

**Attachment 3**

**Draft Limited Site Investigation and Recommendations for Development of a  
Leachate Management System for the Closed Collinsville Landfill**

**John Mathes & Associates, Inc., September 1991**

**Attachment 3-1**

**Text, Tables and Figures, Draft Limited Site Investigation and Recommendations  
for Development of a**

**Leachate Management System for the Closed Collinsville Landfill**

**John Mathes & Associates, Inc., September 1991**

LIMITED SITE INVESTIGATION AND  
RECOMMENDATION FOR DEVELOPMENT OF A  
LEACHATE MANAGEMENT SYSTEM FOR THE  
CLOSED COLLINSVILLE LANDFILL  
COLLINSVILLE, ILLINOIS

September 1991

Prepared for:

CITY OF COLLINSVILLE  
Collinsville, Illinois

Project 123744

JOHN MATHES & ASSOCIATES, INC.  
210 West Sand Bank Road  
Post Office Box 330  
Columbia, Illinois 62236-0330



**John Mathes & Associates, Inc.**  
*A Burlington Environmental Inc. Company*

EXECUTIVE SUMMARY

On behalf of the City of Collinsville, John Mathes & Associates, Inc., (Mathes) conducted a limited investigation of the closed Collinsville Landfill. The purpose of the investigation was to gather information necessary to recommend a course of action to address leachate seepage at the landfill. This report contains detailed descriptions of the activities performed and results obtained including data evaluation summaries, a well location map, cross sections of the landfill, a piezometric surface map, a landfill surface contour map, and information to assist in the design of a leachate recovery system. In addition, based on the results of the investigation, Mathes has recommended a course of action to address leachate seepage at the landfill.

The results from the limited site investigation are as follow:

- the hydrology of the landfill appears conducive to the production of leachate because the landfill is relatively saturated;
- the volume of leachate in the landfill is estimated to be 31 million gallons; and
- leachate seepage along the perimeter of the landfill may be seasonal and probably occurs only occasionally in the spring when the piezometric surface rises and intersects the landfill slopes.

Based on the results of this investigation Mathes recommends:

- installation of pumps in Wells LRW-01 and LRW-02 to be operated when seepage is observed in the nearby slopes and installation of storage tanks to collect and store leachate from these areas;
- monthly inspections of the entire length of the landfill slopes for signs of leachate seeps;
- monthly monitoring of monitoring well leachate levels to see if there are seasonal fluctuations or trends in the leachate levels;

- continued collection of leachate from the system installed by Brotcke Environmental Services, Inc., (Brotcke) on the northwest slope of the landfill (Well LRW-01 will replace the leachate recovery system installed by Brotcke on the south side of the landfill.); and
- considering reduction of the amount of leachate being generated by rainwater infiltration and possibly by lateral flow of groundwater if additional monitoring of the wells indicates a net increase in leachate or if the frequency or severity of leachate seeps increases.

Collection of leachate from Wells LRW-01 and LRW-02 will necessitate building of a road across the top of the landfill and running electricity to the two well locations.

The frequency of leachate seepage and of leachate level monitoring should be evaluated after collection and evaluation of the first year of data.

LIMITED SITE INVESTIGATION AND  
RECOMMENDATION FOR DEVELOPMENT OF A  
LEACHATE MANAGEMENT SYSTEM FOR THE  
CLOSED COLLINSVILLE LANDFILL  
COLLINSVILLE, ILLINOIS

1 INTRODUCTION

This report describes work performed for the City of Collinsville (Collinsville) by John Mathes & Associates, Inc., (Mathes) at the closed Collinsville Landfill in Collinsville, Illinois. Collinsville authorized Mathes to perform a limited investigation of the above-referenced landfill and recommend an approach to manage leachate at the landfill.

1.1 Site Description and History

The landfill was operated by Collinsville from the early 1970s through 1984. The landfill is approximately 22 acres in size and reportedly accepted only municipal household waste. The approximate location of the landfill is shown in Figure 1.

According to Mr. Ken Keene, Collinsville City Engineer, a final cover consisting of silty loess soil was placed on the landfill in 1984. The thickness of the final cover reportedly ranged from 2 to 15 feet. No records on how the cover was placed or compacted are available.

In spring 1991, areas of leachate seeps appeared, and Brotcke Environmental Services, Inc., (Brotcke) was contracted by Collinsville to install leachate collection piping and containment tanks in two areas of seepage along the slope of the landfill. Although these systems are collecting leachate, they do not appear to be capable of providing an overall long-term solution to the leachate problem for the entire landfill.

## 1.2 Landfill Investigation Objectives

The objectives of the limited site investigation were to gather information necessary to provide Collinsville with a recommended course of action, along with the data required to assist in the development and implementation of a leachate management system. Mathes installed 3 six-inch-diameter wells and 5 two-inch-diameter wells to assess current leachate elevations and allow for future monitoring. The six-inch wells were installed near areas where signs of seepage were present in spring 1991 so the wells could easily be converted to leachate recovery wells, if following the evaluation, recovery wells were recommended.

Mathes performed short duration aquifer tests in each of the eight wells to evaluate the permeability of the waste in several locations. The tests were also performed to identify possible pumping rates for evaluating the effectiveness of recovery wells for leachate collection.

The information collected during the investigation activities described above was used to perform a limited landfill hydrology evaluation. The evaluation consisted of estimating the volume of leachate contained in the landfill based on data gathered from the eight wells and assessing the possibility that groundwater from upgradient recharge zones is laterally migrating into the landfill.

Mathes' scope of work included the evaluation of the practicability and cost effectiveness of reducing or eliminating potential sources of leachate generation in the landfill to reduce the volume of leachate to be collected. In addition, Mathes' scope of work included a preliminary evaluation of leachate treatment alternatives. Neither of these tasks were performed because of the seasonal nature of the seepage observed and the probability that only occasional leachate collection will be required to mitigate leachate seepage. On August 14, 1991, Collinsville requested that these two tasks be replaced with additional aquifer testing at Wells LRW-01 and LRW-02 to provide more accurate recovery rates to size a leachate collection system.

## 2 FIELD INVESTIGATION ACTIVITIES

Investigation activities at the landfill were initiated on June 17, 1991. Field investigation activities summarized in this report include drilling and installation of 3 six-inch-diameter and 5 two-inch-diameter leachate monitoring wells. The six-inch wells were installed near areas where leachate seeps were reportedly observed in spring 1991. These wells were installed as six-inch wells for potential future use as leachate recovery wells. Mathes also conducted groundwater drawdown and recovery tests at each of the wells. The leachate pumping rates and well recovery rates were recorded to obtain information relating to the permeability of the waste in the landfill and also to obtain possible pumping rates for evaluating the effectiveness of recovery wells to collect leachate.

### 2.1 Drilling and Installation of Six- and Two-Inch-Diameter Monitoring Wells

Mathes drilled nine boreholes and installed eight monitoring wells at the landfill between June 17, 1991, and June 20, 1991. Three boreholes were drilled using a 10.25-inch hollow-stem auger. The remaining six boreholes were drilled using a 4.5-inch hollow-stem auger. Natural materials (believed to be the outer berm of the landfill) were encountered in one borehole at a shallow depth and the borehole was terminated. This borehole was located about 50 feet northwest of Borehole LRW-03. The thicknesses and depths of the cover material, a muck/sludge material, the trash and debris, and the depth to the subsurface natural material were noted on the geologic logs. Boreholes LRW-01, LRW-02, and LRW-03 were drilled through the landfill and terminated at natural material.

Eight of the boreholes were completed as monitoring wells with 0.010-inch slot screens. Table 1 summarizes the screen intervals for each well and other hydrogeologic data. Geologic logs and well completion reports were completed for each of the boreholes/

Table 1  
 SUMMARY OF MONITORING WELL HYDROGEOLOGIC DATA  
 COLLINSVILLE LANDFILL  
 COLLINSVILLE, ILLINOIS

Well Number	Ground Surface Elevation (MSL)	Measuring Point Elevation (MSL)	Screened Interval (Feet Below Ground Surface)	Depth (Feet Below Measuring Point)	Static Water Level		Elevation (MSL)	Total Saturated Thickness* (Feet)	Estimated Saturated Thickness Above Natural Materials (Feet)	Estimated Thickness of Cover Material (Feet)	Approximate Thickness of Trash** (Feet)	Estimated Depth to Natural Materials (Feet)
					June 21, 1991	Depth Below Ground Surface (Feet)						
LRW-01***	527.4	530.61	3.3 - 29.0	2.76	-0.45	527.85	28.45	28.45	11	17	28	
LRW-02***	539.1	542.50	8.3 - 34.0	12.20	8.80	530.30	25.20	23.20	7	25	32	
LRW-03***	525.6	528.89	4.0 - 29.0	10.97	7.68	517.92	21.32	20.32	3	25	28	
MW-01	542.4	545.45	4.0 - 24.0	9.18	6.13	536.27	17.87	> 17.87	6	> 18	> 24	
MW-02	550.1	553.34	13.0 - 28.0	12.77	9.53	540.57	18.47	0	2.5	5	7.5	
MW-03	535.6	538.82	13.0 - 28.0	19.31	16.09	519.51	11.91	> 11.91	5	> 23	> 28	
MW-04	521.2	527.93	13.0 - 28.0	23.20	16.50	504.73	11.50	> 11.50	3	> 25	> 28	
MW-05	530.3	533.26	8.0 - 23.0	5.50	2.54	527.76	20.46	> 20.46	2.5	> 20.5	> 23	

Notes: 1. Wells MW-01, MW-03, MW-04, and MW-05 did not extend deep enough to encounter natural materials. 2. Wells LRW-02 and LRW-03 were completed slightly below contact of trash and natural materials. 3. Well MW-02 was screened solely in natural materials.

MSL Feet above mean sea level.

\* Includes all materials encountered in well; some wells did not extend to the depth of natural materials.

\*\* Includes muck/sludge material.

\*\*\* Six-inch well.

monitoring wells. Appendix A contains the geologic logs and Appendix B contains the well completion reports.

The 3 six-inch-diameter wells were installed through the top of the landfill to the top of the natural material below the landfill. The natural material below the landfill was located by the Mathes site geologists based on observations of split-spoon samples collected from the boreholes. Monitoring Wells LRW-01, LRW-02, and LRW-03 were completed using six-inch PVC risers and well screens.

Four 2-inch-diameter wells were installed through the top of the landfill to a depth of 15 feet below the first encountered leachate. These four monitoring wells (MW-01, MW-03, MW-04, and MW-05) were completed using two-inch PVC risers and well screens.

