landfills in the CLP. The LCA terms the landfills as "qualified facilities". The statute states:

> The Commissioner shall develop a land use plan for each qualified facility. All local land use plans must be consistent with a land use plan developed under this subdivision. Plans developed under this subdivision must include provisions to prevent any use that disturbs the integrity of the final cover, liners, any other components of any containment system, or the function of any monitoring systems unless the commissioner finds that the disturbance:
> - is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or
> - is necessary to reduce a threat to human health or the environment.

(Appendix A: Land Use Plan Fact Sheet and is available on the MPCA's web page at: www.pca.state.mn.us/cleanup/closedlandfills.html#lup)

Possible Problems Associated with Closed Landfills

Landfill gas migration and ground water contamination are serious concerns associated with many landfills in the CLP; not only at the landfill itself, but also on adjacent property. In several cases, these situations could pose a threat to the health and safety of persons living close to these landfills or to persons associated with some activity either at or in the vicinity of these landfills. Specific examples of these potential threats include explosive concentrations of landfill gas in buildings and other structures at and near the landfill, the risk of inducing contaminated groundwater into other aquifers by constructing groundwater wells in multiple aquifers, and the consumption of contaminated drinking water as the result of constructing potable wells in contaminated aquifers.

Because the MPCA is responsible for the long-term care of these landfills, the MPCA has implemented monitoring programs and corrective actions at most of the sites. The MPCA is not only responsible for addressing the landfill gas and groundwater issues at the facility, but is also responsible for the operation and maintenance (O&M) of the landfill cover, any remediation and monitoring systems present, and site security. In addition, worst case situations sometimes mean that more elaborate remediation systems, such as active gas extraction systems and groundwater treatment systems, need to be constructed and operated at these landfills in order

to help mitigate these problems. Consequently, any future use and development of the landfill property needs to be planned carefully and responsibly and must be compatible with the MPCA's responsibilities for the qualified facility.

Purpose of Land Use Plans

The purpose for preparing a Land Use Plan (LUP), for each landfill, is to protect human health and public safety; and to protect the integrity of the landfill's remediation and monitoring systems. The LUP also helps local government balance needs and desires for land use with consideration for health and safety requirements.

To meet the requirements of the statute, local units of government must make their land-use plans for the qualified facility land (landfill boundary) consistent with the MPCA's land-use plan. In some cases, adoption of a consistent local plan may require a change to local zoning and other land-use measures.

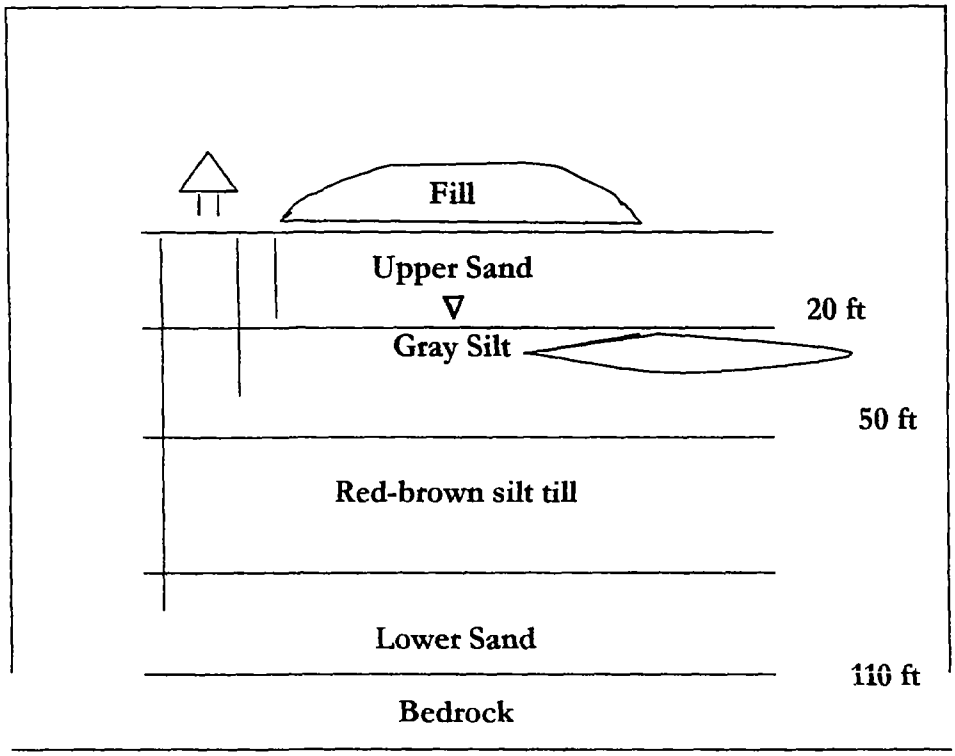
Site Location and Description

The Waste Disposal Engineering Landfill (Landfill) is located in the City of Andover, Anoka County, Minnesota. The Landfill property boundary (Figure 1 *Boundary Survey-URS 2006*)* is bounded on the east by Hanson Boulevard, to the north by Coon Creek, to the west by Crosstown Boulevard, private property, and city park land, and to the south by land owned by the City of Andover's Economic Development Authority. The property comprising the landfill boundary is currently owned by the State of Minnesota, through tax forfeiture and portions by the MPCA.

The Landfill is located in a glacial geomorphic feature referred to as the Anoka Sand Plain. The geology at the site reflects its location. There are two aquifers at the site referred to as the Upper and Lower Sand. The Upper Sand is unconfined and water in this aquifer is found at a depth of 15 to 20 feet below the ground surface at the site. The Upper Sand is approximately 50 feet thick and contains discontinuous gray silt. Monitoring wells with an "A" suffix are vertically placed in the Upper Sand to intersect the water table. Monitoring wells with a "B" suffix are vertically placed at the base of the Upper Sand. The Upper Sand discharges to Coon Creek which is north of the site. The Upper Sand is separated from the Lower Sand by the Grantsburg Till which is characterized at the site by red-brown silts. The Grantsburg Till acts as an impermeable barrier between the two sand aquifers and is up to 40 feet thick below the site. Contamination has not been found in the Lower Sand. Residential wells and monitoring wells with a "D" suffix are screened in the Lower Sand. The thickness of the Lower Sand has not been defined beneath the site but depth to the Lower Sand in the residential and monitoring wells varies from 90 to 110 feet below the ground surface. The bedrock beneath the site is characterized by the St. Lawrence Formation (shales) and has been found south of the site at a depth of 120 feet below the ground surface.

*Footnote: Figure 1 is based on a current survey (March 2006). Figures 2-10 are pdf maps done in the fall of 2004 and therefore, not accurate for the landfill boundary.

General Geology of Site



(The vertical lines represent wells in D, B, and A horizons, from left to right.)

Site History and Remediation System

The site was operated as a private dump for at least ten years prior to the MPCA issuing an operating permit in 1971. The Landfill stopped accepting waste in 1983. The permitted facility is 114 acres, with a fill area of approximately 73 acres. It contains approximately 2,410,000 cubic yards of compacted mixed municipal solid waste and soil cover material. A permitted hazardous waste disposal pit also accepted liquid industrial and hazardous waste from November 1972 to January 1974, at which time the MPCA ordered the pit closed. The Landfill was placed on EPA's National List of Priorities (Superfund) in September 1983. Information included in the EPA 106 Superfund Administrative Order (106 Order) for the Landfill, dated July 26, 1991, indicated a truck load of barrels reportedly broke through the asphalt liner of the hazardous waste pit in November 1972. The repairs were not completed until July 1973. The 106 Order also describes an undetermined quantity of hazardous waste, much of it in bulk loads, disposed throughout the Landfill.

In response to the 106 Order, the Waste Disposal Engineering (WDE) Potential Responsible Parties (PRP) Group installed a ground water pumpout system in 1992 and 1993, and constructed a final cover system in 1993. The ground water pumpout system included eight perimeter pumpout wells to capture the contaminant plume and a single pumpout well located inside a slurry wall constructed around the hazardous waste disposal pit. This was done to create an inward hydraulic gradient thereby minimizing migration of contaminants from the pit area. Two perimeter pumpout wells were manifold together due to low flow rates. The final cover system included regrading the waste prior to constructing a cover and installing twelve passive gas vents and two gas barrier membranes.

During this phase of construction, the ground water from each pumpout well was manifold into a common header before being pumped to a sanitary sewer located in Crosstown Boulevard. Monitoring data indicated that the flash point limit, for the Metropolitan Council Environmental Services Industrial Discharge Permit, was exceeded on three occasions (1993), requiring further treatment of the ground water prior to discharge to the sanitary sewer. Therefore, a tray stripper unit was installed to volatilize contaminants from the waste stream. One flash point exceedance of the tray stripper effluent occurred in November 1995 after the tray stripper unit was installed. However, there have not been any exceedances of flash point since 1995.

In October 1995 Anoka County, the WDE PRP Group and the MPCA signed a Landfill Cleanup Agreement and the MPCA issued the Notice of Compliance. The site was deleted from the National Priorities List by EPA in March 1996. This resulted from the State's 1995 agreement with the EPA, implementation of the CLP, and the signed Landfill Cleanup Agreement which requires the State to assume the long-term care of the Landfill.

The cost of operating the pumpout system, with little indication of near-future decrease in costs, caused MPCA to consider alternatives to more efficiently remove volatile organic compounds from the Landfill. The potential for off-site gas migrating towards nearby private property also influenced MPCA's considerations. The MPCA concluded that it would install an active gas extraction system to remove methane and other volatile organic compounds from the waste and combust them in an enclosed flare. The MPCA has been operating the active gas extraction system, a system which includes 54 gas extraction wells, since 1998.

In 2004, the MPCA installed a new extraction well (EW-8) because the 2003 groundwater monitoring well data indicated that the contaminant plume extends beyond the capture zone of the pumpout system in one location. In addition, because of safety issues surrounding the cleaning of the tray striper, the MPCA redesigned the effluent treatment system and eliminated the need for the tray stripper. The new design pumps extracted groundwater and condensate into a lined treatment basin for pretreatment prior to discharge to the sanitary sewer. The MPCA constructed this new system in the fall of 2004.

A WDE Landfill Fact Sheet is provided as Appendix B and is available on MPCA's web page at: www.pca.state.mn.us/cleanup/closedlandfills.html#factsheets. It highlights historical points, contamination issues and provides MPCA staff contact information.

The MPCA has determined that a gas to energy system is feasible at the Landfill and has received bids to construct the project.

Environmental Impacts from the Landfill

Due to the types of the materials that were disposed of at the Landfill and left on site at the time of its closure, there are numerous public health concerns associated with the Landfill. The toxic materials have migrated into the soil, surface water and ground water. Also, the site continues to generate methane gas, which is explosive when concentrated to certain levels. Remediation procedures such as capping the site, pumping out contaminated groundwater, and extracting and burning the landfill gas have partially mitigated these dangers but public use of land and water, in and near the landfill site, still is not completely safe. In order to protect public health and welfare from these dangers certain land and water uses must be controlled, now and well into perpetuity.

Groundwater Contamination

The influent and effluent data showed a marked decrease in contaminants removed seasonally from the groundwater and the landfill gas. The contaminants that exceed drinking water standards in the groundwater, at the compliance boundary (200 feet from the waste footprint), include arsenic, benzene, vinyl chloride, and 1,1,2,2 tetrachloroethene. Figure 2 represents the Total Volatile Organic Compound (*VOC*) *Contamination at the Base of the Upper Sand* and Figure 3 represents *Flow at the Base of the Upper Sand.* The monitoring wells completed in the lower sand aquifer have not shown VOC contamination from the Landfill. The monitoring wells north of Coon Creek exceeded the Health Risk Limit for 1,1,2,2 tetrachloroethene in 2003. Surface water sampling during 2003 of Coon Creek indicated no exceedance of Aquatic Life Standards.

It is important to note that groundwater contamination has been detected off-site north of the Landfill. Although this Land Use Plan does not address land-use off of the landfill boundary, the MPCA's Annual Report for the Landfill provides detailed information about this off-site concern.

Gas Migration

The active gas extraction system operated 97 percent of the time during 2003. The active gas extraction system is designed to remove landfill gas including methane and volatile organic compounds from the waste and combust them in an enclosed flare. There are 54 gas extraction wells in the Landfill. MPCA installed one of the gas extraction wells in the hazardous waste pit to further reduce ground water contamination. The gas extraction system is controlling gas migration. There were no significant detections of explosive gas beyond the landfill boundaries in 2003. The MPCA tested the flare stack in November 2003. The results indicated that the flare's combustion exceeds 99.9% destruction of combustible organics measured in the inlet gas of the flare.

Land Use Issues

The key document which guides the use of the Landfill is the October 1995 *Landfill Cleanup Agreement: Document # 1203355* (Figure 4) between Anoka County, the WDE PRP Group and the MPCA. It placed the following controls on the Landfill:

- No transfer of any rights in the tax-forfeited property without an easement to the MPCA;
- No sale of any tax-forfeited property improved with state general obligation bond funds without compliance with state law and orders;
- No structures on the tax-forfeited property without prior written approval of the MPCA;
- Any approved structures shall be built to protect occupants from landfill gas infiltration;
- No placement of materials, personal property, equipment, or any other items on the tax-forfeited property without the MPCA's written consent;
- No public access or development of the property except in the Hanson Boulevard right-of-way lying outside the landfill fence and except as defined in other existing easements;
- No trees or shrubs can be planted which may potentially disturb or impede the landfill cover;
- No groundwater extraction from the tax-forfeited property. This does not apply to the repair or replacement of existing wells provided that there is no material increase in the

amount of water extracted. This also does not apply to water extraction that is part of the remedial action;
- Any dewatering for public utility or public road purposes requires the MPCA's prior written approval;
- No drinking water well without written approval of the MPCA and the Minnesota Department of Health;
- Various exceptions and conditions relating to work on Hanson Boulevard and public utilities in the vicinity.

Figure 5 *Refuse limits, with 200' and 500' zones,* identifies the two refuse limit boundaries around the Landfill.

Another key document guiding the use of the Landfill and surrounding property is the *Andover City Ordinance 19* (Figure 6). This ordinance contains the following restrictions:

- No enclosed structures can be built on the Landfill or within 200 feet of WDE refuse limit as depicted by Line F (should be Line E) in Exhibit A (attached to the ordinance), except north of Coon Creek;
- Enclosed structures between 200 feet of refuse (as shown by Line E in Exhibit A) and 500 feet of refuse limit (as shown by Line F in Exhibit A) require installation of soil gas monitoring probe between the structure and the refuse;
- Structures between 200 feet of refuse (as shown by Line E in Exhibit A) and 500 feet of refuse limit (as shown by Line F in Exhibit A) must have explosive gas monitor installed at lowest level;
- MPCA is granted access for monitoring purposes to all monitors and probes that are covered by the ordinance;
- No extraction of groundwater from the Upper Sand Aquifer within 500 feet of limit of refuse. No extraction of groundwater from the Lower Sand Aquifer within area indicated in Exhibit A to the ordinance.

Land use of the Landfill, as well as surrounding properties is also governed by the current city municipal code, easements and land use restriction agreements. Future zoning and land use will be guided by the City of Andover Comprehensive Plan. In addition, there are Federal Emergency Management Agency (FEMA) floodplains and National Wetlands Inventory (NWI) indicated wetlands on the WDE Landfill and surrounding properties (Figure 7 *Wetlands and Floodplains*).

Controls, Easements, Other Restrictions

In addition to the Landfill Cleanup Agreement and the Andover City Ordinance 19, there are multiple documents and regulations which place controls on the Landfill property and adjacent properties. These restrictions come from easements, restrictive covenants, deed conditions, agreements, local, state and federal wetland regulations, Federal Emergency Management Agency (FEMA) restrictions and City of Andover/Coon Creek Watershed District regulations. Following is a list of these documents, a recording number, if applicable and a brief description of the controls:

- Utilities:
  United Power Association Easement (Document #1626332)
  Sewer Easement (Document #820166)
  Rural Cooperative Power Association Easement (Document #297946)

Rural Cooperative Power Association Easement (Document #297578)

- Wetland Conservation Act and Clean Water Act (Section 404)
- Windschitl Access Easement (Document # 1215236): 200' from refuse boundary; no construction of any kind other than city road to connect with 142nd Lane NW; no underground utility construction without MPCA approval; no installation of wells for groundwater extraction from the Upper Sand Aquifer; no extraction from Lower Sand Aquifer; and, gas monitoring equipment required for any enclosed structure.
- Modifications to the Access Agreements: City of Andover Property and NSP Easement.
- Quit Claim Deed (Document #1450970): parcels south of the Landfill.
- Nature's Run Declaration of Restrictive Covenants (Document #1623821): 500' from refuse boundary; no groundwater extraction from Upper Sand Aquifer without prior MPCA approval; and, no groundwater extraction from Lower Sand Aquifer without prior MPCA approval (except existing wells).

The above referenced documents or regulations address multiple land use issues as highlighted below:

- Development/Grading/Construction Restrictions
- Upper Sand Aquifer Groundwater Restrictions
- Lower Sand Aquifer Groundwater Restrictions
- Building Restrictions
- Planting Restrictions
- Utilities
- Fences
- Roadways
- Soil/Minerals
- Wetland and Floodplain Restrictions
- Zoning Restrictions

Sanders Wacker Bergly developed Figure 8, *All Development Restriction*, to aid those interested in identifying these multiple restrictions.

Hazard Disclosure Document

The MPCA had a Hazard Disclosure Document (2004) developed for the Landfill. The purpose of the document is to inform the MPCA's contractors and consultants about a broad range of hazards that they could encounter when working at the facility. A copy of the Hazard Disclosure Document is included in this LUP to better inform interested persons and units of government of the types of potential hazards that exist at the Landfill. The document highlights physical, biological, and chemical hazards. A copy of the *Potential Hazards at Closed Landfill Sites* is included as Appendix C.

Existing and Future Land Use

The MPCA will continue its long-term care responsibility for the Landfill including monitoring of groundwater and landfill gas, operating the active gas extraction system, and other maintenance responsibilities for as long as necessary. Due to public safety concerns, the MPCA will continue to prohibit public access onto the site without its authorization. At this time, the MPCA believes the appropriate land use for the site for the foreseeable future is open space with no public use or development. The City of Andover's *Comprehensive Plan: Guided Land Use* (Figure 9), identifies the Landfill as Open Space. In Figure 10, *Zoning Districts*, the zones are identified

and the majority of the Landfill is zoned R-1 – Single Family, with additional areas zoned R-4 – Single Family-Urban and GB – General Business.

Discussions / Conclusions

Andover City Ordinance 19 - Recommendation

The MPCA's consultant, Sanders Wacker and Bergly, Inc., reviewed documents pertaining to the WDE Landfill including Andover City Ordinance 19. Based upon that review, the MPCA is recommending that the Ordinance 19 be amended as follows:

- In Section 7.1. the 200-foot limit is mistakenly referred to as Line F, instead of Line E
- Exhibit A (a site map) should be attached to the Ordinance (it is referenced).
- In Section 7.4. the language regarding the 500-foot limit should include a reference to Line F.

The City of Andover adopted Ordinance 19 by resolution in January 1996. It has not been incorporated into the City Zoning Code, Subdivision Code, or other information sources that the City hands out to prospective property developers. Without inclusion of Ordinance 19 in codes, plans, and handouts, there is a danger that prospective developers may not become aware of the Ordinance until after significant decisions have been made. It also appears to pose a challenge for City planning staff to keep track of the requirements of Ordinance 19 since staff does not need to refer to it on a regular basis. Therefore, the MPCA recommends that the City of Andover incorporate Ordinance 19 into an informational source that would be used by developers and City staff (i.e. City Zoning Code).

Qualified Facility

State statute requires that all local land-use plans be consistent with the MPCA's Land Use Plan for the qualified facility. The MPCA's environmental response action obligations for the qualified facility conflict with the current zoning, for this property (Figure 10 *Zoning Districts*). The MPCA believes the R-1 – Single Family – Rural, R-4 – Single Family – Urban and GB – General Business zonings, are not compatible with the MPCA's present and future responsibilities for the qualified facility due to public health and safety concerns and the need to preserve the integrity of the Landfill's remediation systems. It is misleading to potential developers, property owners, or any other interested parties, for the Landfill to be zoned for residential use.

As a result, the MPCA recommends that the City of Andover amend its land use plan and adopt a new zoning district and ordinance specific to the qualified facility. The recommended zoning district is called Closed Landfill Restricted (CLR). A draft ordinance is included as Appendix D.

Property Outside the Qualified Facility

Unlike the qualified facility, the State statute requiring the development of an LUP at closed landfills does not apply to property outside of the qualified facility. However, Minn. Stat. § 115B.412, subd. 4(a) requires the MPCA to provide affected local units of government with site information including a description of the types, locations, and potential movement of hazardous substances, pollutants and contaminants, or decomposition gases related to the landfill. Furthermore, Minn. Stat. § 115B.412, subd. 4(b) requires local units of government to notify persons applying for a permit to develop affected property of the existence of this information and, on request, to provide them a copy of the information. Lastly, the MPCA understands that

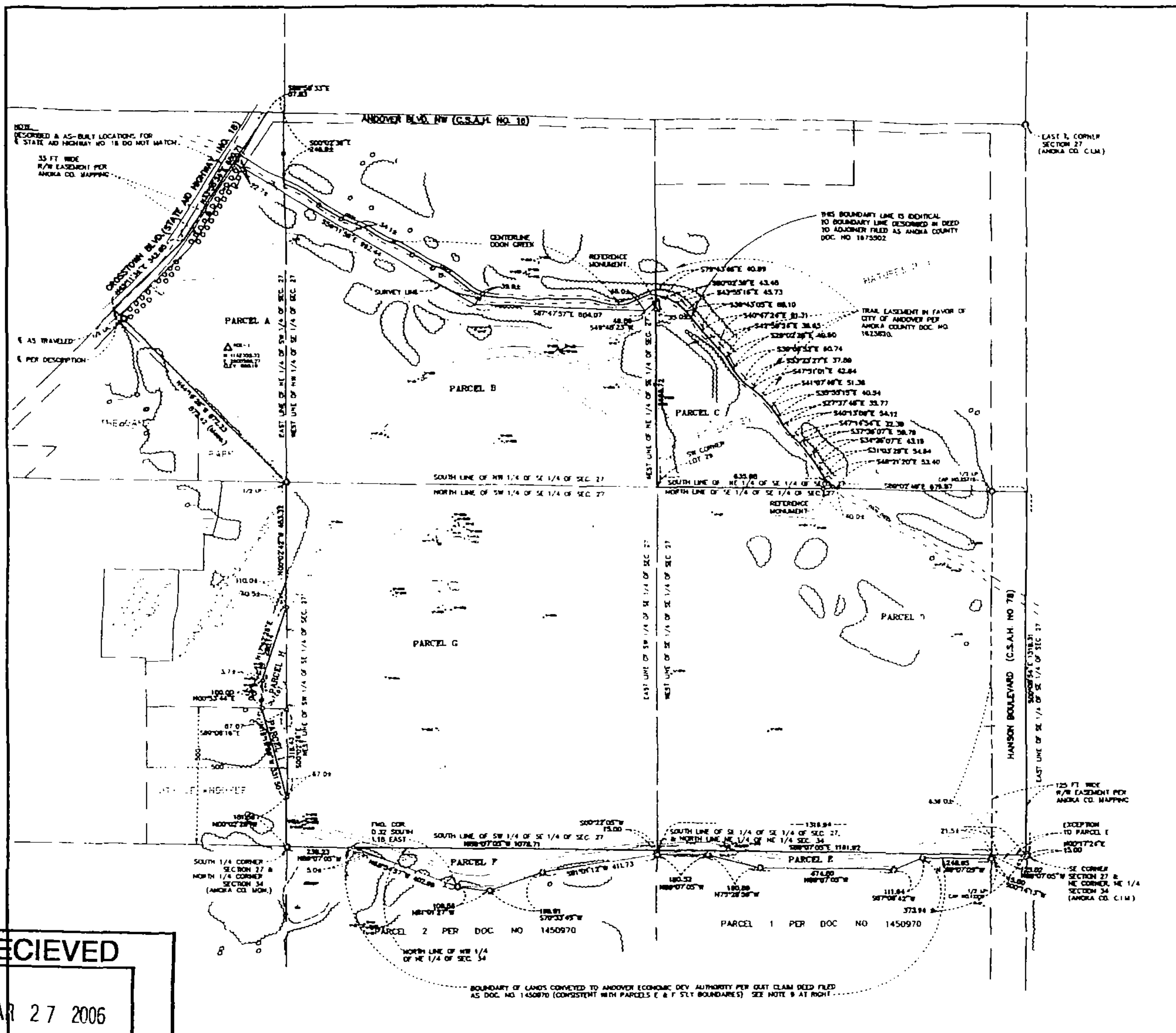
Minn. Stat. § 115B.412, subd. 4(b) requires local units of government incorporate this information in its future land-use planning efforts.

The MPCA refers the City of Andover and any prospective persons interested in developing property near the Landfill to the MPCA's latest Annual Report for the WDE Landfill, which is on the MPCA's web site at: www.pca.state.mn.us/cleanup/clp-sitereports.html. The Annual Report summarizes the information listed above and serves to fulfill the MPCA's obligation in this regard.

FIGURES

Minn. Stat. § 115B.412, subd. 4(b) requires local units of government incorporate this information in its future land-use planning efforts.

The MPCA refers the City of Andover and any prospective persons interested in developing property near the Landfill to the MPCA's latest Annual Report for the WDE Landfill, which is on the MPCA's web site at: www.pca.state.mn.us/cleanup/clp-sitereports.html. The Annual Report summarizes the information listed above and serves to fulfill the MPCA's obligation in this regard.



LEGEND

Symbol	Meaning	Symbol	Meaning
	FENCE		DENOTES FOUND MONUMENT MARKED WITH PLASTIC CAP INSCRIBED "ANOKA COUNTY" UNLESS OTHERWISE NOTED
	TREE LINE		
— 880 —	ORIGINAL CONTOUR		DENOTES SET MONUMENT (14" x 5/8" REBAR MARKED WITH YELLOW PLASTIC CAP INSCRIBED LAND CORNER R.L.S. 18418
	PROPERTY BOUNDARY		
890	FINAL CONTOUR		UTILITY POLE
	OBSERVATION WELL		RADIO, TV TOWERS
	BORE HOLE		TOP SECURITY MONUMENT
	GAS PROBE		SWAMP SYMBOL
	SOIL BORING		TREE
	SANITARY SEWER LINE	(S)	SANITARY MANHOLE
	STORM SEWER LINE	(D)	STORM MANHOLE
			EXTRACTION WELL

200 100 0 200
SCALE IN FEET

ZONING (FROM THE CITY OF ANDOVER)

PARCEL A - R4 SINGLE FAMILY URBAN
PARCEL B - R1 SINGLE FAMILY RURAL
PARCEL C - NOT ASSIGNED BY CITY AS OF 12/27/2002
PARCEL D - R1 SINGLE FAMILY RURAL
PARCEL E - GB GENERAL BUSINESS
PARCEL F - GB GENERAL BUSINESS
PARCEL G - R1 SINGLE FAMILY RURAL
PARCEL H - R4 SINGLE FAMILY URBAN

BUILDING SET-BACK REQUIREMENTS (FROM THE CITY OF ANDOVER)

HANSON BLVD. (C.S.A.H. NO 78) - 50 FT
CROSSTOWN BLVD. (CO. RD. NO. 18) - 50 FT
COON CREEK OR WETLAND - 16 FT
INTERIOR LOT LINE - 10 FT
REAR LOT LINE - 50 FT

LANDFILL BOUNDARY DESCRIPTION

PARCEL A
(P.I.D. # 27-32-24-31-0007)

All that part of the Northwest Quarter of the Southeast Quarter of Section 27 Township 32 Range 24 Anoka County Minnesota, described as follows:

Commencing at the northeast corner of said Northeast Quarter of the Southeast Quarter, thence westerly along the north line thereof for 58.6 feet to the center line of County State Aid Highway No. 18, thence South 32 degrees 55 minutes West for 550.17 feet along said center line, thence South 44 degrees 11 minutes West for 342.85 feet along said center line, thence South 45 degrees 28 minutes East for 872.00 feet to the southeast corner of said Northeast Quarter of Southeast Quarter thence north along the East line of said Northwest Quarter of the Southeast Quarter to the point of commencement.

