Prepared for

Land and Lakes Company
123 N. Northwest Highway
P.O. Box 778
Park Ridge, Illinois 60068-0778

SUMMARY OF SITE INVESTIGATIONS AND RESPONSE TO THE EXPANDED SITE INVESTIGATION REPORT FOR LAND AND LAKES COMPANY NUMBER 3 FACILITY (122ND STREET LANDFILL) APPENDIX B VOLUME I

Prepared by

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August 1996

INDEX TO APPENDIX B

Index to Appendix B

Significant Modification Application (SIGMOD) and Addendums
(12 Volumes)

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August 7, 1996

Mr. Edwin Bakowski, P.E.
Manager, Permit Section
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Springfield, Illinois 62794

Federal Express
#8864474894

RE: Land and Lakes #3
#0316000034 - Cook County
Addendum to Application for Significant Modification
Log # 1995-060

Dear Mr. Bakowski:

In accordance with conversations and meetings between the Illinois Environmental Protection Agency (Agency) and representatives of Land and Lakes Company (LALC), this letter and its attachments serve as an Addendum to the above-referenced permit application. This Addendum replaces or supplements parts of Log #1995-060.

The Addendum was prepared in response to Agency comments received by LALC. In order to facilitate the review of LALC's response to the Agency comments, this Addendum was formatted by presenting Agency comments in italics and LALC responses in standard text.

LALC understands that this Addendum to Log #1995-060 will necessitate an additional review period by the Agency and that the intended action date for Log #1995-060 is currently October 7, 1996.

If you have any questions or require additional information, please do not hesitate to call the undersigned at 847-825-5000 or LALC's consultant, Eileen Sheliga of EnviroResources, Inc. at 713-395-2132.

Very truly yours,

Jay S. Goldstein
Environmental Director

JSG:bmj

A. General and Design

Appendix II-A to the original application received February 17, 1995.

1. *The signatures for owner and operator on the LPC-PA1 form were not notarized. Pursuant to 35 Ill. Adm. Code 812.104, a notarized statement from the owner and operator needs to be provided attesting to the agents authority to sign the application.*

   Attachment 1 to this Addendum is a notarized statement from the owner and operator attesting to the agent's authority to sign the application.

Attachment 10 of the Addendum received 2/2/96
Leachate Management System

2. *No specific withdrawal criteria are provided. It is stated that the model in Section V-4 will utilized the need and appropriate withdrawal. This is too vague to demonstrate adequate compliance with 35 Ill. Adm. Code 814.302 (b)(1) and 811.317.*

   The leachate from the landfill will be extracted from the French drain located in Cells I-1, I-2, I-3, I-4, and I-5 via Leachate Manholes LM1, LM2, and LM3, from deep manholes LM4 and LM5 located in Cell II-II, and from Cells II-V and II-VI via the leachate sump in Cell II-VI (Figure 1 to this Addendum). Leachate extraction rates will be maintained such that the cell area weighted average leachate elevation in the landfill is equal to or below the elevations computed by the leachate extraction model (Table V-5-2, Addendum to SIGMOD, 122nd Street Landfill, February 1996, included as Attachment 2 to this Addendum) Time 0 will be 1996. Elevation of leachate will be monitored at leachate manhole locations LM1, LM2, LM3, LM4, and LM5, at the leachate sump in Cell II-VI, and at leachate piezometers P1, P2, and P3 which will be installed in Cells I-2, I-3, and I-4, respectively (Figure 1). The leachate elevations will be monitored quarterly for two years, annually for the remainder of the design period. The leachate elevations in the leachate manholes will be measured such that the leachate elevation represents the elevation of leachate in the vicinity under steady state conditions. In order to ensure that steady state leachate elevations are attained in the leachate manhole before leachate elevation measurement, the procedure will consist of:

   (1) shut off pumping from the manhole at least 5 days before the scheduled leachate elevation measurement;

   (2) measure leachate elevation in the manhole every day after the pumping has been stopped for at least five days and/or until the change in the leachate elevation reading is less than 0.25 ft. (7.5 cm); and

   (3) report the steady state leachate elevation of the manhole which is the leachate elevation on the fifth day after pumping from the manhole has stopped or the leachate elevation corresponding to less than 0.25 ft. (7.5 cm) of change in leachate elevation since the day before.

If the weighted average leachate elevation is above the elevation computed by the leachate extraction model, then adjustments will be made to leachate withdrawal rates and or the leachate withdrawal system and the weighted average leachate elevation will be determined again within 90 days. If re-determined weighted leachate elevation is still above the elevation computed in the leachate extraction model after adjustments have been made, the operator will submit a permit modification to modify the system to meet the leachate elevations computed by the leachate extraction model.

3. *It is stated that dedicated pumps may be added. This does not describe a specific design or plan as may be required to demonstrate adequate compliance with 35 Ill. Adm. Code 814.302 (b)(1) and 811.317.*

Each manhole (LM1-LM5) will be provided with a dedicated pump designed to meet or exceed the recovery rate of each manhole. The pumping rates decrease with decreasing leachate elevations. Adjustments to the pumping rates will be made if pumps are selected which are not designed to operate continuously. The pumps will be either pneumatic-powered pumps (which operate continuously) or electrically-powered pumps (which operate intermittently). The electrically-powered pumps would be controlled by float or transducer switches for automatic discharge depending on the leachate level in the manholes. In addition to the dedicated pumps, leachate may also be removed from the manholes using a tanker truck and associated suction pump (or another type of pump) on an as-needed basis.

A permanent leachate disposal system has been completed in general accordance with the drawings and designs presented in the development permit application for Cell VI. The system includes about 3,000 feet of 2-inch diameter HDPE force main pipeline dual encased inside a 6-inch diameter gravity main. The gravity main is constructed to drain into one of 5 reinforced concrete manholes installed along the length of the force main pipeline disposal system. The force main extends from the Cell VI leachate collection discharge pipe; transfers leachate to the leachate storage pond; pumps leachate from the pond to the permanent MWRDGC sewer discharge located near 122nd Street and Stony Island Avenue.

In addition to the leachate force main described above, leachate will be pumped from manholes LM1-LM5 and will be conveyed via 2" to 4" diameter buried HDPE pipes. The HDPE pipes will be buried below the existing cover within the landfilled areas. The buried HDPE pipes from manholes LM1-LM3 will run from each manhole to a common header pipe near the southwest corner of the landfill north of the LRS parking lot. From this location, the combined flow from these three manholes will be routed into the existing leachate force main just prior to discharge to the MWRDGC sewer. The buried HDPE pipes from manholes LM4 and LM5 will run from each manhole and will be connected directly to the existing leachate force main at a location near leachate manhole 4 (LM4). The total combined flow will be discharged to the MWRDGC sewer in accordance with approved permits from MWRDGC and IEPA Bureau of Water. During periods of maintenance for this system and above ground temporary HDPE force main may be used.

As described above, the leachate removed from the manholes using the dedicated pumps will be conveyed to the discharge point in the Metropolitan Water Reclamation District Greater Chicago (MWRDGC) sewer system using a buried forcemain consisting of high density polyethylene (HDPE) pipes. The force main system for the manholes will be connected to the existing force main system upstream from the discharge point in the MWRDGC sewer system. To increase the flow capacity of the system, portions of the existing 2-in (50-mm) diameter double-cased force main may be upgraded to a 6-in (150-mm) diameter single-cased forcemain.

4. *It is stated that the continued use of the temporary above grade 4" leachate line is proposed. It is not clear what the details of the permanent system are or when it will be implemented.*

Recent pump discharge tests concluded that the permanent leachate discharge force main, described in response #3 above, from the pond to the MWRDGC sewer is capable of producing flows in excess of about 30 gpm which exceeds the expected long term leachate generation quantity from Cell VI. However, during the excavation of Cell VI, the amount of stormwater which becomes leachate greatly surpasses the flow capacity of the permanent leachate force main and storage capacity of the leachate storage pond. The excess leachate capacity is currently being handled by the temporary 4-inch diameter above ground HDPE force main from the storage pond to the MWRDGC sewer. It is therefore requested that the temporary leachate force main be allowed to remain in use for the duration of anticipated development of Cell VI. The temporary leachate force main will be inspected daily for any signs of leakage or damage. The temporary force main is necessary and is expected to be used for at least 4 more years.

Attachment 21 of the Addendum received 2/2/96
Construction Quality Control Plan

5. *The plan only addresses the construction of liners and cover. Pursuant to 35 Ill. Adm. code 811.503, other activities such as gas control facilities, ponds, ditches, lagoons and berms must also be covered by the CQA plan.*

The Construction Specifications Construction Quality Assurance (CQA) Plan (Attachments 20 and 21, respectively) of the February 1996 SIGMOD Addendum, address all the activities required by Section 811.503 of 35 IAC with the exception of the installation of gas control facilities. A guide to the location of specifications and CQA requirements is presented in a revised Table VII-1 which is included as Attachment 3 to this Addendum. The CQA of the installation of gas control facilities is addressed by SCS Consultants, the designer of the gas control facilities in response to Agency comment A-13 in this Addendum.

6. *It is stated that the CQA consultant will be independent from the owner, contractor,*

manufacturer and installer. However, the operator was not mentioned. The CQA officer must also be independent from the operator pursuant to 35 Ill. Adm. Code 811.502(a). It is somewhat confusing that in 3.1.13 the "owner" is defined as Land and Lakes Company which is actually the operator of record. The Agency requires that the CQA official(s) be independent from both the owner and the operator.

In compliance with Section 811.502(a) of 35 IAC, the CQA consultant will be independent from the operator, owner, contractor, manufacturer, and installer.

7. *The plan does not specifically identify a CQA officer or officers as described in 35 Ill. Adm. Code 811.502(b). The CQA officer must be registered professional engineer. Instead of a CQA officer, a CQA "consultant" is specified which is a firm that includes a number individuals. The Agency does not allow the duties and responsibilities of the CQA officer (s) to be spread among various staff including individuals not meeting the qualifications and/or obligations of the CQA officer(s). Note however, that not all CQA work must be done by the CQA officer(s).*

In compliance with Section 811.502(b)(2) of 35 IAC, as indicated in Sections 3.2.10 and 3.2.11 of the CQA Plan, the CQA Consultant will provide a CQA Managing Engineer (i.e., a CQA Officer) who is a professional engineer registered in the State of Illinois. In compliance with Section 811.502(b)(1) of 35 IAC, the CQA Managing Engineer will supervise and be responsible for all inspections, testing, and other activities required to be implemented as part of the CQA Plan. In compliance with Section 811.503(b), if the CQA Managing Engineer is not present to supervise all inspections, testing, and other activities, the CQA Managing Engineer will designate a CQA Managing Engineer-in-absentia, (i.e., the Site CQA Manager) to carry out the on-site duties of the CQA Managing Engineer. The Site CQA Manager will report to the CQA Managing Engineer who will be fully responsible for all inspections performed and reports prepared by the Site CQA Manager.

8. *Table VII B-3, Page VIIB-17, Moisture and density tests are proposed at the rate of 1/acre/lift. The Agency expects these to be taken at the rate of 5/acre/lift. The adequacy of the lesser frequency has not been properly justified, particularly in light of the reduction in hydraulic conductivity tests (from 1/acre/alternate lift in the original app. to 1/3 acres/alternate lift in the 2/2/96 addendum).*

In compliance with the above request, the in-situ moisture content and in-situ density tests for the compacted clay layer will be performed at a frequency of 5 per acre per lift.

Attachment 14, et. al. of addendum received 2/2/96

9. *No specific details were provided for gas monitoring in on-site buildings as required by 811.310(d) (3).*

All on-site buildings are equipped with gas monitoring devices which sound an alarm if methane exceeds the appropriate action level. The devices are wall mounted in the buildings in locations so that methane, if present, would be detected.

Employees are trained in the proper maintenance of these units including periodic manual checking of alarm functions. Employees are also trained in the appropriate procedures to follow in the event a methane gas detection device alarm is sounded.

Attachment 17 of addendum received 2/2/96

10. *It is stated that only methane detections exceeding the trigger limits that are attributable to the facility will be reported to the Agency. Pursuant to 811.311(b), any observed exceedance should be reported to the Agency.*

LALC will notify the Agency in writing within two business days of any observed exceedence of the limits specified in 811.311(a)(1) or 811.311(a)(2).

Attachment 39 of addendum received 2/2/96

11. *The cost estimates seem low for the excavation, hauling and compaction of soil. It has not been demonstrated that the soil is available and can be moved and compacted for the costs assumed. It has also not been demonstrated that the assumed use of intermediate cover will meet the cover standards of 811.314(b). No justification was provided for the leachate disposal costs.*

Revised Closure and Post Closure Cost Estimates are included as Attachment 4 to this Addendum. The following information addresses the Agency comments on: 1) soil balance for the facility; 2) the cost for excavating, hauling and compacting clay for final cover; 3) the use of intermediate cover and 4) justification for leachate disposal costs.

1) Soil Balance

Excavated Clay Stockpiles from Cell V and Cell VI currently exceeds 200,000 cubic yards of clay. When the excavation of Cell VI is completed (approximately 12 acres with clay from elevation 575 MSL to 535 MSL) the clay excavated at the site will be approximately 800,000 cubic yards. Final cover clay requirements are approximately 150,000 cubic yards.

2) Cost of Excavating, Hauling and Compacting

There currently exists stockpiled clay at the landfill to meet the final cover clay requirements. As stated above, as Cell VI excavation continues additional clay will be stockpiled. LALC obtained a quote from a third party contractor, T.J. Lambrecht, which states that they will haul and compact this stockpiled clay for final cover for $1.41 per cubic yard. A copy of this quote is included as part of the Closure and Post Closure Cost Estimate which is Attachment 4 to this Addendum.

3) Use of Intermediate Cover

Intermediate cover will be tested to ensure that it meets the requirements of 811.314(b). With respect to areas not designed with a geomembrane final cover system, LALC recently installed final cover on the south and east sides of the facility. The intermediate cover in place was tested by third party CQA officers and found to meet the appropriate requirements for use as part of the final cover system after minor reworking.

With respect to areas designed with a geomembrane final cover system, see the response to the Agency's comment Number A-18 to this Addendum which includes an equivalency demonstration for the intermediate cover system.

4) Leachate Disposal Costs

LALC based its costs for leachate disposal on actual costs incurred to dispose of leachate from the Land and Lakes #3 facility to the Metropolitan Water Reclamation District. Information regarding how the costs were calculated based on actual costs incurred is included in the Closure and Post Closure Cost Estimate which is Attachment 4 to this Addendum.

Addendum received April 22, 1996 for an active gas collection system. This addendum generally restates the regulatory requirements without giving the required specific information to demonstrate compliance. There are also too many open ended proposals and options. A specific plan needs to be identified.

12. *Closure Plan and Post closure care plans and cost estimates were not provided for this system (812.114, 812.115 and 812.116)*

Closure and Post Closure Cost Estimates for the Active Gas Extraction System are included as part of the revised Closure and Post Closure Cost Estimates for the facility which are found in Attachment 4 to this Addendum.

13. *The Construction Quality Assurance Plan needs to be revised as stated in item 5, above, to specifically include the following:*

    a). *Landfill Gas Collection/Venting Systems (if these systems are proposed) -- 811.503(a)(7) and 811.504(b)*

A gas venting system is not proposed. The six existing gas vents will be capped and closed after the installation of a full scale, active gas management system.

b) *All On-Site Gas Management Systems (if gas collection system is proposed) -- 811.503(a)(7) and 811.504(b).*

The Construction Quality Assurance (CQA) Plan for the proposed active on-site gas management system will consist primarily of the observation of a Construction Quality Assurance (CQA) Officer dedicated to the gas management system during the time of its installation. The duties and responsibilities of the CQA Officer as regards the gas management system will include the following:

- Ensure conformance with design plans and specifications, regulatory requirements, permit requirements, and the health and safety plan.

- Carefully observe and log the drilling of all landfill gas extraction wells. Observe and log backfill conditions. Make modifications to gas well installations in the field, as may be necessary to ensure proper performance.

- Observation and logging of header line and blower/flare station installation. Coordination on any proposed design changes to accommodate conditions encountered in the field.

- Start-up, shake-down, and fine-tuning of the completed landfill gas extraction system to meet design requirements.

Segment testing of solid pipe portions of the LFG collection header system shall also be performed. These tests shall be executed in conformance with the following requirements:

- All PE header pipe shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed after installation.

- Equivalent sizes of polyethylene piping shall be butt-welded together into testing segments not to exceed 500 ft. Segments shall be connected to a testing apparatus on one end, and fitted with caps on all openings.

- The segment to be tested should be allowed time to reach constant and/or ambient temperature before initiating the test.

- The test shall be performed during a period when the pipe segment will be out of direct sunlight (e.g., early morning, late evening, or cloudy days). This will minimize the pressure changes which will occur during temperature fluctuations.

- The test pressure shall be 5 psig.

- Pressure drop during the test shall not exceed 1 percent of the testing gauge pressure over a period of one hour. This pressure drop may be corrected for temperature changes before determining pass or fail. The CQA Officer shall sign off on the test form to indicate test compliance.

- The CQA Officer shall be notified prior to the commencement of the testing procedure, and shall be present during the test.

- Equipment for this testing procedure will be furnished by the contractor. This shall consist of a polyethylene flange adapter with a PVC blind flange. Tapped and threaded into the blind flange will be a temperature gauge with a 0 to 100 degree Centigrade range, a pressure gauge of 0 to 15 psi range (graduated in 0.1 psi increments), a "tire valve" to facilitate an air compressor hose, and a ball valve to release pipe pressure upon the completion of this test. Polyethylene reducers shall be utilized to adapt test flange to the size of the piping being tested.

- The following steps shall be performed when a pipe segment fails the 1 percent/1 hour test described above.

  - The pipe and all fusions shall be inspected for cracks, pin-holes, and perforations.

  - All blocked risers and capped ends shall be inspected for leaks.

  - Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.

  - All pipe and fused joint leaks shall be repaired by cutting out the leaking area and re-fusing the pipe.

  - After all leaks have been repaired, a re-test shall be performed in accordance with requirements above.

c) Landfill Gas Monitoring System -- 811.503(a)(7) and 811.504(b)

The Construction Quality Assurance (CQA) Plan for the Landfill Gas Monitoring System will consist of a CQA officer that is present to provide supervision and assume responsibility of the installation of future gas monitor wells. The duties and responsibilities of the CQA officer during installation of the gas monitor wells will include the following in accordance with 811.503(a)(7) and 811.504(b).

- Ensure conformance with the design plans and specifications of all materials used.

- Observe and log all pipe and screen lengths and all backfill materials.

- Coordinate any proposed design changes to accommodate conditions encountered in the field.

- Prepare as-built logs of each monitor well, including survey coordinates and elevations.

14. *Descriptions of Gas Collection Systems pursuant to 812.310 to demonstrate compliance with 811.311*

a) *Layout and design of the collection system 812.310(b)*

The layout and design of the collection system has been delineated on the preliminary design drawings entitled "Landfill Gas Recovery System, 122nd Street Landfill, Chicago, Illinois" revised July 11, 1996. Gas collection system description has been contained within a document entitled "Design Criteria Memorandum, Preliminary Design, Landfill Gas Recovery System, 122nd Street Landfill". In accordance with 35 IAC 811.312(b), the proposed landfill gas extraction system will be considered part of the facility.

b) *Description and specifications for all equipment 812.310*

Material specifications have been provided earlier on the design drawings and design criteria memorandum. The two significant equipment pieces to be installed in this landfill gas collection system design include the blowers and flare. A description of each follows below:

- Blowers. In accordance with the Preliminary Design Drawings, two blowers shall be installed at the blower/flare station at 122nd Street Landfill. Under normal circumstances, each of these shall be sufficient to handle the expected maximum flow from the LFG collection system, with one left idle as a mechanical reserve. These shall be single-phase, centrifugal exhausters, and explosion-proofed. Each shall be capable of handling the design flow (targeted at 1,029 cfm, and having a maximum capacity of 1,544 cfm accommodating a 50 percent mark-up factor of safety). Pressure performance shall include a minimum of -40 in. inlet water column vacuum, and +10 in. outlet water column pressure.

- Flare. The flare shall be a utility flare, capable of handling the targeted design flow of 1,029 cfm and the maximum expected flow capacity of 1,544 cfm. A flame arrestor shall be integrated to the utility flare base, with a differential pressure loss not to exceed 2 in. of water column pressure. The utility flare shall have a corrosion resistant shroud sufficient for wind protection of the flame, and to provide general shielding of the flame under normal flow and normal weather conditions. A flame detection and alarm system shall be installed, to allow automatic re-ignition of the utility flare if extinguishment of the landfill gas flame should occur. If re-ignition within 3 sequential attempts to re-ignite the gas flare does not occur, the utility flare shall allow for automatic shut-down and an off-site alarm will sound indicating gas collection system failure.

The utility flare shall be integrated with a propane fueled, pilot flame to allow re-ignition of the landfill gas stream upon extinguishment. The utility flare shall be constructed of landfill gas and corrosion resistant steel, to allow long service operation without interruption.

c) *A gas condensate disposal plan 812.310(d)*

All condensate collected in the header line system of the gas collection system itself, and within the confines of the limits of solid waste, shall be disposed into the leachate collection system, in accordance with the drawings and specifications. Any gas condensate collected at locations outside the limits of solid waste (i.e., at the blower/flare station), shall be collected in a double-walled containment sump with alarm system integrated within. A submersible pump shall be installed within this sump, and allow automatic pumping to the leachate storage pond located nearby. After temporary on-site storage, the combined condensate/leachate stream shall be disposed to on-site force mains, which feed to the Metropolitan Wastewater Reclamation District of Greater Chicago (MWRDGC).

15. *Descriptions of Landfill Gas Disposal. Pursuant to 812.311, the plan shall contain information to demonstrate compliance with 811.312. Specifically, 812.311(a) requires the inclusion of the approved air discharge permit or, the permit application that is pending.*

An air permit application has been compiled for the utility flare on the 122nd Street Landfill gas collection system. A copy of the permit application is enclosed as Attachment 6 to the Addendum. This application has been submitted to the appropriate regulatory authorities at Illinois EPA. The permit application is currently undergoing review.

16. *The proposed condensate storage system, as shown on Drawing No. 4, does not appear to meet the requirements of 811.309(d) as required by 811.311(d)(8). Specifically, it does not seem to have secondary containment or a demonstration of adequate capacity.*

Secondary containment and an alarm system has now been integrated to the design, and will be installed for all condensate storage facilities located outside the limits of solid waste. Specifically, this pertains to the sump location located near the blower/flare station. See Drawing No. 5.

The capacity of the condensate sump as proposed is approximately 500 gallons. With the installation of an automatically operating submersible pump, fluid accumulations will immediately be transferred from the condensate management sump to the separate leachate storage pond.. This leachate storage pond has a relatively unlimited capacity compared to the smaller volumes of gas condensate flow. The pond consists of the IEPA certified double lined leachate storage pond with a capacity of over 1.3 million gallons, which is far more capacity than the minimum 5-day requirement.

17. It was not clearly demonstrated the criteria for leachate recycling specified in 811.309(f) have been satisfied. This must be done if condensate is to be returned to the landfill.

The current plan does not call for condensate for condensate recirculation to the landfill environment. All condensate will either be discharged directly to the leachate collection system within the landfill (for areas located within the landfill limits), or will collect in an off-site sump located near the blower/flare facility. At this location, a submersible pump will be installed in the sump, to allow automatic pump-out to the nearby leachate storage facility.

Original Application received 2/17/95

18. It is proposed to place a geomembrane over intermediate cover in part of the landfill. It has not been adequately demonstrated that a geomembrane on this type of base (1 foot of intermediate cover) will meet the requirements of 811.314(b)(3)(B). One foot of material may not be adequate to protect the membrane in conditions of differential settlement and/or from the migration of sharp objects. Two feet of clay compacted to a low permeability is the preferred base for a geomembrane.

In compliance with the above request and Section 811.314(b)(3)(B) of 35 IAC, the prepared base for the geomembrane of the final cover will consist of 1 ft (0.3 m) of intermediate cover with a maximum hydraulic conductivity of 1×10^{-4} cm/s placed on 2 ft (0.6 m) of compacted select waste (i.e., contaminated soils or sludge). The resulting 3-ft (0.9-m) thick prepared base is more than adequate to protect the geomembrane in conditions of differential settlement and/or from the migration of sharp objects. An equivalency demonstration showing that the proposed final cover system, which includes a geomembrane, is equivalent or superior in performance to a 0.91-m (3-ft) thick compacted outer layer with a hydraulic conductivity of 1×10^{-6} cm/s is provided as Attachment 7 to this Addendum.

B. *Groundwater Impact Assessment*

1. *35 IAC 812.316(b) requires all data, including values of the model's parameter and site-specific hydrogeologic information used in the modeling and analysis of the groundwater impact to be included in the application. The application failed to comply with 812.316(b) for the following reasons:*

   a). *The applicant used a surrogate for modeling purposes, however, the predicted concentration at the Zone Of Attenuation for the surrogate was not provided for the shallow or deep aquifers.*

In the shallow zone, for an initial leachate concentration of the surrogate constituent of 1ug/l, the model predicted a concentration of the surrogate constituent at the zone of attenuation of 1×10^{-6} ug/l.

In the deep aquifer, for an initial leachate concentration of the surrogate constituent of 1ug/l, the model predicted a concentration of the surrogate constituent at the zone of attenuation of 1×10^{-8} ug/l.

   b) *The diskettes containing model input and output files were not included.*

Floppy disks containing model input and output files (POLLUTE and MIGRATE models) were mailed to IEPA on 30 May 1996.

   c) *A hardcopy version of the baseline model prediction for the shallow or deep aquifer was not included.*

Hard copies of baseline model predictions were mailed to the Agency by Fed Ex to IEPA on 30 May 1996.

   d) *Model prediction values for all parameters detected, or expected, in the leachate were not provided in a table, along with the AGQSs, as part of the application to demonstrate compliance with the AGQSs.*

Model prediction values (MPC) and AGQSs for the shallow zone and the deep aquifer are listed in Tables V-6-3 and V-6-7 of the revised Ground-Water Monitoring Plan which is included as Attachment 8 to this Addendum.

2. *35 IAC 811.318(b) requires that a network of monitoring points shall be established at sufficient locations downgradient with respect to groundwater flow and not excluding the downgradient direction, to detect any discharge of contaminants from any part of a potential source of discharge. The application failed to comply with 811.319(b) for the following reasons:*

   a). *Justification for the well spacing was not included.*

See response to Agency Comment C-1 in this Addendum.

b). *Page V-2-10 states "GeoSyntec expects that groundwater flow in the Silurian dolomite aquifer will revert to the southeast historical regional trend after the TARP system is completed and all tunnels have been lined", However, the adequacy of the groundwater monitoring program has not been evaluated with historic groundwater monitoring program. Provisions to modify the deep aquifer monitoring program when the TARP project is completed should be included as a part of the application.*

The groundwater monitoring program for the deep Silurian dolomite aquifer is designed by assuming a northwest to southeast groundwater flow direction. This has been the historical flow direction for the aquifer as well as the flow direction since the first quarter of 1995. The direction of the groundwater flow over the previous four quarters will be determined annually as part of the Annual Report for the facility. If the direction of flow in the Silurian dolomite aquifer is determined to have changed so that the current monitoring program is inadequate, the deep aquifer monitoring program will be modified through the submittal of a permit modification.

Due to the absences of the data required for the Groundwater Impact Assessment, the adequacy of the application to demonstrate compliance with 35 IAC 811.317(b) could not be determined.

C. *Groundwater*

1. *Pursuant to 35 IAC 811.318(b)(1), a network of monitoring points shall be established at sufficient locations downgradient with respect to groundwater flow and not excluding the downward direction, to detect any discharge of contaminants from any part of a potential source of discharge. The Agency will accept a maximum well spacing default value of 250 feet for the downgradient wells. However, the applicant shall provide documentation that the proposed network of monitoring points is capable of detecting a discharge of contaminants from any part of a potential source of discharge. This documentation may use contaminant transport modeling to demonstrate the adequacy of a proposed groundwater monitoring program. The contaminant transport modeling must demonstrate that a proposed monitoring system is capable of detecting a contaminant plume, exceeding the applicable groundwater quality standard, by the time it would reach the limit of the zone of attenuation.*

As per conversation with Mr. Ken Lovett of IEPA on 18 July 1996, a maximum well spacing default value of 300 ft (100 m) for the wells in the deep aquifer, the primary groundwater unit, the Silurian dolomite aquifer, is acceptable.

As per discussion with IEPA during the meeting on 28 June 1996, the existing well spacing for the shallow unit, the secondary groundwater unit is adequate. However, in order to monitor the existence of an inward hydraulic gradient that will be established in accordance with approved leachate withdrawal criteria, (see response to Agency comment A-2 in this Addendum) comparisons of the leachate elevation in the landfill and the groundwater elevations in the shallow unit will be performed and will be reported as part of the facility's Annual Report.

The monitoring system in the deep aquifer with a maximum well spacing default value of 300 ft (100 m) and the monitoring well spacing for the shallow unit as well as the monitoring programs for these units are discussed in detail in the revised Ground-Water Monitoring Plan which is included as Attachment 8 to this Addendum.

2. *Actual field hydraulic conductivity measurements were performed at the Land & Lakes 1&2, and Dolton Facilities. These two facilities are over one and three quarter miles from the Land & Lakes #3 Facility and may not be indicative of the actual site conditions. The applicant shall provide site-specific field hydraulic conductivity values for the different geologic units found at the site in order to verify the laboratory hydraulic conductivity values presented in Table V-2-3 of Attachment 7 of Volume I of the Addendum to Application Log No. 1995-060, received February 2, 1996. This data shall be collected at a minimum of four locations for each hydrogeologic unit down to and including the upper Silurian Dolomite.*

As per discussion with Mr. Mike Hodgkinson of IEPA on 20 June 1996, field hydraulic conductivities of the Dolton sand unit (shallow unit) and the Silurian dolomite aquifer (uppermost aquifer) will be measured using slug tests. These slug tests will be performed at two locations in each of the Dolton Sand unit and the Silurian dolomite aquifer. This data will be submitted to the Agency within 90 days of the date of the permit approval.

Hydraulic conductivities of the shallow unit and the deep aquifer measured by various researchers and consultants for the Lake Calumet region of northeastern Illinois are summarized in Table 1, Field Hydraulic Conductivity Values from Literature for the Dolton Sand and Silurian Dolomite Aquifer which is included as Attachment 9 to this Addendum. The hydraulic conductivities presented in Table 1 are consistent with the hydraulic conductivities measured at the 138th Street and Dolton Landfills. It should be noted that the 138th Street and Dolton Landfills are approximately one and three quarter miles away from the 122nd Street Landfill.