Well MW-02 was completed in only natural materials as a two-inch-diameter well in an area upgradient from most of the landfill for use in evaluating upgradient groundwater recharge. Locations of the monitoring wells are shown in Plate 1.

Water levels were measured in all monitoring wells on June 21, 1991. A summary of monitoring well hydrogeologic data is in Table 1.

Samples for environmental analysis were not collected from any of the boreholes because they were not necessary for the evaluation.

## 2.2 Single Well Pump Tests

Single well pump tests were conducted in the landfill to evaluate the hydraulic conductivity of the waste and/or other materials encountered around the monitoring wells. Water was removed from the monitoring wells by pumping for up to 41 minutes while monitoring water levels and flow rate. To calculate the hydraulic conductivity both time and water level measurements were recorded during recovery. Monitoring Wells LRW-03, MW-01, and

MW-03 did not recover leachate in an adequate amount of time to analyze the test results.

Leachate pumpage rates were estimated during each single well pump test. These data are summarized in Table 2. The flow rates can be used as a ballpark estimate of the maximum rate of flow that can be pumped. Wells LRW-01 and LRW-02 produced at the highest flow rates and recharged following the test in relatively short periods. Methane gas in the wells affected fluid level readings during the drawdown part of the test; therefore, obtaining consistently accurate measurements of fluid drawdowns with time and calculating a specific capacity (flow rate per foot of drawdown) was not possible. The data on flow rates may be useful in design of a leachate recovery system. Mathes believes the variation in flow rate from well to well is due to nonhomogeneous filling of the landfill with varying fill types from location to location, varying amounts of fill compaction, and variations in the lateral extent and saturated thickness of the area tested.

The hydraulic conductivity was evaluated using the Theis method of analysis and fluid level recovery data. The hydraulic conductivity for the wells ranged from 4.2 gallons per day per square foot (gpd/ft<sup>2</sup>) ( $2.0 \times 10^{-4}$  centimeters per second [cm/sec]) to 18.9 gpd/ft<sup>2</sup> ( $8.9 \times 10^{-4}$  cm/sec). Similar hydraulic conductivity results were obtained for Well MW-02, which was completed through the landfill, but screened only in the natural soils below the landfill. The aquifer test analyses were performed using both hand drawn graphs and the computer modeling software AQTESOLV. A summary of the aquifer test analyses is in Table 2.

#### 2.2.1 Additional Aquifer Tests

To further evaluate the rate that leachate can be recovered, longer-term tests with approximately three hours of pumping were performed in Wells LRW-01 and LRW-02.

Table 2

SUMMARY OF AQUIFER TEST ANALYSES

COLLINSVILLE LANDFILL  
COLLINSVILLE, ILLINOIS

Well Number	Total Saturated Thickness* (ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity (gpd/ft <sup>2</sup> )	Estimated Test Flow Rate (gpm) 03/03/91	Duration of Pumping (06/21/91-07/03/91)	Estimated Test Flow Rate (gpm) (08/20/91)	Duration of Pumping (08/20/91)
LRW-01	28.45	120	4.2	7	20 min	2.5	170 Min
LRW-02	25.20	476	18.9	10	20 min	2.5	141 Min
LRW-03	21.32	NA	NA	9	19 min	NT	NT
MW-01	17.87	NA	NA	5	15 min	NT	NT
MW-02	18.47	230	12.5	6	41 min	NT	NT
MW-03	11.91	NA	NA	3	27 min**	NT	NT
MW-04	11.50	105	9.1	3	20 min**	NT	NT
MW-05	20.46	219	10.7	4	10 min**	NT	NT

Note: Flow rates are averages for a short-term test. Much lower flow rates are anticipated for larger durations of pumping.

cm/sec Centimeters per second.

ft Feet.

gpd/ft Gallons per day per foot.

gpd/ft<sup>2</sup> Gallons per day per square foot.

gpm Gallons per minute.

min Minutes.

NA Not analyzed because water levels did not recover an adequate amount to analyze test results.

NT Not tested.

\* Calculated using June 21, 1991, water level data. Includes all materials encountered in well; some wells did not extend to the depth of natural materials.

\*\* Well went dry.

The tests were performed as step-drawdown tests on August 20, 1991. The drawdown in the pumped well was monitored as the flow rate was adjusted to estimate the maximum flow rate achievable during long-term pumping of leachate. Evaluation of this data indicated the maximum rate of leachate recovered, based on the conditions present at the time of the test, was approximately 2.5 gallons per minute (gpm) from each well. Mathes anticipates Well LRW-01 may produce approximately 0.75 gpm more than Well LRW-02 over an extended period of pumping.

At these low flow rates leachate can also be recovered from a small-diameter well (two-inch-diameter well) using a small-diameter pump, which is readily available.

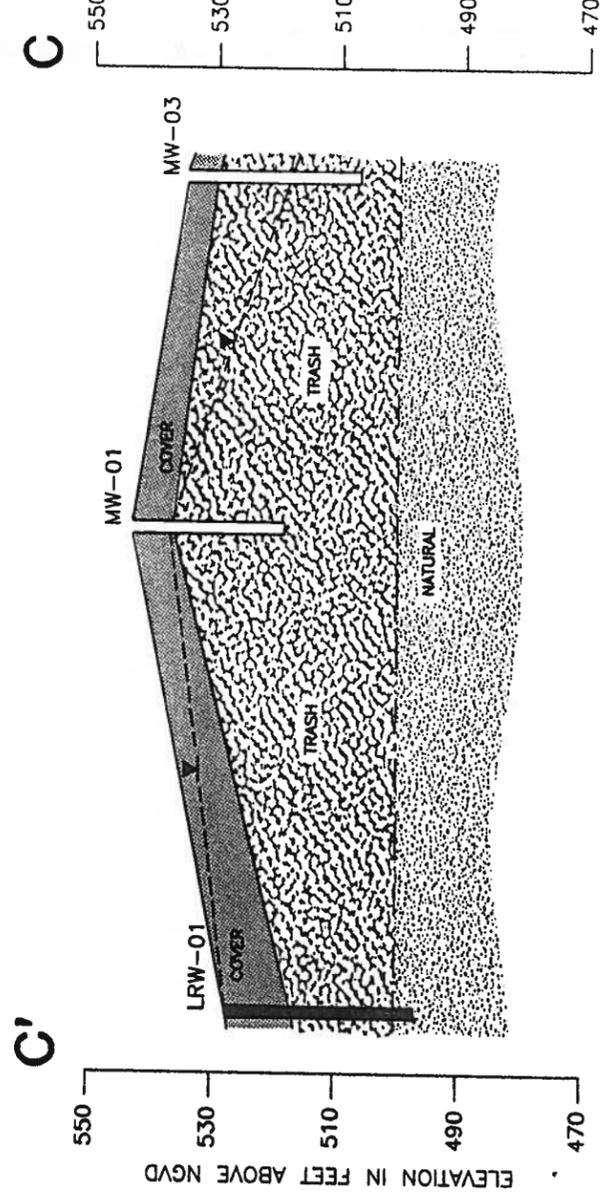
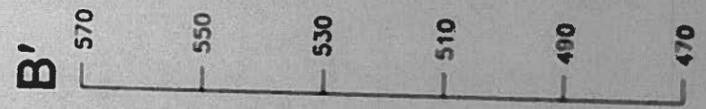
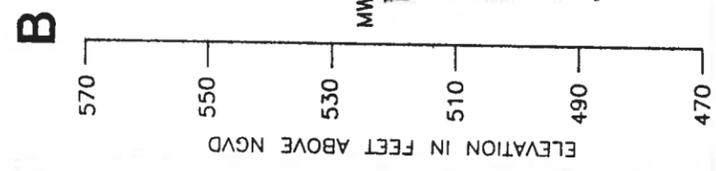
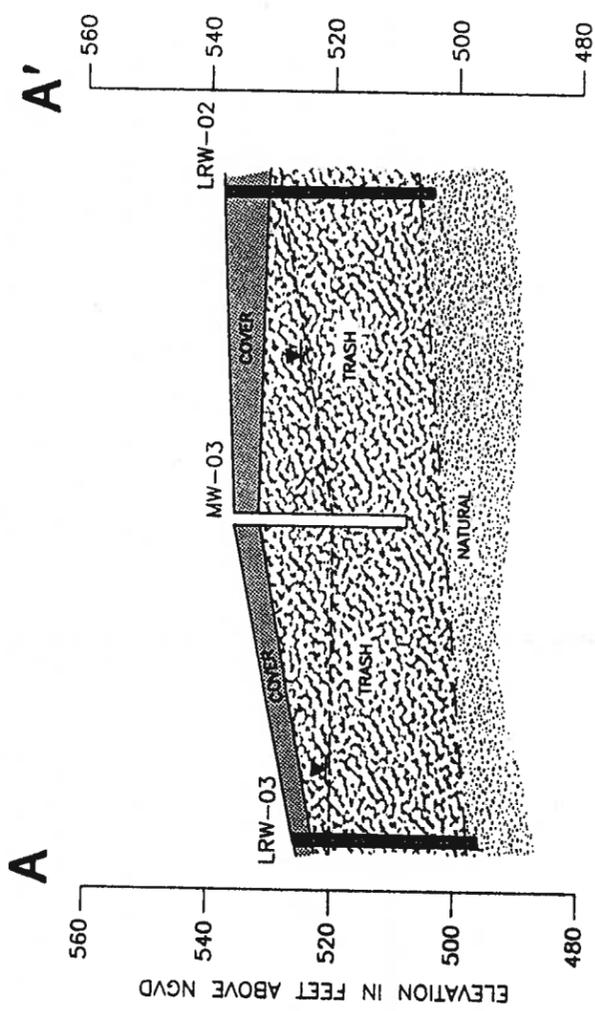
### 3 LANDFILL HYDROLOGY EVALUATION

The hydrologic conditions of the landfill were evaluated using the data obtained from borehole construction, monitoring wells, and aquifer tests. Water level elevations from data collected on June 21, 1991, were used to construct a water level (leachate) piezometric surface map for the landfill (Plate 2). In addition, the amount of leachate in the landfill was calculated and three cross sections of the landfill were constructed. Two east-west cross sections and one north-south cross section were constructed using the data obtained from the boreholes (Figure 2 and Plate 3). Leachate saturated thicknesses were estimated using these cross sections.