Subject to an easement to R.E.A. and other easements of record, if any

Subject to the rights-of-way of C.S.A.H. No. 16 and C.S.A.H. No. 18.

PARCEL B
(P.I.D. # 27-32-24-42-0001)

All that part of the Northwest Quarter of Southeast Quarter of Section 27 Township 32 Range 24, Anoka County, Minnesota, lying south of the center line of Coon Creek.

PARCEL C
(P.I.D. # 27-32-24-41-0122)
That part of Lot 29, Block 1, NATURES RUN C.I.C. NO. 86, Anoka County, Minnesota, described as follows:

Beginning at the Southwest corner of said Lot 29, said corner being also the southwest corner of Northeast Quarter of the Southeast Quarter of Section 27, Township 32, Range 24; thence on a assumed bearing of North 00 degrees 07 minutes 18 seconds West along the most westerly line of said Lot 29 a distance of 888.72 feet; thence South 79 degrees 45 minutes 19 seconds East a distance of 40.89 feet; thence South 60 degrees 04 minutes 12 seconds East a distance of 43.45 feet; thence South 43 degrees 58 minutes 40 seconds East a distance of 45.73 feet; thence South 38 degrees 44 minutes 38 seconds East a distance of 88.10 feet; thence South 40 degrees 48 minutes 37 seconds East a distance of 81.31 feet; thence South 43 degrees 00 minutes 57 seconds East a distance of 36.65 feet; thence South 28 degrees 03 minutes 58 seconds East a distance of 48.60 feet; thence South 38 degrees 08 minutes 25 seconds East a distance of 60.74 feet; thence South 53 degrees 25 minutes 00 seconds East a distance of 37.89 feet; thence South 47 degrees 52 minutes 34 seconds East a distance of 42.84 feet; thence South 41 degrees 09 minutes 22 seconds East a distance of 81.36 feet; thence South 35 degrees 56 minutes 48 seconds East a distance of 40.34 feet; thence South 27 degrees 38 minutes 19 seconds East a distance of 35.77 feet; thence South 40 degrees 14 minutes 42 seconds East a distance of 54.12 feet; thence South 47 degrees 16 minutes 27 seconds East a distance of 32.38 feet; thence South 37 degrees 37 minutes 48 seconds East a distance of 58.78 feet; thence South 34 degrees 27 minutes 40 seconds East a distance of 43.18 feet; thence South 31 degrees 05 minutes 02 seconds East a distance of 54.84 feet; thence South 48 degrees 22 minutes 53 seconds East a distance of 53.40 feet to the most southerly line of said Lot 29; thence North 88 degrees 04 minutes 22 seconds West along the most southerly line of said Lot 29 a distance of 635.88 feet to the Point of Beginning.
(As described in Quit Claim Deed filed as Anoka County Doc. No. 1649763)

PARCEL D
(P.I.D. # 27-32-24-44-0001)

The Southeast Quarter of Southeast Quarter Section 27 Township 32 Range 24, Anoka County, Minnesota.

Subject to the right-of-way of County Road No. 78.

PARCEL E
(P.I.D. # 34-32-24-11-0002)

All that part of the Northeast Quarter of Northeast Quarter of Section 34 Township 32 Range 24, Anoka County, Minnesota, described as follows:

Beginning at northeast corner of the Northeast Quarter of Northeast Quarter, thence North 89 degrees 08 minutes 38 seconds West along north line of said Northeast Quarter of Northeast Quarter 1316.94 feet to the northwest corner of said Northeast Quarter of Northeast Quarter, thence South 0 degrees 18 minutes 44 seconds West along west line of said Northeast Quarter of Northeast Quarter, 15 feet, thence South 89 degrees 08 minutes 38 seconds East 180.52 feet, thence South 75 degrees 30 minutes 33 seconds East 190.88 feet, thence South 89 degrees 08 minutes 38 seconds East 474.80 feet, thence North 87 degrees 05 minutes 08 seconds East 111.84 feet, thence South 89 degrees 08 minutes 38 seconds East 373.94 feet more or less to a point on east line of said Northeast Quarter of Northeast Quarter, thence North 0 degrees 15 minutes 45 seconds East along said east line 15 feet to the point of beginning, except road, subject to easement of record.

PARCEL F
(P.I.D. # 34-32-24-12-0002)

All that part of the Northwest Quarter of Northeast Quarter of Section 34 Township 32 Range 24, Anoka County, Minnesota, described as follows:

Beginning at northeast corner of said Northwest Quarter of Northeast Quarter, thence North 89 degrees 08 minutes 38 seconds West along north line of said Northwest Quarter of Northeast Quarter, 1078.71 feet, thence South 68 degrees 56 minutes 31 seconds East 402.99 feet, thence South 81 degrees 03 minutes 01 seconds East 109.58 feet, thence North 70 degrees 32 minutes 11 seconds East 198.91 feet, thence North 80 degrees 59 minutes 38 seconds East 411.73 feet more or less to a point on the east line of said Northwest Quarter of Northeast Quarter, 15 feet southerly of the point of beginning, thence North 0 degrees 18 minutes 44 seconds East along said east line 15 feet to the point of beginning, subject to easement of record.

PARCEL G
(P.I.D. # 27-32-24-43-0001)

The Southwest Quarter of Southeast Quarter of Section 27 Township 32 Range 24, Anoka County, Minnesota.

PARCEL H
(P.I.D. # 27-32-24-34-0038)

Outlot A, Kensington Estates 4th Addition, according to the recorded plat thereof, Anoka County, Minnesota.

PARCEL I
(Part of P.I.D. # 27-32-24-34-0003)

All that part of the southerly 500.00 feet of the easterly 500.00 feet of the Southeast Quarter of the Southwest Quarter of Section 27, Township 32, Range 24, Anoka County, Minnesota, described as follows:

Beginning at the northeast corner of said southerly 500.00 feet of the easterly 500.00 feet, said northeast corner also being the southeast corner of OUTLOT A, KENSINGTON ESTATES 4TH ADDITION, according to the recorded plat thereof; thence on an assumed bearing of North 88 degrees 06 minutes 18 seconds West along the northerly line of said southerly 500.00 feet of the easterly 500.00 feet and the southerly line of said OUTLOT A for 87.07 feet to the southwest corner of said OUTLOT A, thence South 15 degrees 15 minutes 57 seconds East for 331.50 feet to the easterly line of said Southeast Quarter of the Southwest Quarter; thence North 00 degrees 02 minutes 28 seconds West along said easterly line for 318.44 feet to the point of beginning.

NOTES

1.) COORDINATE DATUM AND BEARING BASIS: MINNESOTA STATE PLANE NAD 83 (1986) US FEET
2.) VERTICAL DATUM: NGVD 29 US FEET
3.) TOPOGRAPHIC DATA (BASE MAPPING) FROM CARL BOLANDER & SONS INC. 1993/1994, SUPPLEMENTED BY GLENN RENBECK COMPANIES JULY, 1998 AND SUNDE LAND SURVEYING SEPTEMBER 1999
4.) POSITION OF PERIMETER FENCE DETERMINED BY URS FIELD SURVEY 10/15/02
5.) MANHOLE LOCATIONS AND INVERT INFORMATION ON CO. RD. 16 OBTAINED BY URS FIELD SURVEY 12/18/02
6.) AREA = 5,196,426 SQ. FT. (119.293 AC.) GROSS
5,000,702 SQ. FT. (114.800 AC.) NET (LESS ROAD RIGHT-OF-WAY)
7.) ROTATE BEARINGS FOR PARCEL A AS DESCRIBED 358°56'26" CLOCKWISE TO MATCH BASIS OF BEARINGS SHOWN HEREON
ROTATE BEARINGS FOR PARCEL C AS DESCRIBED 00°01'33" CLOCKWISE TO MATCH BASIS OF BEARINGS SHOWN HEREON
ROTATE BEARINGS FOR PARCELS E & F AS DESCRIBED 179°58'26" CLOCKWISE TO MATCH BASIS OF BEARINGS SHOWN HEREON
8.) ORIGINAL DATE OF ISSUE - 12/27/03
9.) PER QUIT CLAIM DEED FROM THE CITY OF ANDOVER TO THE ANDOVER ECONOMIC DEVELOPMENT AUTHORITY PARCELS 1 AND 2 SHOWN HEREON (LYING SOUTHERLY OF AND ADJACENT TO SURVEYED PARCELS E & F) ARE SUBJECT TO THE FOLLOWING CONDITIONS

NO DEVELOPMENT OR ALTERATION OF ANY PORTIONS OF SAID PARCELS 1 & 2 LYING WITHIN 200 FEET OF THE SOUTHERLY BOUNDARIES OF SURVEYED PARCELS E & F

NO DEVELOPMENT OR ALTERATION OF THE NORTH 425 FEET OF THE WEST 450 FEET OF NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 34 (PROHIBITS DEVELOPMENT OF THAT PART OF PARCEL 2 SHOWN HEREON LYING THE ABOVE DESCRIBED AREA

NO ATHLETIC FIELDS (INCLUDING OUTFIELDS) MAY BE CONSTRUCTED WITHIN 65 FEET OF THE SOUTHERLY BOUNDARIES OF SURVEYED PARCELS E & F

NO SHRUBS OR TREES MAY BE PLANTED WITHIN 50 FEET OF THE SOUTHERLY BOUNDARIES OF SURVEYED PARCELS E & F

SUBJECT TO THE NEED FOR ENVIRONMENTAL MONITORING & RESPONSE ACTIONS, NO GROUNDWATER MAY BE EXTRACTED WITHIN 500 FEET OF THE SOUTHERLY BOUNDARIES OF SURVEYED PARCELS E & F

ANY BUILDINGS CONSTRUCTED ON PARCELS 1 & 2 SHALL BE CONSTRUCTED SO AS TO PROTECT OCCUPANTS FROM THE INFILTRATION OF LANDFILL GAS.

REVISION DATE	DESCRIPTION
6-18-03	ADD TRAIL EASEMENT & DOCUMENT NUMBER FOR BOUNDARY
8-05-03	ADD PARCEL C & CORRECT NOTE FOR PARCEL A, DESCRIPTION OF BOUNDARY LINE BETWEEN PARCELS A & B
6-07-04	ADDED DRAFT SHEET 2
12-16-04	REVISE DRAFT PER MPCA DIRECTION
3-24-06	ADDED PARCEL I TO BOUNDARY

JOB NO.: 38139-020
DRAWN BY: WAL
DWG. NAME: WDE-BDY-SH1
S.T.R.: 27/34-32-24
COUNTY: ANOKA
DWG. NO

I HEREBY CERTIFY THAT THIS SURVEY WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY LICENSED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MINNESOTA.

[signature] 3/24/06

KEITH E. DAHL LAND SURVEYOR DATE
MINN LICENSE NO 18418

URS

BOUNDARY SURVEY OF THE WDE LANDFILL FOR THE MINNESOTA POLLUTION CONTROL AGENCY

SHEET NO 1 / 1

RECIEVED
MAR 27 2006
MPCA REM DIVISION
PLRSF SECTION

VOC Levels: Base of Upper Sand Aquifer, September 2003

500 0 500 Feet

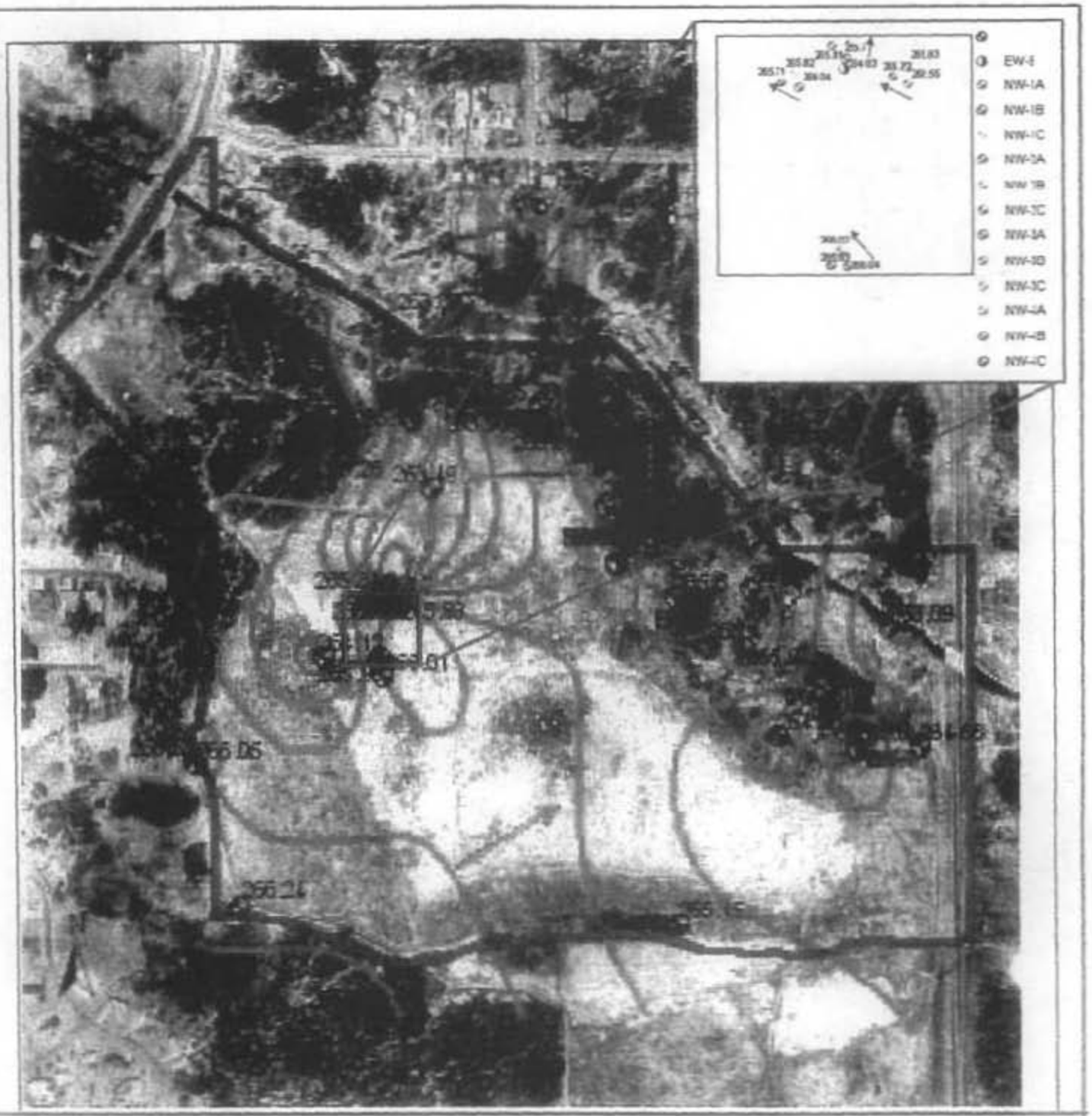
Site boundary

Contour line indicating VOC level, September 2003. (Contour interval: 10,000 ppb.)

N
W E
S

Source: MPCA, November 2004

Figure 2



Flow at the Base of Upper Sand Aquifer, September 2003

Site boundary

B Sept 2003 CI= 0.5 m

Upper Sand Ease Elevation

EW Wells

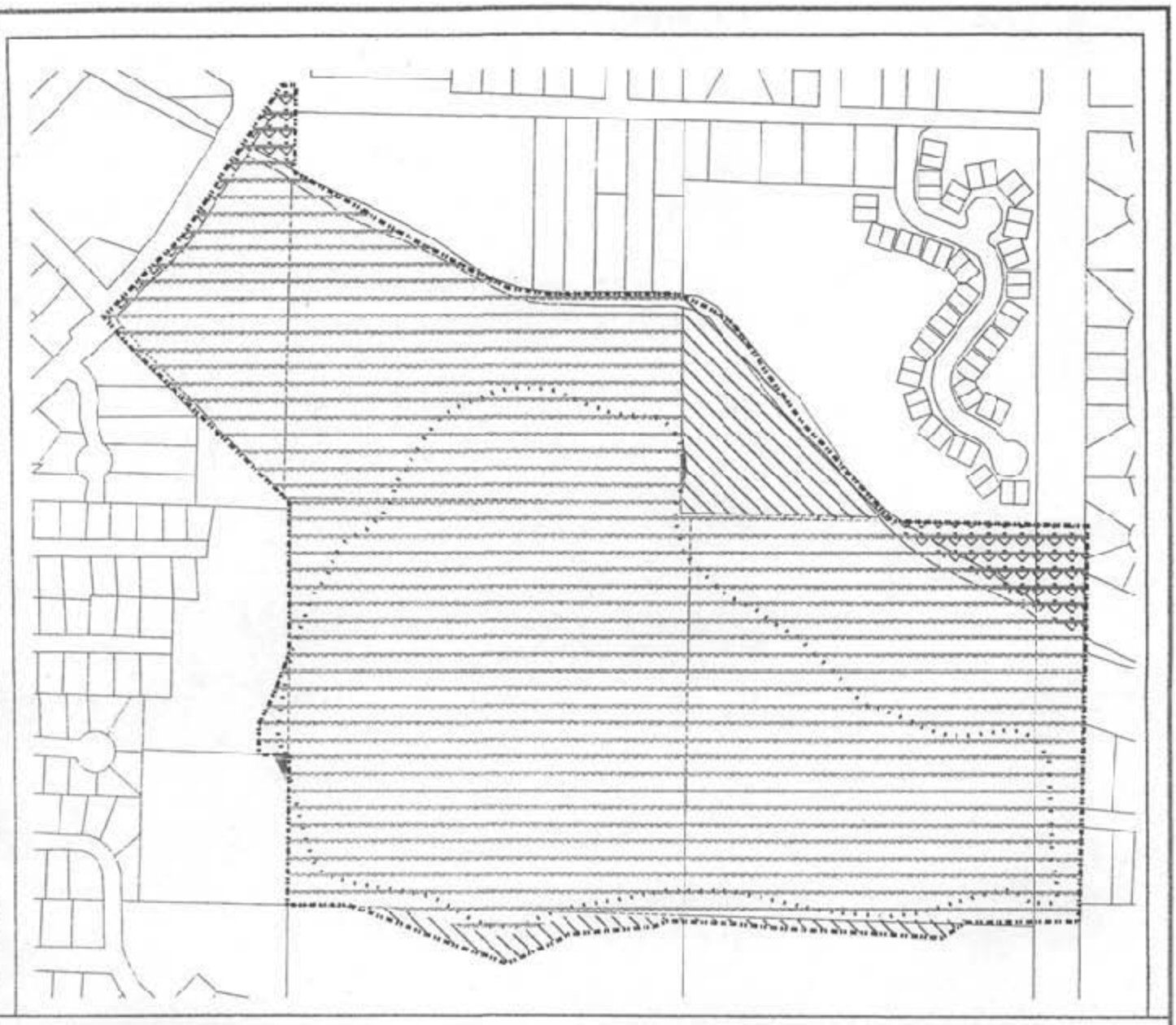
Direction of Flow

N
W E
S

500 0 500 Feet

Source: MPCA, November 2004

Figure 3



Landfill Cleanup Agreement: Document # 1203355

Site boundary

Refuse boundary

Parcel boundaries

N W E S

500 0 500 Feet

Landfill Cleanup Agreement

"Tax-Forfeited Property": No structures without MPCA approval. Any structure must protect from infiltration of landfill gas. No equipment or materials placed without MPCA approval, except outside fence in Hanson Blvd ROW. No public access or development except in Hanson Blvd ROW (except for existing easements.) No groundwater extraction other than remediation (does not apply to existing wells.) Dewatering for public works must have MPCA approval. No installation of drinking water wells without MPCA approval. No installation of utilities west of Hanson Blvd without MPCA approval. Expansion or reconstruction of Hanson Blvd needs MPCA approval. All restrictions must pass to future owners.

"WDE Qualified Facility": County shall not plant trees or shrubs that might disturb the landfill cap.

"Excluded Property": Land that is part of the WDE facility property but is excluded from most of the restrictions of the Landfill Cleanup Agreement.

Land defined in Landfill Cleanup Agreement as "WDE Qualified Facility", but not included in descriptions of "Tax-Forfeited Property" or "Excluded Property".

WDE lands (according to URS survey, 2003), but not included in Landfill Cleanup Agreement's legal description of "WDE Qualified Facility"

Figure 4

Refuse Limits, with 200' and 500' zones

Site boundary

Parcel boundaries

200' from refuse limit, and additional property as shown in City of Andover Ordinance 19, Exhibit A.

500' from refuse limit, and additional property as shown in City of Andover Ordinance 19, Exhibit A.

Waste boundary

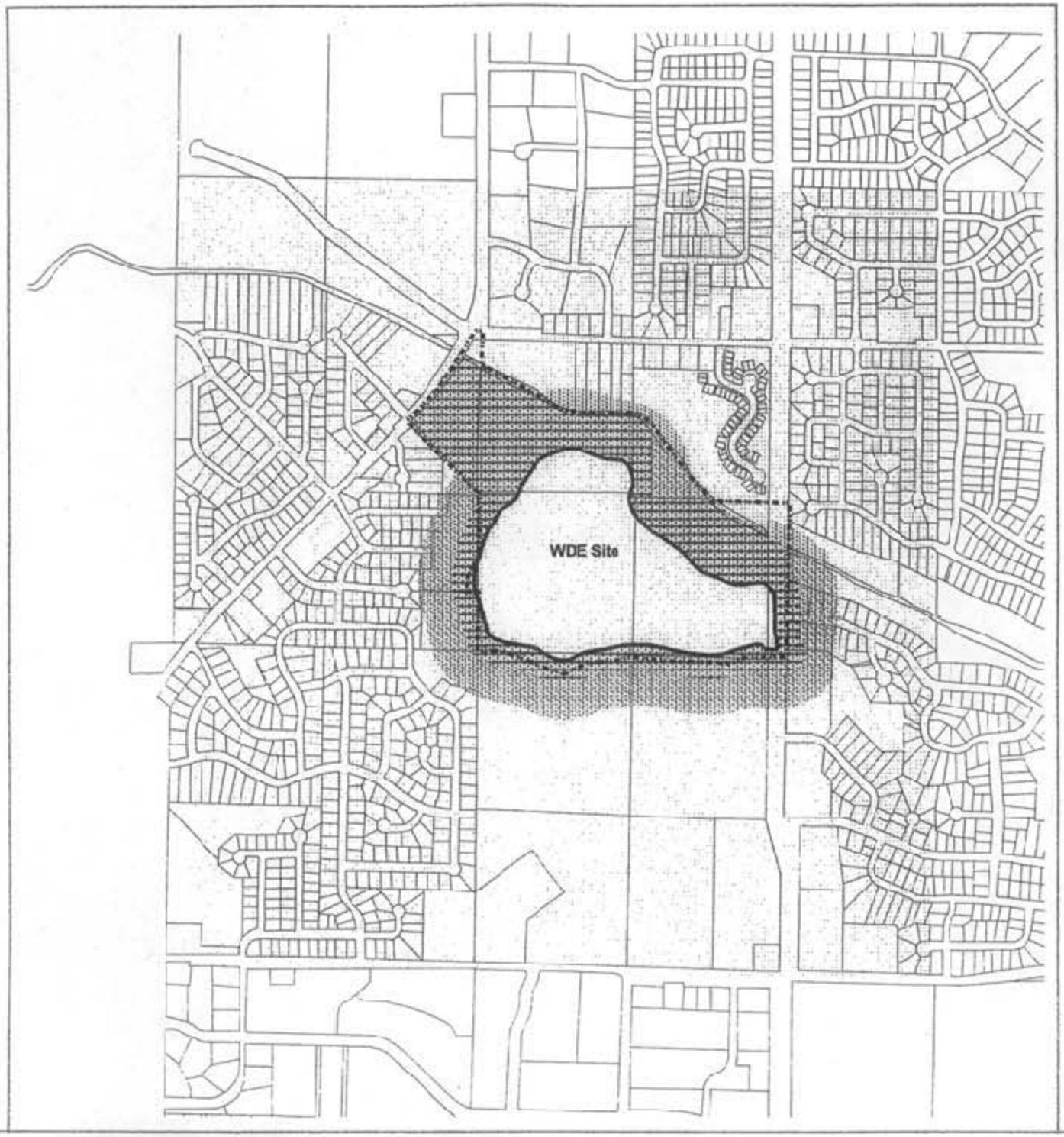
Wetland

800 0 800 Feet

N W E S

Source: City of Andover, URS Corporation survey, 2003

Figure 5



Andover City Ordinance 19

Site boundary

Refuse boundary

200' Buffer from refuse boundary, and additional property as shown in Ordirance 19, Exhibit A. No enclosed structures.

200'-500' Buffer from refuse boundary, and additional property as shown in Ordinance 19, Exhibit A, excluding areas north of Coon Creek. Enclosed structures must include soil gas monitoring probe and explosive gas monitor.

500' Buffer from refuse boundary, and additional property as shown in Ordirance 19, Exhibit A. No groundwater extraction from Upper Sand Aquifer. Does not apply to existing wells, as long as no material increase in water extracted and drinking water meets standards.

No groundwater extraction from the Lower Sand Aquifer without prior written approval of Commissioner. Does not apply to repair/replacement of existing wells if no material increase in water extracted and drinking water meets standards.