The filed hydraulic conductivity data summarized in Table 1, and Table V-2-4 of Part V, Addendum to SIGMOD, 122nd Street Landfill, February 1996, and the two slug tests to be performed in the Dolton sand unit and the Silurian dolomite aquifer will provide adequate data on the hydraulic conductivities of the hydrogeologic units at the 122nd Street Landfill site.

3. *The AGQS and the MAPC values may not be acceptable. The applicant has failed to provide an adequate justification for using the shallow wells upgradient of the slurry wall as the upgradient background wells. The applicant shall provide a discussion and a comparison of the upgradient background groundwater quality (used to establish the AGQS values) to that of the existing groundwater quality downgradient of the waste boundary and slurry wall. Additionally, the applicant shall evaluate the appropriateness of establishing shallow groundwater quality and therefore, AGQS values, on an intrawell basis.*

As per discussion with the IEPA during the meeting on 28 June 1996, shallow zone groundwater quality will be evaluated using intra-well comparisons. A detailed discussion on this issue can be found in the revised version of the Ground-Water Monitoring Plan which is included as Attachment 8 to this Addendum.

References:

Bonaparte, R., Giroud, J.P., and Gross, B.A., "Rates of Leakage through Landfill Liners", *Conference Proceedings, Geosynthetics '89*, Vol. 1, San Diego, CA, Feb 1989, pp. 18-29.

Giroud, J.P., and Bonaparte, R., "Leakage Through Liners Constructed with Geomembranes, Part I: Geomembrane Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 1, 1989a, pp. 27-67.

Giroud, J.P., and Bonaparte, R., "Leakage Through Liners Constructed with Geomembranes, Part II: Composite Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 2, 1989b, pp. 71-111.

Giroud, J.P., and Fluet, J.E., Jr., "Quality Assurance of Geosynthetic Lining Systems", *Geotextiles and Geomembranes*, Vol. 3, No. 4, 1986, pp. 249-287.

Giroud, J.P., Khatami, A., and Badu-Tweneboah, K., "Evaluation of the Rate of Leakage through Composite Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 4, 1989, pp. 337-340.

USEPA, "*Background Document: Proposed Liner and Leak Detection Rule*", EPA/530-SW-87-015, Prepared by GeoServices Inc., May 1987a, 526 p.

USEPA, "*Background Document: Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments*", EPA/530-SW-87-013, Prepared by GeoServices Inc., Apr. 1987b, 301 p.

Attachment 1

ATTACHMENT 1

Certificate of Secretary

I, Mary Margaret Cowhey, the duly elected qualified and acting Assistant. Secretary of Land and Lakes Company ("Company"), an Illinois corporation, hereby certify that in accordance with the Company's By-Laws duly adopted and in effect on the date hereof, that the following names and titles are duly elected, qualified and acting officers of the Company who are authorized and empowered by the Company to execute Illinois Environmental Permit Applications ("Permit Applications") and any other documents executed in connection with such Permit Applications:

James J. Cowhey, Sr.	President,
James J. Cowhey, Jr.	Vice President - Operations
Marie N. Cowhey	Secretary/Treasurer
Mary Margaret Cowhey	Asst. Secretary
Thomas P. Fitzsimons	Asst. Secretary.

IN WITNESS WHEREOF, the undersigned has executed this Secretary's Certificate this 7th day of August, 1996.

Land and Lakes Company, an Illinois Corporation

By: [signature]
Assistant Secretary

SUBSCRIBED AND SWORN TO BEFORE ME
this 7th day of August, 1996

Barbara Jarecki
Notary Public

"OFFICIAL SEAL"
Barbara Jarecki
Notary Public, State of Illinois
My Commission Expires 11/14/98

secctf.doc

ATTACHMENT 2

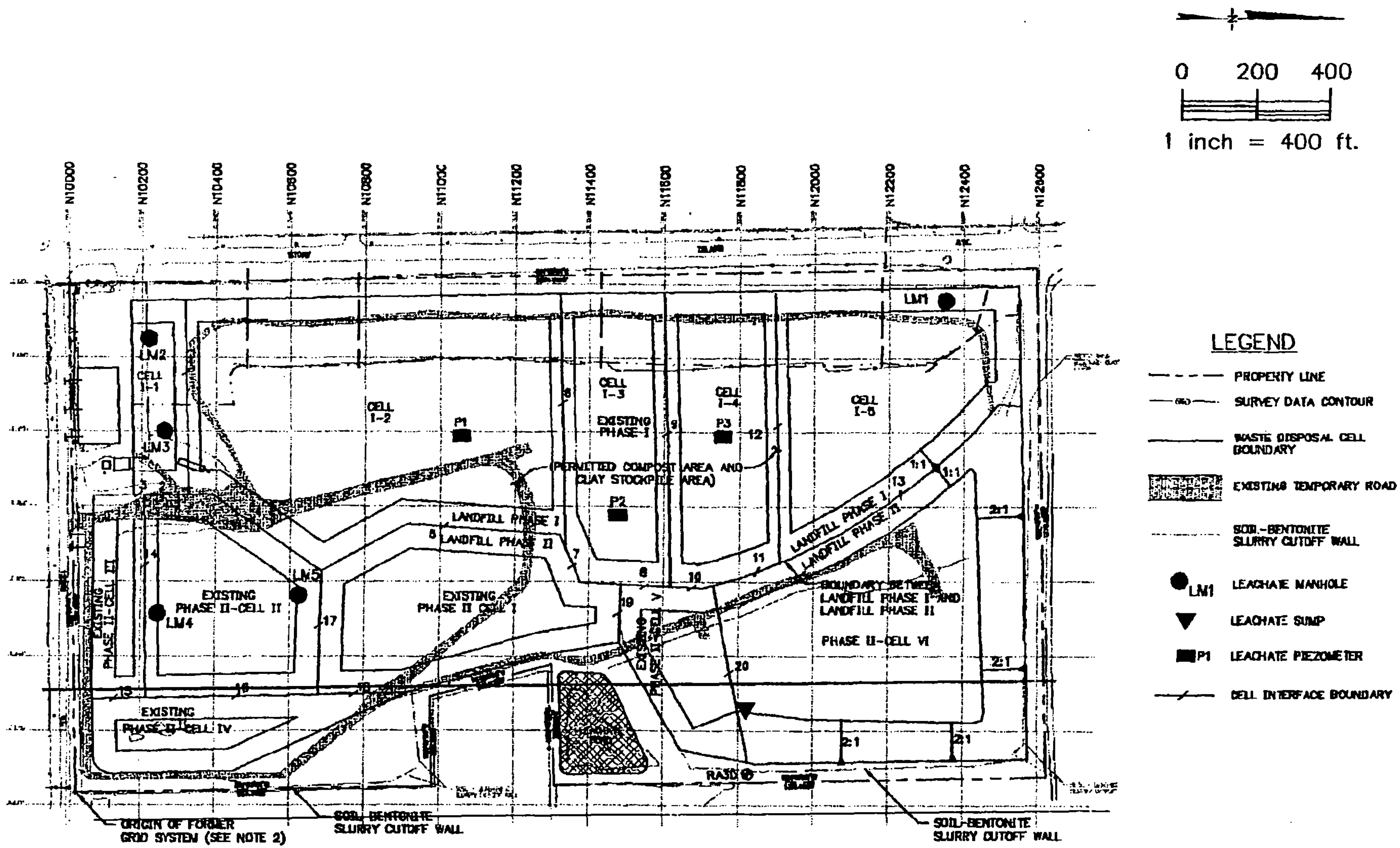
Table V-5-2
122nd Street Landfill: Darcy Velocities in Side Liner and Lemont Till for Baseline Models

ELAPSED TIME (years)	AVERAGE LEACHATE ELEVATION (ft)	HORIZONTAL VELOCITY IN SIDE LINER (cm/s)	VERTICAL VELOCITY IN LEMONT TILL (cm/s)	DOWNGRADIENT HORIZONTAL VELOCITY IN SILURIAN DOLOMITE AQUIFER (cm/s)
0	594.00	8.0E-08	1.6E-08	5.4E-06
1	590.56	4.6E-08	1.4E-08	4.9E-06
2	588.94	2.9E-08	1.3E-08	4.6E-06
3	587.78	1.8E-08	1.3E-08	4.5E-06
4	586.93	9.3E-09	1.2E-08	4.3E-06
5	586.27	2.7E-09	1.2E-08	4.2E-06
6	585.02	-9.8E-09	3.1E-09	2.0E-06
7	583.99	-2.0E-08	2.4E-09	1.8E-06
8	583.13	-2.9E-08	1.9E-09	1.7E-06
9	582.38	-3.6E-08	1.4E-09	1.6E-06
10	581.73	-4.3E-08	1.1E-09	1.5E-06
12	580.58	-5.4E-08	3.6E-10	1.3E-06
14	579.70	-6.3E-08	-1.9E-10	1.2E-06
16	578.97	-7.0E-08	-6.3E-10	1.2E-06
18	578.31	-7.7E-08	-1.0E-09	1.2E-06
20	577.72	-8.3E-08	-1.4E-09	1.2E-06
22	577.17	-8.8E-08	-1.7E-09	1.2E-06
24	576.67	-9.3E-08	-2.0E-09	1.2E-06
26	576.22	-9.8E-08	-2.3E-09	1.2E-06
28	575.82	-1.0E-07	-2.5E-09	1.2E-06
30	575.46	-1.1E-07	-2.8E-09	1.2E-06
32	575.15	-1.1E-07	-3.0E-09	1.2E-06
34	574.87	-1.1E-07	-3.1E-09	1.2E-06
36	574.91	-1.1E-07	-3.1E-09	1.2E-06
38	574.96	-1.1E-07	-3.1E-09	1.2E-06
40	575.02	-1.1E-07	-3.0E-09	1.2E-06
42	575.08	-1.1E-07	-3.0E-09	1.2E-06
44	575.14	-1.1E-07	-3.0E-09	1.2E-06
46	575.21	-1.1E-07	-2.9E-09	1.2E-06
48	575.27	-1.1E-07	-2.9E-09	1.2E-06
50	575.34	-1.1E-07	-2.8E-09	1.2E-06
52	575.41	-1.1E-07	-2.8E-09	1.2E-06
54	575.47	-1.1E-07	-2.8E-09	1.2E-06
56	575.54	-1.0E-07	-2.7E-09	1.2E-06
58	575.61	-1.0E-07	-2.7E-09	1.2E-06

Table V-5-2
122nd Street Landfill: Darcy Velocities in Side Liner and Lemont Till for Baseline Models (continued)

ELAPSED TIME (years)	AVERAGE LEACHATE ELEVATION (ft)	HORIZONTAL VELOCITY IN SIDE LINER (cm/s)	VERTICAL VELOCITY IN LEMONT TILL (cm/s)	DOWNGRADIENT HORIZONTAL VELOCITY IN SILURIAN DOLOMITE AQUIFER (cm/s)
60	575.68	-1.0E-07	-2.6E-09	1.2E-06
62	575.75	-1.0E-07	-2.6E-09	1.2E-06
64	575.81	-1.0E-07	-2.6E-09	1.2E-06
66	575.87	-1.0E-07	-2.5E-09	1.2E-06
68	575.94	-1.0E-07	-2.5E-09	1.2E-06
70	576.00	-1.0E-07	-2.4E-09	1.2E-06
72	576.05	-9.9E-08	-2.4E-09	1.2E-06
74	576.10	-9.9E-08	-2.4E-09	1.2E-06
76	576.15	-9.9E-08	-2.3E-09	1.2E-06
78	576.19	-9.8E-08	-2.3E-09	1.2E-06
80	576.24	-9.8E-08	-2.3E-09	1.2E-06
82	576.28	-9.7E-08	-2.3E-09	1.2E-06
84	576.32	-9.7E-08	-2.2E-09	1.2E-06
86	576.37	-9.6E-08	-2.2E-09	1.2E-06
88	576.42	-9.6E-08	-2.2E-09	1.2E-06
90	576.45	-9.6E-08	-2.2E-09	1.2E-06
92	576.49	-9.5E-08	-2.1E-09	1.2E-06
94	576.53	-9.5E-08	-2.1E-09	1.2E-06
96	576.55	-9.4E-08	-2.1E-09	1.2E-06
98	576.58	-9.4E-08	-2.1E-09	1.2E-06
100	576.62	-9.4E-08	-2.1E-09	1.2E-06
102	576.65	-9.4E-08	-2.0E-09	1.2E-06
104	576.67	-9.3E-08	-2.0E-09	1.2E-06
105	576.68	-9.3E-08	-2.0E-09	1.2E-06

Notes:
1. Average water table elevation in Dolton Sand and Fill Unit assumed equal to 586 ft.
2. Elevations of potentiometric surface in the Silurian dolomite aquifer assumed equal to 567 ft for 0 - 5 years and 580 ft for 6 - 105 years.
3. Average leachate elevation was calculated by weighting the leachate elevation in each cell with respect to the area of cell.
4. Negative horizontal velocity indicates flow into the landfill.
5. For 1-D baseline model, average hydraulic conductivity of side liner selected as 1 x 10^{-7} cm/s.
6. For 2-D baseline model average hydraulic conductivity of Lemont till selected as 1.4 x 10^{-8} cm/s.
7. Downgradient horizontal velocity in Silurian dolomite aquifer was calculated by adding seepage rate from the landfill to the upgradient horizontal velocity in the aquifer (1.2 x 10^{-6} cm/s).



122nd STREET LANDFILL: LEACHATE ELEVATION POINTS

GeoSyntec Consultants

FIGURE NO.	1
PROJECT NO.	FE2226
DOCUMENT NO.	
PAGE NO.	

2226F008 199608070933RO

ATTACHMENT 3

Table VII-1. [illegible]le to Location of Specifications and CQA Requirements for [illegible] Components.

COMPONENT	MATERIAL AND CONSTRUCTION REQUIREMENTS	CONSTRUCTION QUALITY ASSURANCE ACTIVITIES
Surface-Water Control Structures: • Cast in Place Concrete • Precast Concrete Structures • Storm Water Drainage Pipes • Trenching • Berms • Ponds • Erosion Control	Section 03310 of Part VII-A: Construction Specifications Section 03320 of Part VII-A: Construction Specifications Section 02830 of Part VII-A: Construction Specifications Section 02221 of Part VII-A: Construction Specifications Section 02210 of Part VII-A: Construction Specifications Section 02200 of Part VII-A: Construction Specifications Section 03110 of Part VII-A: Construction Specifications	Section 03310 of Part VII-A: Construction Specifications Section 03320 of Part VII-A: Construction Specifications Section 02830 of Part VII-A: Construction Specifications Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan
Liner: • Excavation and Subgrade Preparation • Liner Compacted Clay • Liner Geomembrane	Section 02200 of Part VII-A: Construction Specifications Section 02230 of Part VII-A: Construction Specifications Section 02740 of Part VII-A: Construction Specifications	Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 7 of Part VII-B: Construction Quality Assurance Plan
Leachate Drainage and Collection Systems: • Geotextile Filters • Geotextile Cushions • Geotextile Separators • Geonet • Geocomposite • HDPE Pipes and Fittings • Liner Protective Layer (LCS Drainage Sand) • Leachate Collection Pipe Bedding Gravel	Section 02710 of Part VII-A: Construction Specifications Section 02710 of Part VII-A: Construction Specifications Section 02710 of Part VII-A: Construction Specifications Section 02730 of Part VII-A: Construction Specifications Section 02735 of Part VII-A: Construction Specifications Section 02718 of Part VII-A: Construction Specifications Section 02235 of Part VII-A: Construction Specifications Section 02225 of Part VII-A: Construction Specifications	Section 9 of Part VII-B: Construction Quality Assurance Plan Section 9 of Part VII-B: Construction Quality Assurance Plan Section 9 of Part VII-B: Construction Quality Assurance Plan Section 10 of Part VII-B: Construction Quality Assurance Plan Section 11 of Part VII-B: Construction Quality Assurance Plan Section 13 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan
Leachate Management System: • Cast in Place Concrete • Precast Concrete Structures • HDPE Pipe and Fittings • Trenching	Section 03310 of Part VII-A: Construction Specifications Section 03320 of Part VII-A: Construction Specifications Section 02718 of Part VII-A: Construction Specifications Section 02221 of Part VII-A: Construction Specifications	Section 03310 of Part VII-A: Construction Specifications Section 03320 of Part VII-A: Construction Specifications Section 13 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan
Final Cover: • Protective Soil • Topsoil • Geomembrane • Geocomposite	Section 02250 of Part VII-A: Construction Specifications Section 02265 of Part VII-A: Construction Specifications Section 02745 of Part VII-A: Construction Specifications Section 02735 of Part VII-A: Construction Specifications Section C of Part VI: Design Report	Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VII-B: Construction Quality Assurance Plan Section 7 of Part VII-B: Construction Quality Assurance Plan Section 11 of Part VII-B: Construction Quality Assurance Plan Section 6 of Part VI: Design Report To Be Provided by SCS To Be Provided by SCS To Be Provided by SCS

ATTACHMENT 4

ATTACHMENT 4
Addendum to Log #1995-060
122nd Street Landfill
Land and Lakes #3 Facility
CLOSURE AND POST CLOSURE CARE COST ESTIMATES
August 7, 1996

Premature Final Closure Cost Estimate

Total area of landfill at time of premature closure =
41 acres requiring final cover + 18 certified closed + 10 certified final cover +buffer areas

Total area requiring final cover = 41 acres

Total area with intermediate cover = 41 acres of 1 ft (0.3m) of clay

1. Grading and Backfilling
   Grading-Machine and Operator
   32 hrs x $80/hr = $ 2,560
   (no change)

   Miscellaneous Backfill - Excavate, Haul and Place
   (includes removal of concrete and tire stockpile)

   5,000 yd^3 x $1.50 yd^3 = $ 7,500
   (no change)

2. Equipment Decontamination
   Materials and Labor
   10 hrs x $80/hr = $ 800
   (no change)

3. Cover Placement
   29 acres of the area with intermediate cover must receive 2.0 ft. of compacted clay, 2.5 ft. of final protective cover and 0.5 ft. of topsoil.

   The remaining 12 acres of intermediate and daily cover will receive a 40 mil geomembrane, 2.5 ft. of final protective soil and 0.5 ft. of topsoil.

   Compacted Clay

   Excavate Haul and Compact
   29 acres x 2.0 ft x 43,560 ft^2/acre

x $yd^3/27\ ft^3$ x $\$1.5/yd^3$ (See attached quote for unit cost by TJ Lambrecht dated 6/25/96)	=	$140,360 (no change)

Synthetic Cap

12 acres of 40 mil geomembrane x $12,000/acre	=	$144,000 (no change)

Final Protective Cover

Excavate Haul and Compact

41 acres x 2.5 ft x 43,560 ft^2/acre x $yd^3/27\ ft^3$ x $\$0.50/yd^3$* (includes removal of concrete and tire stockpile)	=	$ 82,683 (no change)

Topsoil

Excavate Haul and Place

41 acres x 0.5 ft x 43,560 ft^2/acre x $yd^3/27\ ft^3$ x $\$1.00/yd^3$	=	$ 33,073 (no change)

Construction Quality Assurance

• 3 ft compacted clay: 29 acres x $2,000/acre	$58,000		
• 40 mil geomembrane: 12 acres x $2,000/acre	$ 24,000		
• 3 ft final protective layer: 41 acres x $250/acre	$ 10,250	=	$92,250 (no change)

*Includes using compost and/or sludge as approved final protective cover layer amendments.

4. Vegetation
Fertilize, Seed and Mulch
41 acres x $1,000/acre = $ 41,000
(no change)

7.	Security Measures	=	$ 500 (no change)

8.	Gas Recovery System	Phase I	Phase II
A.	Vertical extraction wells: 15 wells x $70.00/l.f. x 50' avg =	$ 52,500	----
	29 wells x $70.00/l.f. x 55' avg =	-----	$111,650
B.	Header pipe: $20.00/l.f. x 3,900 l.f.	$ 78,000	----
	$20.00/l.f. x 4,900 l.f.	----	$ 98,000
C.	Blower	$ 5,000	----
D.	Flare skid station	$ 60,000	----
E.	Condensate Management System 3 traps, sump @ $2,500.00	$ 7,500	----
	1 trap @ $2,500.00		$ 2,500
F.	Construction Quality Assurance	$ 10,000	$ 10,000
		$213,000	$222,150
		(Phase I)	(Phase II)

Land and Lakes Company will provide financial assurance for Phase I installation at this time. If Phase II is developed, Land and Lakes Company will provide financial assurance at the time of Phase II development.

9.	Certification of Closure	=	$ 20,000 (no change)
Total Closure Cost		=	**$ 777,727**

Post-Closure Care Cost Estimate

Total area of closed landfill = 73 acres
Total area with cover = 69

1.	Inspections 4/year x $80/inspection	=	$ 320/yr (no change)
2.	Cover Maintenance 69 acres x 43,560 ft^2/acre x 0.5% x 1 ft x yd^3/27 ft^3 x $2.00/$yd^3$	=	$ 1,113/yr (no change)
3.	Vegetation Maintenance 69 acres x 1.5% x $1,000/acre	=	$ 1,035/yr (no change)
4.	Mowing $25/hr x 32 hrs	=	$ 800/yr (no change)
5.	Monitoring Gas Monitoring System $25/hr x 52 hrs	=	$ 1,300/yr (no change)
6.	Miscellaneous Maintenance $500/yr	=	$ 500/yr (no change)
7.	Leachate/Removal Treatment at MWRDGC 530,000 gallons x $.0004/gallon[2]	=	$ 212/yr (no change)
8.	Gas System Maintenance		
	A. Install 1 gas well during each 5 year period @ $5,000/well $5000 ÷ 5 yrs	=	$1,000/yr.

B. Inspection & Maintenance = $1,500/yr.

C. 7kw. x $0.07\kw. hr. x 8,760 hrs. per yr. x 1/3 = $1,430/yr.

D. Condensate Disposal Cost

500[1] gal/day x 365 days/yr. x $0.0004[2]/gal	=	$ 73/yr
		$4003/yr

9. Groundwater Monitoring

14 groundwater and leachate monitoring points

Sample collection, field measurements, preparation, transportation, and documentation reporting

$1,249/point /yr x 14 points	=	$ 17,486/yr (no change)
Total Post-Closure Cost/Year	=	$ 26,769/yr
x 30 Years at 4% Discount	=	$ 462,890
Total Closure/Post-Closure Cost	=	**$1,240,617**

[1]Quantity based on the average of Phase I vs. Phase I and Phase II (See response #2)

[2]The price of $0.0004/gallon for leachate discharge to the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) is based on actual costs incurred in 1995 for the discharging of leachate from the Land and Lakes #3 facility. Attached to this cost estimate is a copy of the User Charge Annual Certified Statement for Land and Lakes #3.

The total number of gallons of leachate discharged from Land and Lakes #3 to the MWRDGC covered by the Annual Certified Statement is 5,891,373 gallons. The cost (before the Ad Valorem tax rebate) to discharge this leachate to the MWRDGC is $2,196. Therefore, the cost per gallon of discharging this leachate is $0.0003727. In the post closure cost estimate for Land and Lakes #3, this cost is rounded up to $0.0004 per gallon.

T.J. Lambrecht Construction, Inc. (815) 726-7722
Route 30 & Gougar, R.F.D. 2
Joliet, Illinois 60432

T.J. Lambrecht Construction

AUG 06 1996

June 25, 1996

Mr. James Cowey Jr.
Land & Lakes Company
123 N. Northwest Highway
Park Ridge, IL 60068

RE: Clay Cap - 122nd Street Landfill

Dear Jim:

Please accept the following price to spread and compact existing clay pile located on top of the above referenced project:

Cost per Cubic Yard $1.41/CY

Cost reflects measuring existing pile per cross section (average end areas).

Includes leveling at 6" compacted lifts, to the densities and permeabilities as per your closure permit.

Any questions, please contact the undersigned at your earliest convenience.

Respectfully,

Thomas E. Bolek

Thomas E. Bolek
Vice President

TEB:jch

(847)825-5000
F(847)825-0887

User Charge Annual Certified Statement

1.a. Parent Company
Name Land and Lakes Company
Address 123 North Northwest Highway
City, Zip Code Park Ridge, Illinois 60068
Telephone (708) 825-5000

b. Reporting Facility
Name Land and Lakes #3
Address 2000 East 122nd Street
City, Zip Code Chicago, IL 60633
Telephone (312) 646-1138

2. Federal Tax Identification No. 36-3577 682

Plant Code*

3. Real Estate Index Numbers See Attached

*As assigned by the District

4. Nature of Business Solid Waste Landfill
5. Tax-Exempt Reporting Option 7l (Refer to Instructions, Line 5.) ☐ Yes, we elect the option.
6. Standard Concentrations Reporting Option 7g (Refer to instructions, Line 6.) ☐ Yes, we have received written approval to report under this option.
7. District's Determination Sampling Option 7h (Refer to instructions, Line 7.) ☐ Yes, we have written approval to report under this option.
8. Historical Concentrations Option 7i (Refer to instructions, Line 8.) ☐ Yes, we have received written approval to report under this option.
9. Number of employees in 1995 15
10. Number of workdays in 1995 307
11. Measurement Procedure: (Attach supporting documents; check as applicable.)
a. ☒ Direct Measurement of Discharge b. ☐ Metered Water Supply (Water Bills) c. ☐ Other Measured Water Supply
12. Total Number of Outlets
13. Total Number of Incoming Water Meters 0
14. Other Water Sources
15. Volume reported represents period from 1/1/95 to 12/31/95
16. Toxic, Hazardous, or Injurious Materials (See Appendix A of the User Charge Ordinance) a. ☐ Discharge b. ☐ Used c. ☒ Not Applicable
17. Sampling Procedure: (Check one)
a. ☐ Week-Long, Flow-Proportioned, 24-Hour Composite Sampling
b. ☑ Two Consecutive Day-Long, Equal-Volume, 24-Hour Time-Composite Sampling
c. ☐ Other (Specify) 2 done for 3 days in 1995
18. Dates Samples Taken 5/8/95, 5/9/95, 5/10/95, 10/10/95, 10/11/95, 10/12/95

Annual Quantities	1st Half	2nd Half			Total
19. Volume (gal)	3,337,928	2,553,445			5,891,373
20. Five-Day BOD (mg/L)	23	52			
21. Five-Day BOD (lbs.)	640	1107			1,747
22. Suspended Solids (mg/L)	92	124			
23. Suspended Solids (lbs.)	2,561	2,641			5,202

Computation of User Charge

24. Total Annual Volume Charge	1,053
25. Total Annual BOD Charge	327
26. Total Annual Suspended Solids Charge	816
27. Extraordinary Monitoring and Enforcement Charge (If Applicable)	
28. Total Annual Gross User Charge (Total of Lines 24 through 27)	2,196
29. Annual Ad Valorem Property Taxes Paid to the District in 1995 (Attach a copy of the most recent tax bill)	2,438
30. Total Ad Valorem Tax Credit (Multiply Line 29 by 0.502)	1,224
31. Total Net User Charge (Subtract Line 30 from Line 28)	972
32. Total Payments Made (Year to Date)	0
33. Total User Charge Remaining Due (Subtract Line 32 from Line 31) Amount Due	$972

34. Overpayment: ☐ Credit ☐ Refund

Prepared by Carla J. Blum Tel. (708) 825-5000

Certification. The undersigned, being first duly sworn on oath, deposes and says that he/she has examined the statement and its supporting documentation and to the best of his/her knowledge and belief, same are true, correct and complete.

Signature of Officer/Owner [signature] Tel. (708) 825-5000
Officer's Name & Title Mary Margaret Cowhey - Asst. Secretary
Subscribe and sworn to me this 18th day of January
(Seal) Notary Public [signature: Barbara Jarecki]

"OFFICIAL SEAL"
Barbara Jarecki
Notary Public, State of Illinois
My Commission Expires [illegible]

Mail the original and one copy of this Certified Statement and payment by January 20, 1996 to:
Metropolitan Water Reclamation District of Greater Chicago
Lock Box No. 98429
Chicago, IL 60693

Failure to file on time a corrected and completed statement together with all required supporting documentation and to pay the full amount owed by the due date will subject the User to penalty and/or interest charges as provided by the User Charge Ordinance. For phone inquiries call (312) 751-3000.

For District Use Only
Year
$ Paid
Deposit Date
Post Date
Chk. No.
Trans. Type
SIC Code
UC No.

Attachment 5

DESIGN CRITERIA MEMORANDUM

PRELIMINARY DESIGN
LANDFILL GAS RECOVERY SYSTEM
122ND STREET LANDFILL
CHICAGO, ILLINOIS

Prepared for:

Zahren Alternative Power Corporation
124 Sills Road
P.O. Box 7
Yaphank, New York 11980
(516) 924-5627

Land and Lakes Company
123 N. Northwest Highway
P.O. Box 778
Park Ridge, Illinois 60068
(708) 825-5000

Prepared by:

SCS Engineers
2060 Reading Road
Cincinnati, Ohio 45202
(513) 421-5353

File No. 0595037
April 18, 1996

CONTENTS

DESIGN CRITERIA MEMORANDUM

PRELIMINARY DESIGN
LANDFILL GAS RECOVERY SYSTEM
122ND STREET LANDFILL
CHICAGO, ILLINOIS

INTRODUCTION

This Landfill Gas (LFG) Collection System Design Criteria Memorandum for the Land and Lakes 122nd Street Landfill in Chicago, Illinois, has been prepared for Zahren Alternative Power Corporation as specified in the proposal scope of services dated January 15, 1996. This memorandum along with the LFG collection system design drawings, constitutes the design documents for the wellfield and piping network for the LFG collection system.

BACKGROUND

The 122nd Street landfill site presently has a passive gas system with passive gas flares. These flares are located mainly on the western slope of the landfill, approximately half way down the slope. There are three gas flares along the southern slope of the landfill. The information on the construction of the gas flares was reported from Land and Lakes Company. The gas flares were constructed to a depth of approximately 30 to 40 ft, in an 18-inch borehole. In the borehole, a 6-inch diameter PVC pipe was installed from the bottom of the borehole to approximately 8 to 10 ft above ground. The pipe was perforated (or slotted) to within 4 or 5 ft of the surface. On top of the pipe (above ground), there is a wind shield and a shut-off valve. The existing passive flares will be properly abandoned upon the construction and operation of the LFG system.