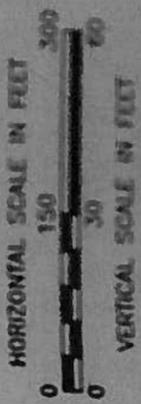
The thicknesses of the trash and debris material encountered in the boreholes ranged from approximately five feet in Monitoring Well MW-02 on the east end of the landfill to greater than 25 feet in Monitoring Well MW-04 located on the west end of the landfill.

Water in Monitoring Well LRW-01 was found to be at a level above ground surface. The artesian conditions are present at Well LRW-01 because upgradient recharge areas have higher groundwater elevations than the leachate elevation at this location. In addition, the thick soil cover over the waste materials at Well LRW-01 (approximately 11 feet) appears to be preventing nearby seeps from occurring and apparently allowing the piezometric surface at this location to rise. The estimated saturated thickness within the trash and sludge material above the natural material in Monitoring Well LRW-01 was approximately 28.5 feet, the greatest actual measurement based on the geologic logs of the boreholes.

Based on the water level data, an isopach map showing the thickness of the saturated trash and debris material was constructed (Plate 4). The geologic logs and the cross sections indicate that the estimated saturated trash thickness is as great as 36 feet (Well MW-01). The saturated thickness of the trash and debris material gradually decreases in the western and northern



- EXPLANATION**
- COVER MATERIAL (PRIMARY SILTY CLAY)
  - TRASH MATERIAL (SLUDGE AND DEBRIS)
  - NATURAL MATERIAL (PRIMARY CLAY)
  - PEIZOMETRIC SURFACE OF LEACHATE ON JUNE 21, 1991
  - BOREHOLE NUMBER AND APPROXIMATE LENGTH OF BOREHOLE. A SOLID LINE INDICATES THE BOREHOLE EXTENDED TO NATURAL MATERIAL



General Note:

This profile was developed by interpolation between widely spaced boreholes. Only at the borehole locations should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.

John Mothes & Associates, Inc.  
 COLLINSVILLE LANDFILL  
 COLLINSVILLE, ILLINOIS  
 12/3/44

CROSS SECTIONS  
 A-A', B-B', AND C-C'

FIGURE 2

REVISION	DATE	BY	BY	CHECKED	BY	DATE	PROJECT
A	9/20/91	PTS	PTS	PTS	RJR	10/3/91	10/5/91

parts of the landfill until reaching zero saturated thickness at the edge of the creek.

The volume of leachate contained in the landfill was calculated based on the saturated thickness of the material above natural soils. A porosity value of 30 percent was used for the trash material. The volume of leachate contained in the landfill on June 21, 1991, is estimated to be approximately 31 million gallons.

4 LEACHATE COLLECTION SYSTEM DESIGN CRITERIA

Based on data obtained in this investigation, use of leachate extraction wells in conjunction with Brotcke's interceptor trench in the northwestern part of the site will reduce the potential for leachate seepage through the northwestern slope of the landfill.

Mathes anticipates that Wells LRW-01 and LRW-02 will be the most productive leachate collection wells based on the aquifer test results. These two wells are also in areas where collection of leachate is likely to reduce or prevent occasional leachate seepage along the slope of the landfill.

Based on the aquifer tests, the sustained average flow rate from Wells LRW-01 and LRW-02 is anticipated to be less than 2.5 gpm. The pumps in the wells should be specified to handle flows in this range, and calculations should be performed to select proper pipe sizes prior to installation.

If leachate collection is initiated, Mathes recommends this be performed in a step-wise fashion to observe the benefits achieved by pumping from each recovery well.

5 CONCLUSIONS AND RECOMMENDATIONS

Mathes did not observe leachate seeps during a site reconnaissance of the landfill and perimeter areas on August 8, 1991. Mathes believes the seepage is seasonal and probably occurs in the spring when the piezometric surface rises and intersects the landfill slopes due to precipitation. However, there is a significant amount of leachate in the landfill. This information in conjunction with that gathered during field investigation activities indicates the installation of additional leachate collection systems may be necessary to control possible future leachate seeps.

Mathes believes the major sources of leachate generation in the landfill are precipitation infiltrating through the existing cover, and to a lesser extent, potential lateral groundwater movement into the landfill from the higher natural topographic areas east of the landfill.

Because the conditions at the landfill could change, the situation needs to be monitored closely. Mathes recommends:

- installation of pumps in Wells LRW-01 and LRW-02 to be operated when seepage is observed in the nearby slopes and installation of storage tanks to collect and store leachate from these areas;
- monthly inspections of the entire length of the landfill slopes for signs of leachate seeps;
- monthly monitoring of monitoring well leachate levels to see if there are seasonal fluctuations or trends in the leachate levels;
- continued collection of leachate from the system installed by Brotcke Environmental Services, Inc., (Brotcke) on the northwest slope of the landfill (Well LRW-01 will replace the leachate recovery system installed by Brotcke on the south side of the landfill.); and
- considering reduction of the amount of leachate being generated by rainwater infiltration and possibly by lateral flow of groundwater if additional monitoring of the wells indicates a net

increase in leachate or if the frequency or severity of leachate seeps increases.

The frequency of leachate seepage and of leachate level monitoring should be re-evaluated after collection and evaluation of the first year of data.



RECORD OF SUBSURFACE EXPLORATION

Borehole No. \_\_\_\_\_  
Well No. LRW-01

PROJECT NAME: Collinsville Landfill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: Swartz GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: CME-95 10 1/4 Hollow Stem Augers  
 DATE/TIME STARTED: 6/17/91 1030 DATE/TIME COMPLETION (S): 6/17/91 1130  
 AIR MONITORING TYPE: HNU - CBI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM: <u>USCS</u>	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS <u>NDG</u>			DRILLING CONDITIONS AND (BLOG COUNTS)
							BZ	BH	S	
5				Brown Silty-Clay, Damp Moderately Stiff, Cover material <u>wet at 6'</u>	CL Fill	11.0	0	0		<u>wet at 6'</u>
15	1	14/16	2	GREY-BLACK Clayey very soft, SATURATED, FREE WATER.	ML Fill		0	0	0	(1,1,1,1) 13' → methane at 13' 15 LEL in Bore hole 5% LEL in Breathing zone
25	2	24/26	0	SAP. Some paper trash from 20'-25'			0	0	0	(2,1,1,1) TOO SOFT TO GET RECOVERY LEL = 6% in Bore Hld.
31	3	29/31		Brown Clay. w/ oxidation stains Hard, wet.  <u>TOB = 31'</u>	CL	28	0	0	0	(3,4,8,9)

COMMENTS: Bottom of hole 29' with spoon to 31'  
Bottom liner starts at 28'

GEOLOGIST SIGNATURE: [Signature]



PROJECT NAME: Collinsville Landfill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: Swartz GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: CME-95 10 1/4 Hollow Stem Augers  
 DATE/TIME STARTED: 6/17/91 1445 DATE/TIME COMPLETION (S): 6/17/91 1630  
 AIR MONITORING TYPE: HNU - CAI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM <u>USCS</u>	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS <u>NDGS</u>			DRILLING CONDITIONS AND (BLOG COUNTS)
							BZ	BH	S	
5				Brown Silty Clay, damp moderately stiff	CL Fill		0	0		
10				TRASH - at 7' Grey-Black Clay-Trash very soft, saturated, soupy - free water Paper & rags	ML Fill	7.0	0	0		water at 8' LEL = 0 (1, 4, 5, 7)
15	1	14/16	12				0	0	0	
20				SAA						
25										
30	2	29/31	0	very hard			0	0	2% LEL	(30/3) very hard unable to drive spoon, must be on metal in trash.
35	3	34/36	12	Brown Silty sand, wet, stiff	CL	32	0	0	0	(2, 5, 6, 8)
				TOB = 36'						

COMMENTS: Bottom line starts at 32'

GEOLOGIST SIGNATURE Jay Swartz

PROJECT NAME: Collinsville Landfill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: Swartz GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: CME-95 1 1/4 Hollow Stem Augers  
 DATE/TIME STARTED: 6/18/91 1030 DATE/TIME COMPLETION (S): 6/18/91 1100  
 AIR MONITORING TYPE: HNU-CBI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM <u>USCS</u>	USCS SYMBOL	DEPTH CNG (feet)	AIR MONITORING UNITS <u>ND43</u>			DRILLING CONDITIONS AND (BLOG COUNTS)	
							BZ	BH	S		
5				Brown SILTY-CLAY, Damp moderately stiff	CL	2.5	0	0		Trash at 2.5	
10				Grey clayey Paper + cans wet, soft	ML						
15	1	14/16	3	SAA	ML fill		0	0	0	(4, 4, 3, 18)	
20	2	19/21	8	Brown clay wet, stiff Bottom of Land fill.	CL	18	0	0	0	(6, 7, 7, 13)	
				<u>TOB-21'</u>							
No water, Back filled Hole an moved East 75' feet											

COMMENTS: Liner starts ≈ 17'

GEOLOGIST SIGNATURE Sam Swartz

PROJECT NAME: Collinsville Landfill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: Swartz GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: CME-95 10 1/4 Hollow Stem Augers  
 DATE/TIME STARTED: 6/18/91 1230 DATE/TIME COMPLETION (S): 6/18/91 1330  
 AIR MONITORING TYPE: HNU - CAI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM <u>USCS</u>	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS <u>ND45</u>			DRILLING CONDITIONS AND (BLOK COUNTS)
							ZEL	BH	S	
0				Brown Silty Clay damp, moderately stiff.	CL	3.0				3' of cover
5					Fill		0/0	0/0		
10				Grey-Black, clayey trash, very soft, muck saturated, free water	ml		0/0	0/0		
15				Paper + cloth, plastic	fill		0/0	0/0		water at 10.5'
20				SAA			0/0	0/0		
25							3/3	3/3		
30	1	29 31		Brown. Clay, stiff, wet	CL	28	0/7%	0/15%	0	(1,7,7,11)
				<u>TDB = 31'</u>						

COMMENTS: Bottom liner starts at 26'

GEOLOGIST SIGNATURE Mary Swartz



Mathes & Associates, Inc.

Electronic Filing Submittal Received, Open File Office : 08/10/2015

A-5

Borehole No.