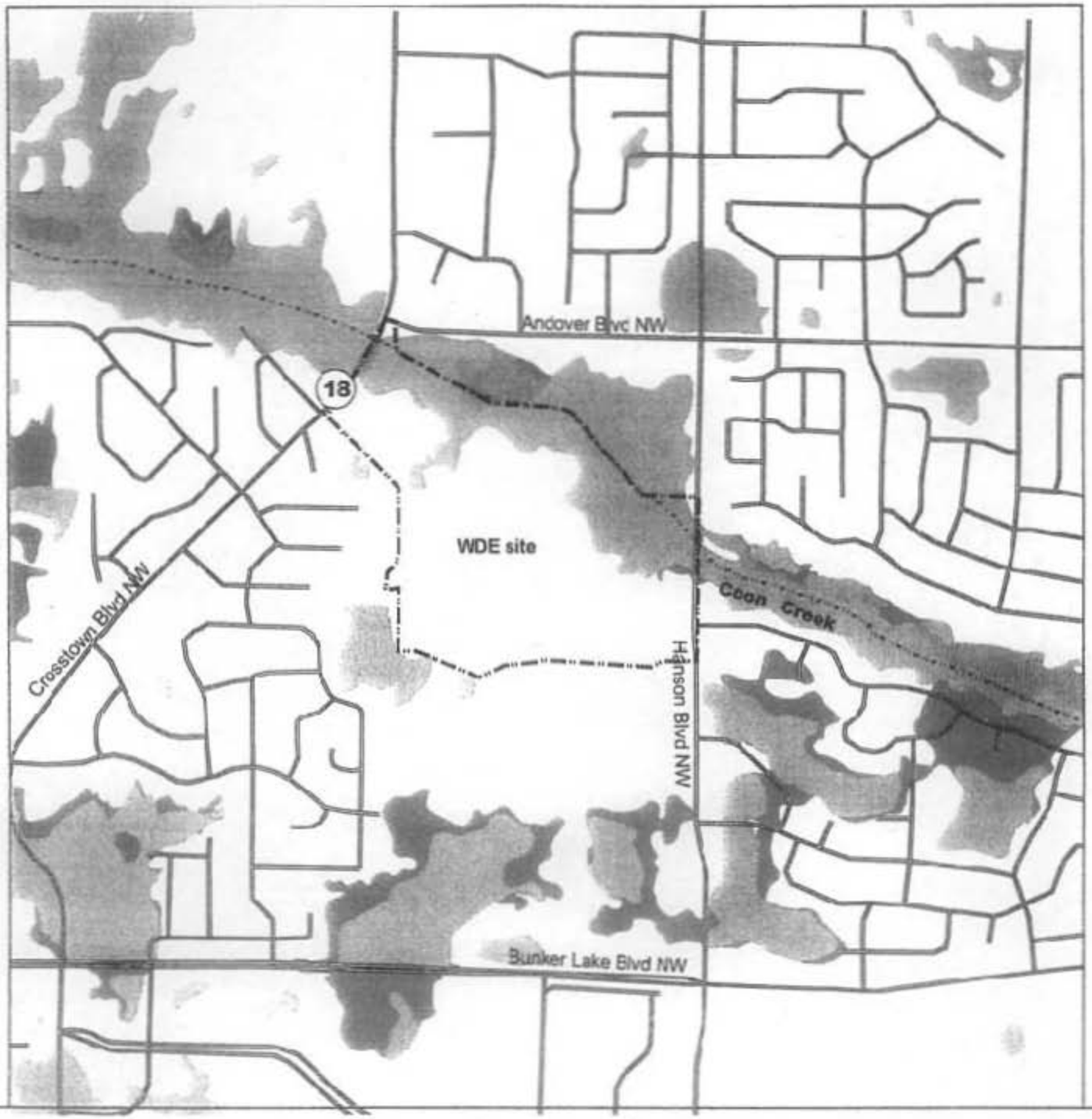
Parcel boundaries

1200 0 1200 Feet

Source: City of Andover

N W E S

Figure 6



Wetlands and Floodplains

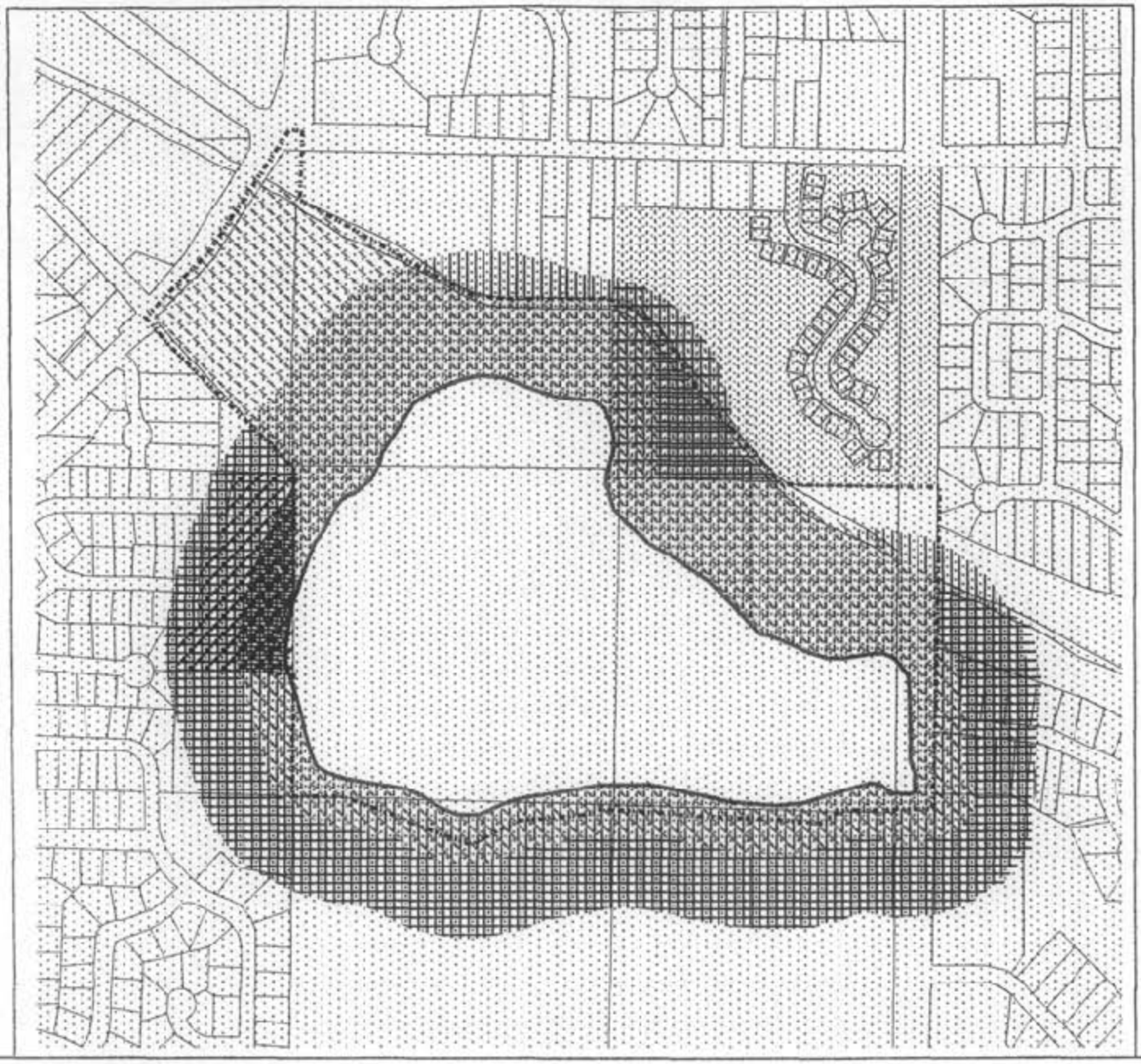
1200 0 1200 Feet

Site boundary
Street
Wetland (as depicted on NWI)
FEMA 100-year floodplain
FEMA 500 year floodplain

N
W E
S

Source: Minnesota DNR

Figure 7



All Development Restrictions

(See legend on other page.)

500 0 500 Feet

Site boundary

Refuse boundary

Parcel boundaries

N
W E
S

Figure 3a

All Development Restrictions

Legend

Andover City Ordinance 19

200' from refuse boundary: No enclosed structures.

200'-500' from refuse boundary, except areas north of Coon Creek: Enclosed structures must include soil gas monitoring probe and explosive gas monitor.

No extraction of groundwater from Lower Sand Aquifer without prior MPCA permission, except existing wells.

500' from refuse boundary: No extraction of groundwater from Upper Sand Aquifer except for remediation. (Does not apply to existing wells.) Dewatering for public works must have prior MPCA approval.

Windschitl Access Agreement

200' from refuse boundary: No construction of any kind other than city road to connect with 142nd Lane NW. No underground utility construction without MPCA approval.

Windschitl Property and Disputed Property: No installation of wells for groundwater extraction from the Upper Sand Aquifer. No extraction from Lower Sand Aquifer. Gas monitoring equipment required for any enclosed structure.

Landfill Cleanup Agreement

Tax-Forfeited Property: Any structure approved by the Commissioner shall be constructed so as to protect the occupants from infiltration of landfill gas. County shall not construct on TFP without MPCA approval. No public access or development of TFP except in Hanson Blvd ROW (except as defined in existing easements. No planting that might disturb the cap. No groundwater extraction except remediation (except existing wells). Dewatering for public works must have MPCA approval. No new drinking wells without prior MPCA approval. No installation of utilities on west of Hanson Blvd without MPCA approval. Reconstruction or expansion of Hanson Blvd needs MPCA approval. Restrictions must be passed on to any subsequent owners.

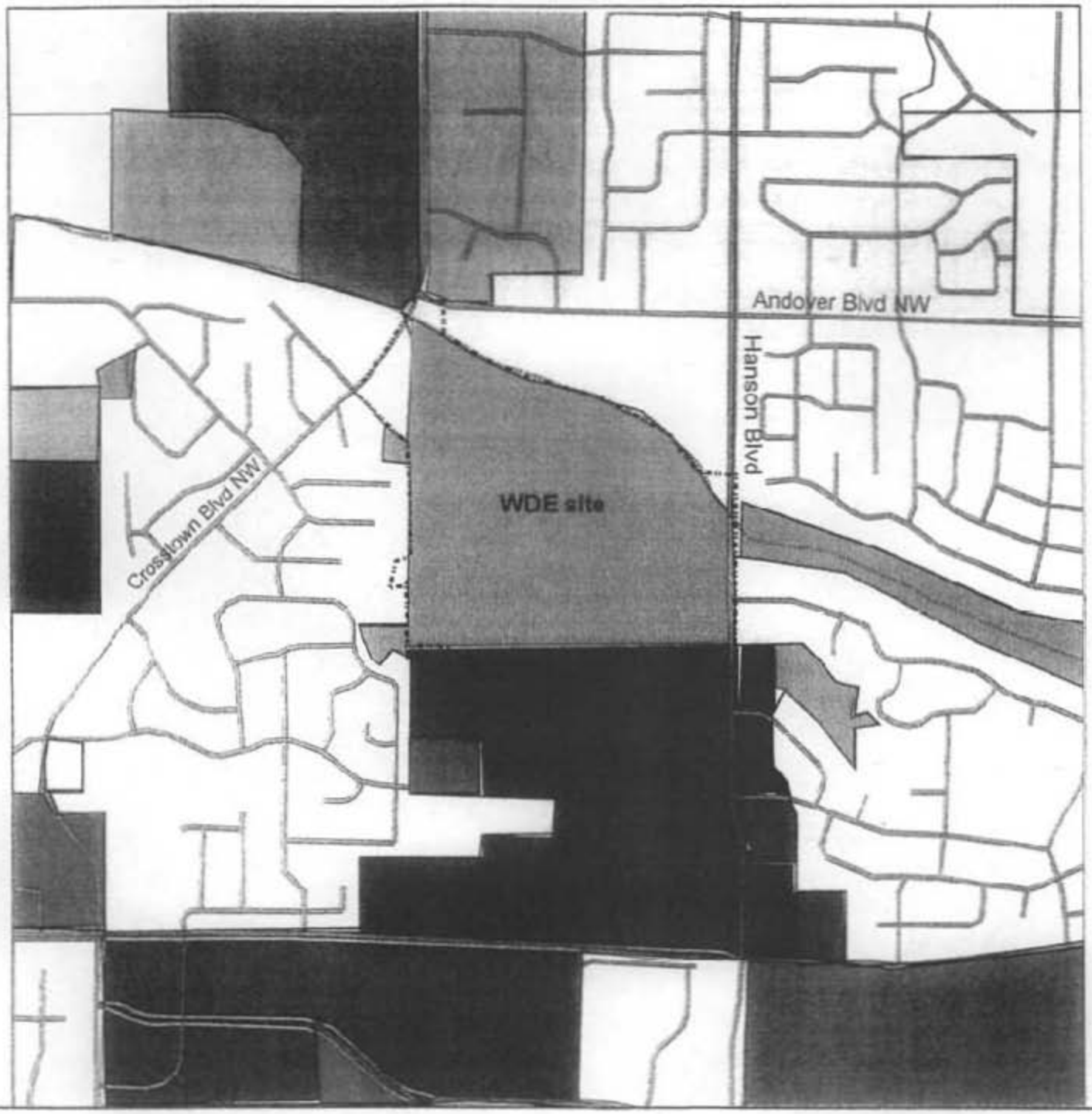
Tax-Forfeited Property within Hanson Blvd ROW: Work permits required. No fence shall encroach.

Declaration of Restrictive Covenants for Hupp and Nature's Properties

500' from refuse boundary: No groundwater extraction from Upper Sand Aquifer without prior MPCA approval.

No groundwater extraction from Lower Sand Aquifer without prior MPCA approval

Figure 8b



Comprehensive Plan: Guided Land Use

1200 0 1200 Feet

- Coon Creek
- Site boundary
- Local street
- Open Space
- Agricultural
- Limited Commercial/ Medium Density
- Neighborhood Commercial
- Urban Residential High Density
- Transitional Residential
- Urban Residential Low Density
- Public
- General Commercial

Source: City of Andover
January 2003

N W E S

Figure 9

APPENDICES

Minnesota Pollution Control Agency

Remediation Division
Closed Landfill Program

Closed Landfill Program – Land Use Plans

1.02, November, 2004

Introduction

In 1994, the Minnesota Legislature passed the Landfill Cleanup Act (LCA) which created the Closed Landfill Program (CLP). Under the CLP, the Minnesota Pollution Control Agency (MPCA) is authorized to initiate cleanup actions, complete closures, and take over the long-term operation and maintenance at over 100 closed, municipal solid waste landfills throughout Minnesota.

The Act also requires the MPCA to develop a land use plan (Minn. Stat. § 115B.412, subd. 9) for each qualified facility or landfill and requires local units of government to make their local land use plans consistent with the plans developed by the MPCA.

Contamination Issues at Landfills

Landfill gas migration and ground-water contamination can be serious issues associated with many landfills. These problems can pose a threat to the health and safety of those living, or occupying land, near these sites.

Because the MPCA is responsible for the long-term care of these landfills, the MPCA has implemented monitoring programs and corrective actions at many of the sites. The MPCA is also responsible for the operation and maintenance of the landfill cover, any remediation and monitoring systems present, as well as site security. In some cases, remediation systems need to be constructed and operated at these landfills to mitigate these gas migration and/or contamination problems.

Future Land Use

The future use of the property needs to be planned carefully and responsibly and must be compatible with the MPCA's responsibilities for the facility. The purpose of developing a land use plan at each landfill is to:

- protect the integrity of the landfill's remediation systems;
- protect human health and public safety at each landfills; and
- accommodate local government needs and desires for land use with consideration for health and safety requirements.

This can be accomplished through the adoption and implementation of a site specific land use plan that may recommend local zoning and other land-use measures. Therefore, land use plans are intended to provide valuable information to local units of government (townships, cities, counties, and Indian tribes) that have authority for local planning and zoning.

To meet the requirements of the statute, local units of government must make their land use plans consistent with the land use plans developed by the MPCA. The MPCA may recommend that local units of government consider adopting a zoning district and ordinance for the qualified facility that will be consistent and compatible with the MPCA's future obligations at the facility and, at the same time, possibly allow for certain uses of the property.

Off-site Contamination

The State statute requiring the development of a land use plan for each closed landfill does not apply to property outside of the qualified facility that may be affected by landfill gas and/or ground-water contamination. However, Minn. Stat. § 115B.412, subd.4(a) requires the MPCA to provide affected local units of government with site information including a description of the types, locations, and potential movement of hazardous substances, pollutants and contaminants, or decomposition gases related to the landfill. This information is available in the MPCA's site annual report for each closed landfill.

Furthermore, Minn. Stat. § 115B.412, Subd. 4(b) requires local units of government to incorporate this information into their land use plans and to notify persons applying for a permit to develop affected property of the existence of this information and, on request, to provide them a copy of the information.

For More Information

If you would like more information about land use plans at closed landfills, please contact Shawn Ruotsinoja of the MPCA at (651) 282-2382 or toll-free/TTY (800) 657-3864.

You can get the specific land-management-plan legislation at the following link.

http: www.revisor.leg.state.mn.us stats/115B/412.html

MPCA Web site: http:/ www.pca.state.mn.us

Minnesota Pollution Control Agency

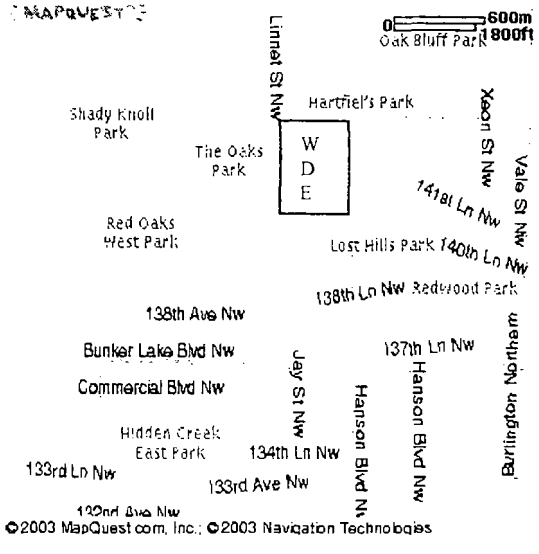
Waste Disposal Engineering Landfill – Closed Landfill Issues

Closed Landfill Program/#2.01/October 2005

What is the site history?

Located in Andover, the Waste Disposal Engineering (WDE) Landfill operated as a dump in the 1960s. From 1971 to 1983, it was a sanitary landfill with a Minnesota Pollution Control Agency (MPCA) permit. The site contains approximately 2,410,000 cubic yards of compacted mixed municipal solid waste and soil cover material. At the site, a permitted hazardous waste disposal pit also accepted liquid industrial and hazardous waste from 1972 to 1974. In 1974, the MPCA ordered the pit to be closed.

This landfill was placed on the U.S. Environmental Protection Agency's (EPA's) National List of Priorities (federal Superfund) in September 1983. EPA issued an administrative order requiring potentially responsible parties to install a remediation system and place environmental controls around the landfill.



A tray stripper was constructed in 1995 to remove volatile organic compounds from the ground water that were collected prior to being discharged into the sanitary sewer.

The Closed Landfill Program

Minnesota's Closed Landfill Program (CLP) was enacted in 1994 to clean up old, leaking landfills statewide. The MPCA assumed responsibility for the WDE landfill remediation activities and long-term care once all parties signed the binding agreement and the notice of compliance was issued.

Anoka County, the MPCA commissioner, and a group of responsible parties signed the Binding Agreement for the WDE landfill in October 1995. That same month, the Notice of Compliance was issued to the parties involved with the Binding Agreement.

In March 1996, the site was deleted from the federal Superfund list by EPA because of the MPCA's 1995 agreement with EPA, the signing of the Binding Agreement and the issuance of the Notice of Compliance.

Active-Gas Extraction

In 1997, the MPCA determined that active-gas extraction would enhance

Minnesota Pollution Control Agency, 520 Lafayette Rd. N., St. Paul, MN 55155-4194
(651) 296-6300, toll-free (800) 657-3864, TTY (651) 282-5332 or (800) 657-3864
This material can be made available in alternative formats for people with disabilities.

the remediation system at .he WDE Landfill by removing contaminants more quickly and efficiently.

Active-gas extraction removes methane gas and other volatile compounds, preventing their migration off site. The active-gas extraction system draws gas and vapors from the buried waste through a system of wells, pipes, and a blower. The captured gas is ignited in a controlled manner inside a stack or flare. The gases are converted to simple exhaust gases (mostly carbon dioxide, water vapor, and chloride compounds).

The MPCA tested the flare stack in November 2003. The test results indicated that the flare's combustion exceeds 99.9 percent destruction of combustible organics.

What does the flare look like and how does it work?

The flare stack is typically 25 to 30 feet tall in order to contain the flame completely inside it. An insulating material lines the stack to keep the outside cool enough to touch. The blower and other controls are typically mounted on a steel frame next to the stack. A multistage blower is used to provide efficient gas movement and keep the noise level low.

What is methane and should I be worried about it?

Methane is a gas that is produced by certain bacteria as organic materials decay. It is colorless, odorless (although it usually is accompanied by other odors from the waste), and flammable. Most landfills produce methane. WDE Landfill is no exception.

Methane also can move through soil and be a problem if it makes its way into poorly ventilated house basements. If enough methane builds up inside a structure and is ignited, an explosion is possible. The WDE site has two methane barriers adjacent to the east and west boundaries to restrict methane migration to nearby properties. Some methane gas movement has been detected at the site, although no methane has moved very far off the site at this time. An active-gas extraction system is the most reliable method to control gas migration at landfills.

What does the MPCA do to make sure the system works?

The MPCA regularly monitors all systems at the WDE site. This includes monitoring the gas flare, sampling ground-water monitoring wells for laboratory analysis three times a year, monthly monitoring of effluent from the present pump-out system, and quarterly checks on gas monitoring probes. Also, the MPCA staff or designated contractor check the site continuously for signs of trespassing and to ensure the remediation equipment is operating.

What is the citizen's role in the cleanup process?

Trespassing has been a problem at the site. Because gas and monitoring wells stick up above the surface, people that sled, snowmobile, or drive all-terrain vehicles on the WDE Landfill are in danger of being injured if they run into this equipment. Damage to the remediation equipment could also cause the systems to stop functioning. This would lead to an unsafe environment (explosive gases building up) around the landfill. The WDE Landfill is fenced and posted to prevent public access because of this danger and to protect on-site equipment.

There are also monitoring wells and gas probes located outside of the fenced-in area. This equipment is marked with three bumper posts.

Residents should keep curious or adventurous children away from the site, especially during construction activities, and report vandalism to the Anoka County Sheriff and the MPCA. Since taxpayers' dollars pay for the landfill upkeep, it is in the public interest to prevent damage to landfill cleanup systems.

Can land near closed landfills be used and developed?

Ground-water contamination and landfill gas from closed landfills can present a health and public safety threat to persons wishing to use and/or develop land near some closed landfills. The Landfill Cleanup Act (Act) requires that a land use plan be developed in order to assist local units of government to prudently manage land use and development around these landfills. Essentially, the purpose of the land use plan is to:

- Protect the integrity of the landfill's remediation systems;
- Protect human health and the environment at and around the landfill;
- Ensure that the cleanup and future operation and maintenance of the remediation systems at the landfill are successful; and
- Accommodate local government needs and desires for land use where health and safety requirements can be met.

The Act also requires local units of government to make their land-use plans consistent with the plan developed by the MPCA. These goals can be accomplished not only by the state's cleanup efforts, but also through the adoption and implementation of a site-specific land management plan through local zoning and other land-use measures consistent with public health and safety needs.

The land use plan for the WDE site should be completed in 2006.

For more information

For more information about the Closed Landfill Program, you can go to the program's Web page at http:www.pca.state.mn.us/programs/landfill_p.html

You can also call the MPCA at (800) 657-3864 and ask for the Closed Landfill Program staff associated with this site.

Potential Hazards at Closed Landfill Sites

WDE Landfill
Andover, Minnesota

Minnesota Pollution Control Agency

To assist contractors and consultants working on closed landfill sites, the MPCA has developed this fact sheet, which describes potential occupational health and safety hazards at the WDE Landfill. The fact sheet provides general information about hazards and potential safety issues; however it may not include all potential hazards. Contractors and consultants must exercise due caution at any closed landfill site and always verify this information is complete.

This information is provided to help you keep your employees and subcontractors safe. It is your responsibility to take all prudent precautions and follow all regulations and standards pertaining to the tasks you perform at the WDE Landfill.

Location
The WDE Landfill is a 70-acre site located in the City of Andover. The main access is at the northwest corner of the facility; 14437 Crosstown Boulevard.

Physical and Biological Hazards
Potential physical and biological hazards at the site include but are not limited to:

- uneven terrain on landfill slopes hidden by long grass
- an artificial wetland with standing water and soft terrain on the west side of the site (may be frozen over in winter)
- gas-recovery wells and other wells hidden by long grass
- poison ivy or noxious weeds
- ticks and mosquitoes

Flare Stack
The landfill gas extraction system flare is not shielded, but is insulated on the inside. The surface can be very hot, creating a potential burn hazard for anyone working near it. In addition, there is a high-voltage electrical panel associated with the flare that could pose an electrocution hazard.

Ground Water Remediation Control Building
This building contains piping from each of the site's ground water extraction wells with corresponding valves, flow meters, and electrical control panels. Here, flow from each well can be directed to the treatment pond, storm water pond, or sanitary sewer. Inside, there is:

- potential for contact with contaminated ground water
- electrical hazard from the control panels

Confined Spaces

Confined spaces may contain landfill gases, including high concentrations of highly flammable methane gas. They may also be oxygen deficient. Confined space entry procedures, including atmospheric testing, should be followed before entering these spaces. Confined spaces on this site include:

- sumps and vaults for condensate and groundwater recovery wells
- hazardous waste pit vault
- outlet structure vault for treatment pond

Ground Water Treatment Pond

The ground water treatment pond detains and aerates contaminated ground water prior to discharge to the sanitary sewer. Within the fenced enclosure, there are:

- slip hazards associated with smooth geomembrane liner and formation of ice around pond perimeter during winter
- drowning hazard from deep aerated water and difficult egress up steep geomembrane covered slopes
- potential exposure to volatile organic compounds in air and water
- electrical hazard from aeration equipment control panels

Chemical Hazards

Landfill gas (LFG) is made up of approximately 50 percent methane gas, which is potentially explosive. Other corrosive and possibly toxic constituents may also be found in LFG. Ground water at this site is contaminated with volatile hydrocarbons. Condensate from the LFG extraction system may also contain low levels of hydrocarbons. Gloves should be worn when sampling or when servicing equipment used for ground water or condensate recovery and treatment.

More detailed information on chemical hazards at the WDE Landfill is provided in a summary table on the following page.

Pesticides

Due caution should be exercised where herbicides or rodenticides are used. Herbicides such as Round-up™ and Crossbow™ may be sprayed to control vegetation around the pond and flare enclosures and to control woody vegetation. Rodenticides may be used in the ground water remediation control building.

For more information

For more information on these or other potential hazards at the WDE landfill site, please contact Pat Hanson at 651-296-7740 or e-mail pat.hanson@pca.state.mn.us.

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District CLR – Closed Landfill Restricted

A. Purpose

The Closed Landfill Restricted (CLR) District is intended to apply to former landfills and adjacent lands which are managed under the Closed Landfill Program of the Minnesota Pollution Control Agency (MPCA). The purpose of the district is to limit uses of land both actively filled and related lands, to minimal uses in order to protect the land from human activity where response action systems are in place. This district shall only apply to the former landfill and pertinent adjacent lands (the limits of which are defined by the MPCA). This district shall apply whether the landfill is in public (State, MPCA, County, City, Township), Indian tribal, or private ownership.

For purposes of this ordinance, the Closed Landfill Restricted District consists of the following parcels:

PARCEL A
(P.I.D. # 27-32-24-31-0007)
All that part of the Northeast Quarter of the Southwest Quarter of Section 27 Township32 Range 24 Anoka County, Minnesota, described as follows:

Commencing at the northeast corner of said Northeast Quarter of the Southwest Quarter, thence westerly along the north line thereof for 58.6 feet to the center line of County State Aid Highway No. 18, thence South 32 degrees 55 minutes West for 550.17 feet along said center line, thence South 44 degrees 11 minutes West for 342.85 feet along said center line, thence South 45 degrees 26 minutes East for 872.00 feet to the southeast corner of said Northeast Quarter of Southwest Quarter, thence north along the East line of said Northeast Quarter of the Southwest Quarter to the point of commencement.

Subject to an easement to R.E.A and other easements of record, if any.
Subject to the rights-of-way of C.S.A.H. No. 16 and C.S.A.H No. 18.

PARCEL B
(P.I.D. # 27-32-24-42-0001)
All that part of the Northwest Quarter of Southeast Quarter of Section 27 Township 32 Range 24, Anoka County, Minnesota, lying south of the center line of Coon Creek.

PARCEL C
(P.I.D. # 27-32-24-41-0122)
That part of Lot 29, Block 1, NATURES RUN C.I.C. NO. 96, Anoka County, Minnesota, described as:

Beginning at the Southwest corner of said Lot 29, said corner being also the southwest corner of the Northeast Quarter of the Southeast Quarter of said Section 27, Township 32, Range 24; thence along an assumed bearing of North 00 degrees 07 minutes 18 seconds West along the most westerly line of said Lot 29 a distance of 688.72 feet; thence South 79 degrees 45 minutes 19 seconds East a distance of 40.89 feet; thence South 60 degrees 04 minutes 12 seconds East a distance of 43.45 feet; thence South 43 degrees 56 minutes 49 seconds East a distance or 45.73 feet; thence South 39 degrees 44 minutes 38 seconds East a distance of 88.10 feet; thence South 40 degrees 48 minutes 57 seconds East a distance of 91.31 feet; thence South 43 degrees 00 minutes 57 seconds East a distance of 36.65 feet; thence South 29 degrees 03 minutes 59 seconds East a distance of 49.60 feet; thence South 39 degrees 08 minutes 25 seconds East a distance of 60.74 feet; thence South 53 degrees 25 minutes 00 seconds East a distance of 37.89 feet; thence South 47 degrees 52 minutes 34 seconds East a distance of 42.64 feet; thence South 41 degrees 09 minutes 22 seconds East a distance of 51.36 feet; thence South 35 degrees 56 minutes 48 seconds East a distance of 40.54 feet; thence South 27 degrees 39 minutes 19 seconds East a distance of 35.77 feet; thence South 40 degrees 14 minutes 42 seconds East a distance of 54.12 feet; thence South 47 degrees 16 minutes 27 seconds East a distance of 32.39 feet; thence South 37 degrees 37 minutes 40 seconds East a distance of 59.79 feet; thence South 34 degrees 27 minutes 40 seconds East a distance of 43.18 feet; thence South 31 degrees 05 minutes 02 seconds East a distance of 54.84 feet; thence South 48 degrees 22 minutes 53 seconds East a distance of 53.40 feet to the most southerly line of said Lot 29; thence North 89 degrees 04 minutes 22 seconds West along the most southerly line of said Lot 29 a distance of 635.88 feet to the Point of Beginning.
(As described in Quit Claim Deed filed as Anoka County Doc. No. 1649743)

PARCEL D
(P.I.D. # 27-32-24-44-0001)
The Southeast Quarter of Southeast Quarter Section 27 Township 32 Range 24, Anoka County, Minnesota.