PROPOSED LFG SYSTEM DESCRIPTION AND OBJECTIVES

The purpose of the proposed LFG collection system is to extract LFG from the landfill and to control off-site migration of the landfill gas in accordance with 35 Illinois Administrative Code (IAC) Section 811.311 (d)(3). The LFG may be used to fuel internal combustion engine generators, which could generate electricity for sale to a utility, or be used directly by a medium Btu user, such as a boiler or kiln. The proposed LFG collection system is comprised of vertical extraction wells, collection piping to transport the LFG from the wellfield to a condensate handling system, the blower/flare unit, and eventually to the end-user.

Based on information obtained during field observations and review of existing data, SCS developed design criteria for the LFG collection system. The design criteria was developed for the following:

- Vertical extraction well depth and spacing.

- LFG system sizing.

The well system was designed with all the wells being placed within the landfill limits of solid waste, in accordance with 35 IAC 811.311 (d)(1). The vertical well spacing was design based on the projected radius of influence that each well will exert on the landfill. The spacing and layout of the well system was designed to maximize collection of the landfill gas, and to minimize the potential for off-site migration of landfill gas, in accordance with 35 IAC 811.311 (d)(2).

The radius of influence was calculated in two different ways, depending on the part of the landfill in which the wells were being placed. For the existing cells (Cells 1 through 5), the radius of influence was calculated using a well depth equal to the difference between the existing surface elevation and the average elevation of the leachate. A pipe will be placed in that borehole, equal to 1 ft less than the depth calculated above. The pipe will have the bottom two-thirds slotted, and the top one-third solid. The borehole will be backfilled with gravel around the slotted portion of the pipe, a soil/bentonite plug above the gravel, more soil backfilled around the solid pipe, and another soil/bentonite plug.

For wells being designed for future Cell 6, the radius of influence was calculated using a well depth equal to three quarters of the difference between the final grade elevation and the bottom of waste elevation. The remaining design criteria is the same for these wells as for the wells designed for the existing cells. The pipe material will be Schedule 80 PVC pipe to meet the requirements of 35 IAC 811.311 (d)(5).

The final cover system for various parts of the landfill is: The western slope has 2 ft of clay and 6 inches of topsoil placed prior to September 18, 1990, per 35 IAC 807 regulations. The south and east slopes, along with most of the top area will receive a cap consisting of 3 ft of clay, 2.5 ft of protective soil, and 6 inches of topsoil. The cap over Cell 6 will receive 1 ft of clay cover, 1 40-mil flexible membrane liner, 2.5 ft of protective soil, and 6 inches of topsoil. For those areas where wells will be drilled into the existing cap (west slope, south slope, and some of the east slope), the cap will be replaced with the identical configuration as described above. For those areas where there is not a cap system presently in place, the well heads will be protected from damage, and the capping system will be placed around the wells, when the cap is installed for that area. In accordance with 35 IAC 811.311(d)(9), under no circumstances will the gas collection system compromise the integrity of the liner, leachate collection, or cover system.

The vertical extraction wells are connected together by HDPE header system and condensate management system. The header system is designed to transport the landfill gas to a blower/flare facility for processing. From this facility, the gas can either be destroyed by a candle flare, or transported to an end-user for consumption. The header system was laid out to run with the natural slope of the final grading plan at a minimum slope of 3 percent. The same minimum slope requirement was used for laying out the well laterals that connect the wells to the header system. At low points along the header system, and at the blower/flare station, condensate knockout devices are to be installed for the removal of condensate from the system. For low points located within the limits of solid waste, the condensate will be returned to the landfill. For the condensate knockout at the blower/flare station, the condensate will be returned to the landfill or managed separately in accordance with the requirements of 35 IAC 811.311(d)(8).

For sizing of the header system, flow rates were calculated for each well. The flow rate was calculated using the volume of the zone of influence from each well. The flow rate was then subjected to a factor of safety of 50 percent. The flow rate was then input at the appropriate points along the header system. The header sizing was then determined based on limiting the velocity in the header system. The limiting velocities are 2,400 ft per minute (fpm) when the gas flow and the condensate flow are in the same direction, and 1,200 fpm when the gas flow and the condensate flow are in the opposite direction. In accordance with 35 IAC 811.312(d), representative flow rate measurements shall be made of gas flow into treatment or combustion devices. The portion of the gas collection system used to convey the gas collected from one or more units for processing and disposal shall be tested to be airtight to prevent the leaking of gas from the collection system or entry of air into the system in accordance with 35 IAC 811.311(d)(10).

In accordance with 35 IAC 811.311(d)(4), the gas collection system is designed to function for the entire design period. However, as stated in 35 IAC 811.311(d)(4), in the design period there may be changing gas flow rates and compositions. Additional vertical extraction wells may be added to the existing system to accommodate these changes. In anticipation of this, the header system and blower/flare system has been designed to accommodate flow from at least three times the number of wells currently designed for the facility. Therefore, at any time during the design period, vertical extraction wells may be added to the system up to the design capacity. In accordance with 35 IAC 811.311(d)(11), the gas collection system shall be operated until the waste has stabilized enough to no longer produce methane in quantities that exceed the minimum allowable concentrations stated in 35 IAC 811.311(a)(1), (a)(2), and (a)(3).

The gas collection system has been designed and constructed to withstand all landfill operating conditions, including settlement, in accordance with 35 IAC 811.311(d)(6). In accordance with 35 IAC 811.311(d)(5), all materials and equipment used in construction of the system shall be rated by the manufacturer as safe for use in hazardous or explosive environments and shall be resistant to corrosion by constituents of the landfill gas.

The blower/flare facility was designed to handle the total amount of landfill gas generated from the entire facility. When used for the on-site combustion of landfill gas, the flare shall meet the general control device requirements of new source performance standards adopted pursuant to Section 9.1(b) of the Act. As required by 35 IAC 811.312(c), no gas will be discharged directly to the atmosphere unless treated or burned on site prior to discharge in accordance with a permit issued by the Agency pursuant to 35 IAC 200 through 245.

If the gas is combusted on site in a device other than flares, it will be done in accordance with the requirements of 35 IAC 811.312(f). If the landfill gas is transported off site to a gas processing facility, it will be done in accordance with the requirements of 35 IAC 811.312(g).

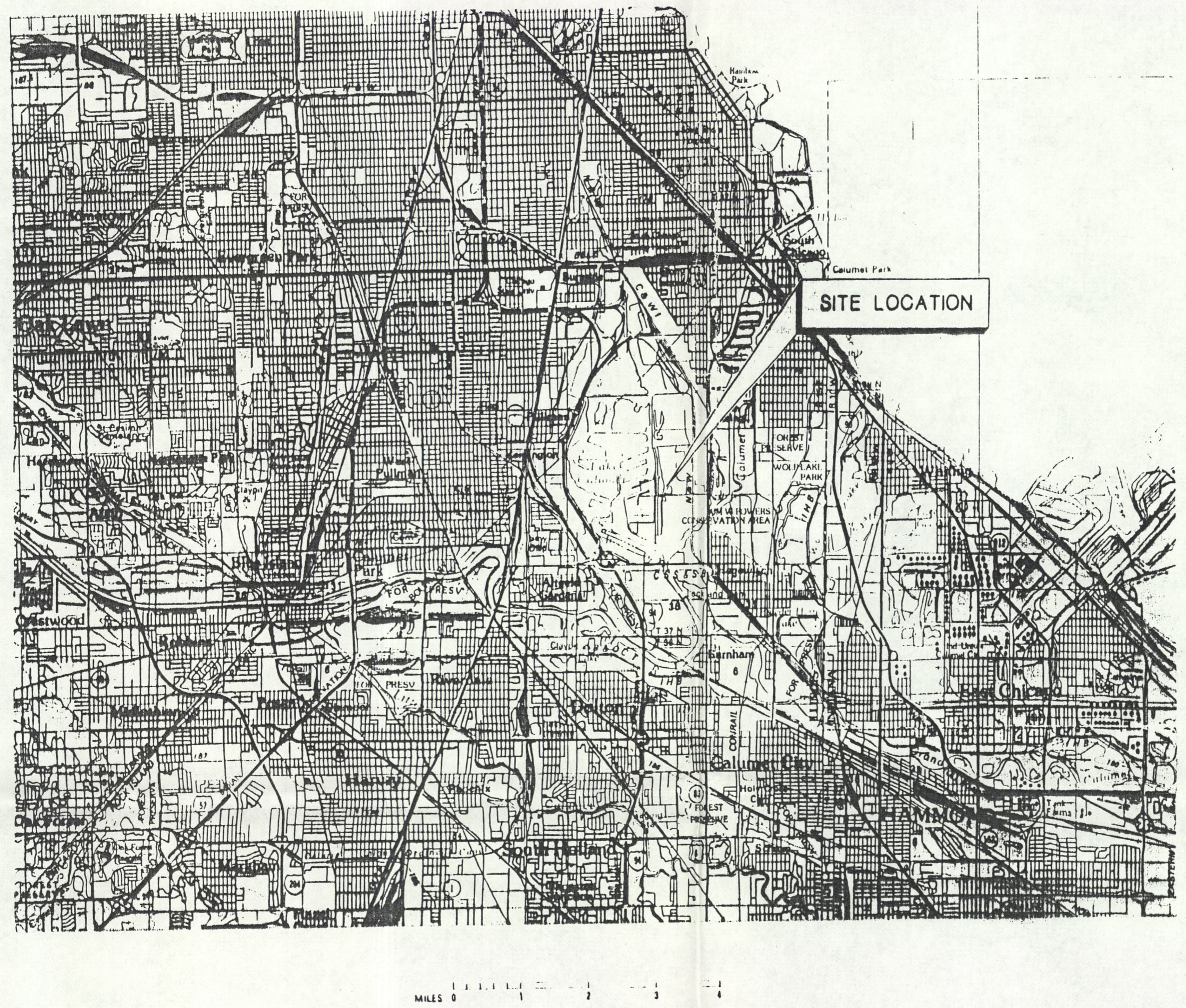
PRELIMINARY DESIGN

LANDFILL GAS RECOVERY SYSTEM

122nd STREET LANDFILL

CHICAGO, ILLINOIS

JAMES J. WALSH
062-043100
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS



LOCATION MAP

N

GAS SYSTEM DEVELOPER:

ZAHREN ALTERNATIVE POW.R CORPORATION
P.O. BOX 7
124 SILLS ROAD
YAPHANK, NEW YORK 1190
PHONE (516) 924-5300
FAX (516) 924-5627

LANDFILL OWNER/OPERATO:

LAND AND LAKES COMPAN
123 N. NORTHWEST HIGHW
P.O. BOX 778
PARK RIDGE, ILLINOIS 60G8-0778
PHONE (708) 825-5000
FAX (708) 825-0887

GAS SYSTEM ENGINEERS:

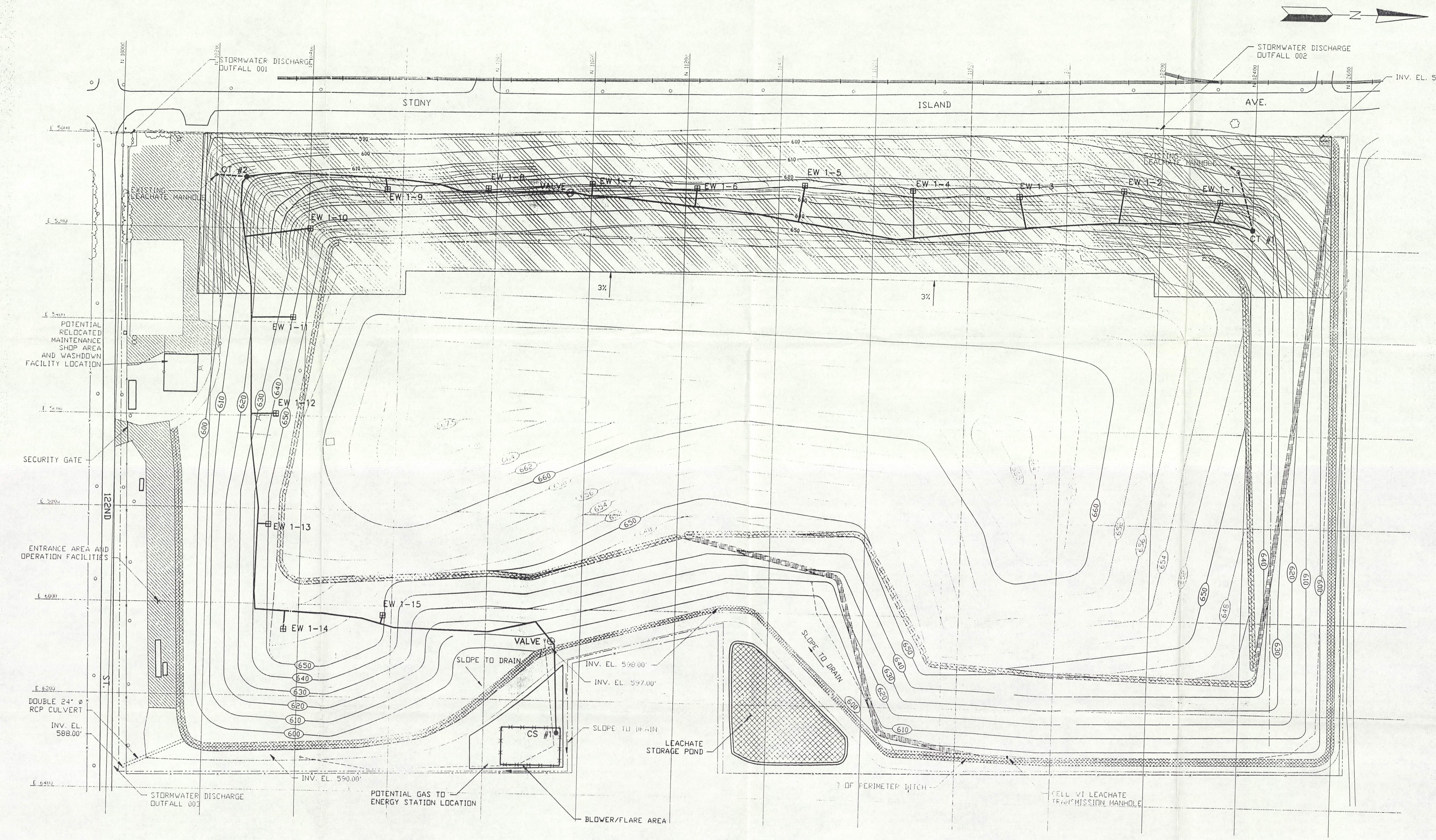
SCS ENGINEERS
2060 READING R.JAD
SUITE #200
CINCINNATI, OHIO 45202-497
PHONE (513) 421-5353
FAX (513) 421-2847

DRAWING INDEX

APRIL 18, 1996
REVISED JULY 11, 1996

CADD/0595037/122ND/PHASE-1/COVER

PRINTED 07-30-96



LEGEND:

● CT #1	PROPOSED CONDENSATE TRAP
● CS #1	PROPOSED CONDENSATE SUMP
⊞ EW 1-x	PROPOSED EXTRACTION WELL
———	PROPOSED HEADER
⊕	PROPOSED VALVE
-------	PROPOSED CONDENSATE DRAIN LINE

NOTES:

1. EXACT SYSTEM LAYOUT WILL CHANGE DURING CONSTRUCTION TO ACCOMODATE FIELD CONDITIONS.
2. VERTICAL EXTRACTION WELLS MAY BE ADDED DURING THE DESIGN PERIOD.
3. HEADER AND LATERAL PIPING MAY BE INSTALLED EITHER ABOVE GROUND OR BELOW GROUND AT THE DISCRETION OF THE DESIGN ENGINEER.

PRINTED 07-30-96

SCALE 100 0 50 100 200 FEET

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 6/96	FDB

SHEET TITLE: WELL AND HEADER LAYOUT PHASE 1

PROJECT TITLE: PRELIMINARY DESIGN LANDFILL GAS RECOVERY SYSTEM 122nd STREET LANDFILL CHICAGO, ILLINOIS

GAS SYSTEM DEVELOPER: SCS ALTERNATIVE POWER CORPORATION P.O. BOX 7,124 SILLS ROAD YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR: LAND AND LAKES COMPANY 123 N. NORTHWEST HIGHWAY P.O. BOX 78 PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.

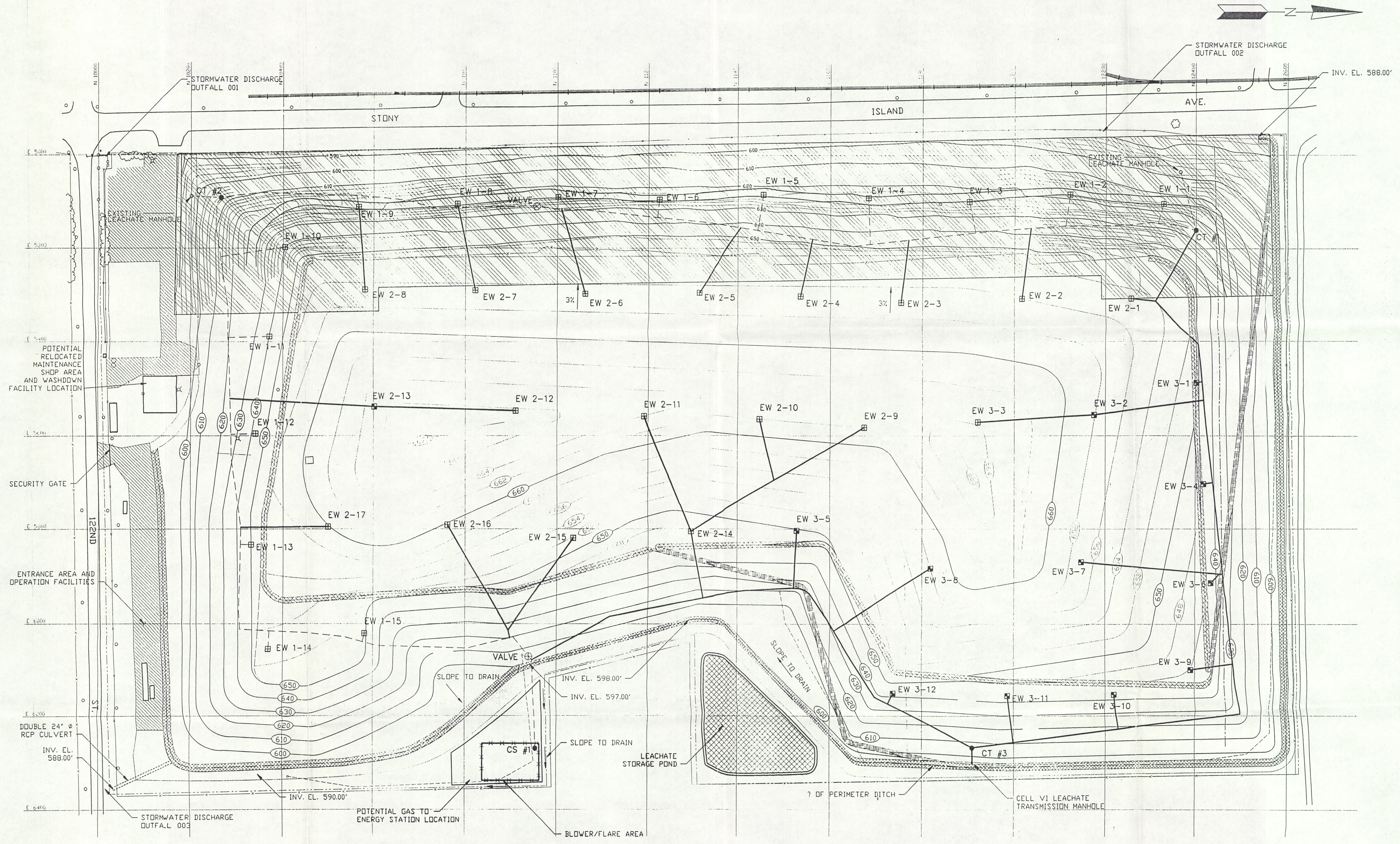
PROJ. NO. 05695037.00 | DWN. BY: FDB | Q/A RVW BY: JJV | DSN. BY: FDB | CHK. BY: CES

CADD FILE: FIN-PH1

DATE: APRIL 18, 1996

SCALE: AS SHOWN

DRAWING NO. 2 of 8



NOTES:

1. EXACT SYSTEM LAYOUT WILL CHANGE DURING CONSTRUCTION TO ACCOMODATE FIELD CONDITIONS.
2. VERTICAL EXTRACTION WELLS MAY BE ADDED DURING THE DESIGN PEROD.
3. HEADER AND LATERAL PIPING MAY BE INSTALLED EITHER ABOVE GROIND OR BELOW GROUND AT THE DISCRETION OF THE DESIGN ENGINEER.

LEGEND:

● CT #1	PROPOSED CONDENSATE TRAP
● CS #1	PROPOSED CONDENSATE SUMP
⊞ EW 1-x	PROPOSED EXTRACTION WELL
———	PROPOSED HEADER
⊕	PROPOSED VALVE

PRINTED 07-30-96

SCALE 100 0 50 100 200 FEET

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 6/96	FDB

SHEET TITLE: WELL AND HEADER LAYOUT PHASE 2

PROJECT TITLE: PRELIMINARY DESIGN LANDFILL GAS RECOVERY SYSTEM 122nd STREET LANDFILL CHICAGO, ILLINOIS

GAS SYSTEM DEVELOPER: LAUREN ALTERNATIVE POWER CORPORATION P.O. BOX 7,124 SILLS ROAD YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR: LAND AND LAKES COMPANY 123 N. NORTHWEST HIGHWAY P.O. BOX 778 PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2090 READING ROAD SUITE 200 CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

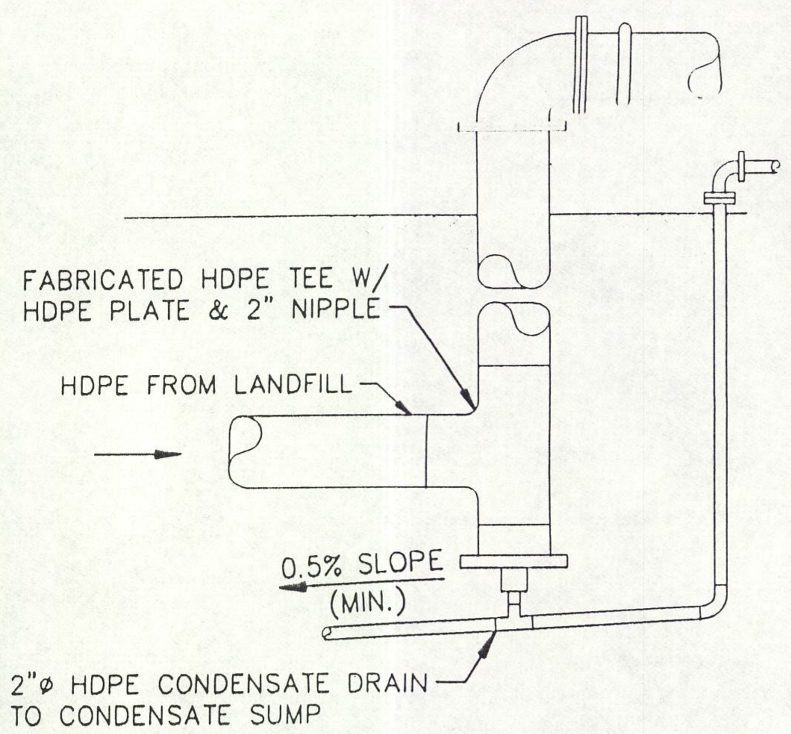
PROJ. NO.	DWN. BY:	Q/A RVW BY:
0595037.00	FDB	JJV
DSN. BY: FDB	CHK. BY: CES	

CADD FILE: FIN-PH22

DATE: APRIL 18, 1996

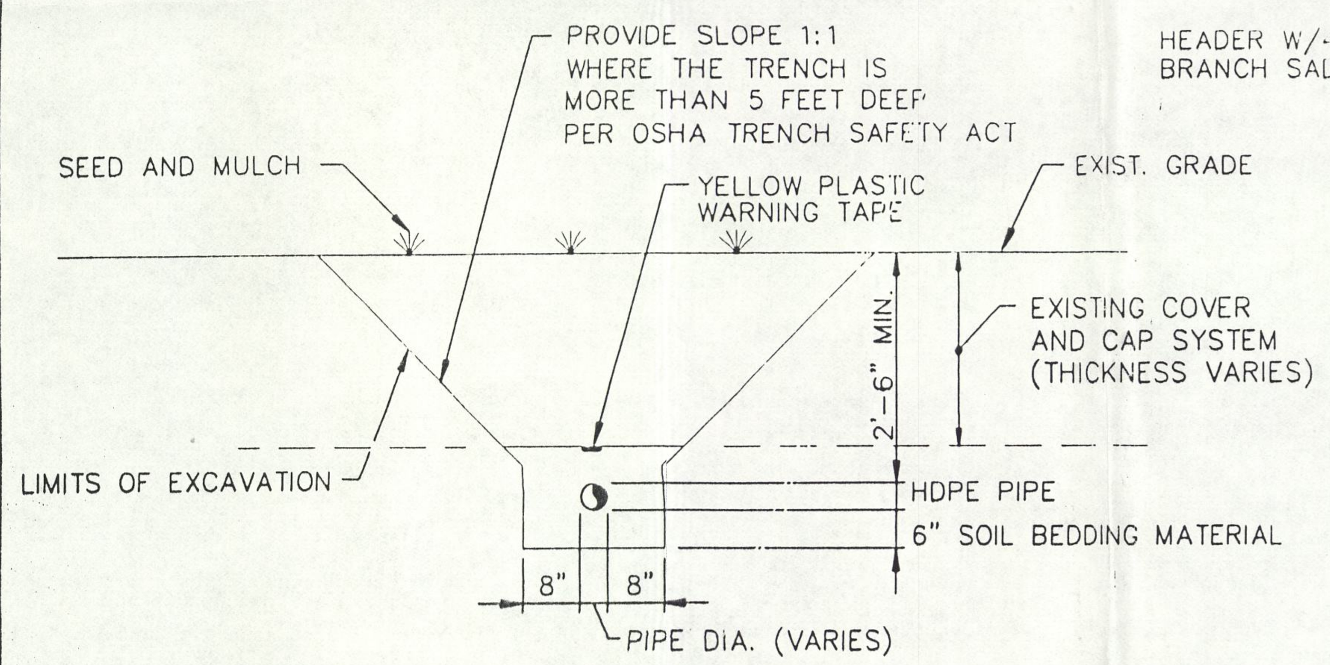
SCALE: AS SHOWN

DRAWING NO. 3 of 8



LFG HDPE HEADER PIPE STUB-UP AT BLOWER STATION (6, 2|4)

(NOT TO SCALE)

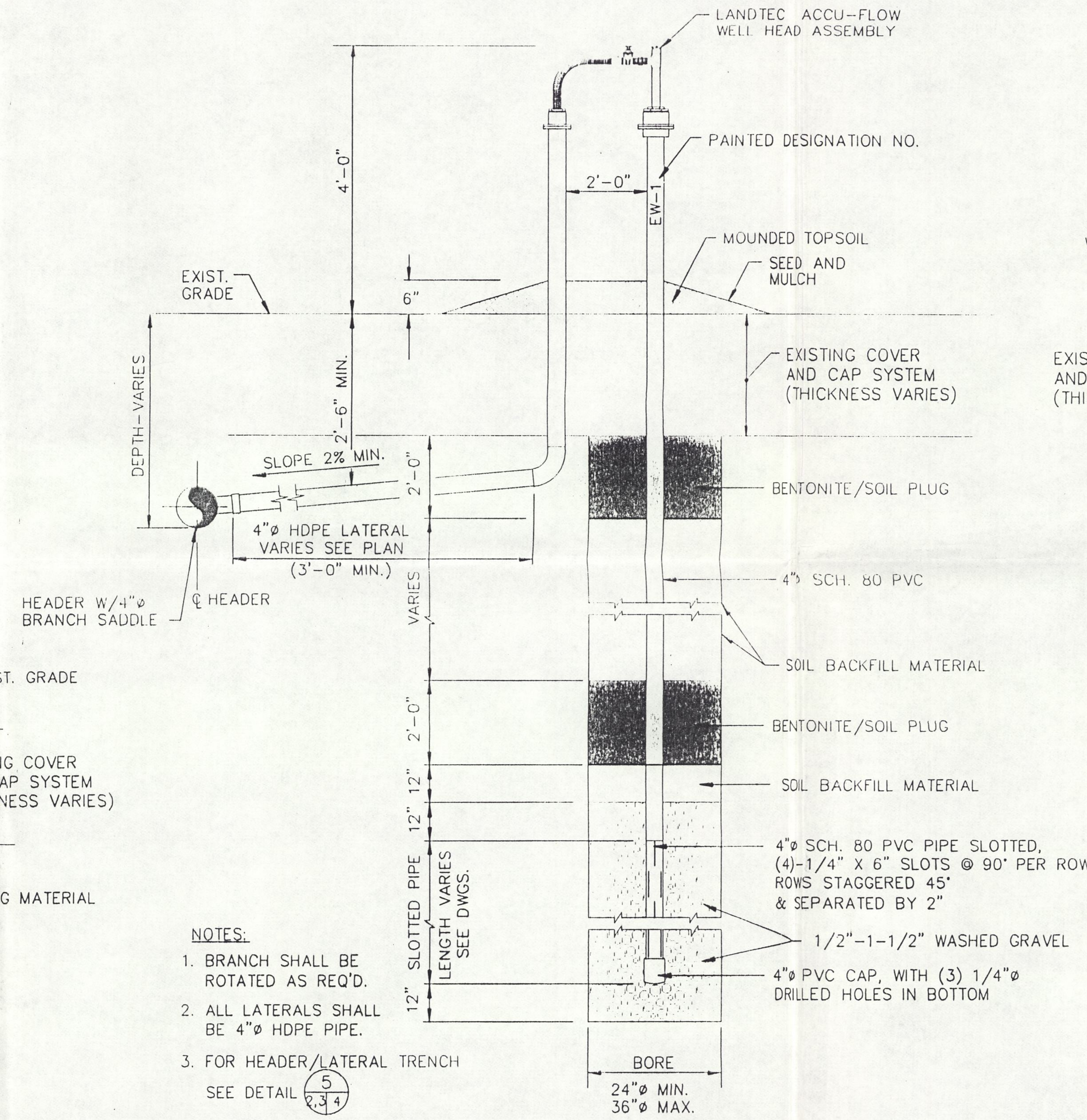


HEADER/LATERAL TRENCH DETAIL (5, 2|4)

(NOT TO SCALE)

NOTES:

1. PIPE SHALL BE INSTALLED WITH A MINIMUM SLOPE OF 3%.
2. FOR UNDERGROUND PIPE, PIPE SHALL BE PLACED A MINIMUM OF 2.5 FT. BELOW GROUND SURFACE.