Well No. MW-01

PROJECT NAME: Collinsville Land Fill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: SWARTZ GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: SMC-95 4 1/2 Narrow Stem Augers  
 DATE/TIME STARTED: 6/19/91 830 DATE/TIME COMPLETION(S): 6/19/91 900  
 AIR MONITORING TYPE: HNU - CGI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS <del>ADW</del>			DRILLING CONDITIONS AND (BLOG COUNTS)
							BZ	BH	S	
5				Brown Silty-Clay, damp moderately stiff	CL Fill	6.0	0/0	0/0		6.0' of cover
10				Grey - Clay wet, soft trash at 11'	ML Fill		0/0	0/0		TRASH AT 11'
15				Grey - Black very soft clayey trash, muck, saturated, free water	ML		0/2	0/11		WATER - 13'
20							0/0	0/0		
25										
30				TOB = 24'						

COMMENTS: \_\_\_\_\_

GEOLOGIST SIGNATURE Ray Swartz



PROJECT NAME: Collinsville Land Fill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: SWARTZ GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: D. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: SMC-95 4 1/2 Hollow Stem Augers  
 DATE/TIME STARTED: 6/19/91 1015 DATE/TIME COMPLETION (S): 6/19/91 1045  
 AIR MONITORING TYPE: NWU - CGI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM	USCS SYMBOL	DEPTH (feet)	AIR MONITORING UNITS <sup>NDW</sup> <sub>LEL</sub>			DRILLING CONDITIONS AND (BLOG COUNTS)
							BZ	BH	S	
5				Brown Silty Clay, moderately stiff, damp	CL					Cover = 2.5'
				Black silty clay trash, damp soft	ML Fm	2.5	0/0	0/0	0/0	Trash at 2.5
10				Brown silty clay, damp stiff	CL Fm	7.5	0/0	0/0	0/0	Small pocket of water at 13' would not accumulate in hole
15				SAA			0/0	0/0	0/0	water at 18'
20				SAA			0/0	0/0	0/0	
25							0/0	0/0	0/0	
30				TOB = 28'						Thought layer at 10' was a cover kept looking for more trash layers.

COMMENTS: \_\_\_\_\_

GEOLOGIST SIGNATURE Greg Swartz

PROJECT NAME: Collinsville Land Fill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: SWARTZ GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: CME-95 4 1/2 Hollow Stem Augers  
 DATE/TIME STARTED: 6/19/11 1330 DATE/TIME COMPLETION(S): 6/19/11 1400  
 AIR MONITORING TYPE: Hvu - CG1 BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS AND LEL			DRILLING CONDITIONS AND (BLOG COUNTS)
							BZ	BH	S	
5				Brown silty clay, damp stiff.	CL Fill		0/0	0/0		Cover to 5'
10				Grey silty clay - Trash material - + paper	ML Fill	5.0	0/0	0/0		
15							0/0	0/0		
20				SATURATED at 18' SAA. Free water + very soft			0/0	0/12		water at 18'
25				SAA			0/0	0/3		
30				<u>TOB = 28'</u>			0/0	0/0		TRASH CONSISTED OF MATERIAL, PAPER + plastic

COMMENTS: \_\_\_\_\_

GEOLOGIST SIGNATURE Tom Swartz



John Mathes & Associates, Inc.

RECORD OF SUBSURFACE EXPLORATION: 08/10/2015 of Borehole No.

A-8

Well No. MW-04

PROJECT NAME: Collinsville Land Fill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: SWARTZ GWL: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GWL: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: SmE-95 4 1/2 Hollow Stem Augers  
 DATE/TIME STARTED: 6/19/91 1515 DATE/TIME COMPLETION(S): 6/19/91 1545  
 AIR MONITORING TYPE: HWU - CG1 BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS <u>ADU</u>			DRILLING CONDITIONS AND (BLOG COUNTS)
							BZ	BH	S	
0				Brown Silty Clay, stiff, damp.	CL					Cover 3'
5				Lime residue 3-4'	ML	3'	0/0	0/0		
10				Grey Clayey Trash	ML		0/0	0/0		
15				Grey-Black clay-trash Very soft			0/0	0/0		
20				SAA free water, saturated very soupy			u/p	u/p		water 18'
25							0/0	0/0		
30				TOB - 28'						

COMMENTS: \_\_\_\_\_

GEOLOGIST SIGNATURE Larry Swartz



John Mathes & Associates, Inc.

Subsurface Exploration

Borehole No. Well No. MW-05

PROJECT NAME: Collinsville Land Fill PROJECT NO: 123347  
 ELEVATION: \_\_\_\_\_ BOREHOLE LOCATION/COORDINATES: \_\_\_\_\_  
 LOGGED BY: SWARTZ GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLED BY: J. Breeding GML: depth \_\_\_\_\_ date/time \_\_\_\_\_  
 DRILLING/RIG METHODS: CME-95 4 1/2 Hollow Stem Augers  
 DATE/TIME STARTED: 6/20/91 930 DATE/TIME COMPLETION (S): 6/20/91 945  
 AIR MONITORING TYPE: HVU - CGI BZ = Breathing Zone; BH = Borehole; S = Sample

DEPTH (feet)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMP TYPE RECOV. (in)	SAMPLE DESCRIPTION CLASSIFICATION SYSTEM	USCS SYMBOL	DEPTH CHG (feet)	AIR MONITORING UNITS ADW			DRILLING CONDITIONS AND (BLOG COUNTS)	
							BZ	BH	LEL S		
-				Brown Silty Clay, damp moderately stiff	CL					Cover 2.5'	
-5				Grey clay, wet, moderately stiff	CL	2.5	0	0	0		
-10				BLACK; very soft clayey trash material, plastic	ML	2.0	0	0	0		
-15							4	12	0	WATER AT 13'	
-20							10	5	0		
-25							10	0	0		
-30											
				TOB = 23'							

COMMENTS: \_\_\_\_\_

GEOLOGIST SIGNATURE Ray Swartz



Site #: 123747 Electronic Filing - Received Clerk's Office : 08/10/2015  
County: Madison Well #: LRW-01

Site Name: Collinsville Landfill Grid Coordinate: Northing 5121.93 Easting 4996.51  
Drilling Contractor: Mathes Date Drilled Start: 6/17/91 10:30  
Driller: J. Breeding Geologist: G. Swantz Date Completed: 6/17/91 13:30  
Drilling Method: CME-95 10 1/4 HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Bentonite  
Type of Annular Sealant: Bentonite  
Amount of cement: # of bags 0 lbs. per bag  
Amount of bentonite: # of bags lbs. per bag  
Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50  
Type of Sand Pack: WB-40  
Source of Sand: Commercial  
Amount of Sand: # of bags 20 lbs. per bag 100

Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH40	
Riser pipe above w.t.			SCH40	
Riser pipe below w.t.			SCH40	
Screen			SCH40	
Coupling joint screen to riser			SCH40	
Protective casing				

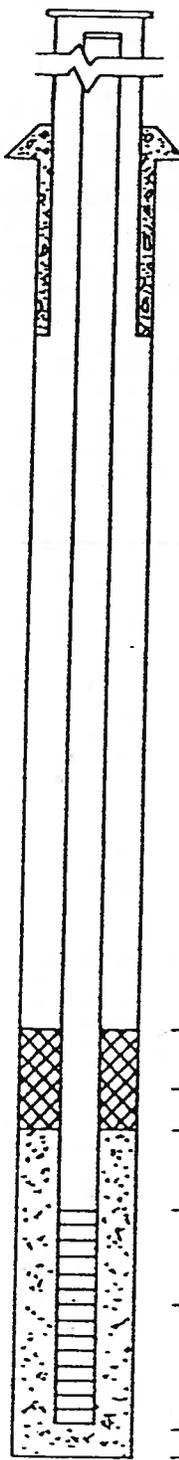
Measurements

to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	25.0
Bottom of screen to end cap	0.7
Top of screen to first joint	
Total length of casing	
Screen slot size	0.010
Number of openings in screen	
Diameter of borehole (in)	14"
Diameter of riser pipe (in)	6"

Elevations - .01 ft.

NA		MSL Top of Protective Casing
530	61	MSL Top of Riser Pipe
3	21	ft. Casing Stickup
527	40	MSL Ground Surface
527	40	ft. Top of annular sealant



Depths or Intervals

0	0	ft. Top of Seal
2	0	ft. Total Seal Interval
2	0	ft. Top of Sand
3	3	ft. Top of Screen
25	0	ft. Total Screen Interval
28	3	ft. Bottom of Screen
29	0	ft. Bottom of Borehole

Completed by: JEM Surveyed by: Sherbut-Carson & Assoc Ill. registration # 2047



Site #: 123799 County: Madison Well #: LRW-02  
 Site Name: Collinsville Landfill Grid Coordinate: Northing 5685.22 Easting 5383.71  
 Drilling Contractor: Mathes Date Drilled Start: 6/17/91 16:30  
 Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/18/91 9:45  
 Drilling Method: CME-95 10 1/4 HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Bentonite  
 Type of Annular Sealant: Bentonite  
 Amount of cement: # of bags 0 lbs. per bag \_\_\_\_\_  
 Amount of bentonite: # of bags \_\_\_\_\_ lbs. per bag \_\_\_\_\_  
 Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 3 lbs. per bag 50  
 Type of Sand Pack: WB-40  
 Source of Sand: Commercial  
 Amount of Sand: # of bags 22 lbs. per bag 100

Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

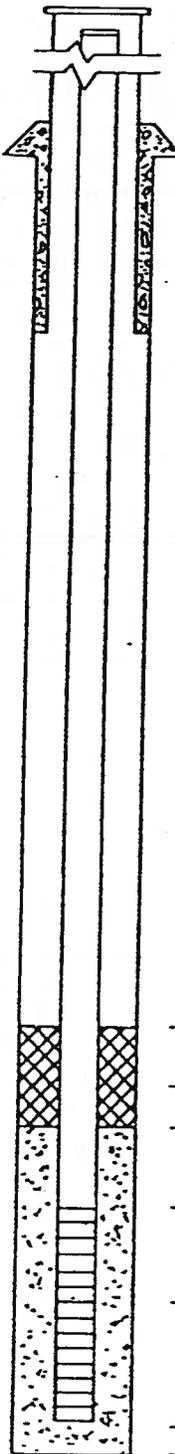
Measurements

to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	<u>25.00</u>
Bottom of screen to end cap	<u>0.70</u>
Top of screen to first joint	
Total length of casing	
Screen slot size	<u>0.010</u>
Number of openings in screen	
Diameter of borehole (in)	<u>14"</u>
OD of riser pipe (in)	<u>6"</u>

Elevations - .01 ft.