Subject to the right-of-way of County Road No. 78.

PARCEL E
(P.I.D. # 34-32-24-11-0002)
All that part of the Northeast Quarter of Northeast Quarter of Section 34 Township 32 Range 24, Anoka County, Minnesota, described as follows:

Beginning at northeast corner of the Northeast Quarter of Northeast Quarter, thence North 89 degrees 08 minutes 39 seconds West along north line of said Northeast Quarter of Northeast Quarter 1316.94 feet to the northwest corner of said Northeast Quarter of Northeast Quarter, thence South 0 degrees 18 minutes 44 seconds West along west line of said Northeast Quarter of Northeast Quarter, 15 feet, thence South 89 degrees 08 minutes 39 Seconds east 180.52 feet, thence South 75 degrees 30 minutes 33 seconds East 190.89 feet, thence South 89 degrees 08 minutes 39 seconds East 474.80 feet, thence North 67 degrees 05 minutes 08 seconds East 111.64 feet, thence South 89 degrees 08 minutes 39 seconds East 373.94 feet more or less to a point on east line of said Northeast Quarter of

Northeast Quarter, thence North 0 degrees 15 minutes 45 seconds East along said east line 15 feet to the point of beginning, except road, subject to easement of record.

PARCEL F
(P.I.D. # 34-32-24-12-0002)
All that part of the Northwest Quarter of Northeast Quarter of Section 34 Township 32 Range 24, Anoka County, Minnesota, described as follows:

Beginning at northeast corner of said Northwest Quarter of Northeast Quarter, thence North 89 degrees 08 minutes 39 seconds West along north line of said Northwest Quarter of Northeast Quarter, 1078.71 feet, thence South 68 degrees 56 minutes 31 seconds East 402.99 feet, thence South 81 degrees 03 minutes 01 seconds East 109.56 feet, thence North 70 degrees 32 minutes 11 seconds East 198.91 feet, thence North 80 degrees 59 minutes 38 seconds East 411.73 feet more or less to a point on the east line of said Northwest Quarter of Northeast Quarter, 15 feet southerly of the point of beginning, thence North 0 degrees 18 minutes 44 seconds East along said east line 15 feet to the point of beginning, subject to easement of record.

PARCEL G
(P.I.D. # 27-32-24-43-0001)
The Southwest Quarter of Southeast Quarter of Section 27 Township 32 Range 24, Anoka County, Minnesota.

PARCEL H
(P.I.D. # 27-32-24-34-0038)
Outlot A, Kensington Estates 4th Addition, according to the recorded plat thereof, Anoka County, Minnesota.

PARCEL I
(Part of P.I.D. # 27-32-24-34-0003)
All that part of the southerly 500.00 feet of the easterly 500.00 feet of the Southeast Quarter of the Southwest Quarter of Section 27, Township 32, Range 24, Anoka County, Minnesota, described as follows: Beginning at the northeast corner of said southerly 500.00 feet of the easterly 500.00 feet, said northeast corner also being the southeast corner of OUTLOT A, KENSINGTON ESTATES 4TH ADDITION, according to the recorded plat thereof; thence on an assumed bearing of North 89 degrees 06 minutes 16 seconds West along the northerly line of said southerly 500.feet of the easterly 500.00 feet and the southerly line of said OUTLOT A for 87.07 feet to the southwest corner of said OUTLOT A; thence South 15 degrees 15 minutes 57 seconds East for 331.50 feet to the easterly line of said Southeast Quarter of the Southwest Quarter; thence North 00 degrees 02 minutes 26 seconds West along said easterly line for 318.44 feet to the point of beginning.

B. Permitted Uses

There are no permitted uses within the CLR District.

C. Accessory Uses

Accessory uses allowed in this district include outdoor equipment or small buildings used in concert with gas extraction systems (i.e. gas to energy system), other response action systems, monitoring wells or any other equipment designed to protect, monitor or otherwise ensure the integrity of the landfill monitoring or improvement systems. Fences and gates shall be allowed under these provisions.

D. Conditional Uses

Conditional uses shall be limited to passive uses to protect the integrity of the landfill area and to protect any person from hazards associated with the landfill. The landfill shall be planted in cover crops and shall be maintained by the MPCA.

Any proposed conditional use must be approved by the Commissioner of the Minnesota Pollution Control Agency (MPCA) and the City of Andover. Such approved use shall not disturb or threaten to disturb, the integrity of the landfill cover, liners, any other components of any containment system, or the function of any monitoring system that exists upon the described property.

E. Prohibited Uses and Structures

All other uses and structures not specifically allowed as conditional uses, or that cannot be considered as accessory uses, shall be prohibited in the CLR District.

F. General Regulations

Requirements for parking, signs, area, height and other regulations are set forth in Articles _____.

WDE Sanitary Landfill Chemical Hazards Summary Table

Compound	Standard (µg/L)		Contaminant Concentration (µg/L)		
	HRL	MCL	EW-9	Influent	Condensate
Acetone	700	-	11,000 – 48,000	<2,000 – 5,700	1,800 – 8,800
Benzene	10	5	<100	20 - 30	20 – 100
Carbon tetrachloride	3	5	<100 – 2,100	<100 – 1,600	<100 – 3,700
Chloroform	60	-	<100 - 170	<100	<100
Chlorobenzene	100	100	<100 – 110	<100	<100
Chloroethane	-	-	480 - 940	<100	<100
Dichlorodifluoromethane	1,000	-	<100 – 160	<100	<100
Dichlorofluoromethane	-	-	420 - 560	<100	<100
1,1-Dichloroethene	6	7	460 – 1,200	<100	<100
1,2-Dichlorobenzene	600	600	220 – 340	<100	<100
1,2-Dichloroethane	4	5	270 – 360	<100	<100
1,1-Dichloroethane	70	-	9,700 – 38,000	20 – 3,300	90 – 1400
cis-1,2-Dichloroethylene	70	70	34,000 – 47,000	30 – 10,000	30 – 3,900
trans-1,2-Dichloroethlylene	100	100	<100 - 400	<100	<100
Ethylbenzene	700	700	2,000 – 3,100	<100 - 110	480
Methylene chloride	50	5	36,000 – 62,800	<200 – 15,000	<200 – 3,700
Methyl ethyl ketone	4,000	-	19,000 – 63,000	940 – 17,000	1,700 – 10,000
Methyl isobutyl ketone	300	-	5,700 – 8,600	<500 – 2,200	480 – 1,600
Tetrachloroethylene	7	5	110 – 4,000	30 – 3,900	21 – 260
Tetrahydrofuran	-	-	6,100 – 8,900	260 – 3,400	360 – 2,500
Toluene	1,000	1,000	20,000 – 25,200	<100 – 6,300	600 – 2,500
1,1,1-Trichloroethane	600	200	14,000 – 120,000	<100 – 29,000	30 – 5,300
1,1,2-Trichloroethane	3	5	<100 - 150	<100	<100
Trichloroethylene	30	5	2,400 – 18,700	<100 – 12,000	<100 – 770
Trichloroflouromethane	2,000	-	<100 – 550	<100	<100
1,1,2-Trichloro-1,2,2-trifluoroethane	200,000	-	800 – 2,500	<100	<100
Vinyl chloride	0.2	2	1,400 – 22,000	82 - 880	50 – 720
2-Methyl phenol	30	-	<10	<10	27 – 57
4-Methyl phenol	3	-	<10	<10	<10 – 255
Isophorone	100	-	<10	<5 - 535	12 – 800
Xylene m&p	10,000	10,000	7,500 – 9,000	<100 - 300	940
Xylene, o	10,000	10,000	2,700 – 3,000	<100	230
Total VOCs			173,780 – 490,840	1,382 – 111,255	6,870 – 48,012
Lead		15	ND	ND	<1 – 81
Manganese	100	50	4.8 – 5.1 mg/L	ND	ND
Nickel	100	-	ND	ND	16 - 120

HRL – Health Risk Limit: Concentration of a ground water contaminant that can be safely consumed daily for a lifetime.
MCL – Maximum Contaminant Level: The maximum permissible level of a contaminant in a public drinking water system.
VOCs – Volatile organic compound.
EW-9 – Ground water from extraction well EW-9, sampled prior to mixing with "influent".
Influent – Ground water from combined ground water extraction wells that make up the "influent" to the treatment pond.
Condensate – Liquid collected from landfill gas collection system.

Prepared December 2004

Appendix E

2007 Annual Report
Minnesota Pollution Control Agency's Closed Landfill Program;
WDE Sanitary Landfill # SW-028

Minnesota Pollution Control Agency's

Closed Landfill Program

Annual Report 2007

WDE Sanitary Landfill

SW-028

Minnesota Pollution Control Agency

Compiled By

The Closed Landfill Program
Petroleum & Closed Landfill Remediation Section
Remediation Division
Minnesota Pollution Control Agency
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Report Dates

Forum completed: December 17, 2007
Report completed: January 31, 2008

MPCA Staff

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Appendix A: Monthly Summary of Operation and Maintenance (2007) by Willow Brook Engineering

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I. Site Background

The Waste Disposal Engineering Sanitary Landfill (WDE) located in the City of Andover, Anoka County, T32N, R24W, Sect. 27, was permitted in 1971 by the Minnesota Pollution Control Agency (MPCA) as Permit Number SW-28 to accept solid waste. It continued operating as a privately owned facility until January 1983. A Closure Order By Consent was issued April 4, 1984, which required that the owners complete a Remedial Investigation and Feasibility Study. The Record of Decision was signed December 31, 1987. The United States Environmental Protection Agency (USEPA) issued a 106 Order requiring the responsible parties to complete Remedial Design and Remedial Action at the site in August 1989. A Unilateral Administrative Order (Order) was issued which required performance of response actions. In 1993 and 1994, a six foot cover with a passive gas venting system and a ground water pumpout system were installed. In addition a barrier system to prevent landfill gas migration was installed on the east and west perimeter of the landfill near residences that were located close to the fill area. In September 1995, the USEPA and MPCA signed a Concurrent Determination indicating that the remedial actions performed under the Order had been completed and "that the remedial actions are functioning properly and are performing as designed."

In accordance with the legislation enacted in 1992, (Minn. Laws 1992, Ch. 513, Art. 2, Sec. 2, Subd. 3), the MPCA assessed and classified closed landfills in Minnesota. According to that assessment and classification, the WDE Sanitary Landfill was given a ranking of Class D and a Priority Score of 116. Additional information regarding the Closed Landfill Assessment can be found in the Closed Landfill Assessment Report (January 1995). (This information is also available from the Closed Landfill Program's web page: http://www.pca.state.mn.us/cleanup/landfill-metro.html#WDE).

A Closed Landfill Program Binding Agreement was signed between the Commissioner of the MPCA, Anoka County, and the Waste Disposal Engineering Group on October 27, 1995. A Notice of Compliance was issued on October 30, 1995. The WDE Landfill was removed from the Federal Superfund National Priorities List in June 1996.

A forum is held annually among MPCA staff members assigned to the WDE Sanitary Landfill to discuss issues pertaining to the binding agreement and the effectiveness of the remediation system. In 1997, the team determined that additional corrective action was necessary to accelerate ground water remediation. An active gas extraction system and enclosed flare to better control methane migration and remove volatile compounds prior to leaching into ground water was chosen. With this in mind, the site was reclassified in 1997 to a Class B with a score of 117. The site was scored in 1998 to a Class B with a rise in Priority Score to 123 due to continued ground water contamination.

At a forum held in January 1999, the site was reclassified to a Class D with a Priority score of 123 due to continued ground water contamination. The Active Gas Extraction system was still in a start up phase. The site was reclassified and rescored at the November 2002 forum to B 116 because the ground water plume was not being captured and another extraction well was needed for plume capture. The site was rescored at the December 2006 forum meeting. The new score and classification is B 236.

The WDE Sanitary Landfill has a waste footprint of approximately 70 acres and contains approximately 2,410,000 cubic yards of waste. The final cover system has a two foot thick compacted clay barrier layer overlain by sand drainage and vegetative soil layers. The Ground Water Monitoring System includes 72 monitoring wells and 4 residential wells. Surface water is monitored at 4 stations along Coon Creek. There are 7 ground water extraction wells that control the movement of contaminated ground water beneath the site. Landfill gas migration is currently monitored with 20landfill gas monitoring probes and controlled with an active gas extraction system. The active gas extraction system was installed in 1998.

This site is part of a pilot Land Use Plan that was initiated in September 2002 and was completed at the end of 2006.

II. Site Engineering Summary

A. Landfill Cover Maintenance / Construction Summary

A six-foot thick final cover system was constructed over the entire landfill in 1993, including a two-foot thick compacted clay barrier layer. Severe erosion was repaired during the summer of 1994. Since 1994, minor erosion has been repaired on an as-needed basis. The landfill cover was mowed June 16 through 25 and August 18 through 26 to control the spread of woody invasive weeds.

During construction of the active gas extraction system in the summer of 1998, it was found that the cover soils did not consistently meet 1993 design specifications and was not of a uniform 6 foot thickness. Those areas disturbed by construction of the active gas extraction system were reconstructed using the existing clay soil overlain by a geosynthetic clay liner (GCL). A GCL is a quarter-inch thick layer of bentonite clay sandwiched between filter fabric. In addition, the waste extended beyond the limits of the cover in the area where the flare was being built. This waste was removed and placed back in the landfill. The existing passive gas vents were also sealed as part of this construction project.

Glenn Rehbein Excavating, Inc. installed cleanouts to the extraction well forcemains in May 2000. MPCA's O&M contractor, Willow Brook Engineering, completed restoration of areas disturbed by cleanout construction.

A lined treatment basin to allow volatile organic compounds to volatilize from contaminated ground water pumped from some of the most contaminated extraction wells and landfill gas condensate was constructed at the site in the fall of 2004 by Veit Companies. The treated water flows by gravity to a sanitary sewer. Construction commenced September 30 and was complete by November 10, 2004.

B. Leachate Management System Summary

1. Leachate Management System Maintenance Summary

The WDE Sanitary Landfill does not have a leachate collection system. The landfill does not have a liner. Leachate travels from the waste into the groundwater. A majority of the leachate generated is captured by the groundwater pumpout system, discussed in more detail in Part III.

2. Leachate Monitoring Summary

Leachate generated by the WDE Sanitary Landfill is not collected or monitored. Ground water contaminated by leachate is monitored with the site's ground water monitoring system. These monitoring results are discussed in detail in Section III of this report.

C. Landfill Gas Management System Summary

1. Landfill Gas Management System Maintenance Summary

The design and preliminary work to install an active gas extraction system was completed in 1997. An active gas extraction system was installed and began start-up on August 27, 1998. This system is designed to remove landfill gas including methane and volatile compounds from the waste and combust them in an enclosed flare. There are 54 gas extraction wells placed in the landfill (Figure 1A). One of the gas extraction wells is installed in the hazardous waste pit to further reduce ground water contamination but did not operate in 2006.

The flare operated 74 percent of the time during 2006. The maximum gas flow rate for the flare was 190 cfm in 2006 and the maximum amount of methane was 52.3 percent by volume. Normally the flare operates at a flow rate of 175 cfm. The flare stack was tested in November 2003. Results showed the flare to be exceeding 99.9% destruction of combustible organics measured in the inlet gas of the flare. Based on this monitoring, approximately 1.7 million pounds of methane and 112,000 pounds of NMOCs were destroyed in 2004. Approximately 1.3 million pounds of methane was destroyed in 2006.

2. Landfill Gas Monitoring Summary

Twenty (20) landfill gas-monitoring probes are found at 18 locations at the WDE Sanitary Landfill, as shown on Figure 1A, Table 2 presents the results of the monthly to quarterly gas monitoring. Migration off-site of landfill gas was controlled in accordance with Minnesota Rule Chap. 7035.2815 subp. 11. There were minor hits in GP-22 in January, April and July that ranged from 0.3 to 2.3 percent by volume of methane.

D. Additional Maintenance Summary

A detailed list of the maintenance activities performed by Willow Brook Engineering is available upon request in electronic format.

E. Electricity Generated/Beneficial Use of Gas

January 4, 2007: A Certificate of Substantial Completion of LFGTE facility issued to contractor (Total Mechanical, Inc.) who constructed building installed 4 LFGTE engines and modified enclosed flare.

January 4-5, 2007: Four LFGTE engines run for 24 hours then shut down pending execution of Interconnection, Technical Requirements and Electric Service agreements.

March 26, 2007: Interconnection, Technical Requirements and Electric Service agreements executed by MPCA, Department of Administration and Connexus Energy.

March 27, 2007: Four engines began operation.

May, 2007: STM Power (the manufacturer of the LFGTE engines) ceased operations.

July, 2007. Stirling BioPower began operations as successor company to STM Power.

July 23, 2007:.All four LFGTE engines were shipped to Stirling BioPower in Ann Arbor, MI. Between March 27, and the end of June anywhere from 1 to four of the engines had been in operation but all engines had ceased running by the end of June due to various reasons.

November 26, 2007: Two of the four LFGTE engines returned to WDE and became operational.

December 12, 2007: The two LFGTE engines in operation at the WDE facility were shut down to replace a faulty compressor valve.

December 19, 2007. The two LFGTE engines were restarted with new compressor valves.

January, 2008: The other two LFGTE engines are anticipated to be delivered from the factory and made operational.

F. Site Engineering Recommendations

III. Site Hydrologic Monitoring Summary

A. Ground Water Monitoring / Remediation System Maintenance Summary

1. Ground Water Monitoring System Maintenance Summary

Pump repair was not necessary in 2007.

2. Ground Water Monitoring Summary

Interpoll Laboratories, Inc. collected 3 rounds of water quality samples in 2007 at the WDE Landfill. These events occurred during late May, mid August, and early November. The landfill monitoring

system consists of 52 wells and 4 surface water monitoring points. Twenty additional piezometers are used to determine ground water elevations. A cross-section showing the detailed glacial geology of the landfill area is presented on Figure 2. This figure can be correlated to the general geology figure in past reports. The Upper Sand identified in previous reports that contain wells with A and B suffixes is shown in Figure 2 as the Glaciofluvial Facies that is further subdivided into Subfacies A, Subfacies B and Subfacies C. Monitoring wells with suffix A are screened in Subfacies A. Subfacies A is characterized by brown to gray silty sands. Subfacies B is correlated to the discontinuous Gray Silt unit shown in previous versions of Figure 2. It is characterized by a dark gray sandy lean clay to a gray clayey sand. B suffix monitoring wells are screened in Subfacies C which is characterized by gray to brown well graded sand with silt. The Red Brown Silt Till is correlated to the Glaciolacustrine Facies unit found below the Glaciofluvial Facies unit. The cross section in Figure 2 is not deep enough to show the Lower Sand depicted in previous versions of Figure 2.

Daily, monthly, and annual precipitation graphs are included as Figures 3 through 4. Monthly precipitation in 2007 was characterized by a peak of over 6 inches in October 2007 and two secondary peaks of 5 inches in August and September 2007. The annual precipitation in 2007 was 28.9 inches and was wetter than 2006 but was drier than in 2005. The relationship of the precipitation to the sampling events indicates that the summer event occurred during the second wettest month and the second day of the event was characterized by rain of 1.32 inches. The spring event was characterized by 4 consecutive days of rain despite monthly precipitation of approximately 1.89 inches. The November event represents the driest month of the year with only 0.1 inch for the month that occurred on November 18, 2007 after the sampling event took place. There is an inverse correlation between rainfall and contamination released. The Upper Sand water table is plotted with the lowest ground water elevation during the wettest month (Figure 10, 11, 12, and 13). The contamination at this level is at its lowest during the wettest month (see the same figures). This suggests dilution is at work. This is also seen in some B level wells. This trend has developed over the last two years. Conversely, more contamination was detected in the driest event. The trend in EW-9 follows the precipitation and suggests that infiltration through the pit is more complicated (Figure 14).

Table 1 and 2 contain groundwater elevation and Volatile Organic Compound (VOC) concentration data for each of the monitoring wells. Graphs showing trends in ground water elevations and total VOC concentrations are also included on Figures 5 through 16 and Figure 27. Figures 17 through 26 are contour maps either of ground water flow or projections in plan view of the plume of contamination at various levels in the aquifer.

Ground water elevation data was plotted for the August 2007 and November 2007 events to track contamination that peaked in the November event and determine the effectiveness of the ground water extraction system by looking at two events that bracket the installation of two new extraction wells in between the slurry wall and the hazardous waste pit. The groundwater flow direction at the water table was generally to the northwest and northeast from the south side of Coon Creek and to the south from the north side of Coon Creek (Figure 21 and 23). Flow at the base of the surficial aquifer is influenced by the extraction wells (Figures 8, 22 and 24). Adequate capture of the Upper Sand plume is achieved since contamination trends at the south side of the Creek appear stable (wells 2B and 13B in Figure 13 and EW-12, EW-13 and EW-10 in Figure 15). The extraction wells influence the direction of flow in the Upper Sand and capture ground water prior to discharge to Coon Creek.

The flow in the Lower Sand was predominantly to the north and northwest and was consistent with flow observed in previous years (Figures 25 and 26). A long term downward trend in ground water elevations is seen in some wells at the top of the Upper Sand, the base of the Upper Sand, the hazardous waste pit and in the Lower Sand (Figures 5, 6, 9, 11, and 13). This trend has been seen over the past two years. Plots of ground water elevations in the extraction wells indicated that the wells were cycling during 2007 (Figure 16). Hydrographs of the Lower Sand indicate a downward trend continued from 2002. They appear to react to the precipitation in the same manner as wells in the Upper Sand. This may indicate a regional influence in the aquifer.

The horizontal hydraulic gradient was consistently flat beneath the fill area and appears to be consistent between years. The horizontal hydraulic gradients were calculated using August and November 2007 data. In the Lower Sand, the horizontal hydraulic gradient was 0.002. In the Upper Sand at the water table, the horizontal hydraulic gradient averaged 0.006 under the fill area in an unstressed area and is similar to measurements calculated from 1999 through 2006. The gradient at the water table steepened an order of magnitude at the infiltration basin in November with a reading of 0.02. At the base of the Upper Sand, the horizontal hydraulic gradients are steeper reflecting impacts due to the extraction wells. The horizontal hydraulic gradient near the extraction wells was steep and averaged 0.04. The horizontal gradient measured near the hazardous waste pit was an order of magnitude higher and averaged 0.15 to the northeast. This explains in part detections found in W-32A.

The relative direction of the vertical hydraulic gradients had remained consistent from 1992 until 1999. However, in 2000 gradient direction or magnitudes changed at a majority of well nests and the trends have continued to the present. Upgradient monitoring well nests in the Upper Sand exhibit moderate downward gradients. The average at the southwest corner was 0.09 and the average at the west side (nest 15) was 0.014. The direction of flow at the west side remained constant in for the past two years. Upper Sand monitoring wells around the hazardous waste pit were moderate and downward with averages varying from 0.032 to 0.04. Upper Sand well nests on the south side of Coon Creek show a moderate to steep upward gradient at the northeast side of the fill area (the average for well nest 2 was -0.1 and the average for well nest 13 was -0.02). The gradients at well nest 11 continued to be strong and down and reflects the influence of EW-11. The monitoring wells along the south bank of Coon Creek commonly exhibited moderate to steep upward gradient with the average ranging from -0.1 to -0.15. The exception was at B2/A2 that was downward with a flat gradient that matches the horizontal gradient and averaged 0.006. North of Coon Creek the vertical gradients in nest 12 were upward and flat with an average of -0.001. The average gradient observed in nest 21 was -0.04 and moderately upward. Several factors may be changing the vertical gradients including extraction of ground water through the pumpout system, recharge in the Upper Sand due to infiltration at the infiltration pond, proximity to Coon Creek which may be either losing or gaining, precipitation into the Upper Sand and storm water management in areas around the site.

The Minnesota Department of Health Environmental Laboratory analyzes the ground water samples for inorganic and organic parameters. Ground water samples collected from monitoring wells and groundwater extraction wells have shown impacts from organic and inorganic parameters. Figures 7, 11, 12, 13, 14, 15, 17, 18, 19, 20 and 27 show the concentrations of total VOCs across the site in the surficial aquifer. The highest concentrations are in all NW- wells, monitoring wells W-3, W-32A and extraction wells EW-9, EW-11, EW-14, and EW-15. The trend in EW-9 is decreasing but EW-14 and EW-15 replaced EW-9 and the concentration in both wells has increased. The trend in EW-11 has remained within the same order of magnitude concentration and indicates it is providing sufficient capture. The trend in W-3 has been stable and indicates that capture is occurring at that location by EW-8. The NW wells were sampled this year and concentrations in these wells vary from 113 to 698,048 µg/L with a mean of 72,296 µg/L and a median of 644 µg/L. This data indicates that the pit is a source that needs better control. The detection in W-32A was the first time this well has detected contamination and it is northeast of the hazardous waste pit. It suggests that a release has occurred from the pit.

The highest concentration detected in 2007 at the water table was in November with a concentration of 7280 micrograms per liter total VOCs (Figure 19). Concentrations detected at the base of the Upper Sand are contoured in Figure 20 to show the plume in the last event of 2007. The highest concentration detected in 2007 was beneath the hazardous waste pit and was 698,084 micrograms per liter total VOCs detected at NW-3A in November 2007. This NAPL detection well is at the northeast corner of the slurry wall and correlates with the contamination detected at W-32A. Nineteen VOCs were detected at NW-3A. Contamination in EW-9 correlates with precipitation. Compounds detected at these wells include 1,1 dichloroethane, cis-1,2 dichloroethene, 1,1,2,2 tetrachloroethene, 1,2 dichloroethane, 2 methyl phenol, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, ethylbenzene, toluene, 1,1,2 trichloroethene, trans-1,2 dichloroethene, 1,1,1 trichloroethane, tetrahydrofuran, vinyl chloride, 1,1,2 trichloroethane, acetone, 1,1 dichloroethene, chlorobenzene, chloroethane and nickel. Levels of many VOCs detected in the monitoring wells on site exceed the Health Risk Limits (HRLs).

The compounds that exceed standards at the compliance boundary are detailed in Table 4. These compounds include arsenic, benzene, vinyl chloride and tetrahydrofuran. They exceed standards in A1, B2, W-4, W-10B, W-7, W-3 and W-2A. Many of these wells are seasonally downgradient of the hazardous waste pit. The vinyl chloride violations at W-2A remained the same (on average) since the last two years. The violations north of the landfill suggest complex flow that may shift seasonally. Monitoring wells north of this nest and Coon Creek now exist (nest of B2 and A2). The water table well, B2, exceeds standards for arsenic and vinyl at the same order of magnitude but slightly less concentration. North of the creek there were no violations of the ground water standards in 2007; this suggests that the upgraded system is providing capture of the plume. A deep monitoring well on the south bank of Coon Creek and to the left of the overflow drainage channel from the infiltration basin was installed in 2006 and exceeds standards for vinyl chloride but is on a declining trend overall (Figure 7) The monitoring wells completed in the lower sand aquifer have not shown VOC contamination from the landfill.

Arsenic is exceeded at B2, W-7 and W-2A. The concentration detected varies within the same order of magnitude and appears to be restricted to a localized area bounded by B2, W-2A and W-7. Where arsenic exceeds a standard the ground water conditions are reducing (represented by negative oxidation reduction potential readings).

3. Ground Water Remediation System Maintenance Summary

A ground water remediation system is in operation at the WDE Landfill and was upgraded in August 2007. The upgraded system is shown in Figure 1B. The ground water remediation system includes 8 extraction wells. Well EW-14 and EW-15 replaced EW-9. The other wells are EW-10, EW-11, EW-12 and EW13. Maintenance on the system includes optimizing flow to the extraction wells by analyzing the flow data on a weekly basis; jetting wells, lines and forcemains including the forcemain out to the treatment pond and manhole on Crosstown Boulevard; replacing pumps, pump motors, back flow preventors and flow meters. Two aerators were installed in the treatment pond in April through May 2005 by Veit Companies. The details of maintenance are found in weekly Facility Inspection Reports prepared by Willow Brook Engineering, the O & M contractor for the site, and found in Appendix A.