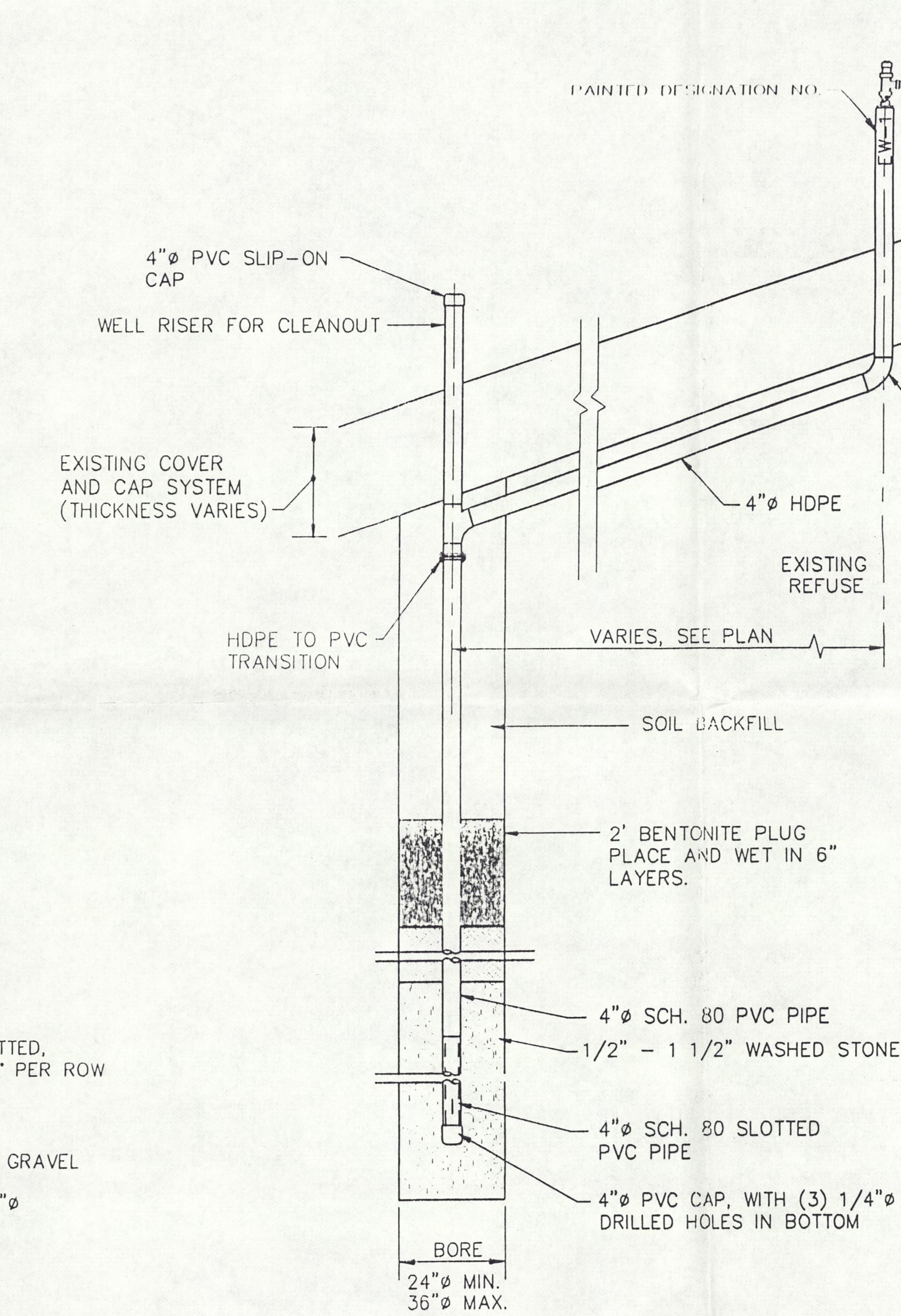


NOTES:

1. BRANCH SHALL BE ROTATED AS REQ'D.
2. ALL LATERALS SHALL BE 4"ø HDPE PIPE.
3. FOR HEADER/LATERAL TRENCH SEE DETAIL (5, 2,3|4)

TYPICAL EXTRACTION WELL DETAIL (2, 2|4)

(NOT TO SCALE)



NOTES:

1. BRANCH SHALL BE ROTATED AS REQ'D.
2. ALL LATERALS SHALL BE 4"ø HDPE PIPE.
3. FOR HEADER/LATERAL TRENCH SEE DETAIL (5, 2,3|4)

NOTES:

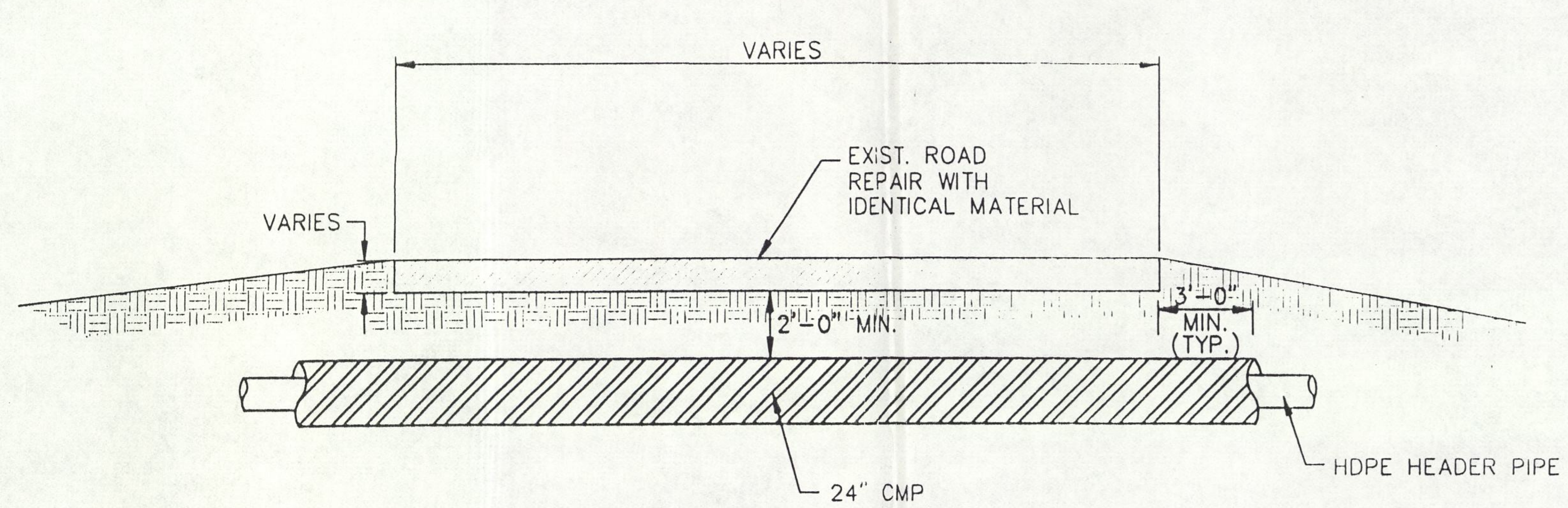
1. WELL BORING DEPTHS AND SLOTTED LENGTHS WILL BE AS NOTED IN THE DESIGN MEMORANDUM.

BURIED EXTRACTION WELL DETAIL (1, 2|4)

(NOT TO SCALE)

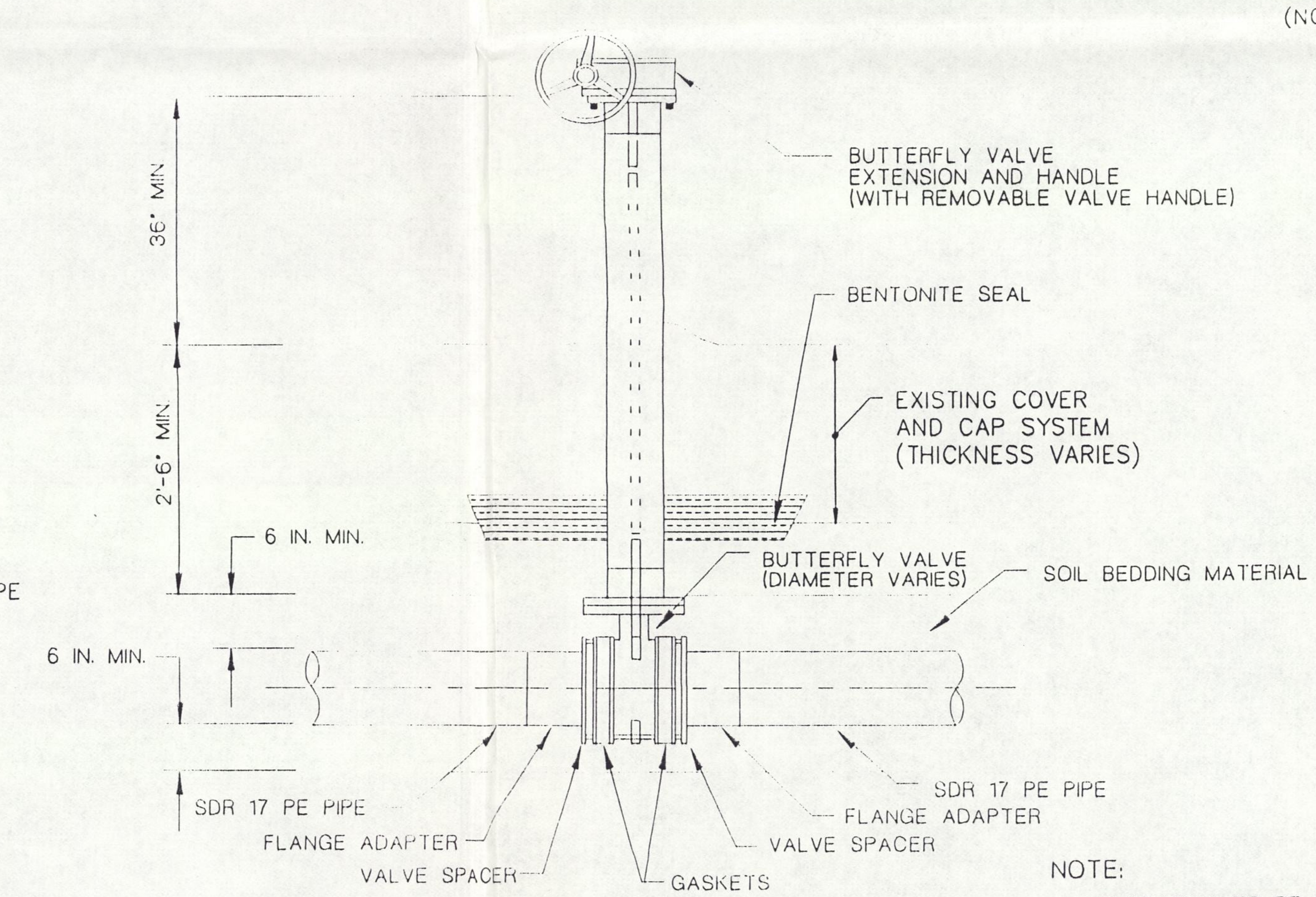
GENERAL NOTES:

1. EXACT LAYOUT AND DIMENSIONS MAY CHANGE DURING CONSTRUCTION TO ACCOMODATE FIELD CONDITIONS.



LFG HEADER PIPE CROSSING UNDER EXISTING ROAD DETAIL (4, 2|4)

(NOT TO SCALE)



TYPICAL VALVE VAULT DETAIL (3, 2|4)

(NOT TO SCALE)

NOTE:

VALVE STATION TO BE CONSTRUCTED AS NEEDED TO ADJUST GAS FLOWS, AND TO SEPARATE STAGES OF GAS SYSTEM INSTALLATION.

PRINTED 07-30-96

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 6/96	FDB

SHEET TITLE: UNDERGROUND HEADER DETAILS

PROJECT TITLE: PRELIMINARY DESIGN LANDFILL GAS RECOVERY SYSTEM 122nd STREET LANDFILL CHICAGO, ILLINOIS

GAS SYSTEM DEVELOPER: ZAHREN ALTERNATIVE POWER CORPORATION P.O. BOX 7,124 SILLS ROAD YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR: LAND AND LAKES COMPANY 123 N. NORTHWEST HIGHWAY P.O. BOX 778 PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD SUITE 200 CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

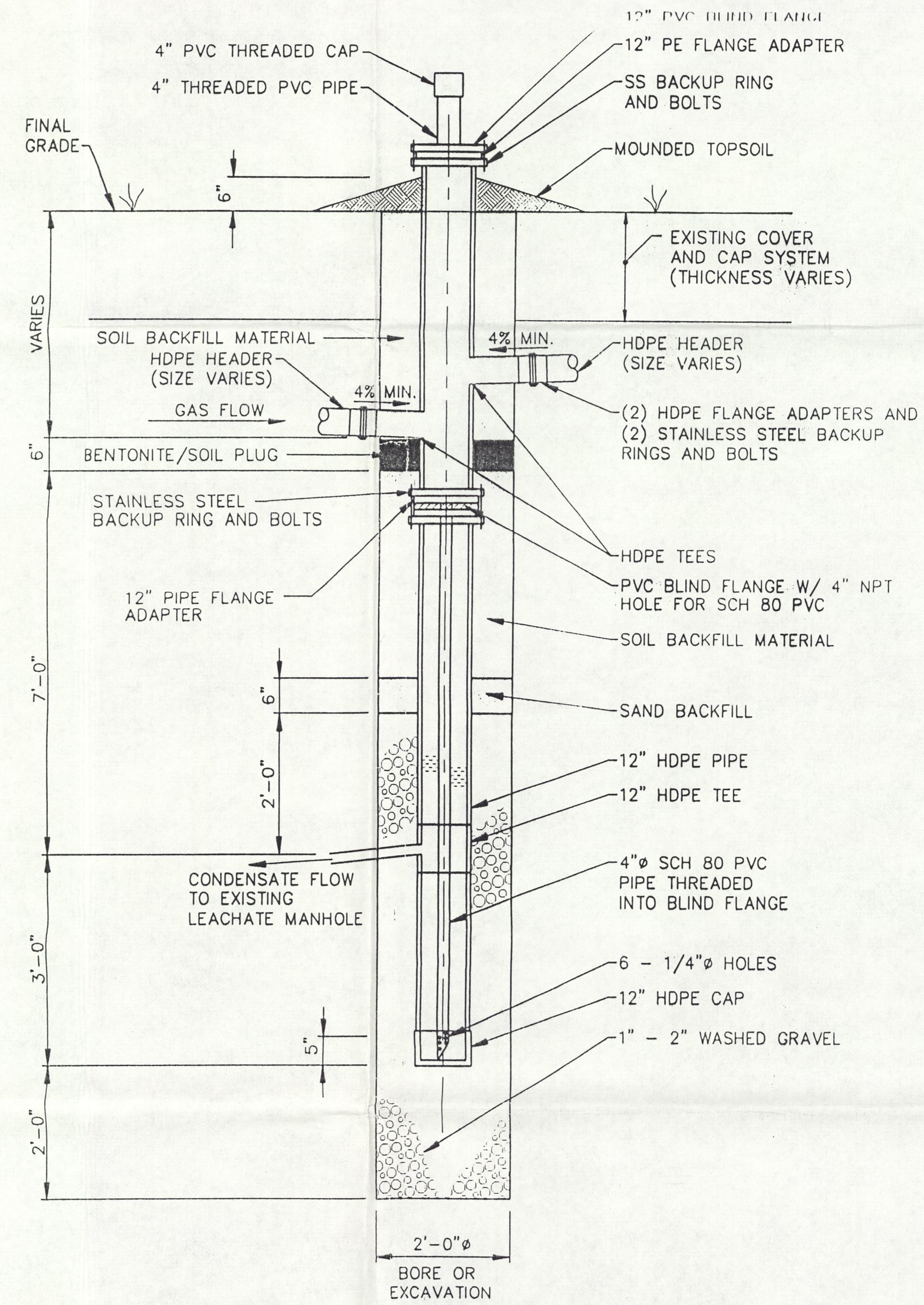
PROJ. NO. 0595037.00 | DWN. BY: FDB | Q/A RVW BY: JJW | CHK. BY: CES | DSN. BY: FDB

CADD FILE: STDDET1

DATE: APRIL 18, 1996

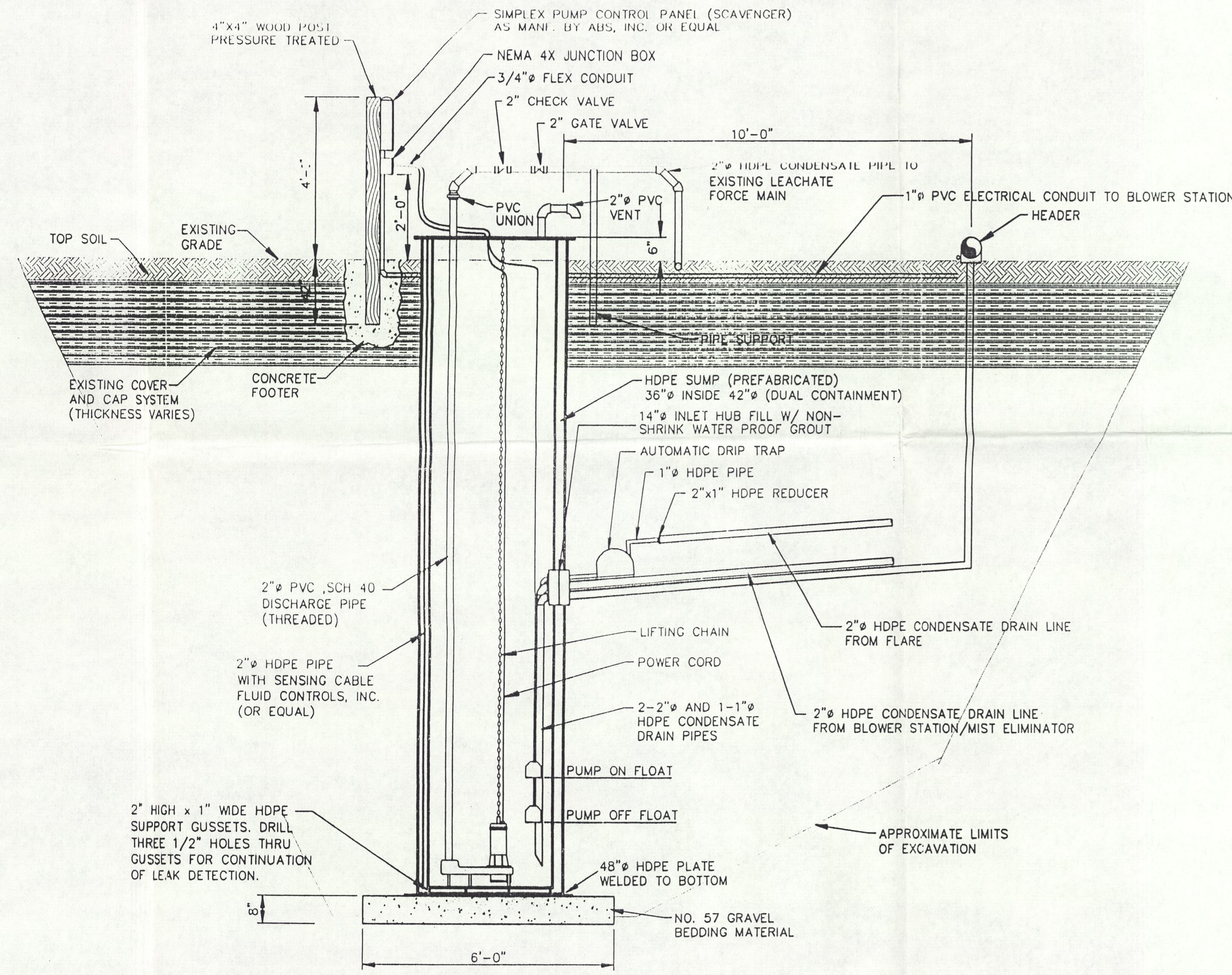
SCALE: AS SHOWN

DRAWING NO. 4 of 8



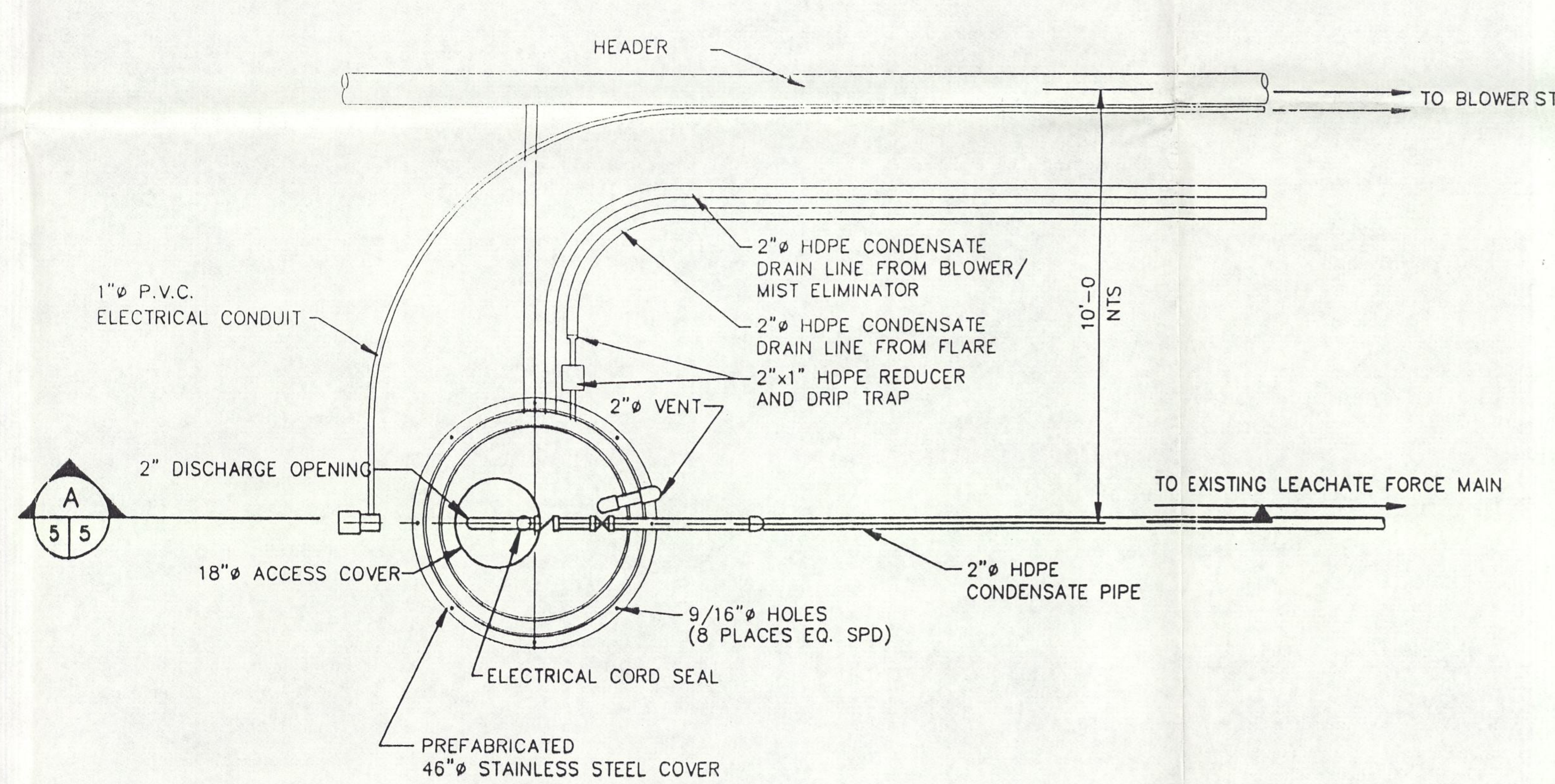
TYPICAL CONDENSATE TRAP DETAIL (2 / 5)

(NOT TO SCALE)



SECTION (A / 5 5)

N.T.S.



CONDENSATE SUMP (1 / 5)

N.T.S.

2,3

NOTES:

1. ALL PIPE WILL BE DUAL-CONTAINMENT HDPE PIPE, FLUID CONTROLS, INC. (OR EQUAL).
2. LEAK DETECTION SENSING CABLE WILL BE TRACE TEK LEAK DETECTION SYSTEM, FLUID CONTROLS,INC (OR EQUAL).

PRINTED 07-30-96

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 5/96	FDB

SHEET TITLE: CONDENSATE DETAILS (UNDERGROUND TRENCH)

PROJECT TITLE: PRELIMINARY DESIGN LANDFILL GAS RECOVERY SYSTEM 122nd STREET LANDFILL CHICAGO, ILLINOIS

GAS SYSTEM DEVELOPER: ZAHREN ALTERNATIVE POWER CORPORATION P.O. BOX 7,124 SILLS ROAD YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR: LAND AND LAKES COMPANY 123 N. NORTHWEST HIGHWAY P.O. BOX 778 PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.

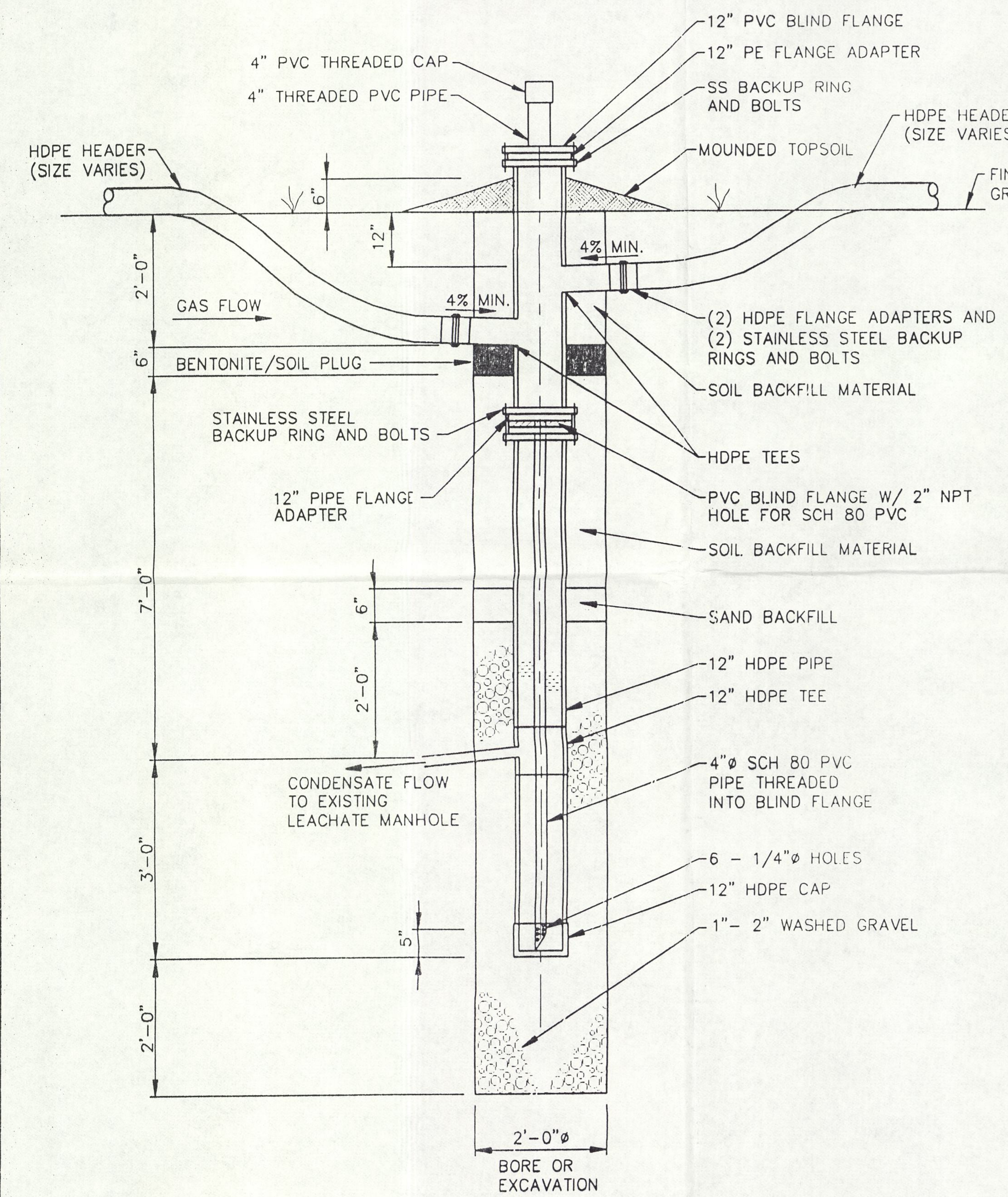
PROJ. NO. 0595037.00 | DWN. BY: FDB | Q/A RVW BY: JJW | DSN. BY: FDB | CHK. BY: CES