<u>NA</u>		MSL Top of Protective Casing
<u>542</u>	<u>50</u>	MSL Top of Riser Pipe
<u>3</u>	<u>40</u>	ft. Casing Stickup
<u>539</u>	<u>10</u>	MSL Ground Surface
<u>539</u>	<u>10</u>	ft. Top of annular sealant



Depths on Intervals

<u>4</u>	<u>3</u>	ft. Top of Seal
<u>2</u>	<u>0</u>	ft. Total Seal Interval
<u>6</u>	<u>3</u>	ft. Top of Sand
<u>8</u>	<u>3</u>	ft. Top of Screen
<u>25</u>	<u>0</u>	ft. Total Screen Interval
<u>33</u>	<u>3</u>	ft. Bottom of Screen
<u>34</u>	<u>0</u>	ft. Bottom of Borehole

Completed by: GEM Surveyed by: Sherbut-Carson & Assoc Ill. registration = 2047

Site Name: Collinsville Landfill Grid Coordinate: Northing 5676.20 Easting 4878.99  
 Drilling Contractor: Mathes Date Drilled Start: 6/18/91 12:30  
 Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/18/91 15:00  
 Drilling Method: CME-95 10 1/4 HSA Drilling Fluids (type): None

**Annular Space Details**

Type of Surface Seal: Bentonite  
 Type of Annular Sealant: Bentonite  
 Amount of cement: # of bags 0 lbs. per bag \_\_\_\_\_  
 Amount of bentonite: # of bags 1 lbs. per bag 50  
 Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags \_\_\_\_\_ lbs. per bag \_\_\_\_\_  
 Type of Sand Pack: WB-40  
 Source of Sand: Commercial  
 Amount of Sand: # of bags 24 lbs. per bag 100

**Well Construction Materials**

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

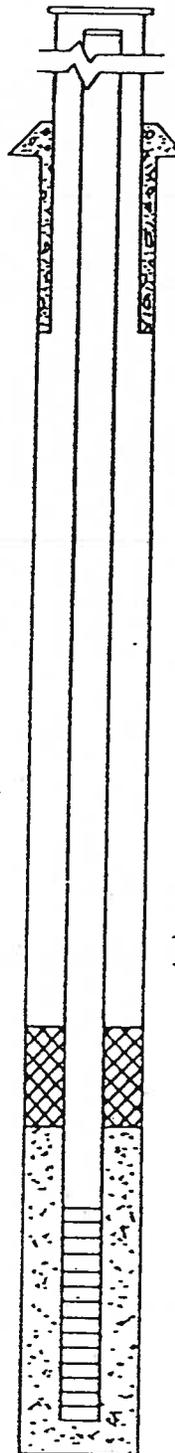
**Measurements**

to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	25.00
Bottom of screen to end cap	0.70
Top of screen to first joint	
Total length of casing	
Screen slot size	0.010
No. of openings in screen	
Diameter of borehole (in)	14"
D of riser pipe (in)	6"

**Elevations - .01 ft.**

NA		MSL Top of Protective Casing
528	89	MSL Top of Riser Pipe
3	29	ft. Casing Stickup
525	60	MSL Ground Surface
525	60	ft. Top of annular sealant



**Depths or Intervals**

0	0	ft. Top of Seal
2	0	ft. Total Seal Interval
2	0	ft. Top of Sand
4	0	ft. Top of Screen
25	0	ft. Total Screen Interval
29	0	ft. Bottom of Screen
29	0	ft. Bottom of Borehole

Completed by: DEM Surveyed by: Sherbut-Carson & Assoc Ill. registration = 2047



Site #: 123710 Electronic Filing - Received Clerk's Office : 08/10/2015  
County: Madison Well #: MW-01

Site Name: Collinsville Landfill Grid Coordinate: Northing 5458.22 Easting 5195.17

Drilling Contractor: Mathes Date Drilled Start: 6/19/91 9:00

Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/19/91 10:15

Drilling Method: CME-95 4 1/4 HSA Drilling Fluids (type): NONE

Annular Space Details

Type of Surface Seal: Bentonite

Type of Annular Sealant: Bentonite

Amount of cement: # of bags 0 lbs. per bag

Amount of bentonite: # of bags 1 lbs. per bag 50

Type of Bentonite Seal (Granular, Pellet):

Amount of bentonite: # of Bags lbs. per bag

Type of Sand Pack: WB-40

Source of Sand: Commercial

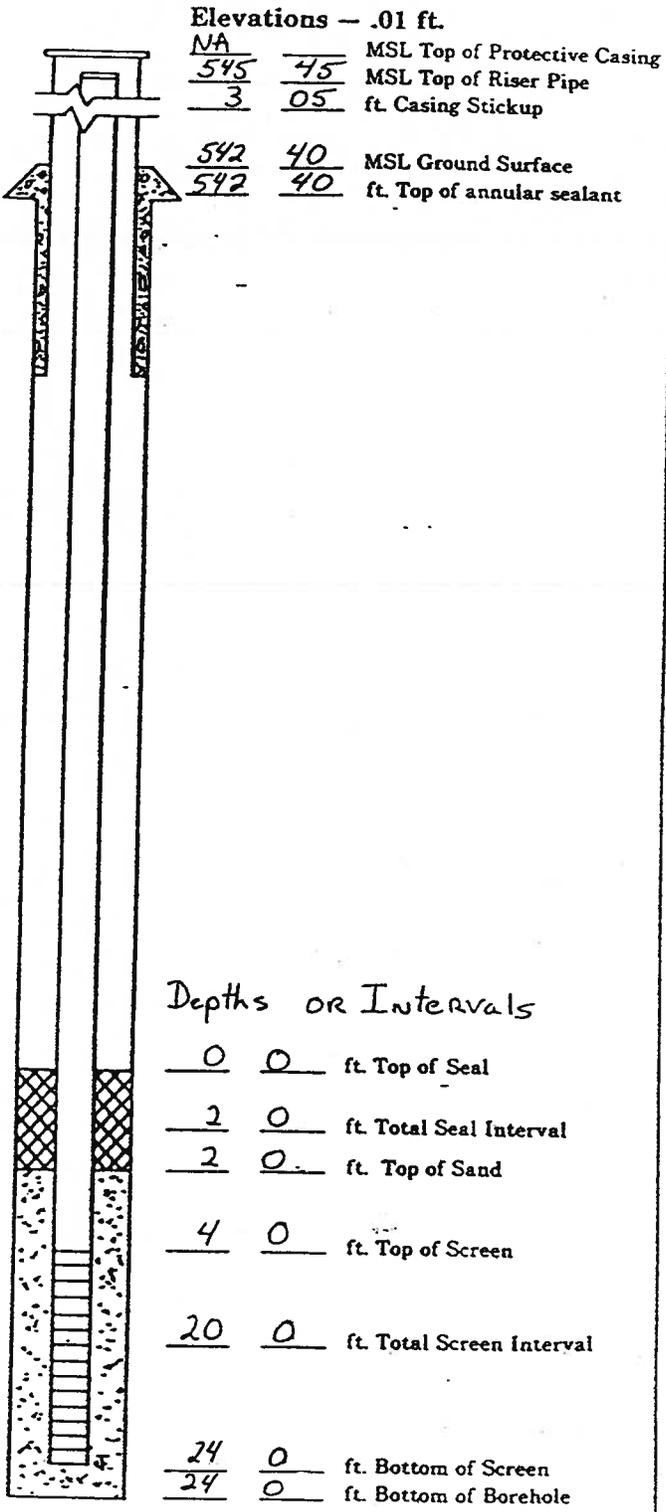
Amount of Sand: # of bags 8 lbs. per bag 100

Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

Measurements to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	20.00
Bottom of screen to end cap	
Top of screen to first joint	
Total length of casing	
Screen slot size	0.010
Number of openings in screen	
Diameter of borehole (in)	8"
Diameter of riser pipe (in)	2"



Completed by: [Signature] Surveyed by: Sherbot-Carson & Assoc Ill. registration # 2047

Site Name: Collinsville Landfill Grid Coordinate: Northing 5444.01 Easting 5490.47  
 Drilling Contractor: Mathco Date Drilled Start: 6/19/91 10:15  
 Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/19/91 13:00  
 Drilling Method: CME-95 4 1/4 HSA Drilling Fluids (type): None

**Annular Space Details**

Type of Surface Seal: GROUT  
 Type of Annular Sealant: GROUT  
 Amount of cement: # of bags NA lbs. per bag \_\_\_\_\_  
 Amount of bentonite: # of bags \_\_\_\_\_ lbs. per bag \_\_\_\_\_  
 Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50  
 Type of Sand Pack: WB-40  
 Source of Sand: Commercial  
 Amount of Sand: # of bags 6 lbs. per bag 100

**Well Construction Materials**

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

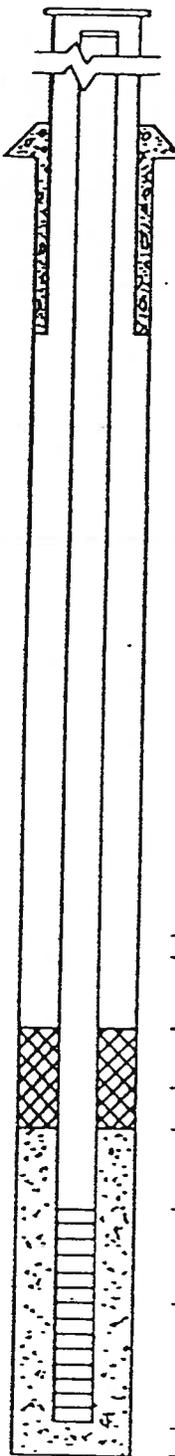
**Measurements**

to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	<u>15.00</u>
Bottom of screen to end cap	
Top of screen to first joint	
Total length of casing	
Screen slot size	<u>0.010</u>
Number of openings in screen	
Diameter of borehole (in)	<u>8"</u>
ID of riser pipe (in)	<u>2 1/2</u>

**Elevations - .01 ft.**

<u>NA</u>		MSL Top of Protective Casing
<u>553</u>	<u>34</u>	MSL Top of Riser Pipe
<u>3</u>	<u>29</u>	ft. Casing Stickup
<u>550</u>	<u>10</u>	MSL Ground Surface
<u>550</u>	<u>10</u>	ft. Top of annular sealant



**Depths or Intervals**

<u>9</u>	<u>5</u>	ft. Top of Seal
<u>2</u>	<u>0</u>	ft. Total Seal Interval
<u>11</u>	<u>5</u>	ft. Top of Sand
<u>13</u>	<u>0</u>	ft. Top of Screen
<u>15</u>	<u>0</u>	ft. Total Screen Interval
<u>28</u>	<u>0</u>	ft. Bottom of Screen
<u>28</u>	<u>0</u>	ft. Bottom of Borehole