4. Ground Water Remediation Summary

The ground water pumpout system captures contaminated groundwater moving north and northeast from the WDE Landfill towards Coon Creek. The trend of contamination has increased with the new extraction wells suggesting greater capture of the plume. This is verified by the absence of violations north of Coon Creek and the absence of violations in the surface water. Table 5 shows the volume of water pumped and the pounds of VOCs removed. The pumpout system removed 398.8 pounds in 2003, 505 pounds in 2004, 475 pounds in 2005, 771 pounds in 2006 and 572 pounds in 2007.

The data for EW-14 and EW-15 is shown in the table as EW-9 because its forcemain was used to hook up the two new wells. It's not clear whether the new wells are effective at removing contaminants from the pit since a release from the pit was seen at the water table northeast of the pit in W-32A in November 2007. A report on the effectiveness of the work completed in the pit this August is due at the end of January 2008. EW-9 removed between 90 and 99 % of total contaminants in the years between 1997 through 2007.

Concentration contour maps have been included to illustrate the effectiveness of the pumpout system. Figures 17 through 20 show the concentration contours as plotted for the August and November events to bracket when an upgrade was completed in extraction wells in the pit. The system is effective in containing the plume before it enters the creek but its effectiveness in removing contaminants from the pit has not been verified. This is shown by comparing Figures 17 and 19. The contamination at the water table jumped an order of magnitude between August and November 2007. Monitoring wells located north of Coon Creek generally show a long term decreasing trend in VOC levels and did not violate ground water standards this year (Figure 7).

Figure 27 plots precipitation and influent concentrations. The data shows that since late 2004 the influent concentration has not exceeded the MCES total toxics standard. However, a disturbing trend in the influent concentration occurred in the last sampling event when the concentration plummeted 4 orders of magnitude and indicated that contaminants from the pit are not going to the treatment pond but are apparently being released to the water table.

5. Monitoring System Modifications

EW-9 should be brought back on line to remove contaminants from the pit or other means should be used to remediate contamination below the pit.

B. Surface Water Monitoring Summary

Surface water quality monitoring was completed at 4 locations near the WDE Sanitary Landfill along Coon Creek., including locations upstream (CC8) and downstream (CC5) of the landfill. Surface water samples collected from Coon Creek have historically shown impacts from organic parameters and metals. The Aquatic Life Standards for a Class 2B Water were not exceeded for any of the VOCs or metals in 2007.

C. Additional Ground Water Monitoring Summary

Four residential wells are part of the monitoring system for the WDE Sanitary Landfill. These well are very deep ranging in depth from 236 to 261 feet below the ground surface. There were no detections of any VOCs in the residential wells from 1995 through 2005. The wells will not be sampled annually but every 3 to 5 years.

D. Site Ground Water Monitoring Recommendations

Continue monitoring quarterly for VOCs, specific metals and annually for general parameters. Collect oxidation reduction data around monitoring wells with elevated arsenic concentrations. Monitoring wells completed into and through the waste should be sealed. New extraction wells that will be installed to capture flow beneath the hazardous waste pit should be tested monthly.

IV. Inspections

MPCA hires an Operation and Maintenance (O&M) contractor to conduct weekly site and security checks and to complete routine maintenance activities at the site. Common maintenance activities includes: annual mowing of landfill cover, grass and brush trimming around wells, fence repair/maintenance, access road maintenance, snow plowing, and litter control. In addition, MPCA staff are at the site several times each month to check on site conditions, equipment performance and site security. Weekly inspections in 2007 were conducted by the O & M contractor, Willow Brook Engineering. Copies of Willow Brook Engineering inspection reports and monthly summaries are available upon request in electronic format.

V. Required Permits

Minnesota Department of Health Well Maintenance Permits are completed annually. A MCES Industrial Discharge Permit is required for disposal of the treated ground water into the sanitary sewer (this permit was renewed in the fall of 2001). The discharge water must be monitored monthly, with quarterly reports filed with the MCES. In addition there is a Minnesota Department of Natural Resources (DNR) Water Appropriation Permit for the pumpout system. A Water Use Report is filed annually with the DNR

VI. Summary of Site Recommendations

Groundwater monitoring will continue quarterly for VOCs, arsenic and manganese and annually for general parameters.

VII. Land Recovered for Beneficial Use/Assistance to Local Units of Government

MPCA staff has worked with City of Andover planning staff in the development of the Andover Station and the landfill's forcemain usage. The landfill is registered with Gopher State One Call and utility locates are now coordinated through the O & M contractor. A Gas to Energy project at the landfill is proceeding and start up occurred in December 2006.

VIII. Land Use Planning Issues

The MPCA hopes to complete transfer of ownership with Anoka County in 2008 of the qualified facility. The Land Use Plan was completed in late 2006.

IX. Conclusions and Recommendations

The active gas extraction system operated at 89 percent of the time during the past year and this indicates that the gas to energy system did not operate that often.

Ground water flow at the site is to the north, northeast and northwest. Ground water flow is controlled by the ground water extraction system and the seasonal flow in Coon Creek. Those wells that exceed standards at the compliance boundary are detailed in Table 4. The compounds include arsenic, benzene, vinyl chloride, tetrahydrofuran. The monitoring wells completed in the lower sand aquifer have not shown VOC contamination from the landfill. The monitoring wells north of Coon Creek did not exceed ground water standards.

Aquatic Life Standards were not exceeded during 2007 sampling events in Coon Creek samples.

MPCA has constructed a new treatment pond to remediate the ground water effluent in the fall of 2004. The system is meeting MCES standards prior to discharge into the sanitary sewer. Ground water and methane monitoring, inspections, erosion repair and mowing will be continued. The ground water extraction system was upgraded in late spring 2006 and extraction wells were installed in the hazardous waste pit in 2007. The plume is being captured by this system prior to entering the creek. The effectiveness of the extraction wells in the pit has not been documented. A release to the water table from the pit was documented in November 2007. The extraction wells along the south side of the creek will capture this plume. Extraction Wells EW-6 and EW-7 should be operated if one of the other extraction wells along the south side of Coon Creek fails or goes off-line to insure complete capture.

Figure 1A Location of Gas Probes around WDE Landfill

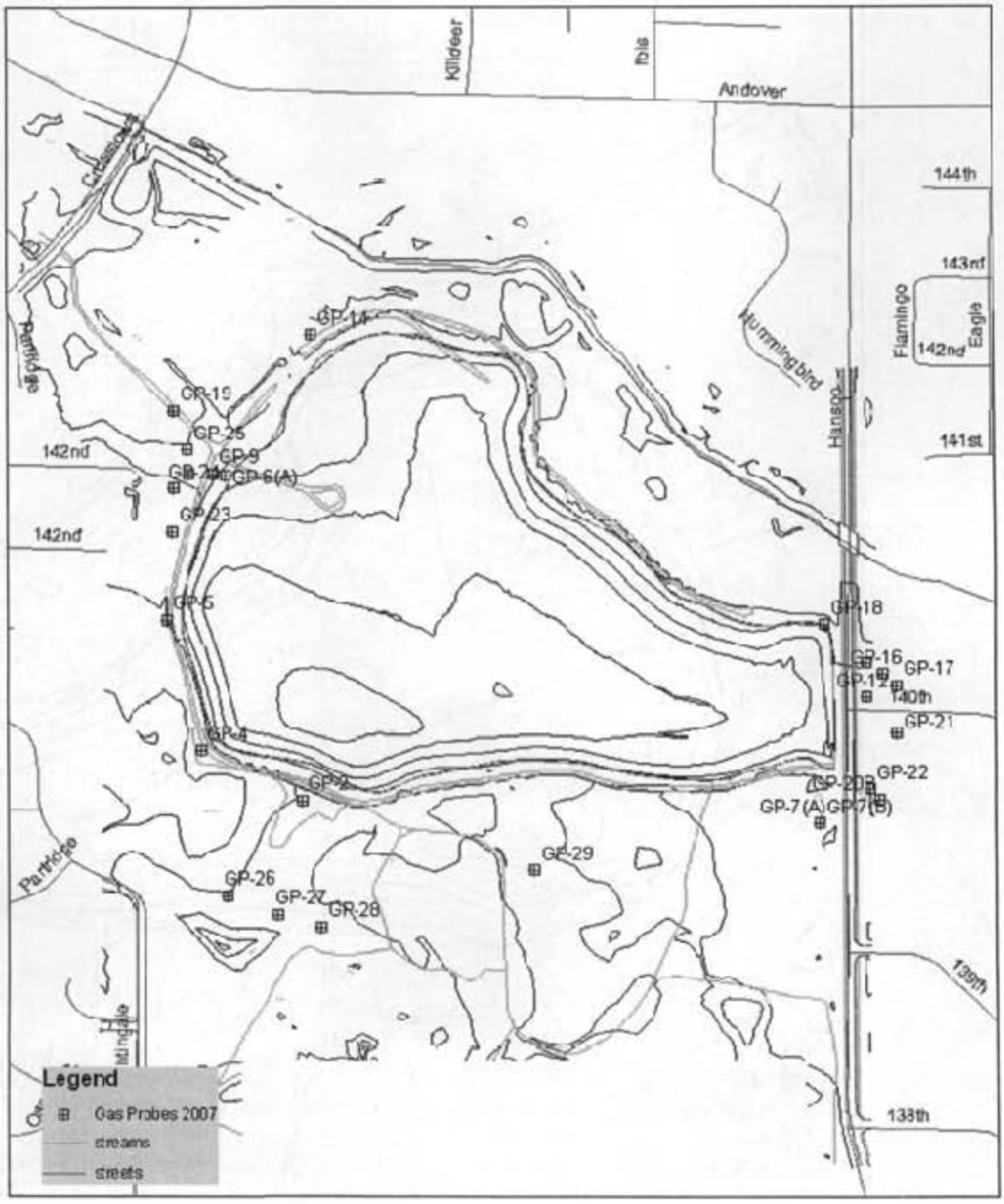

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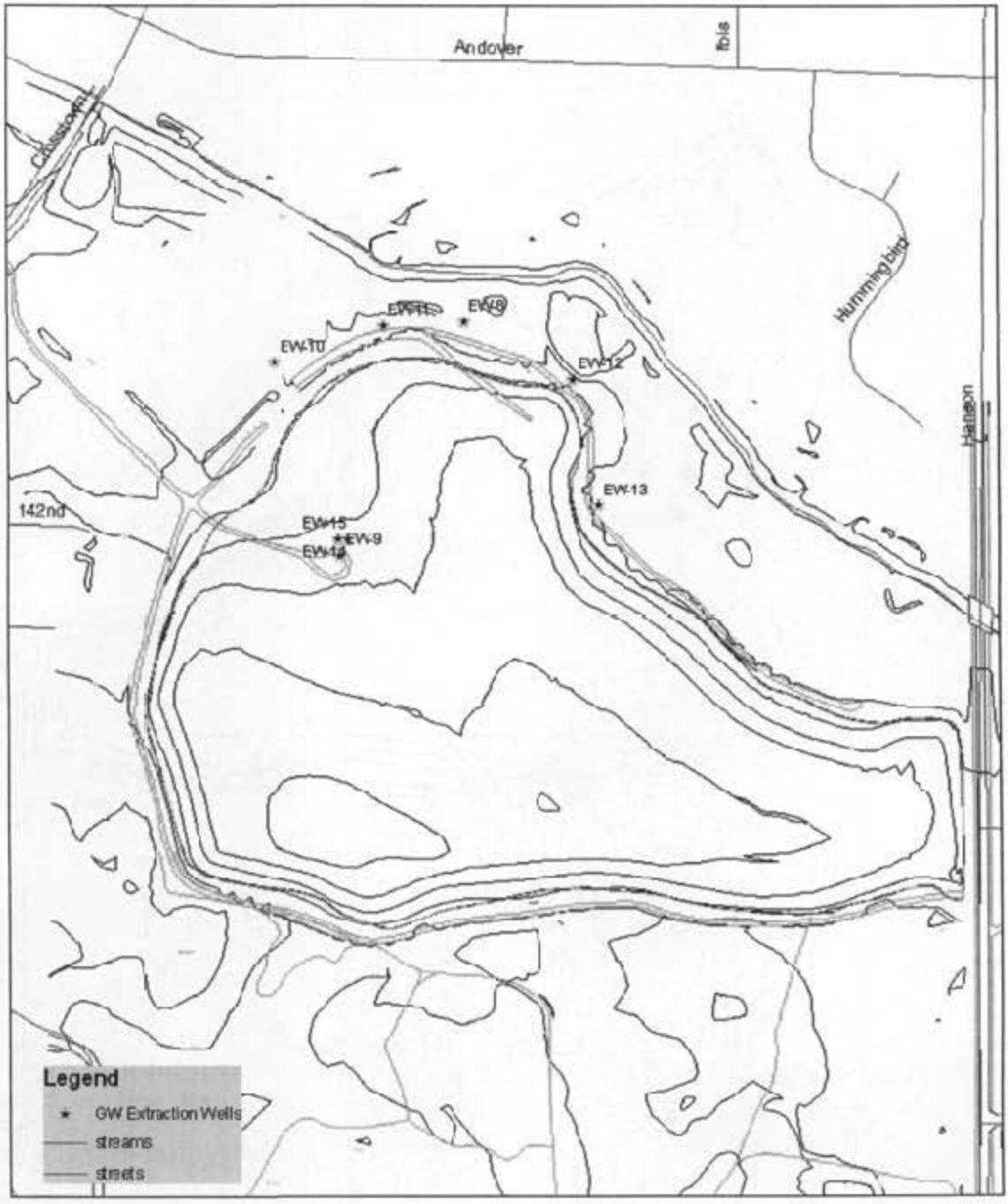
Figure 1B Location of Ground Water Extraction Wells around WDE Landfill



140 70 0 140 Meters

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Figure 2: Geology at WDE Landfill. EW wells are at same level as B wells.

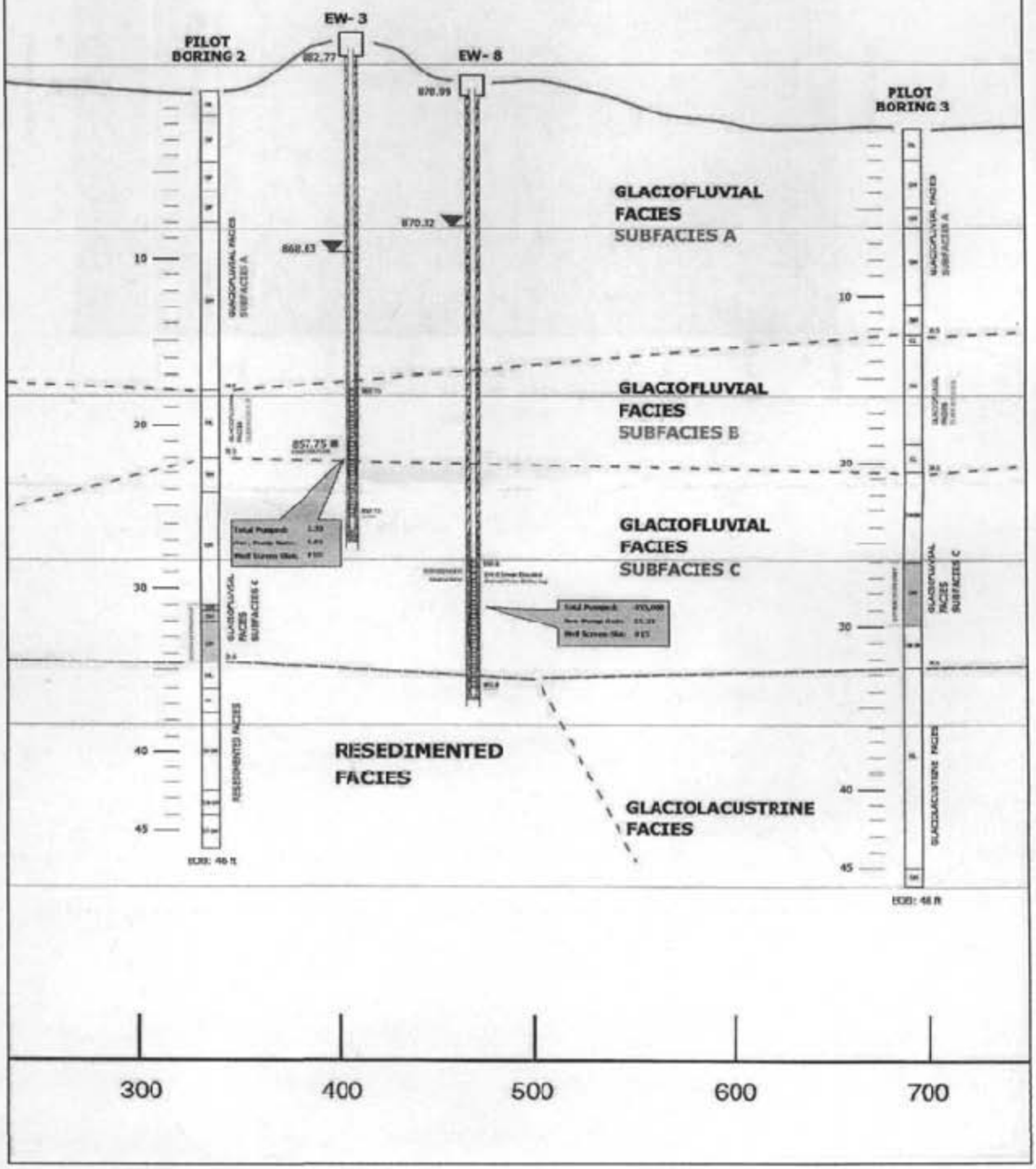


Figure 3. Daily and Monthly Precipitation from January 1, 1999 through December 31, 2007 (Source of Data: State Climatologist)

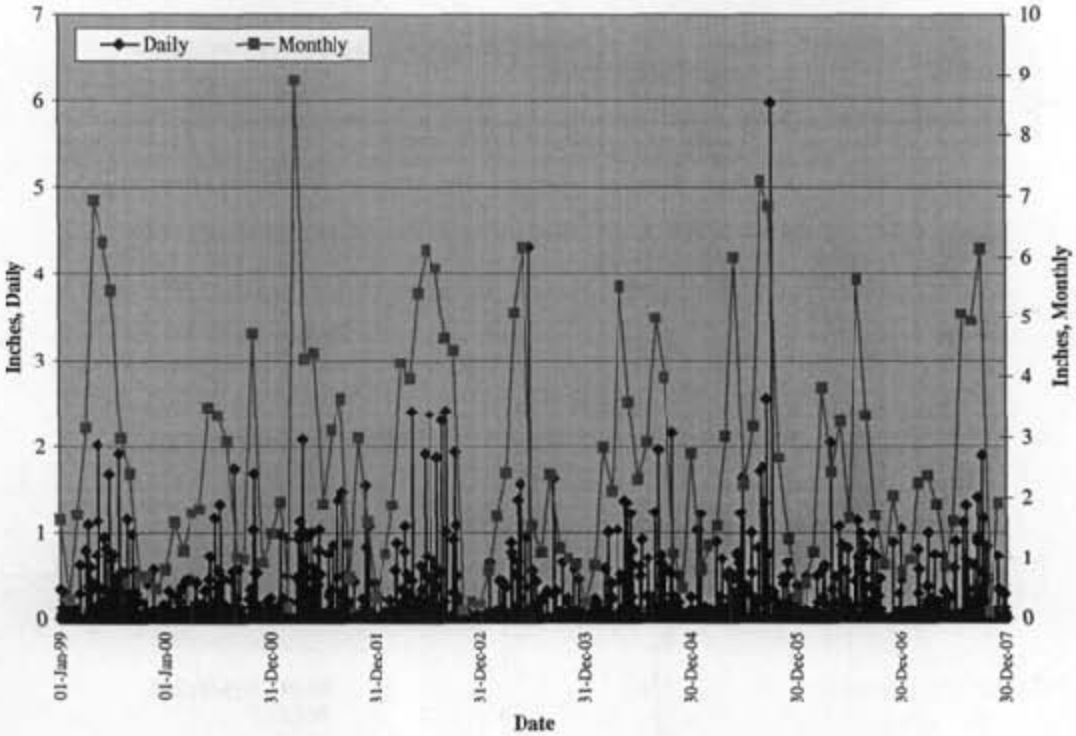


Figure 4 Annual Rainfall around WDE Landfill (Source of Data: State Climatologist)

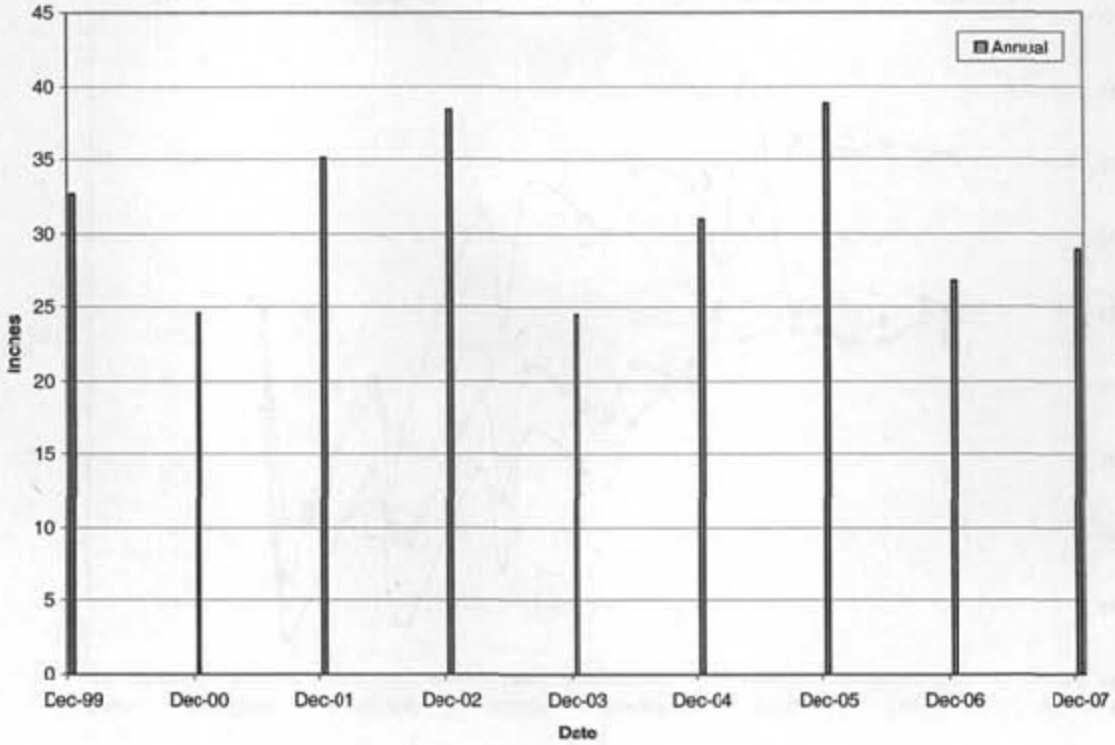


Figure 5 Lower Sand Ground Water Elevations - NGVD

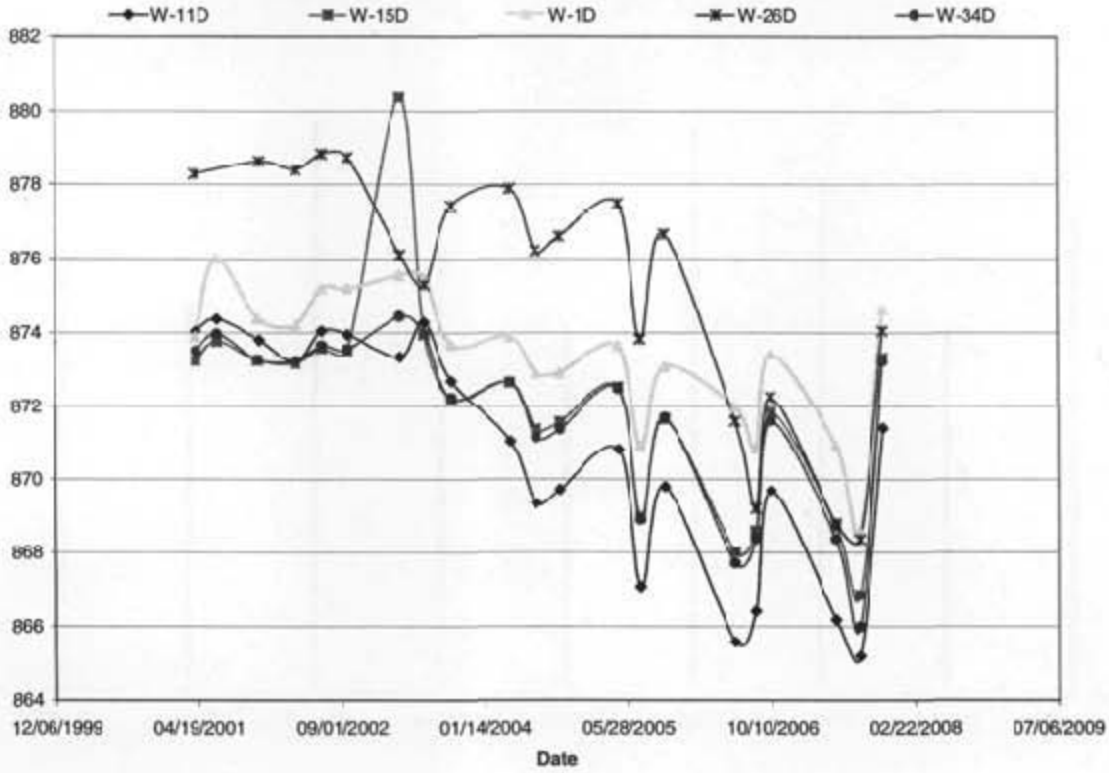


Figure 6 Ground Water and Surface Water Elevations around Coon Creek - NGVD

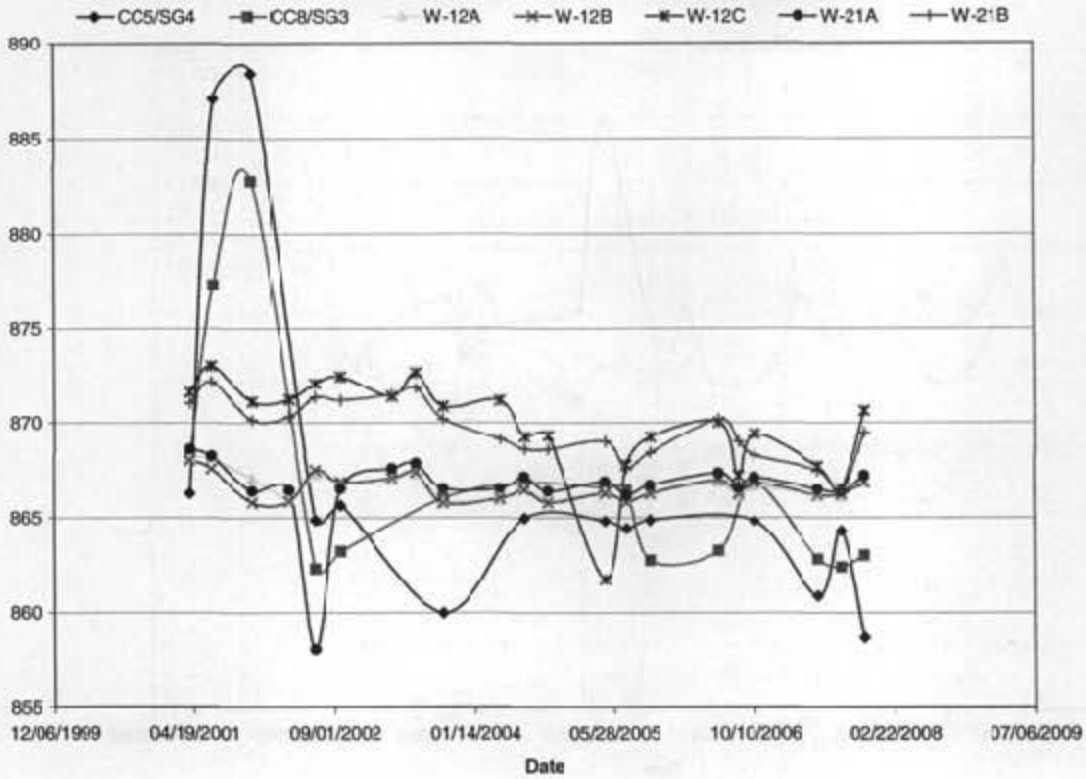


Figure 7 Ground water and surface water quality around Coon Creek (Total VOCs)