CADD FILE: STDDET2B

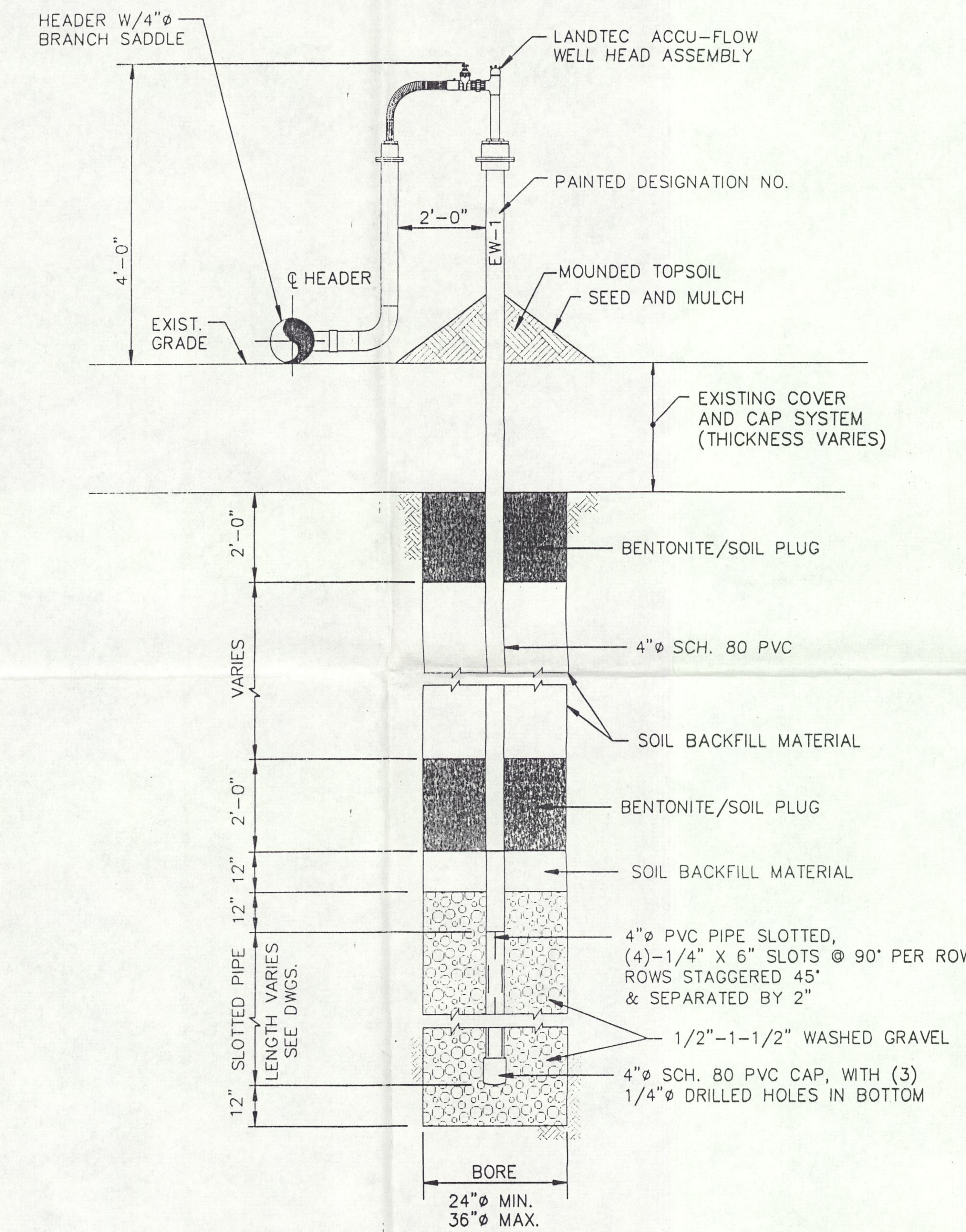
DATE: APRIL 18, 1996

SCALE: AS SHOWN

DRAWING NO. 5 of 8

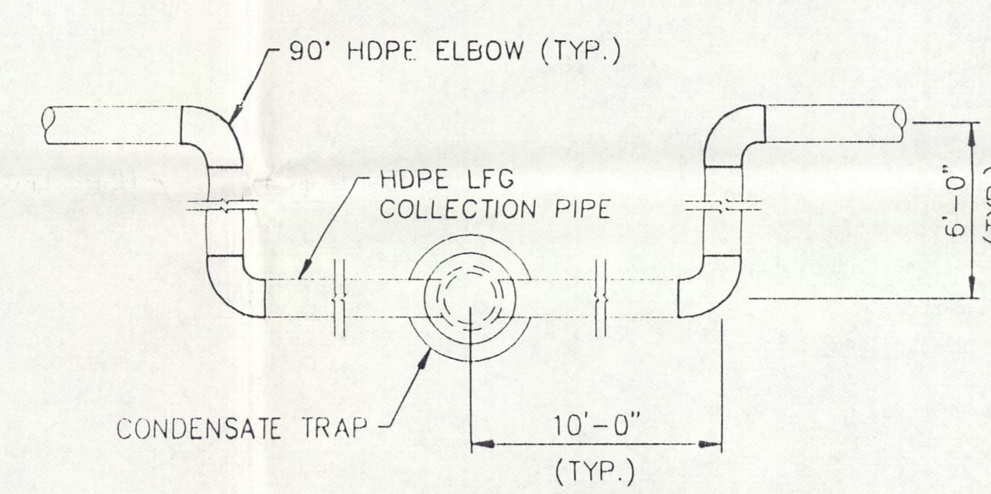


TYPICAL CONDENSATE TRAP ABOVE GROUND DETAIL 5/26
(NOT TO SCALE)



TYPICAL EXTRACTION WELL ABOVE GROUND DETAIL 1/26
(NOT TO SCALE)

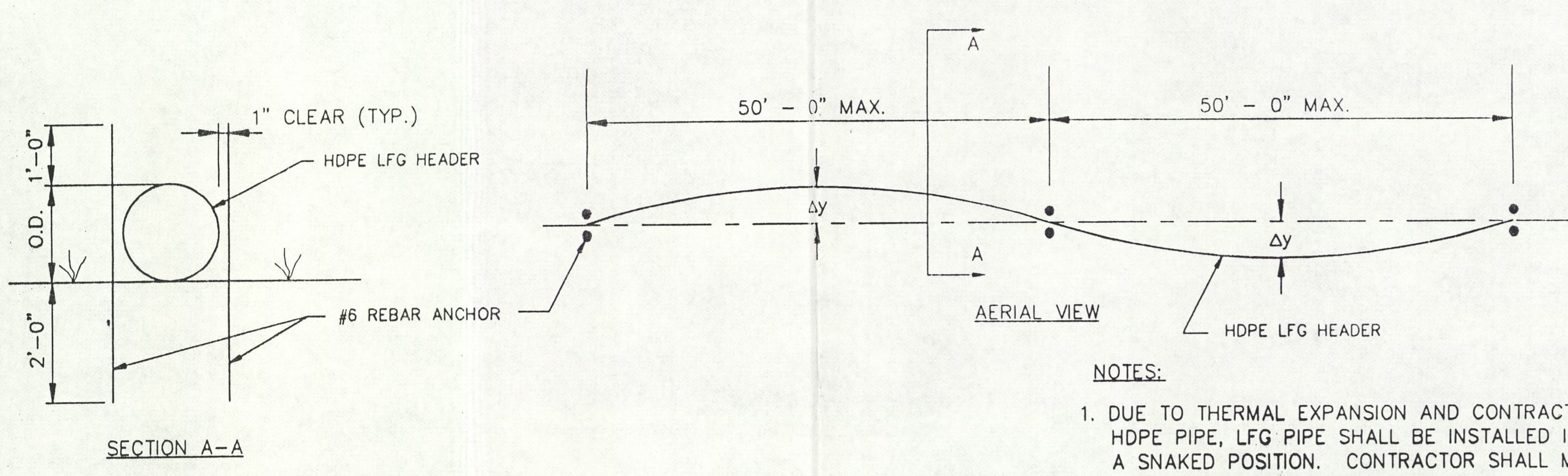
NOTES:
1. BRANCH SHALL BE ROTATED AS REQ'D.
2. ALL LATERALS SHALL BE 4"ø HDPE PIPE.



PLAN VIEW

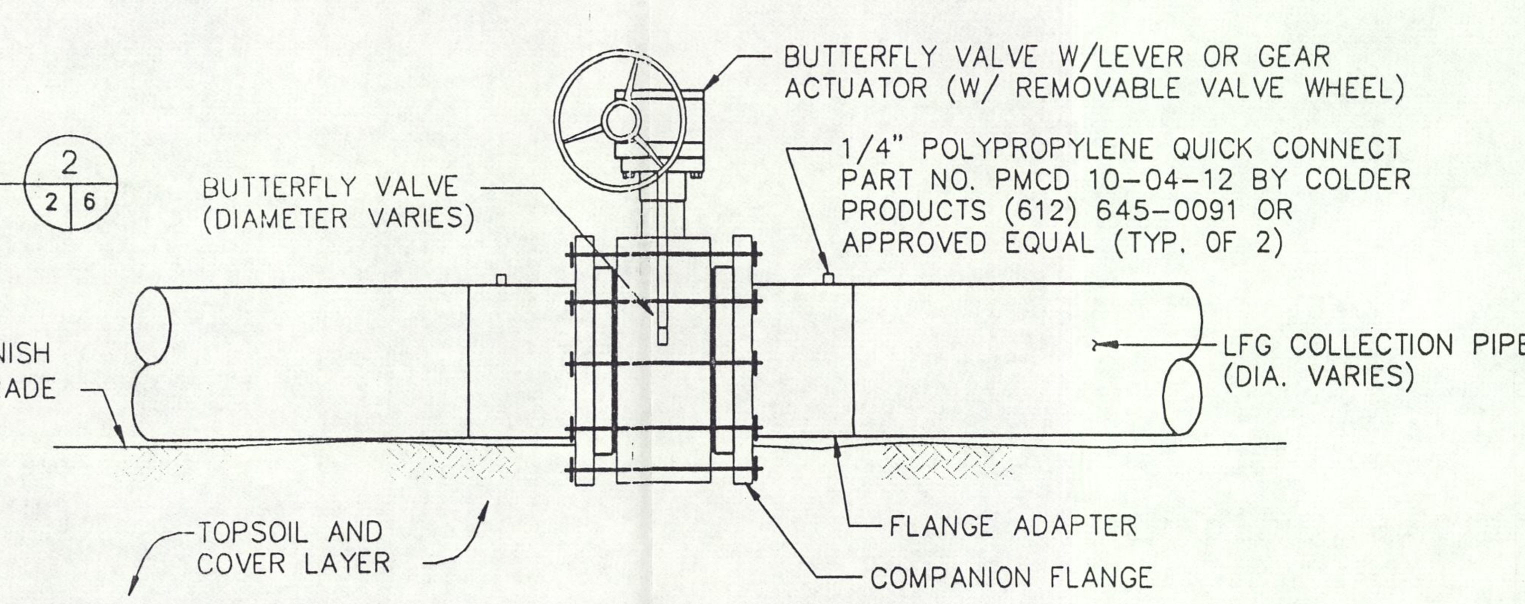
EXPANSION LOOP AT CONDENSATE TRAP DETAIL 2/26
(NOT TO SCALE)

GENERAL NOTES:
1. EXACT LAYOUT AND DIMENSIONS MAY CHANGE DURING CONSTRUCTION TO ACCOMODATE FIELD CONDITIONS.



NOTES:
1. DUE TO THERMAL EXPANSION AND CONTRACTION OF HDPE PIPE, LFG PIPE SHALL BE INSTALLED IN A SNAKED POSITION. CONTRACTOR SHALL MAKE ALLOWANCE FOR EXTRA LENGTH OF PIPE.
2. Δy VARIES DEPENDING ON THE OUTSIDE TEMPERATURE
3. PIPE SHALL BE INSTALLED TO PROVIDE A MINIMUM SLOPE OF 3%.

ABOVE GROUND HDPE PIPE SNAKING DETAIL 4/26
(NOT TO SCALE)



ISOLATION VALVE DETAIL 3/26
(NOT TO SCALE)

PRINTED 07-30-96

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 6/96	FDB

SHEET TITLE: ABOVEGROUND HEADER DETAILS

PROJECT TITLE: PRELIMINARY DESIGN LANDFILL GAS RECOVERY SYSTEM 122nd STREET LANDFILL CHICAGO, ILLINOIS

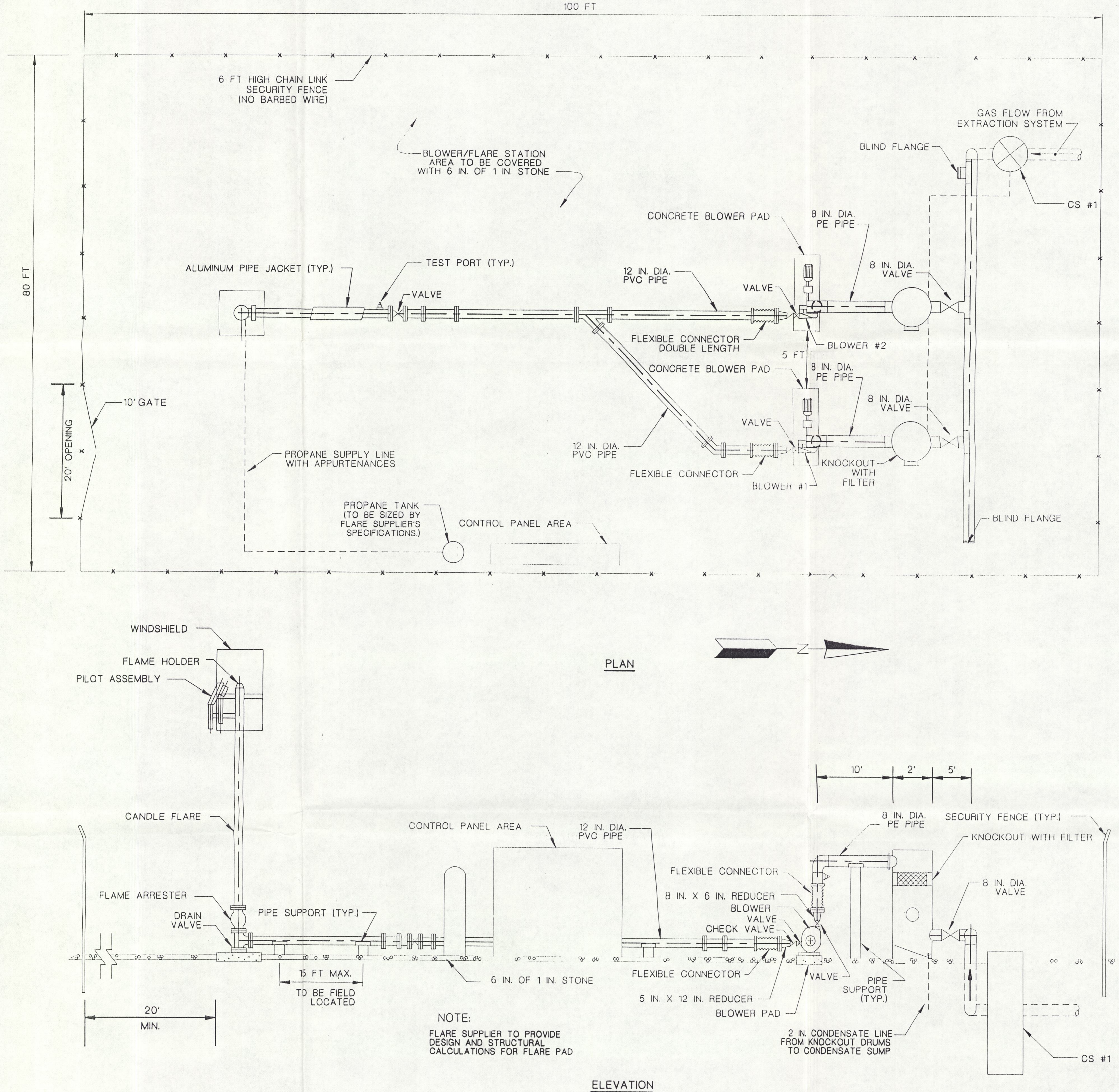
GAS SYSTEM DEVELOPER: ZAHREN ALTERNATIVE POWER CORPORATION P.O. BOX 7,124 SILLS ROAD YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR: LAND AND LAKES COMPANY 123 N. NORTHWEST HIGHWAY P.O. BOX 778 PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2060 READING ROAD SUITE 200 CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

PROJ. NO. 0595037.00 | DWN. BY FDB | Q/A RVW BY AJW
DSN. BY FDB | CHK. BY CES

CADD FILE: STDDET32
DATE: APRIL 18, 1996
SCALE: AS SHOWN
DRAWING NO. 6 of 8



GENERAL NOTES:

1. EXACT LAYOUT AND DIMENSIONS MAY CHANGE DURING CONSTRUCTION TO ACCOMODATE FIELD CONDITIONS.

BLOWER/FLARE STATION

(NOT TO SCALE)

NOTES:

1. ALL PE PIPE SHALL BE SDR 17.
2. ALL PVC PIPE SHALL BE SCHEDULE 80.
3. ALL PIPE SIZES SHOWN ARE MINIMUMS.

PRINTED 07-30-96

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 6/96	FDB

SHEET TITLE: BLOWER/FLARE STATION

PROJECT TITLE: PRELIMINARY DESIGN LANDFILL GAS RECOVERY SYSTEM 122nd STREET LANDFILL CHICAGO, ILLINOIS

GAS SYSTEM DEVELOPER: [illegible] ALTERNATIVE POWER CORPORATION P.O. BOX 7,124 SILLS ROAD YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR: LAND AND LAKES COMPANY 123 N. NORTHWEST HIGHWAY P.O. BOX 778 PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
2000 READING ROAD SUITE 200 CINCINNATI, OHIO 45202

PROJ. NO. 0995037.00 | DWN. BY: FDB | Q/A RVW BY: JJW | DSN. BY: FDB | CHK. BY: CES

CADD FILE: STDDET4

DATE: APRIL 18, 1996

SCALE: AS SHOWN

DRAWING NO. 7 of 8

EARTHWORK

1. PIPE BEDDING SHALL BE USED WHENEVER THE COLLECTION PIPING RUNS BELOW GRADE. PIPE BEDDING SHALL BE CLEAN, DRY SAND, FREE OF CLAY, MUCK, ORGANIC MATTER, AND OTHER DELETERIOUS SUBSTANCES, AND SHALL BE 6 INCHES MINIMUM THICKNESS BELOW AND 8 INCHES ON BOTH SIDES OF PIPE TO THE SPRINGLINE OF THE PIPE.

2. SOIL BACKFILL MATERIAL SHALL POSSESS SIMILAR PROPERTIES TO THE EXISTING LANDFILL COVER SOIL. EXCAVATED MATERIAL THAT IS CLEAN, FREE OF LARGE OBSTRUCTIONS AND REFUSE, MAY BE USED.

LFG EXTRACTION WELLS

1. GRAVEL BACKFILL SHALL BE WASHED CLEAN, HARD, DURABLE, *CRUSHED* STONE OR GRAVEL. GRAVEL BACKFILL SIZE SHALL BE 1/2" TO 1 1/2" WASHED STONE.

2. BACKFILL MATERIAL SHALL BE CLEAN, GRANULAR FILL FREE OF THE FOLLOWING: STONES LARGER THAN 2 INCH, CONSTRUCTION DEBRIS, REFUSE, MUCK, SOFT CLAY, LOAM, SPONGY MATERIAL, VEGETATION/ ORGANIC MATTER, OR ANGULAR ROCKS.

3. BENTONITE/SOIL PLUG SHALL BE PLACED AS SHOWN ON THE DRAWINGS AND SHALL BE PREPARED WITH 5 POUNDS OF BENTONITE PER CUBIC FOOT OF SOIL THE SOIL MATERIAL SHALL BE FREE OF STONES LARGER THAN 1 INCH. IMMEDIATELY PRIOR TO PLACEMENT, THE MIXTURE SHALL BE WETTED TO A THICK MUD CONSISTENCY.

4. THE CONTRACTOR SHALL KEEP DETAILED WELL LOGS FOR ALL WELLS DRILLED. LOGS SHALL INCLUDE: TOTAL DEPTH OF WELL, LENGTH OF SLOTTED PIPE, STATIC WATER LEVEL, DESCRIPTION OF THE WASTE STRATA BY INDICATING ITS DEPTH AND THICKNESS, AND THE OCCURENCE OF ANY WATER BEARING ZONES. WELL LOGS SHALL BE SUBMITTED TO THE ENGINEER.

5. THE BORE FOR THE WELL SHALL BE STRAIGHT AND THE WELL PIPE SHALL BE INSTALLED IN THE CENTER OF THE BORE HOLE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN THE WELL PIPE VERTICALLY PLUMB DURING THE BACKFILL OPERATION OF THE BORED HOLE. SLOTTED PIPE MAY BE FIELD FABRICATED OR SUPPLIED BY THE FACTORY.

6. VERTICAL WELL PIPE SECTIONS SHALL BE JOINED BY PVC COUPLINGS. LAG SCREWS SHALL BE USED WITH SOCKET TYPE FITTINGS TO SECURE THE PIPE DURING WELL PLACEMENT. 4 LAG SCREWS SHALL BE INSTALLED FOR EACH COUPLING AND EACH SCREW SHALL HAVE A LENGTH EQUAL TO THE SUM OF THE PIPE AND FITTING WALL THICKNESSES.

7. WELLHEAD ASSEMBLIES SHALL BE ACCU-FLO SERIES 150 MANUFACTURED BY LANDTEC, LOS ANGELES, CA., OR EQUAL.

8. EACH WELLHEAD SHALL HAVE ITS NUMBER STENCILED ON ITS SIDE.

10. IF WATER IS ENCOUNTERED IN A BORING, THE ENGINEER MAY DECREASE THE DEPTH OF THE BORING AND SLOTTED PIPE, CONTINUE DRILLING TO DETERMINE IF A PERCHED WATER LAYER EXISTS, OR RELOCATE THE WELL.

PIPES AND FITTINGS

1. HDPE LFG HEADER PIPE SHALL BE SDR-17 WITH TYPE 3408 RESIN.

2. HDPE PIPE INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND THESE DRAWINGS, WHICHEVER IS MORE STRINGENT.

3. HDPE PIPE SHALL BE JOINED BY THE FOLLOWING METHODS:

   - UNLESS OTHERWISE STATED, HDPE SHALL BE JOINED BY HEAT FUSION AS SPECIFIED IN THE PIPE MANUFACTURER'S INSTRUCTIONS.
   - HDPE FLANGE ADAPTERS SHALL BE EMPLOYED WHERE INDICATED ON THE DRAWINGS. FLANGES FOR HDPE PIPE SHALL BE CONVOLUTED DUCTILE IRON BACKUP RINGS WITH EPOXY COATING AND A MINIMUM THICKNESS OF 1 INCH, AS MANUFACTURED BY IMPROVED PIPING PRODUCTS, INC., OF ORINDA, CALIFORNIA OR APPROVED EQUAL. BACKUP RINGS SHALL BE FINISHED WITH ZINC CHROMATE PRIMER.

4. BOLTS AND STUDS SHALL BE ASTM A-276, TYPE 316 STAINLESS STEEL. NUTS AND WASHERS SHALL BE ASTM A-276, TYPE 304 STAINLESS STEEL.

5. STUDS, NOT BOLTS, SHALL BE USED TO CONNECT FLANGES. THE STUDS SHALL BE ASTM A-276, TYPE 316 STAINLESS STEEL. THE STUDS SHALL BE FASTENED WITH HEAVY, SEMI-FINISHED HEXAGON NUTS AND COMPLETELY COATED JUST PRIOR TO INSTALLATION WITH AN ANTI-SEIZE COMPOUND SUCH AS MANUFACTURED BY KOPR-KOTE OR APPROVED EQUAL.

6. THE CONTRACTOR SHALL TEST ALL LFG COLLECTION PIPE WITH PRESSURIZED AIR (5 PSI) TO DETECT ANY LEAKS IN THE PIPING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS OR RESTORATIONS MADE IN AREAS WHERE LEAKS ARE DISCOVERED. TEST SEGMENTS SHALL NOT EXCEED 2000 LINEAR FEET.

7. PVC SHALL BE SCHEDULE 80 ALIGNED TO MINIMIZE LINEAR DEVIATIONS AT THE JOINTS AND CONNECTED BY PVC SOCKET FITTINGS. A COATING OF CPS PRIMER SHALL BE APPLIED TO THE INTERIOR SURFACE OF THE FITTING SOCKET PRIOR TO THE APPLICATION OF SOLVENT CEMENT.

8. FLEXIBLE PVC PIPE AND CLAMPS SHALL BE AS MANUFACTURED BY KANAFLEX IN COMPTON, CA., OR APPROVED EQUAL.

9. ALL KANAFLEX HOSE OR APPROVED EQUAL AND PVC PIPE EXPOSED TO WEATHER SHALL BE UV RESISANT.

10. MONITORING PORTS SHALL BE 1/4 INCH POLYPROPYLENE QUICK CONNECT PART NO. PMCD 10-04-12 BY COLDER PRODUCTS (612)645-0091 OR EQUAL.

11. PVC BUTTERFLY VALVES SHALL BE WAFER STYLE WITH NITRILE SEAT. GASKET FOR PHASE I BUTTERFLY VALVES SHALL BE FLOURINATED ELASTOMERS CONFORMING TO ASTM D-2000, SUITABLE FOR THE PRESSURE AND TEMPERATURE RANGES ENCOUNTERED, AND COMPATIBLE WITH FLANGE FACES. PHASE I PVC BUTTERFLY VALVES SHALL BE MANUFACTURED BY ASAHI/ AMERICA, BEDFORD, MA, OR APPROVED EQUAL. PHASE II POLYETHYLENE BUTTERFLY VALVES SHALL BE MANUFACTURED BY SHAFER MOLDING, PERRYTOWN, TX. OR APPROVED EQUAL.

PRINTED 07-30-96

JAMES J. WALSH
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

REV.	DATE	DESCRIPTION	CK. BY
1	7/96	PER IEPA COMMENTS 6/96	FDB

SHEET TITLE: CONSTRUCTION NOTES

PROJECT TITLE: PRELIMINARY DESIGN
LANDFILL GAS RECOVERY SYSTEM
122nd STREET LANDFILL
CHICAGO, ILLINOIS

GAS SYSTEM DEVELOPER:
ZAHREN ALTERNATIVE POWER CORPORATION
P.O. BOX 7,124 SILLS ROAD
YAPHANK, NY 11980

LANDFILL OWNER/OPERATOR:
LAND AND LAKES COMPANY
123 N. NORTHWEST HIGHWAY
P.O. BOX 778
PARK RIDGE, ILLINOIS 60068-0778

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
2060 READING ROAD SUITE 200 CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

PROJ. NO.	DWN. BY:	Q/A RVW BY:
0595037.00	FDB	JJW
DSN. BY: FDB	CHK. BY: CES	

CADD FILE: STDDET5

DATE: APRIL 18, 1996

SCALE: AS SHOWN

DRAWING NO. 8 of 8

ATTACHMENT 6

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

APPLICATION FOR PERMIT(A)	FOR AGENCY USE ONLY
[x] CONSTRUCT [x] OPERATE	I.D. NO. ______
NAME OF EQUIPMENT TO BE CONSTRUCTED OR OPERATED: Sanitary Landfill Gas Management System (B)	PERMIT NO. ______
	DATE ______

1a. NAME OF OWNER: Stoney Island Reclamation		2a. NAME OF OPERATOR: Land and Lakes Company	
1b STREET ADDRESS OF OWNER: 123 N. Northwest Highway		2b. STREET ADDRESS OF OPERATOR: P.O. Box 778	
1c. CITY OF OWNER: Park Ridge		2c. CITY OF OPERATOR: Park Ridge	
1d. STATE OF OWNER: Illinois	1e. ZIP CODE: 60068	2d. STATE OF OPERATOR: Illinois	2e. ZIP CODE: 60068

3a. NAME OF CORPORATE DIVISION OR PLANT: Land and Lakes No. 3		3b. STREET ADDRESS OF EMISSION SOURCE: 2000 East 122nd Street		
3c. CITY OF EMISSION SOURCE: Chicago	3d. LOCATED WITHIN CITY LIMITS: [x] YES [ ] NO	3e. TOWNSHIP:	3f. COUNTY: Cook	3g. ZIP CODE: 60633

4. ALL CORRESPONDENCE TO: (TITLE AND/OR NAME OF INDIVIDUAL) James J. Cowhey	5. TELEPHONE NUMBER FOR AGENCY TO CALL: (847) 825-5000
6. ADDRESS FOR CORRESPONDENCE: (CHECK ONLY ONE) [ ] OWNER [x] OPERATOR [ ] EMISSION SOURCE	7. YOUR DESIGNATION FOR THIS APPLICATION:(C) ___________

8. THE UNDERSIGNED HEREBY MAKES APPLICATION FOR A PERMIT AND CERTIFIES THAT THE STATEMENTS CONTAINED HEREIN ARE TRUE AND CORRECT, AND FURTHER CERTIFIES THAT ALL PREVIOUSLY SUBMITTED INFORMATION REFERENCED IN THIS APPLICATION REMAINS TRUE, CORRECT AND CURRENT. BY AFFIXING HIS SIGNATURE HERETO HE FURTHER CERTIFIES THAT HE IS AUTHORIZED TO EXECUTE THIS APPLICATION.

AUTHORIZED SIGNATURE(S):(D)

BY [signature] SIGNATURE	8/7/96 DATE	BY [signature] SIGNATURE	8/7/96 DATE
James J. Cowhey TYPED OR PRINTED NAME OF SIGNER		James J. Cowhey TYPED OR PRINTED NAME OF SIGNER	
President TITLE OF SIGNER		President TITLE OF SIGNER	

(A) THIS FORM IS TO PROVIDE THE AGENCY WITH GENERAL INFORMATION ABOUT THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS FORM MAY BE USED TO REQUEST A CONSTRUCTION PERMIT, AN OPERATING PERMIT, A CONSTRUCTION OR OPERATING PERMIT.

(B) ENTER THE GENERIC NAME OF THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS NAME WILL APPEAR ON THE PERMIT WHICH MAY BE ISSUED PURSUANT TO THIS APPLICATION. THIS FORM MUST BE ACCOMPANIED BY OTHER APPLICABLE FORMS AND INFORMATION.

C) PROVIDE A DESIGNATION IN ITEM 7 ABOVE WHICH YOU WOULD LIKE THE AGENCY TO USE FOR IDENTIFICATION OF YOUR EQUIPMENT. YOUR DESIGNATION WILL BE REFERENCED IN CORRESPONDENCE FROM THIS AGENCY RELATIVE TO THIS APPLICATION. YOUR DESIGNATION MUST NOT EXCEED TEN (10) CHARACTERS.

(D) THIS APPLICATION MUST BE SIGNED IN ACCORDANCE WITH 35 ILL. ADM. CODE 201.154 OR 201.159 WHICH STATES: "ALL APPLICATIONS AND SUPPLE-'ENTS THERETO SHALL BE SIGNED BY THE OWNER AND OPERATOR OF THE EMISSION SOURCE OR AIR POLLUTION CONTROL EQUIPMENT, OR THEIR 'HORIZED AGENT, AND SHALL BE ACCOMPANIED BY EVIDENCE OF AUTHORITY TO SIGN THE APPLICATION."

IF THE ONWER OR OPERATOR IS A CORPORATION, SUCH CORPORATION MUST HAVE ON FILE WITH THE AGENCY A CERTIFIED COPY OF A RESOLUTION OF THE CORPORATION'S BOARD OF DIRECTORS AUTHORIZING THE PERSONS SIGNING THIS APPLICATION TO CAUSE OR ALLOW THE CONSTRUCTION OR OPERATION OF THE EQUIPMENT TO BE COVERED BY THE PERMIT.

9. DOES THIS APPLICATION CONTAIN A PLOT PLAN/MAP:

[x] YES [ ] NO

IF A PLOT PLAN/MAP HAS PREVIOUSLY BEEN SUBMITTED, SPECIFY:

AGENCY I.D. NUMBER ________________ APPLICATION NUMBER ________________

IS THE APPROXIMATE SIZE OF APPLICANT'S PREMISES LESS THAN 1 ACRE?