Completed by: OEM Surveyed by: Sherbot-Carson & Assoc. Ill. registration = 2047



Site #: 123749 County Madison Well # MW-03

Site Name: Collinsville Landfill Grid Coordinate: Northing 5741.79 Easting 5129.81

Drilling Contractor: Mathes Date Drilled Start: 6/19/91 13:30

Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/19/91 14:45

Drilling Method: CME-95 4 1/4 HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Grout

Type of Annular Sealant: Grout

Amount of cement: # of bags NA lbs. per bag

Amount of bentonite: # of bags lbs. per bag

Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: WB-40

Source of Sand: Commercial

Amount of Sand: # of bags 6 lbs. per bag 100

Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

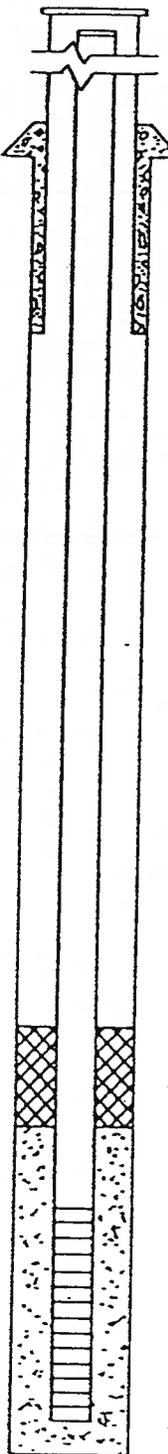
Measurements

to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	15.00
Bottom of screen to end cap	
Top of screen to first joint	
Total length of casing	
Screen slot size	0.010
Number of openings in screen	
Diameter of borehole (in)	8"
Diameter of riser pipe (in)	2"

Elevations - .01 ft.

NA		MSL Top of Protective Casing
538	82	MSL Top of Riser Pipe
3	22	ft. Casing Stickup
535	60	MSL Ground Surface
535	60	ft. Top of annular sealant



Depths or Intervals

9	0	ft. Top of Seal
2	0	ft. Total Seal Interval
11	0	ft. Top of Sand
13	0	ft. Top of Screen
15	0	ft. Total Screen Interval
28	0	ft. Bottom of Screen
28	0	ft. Bottom of Borehole

Completed by: OEM Surveyed by: Sherbut-Carson Assoc. Ill. registration = 2047



Site #: 12374 County Madison Well # MW-04

Site Name: Collinsville Landfill Grid Coordinate: Northing 5455.99 Easting 4688.50

Drilling Contractor: Mathes Date Drilled Start: 6/19/91 15:15

Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/19/91 16:15

Drilling Method: CME-95 4 1/4 HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: GROUT

Type of Annular Sealant: GROUT

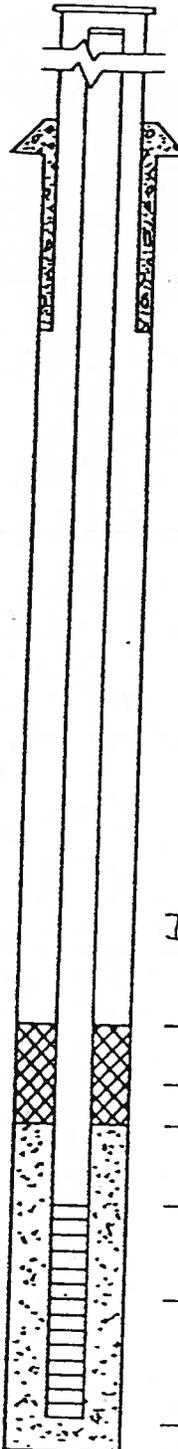
Amount of cement: # of bags NA lbs. per bag \_\_\_\_\_

Amount of bentonite: # of bags \_\_\_\_\_ lbs. per bag \_\_\_\_\_

Type of Bentonite Seal (Granular, Pellet): Pellet

Elevations - .01 ft.

NA		MSL Top of Protective Casing
527	93	MSL Top of Riser Pipe
6	73	ft. Casing Stickup
521	20	MSL Ground Surface
521	20	ft. Top of annular sealant



Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: WB-40

Source of Sand: Commercial

Amount of Sand: # of bags 6 lbs. per bag 100

Well Construction Material

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

Depths or Intervals

9	5	ft. Top of Seal
2	0	ft. Total Seal Interval
11	5	ft. Top of Sand
13	0	ft. Top of Screen
15	0	ft. Total Screen Interval
28	0	ft. Bottom of Screen
28	0	ft. Bottom of Borehole

Measurements

to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	15.00
Bottom of screen to end cap	
Top of screen to first joint	
Total length of casing	
Screen slot size	0.010
Number of openings in screen	
Diameter of borehole (in)	8"
Diameter of riser pipe (in)	2"

Completed by DEW

Surveyed by: Sherbut-Carson & Assoc. Ill. registration # 2047



Site #: 123747 County: Madison Well #: MW-03

Electronic Filing - Received Clerk's Office : 08/10/2015

Site Name: Collinsville Landfill Grid Coordinate: Northing 527.18 Easting 4734.85

Drilling Contractor: Mathes Date Drilled Start: 6/20/91 9:30

Driller: J. Breeding Geologist: G. Swartz Date Completed: 6/20/91 10:30

Drilling Method: CME-95 4 1/4 HSA Drilling Fluids (type): NONE

Annular Space Details

Type of Surface Seal: Grout

Type of Annular Sealant: Grout

Amount of cement: # of bags NA lbs. per bag

Amount of bentonite: # of bags lbs. per bag

Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: WB-40

Source of Sand: Commercial

Amount of Sand: # of bags 6 lbs. per bag 100

Well Construction Materials

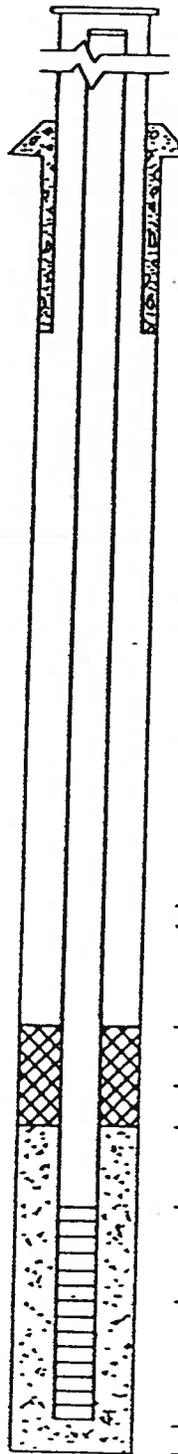
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			SCH 40	
Riser pipe above w.t.			SCH 40	
Riser pipe below w.t.			SCH 40	
Screen			SCH 40	
Coupling joint screen to riser			SCH 40	
Protective casing				

Measurements to .01 ft. (where applicable)

Riser pipe length	
Protective casing length	
Screen length	15.00
Bottom of screen to end cap	
Top of screen to first joint	
Total length of casing	
Screen slot size	0.010
Number of openings in screen	
Diameter of borehole (in)	8"
Diameter of riser pipe (in)	2"

Elevations - .01 ft.

NA		MSL Top of Protective Casing
533	26	MSL Top of Riser Pipe
2	96	ft. Casing Stickup
530	30	MSL Ground Surface
530	30	ft. Top of annular sealant



Depths or Intervals

4	0	ft. Top of Seal
2	0	ft. Total Seal Interval
6	0	ft. Top of Sand
8	0	ft. Top of Screen
15	0	ft. Total Screen Interval
23	0	ft. Bottom of Screen
23	0	ft. Bottom of Borehole