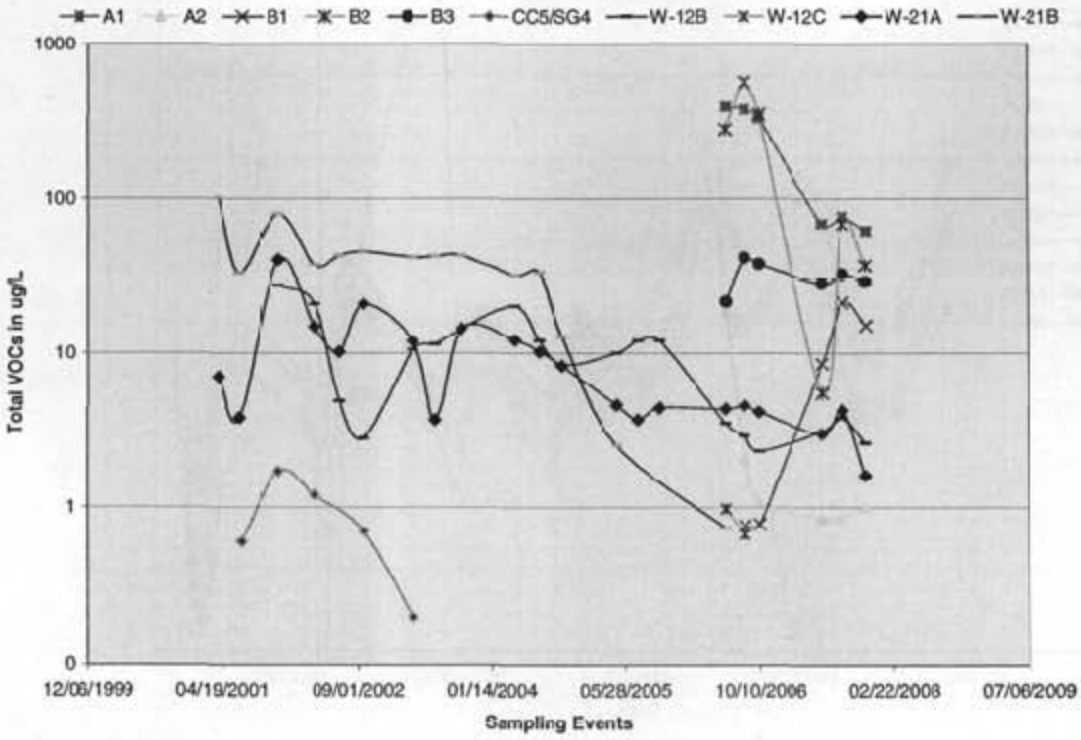


Figure 8 Ground Water Elevations measured in piezometers - NGVD

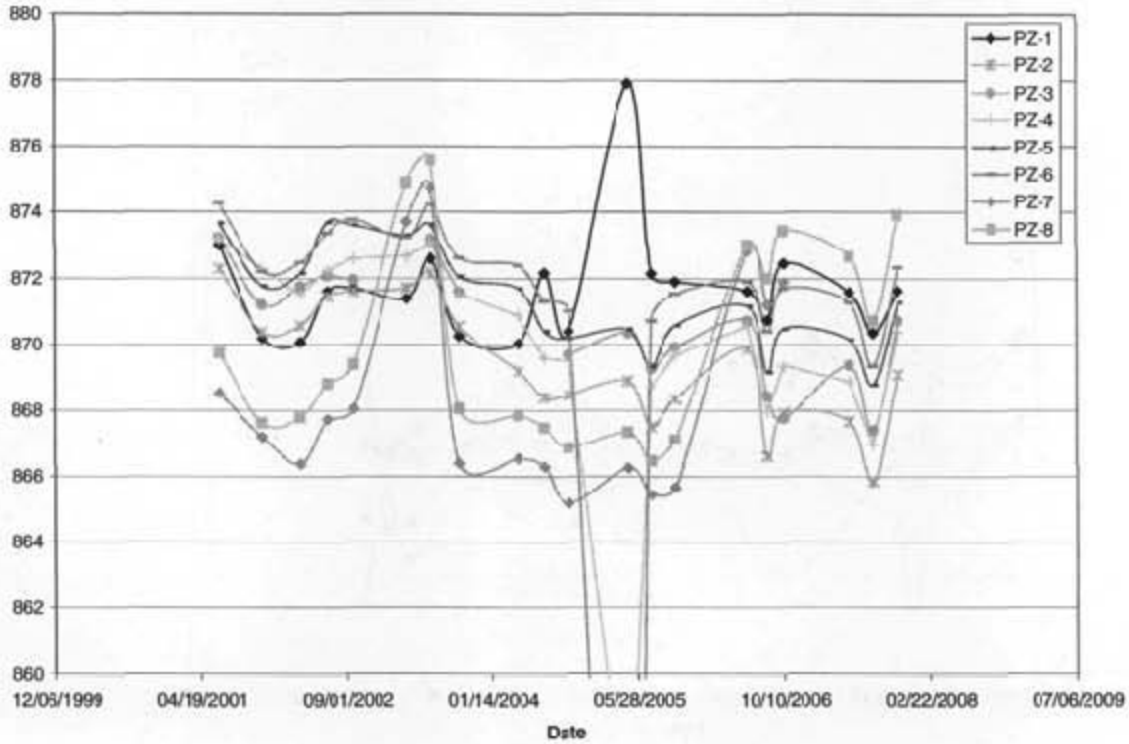


Figure 9 Ground Water Elevations measured around the Hazardous Waste Pit Slurry Wall

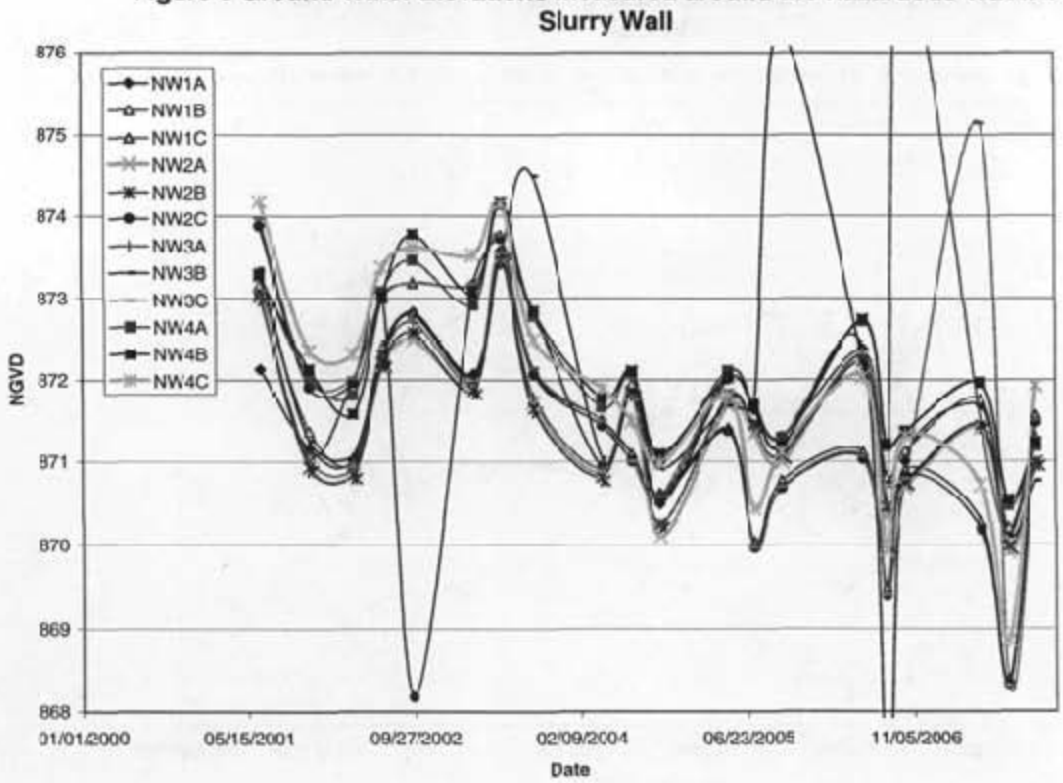


Figure 10 Upper Sand Ground Water Elevations (Glaciofluvial Facies Subfacies A) - NGVD

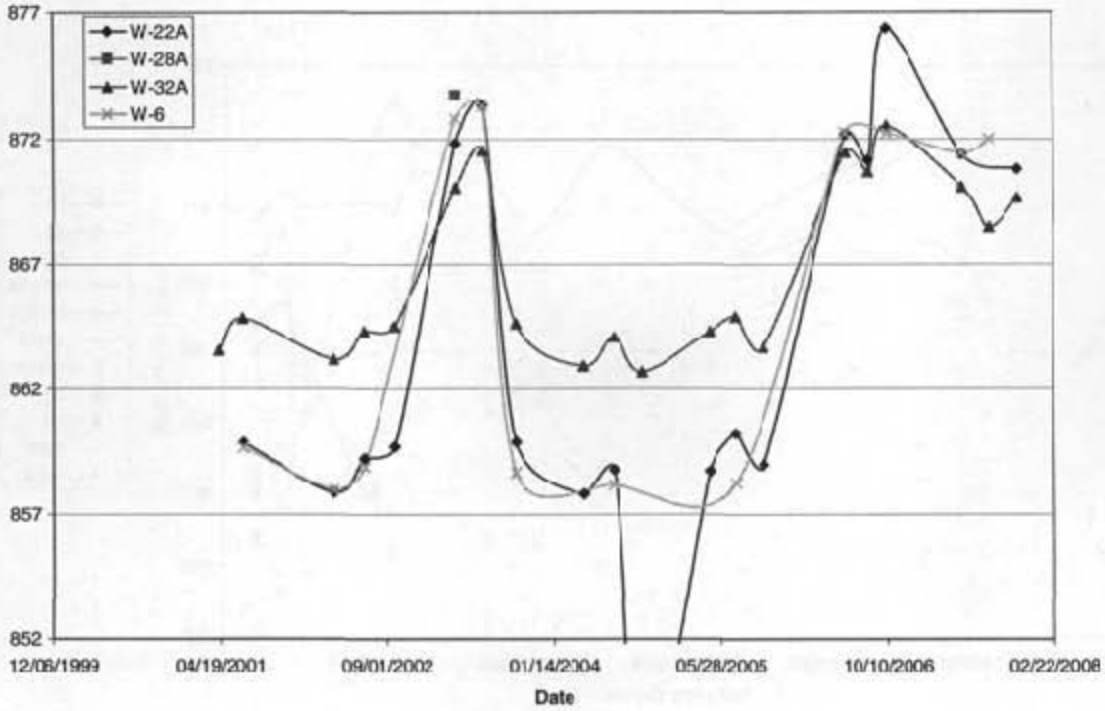


Figure 11 Total Volatile Organic Compounds and Ground Water elevation at the top of the Upper Sand [Subfacies A (Graph 1)]

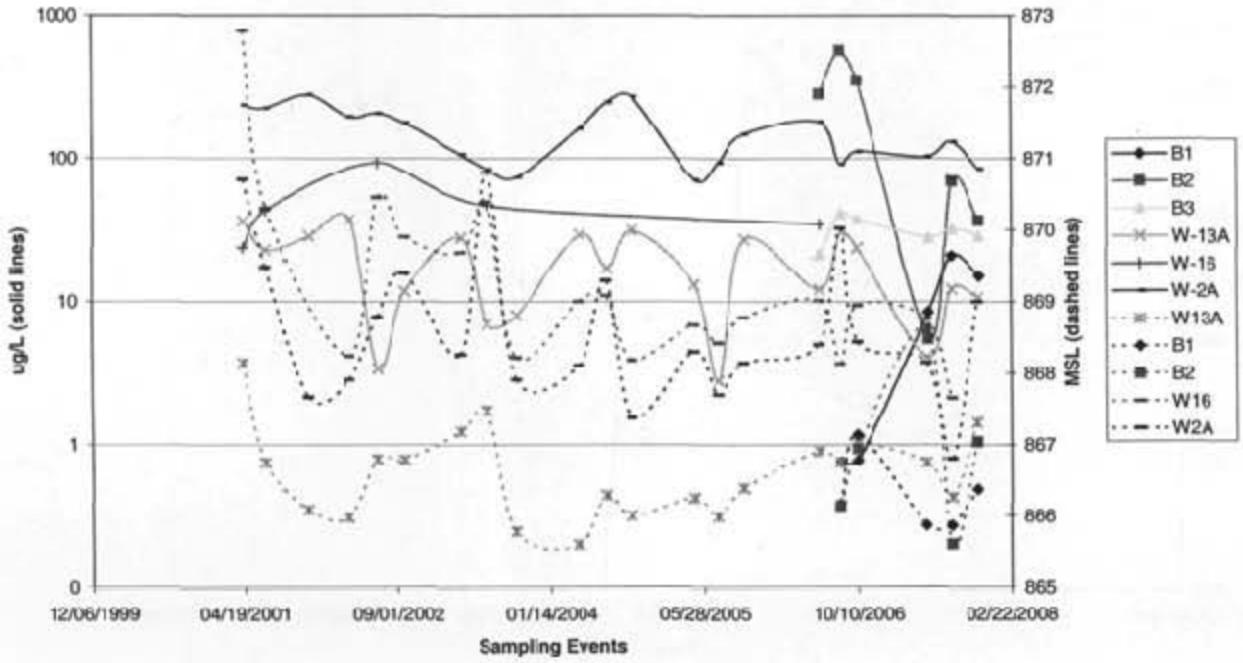


Figure 12 Total Volatile Organic compounds and ground water elevations at the top of the Upper Sand [Subfacies A (Graph 2)]

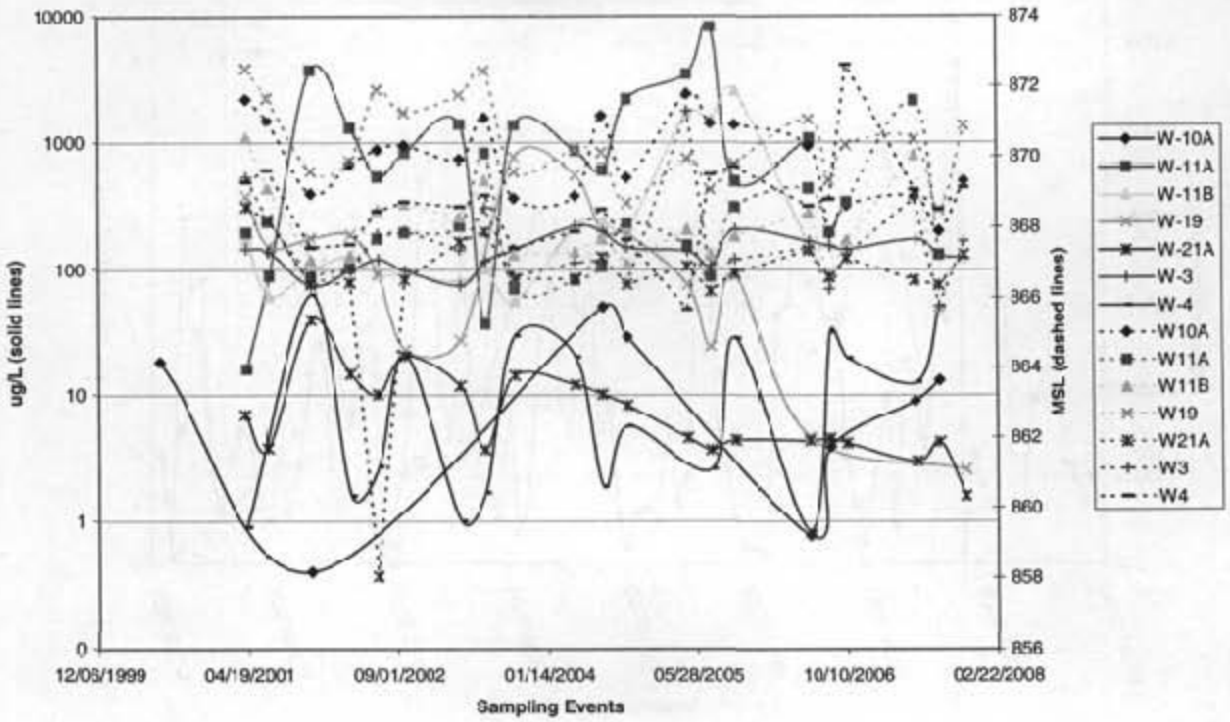


Figure 13 Total VOCs and Ground Water elevations at the bottom of the Upper Sand (Subfacies B and C)

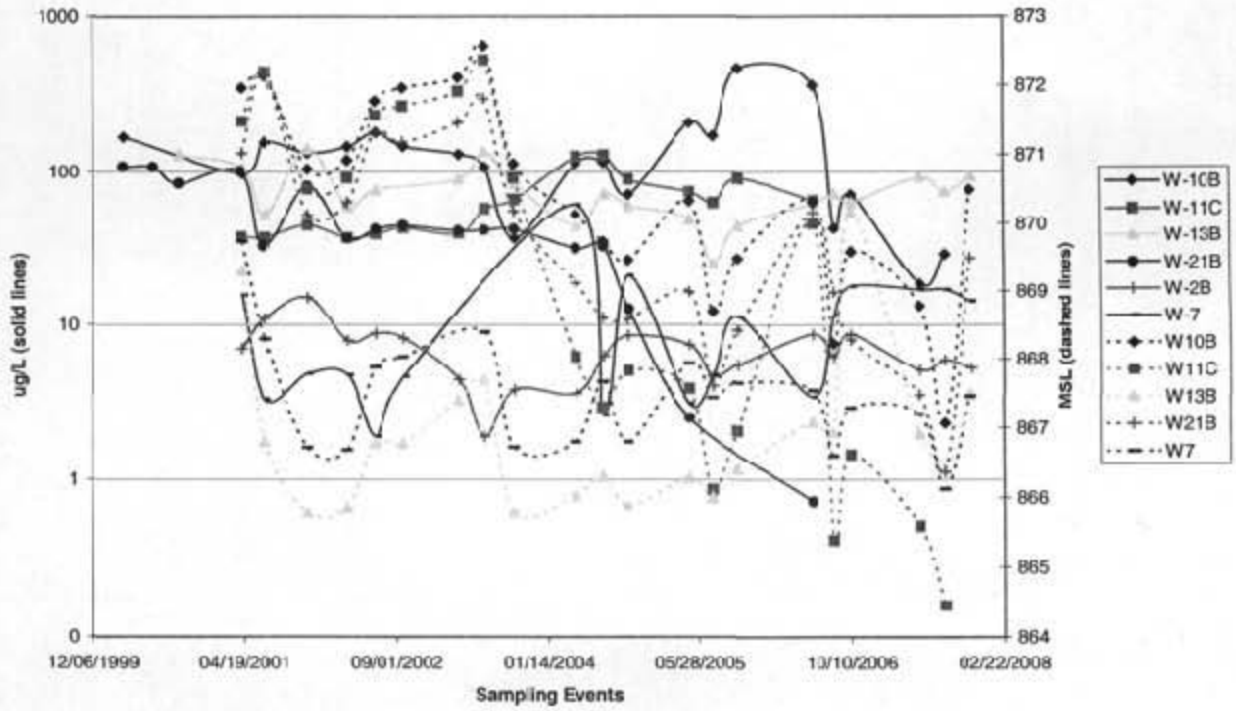


Figure 14 Rainfall around WDE Landfill and Total VOCs in EW-9

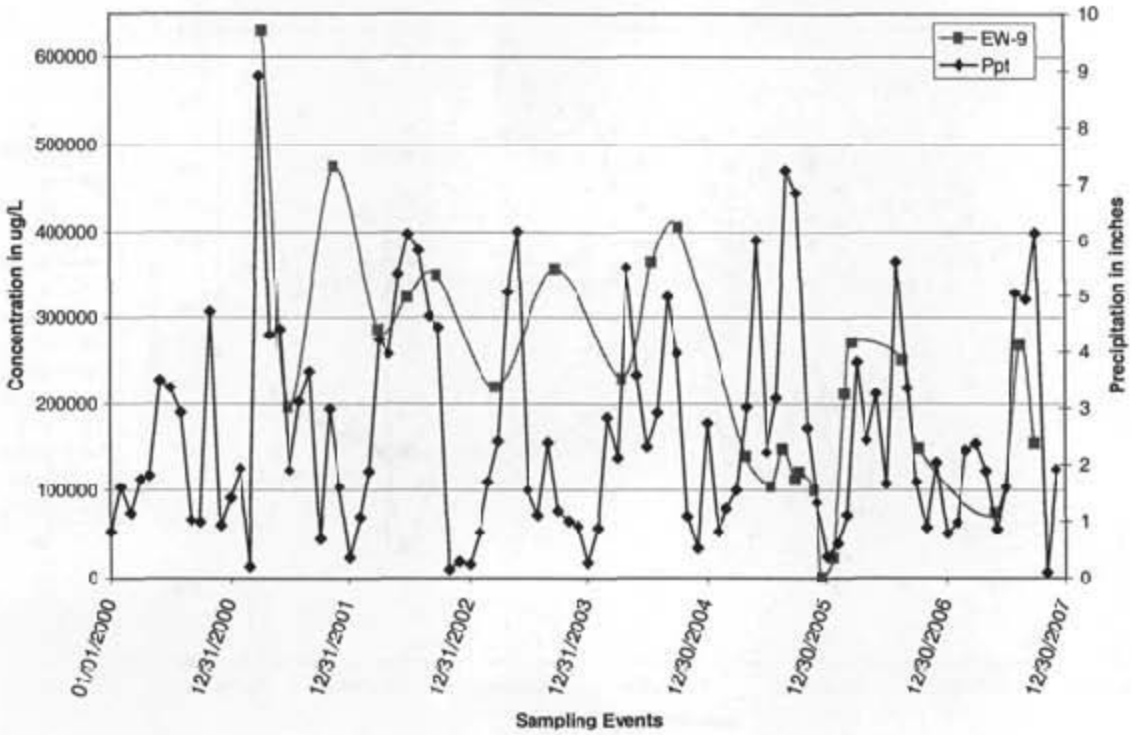


Figure 15 Total VOCs in remaining Groundwater Extraction wells

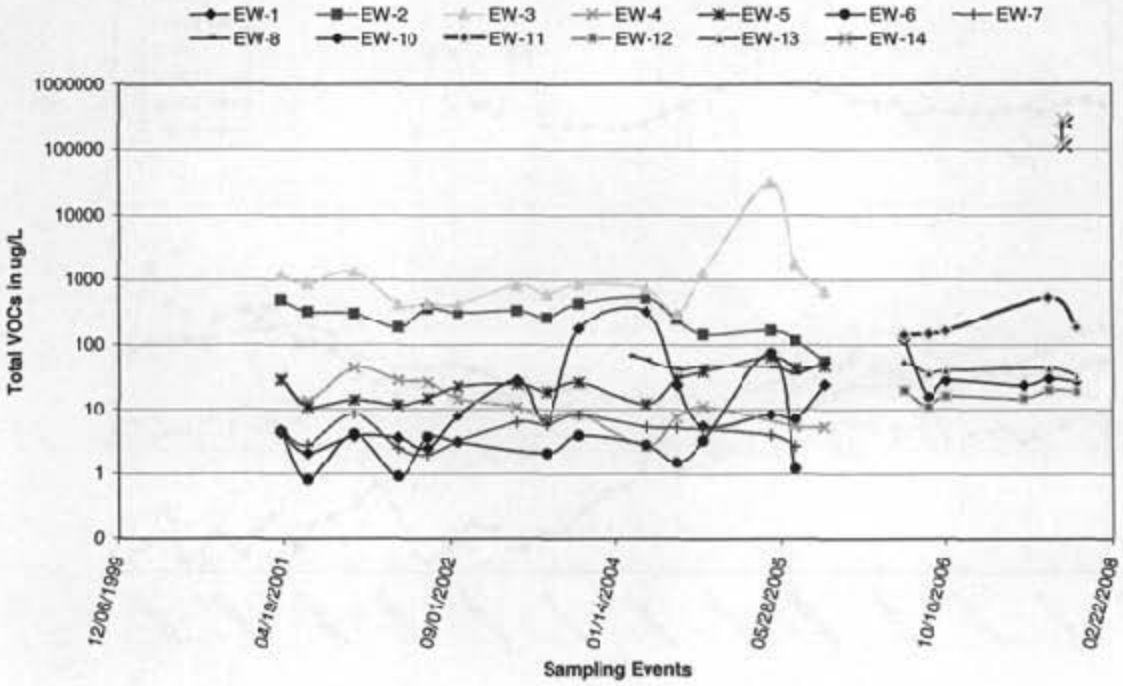


Figure 16 Ground Water Elevations measured in the Extraction wells in 2007

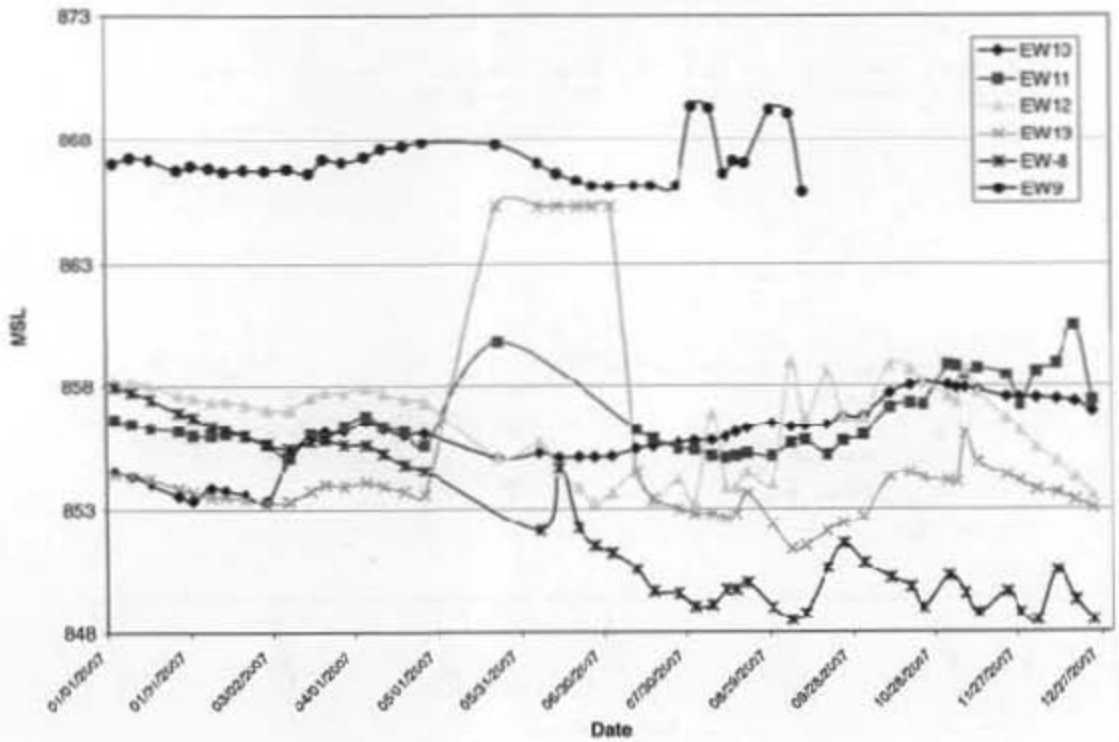
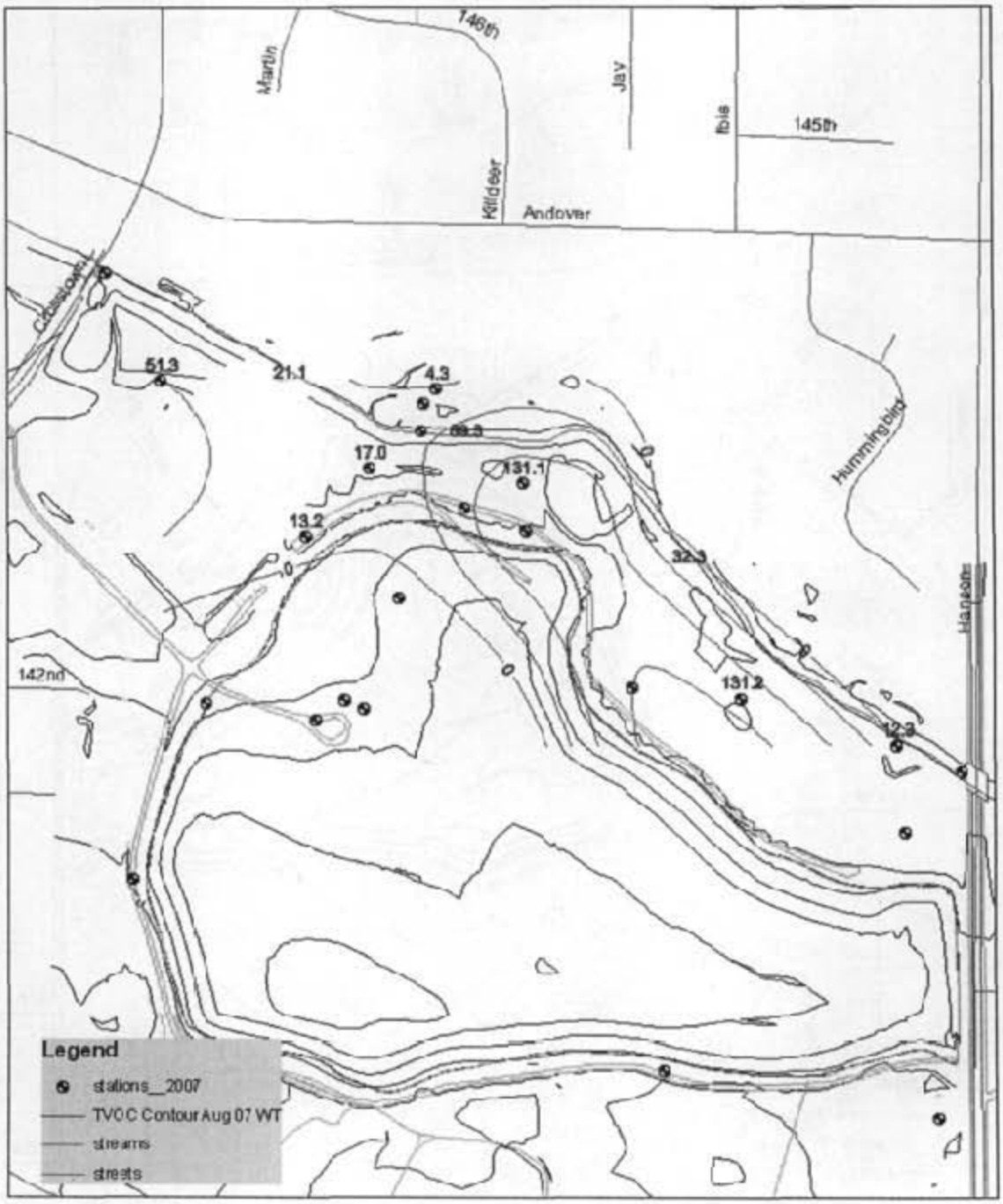