[ ] YES [x] NO: SPECIFY 80.7 ACRES

10. DOES THIS APPLICATION CONTAIN A PROCESS FLOW DIAGRAM(S) THAT ACCURATELY AND CLEARLY REPRESENTS CURRENT PRACTICE.

[ ] YES [x] NO

11a. WAS ANY EQUIPMENT, COVERED THIS APPLICATION, OWNED OR CONTRACTED FOR, BY THE APPLICANT PRIOR TO APRIL 14, 1972:

[ ] YES [x] NO

IF "YES" ATTACH AN ADDITIONAL SHEET, EXHIBIT A, THAT:
(a) LISTS OR DESCRIBES THE EQUIPMENT
(b) STATES WHETHER THE EQUIPMENT WAS IN COMPLIANCE WITH THE RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION PRIOR TO APRIL 4, 1972

11b. HAS ANY EQUIPMENT, COVERED BY THIS APPLICATION, NOTPREVIOUSLY RECEIVED AN OPERATING PERMIT:

[ ] YES [x] NO

IF "YES", ATTACH AN ADDITIONAL SHEET, EXHIBIT B, THAT:
(a) LISTS OR DESCRIBES THE EQUIPMENT
(b) STATES WHETHER THE EQUIPMENT
  (i) IS ORIGINAL OR ADDITIONAL EQUIPMENT
  (ii) REPLACES EXISTING EQUIPMENT, OR
  (iii) MODIFIES EXISTING EQUIPMENT
(c) PROVIDES THE ANTICIPATED OR ACTUAL DATES OF THE COMMENCEMENT OF CONSTRUCTION AND THE START-UP OF THE EQUIPMENT

12. IF THIS APPLICATION INCORPORATES BY REFERENCE A PREVIOUSLY GRANTED PERMIT(S), HAS FORM APC-210, "DATA AND INFORMATION—INCORPORATION BY REFERENCE" BEEN COMPLETED.

APPLICATION FOR OPERATING PERMIT ONLY

13. DOES THE STARTUP OF AN EMISSION SOURCE COVERED BY THIS APPLICATION PRODUCE AIR CONTAMINANT EMISSION IN EXCESS OF APPLICABLE STANDARDS:

[ ] YES [x] NO

IF "YES," HAS FORM APC-203, "OPERATION DURING STARTUP" BEEN COMPLETED FOR THIS SOURCE.

[ ] YES [ ] NO

14. DOES THIS APPLICATION REQUEST PERMISSION TO OPREATE AN EMISSION SOURCE DURING MALFUNCTIONS OR BREAKDOWNS:

[ ] YES [x] NO

IF "YES," HAS FORM APC-204, "OPERATION DURING MALFUNCTION AND BREAKDOWN" BEEN COMPLETED FOR THIS SOURCE

[ ] YES [ ] NO

15. IS AN EMISSION SOURCE COVERED BY THIS APPLICATION SUBJECT TO A FUTURE COMPLIANCE DATE:

[ ] YES [x] NO

IF "YES," HAS FORM APC-202, "COMPLIANCE PROGRAM & PROJECT COMPLETION SCHEDULE," BEEN COMPLETED FOR THIS SOURCE:

[ ] YES [ ] NO

16. DOES THE FACILITY COVERED BY THIS APPLICATION REQUIRE AN EPISODE ACTION PLAN (REFER TO GUIDELINES FOR EPISODE ACTION PLANS):

[ ] YES [x] NO

17. LIST AND IDENTIFY ALL FORMS, EXHIBITS, AND OTHER INFORMATION SUBMITTED AS PART OF THIS APPLICATION. INCLUDE THE PAGE NUMBERS OF EACH ITEM (ATTACH ADDITIONAL SHEETS IF NECESSARY):

Forms APC 220 and APC 260

TOTAL NUMBER OF PAGES ________

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

***DATA AND INFORMATION**

PROCESS EMISSION SOURCE

*THIS INFORMATION FORM IS TO BE COMPLETED FOR AN EMISSION SOURCE OTHER THAN A FUEL COMBUSTION EMISSION SOURCE OR AN INCINERATOR. A FUEL COMBUSTION EMISSION SOURCE IS A FURNACE, BOILER, OR SIMILAR EQUIPMENT USED PRIMARILY FOR PRODUCING HEAT OR POWER BY INDIRECT HEAT TRANSFER. AN INCINERATOR IS AN APPARATUS IN WHICH REFUSE IS BURNED.

1. NAME OF PLANT OWNER: Stoney Island Reclamation	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER): Land and Lakes No. 3
3. STREET ADDRESS OF EMISSION SOURCE: 2000 East 122nd Street	4. CITY OF EMISSION SOURCE: Chicago, Illinois

GENERAL INFORMATION

5. NAME OF PROCESS: Landfill Gas Management System	6. NAME OF EMISSION SOURCE EQUIPMENT: Landfill Gas Flare	
7. EMISSION SOURCE EQUIPMENT MANUFACTURER: To be determined	8. MODEL NUMBER: To be Determined	9. SERIAL NUMBER: N/A
10. FLOW DIAGRAM DESIGNATION(S) OF EMISSION SOURCE: Please refer to Appendix A		
11. IDENTITY(S) OF ANY SIMILAR SOURCE(S) AT THE PLANT OR PREMISES NOT COVERED BY THE FORM (IF THE SOURCE IS COVERED BY ANOTHER APPLICATION, IDENTIFY THE APPLICATION): N/A		
12. AVERAGE OPERATING TIME OF EMISSION SOURCE: 24 HRS/DAY 7 DAYS/WK 52 WKS/YR	13. MAXIMUM OPERATING TIME OF EMISSION SOURCE: 24 HRS/DAY 7 DAYS/WK 52 WKS/YR	
14. PERCENT OF ANNUAL THROUGHPUT: DEC-FEB 25 % MAR-MAY 25 % JUN-AUG 25 % SEPT-NOV 25 %		

INSTRUCTIONS

1. COMPLETE THE ABOVE IDENTIFICATION AND GENERAL INFORMATION SECTION.
2. COMPLETE THE RAW MATERIAL, PRODUCT, WASTE MATERIAL, AND FUEL USAGE SECTIONS FOR THE PARTICULAR SOURCE EQUIPMENT. COMPOSITIONS OF MATERIALS MUST BE SUFFICIENTLY DETAILED TO ALLOW DETERMINATION OF THE NATURE AND QUANTITY OF POTENTIAL EMISSIONS. IN PARTICULAR, THE COMPOSITION OF PAINTS, INKS, ETC., AND ANY SOLVENTS MUST BE FULLY DETAILED.
3. EMISSION AND EXHAUST POINT INFORMATION MUST BE COMPLETED, UNLESS EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.
4. OPERATING TIME AND CERTAIN OTHER ITEMS REQUIRE BOTH AVERAGE AND MAXIMUM VALUES.
5. FOR GENERAL INFORMATION REFER TO "GENERAL INSTRUCTIONS FOR PERMIT APPLICATIONS," APC-201.

DEFINITIONS

AVERAGE - THE VALUE THAT SUMMARIZES OR REPRESENTS THE GENERAL CONDITION OF THE EMISSION SOURCE, OR THE GENERAL STATE OF PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:
- AVERAGE OPERATING TIME - ACTUAL TOTAL HOURS OF OPERATION FOR THE PRECEDING TWELVE MONTH PERIOD.
- AVERAGE RATE - ACTUAL TOTAL QUANTITY OF "MATERIAL" FOR THE PRECEDING TWELVE MONTH PERIOD, DIVIDED BY THE AVERAGE OPERATING TIME.
- AVERAGE OPERATION - OPERATION TYPICAL OF THE PRECEDING TWELVE MONTH PERIOD, AS REPRESENTED BY AVERAGE OPERATING TIME AND AVERAGE RATES.

MAXIMUM - THE GREATEST VALUE ATTAINABLE OR ATTAINED FROM THE EMISSION SOURCE, OR THE PERIOD OF GREATEST OR UTMOST PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:
- MAXIMUM OPERATING TIME - GREATEST EXPECTED TOTAL HOURS OF OPERATIONS FOR ANY TWELVE MONTH PERIOD.
- MAXIMUM RATE - GREATEST QUANTITY OF "MATERIAL" EXPECTED PER ANY ONE HOUR OF OPERATION.
- MAXIMUM OPERATION - GREATEST EXPECTED OPERATION, AS REPRESENTED BY MAXIMUM OPERATING TIME AND MAXIMUM RATES.

RAW MATERIAL INFORMATION N/A		
NAME OF RAW MATERIAL	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
20a.	b. LB/HR	c. LB/HR
21a.	b. LB/HR	c. LB/HR
22a.	b. LB/HR	c. LB/HR
23a.	b. LB/HR	c. LB/HR
24a.	b. LB/HR	c. LB/HR

PRODUCT INFORMATION N/A		
NAME OF PRODUCT	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
30a.	b. LB/HR	c. LB/HR
31a.	b. LB/HR	c. LB/HR
32a.	b. LB/HR	c. LB/HR
33a.	b. LB/HR	c. LB/HR
	b. LB/HR	c. LB/HR

WASTE MATERIAL INFORMATION N/A		
NAME OF WASTE MATERIAL	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
40a.	b. LB/HR	c. LB/HR
41a.	b. LB/HR	c. LB/HR
42a.	b. LB/HR	c. LB/HR
43a.	b. LB/HR	c. LB/HR
44a.	b. LB/HR	c. LB/HR

*FUEL USAGE INFORMATION N/A		
FUEL USED	TYPE	HEAT CONTENT
50a. NATURAL GAS ☐	b.	c. 1000 BTU/SCF
OTHER GAS ☐		BTU/SCF
OIL ☐		BTU/GAL
COAL ☐		BTU/LB
OTHER ☐		BTU/LB
d. AVERAGE FIRING RATE PER IDENTICAL SOURCE: BTU/HR	e. MAXIMUM FIRING RATE PER IDENTICAL SOURCE: BTU/HR	

*THIS SECTION IS TO BE COMPLETED FOR ANY FUEL USED DIRECTLY IN THE PROCESS EMISSION SOURCE, E.G. GAS IN A DRYER, OR COAL IN A MELT FURNACE.

*EMISSION INFORMATION N/A

51. NUMBER OF IDENTICAL SOURCES (DESCRIBE AS REQUIRED):

AVERAGE OPERATION

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL SOURCE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	52a. GR/SCF	b. LB/HR	c.
CARBON MONOXIDE	53a. PPM (VOL)	b. LB/HR	c.
NITROGEN OXIDES	54a. PPM (VOL)	b. LB/HR	c.
ORGANIC MATERIAL	55a. PPM (VOL)	b. LB/HR	c.
SULFUR DIOXIDE	56a. PPM (VOL)	b. LB/HR	c.
**OTHER (SPECIFY)	57a. PPM (VOL)	b. LB/HR	c.

MAXIMUM OPERATION

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL SOURCE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	58a. GR/SCF	b. LB/HR	c.
CARBON MONOXIDE	59a. PPM (VOL)	b. LB/HR	c.
NITROGEN OXIDES	60a. PPM (VOL)	b. LB/HR	c.
ORGANIC MATERIAL	61a. PPM (VOL)	b. LB/HR	c.
SULFUR DIOXIDE	62a. PPM (VOL)	b. LB/HR	c.
*OTHER (SPECIFY)	63a. PPM (VOL)	b. LB/HR	c.

*ITEMS 52 THROUGH 63 NEED NOT BE COMPLETED IF EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.
**"OTHER" CONTAMINANT SHOULD BE USED FOR AN AIR CONTAMINANT NOT SPECIFICALLY NAMED ABOVE. POSSIBLE OTHER CONTAMINANTS ARE ASBESTOS, BERYLLIUM, MERCURY, VINYL CHLORIDE, LEAD, ETC.

***EXHAUST POINT INFORMATION N/A

64. FLOW DIAGRAM DESIGNATION(S) OF EXHAUST POINT:

65. DESCRIPTION OF EXHAUST POINT (LOCATION IN RELATION TO BUILDINGS, DIRECTION, HOODING, ETC.):

66. EXIT HEIGHT ABOVE GRADE:	67. EXIT DIAMETER:
68. GREATEST HEIGHT OF NEARBY BUILDINGS: FT	69. EXIT DISTANCE FROM NEAREST PLANT BOUNDARY: FT
AVERAGE OPERATION	MAXIMUM OPERATION
70. EXIT GAS TEMPERATURE: °F	72. EXIT GAS TEMPERATURE: °F
71. GAS FLOW RATE THROUGH EACH EXIT: ACFM	73. GAS FLOW RATE THROUGH EACH EACH EXIT: ACFM

***THIS SECTION SHOULD NOT BE COMPLETED IF EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

This agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111½, Section 1039. Disclosure of this information is required under that section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center

*DATA AND INFORMATION AIR POLLUTION CONTROL EQUIPMENT	

*THIS INFORMATION FORM IS FOR AN INDIVIDUAL UNIT OF AIR POLLUTION CONTROL EQUIPMENT OR AN AIR POLLUTION CONTROL SYSTEM.

1. NAME OF OWNER: Stoney Island Reclamation	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER): Land and Lakes No. 3
3. STREET ADDRESS OF CONTROL EQUIPMENT: 2000 East 122nd Street	4. CITY OF CONTROL EQUIPMENT: Chicago, Illinois
5. NAME OF CONTROL EQUIPMENT OR CONTROL SYSTEM: Sanitary Landfill Gas Management System	

INSTRUCTIONS

1. COMPLETE THE ABOVE IDENTIFICATION.
2. COMPLETE THE APPROPRIATE SECTION FOR THE UNIT OF CONTROL EQUIPMENT, OR THE APPROPRIATE SECTIONS FOR THE CONTROL SYSTEM. BE CERTAIN THAT THE ARRANGEMENT OF VARIOUS UNITS IN A CONTROL SYSTEM IS MADE CLEAR IN THE PROCESS FLOW DIAGRAM.
3. COMPLETE PAGE 6 OF THIS FORM, EMISSION INFORMATION AND EXHAUST POINT INFORMATION.
4. EFFICIENCY VALUES SHOULD BE SUPPORTED WITH A DETAILED EXPLANATION OF THE METHOD OF CALCULATION, THE MANNER OF ESTIMATION, OR THE SOURCE OF INFORMATION. REFERENCE TO THIS FORM ANY RELEVANT INFORMATION OR EXPLANATION INCLUDED IN THIS PERMIT APPLICATION.
5. EFFICIENCY VALUES AND CERTAIN OTHER ITEMS OF INFORMATION ARE TO BE GIVEN FOR AVERAGE AND MAXIMUM OPERATION OF THE SOURCE EQUIPMENT. FOR EXAMPLE, "MAXIMUM EFFICIENCY" IS THE EFFICIENCY OF THE CONTROL EQUIPMENT WHEN THE SOURCE IS AT MAXIMUM OPERATION, AND "AVERAGE FLOW RATE" IS THE FLOW RATE INTO THE CONTROL EQUIPMENT WHEN THE SOURCE IS AT AVERAGE OPERATION.
6. FOR GENERAL INFORMATION REFER TO "GENERAL INSTRUCTIONS FOR PERMIT APPLICATIONS", APC-201.

DEFINITIONS

AVERAGE - THE VALUE THAT SUMMARIZES OR REPRESENTS THE GENERAL CONDITION OF THE EMISSION SOURCE OR THE GENERAL STATE OF PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:

AVERAGE OPERATION - OPERATION TYPICAL OF THE PRECEDING TWELVE MONTH PERIOD, AS REPRESENTED BY AVERAGE OPERATING TIME AND AVERAGE RATES.

MAXIMUM - THE GREATEST VALUE ATTAINABLE OR ATTAINED FROM THE EMISSION SOURCE, OR THE PERIOD OF GREATEST OR UTMOST PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:

MAXIMUM OPERATION - THE GREATEST EXPECTED OPERATION, AS REPRESENTED BY MAXIMUM OPERATING TIME AND MAXIMUM RATES.

ADSORPTION UNIT N/A

1. FLOW DIAGRAM DESIGNATION(S) OF ADSORPTION UNIT:	
2. MANUFACTURER:	3. MODEL NAME AND NUMBER:
4. ADSORBENT: ☐ ACTIVATED CHARCOAL: TYPE ______	☐ OTHER: SPECIFY ______
5. ADSORBATE(S):	
6. NUMBER OF BEDS PER UNIT:	7. WEIGHT OF ADSORBENT PER BED: LB
8. DIMENSIONS OF BED: THICKNESS ______ IN, SURFACE AREA ______ SQUARE IN	
9. INLET GAS TEMPERATURE: °F	10. PRESSURE DROP ACROSS UNIT: INCH H_2O GAUGE
11. TYPE OF REGENERATION: ☐ REPLACEMENT ☐ STEAM ☐ OTHER: SPECIFY ______	
12. METHOD OF REGENERATION: ☐ ALTERNATE USE OF ______ ENTIRE UNITS ☐ SOURCE SHUT DOWN ☐ OTHER: DESCRIBE	☐ ALTERNATE USE OF ______ BEDS IN A SINGLE UNIT
AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
13. TIME ON LINE BEFORE REGENERATION: MIN/BED	15. TIME ON LINE BEFORE REGENERATION: MIN/BED
14. EFFICIENCY OF ADSORBER (SEE INSTRUCTION 4): %	16. EFFICIENCY OF ADSORBER (SEE INSTRUCTION 4): %

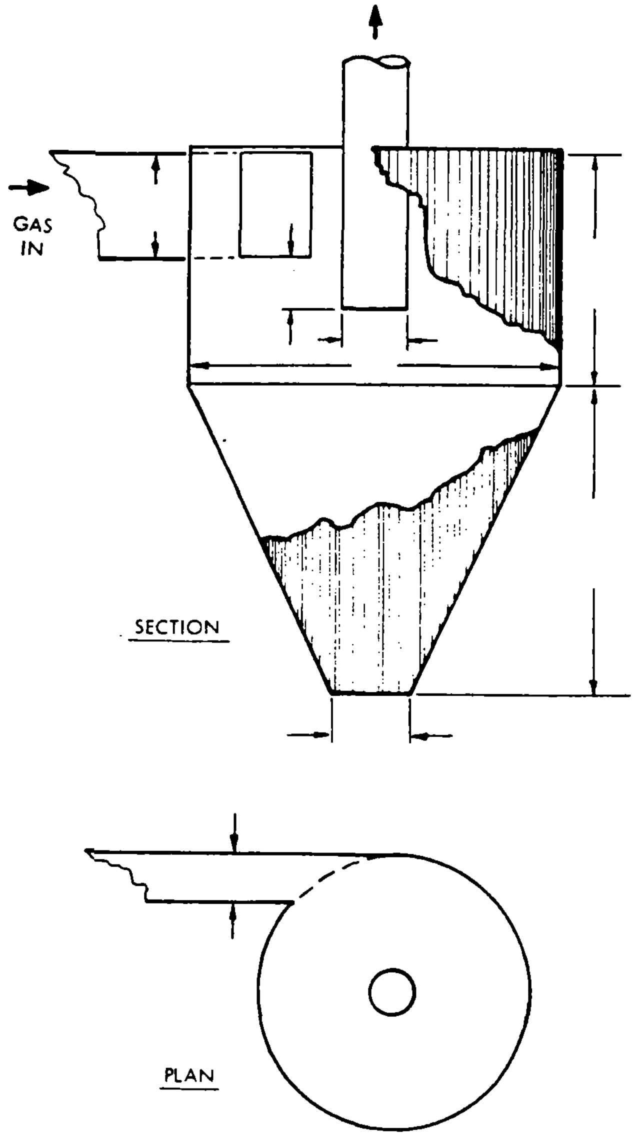
AFTERBURNER N/A

1. FLOW DIAGRAM DESIGNATION(S) OF AFTERBURNER:	
2. MANUFACTURER:	3. MODEL NAME AND NUMBER:
4. COMBUSTION CHAMBER DIMENSIONS: LENGTH ______ IN, CROSS-SECTIONAL AREA ______ SQUARE IN.	
5. INLET GAS TEMPERATURE: °F	7. FUEL: ☐ GAS ☐ OIL: SULFUR ______ WT%
6. OPERATING TEMPERATURE OF COMBUSTION CHAMBER: °F	8. BURNERS PER AFTERBURNER: @ BTU/HR EACH
9. CATALYST USED: ☐ NO ☐ YES: DESCRIBE CATALYST ______	
10. HEAT EXCHANGER USED: ☐ NO ☐ YES: DESCRIBE HEAT EXCHANGER ______	
AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
11. GAS FLOW RATE: SCFM	13. GAS FLOW RATE: SCFM
12. EFFICIENCY OF AFTERBURNER (SEE INSTRUCTION 4): %	14. EFFICIENCY OF AFTERBURNER (SEE INSTRUCTION 4): %

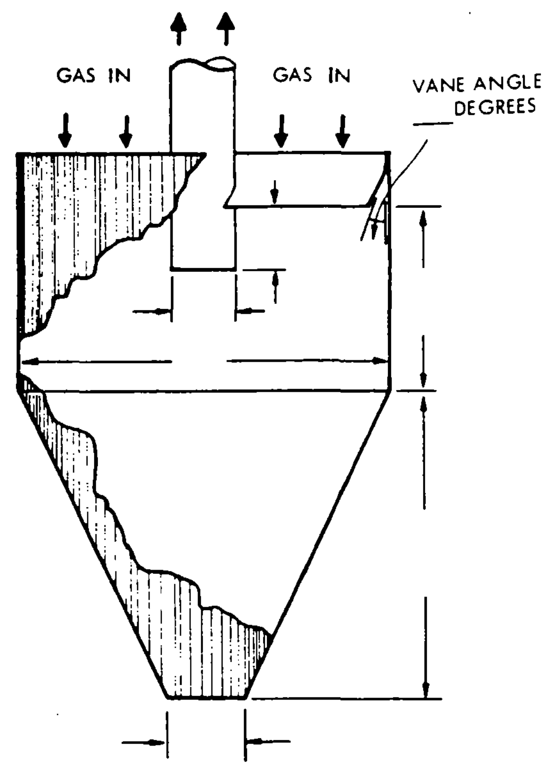
CYCLONE N/A	
1. FLOW DIAGRAM DESIGNATION(S) OF CYCLONE:	
2. MANUFACTURER:	3. MODEL:
4. TYPE OF CYCLONE: ☐ SIMPLE ☐ MULTIPLE	5. NUMBER OF CYCLONES IN EACH MULTIPLE CYCLONE:

6. DIMENSION THE APPROPRIATE SKETCH (IN INCHES) OR PROVIDE A DRAWING WITH EQUIVALENT INFORMATION:

TANGENTIAL INLET CYCLONE



AXIAL INLET CYCLONE
(INDIVIDUAL CYCLONE OF MULTIPLE CYCLONE)



NOT TO SCALE

AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
7. GAS FLOW RATE: SCFM	9. GAS FLOW RATE: SCFM
8. EFFICIENCY OF CYCLONE (SEE INSTRUCTION 4): %	10. EFFICIENCY OF CYCLONE (SEE INSTRUCTION 4): %

CONDENSER N/A

1. FLOW DIAGRAM DESIGNATION(S) OF CONDENSER:

2. MANUFACTURER:	3. MODEL NAME AND NUMBER:	4. HEAT EXCHANGE AREA: FT^2

AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
5. COOLANT FLOW RATE PER CONDENSER: WATER ______ GPM AIR ______ SCFM OTHER: TYPE ______, FLOW RATE ______	10. COOLANT FLOW RATE PER CONDENSER: WATER ______ GPM AIR ______ SCFM OTHER: TYPE ______, FLOW RATE ______
6. GAS FLOW RATE: SCFM	11. GAS FLOW RATE: SCFM
7. COOLANT TEMPERATURE: INLET ___ °F OUTLET ___ °F 8. GAS TEMPERATURE: INLET ___ °F OUTLET ___ °F	12. COOLANT TEMPERATURE: INLET ___ °F OUTLET ___ °F 13. GAS TEMPERATURE: INLET ___ °F OUTLET ___ °F
9. EFFICIENCY OF CONDENSER (SEE INSTRUCTION 4): %	14. EFFICIENCY OF CONDENSER (SEE INSTRUCTION 4): %

*ELECTRICAL PRECIPITATOR N/A

1. FLOW DIAGRAM DESIGNATION OF ELECTRICAL PRECIPITATOR:

2. MANUFACTURER:	3. MODEL NAME AND NUMBER:

4. COLLECTING ELECTRODE AREA PER CONTROL DEVICE: FT^2

AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
5. GAS FLOW RATE: SCFM	7. GAS FLOW RATE: SCFM
6. EFFICIENCY OF ELECTRICAL PRECIPITATOR (SEE INSTRUCTION 4): %	8. EFFICIENCY OF ELECTRICAL PRECIPITATOR (SEE INSTRUCTION 4): %

SUBMIT THE MANUFACTURER'S SPECIFICATIONS FOR THE ELECTRICAL PRECIPITATOR. REFERENCE THE INFORMATION TO THIS FORM.

*ELECTRICAL PRECIPITATORS VARY GREATLY IN THEIR DESIGN AND IN THEIR COMPLEXITY. THE ITEMS IN THIS SECTION PROVIDE A MINIMUM AMOUNT OF INFORMATION. THE APPLICANT MUST, HOWEVER, SUBMIT WITH THIS APPLICATION THE MANUFACTURER'S SPECIFICATIONS, INCLUDING ANY DRAWINGS, TECHNICAL DOCUMENTS, ETC. IF THE INFORMATION PROVIDED BY THE MANUFACTURER'S SPECIFICATIONS IS INSUFFICIENT FOR FULL AND ACCURATE ANALYSIS, THE AGENCY WILL REQUEST SPECIFIC ADDITIONAL INFORMATION.

FILTER UNIT N/A

1. FLOW DIAGRAM DESIGNATION(S) OF FILTER UNIT:

2. MANUFACTURER:	3. MODEL NAME AND NUMBER:
4. FILTERING MATERIAL:	5. FILTERING AREA:

6. CLEANING METHOD:
☐ SHAKER ☐ REVERSE AIR ☐ PULSE AIR ☐ PULSE JET ☐ OTHER: SPECIFY ______

7. GAS COOLING METHOD: ☐ DUCTWORK: LENGTH ______ FT., DIAM ______ IN.
☐ BLEED-IN AIR ☐ WATER SPRAY ☐ OTHER: SPECIFY

AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
8. GAS FLOW RATE (FROM SOURCE): SCFM	12. GAS FLOW RATE (FROM SOURCE): SCFM
9. GAS COOLING FLOW RATE: BLEED-IN AIR ______ SCFM, WATER SPRAY ______ GPM	13. GAS COOLING FLOW RATE: BLEED-IN AIR ______ SCFM, WATER SPRAY ______ GPM
10. INLET GAS CONDITION: TEMPERATURE ______ °F DEWPOINT ______ °F	14. INLET GAS CONDITION: TEMPERATURE ______ °F DEWPOINT ______ °F
11. EFFICIENCY OF FILTER UNIT (SEE INSTRUCTION 4): %	15. EFFICIENCY OF FILTER UNIT (SEE INSTRUCTION 4): %

SCRUBBER N/A

1. FLOW DIAGRAM DESIGNATION(S) OF SCRUBBER:

2. MANUFACTURER:	3. MODEL NAME AND NUMBER:

4. TYPE OF SCRUBBER:

☐ HIGH ENERGY: GAS STREAM PRESSURE DROP ________ INCH H_2O

☐ PACKED: PACKING TYPE ________, PACKING SIZE ________, PACKED HEIGHT ________ IN.

☐ SPRAY: NUMBER OF NOZZLES ________, NOZZLE PRESSURE ________ PSIG

☐ OTHER: SPECIFY ________ ATTACH DESCRIPTION AND SKETCH WITH DIMENSIONS

5. TYPE OF FLOW:
☐ COCURRENT ☐ COUNTERCURRENT ☐ CROSSFLOW

6. SCRUBBER GEOMETRY:
LENGTH IN DIRECTION OF GAS FLOW ________ IN., CROSS-SECTIONAL AREA ________ SQUARE IN.

7. CHEMICAL COMPOSITION OF SCRUBBANT:

AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
8. SCRUBBANT FLOW RATE: GPM	12. SCRUBBANT FLOW RATE: GPM
9. GAS FLOW RATE: SCFM	13. GAS FLOW RATE: SCFM
10. INLET GAS TEMPERATURE: °F	14. INLET GAS TEMPERATURE: °F
11. EFFICIENCY OF SCRUBBER (SEE INSTRUCTION 4): ______ % PARTICULATE ______ % GASEOUS	15. EFFICIENCY OF SCRUBBER (SEE INSTRUCTION 4): ______ % PARTICULATE ______ % GASEOUS

OTHER TYPE OF CONTROL EQUIPMENT (Sanitary Landfill Management System)

1. FLOW DIAGRAM DESIGNATION(S) OF "OTHER TYPE" OF CONTROL EQUIPMENT:
Please refer to Appendix A (Drawings)

2. GENERIC NAME OF "OTHER" EQUIPMENT:	3. MANUFACTURER:	4. MODEL NAME AND NUMBER:
Flare	To Be Determined	To Be Determined

5. DESCRIPTION AND SKETCH, WITH DIMENSIONS AND FLOW RATES, OF "OTHER" EQUIPMENT:

Land and Lakes Company intends to construct and operate a flare system to combust compounds contained within the landfill gas collected from the 122nd Street Landfill, in Chicago, Illinois. The flare system may use an outside gas as a start-up fuel.

AVERAGE OPERATION OF SOURCE	MAXIMUM OPERATION OF SOURCE
6. FLOW RATES: ______ GPM 1430 SCFM	8. FLOW RATES: ______ GPM 2145 SCFM
7. EFFICIENCY OF "OTHER" EQUIPMENT (SEE INSTRUCTION 4): 98 %	9. EFFICIENCY OF "OTHER" EQUIPMENT (SEE INSTRUCTION 4): 98 %

EMISSION INFORMATION

1. NUMBER OF IDENTICAL CONTROL UNITS OR CONTROL SYSTEMS (DESCRIBE AS REQUIRED):

AVERAGE OPERATION OF SOURCE

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL CONTROL UNIT OR CONTROL SYSTEM		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	2a. GR/SCF	b. Negligible LB/HR	c.
CARBON MONOXIDE	3a. PPM (VOL)	b. 8.58 LB/HR	c. Engineering Calculations (attached)
NITROGEN OXIDES	4a. PPM (VOL)	b. 2.57 LB/HR	c. Engineering Calculations (attached)
ORGANIC MATERIAL	5a. PPM (VOL)	b. Negligible LB/HR	c.
SULFUR DIOXIDE	6a. PPM (VOL)	b. 1.43 LB/HR	c. Engineering Calculations (attached)
OTHER (SPECIFY)	7a. PPM (VOL)	b. N/A LB/HR	c.