Completed by: DEM

Surveyed by: Sherbut-Carson & Assoc

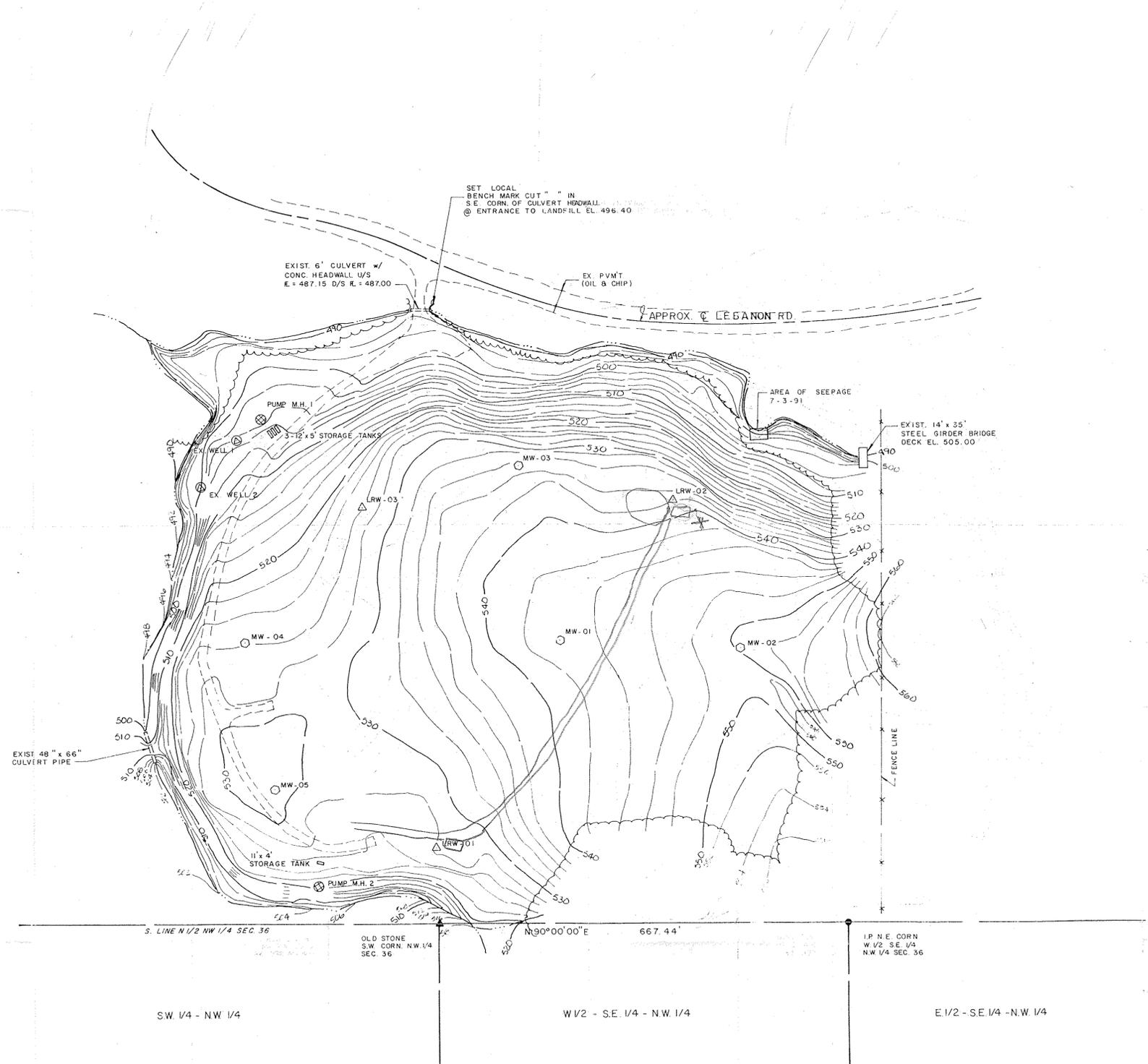
Ill. registration # 2047

**Attachment 3-2**

**Plate 1**

# TOPOGRAPHIC MAP - COLLINSVILLE LANDFILL

IN PART OF THE N. 1/2 OF THE N.W. 1/4 OF SEC. 36 T. 3N., R. 8W. OF THE 3rd P.M. MADISON COUNTY, ILLINOIS



- NOTES:
1. Basis of Coordinates, assumed old stone at southwest corner, NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , Section 36, as 5000.00 grid north, 5000.00 grid East.
  2. Basis of bearings, assumed south line N $\frac{1}{2}$ , NW $\frac{1}{4}$  Section 36 as North 90 degrees 00 minutes 00 seconds East.
  3. Basis of Vertical datum, from FIRM Community Panel No. 170436 0100 B, effective date April 15, 1982. RM61 chiseled square on top of abutment at northwest corner of Lebanon Road Bridge over Canteen Creek. Ele. 486.62.

WELL	WELL SCHEDULE		TOP PVC ELEVATION	GROUND ELEVATION
	NORTHING	EASTING		
MW-01	5458.22	5195.17	545.45	542.4
MW-02	5444.01	5490.47	553.34	550.1
MW-03	5741.79	5129.81	538.82	535.6
MW-04	5455.99	4688.50	527.93	521.2
MW-05	5217.18	4734.85	533.26	530.3
Previously existing well (1)	5781.19	4672.24	507.56	505.1
Previously existing well (2)	5708.24	4615.75	501.75	498.9
LRW-01	5121.93	4996.51	530.61	527.4
LRW-02	5685.22	5383.71	542.50	539.1
LRW-03	5676.20	4878.99	528.89	525.6
Pump M.H. (1)	5819.52	4713.90	Top Grate = 502.99	
Pump M.H. (2)	5060.02	4805.39	Top Grate = 518.39	

Note: Wells MW-02 thru MW-05 and LRW-02 adjusted by Mathes 7/03/91

- LEGEND
- ▲ Denotes found old stone
  - Denotes found iron pin
  - Denotes traverse nail
  - Denotes monitoring well
  - △ Denotes L.R. well
  - Denotes Leachate pump M.H.
  - Denotes Leachate storage tank as noted
  - ⊗ Denotes previously existing well
  - Denotes tree line
  - Denotes existing contour lines
  - Denotes existing gravel roadway
  - Denotes flowline of existing creek

Underground facilities, structures, and utilities have been plotted from available surveys and records and, therefore, their locations must be considered approximate only. There may be other utilities of which no record is known. It will be the responsibility of the construction contractor to contact J.R.I.E. (1-800-897-0123), prior to construction, to verify the locations of any underground utilities which may exist.

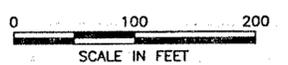
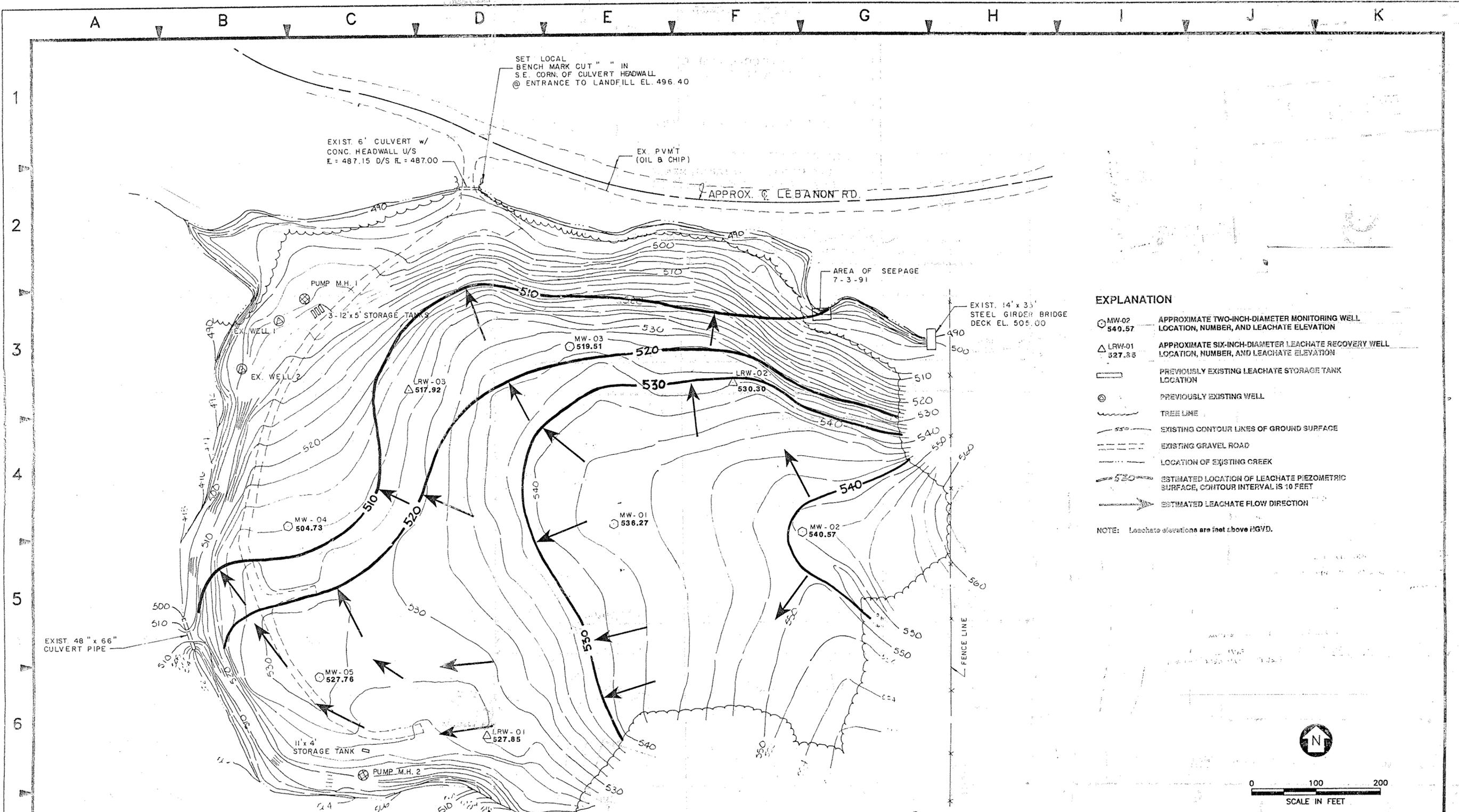
This is to certify that we, Sherbut-Carson & Associates, P.C., have at the request of the City of Collinsville, performed a topographic survey of the existing landfill as shown hereon, and that this is a true representation of the topographic survey.

Sherbut - Carson & Associates, P.C.  
*J.G. Sherbut*  
 J.G. Sherbut, I.P.L.S. 2047

SHEET TITLE	PROJECT NO. 1394
SURVEY PLAT	SCALE 1" = 100'
	DATE JULY 1991
SHERBUT - CARSON & ASSOC., P.C. 4 MEADOW HEIGHTS PROFESSIONAL PARK COLLINSVILLE, ILLINOIS 62234 (618) 345-5454	DRAWING NO.
	PLATE 1
	1 OF 1 SHEETS

**Attachment 3-3**

**Plate 2**



S. LINE N 1/2 NW 1/4 SEC. 36

OLD STONE S.W. CORN. N.W. 1/4 SEC. 36

N 90° 00' 00" E 667.44'

I.P. N.E. CORN W. 1/2 S.E. 1/4 N.W. 1/4 SEC. 36

SW 1/4 - NW 1/4

W 1/2 - S.E. 1/4 - N.W. 1/4

E 1/2 - S.E. 1/4 - N.W. 1/4

**General Note:**  
This contour map is based on interpolation between widely spaced monitoring wells and only at the monitoring well location is the elevation actually known.

Modified from Sherbut-Carson and Assoc., P.C.  
July 1991 Topographic Map - Collinsville Landfill.