Figure 17 Contour map of Total VOCs at the water table (August 2007)



Contour interval is 50 ug/L

140 70 0 140 Meters

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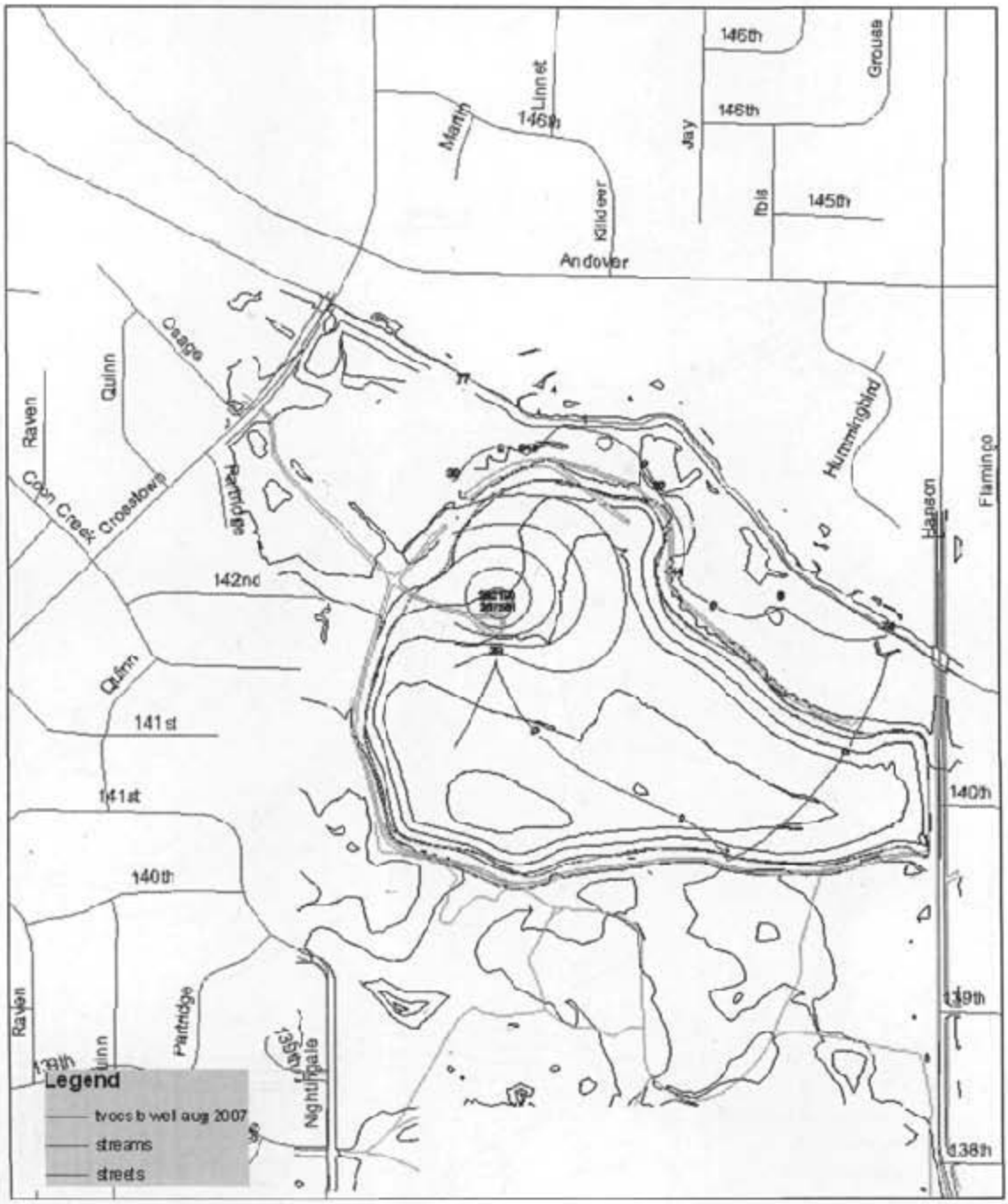
Figure 18 Contour map of Total VOCs at base of the Upper Sand (August 2007)



Contour interval is 50,000 ug/L

Highest Concentration is 292190
EW-14 data from 27Sep07 included

200 100 0 200 Meters

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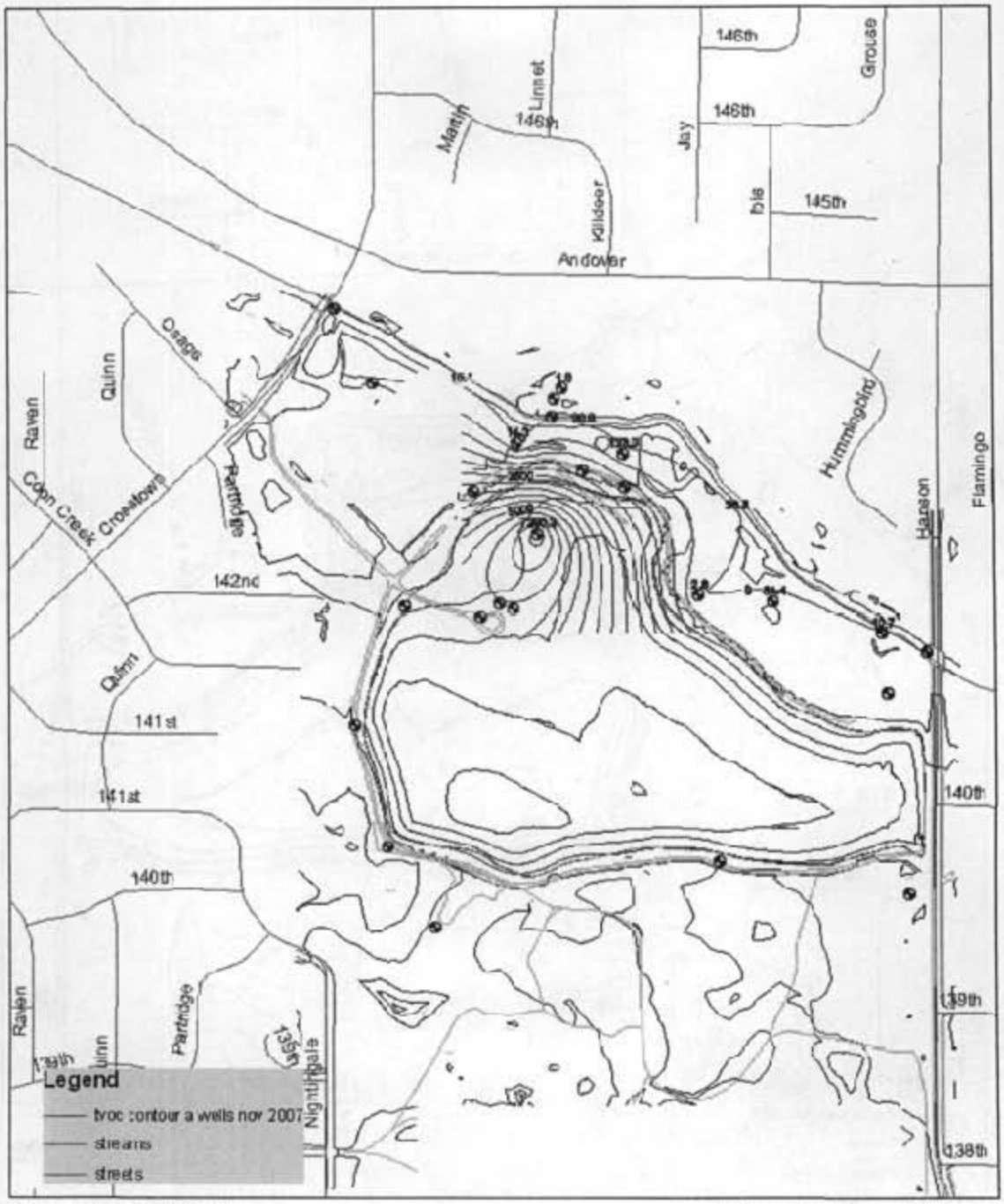
Figure 19 Contour map of Total VOCs at the water table (November 2007)



Contour interval is 500 ug/L

Highest concentration is 7280 ug/L

200 100 0 200 Meters

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Figure 20 Contour map of Total VOCs at the base of the Upper Sand (November 2007)

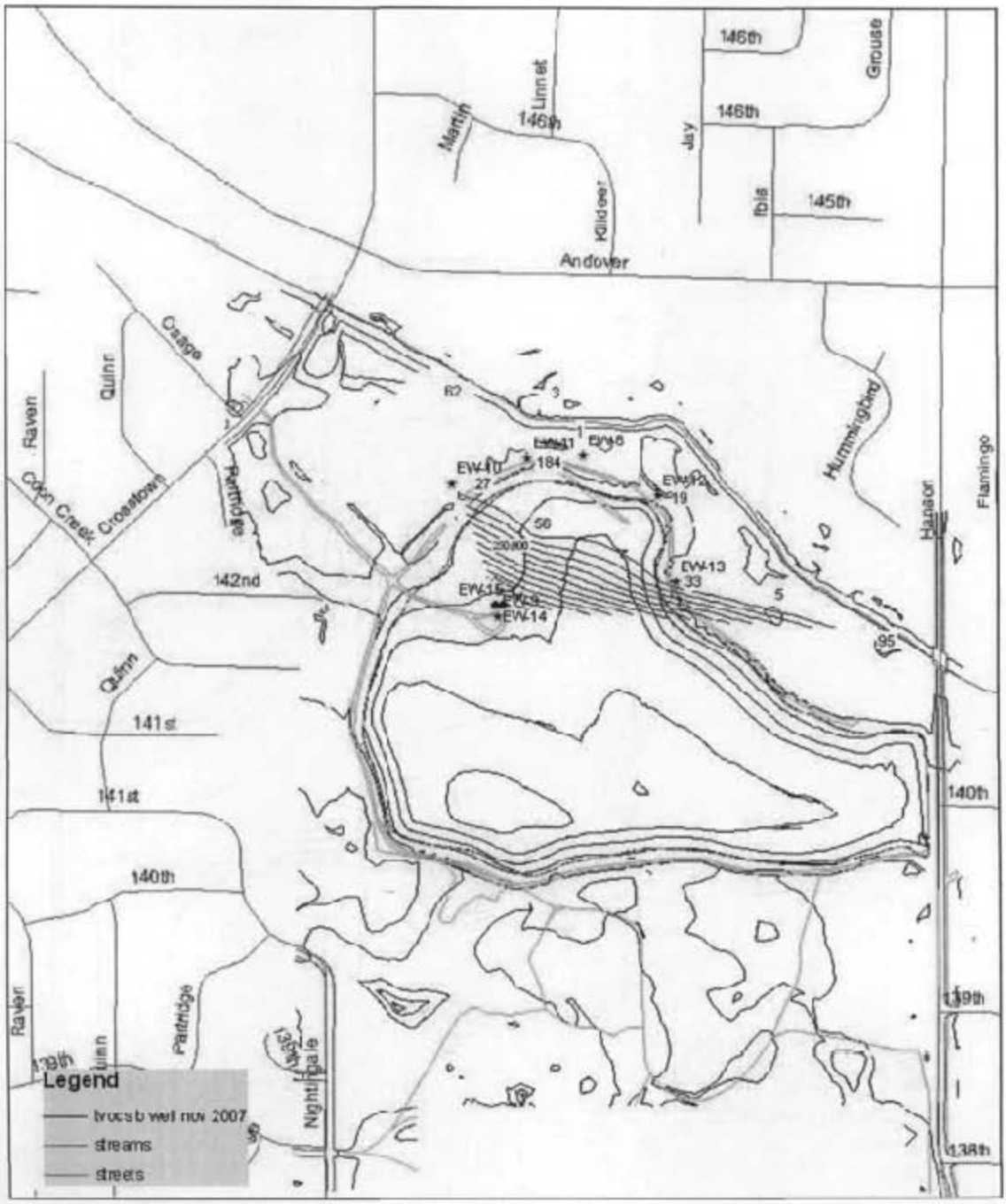

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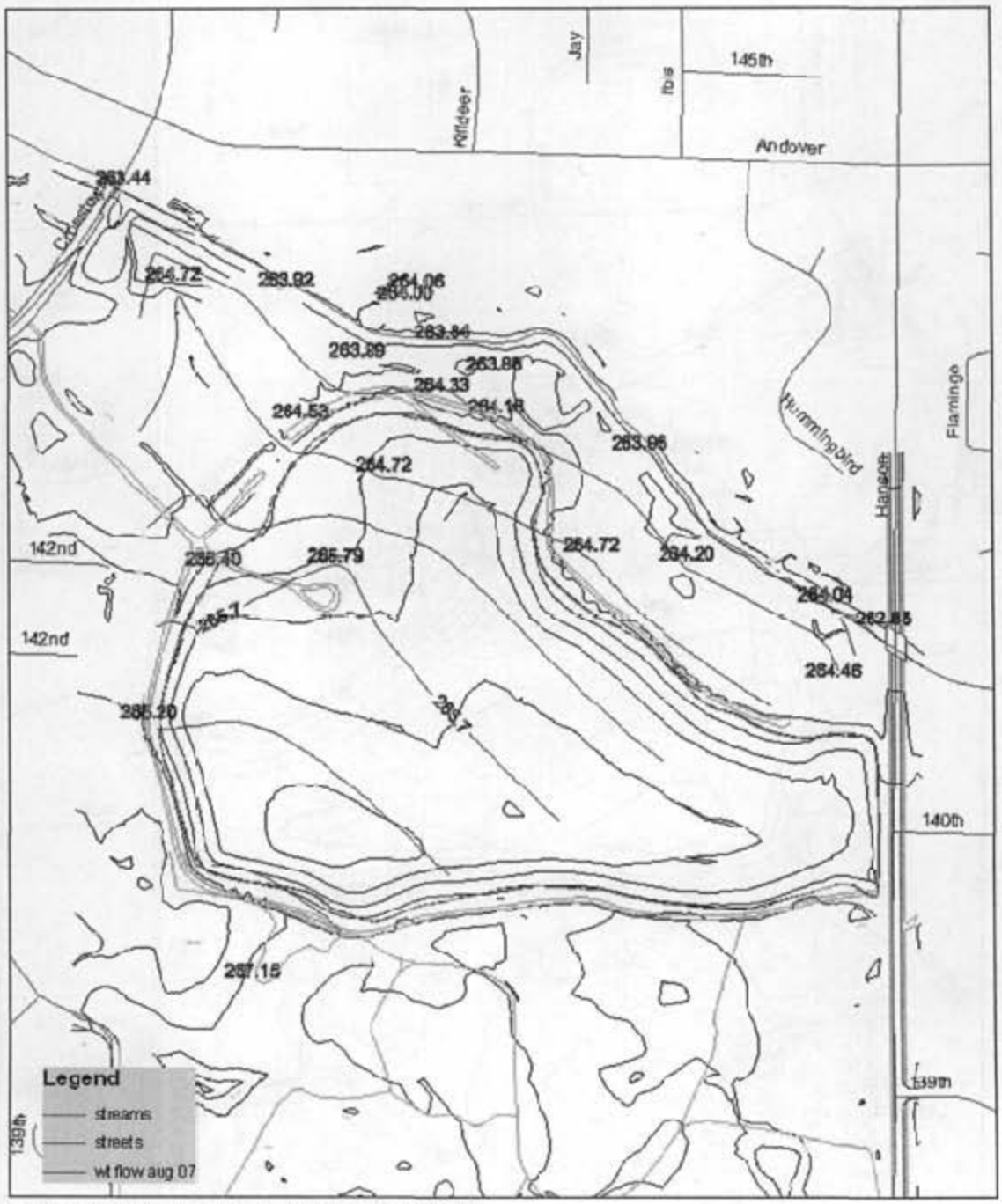
Figure 21 Contour map of flow at the water table (August 2007)

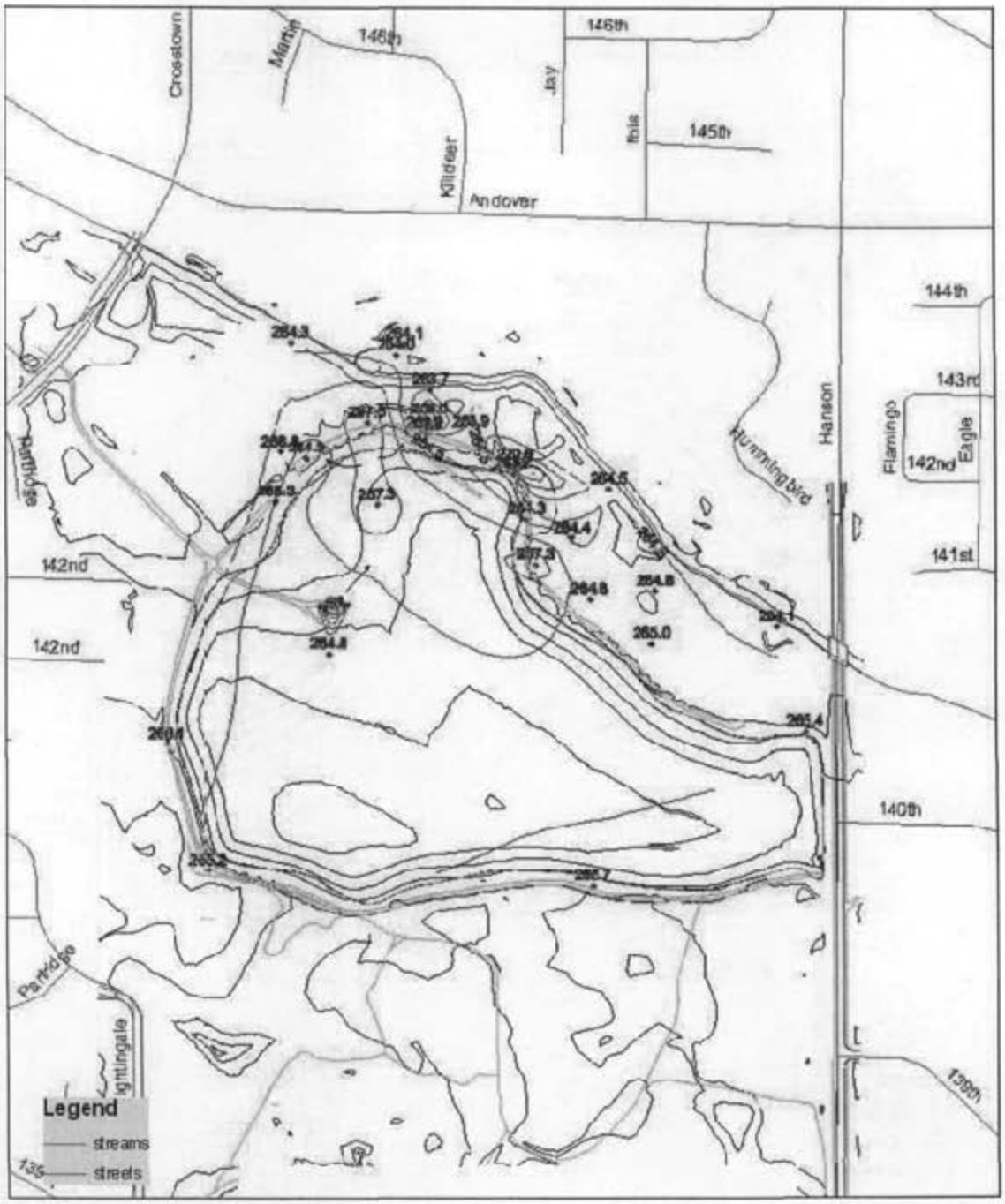


Contour interval is 0.5 meter. Algorithm is natural neighbor

100 50 0 100 Meters

Minnesota Pollution Control Agency

Figure 22 Contour map of flow at the base of the Upper Sand (August 2007)



Contour interval is 1 meter, Algorithm is natural neighbor

Flow is out of pit to NE

110 55 0 110 Meters

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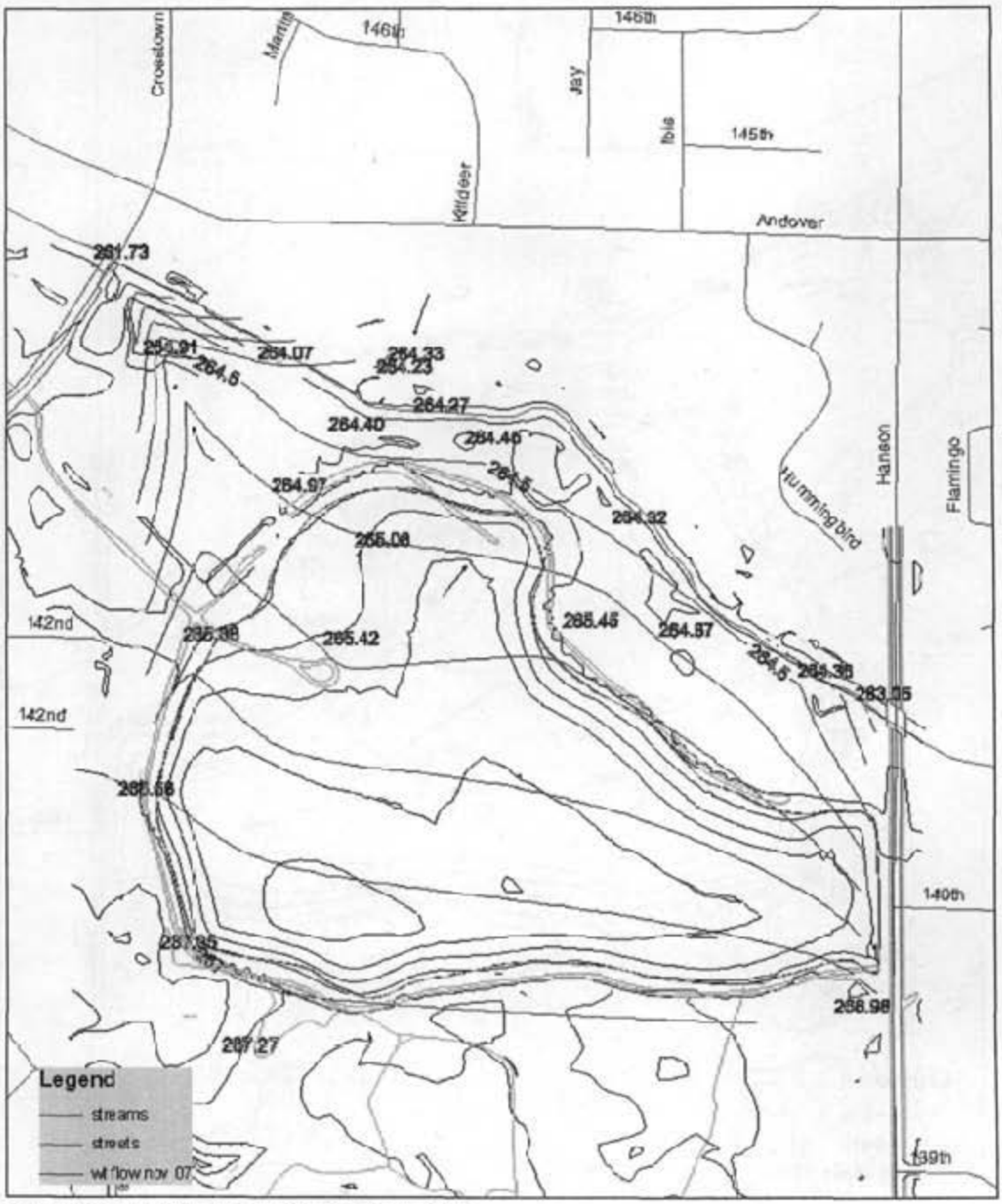
Figure 23 Contour map of flow at the water table (November 2007)

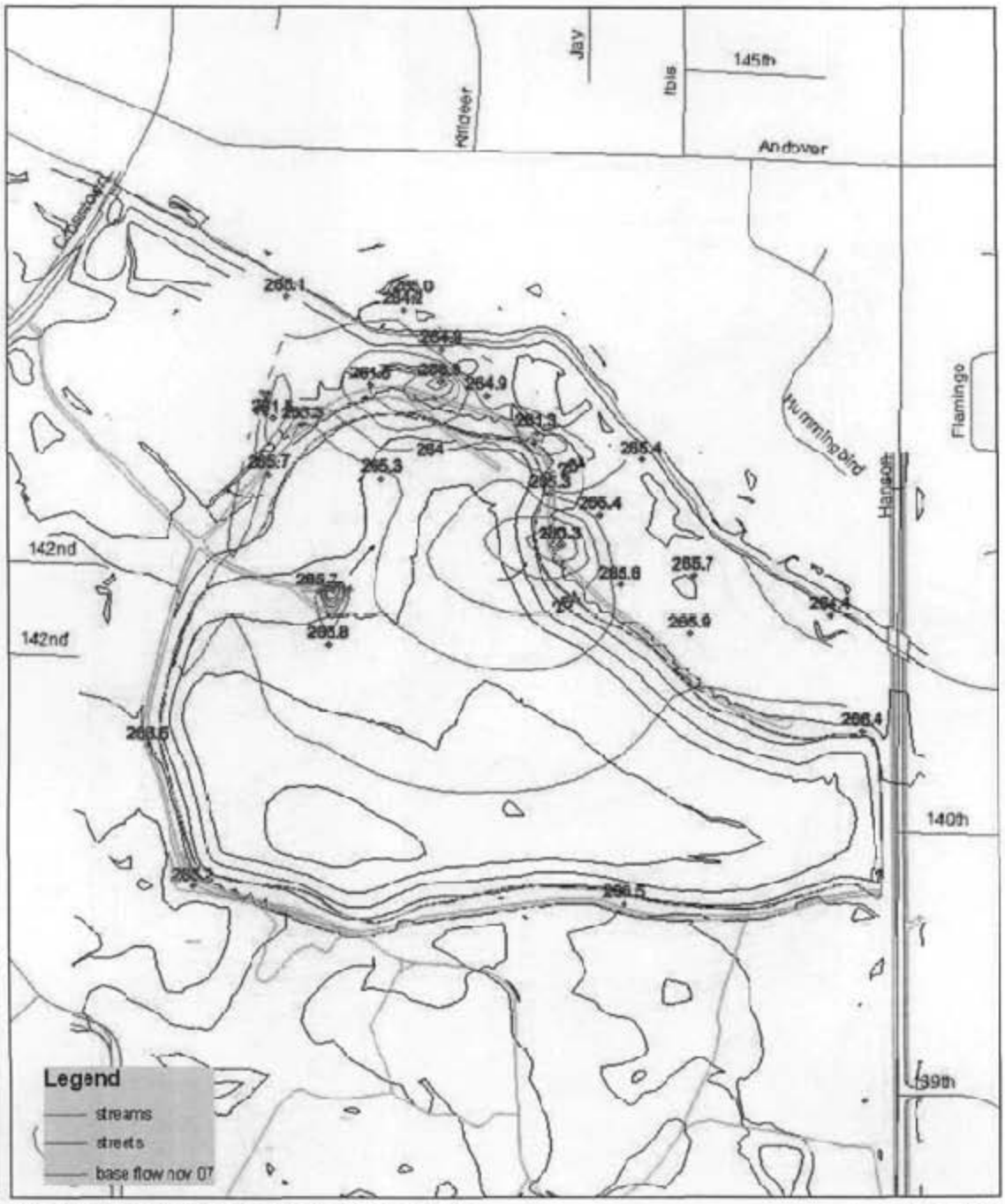


Contour interval is 0.5 meter, Algorithm is natural neighbor

100 50 0 100 Meters

Minnesota Pollution Control Agency

Figure 24 Contour map of flow at the base of the Upper Sand (November 2007)