MAXIMUM OPERATION OF SOURCE

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL CONTROL UNIT OR CONTROL SYSTEM		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	8a. GR/SCF	b. Negligible LB/HR	c.
CARBON MONOXIDE	9a. PPM (VOL)	b. 12.87 LB/HR	c.
NITROGEN OXIDES	10a. PPM (VOL)	b. 3.85 LB/HR	c.
ORGANIC MATERIAL	11a. PPM (VOL)	b. Negligible LB/HR	c.
SULFUR DIOXIDE	12a. PPM (VOL)	b. 2.14 LB/HR	c.
OTHER (SPECIFY)	13a. PPM (VOL)	b. N/A LB/HR	c.

**"OTHER" CONTAMINANT SHOULD BE USED FOR AN AIR CONTAMINANT NOT SPECIFICALLY NAMED ABOVE. POSSIBLE OTHER CONTAMINANTS ARE ASBESTOS, BERYLLIUM, MERCURY, VINYL CHLORIDE, LEAD, ETC.

EXHAUST POINT INFORMATION

1. FLOW DIAGRAM DESIGNATION(S) OF EXHAUST POINT: Please refer to Appendix A
2. DESCRIPTION OF EXHAUST POINT (LOCATION IN RELATION TO BUILDINGS, DIRECTION, HOODING, ETC.):

3. EXIT HEIGHT ABOVE GRADE: To Be Determined	4. EXIT DIAMETER: To Be Determined
5. GREATEST HEIGHT OF NEARBY BUILDINGS: FT	6. EXIT DISTANCE FROM NEAREST PLANT BOUNDARY: FT
AVERAGE OPERATION OF SOURCE	**MAXIMUM OPERATION OF SOURCE**
7. EXIT GAS TEMPERATURE: 1400 °F	9. EXIT GAS TEMPERATURE: 2000 °F
8. GAS FLOW RATE THROUGH EACH EXIT: 1430 ACFM	10. GAS FLOW RATE THROUGH EACH EXIT: 2145 ACFM

Calculations

Assumptions

Gas Composition

CH_4	50%
CO_2, Air, Inerts	50%
Low Heating Value	500 Btu/SCF
Temp	100° F

Flare Gas

Type	Landfill Gas
Average Flow	1430 cfm
Waste Heat Release	42.9 MMBTU/hr
Operating Temp	1400°-2000°F

Operating Temperature - Expected Emissions

	1600°F	1800°F
Destruction Efficiency	> 98%	> 99%
NO_x (lb/MMBtu)	0.06	0.08
CO (lb/MMBtu)	0.03	0.20

SO_2 Emissions = 0.002 lb/hr per scfm of CH_4
(from AP-42)

Maximum Flow Rate

Flow = Average + 50%

= 2145 cfm

NO_x = 0.06 lb/MM Btu

CO = 0.20 lb/MM Btu

SO_2 = 0.002 lb/hr per scfm of CH_4

NO_x Emissions

$$\left[0.06\ \text{lb/mm Btu}\right]\left[2145\ \text{cfm}\right]\left[500\ \frac{\text{Btu}}{\text{scf}}\right]\left[60\ \frac{\text{min}}{\text{hr}}\right]\left[1\ \frac{\text{mm Btu}}{10^6\ \text{Btu}}\right]$$

= 3.85 lb/hr

CO Emissions

$$\left[0.20\ \text{lb/mm Btu}\right]\left[2145\ \text{cfm}\right]\left[500\ \frac{\text{Btu}}{\text{scf}}\right]\left[60\ \frac{\text{min}}{\text{hr}}\right]\left[1\ \frac{\text{mm Btu}}{10^6\ \text{Btu}}\right]$$

= 12.87 lb/hr

SO_2 Emissions

$$\left[0.002\ \text{lb/hr}\right]\left[2145\ \text{cfm}\right]\left[50\%\ CH_4\right]$$

= 2.14 lb/hr

Emissions

Average Flow Rate

Flow = 1430 cfm

NO_x = 0.06 lb/MMBtu

CO = 0.20 lb/MMBtu

SO_2 = 0.002 lb/hr per scfm of CH_4

NO_x Emissions

$$\left[0.06 \left(\text{lb/mmBtu}\right)\right]\left[1430\ \text{cfm}\right]\left[500\ \frac{\text{Btu}}{\text{scf}}\right]\left[60\ \frac{\text{min}}{\text{hr}}\right]\left[1\ \frac{\text{mmBt}}{10^6\ \text{Bt}}\right]$$

= 2.57 lb/hr

CO Emissions

$$\left[0.20\ \text{lb/mmBtu}\right]\left[1430\ \text{cfm}\right]\left[500\ \frac{\text{Btu}}{\text{scf}}\right]\left[60\ \frac{\text{min}}{\text{hr}}\right]\left[1\ \frac{\text{mmBtu}}{10^6\ \text{Btu}}\right]$$

= 8.58 lb/hr

SO_2 Emissions

$$\left[0.002\ \text{lb/hr}\right]\left[1430\ \text{cfm}\right]\left[50\%\ CH_4\right]$$

= 1.43 lb/hr

ATTACHMENT 7

ATTACHMENT 7

EQUIVALENCY DEMONSTRATION FOR FINAL COVER SYSTEM

Written by: RLS Date: 96 / 07 / 16 (YY MM DD) Reviewed by: AS Date: 96 / 07 / 16 (YY MM DD)

Client: LALC Project: 122nd Street Landfill Project/Proposal No.: FE2226 Task No.: 6

PROBLEM STATEMENT: PRESENT AN EQUIVALENCY DEMONSTRATION TO SHOW THAT THE PROPOSED FINAL COVER SYSTEM IN CELL II-VI, WHICH INCLUDES A GEOMEMBRANE, IS EQUIVALENT OR SUPERIOR IN PERFORMANCE TO A 0.91-m (3-ft) THICK COMPACTED EARTH LAYER WITH A HYDRAULIC CONDUCTIVITY OF 1×10^{-6} cm/s [§811.314(b)(3)(B)(i)].

STEP 1: CALCULATE THE LEAKAGE RATE THROUGH THE PROPOSED FINAL COVER SYSTEM

Description of Final Cover System:

The relatively flat top area of the final cover system in Cell II-VI consists of 0.5 ft (0.15 m) of topsoil and 2.5 ft (0.75 m) of clay with a hydraulic conductivity of approximately 10^{-6} cm/s overlying a geomembrane. The geomembrane is underlain by a 1-ft (0.3-m) thick intermediate clay cover layer with a hydraulic conductivity of 1×10^{-5} cm/s, and 2 ft (0.6 m) of select waste, consisting of contaminated soil, and sludge.

The side slope area of the final cover system in Cell II-VI consists of 0.5 ft (0.15 m) of topsoil and 2.5 ft (0.8 m) of clay with a hydraulic conductivity of approximately 10^{-6} cm/s), a geocomposite drainage layer, a geomembrane, an intermediate clay cover layer with a hydraulic conductivity of 1×10^{-5} cm/s, and 2 ft (0.6 m) of select waste, consisting of contaminated soils and sludge.

Theory:

A conservative estimate of leakage through the top area of the final cover can be calculated assuming the cover soils are fully saturated and using the theory for leakage through composite liners. In this case the composite liner has an upper component comprised of 2.5 ft (0.75 m) of cover soil with a hydraulic conductivity of 10^{-6} cm/s and a lower component comprised of a geomembrane.

Leakage rates through composite liners are a function of many parameters, including hydraulic head, size of the considered geomembrane hole, thickness, and hydraulic conductivity of the soil layer in contact with the geomembrane, and quality of contact between the geomembrane and the soil layer. As indicated by USEPA [1987a] and Giroud and Bonaparte [1989b], the latter parameter plays an essential role.

In the case of *poor contact* between the geomembrane and the soil layer, the leakage rate through the composite liner due to holes in the geomembrane can be calculated as follows [Giroud et al., 1989]:

$$Q = 1.15\, i_{avg}\, h^{0.9}\, a^{0.1}\, k^{0.74} \qquad \text{(Equation 1)}$$

where: Q = rate of leakage through the composite liner due to a single hole in the geomembrane; i_{avg} = average hydraulic gradient, as shown in Figure 1; h = hydraulic head on top of the liner; a = area of the geomembrane hole; and k = hydraulic conductivity of the soil layer in contact with the geomembrane. This equation is only valid with the following SI units: Q (m^3/s), h (m), a (m^2), and k (m/s).

The following assumptions regarding hole size and frequency are used in these leakage calculations. Justifications for many of these assumptions are given by the USEPA [1987a; 1987b]; and Giroud and Bonaparte [1989a].

Construction Quality. It is assumed that the cover system will be constructed with high quality materials, that good construction practices will be followed, and that a good Construction Quality Assurance (CQA) program will be implemented.

Written by: KLO Date: 96 / 07 / 16 (YY MM DD) Reviewed by: AF Date: 96 / 07 / 16 (YY MM DD)

Client: LALC Project: 122nd Street Landfill Project/Proposal No.: FE2226 Task No.: 6

Geomembrane Liner Defects. The average size and frequency of holes considered in the analysis were assumed as follows:

- *Hole Size*. USEPA [1987a] and Giroud and Bonaparte [1989a] present case-study data which provide information on the size of holes that may occur in geomembranes at properly designed and constructed facilities, with good CQA. Using these data, a hole size of 0.005 in^2 (3.14 mm^2), which is considered appropriate for geomembranes installed with proper construction workmanship and good CQA, has been selected for this equivalency analysis.

- *Hole Frequency*. Based on forensic analyses of the frequency of holes in geomembranes [Giroud and Fluet, 1986], a frequency of 1 hole per acre (4,047 m^2) has been selected for the leakage calculations.

Parameter Values:

As discussed above, the geomembrane hole size, a, and frequency are 0.005 in^2 (3.14 mm^2) and one hole per acre (4,047 m^2), respectively.

For the top slopes of the final cover, the hydraulic head on top of the geomembrane, h, is equal to 3 ft (0.91 m) which is the thickness of the overlying cover soil, and the hydraulic conductivity of soil layer in contact with the geomembrane is 10^{-6} cm/s. The thickness of soil layer, D, below the geomembrane is 1 ft (0.3 m). Therefore from Figure 1, for $h/D = 0.91/0.3 = 3.0$, $i_{avg} = 1.5$.

For the side slopes of the final cover, the hydraulic head is taken to be conservatively equal to the thickness of the geocomposite drainage layer, which is 0.2 (5 mm). The average hydraulic gradient, i_{avg}, for side slopes is 1.0 (for $h/D = 5 \times 10^{-3}/0.3 = 0.02$).

Written by: KLS Date: 96 / 07 / 10 Reviewed by: LS Date: 96 / 07 / 16
YY MM DD YY MM DD

Client: LALC Project: 122nd Street Landfill Project/Proposal No.: FE2226 Task No.: 6

Calculations:

For Top Slopes:

Using Equation 1 and the above parameter values for the final cover in the top area gives the following calculated leakage rate for a single geomembrane hole:

$$Q = 1.15\,(1.5)\,(0.91)^{0.9}\,(3.14 \times 10^{-6})^{0.1}\,(1 \times 10^{-8})^{0.74}$$

$$Q = 12.25 \text{ gpd } (5.37 \times 10^{-7} \text{ m}^3/\text{s})$$

Since it is assumed there is one hole per acre (4,047 m^2) the calculated unitized leakage rate for the top area is 12.25 gpad (1.32×10^{-10} m/s):

For Side Slopes:

Using Equation 1, the leakage rate for a single geomembrane hole on the side slopes is:

$$Q = 1.15\,(1)\,(5 \times 10^{-3})^{0.9}\,(3.14 \times 10^{-6})^{0.1}\,(1 \times 10^{-8})^{0.74}$$

$$Q = 0.08 \text{ gpd } (3.31 \times 10^{-9} \text{ m}^3/\text{s})$$

The assumed hole frequency is 1 hole per acre (4,407 m^2). Therefore, for the side slope area the calculated unitized leakage rate through the final cover is 0.08 gpad (8.18×10^{-13} m/s).

To be conservative, the larger of the calculated unitized leakage rates for the top slopes and the side slopes is used for the equivalency demonstration. Therefore, the calculated unitized leakage rate through the final cover system top slopes is 12.25 gpad (1.32×10^{-10} m/s).

STEP 2: LEAKAGE RATE THROUGH A 0.91-M (3-FT) THICK COMPACTED EARTH LAYER [§811.314(B)(3)(B)(i)]

Theory:

Leakage rate calculations for compacted earth layers are performed using a modified form of the Darcy equation:

$$q_{CEL} = k_{CEL} \, (h_{CEL} + T_{CEL}) \, / \, T_{CEL} \qquad \text{(Equation 2)}$$

where: q_{CEL} = leakage rate per m^2 area of compacted earth layer (m/s); k_{CEL} = hydraulic conductivity of the compacted earth liner (m/s); h_{CEL} = head of leachate on top of the compacted earth liner (m); and T_{CEL} = thickness of the compacted earth liner (m).

For cases involving a head of leachate, h_{CEL}, which is small compared to the thickness of the liner, T_{CEL}, (which is the case in this equivalency demonstration) Equation 2 simplifies to the following:

$$q_{CEL} = k_{CEL} \qquad \text{(Equation 3)}$$

Parameter Values:

The hydraulic conductivity of the compacted earth layer is 1×10^{-6} cm/s (1×10^{-8} m/s).

Calculations:

Using Equation 3 and the hydraulic conductivity of the compacted earth layer, k_{CEL}, of 1×10^{-6} cm/s, the following unitized leakage rate is calculated for the compacted earth layer:

$$q_{CEL} = 922 \text{ gpad } (1 \times 10^{-8} \text{ m/s})$$

Written by: KLS Date: 96 / 07 / 16 Reviewed by: AG Date: 96 / 07 / 16
YY MM DD YY MM DD

Client: LALC Project: 122nd Street Landfill Project/Proposal No.: FE2226 Task No.: 6

CONCLUSIONS:

The calculated unitized leakage rate for the compacted earth layer, 922 gpad (1×10^{-8} m/s) is 75 times greater than the calculated unitized leakage rate for the proposed final cover system, 12.25 gpad (1.32×10^{-10} m/s). Therefore, it is concluded that the performance of the proposed final cover system is far superior to the performance of a compacted earth layer 3 ft (0.91 m) thick with a hydraulic conductivity of 1×10^{-6} cm/s [§811.314(b)(3)(B)(i)].

References:

Bonaparte, R., Giroud, J.P., and Gross, B.A., "Rates of Leakage through Landfill Liners", *Conference Proceedings, Geosynthetics '89*, Vol. 1, San Diego, CA, Feb 1989, pp. 18-29.

Giroud, J.P., and Bonaparte, R., "Leakage Through Liners Constructed with Geomembranes, Part I: Geomembrane Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 1, 1989a, pp. 27-67.

Giroud, J.P., and Bonaparte, R., "Leakage Through Liners Constructed with Geomembranes, Part II: Composite Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 2, 1989b, pp. 71-111.

Giroud, J.P., and Fluet, J.E., Jr., "Quality Assurance of Geosynthetic Lining Systems", *Geotextiles and Geomembranes*, Vol. 3, No. 4, 1986, pp. 249-287.

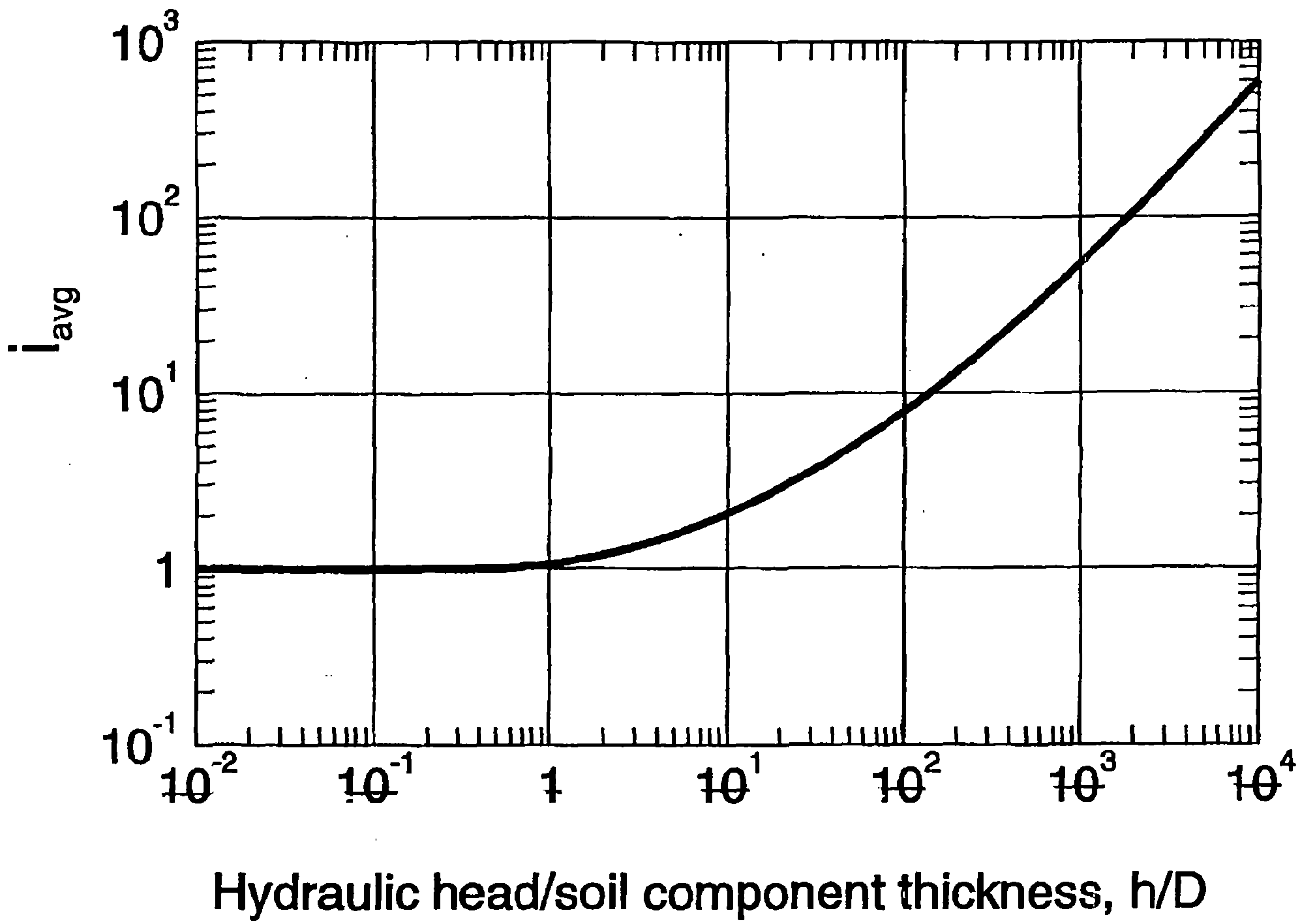
Giroud, J.P., Khatami, A., and Badu-Tweneboah, K., "Evaluation of the Rate of Leakage through Composite Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 4, 1989, pp. 337-340.

USEPA, "*Background Document: Proposed Liner and Leak Detection Rule*", EPA/530-SW-87-015, Prepared by GeoServices Inc., May 1987a, 526 p.

Written by: KLS Date: 96 / 07 / 16 Reviewed by: AS Date: 96 / 07 / 16
YY MM DD YY MM DD

Client: LALC Project: 122nd Street Landfill Project/Proposal No.: FE2226 Task No.: 6

USEPA, "*Background Document: Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments*", EPA/530-SW-87-013, Prepared by GeoServices Inc., Apr. 1987b, 301 p.



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VALUE OF i_{avg}

GEOSYNTEC CONSULTANTS	FIGURE NO. 1
	PROJECT NO. FE2226
	DOCUMENT NO.
	PAGE NO.

ATTACHMENT 8

6. GROUND-WATER MONITORING PLAN

6.1 Overview

The Ground-Water Monitoring Plan was prepared to meet IEPA requirements that a network of monitoring points be established hydraulically downgradient of potential sources of constituents so that constituent discharges may be detected. This Ground-Water Monitoring Plan completely replaces any previously submitted Ground-Water Monitoring Plan.

This Addendum to the Ground-Water Monitoring Plan includes the following: (i) identification of existing monitoring well locations for the Dolton Sand and Fill Unit (shallow unit) and the Silurian dolomite aquifer (deep aquifer); (ii) identification of locations of monitoring wells to be installed in the deep aquifer; (iii) AGQS and MAPC values for the monitoring wells in the shallow unit and the deep aquifer; (iv) monitoring well construction details; (v) schedule for sample collection and summary of the chemical constituents to be analyzed; (vi) description of procedures to be used during sample collection and analysis; and (vii) approach to determine if statistically significant changes in ground-water quality have been detected and the appropriate responses to the changes.

6.2 Monitoring Wells

6.2.1 Monitoring Well Locations

6.2.1.1 Shallow Wells

The monitoring program for the 122nd Street Landfill will include the following shallow monitoring wells:

Shallow Upgradient Monitoring Wells: GA1S, GA4S, GA5S, and RA3S (all on east side of landfill);

Shallow Downgradient Monitoring Wells: GA6S, GA7S, GA14S, and GA16S (all on west side of landfill);

The eight shallow monitoring wells are located within the shallow unit. Locations of the monitoring wells are shown in Figure V-6-1.

There are currently four shallow monitoring wells installed at the downgradient boundary of the landfill (GA7S, RA6S, RA14S, and RA16S). The existing shallow monitoring wells are sufficient to monitor downgradient ground-water quality in the in the shallow unit, including the Dolton Sand. Elevation of ground water in shallow wells will be monitored to evaluate direction of ground-water flow in the shallow zone. Leachate will be extracted from the landfill to an elevation below the bottom of the shallow unit, creating an inward hydraulic gradient. The inward hydraulic gradient will prevent migration of leachate constituents into the shallow unit. P12S will be maintained as piezometer. Monitoring well GA2S along the north border will be abandoned because it will interfere with the construction of permitted cells at the 122nd Street Landfill.

6.2.1.2 Deep Wells

The monitoring program for the 122nd Street Landfill will include the following deep monitoring wells:

<u>Deep Upgradient Monitoring Well :</u> (interim upgradient well) — G15D (northwest corner of landfill);

<u>Deep Downgradient Monitoring Wells:</u>

Existing wells: GA4D, GA5D, GA11D, and G13D (on east and south sides of landfill).

Wells to be installed: G20D, G21D, G22D, G23D, and G24D (on east and south sides of landfill).

The four existing deep monitoring wells are located within the deep aquifer near the contact between the glacial drift and Silurian dolomite. The five new monitoring wells will be installed in the upper portion of the deep aquifer at locations shown in Fig. V-6-1. Locations of the existing monitoring wells are also shown in Figure V-6-1.

After the new monitoring wells are installed in the deep aquifer, the spacing between the wells on the south side of the landfill (downgradient side) will be less than the IEPA default value of 300 ft (100 m) (Figure V-6-1). The spacing between the deep monitoring wells on the east side of the landfill (wells GA1D, GA4D, GA5D, G23D, and G24D) perpendicular to the ground-water flow direction will also be less than 300 ft (100 m) (Figure V-6-1).

It is GeoSyntec's opinion that the aforementioned monitoring points will be capable of detecting any discharges from the landfill. It should be noted that the deep aquifer is protected by a 23-ft (7.0-m) thick layer of low hydraulic conductivity clay till, the aquifer is unimpacted from landfill operations in the region, and the deep aquifer is not used for potable water supply in the south Chicago region.

The following points will be maintained as piezometers: P1D, P3D, P4D, P6D, P7D, and P13D. The piezometers will be kept in service, maintained, and used to collect water level data as part of the routine monitoring program. These piezometers could be reinstated into the monitoring program if ground-water flow directions change and the wells are once again needed to monitor upgradient or downgradient conditions. Monitoring wells GA2D and R19D will be abandoned because they will interfere with the construction of permitted cells at the 122nd Street Landfill.

One upgradient monitoring well will be used until ground-water flow directions stabilize following completion of the TARP deep tunnel system.

6.2.2 Well Construction Details

In the event that new monitoring wells are required, they will be installed under the direction of an experienced geologist or engineer, using hollow stem auger (HSA) and/or rotary drilling methods. Figure V-6-2 presents well construction details for new monitoring wells.

A boring log will be prepared by the monitoring geologist or geotechnical engineer by visually inspecting soil and rock samples retrieved during drilling. A 5-ft (1.5-m) long 2-in (50-mm) diameter stainless steel (SS) 304 pipe with a No. 10 slot (0.01 in (0.25 mm) wide) well screen and end cap will be placed at the appropriate subsurface elevation. SS-threaded flush joint riser pipes will be attached to the screened section.

The riser pipe will extend a minimum of 1.25 ft (0.38 m) above existing grade. The annular space between the well screen/casing and the drilled hole will be filled with sand filter pack (silica sand) from the bottom of the borehole to at least 1 ft (0.3 m) but no more than 2 ft (0.6 m) above the screened interval. A 2- to 3-ft (0.6- to 0.9-m) thick bentonite seal will be placed in the annulus above the sand filter pack. Volclay grout will then be placed from the top of the bentonite seal to a depth of at least 3 ft (0.9 m) below ground surface (i.e., below the frost line). The remaining annular space to the ground surface will be filled with expanding cement from a depth of 3 ft (0.9 m) to slightly above the ground surface (i.e., mounded above the ground surface). A 6-ft (1.8-m) long, 6-in. (150-mm) nominal diameter anodized aluminum or steel protective casing will be set into the concrete and a 2 ft ´ 2 ft ´ 0.5 ft (0.6 m ´ 0.6 m ´ 0.15 m) concrete pad will be constructed around the monitoring well casing. The pad will be finished with an approximate one percent slope away from the monitoring well casing to promote runoff. If appropriate and/or necessary for the respective well location, concrete-filled steel bollards will be placed in each corner of the concrete pad. The bollards will be painted to minimize the potential for damage to the monitoring well. The elevation relative to NGVD and X-Y coordinates (referenced to Illinois state plane) of the top of the casing in the installed wells will be measured by a registered land surveyor.

6.2.3 Well Development

Any new ground-water monitoring wells will be developed to ensure that representative ground-water samples are obtained. The wells will be purged by overpumping to remove suspended particulates. If necessary, a surge block will be used to assist with well development. Development water will be discharged directly to the ground surface.

6.2.4 Well Abandonment

If a well becomes damaged or otherwise unserviceable, it will be abandoned by a licensed well driller in accordance with Illinois Department of Public Health (IDPH) regulations. This abandonment procedure includes: (i) removing the concrete pad, the protective steel casing, and cutting the riser pipe at least 3 ft (0.9 m) below the ground surface; (ii) grouting the well or piezometer to the ground surface using a tremie pipe; and (iii) documenting the abandonment.

6.3 Ground-Water Sampling and Analysis Plan

6.3.1 Overview

The ground-water monitoring program for the 122nd Street Landfill includes the sampling and chemical analysis of ground water in the shallow zone and the deep aquifer, and is composed of two parts: (i) background monitoring; and (ii) detection monitoring. A brief description of the chemical constituents that will be monitored, the sampling frequency, and protocols for these two parts of the ground-water monitoring program are discussed.

6.3.2 Background Monitoring

Section 811.320 of 35 IAC states that applicable ground-water quality standards (AGQSs) for MSWLFs are the background concentrations determined for each chemical constituent, or a Board-adjusted standard. In the case of the 122nd Street Landfill, LALC has chosen to use background concentrations measured in each group of shallow wells listed in Section 6.2.1.1 (for intra-well comparison) and in the deep upgradient monitoring wells listed in Section 6.2.1.2 (for inter-well comparison) as the applicable ground water quality standards (AGQSs). AGQSs are applied to monitoring wells located on the outside edge of the zone of attenuation. Maximum allowable predicted concentrations (MAPCs) are applicable to wells within the zone of attenuation and are assumed equal to the AGQSs.

6.3.2.1 Background Monitoring in the Shallow Zone

The shallow zone surrounding this facility is highly-impacted. Roadcap and Kelley (Roadcap and Kelley, 1994) reached the following conclusions regarding this unit in the Lake Calumet area:

> *Developing a reasonably complete and coherent interpretation of the water chemistry data is probably futile due to the extreme variability observed. Clearly the intense human activity in this area has severely degraded the water quality, and there are probably innumerable sources of contamination as indicated by the data. An additional complication is that determining background ground-water quality may not be possible.*

The ground-water flow direction in the shallow zone is westward toward Lake Calumet. Consequently, the upgradient monitoring wells are GA1S, GA4S, GA5S, and RA3S and the downgradient monitoring wells are RA6S, GA7S, GA14S, and GA16S (Figure V-6-1). For calculating background, the shallow wells are divided into two groups: (i) Group 1: upgradient wells (GA1S, GA4S, GA5S, and RA3S); and (ii) Group 2: downgradient wells (RA6S, GA7S, RA14S, and RA16S).

IEPA regulations require that background monitoring be evaluated by sampling monitoring wells over a period of a year. For the shallow wells (upgradient and downgradient) listed in Section 6.2.1, background data on the routine indicator parameters TOC, alkalinity, sulfate, chloride, and TDS is available for nine years from 1988 to 1996 (Table V-6-1). Comprehensive interim background monitoring was performed for the shallow upgradient wells during November 1993, February 1994, April 1995, and July 1995 and for GA1S additionally during April 1994 and July 1994 (Table V-6-2). Hence, for the shallow upgradient wells (Group 1), data for four quarters is available for most of the constituents as shown in Table V-6-2. However, for some constituents, mainly total metals for which desolved by concentration have been established, one to four quarters of monitoring needs to be performed to establish background. The number of quarters of additional data needed for these constituents is listed in Table V-6-3.

For the shallow downgradient wells (Group 2), to establish background for IEPA List G1 constituents, four quarters of monitoring will be performed in each Group 2 well (RA6S, GA7S, RA14S, and RA16S). For IEPA List G2 constituents, monitoring will be performed for one quarter in each Group 2 well, and for three consecutive quarters in one representative well from Group 2.

Additional data required to establish background will be collected beginning with the 4th quarter 1996.