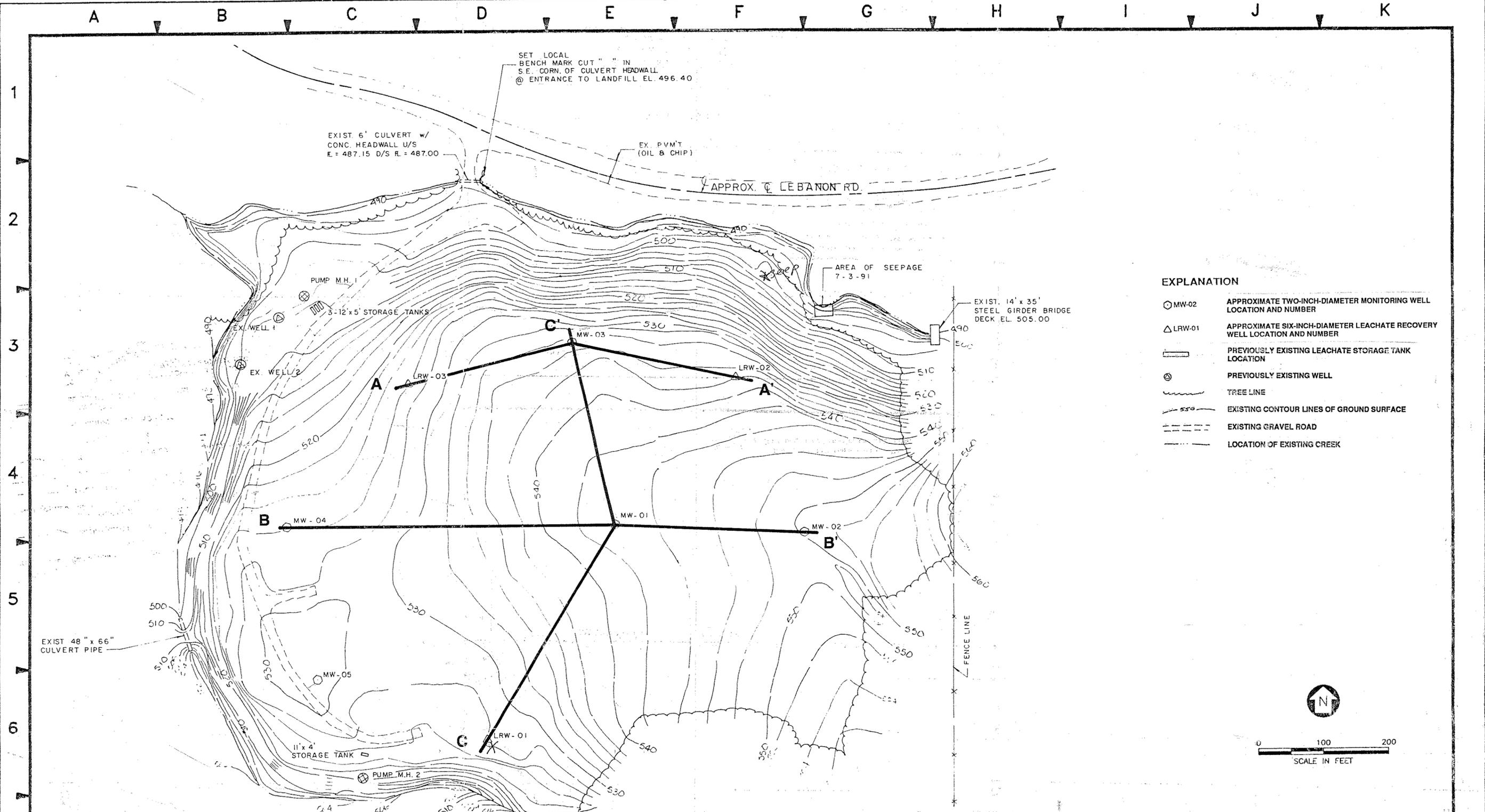


John Mathes & Associates, Inc.  
P.O. Box 350 COLUMBIA, ILLINOIS 62236  
(618) 281-7173 (314) 241-1785

CLIENT <b>CITY OF COLLINSVILLE COLLINSVILLE, ILLINOIS</b>		
PROJECT TITLE <b>CLOSED COLLINSVILLE LANDFILL</b>		
SHEET TITLE <b>LEACHATE PIEZOMETRIC SURFACE AND ESTIMATED FLOW DIRECTION JUNE 21, 1991</b>		
DATE 9/20/91	DESIGNED BY DRAWN BY DJS	DRAWING NO. <b>PLATE 2</b>
PROJECT NUMBER <b>123744</b>	CHECKED BY	SCALE

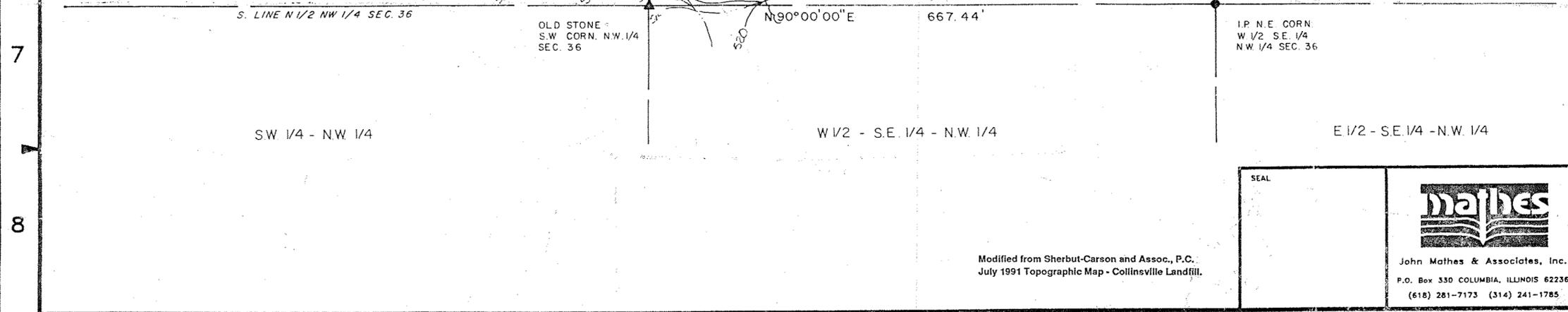
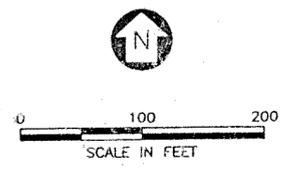
**Attachment 3-4**

**Plate 3**



**EXPLANATION**

○ MW-02	APPROXIMATE TWO-INCH-DIAMETER MONITORING WELL LOCATION AND NUMBER
△ LRW-01	APPROXIMATE SIX-INCH-DIAMETER LEACHATE RECOVERY WELL LOCATION AND NUMBER
▭	PREVIOUSLY EXISTING LEACHATE STORAGE TANK LOCATION
⊗	PREVIOUSLY EXISTING WELL
~~~~~	TREE LINE
— 500 —	EXISTING CONTOUR LINES OF GROUND SURFACE
- - - - -	EXISTING GRAVEL ROAD
~~~~~	LOCATION OF EXISTING CREEK



CLIENT <b>CITY OF COLLINSVILLE COLLINSVILLE, ILLINOIS</b>		
PROJECT TITLE <b>CLOSED COLLINSVILLE LANDFILL</b>		
SHEET TITLE <b>CROSS SECTION TRANSECT MAP</b>		
DATE 9/26/91	DESIGNED BY PTS	DRAWING NO. <b>PLATE 3</b>
PROJECT NUMBER <b>123744</b>	CHECKED BY	SCALE

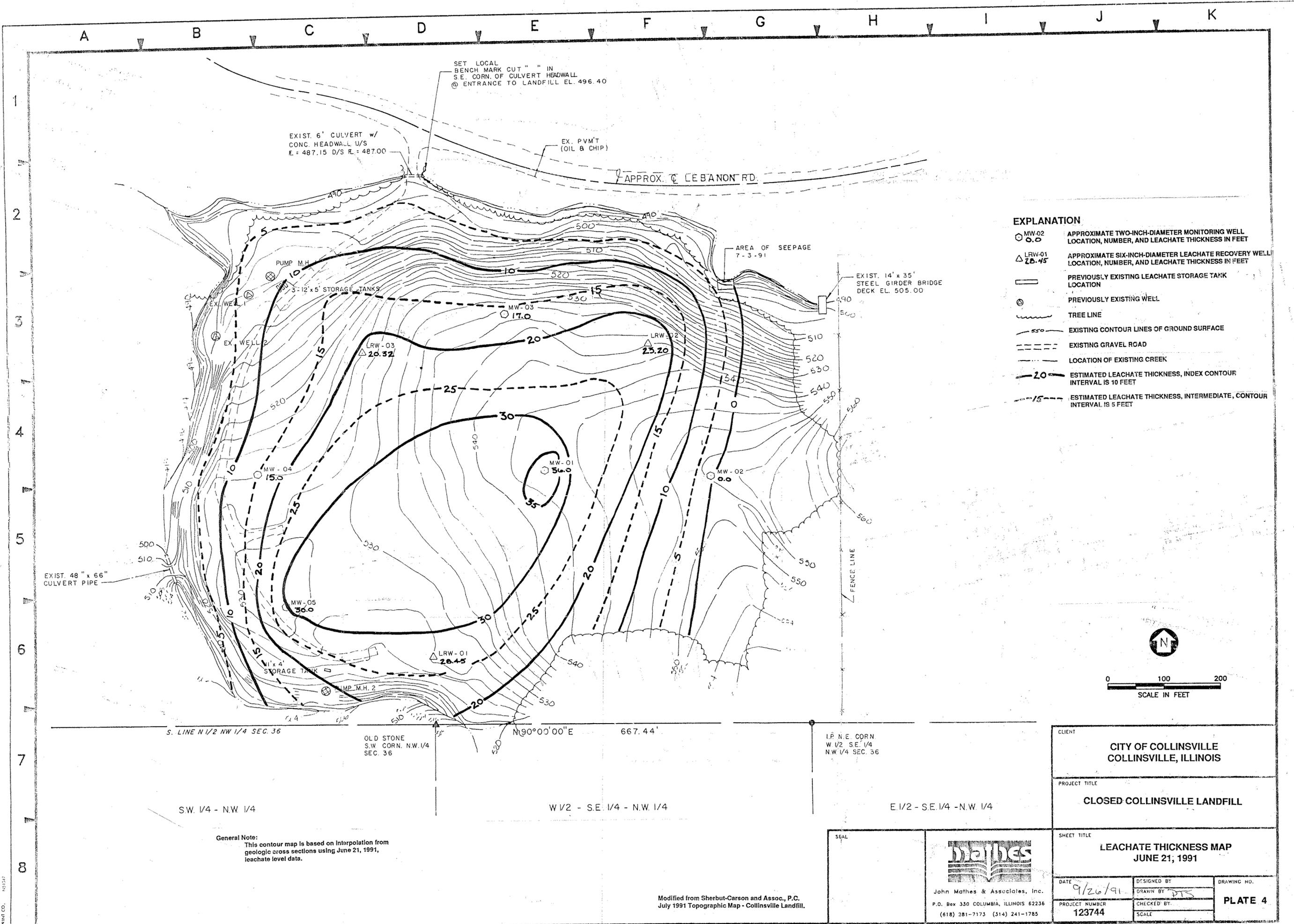
SEAL

John Mathes & Associates, Inc.  
P.O. Box 330 COLUMBIA, ILLINOIS 62236  
(618) 281-7173 (314) 241-1785

Modified from Sherbut-Carson and Assoc., P.C.  
July 1991 Topographic Map - Collinsville Landfill.

**Attachment 3-5**

**Plate 4**



CLIENT	CITY OF COLLINSVILLE COLLINSVILLE, ILLINOIS	
PROJECT TITLE	CLOSED COLLINSVILLE LANDFILL	
SHEET TITLE	LEACHATE THICKNESS MAP JUNE 21, 1991	
DATE	DESIGNED BY	DRAWING NO.
9/26/91	DTS	PLATE 4
PROJECT NUMBER	CHECKED BY	SCALE
123744		