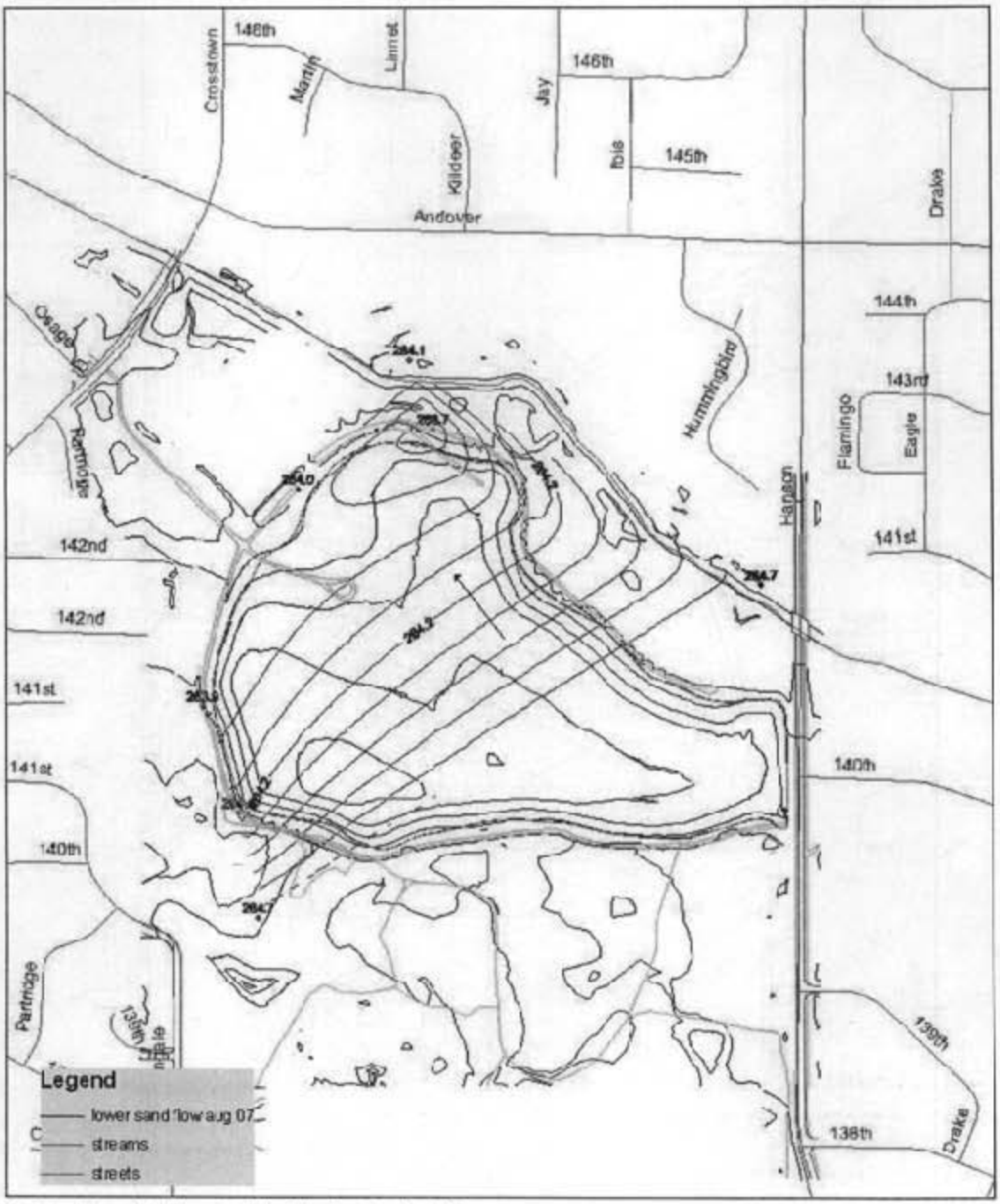
Contour interval is 1 meter, Algorithm is natural neighbor

Flow is out of pit to NE

100 50 0 100 Meters

Minnesota Pollution Control Agency

Figure 25 Contour map of flow in the Lower Sand (August 2007)

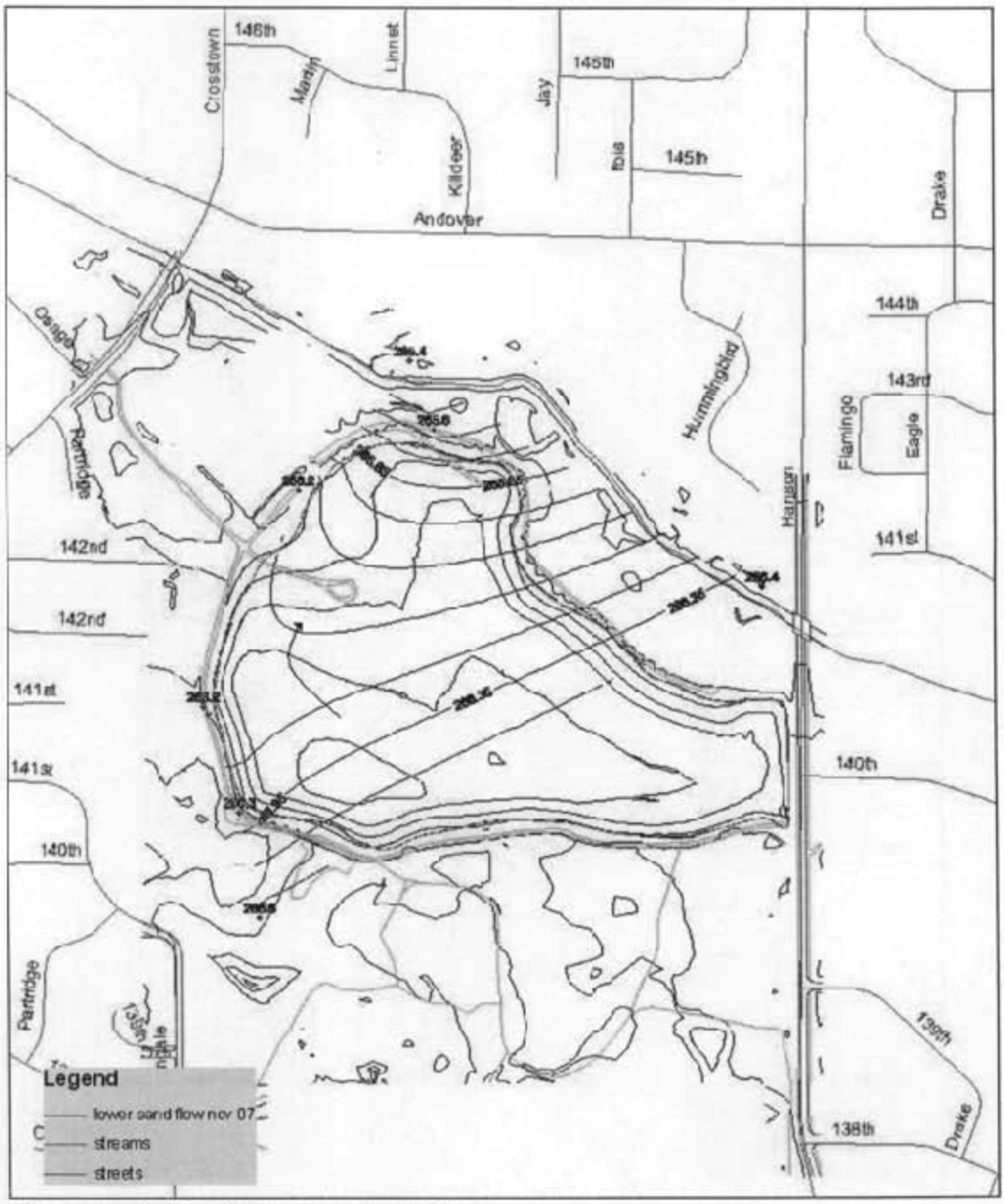


Contour interval is 0.1 meter, Algorithm is natural neighbor

120 60 0 120 Meters

Minnesota Pollution Control Agency

Figure 26 Contour map of flow in the Lower Sand (November 2007)



Contour interval is 0.1 meter, Algorithm is natural neighbor

120 60 0 120 Meters

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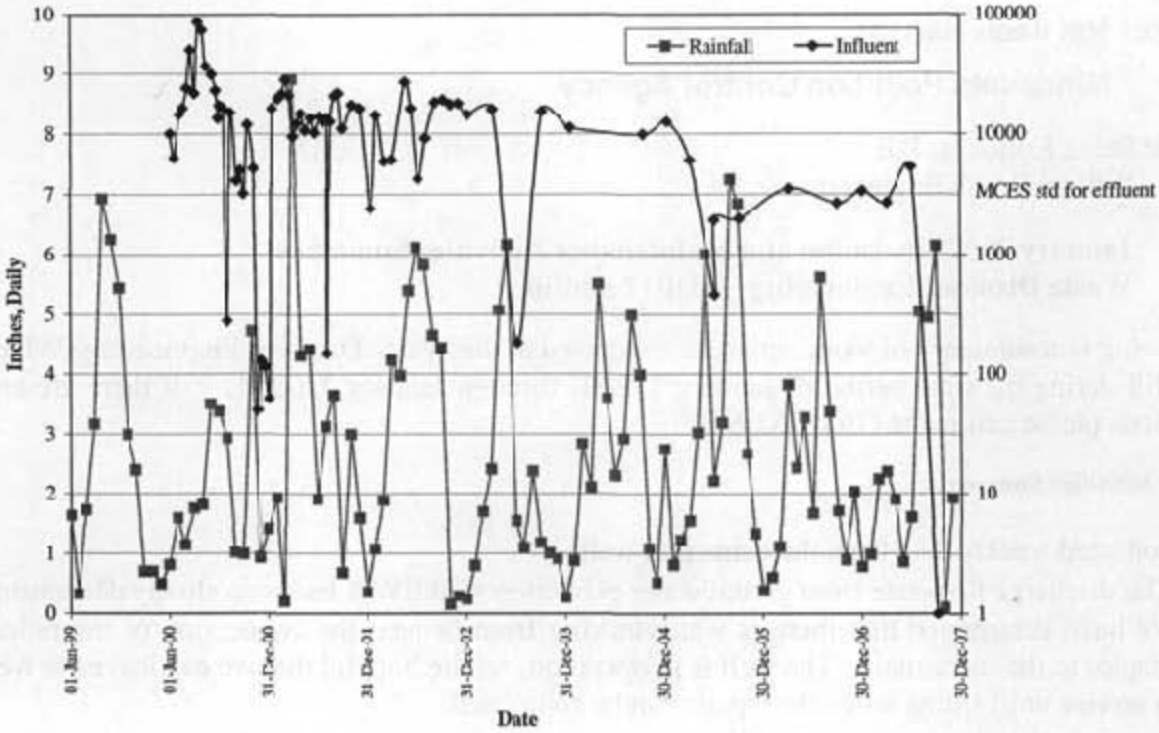
Figure 27. Total Toxic Compounds in WDE Influent (2000 through 2007)



Date: **February 6, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: January 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of January 1, 2007 through January 31, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- The discharge flow rate from groundwater extraction well EW-8 has been slowly decreasing. We have determined that there is water leaking from or near the connection of the pitless adaptor to the force main. The well is in operation, we are hopeful that we can leave the well in service until spring when the repairs can be completed.
- Conducted weekly inspections of the facility.
- Assisted with startup of the gas to energy system. Startup went well all four engines were operating normally. The connections and safety systems to the utility grid were tested and found to be working. The system is ready to be placed into operation. We are currently waiting for final approval from the MPCA to place the engines into service. This approval is on hold we are waiting for the signing the connection agreement between the State and Connexus Energy.
- Received a quote from Unison for performing the first 1000 hr maintenance for the STM engines and for training Willow Brook Engineering personnel on how to perform this maintenance.
- Flare monitoring was performed.
- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators. These two valves would not operate, the operators may be corroded. Will take the valve operators apart and check them out in the spring.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 3 Gopher State One utility locate tickets.
- Plowed snow on one occasion.
- The phone line for the flare is not working. Will need to have Quest come to the site and check for the problem once the weather moderates.
- No evidence of trespassing or vandalism.

Date: **March 7, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: February 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of February 1, through February 28, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- Water continues to discharge at the ground surface adjacent to the well head for EW-8. It does not appear to be getting much worse.
- Conducted weekly inspections of the facility.
- The electrical generators have been off all month. We are waiting for final approval from the MPCA to place the engines into service. This approval is on hold pending the signing the connection agreement between the State and Connexus Energy.
- Flare monitoring was performed.
- Responded to one auto dialer callout for the flare.
- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators. These two valves would not operate, the operators may be corroded. Will take the valve operators apart and check them out in the spring.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Some of the metal protective covering on the air pipe between the flare and the treatment building is deteriorating and beginning to fall off. We have wrapped the metal covering with wire in several places to hold it on. We may want to consider removing the pipe at some point in the future.
- Reviewed 1 Gopher State One utility locate ticket.
- Plowed snow on one occasion.
- No evidence of trespassing or vandalism.

Date: **May 4, 2007**

Minnesota Pollution Control Agency

To: Ms. Jean Hanson

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: April 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of April 1, through April 30, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- Water continues to discharge at the ground surface adjacent to the well head for EW-8. Have contracted with Traut Hydro Tech to perform the repairs. The work should be completed in May.
- Conducted weekly inspections of the facility.
- Startup of the electrical generators occurred on April 2, 2007. Also received training from Unison on the 1000 hour maintenance procedure.
- Prepared monitoring forms for the electrical generators and began routine monitoring.
- Responded to several failures at the electrical generation facility. Engine No. 3 failed due to low hydrogen cycle pressure and engine No. 1 failed due to a high hydrogen cycle pressure. Unison came to the site and worked on both engines. Engine No. 3 is believed to need new seals inside the engine and engine No. 1 was corrected by bleeding off some of the hydrogen from within the system. Hydrogen bleeding did not correct the problem; Unison later talked us though a reprogramming procedure to change a couple of operating parameters. This does appear to have corrected the problem; engine No. 1 is now operating normally.
- Flare monitoring was performed.
- We resolved all problems we were having with the flare telemetry system. The main problem that we overcame this month was obtaining the correct flare program from Perennial. It appears that Booth G. has the only correct copy of the program that allows access to the PLC and lets you observed the correct operating parameters.
- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators. These two valves would not operate, the operators may be corroded. Will take the valve operators apart and check them out in the near future.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 14 Gopher State One utility locate tickets.
- Made keys for our use and three additional keys for MPCA use.
- No evidence of trespassing or vandalism.

To: **Ms. Jean Hanson** Date: **June 11, 2007**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: May 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of May 1, through May 31, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- Water continues to discharge at the ground surface adjacent to the well head for EW-8. Have contracted with Traut Hydro Tech to perform the repairs. The work is currently scheduled for June 14, 2007
- The pump for EW-13 and an electrical transformer for EW-appears to have failed. The problems should be covered under the construction contractors one year warranty period. We have forwarded the problems to the MPCA and Earth Tech.
- Conducted weekly inspections of the facility.
- Unison personnel were on-site working on the engines for the electrical generation facility. Minimal progress was made to correct ongoing problems.
- All of the electrical generators are currently off with various problems. All personnel involved with the project have been notified and are aware of the difficulties.
- Regenerated one set of desiccant filters for the STM engines and vacuum packaged them to prevent moisture from entering them. Regeneration process involves baking the filters in an oven for 24 hours; this has proven to be somewhat of a problem.
- Flare monitoring was performed.
- Responded to an auto dialer callout for the flare, the purple peeper failed. Replaced the purpled peeper with the spare for the East Bethel Landfill gas flare. Operation of the flare is now normal.
- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators. These two valves would not operate, the operators may be corroded. Will take the valve operators apart and check them out in the near future.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 16 Gopher State One utility locate tickets.
- Jetting of the 2" force main pipes from each well head into the treatment building were completed along with the pipe from the treatment building to the treatment pond and the discharge pipe from the pond to the manhole near the entrance gate.
- Mowing of the site entrance, road shoulders and other areas was completed.
- No evidence of trespassing or vandalism.

Date: **July 5, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: June 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of June 1, through June 30, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- Traut Hydro Tech performed repairs to the pipeline for EW-8. A stainless steel fitting had either corroded through or a leak was present allowing water slowly eat away the pipe threads. The well is in operation and is pumping at about 64 gpm.
- The pump for EW-13 and an electrical transformer for EW-11 appear to have failed. The problems should be covered under the construction contractors one year warranty period. We have forwarded the problems to the MPCA and Earth Tech. TPC the pump and control panel manufacturer has made contact with us but no progress has been made to resolve the problems.
- Conducted weekly inspections of the facility.
- Unison personnel were on-site (June 26th-28th) working on the engines for the electrical generation facility. They were able to get two engines started though one engine, No. 4 failed due to low hydrogen pressure after a day of operation. Engine No. 2 operated until July 5, 2007 when it failed on a high cylinder temperature differential.
- Responded to an auto dialer callout for the methane monitoring system in the generator building. The auto dialer is seeing two faults from the methane monitoring system, although the methane monitoring system is not identifying any faults. Cannot reset or clear the faults seen by the auto dialer. The only way we can get the auto dialer to stop calling was to disable the dialer. Have called Earth Tech and informed them of the problem. We will need assistance from the construction contractor/equipment supplier.
- Flare monitoring was performed.
- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators.

- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 31 Gopher State One utility locate tickets.
- Jetting of the 2" force main pipes from each well head into the treatment building were completed along with the pipe from the treatment building to the treatment pond and the discharge pipe from the pond to the manhole near the entrance gate.
- Mowing and trimming of the landfill cover was completed by Mesabi Brushing.
- Mowing of the site entrance, road shoulders and other areas was completed.
- Had 8 loads of Class V road gravel delivered to the site.
- No evidence of trespassing or vandalism.

Date: **August 8, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: July 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of July 1, through July 31, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- Groundwater extraction wells EW-13 and EW-11 have failed. TPC came to the site and we found that a circuit breaker for EW-11 had failed. We switched to a spare circuit breaker and operation of EW-11 returned to normal. An investigation of EW-13 revealed that the motor for the pump had failed. TPC installed a used motor that we had salvaged from another extraction well. Operation of EW-13 is now normal, but we believe that TPC should supply a new replacement motor for the one that failed. We have contacted Earth Tech about a new motor.
- Conducted weekly inspections of the facility.
- All electrical generators are off. Unison came to the site and removed all four engines and shipped them back to the manufacturer.
- Prepared a request for bids for the construction of the hydrogen storage tank storage area. The plan is to have construction completed by 8/20/07.
- Have not received any assistance with the methane monitoring system in the generator building. The auto dialer is seeing two faults from the methane monitoring system, although the methane monitoring system is not identifying any faults. Cannot reset or clear the faults seen by the auto dialer. The only way we can get the auto dialer to stop calling was to disable the dialer. Have called Earth Tech and informed them of the problem.

- Flare monitoring was performed.
- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 11 Gopher State One utility locate tickets.
- Mowing of the site entrance, road shoulders and other areas was completed.
- No evidence of trespassing or vandalism.

Date: **September 11, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: August 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of August 1, through August 31, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the extraction wells.
- Conducted weekly inspections of the facility.
- All electrical generators are off.
- Responded to several auto dialer callouts for the flare due to lightning. Following one failure the flare would not reset and restart. The UPS for the control system was damaged by lightning and had to be replaced. Also had to repair a wire between the VFD and blower motor. Flare operation is normal.
- Received bids and awarded the project for the construction of the hydrogen storage tank storage area to D'Fence Co. The work was completed by the end of August.
- Coordinating with Jim Merten of Air Gas on hydrogen delivery and the manifold system for the hydrogen storage tanks.
- Still waiting on assistance with the methane monitoring system in the generator building. The auto dialer is seeing two faults from the methane monitoring system, although the methane monitoring system is not identifying any faults. Cannot reset or clear the faults seen by the auto dialer. The only way we can get the auto dialer to stop calling was to disable the dialer. Earth Tech is following up with the construction contractor.
- Met with Earth Tech and Ironwood Construction on installation of new extraction wells near EW-9.
- Flare monitoring was performed.

- Gas well monitoring and adjustments were performed.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 7 Gopher State One utility locate tickets.
- Mowing of the site entrance, road shoulders and other areas was completed.
- Repairs to the site entrance road and perimeter road was completed.
- No evidence of trespassing or vandalism.

Date: **October 8, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: September 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of September 1, through September 30, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the groundwater extraction wells.
- Quarterly liquid level monitoring of the gas extraction wells was completed.
- Flare monitoring was performed.
- Gas well monitoring and adjustments were performed.
- Ordered replacement sample ports for the gas extraction wells.
- Conducted weekly inspections of the facility.
- Adjusted the belts on the blower for the gas flare. They were slipping and producing a squealing noise.
- Greased the bearings on the blower for the gas extraction system.
- All electrical generators are off.
- Still waiting on assistance with the methane monitoring system in the generator building. The auto dialer is seeing two faults from the methane monitoring system, although the methane monitoring system is not identifying any faults. Cannot reset or clear the faults seen by the auto dialer. The only way we can get the auto dialer to stop calling was to disable the dialer. Earth Tech is following up with the construction contractor.
- Assisted Earth Tech and Ironwood Construction as needed for installation of new extraction wells near EW-9. Most activities were to for supporting the electrician.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators.

- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 6 Gopher State One utility locate tickets.
- Mowing of the site entrance, road shoulders and other areas was completed.
- No evidence of trespassing or vandalism.

Date: **November 13, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: October 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of October 1, through October 31, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the groundwater extraction wells.
- Flare monitoring was performed.
- Gas well monitoring and adjustments were performed.
- Received replacement sample ports for the gas extraction wells.
- Conducted weekly inspections of the facility.
- Greased the bearings on the blower for the gas extraction system.
- All electrical generators are off. Unison was on-site installing the hydrogen supply system for the engines.
- Met with Automatic Systems about the alarm problems with the generator building. The problem was traced to a faulty ground wire in the fire alarm control panel. Operation of the alarm system is now normal.
- Assisted Earth Tech and Ironwood Construction as needed for installation of new extraction wells near EW-9. Assisted Ironwood with replacement of an O-ring in the pitless adaptor for EW-15. Worked with Earth Tech personnel on start up of the two new wells. Attempted to run the wells in a continuous mode of operation but the discharge flow rate is too low. Had to switch to a cyclic mode of operation, this appears to be working well.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 17 Gopher State One utility locate tickets.
- No evidence of trespassing or vandalism.

Date: **December 12, 2007**

To: **Ms. Jean Hanson**

Minnesota Pollution Control Agency

From: Steve Kollodge, P.E.
Willow Brook Engineering

RE: November 2007 Operation and Maintenance Activities Summary
Waste Disposal Engineering (WDE) Landfill

Following is a summary of work activities conducted at the Waste Disposal Engineering (WDE) Landfill during the time period of November 1, through November 30, 2007. If there are any questions please call me at (763) 753-6038.

Work Activities Summary

- Collected weekly data from the groundwater extraction wells.
- Flare monitoring was performed.
- Gas well monitoring and adjustments were performed.
- Conducted weekly inspections of the facility.
- Greased the bearings on the blower for the gas extraction system.
- Operation of two of the electrical generators was initiated. Unison personnel were on-site and installed new hydrogen compressors in the two engines. Following this work the engines were started and are operating normally.
- Met with Unison and Sterling Bio Power personnel and received training on the hydrogen system for the electrical generators and purging of the hydrogen cylinders during bottle exchange.
- Assisted with a tour of the gas to energy facility hosted by MPCA staff.
- Operated six of the eight valves on the gas extraction system piping. Operation of the valves was normal except for two valves on the top of the landfill with blue operators.
- Operated the valves inside the treatment pond discharge structure. Operation of the valves was normal.
- Reviewed 7 Gopher State One utility locate tickets.
- Earth Tech personnel have been on-site conducting a column test for the treatment of the water being discharged from EW-14 and EW-15.
- Per a request from MPCA staff checked water in the ditch between Crosstown Blvd and the landfill. The water present is ground water which is now at the ground surface because of erosion in the ditch bottom. The erosion in the ditch is caused by storm water runoff that is discharging into the ditch through a concrete storm water pipe. There are no landfill issues and no follow up activity is planned.
- No evidence of trespassing or vandalism.

Appendix F
Five Year Review Report
Waste Disposal Engineering Landfill Superfund Site
Andover, Minnesota

List of Selected Maintenance/ Improvement/ Repair Events: 2004 to 2007

Jan. 2004: Installation of new level controller for the effluent pump at the water treatment facility.

Jan. 2004: Installation of new pressure gauge for the air stripper effluent pump.

Feb. 2004: Extraction well EW-8 installed and started. (Dec. 2003 to Feb. 2004)

Mar. 2004: Replaced effluent pump for the water treatment system, including all electrical and control switches and wiring.

Mar. 2004: Replaced motor for the water treatment system blower.

Apr. 2004: Replaced control wiring for EW-7.

May 2004: Replaced approx. 3400 feet of perimeter fence. (May to June 2004)

June 2004: Replaced sections of barbed wire on the perimeter fence.

Oct 16, 2004: "No trespassing" signage installed on the perimeter fence on the north side of the Site.

Oct. 2004: Half length dedicated bladder pumps (for sampling) installed in W-10A, W-3, W-13A, and W-2A.

Oct 30, 2004: Installed new front gate.

Jan. 2005: Installed new labels on the extraction well piping and flow meters.

April 24, 2005: Installed two aerators in the treatment pond. (April to May 2005)

May 2005: Installed extension pipe on the inlet pipe to the treatment pond.

May 2005: Installed a new hasp and lock on the MCES manhole near the entrance to the site.

2006: A deep monitoring well on the south bank of Coon Creek and to the left of the overflow drainage channel from the infiltration basin was installed.

Mar. 2006: Pumps for EW-4 and EW-7 were replaced.

Late Spring 2006: Groundwater extraction system is upgraded.

Sept. 2006: New gas probes installed along the west side of the landfill.

Nov. 2006: Replaced the blower and blower control system for the flare.

Jan. 4, 2007: A Certificate of Substantial Completion of landfill gas to energy facility is issued to contractor (Total Mechanical, Inc.) who constructed the building, modified the enclosed ground flare, and installed four Stirling engines.

July 2007: Replaced breaker on groundwater extraction well EW-11. Replaced motor on extraction well EW-13.

Aug. to Nov. 2007: Extraction wells EW-14 and EW-15 in the hazardous waste pit are installed and started.