6.3.2.2 Background Monitoring in Uppermost Aquifer

Background monitoring in the deep aquifer may be conducted in two phases, interim and final, because of the fluctuating ground-water flow directions created by the TARP construction. Existing ground-water data collected from G15D will be used to evaluate background concentrations. This will remain in effect until steady-state conditions are attained and ground-water flow directions stabilize. If necessary, a new set of comprehensive background data may be collected for up to four quarters from two wells that are upgradient at the time the flow directions stabilize. The groundwater monitoring program for the deep Silurian dolomite aquifer is designed by assuming a northwest to southeast groundwater flow direction. This has been the historical flow direction for the aquifer as well as the flow directions since the first quarter of 1995. The direction of the groundwater flow over the previous four quarters will be determined annually as part of the Annual Report for the facility. If the direction of flow in the Silurian dolomite aquifer is determined to have changed so that the current monitoring program is inadequate, the deep aquifer monitoring program will be modified through the submittal of a permit modification.

For the deep wells (upgradient and downgradient) listed in Section 6.2.2, background data on the routine indicator parameters TOC, alkalinity, sulfate, chloride, and TDS are available for nine years from 1988 to 1996 (Table V-6-4). Interim comprehensive background sampling and analysis was initiated on monitoring wells GA4D, GA11D, and G13D in November 1993 and continued for two quarters. It was then determined that the ground-water flow direction had changed from northwest to southeast. This 180° change in flow direction was caused by cessation of pumping at the Chem Clear Corporation and the initiation of construction activities at a TARP pumping station to the southeast. Background data collection was discontinued in GA4D, GA11D, and G13D and replaced by four quarters of comprehensive background sampling in G15D, located at the northwest corner of the site. For the leachate constituents listed in Table V-6-5, four quarters of data from well G15D were used to calculate AGQSs and MAPCs as per instructions contained in an IEPA Document LPC-PA19. However, for the routine indicator parameters TOC, alkalinity, sulfate, chloride, and TDS, data from 1988 to 1996 were used to calculate background. If ground-water flow directions change, background will be re-evaluated using different background wells, as necessary.

Chemical constituents considered for ground-water monitoring at non-hazardous landfills are described in an IEPA document entitled *"LPC-PA2 Instructions for the Permit to Develop a Non-Hazardous Landfill"*. Appendix C to LPC-PA2, titled *"Instructions for the Groundwater Protection Evaluation for Putrescible and Chemical Waste Landfill (rev. 10/21/92)*, which presents guidelines for implementing a ground-water monitoring program, includes a list (Attachment 1) of *"Chemical Parameters Associated with Putrescible and Chemical Landfills"*. Ground-water samples collected to establish background water quality were submitted for laboratory analysis of the chemical constituents included on the Attachment 1 list of that report. Radionuclides were not analyzed per IEPA instruction. The laboratory results for the deep background wells for routine indicator parameters are summarized in Table V-6-4. The laboratory results for the comprehensive list of parameters are summarized in Table V-6-5. Table V-6-6 summarizes the analytical methods used for the comprehensive background sampling.

6.3.2.3 MAPCs AND AGQSs

MAPCs are used to establish ground-water quality criteria within the zone of attenuation. According to LPC-PA2, MAPCs "... *are projected concentrations of leachate constituents in the uppermost aquifer that, when exceeded within the zone of attenuation, indicate potential for exceedance of a ground-water quality standard at the limit of the zone of attenuation*".

At the 122nd Street Landfill, background ground-water quality data were used to establish both MAPCs and AGQSs. MAPCs are normally determined based upon constituent transport modeling conducted in the GWIA. In the case of the 122nd Street Landfill, LALC has chosen to conservatively assume that MAPCs are equal the AGQSs because of the narrow (50 ft or 15 m) zone of attenuation at the site. This approach is justified because very little constituent dilution will occur in this narrow zone. Tables V-6-3 and V-6-7 present the MAPCs and AGQSs for the two hydrogeologic zones to be monitored at the 122nd Street Landfill.

AGQSs and MAPCs for the routine indicator parameters (i.e. TDS, chloride, sulfate, alkalinity, and TOC) for the shallow upgradient wells (Group 1) are calculated for each well (for intra-well comparison) using the 1988 to 1996 data listed in Table V-6-1. For the remaining IEPA List G1 constituents, AGQSs and MAPCs are calculated for each well (for intra-well comparison) using a minimum of four quarters of data collected during the comprehensive background monitoring performed during the period from November 1993 to July 1995. The AGQSs and MAPCs for IEPA List G2 constituents are calculated by pooling the data from all Group 1 wells (Tables V-6-2 and V-6-3).

For the deep aquifer, for inter-well comparison, the AGQSs and MAPCs are calculated for the deep upgradient well G15D (Tables V-6-6 and V-6-7).

The MAPCs and AGQSs presented in Tables V-6-3 and V-6-7 were calculated using the upper 99 percent confidence limit. For constituents that were detected in some, but not in all of the ground-water samples, a concentration equal to one-half of the laboratory reporting limit (MDL) was applied in calculating the upper 99 percent confidence limit. If all the background values were less than the MDL for a given parameter, the AGQSs and

MAPCs were set equal to the Practical Quantitation Limit (PQL) as given in 35 Ill. Adm. Code Part 724 Appendix I .

The upper 99 percent confidence limit (CL) is calculated as described by the following equation:

$$CL = x + t(x)\ S(x)\ \sqrt{(1+1/n)}$$

where: x = mean of previous results; S(x) = standard deviation of previous results; t(x) = Student's t value at 99 percent confidence; and n = number of previous results. Values of the 99 percent CL for constituents detected during the comprehensive background monitoring are presented in Table V-6-3 for the shallow wells and in Table V-6-7 for the uppermost aquifer.

Ground water can be classified as either *Class I: potable resource ground water*, or *Class II: general resource ground water.* Based on the ground-water classification regulations described in Section 620 of 35 IAC, ground water within the deep aquifer monitored by the deep wells would be considered Class I, and ground water within the shallow zone monitored by the shallow wells would be considered Class II. Ground water within the shallow zone would be considered Class II ground water because water level data for the shallow wells indicate that the water table is within 10 ft (3 m) of land surface. According to Section 620.210 of 35 IAC, ground water must be deeper than 10 ft (3 m) to be considered Class I.

6.3.3 Detection Monitoring

6.3.3.1 Overview

Based upon ground-water and leachate data for the 122nd Street Landfill, the monitoring program is discussed below.

6.3.3.2 Quarterly List of Inorganic and Organic Parameters for Ground Water

The list of quarterly organic and inorganic parameters for the shallow unit and the uppermost aquifer is shown in Table V-6-8. The list consists of the IEPA's G1 list of indicator parameters minus arsenic, barium, cadmium, chromium, cyanide, lead, and zinc. Chloride will be monitored as an indicator parameter for these metals in the quarterly ground-water monitoring program. Chloride is the most mobile inorganic constituent present in the leachate at elevated concentrations. Chloride is a conservative choice because it is not appreciably affected by attenuation mechanisms such as cation exchange, absorption, or biological uptake [Bagchi, 1994]. In addition, Chloride in the leachate exceeds the background concentration in the shallow wells by factors as high as 84 and for the uppermost aquifer by a factor of 37, and Chloride in leachate occurs at more than three times the drinking water standard (Tables V-6-3 and V-6-7).

A statistically significant increase in chloride, in comparison to the background concentration in ground water, would be indicative of leachate migration from the landfill. The other metals could be reinstated into the quarterly monitoring should such an event occur. There is currently no evidence that chloride occurs at a statistically significant concentration above background in either the shallow or deep hydrostratigraphic units. The inorganics for which chloride is an indicator parameter would be evaluated in the annual ground-water monitoring. Given the fact that there are no nearby receptors and the use of the Silurian dolomite aquifer as a potable water supply has virtually ceased, annual monitoring of these metals is appropriate.

6.3.3.3 Annual List of Inorganic and Organic Parameters for Ground Water

The annual ground-water monitoring program at the 122nd Street Landfill consists of the LPC-PA2 Appendix C list (IEPA G2 list of annual parameters) minus those parameters that have not been detected in the leachate. The parameter list is shown in Table V-6-9.

6.3.3.4 Approaches to Determine Significant Changes in Ground-Water Quality

Water-quality results for the constituents monitored as part of detection monitoring will be evaluated to evaluate if increases in concentrations are apparent, in accordance with procedures described in Section 811.319(a)(4) of 35 IAC. Confirmation procedures will be instituted if the water quality results indicate the following observed increases:

- ❸ the concentration of any constituent monitored shows a progressive increase over four consecutive quarters;

- ❸ the concentration of any constituent exceeds the MAPC;

- ❸ the concentration of any constituent monitored as part of the organic chemicals monitoring program exceeds the preceding measured concentration; and

- ❸ the concentration at or beyond the zone of attenuation exceeds the AGQS.

To evaluate whether a monitored constituent displays a concentration increase, intra-well comparisons will be performed for the shallow wells listed in Section 6.2.1.1 and inter-well comparison will be performed for the deep wells listed in Section 6.2.1.2. The intra-well comparison will involve comparison of each routine monitoring result with 99 percent CLs calculated for routine constituents detected during the background monitoring period for each well. If the 99 percent CL is exceeded for four consecutive quarters, then confirmation procedures will be initiated.

If detection monitoring indicates that concentrations of chemical constituents have increased according to the criteria described in Section 811.319(a)(4) of 35 IAC, then IEPA will be notified in writing within ten days of the observed increases, and procedures to confirm the apparent concentration increases will be instituted. Confirmation procedures will involve collection of additional samples within 45 days of the initial observation in order to verify the apparent concentration increase. If the resampling confirms the initial observation of a concentration increase, the source of the confirmed increase will be determined and assessment monitoring will be initiated.

Detection monitoring will continue for a minimum of 30 years after closure of the 122nd Street Landfill according to regulations described in Section 811.319. Beginning 15 years after closure, or 5 years after all potential threats of discharges to ground water have been removed, monitoring frequency will, on a well by well basis, go to an annual schedule, assuming that one of the following conditions exist: (i) all constituents monitored within the zone of attenuation are less than or equal to 10 percent of the MAPC or are below PQL; or (ii) all constituents within the zone of attenuation are less than or equal to MAPCs for 8 consecutive quarters. Monitoring may be discontinued after 30 years for one of the following reasons: (i) no statistically significant increase in concentration is detected above that recorded during the immediately preceding scheduled sampling for 3 consecutive years, after changing to an annual monitoring program; or (ii) immediately after contaminated leachate is no longer generated by the unit.

6.4 Field and Laboratory Methods

Field and laboratory methods for the ground-water monitoring plan will be performed in accordance with a sampling and analysis plan prepared for Land and Lakes by Weston-Gulf Coast, Inc. (Weston). A copy of the sampling and analysis plan prepared by Weston was presented in Appendix V-D of Part V of the February 1995 SIGMOD.

DATE	TOC (mg/L)							
	GA1S	RA3S	GA4S	GA5S	GA6S	GA7S	GA14S	GA16S
Jan-88	260.0	100.0	300.0	380.0	11.0	22.0		
Apr-88	440.0	81.0	200.0	400.0	15.0	31.0	13.0	7.6
Jul-88	360.0	90.0	200.0	320.0	12.0	27.0	12.0	10.0
Nov-88	462.0	105.0	292.0	185.0	11.0	32.0	15.0	10.0
Feb-89	398.0	93.0	252.0	147.0	32.0	32.0	38.0	10.0
May-89	400.0	245.0	245.0	116.0	46.0	31.0	8.0	11.0
Jul-89	300.0	68.0	180.0	120.0	44.0	30.0	13.5	9.9
Oct-89	240.0	76.0	210.0	9.3	47.0	6.1	19.0	9.0
Jan-90	340.0	67.0	150.0	24.0	76.0	33.0	4.7	11.0
Apr-90	420.0	54.0	140.0	120.0	76.0	30.0	18.0	16.0
Jul-90	361.0	63.9	116.0	98.4	64.5	27.5	14.9	13.1
Oct-90	291.0	39.5	150.0	103.0	96.5	31.3	14.8	11.5
Jan-91	449.0	78.7	142.0	126.0	93.2	39.4	35.3	15.4
Apr-91	389.0	56.6	136.0	99.9	84.8	35.6	20.0	13.9
Jul-91	412.0	76.0	64.2	107.0	121.0	41.8	30.3	17.5
Oct-91	444.0	77.2	103.0	168.0	83.3	32.1	30.0	19.3
Jan-92	419.0	77.8	133.0	15.1	116.0	39.0	31.0	17.6
Apr-92	467.0	77.0	35.4	167.0	145.0	41.1	22.2	17.2
Jul-92	442.0	79.9	113.0	138.0	178.0	53.7	28.6	20.7
Oct-92	492.0	64.4	134.0	199.0	39.8	45.0	33.9	21.2
Jan-93	455.0	7.0	224	95.6	27.8	37.9	38.1	18.2
Apr-93	459.0	7.7	121	120.0	38.7	38.8	23.4	21.7
Jul-93	518	9.5	94.7	88.4	47	39.8	26.4	16.5
Nov-93	424	17.6	83.5	132.0	50.5	42.4	19.6	21.4
Feb-94	330.0	12.1	63.0	44.6	34.2	32.2	16.5	17.4
Apr-94	318	15.6	67.6	15.1	34.2	31.3	13.9	27.6
Jul-94	307	10.4	71.9	75.4	35	33.9	16.5	24.5
Oct-94	440	14.7	150	158	51.8	54.4	25.3	29.1
Jan-95	398	4.2	77.9	21.1	39	39	16.8	33.1
Apr-95	375	17.5	69.5	126	43.8	41.5	19.9	43.2
Jul-95	404	16.2	70.1	150	55.9	44	18.6	31.3
Oct-95	366	22.6	83.2	166	52.5	41.2	16.6	29
Jan-96	426	17.6	94	37.5	65	42	19.8	35
May-96	167	13.1	80	28.7	64.6	34.2	23.2	30
Jul-96	314	20.9	64.2	52.7	66	42.7	24.9	26.4
Count, N	35	35	35	35	35	35	34	34
MEAN	385.3	53.6	134.6	124.4	59.9	35.9	21.2	19.6
STDEV	76.5	46.7	68.9	92.3	37.5	8.7	8.3	8.7
99% CL (mg/L)	576	170	306	354	153	58	42	41

	ALKALINITY (mg/L)							
DATE	GA1S	RA3S	GA4S	GA5S	GA6S	GA7S	GA14S	GA16S
Jan-88	3600	1500	2700	2000	310	1000		
Apr-88	6600	1500	2600	2000	360	840	71	380
Jul-88	2240	689	1624	1060	52	299	63.5	125
Nov-88	6530	1540	3060	1775	60.4	339	59.7	180
Feb-89	4810	1640	2940	1780	1730	493	120	142
May-89	4710	2870	2870	1470	3050	478	80.2	194
Jul-89	3200	1100	2000	940	1900	310	110	150
Oct-89	4000	1200	2200	110	2300	530	300	200
Jan-90	4700	1200	2400	1100	2600	640	120	210
Apr-90	5700	1200	2200	1300	2700	330	51	70
Jul-90	5080	1230	2200	1460	2550	502	66	66
Oct-90	4630	1050	2350	1490	2830	612	142	147
Jan-91	3780	1260	2290	1420	2740	590	111	123
Apr-91	262	1020	2270	1500	2930	654	102	114
Jul-91	4790	1200	2210	1510	2950	756	103	84.7
Oct-91	5390	1260	1570	2260	3010	856	108	88.5
Jan-92	4220	1870	2170	332	3080	783	108	67.2
Apr-92	6170	1430	2320	1870	2500	613	135	66.8
Jul-92	6050	1370	2130	1740	3030	884	163	78.0
Oct-92	6090	1460	2120	946	497	851	138	88.8
Jan-93	6240	212	2810	1500	490	940	155	94.1
Apr-93	5820	181	2130	1640	473	882	127	74.5
Jul-93	5590	244	1810	1350	478	798	129	95.3
Nov-93	8890	284	1480	1660	496	914	773	182
Feb-94	4910	237	1370	208	559	795	1210	127
Apr-94	5270	264	1800	299	518	944	604	398
Jul-94	4670	140	1770	1430	505	929	234	472
Oct-94	4660	143	1710	1550	488	785	220	498
Jan-95	4690	332	1580	377	443	720	549	166
Apr-95	4890	396	1610	239	478	851	590	120
Jul-95	2140	366	1590	1650	440	644	590	352
Oct-95	4750	572	1770	1990	492	892	812	618
Jan-96	4250	374	1520	1780	427	924	965	169
May-96	1570	257	1030	255	394	664	452	249
Jul-96	3530	209	1470	377	439	931	371	450
Count, N	35	35	35	35	35	35	34	34
MEAN	4697.8	908.6	2047.8	1267.7	1380.0	713.5	292.1	195.3
STDEV	1586.7	643.8	490.5	619.4	1160.1	203.7	297.1	145.6
99% CL	8652	2513	3270	2811	4271	1221	1033	558

	SULFATE (mg/L)							
DATE	GA1S	RA3S	GA4S	GA5S	GA6S	GA7S	GA14S	GA16S
Jan-88	160.0	29.0	1100.0	1200.0	410.0	310.0	120.0	790.0
Apr-88	10.0 u	10.0 u	240.0	130.0	170.0	180.0	140.0	430.0
Jul-88	101.0	23.4	296.0	1960.0	216.0	122.0	85.4	452.0
Nov-88	99.8	26.1	72.2	1870.0	245.0	101.0	91.9	395.0
Feb-89	107.0	21.3	107.0	2030.0	14.1	100.0	125.0	349.0
May-89	100.0	61.5	61.5	923.0	5.0 u	104.0	139.0	370.0
Jul-89	10.0 u	70.0	120.0	2660.0	5.0 u	100.0	137.0	410.0
Oct-89	10.0 u	28.0	220.0	1990.0	5.0 u	77.0	38.0	390.0
Jan-90	10.0 u	48.0	75.0	2600.0	5.0 u	48.0	1100.0	390.0
Apr-90	15.0	53.0	230.0	2450.0	5.0 u	94.0	240.0	440.0
Jul-90	10.0 u	24.8	132.0	1900.0	5.0 u	64.6	130.0	408.0
Oct-90	5.0 u	30.7	110.0	2220.0	5.0 u	92.0	161.0	302.0
Jan-91	10.0 u	14.7	145.0	1660.0	5.0 u	46.4	53.6	284.0
Apr-91	5.0	116.0	124.0	762.0	5.0 u	41.2	73.0	286.0
Jul-91	30.7	92.8	200.0	859.0	5.0 u	32.4	33.0	429.0
Oct-91	25.0 u	59.9	166.0	1310.0	5.0 u	9.8	118.0	669.0
Jan-92	10.0 u	40.5	138.0	1250.0	24.4	35.4	158.0	810.0
Apr-92	5.0	5.0 u	139.0	2700.0	5.0 u	5.0 u	151.0	411.0
Jul-92	5.7	30.1	166.0	453.0	5.0 u	7.0	77.9	410.0
Oct-92	25.0	20.2	242.0	1020.0	47.0	20.7	181.0	694.0
Jan-93	25.0 u	346.0	270	496.0	153.0	18.6	104.0	676.0
Apr-93	100.0 u	435.0	177	360.0	132.0	19.3	102.0	616.0
Jul-93	25.0 u	790.0	347	146.0	58.8	17.3	89.4	571
Nov-93	25.0 u	600.0	459.0	135.0	40.2	18.7	522	167.0
Feb-94	25.0 u	613.0	452.0	89.4	45.3	26.8	370	275.0
Apr-94	10.0 u	840	325	1220	75.8	14.7	537	53.8
Jul-94	10.0 u	956	674	120	89.4	16.2	141	19.8
Oct-94	10.0 u	1050	124	67.9	55	26.5	110	80.7
Jan-95	25.0 u	145	187	531	117	34.2	763	391
Apr-95	10.0 u	95.8	482	90.7	114	10.8	729	502
Jul-95	10.0 u	112	197	72.4	12.7	8.9	587	152
Oct-95	10.0 u	46.7	123	5.0 u	19.3	8.3	369	58.9
Jan-96	10.0 u	104	181	10.0 u	59.3	10.1	516	370
May-96	1210	223	18.6	1300	83.8	27.1	1090	72
Jul-96	110	371	200	967	48.7	5.7	1160	28.8
Count, N	35	35	35	35	35	35	35	35
MEAN	62.0	215.0	237.2	1072.9	64.7	52.9	301.2	375.8
STDEV	204.0	300.2	202.6	883.8	88.3	61.5	321.0	212.0
99% CL	570	963	742	3275	285	206	1101	904

Note: "10.0 u" denotes a non-detect having MDL of 10

	CHLORIDE (mg/L)							
DATE	GA1S	RA3S	GA4S	GA5S	GA6S	GA7S	GA14S	GA16S
Jan-88	1400.0	550.0	390.0	1200.0	270.0	220.0	970.0	200.0
Apr-88	3000.0	550.0	360.0	130.0	400.0	260.0	920.0	190.0
Jul-88	2160.0	522.0	365.0	1960.0	343.0	361.0	930.0	229.0
Nov-88	2200.0	481.0	335.0	1870.0	227.0	315.0	55.4	104.0
Feb-89	2380.0	472.0	212.0	2030.0	493.0	319.0	584.0	179.0
May-89	2470.0	288.0	288.0	923.0	741.0	396.0	1150.0	221.0
Jul-89	1990.0	500.0	250.0	2660.0	600.0	370.0	946.0	170.0
Oct-89	2140.0	510.0	240.0	1990.0	710.0	400.0	1160.0	220.0
Jan-90	33.0	490.0	25.0	2600.0	1080.0	20.0	330.0	370.0
Apr-90	3310.0	440.0	250.0	2450.0	770.0	360.0	1030.0	670.0
Jul-90	3500.0	440.0	300.0	1900.0	800.0	360.0	1200.0	630.0
Oct-90	2900.0	360.0	320.0	2220.0	980.0	350.0	1100.0	420.0
Jan-91	420.0	480.0	280.0	1660.0	990.0	350.0	1200.0	420.0
Apr-91	55.0	390.0	340.0	762.0	780.0	380.0	1100.0	480.0
Jul-91	2500.0	530.0	370.0	859.0	26.0	350.0	1200.0	570.0
Oct-91	3900.0	460.0	360.0	1310.0	1200.0	400.0	1200.0	430.0
Jan-92	2300.0	470.0	330.0	1250.0	1000.0	350.0	1000.0	370.0
Apr-92	3500.0	520.0	350.0	2700.0	960.0	340.0	960.0	430.0
Jul-92	3200.0	530.0	350.0	453.0	440.0	55.0	910.0	510.0
Oct-92	2200.0	490.0	370.0	1020.0	270.0	340.0	750.0	400.0
Jan-93	3700.0	91.0	200	496.0	520.0	390	770.0	410.0
Apr-93	4300.0	110.0	230	360.0	540.0	360	820.0	420.0
Jul-93	4200	190.0	210	146.0	550	340.0	790	420
Nov-93	3600	230.0	240.0	135.0	710	370.0	240	420.0
Feb-94	3930.0	231.0	273.0	89.4	615	282.0	367	1230.0
Apr-94	3830	358	343	248	662	347	361	391
Jul-94	3880	216	349	510	569	357	748	364
Oct-94	3480	340	314	812	703	362	533	446
Jan-95	3090	88.9	400	205	763	358	395	450
Apr-95	3810	101	278	758	602	319	392	362
Jul-95	3510	108	757	822	706	381	582	395
Oct-95	3770	151	312	862	706	386	604	339
Jan-96	3510	106	284	847	847	414	666	457
May-96	2080	59.5	223	136	849	298	551	426
Jul-96	3000	105	235	146	754	373	511	402
Count, N	35	35	35	35	35	35	35	35
MEAN	2835.7	341.7	306.7	1100.6	662.2	332.4	772.2	404.1
STDEV	1105.0	172.7	107.2	836.6	256.7	83.8	317.7	191.7
99% CL	5589	772	574	3185	1302	541	1564	882

	TDS/ROE (mg/L)							
DATE	GA1S	RA3S	GA4S	GA5S	GA6S	GA7S	GA14S	GA16S
Jan-88	4600	2100	4400	5600	1400	1400	2000	1700
Apr-88	8000	2000	3400	5100	950	1200	1900	1300
Jul-88	5990	1990	3270	6250	970	1030	1910	1220
Nov-88	6910	2056	3199	4878	988	1089	1921	1109
Feb-89	6721	2096	2988	4731	2698	1109	1922	1064
May-89	6297	3390	3390	3394	3793	1149	2012	1171
Jul-89	5800	2000	3100	6000	3600	1800	1800	1120
Oct-89	5900	2100	3300	4700	3700	1360	2100	990
Jan-90	6800	1900	2600	5600	4000	1300	2100	1200
Apr-90	8100	1800	2800	5800	4000	1100	2200	1800
Jul-90	8400	1850	2600	5100	4100	1100	2300	1900
Oct-90	7280	1530	2730	5080	4390	1270	2240	1370
Jan-91	8760	1850	2720	4940	4350	1260	2180	1350
Apr-91	30	1780	2690	4050	4440	1270	2270	1390
Jul-91	6890	1930	2550	3400	4810	1330	2190	1700
Oct-91	980	1950	2620	5700	4620	1370	2270	1790
Jan-92	6750	1960	252	4610	4750	1300	2110	2030
Apr-92	6170	2160	2680	7280	4620	1360	634	1570
Jul-92	9170	2060	2510	4280	5160	1510	1850	1890
Oct-92	8980	2030	2600	5120	1580	1450	1740	1870
Jan-93	8480	346	3490	1910	1420	1430	1710	1680
Apr-93	9260	970	2660	3350	1560	1360	1760	1720
Jul-93	9600	1620	2480	2370	1640	1390	1690	1680
Nov-93	11500	1580	2310	2720	1730	337	2140	958
Feb-94	8200	1570	2340	1650	1730	1350	2390	958
Apr-94	8280	1980	1100	2530	1710	1450	2030	1070
Jul-94	7980	1900	2200	2390	1600	1480	1710	1250
Oct-94	8760	2180	2320	1500	1750	1390	1870	1300
Jan-95	7550	680	2120	1380	1670	1230	2190	1400
Apr-95	8400	730	2100	72.4	1670	1550	2290	1480
Jul-95	8400	400	2200	3000	1760	1400	2150	1290
Oct-95	6960	763	2200	2980	1780	1450	2370	1270
Jan-96	4090	722	2200	1580	1870	1370	2670	1260
May-96	6210	818	2210	2450	2110	1270	2870	1040
Jul-96	7240	1020	1790	2110	2190	1350	23000	1170
Count, N	35	35	35	35	35	35	35	35
MEAN	7126.8	1651.7	2574.8	3817.3	2717.4	1301.8	2642.5	1401.7
STDEV	2208.7	639.5	707.3	1718.2	1384.1	226.2	3560.4	308.7
99% CL	12631	3245	4337	8099	6166	1865	11515	2171

TABLE V-6-2

BACKGROUND GROUND-WATER QUALITY FOR SHALLOW MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA1S Nov-93 ug/l	GA1S Feb-94 ug/l	GA1S Apr-94 ug/l	GA1S Jul-94 ug/l	GA1S Apr-95 ug/l	GA1S Jul-95 ug/l	GA4S Nov-93 ug/l	GA4S Feb-94 ug/l	GA4S Apr-95 ug/l	GA4S Jul-95 ug/l	GA3S Nov-93 ug/l	GA3S Feb-94 ug/l	GA3S Apr-95 ug/l	GA3S Jul-95 ug/l	GA5S Nov-93 ug/l	GA5S Feb-94 ug/l	GA5S Apr-95 ug/l	GA5S Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
1,1,1,2-tetrachloroethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,1,1-trichloroethane		<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	0.9	<5	<0.5	<0.5	5	<5	200	1000
1,1,2,2-tetrachloroethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,1,2-trichloroethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,1-dichloroethane		2	<5	<5	<12	<0.5	4	12	0.6	5	<5	<0.5	<0.5	<0.5	<5	10	8	10	<5		
1,1-dichloroethene		<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	3	<5	7	35
1,1-dichloropropene	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,2,3-trichlorobenzene	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,2,3-trichloropropane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,2,4-trichlorobenzene	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,2,4-trimethylbenzene		130	74	84	85	62	75	9	0.6	11	18	0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,2-dibromo-3-chloropropane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,2-dichloroethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	5	25
1,2-dichloropropane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	5	25
1,3,5-trimethylbenzene		17	20	21	20	15	18	<5	<0.5	2	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,3-dichloropropane	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
1,4-dichloro-2-butene	x	<3	<30	<30		<3	<6	<3	<3	<3	<30	<3	<3	<3	<30	<3	<3	<3	<30		
2,2-dichloropropane	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
2,4,5-TP (Silvex)	x	<0.05		<0.05		<0.5	<0.05	<0.04		<0.05	<0.05	<0.05		<0.05	<0.05	<0.05		<0.5	<0.05	50	250
2,4-D	x	<0.1		<0.1		<10	<10	<0.1		<10	<10	<0.1		<10	<10	<0.1		<10	<10	70	350
2-butanone (methyl ethyl ketone	x	<2	<20	<20		<2	<4	<20	<2	<2	<20	<2	<2	<2	<20	<2	<2	<2	<20		
2-hexanone		<2	<20	<20		<2	<4	<20	<2	<2	46	<2	<2	<2	<20	<2	<2	<2	<20		
4-methyl-2-pentanone (MIBK)		2	<20	<20		<2	<4	<20	<2	<2	<20	<2	<2	<2	<20	<2	<2	<2	<20		
BOD		21000	55000	110000	66000	69000	68000	450000	31000	150000	35000	2000	7000	62000	11000	30000	23000	62000	43000		
DDT	x	<0.94	<1	<0.099	<0.087	<9.3	<10	<1	<1	<9.9	<10	<0.1	<0.01	<9.9	<10	<0.093	<0.96	<9.6	<10		
TDS		9800000	8155000	7900000	8000000	8400000	8400000	2155000	2370000	2100000	2200000	1490000	1535000	730000	400000	2810000	1625000	2900000	3000000	1200000	1200000
TOC		417000	330000	298000	297000	375000	404000	82550	61200	69500	70100	17500	11950	16000	16200	132000	44500	126000	150000		
TOC Test 2				318000	307000	392000	402000			60900	70600			15600	16700			132000	148000		
acetone		12	25	24		<2	<4	<20	<2	<2	70	3	2	<2	57	57	7	<2	<20		
acrolein	x	<160	<1600	<1600		<160	<100	<1600	<160	<160	<1600	<160	<160	<160	<1600	<160	<160	<160	<1600		
acrylonitrile	x	<20	<200	<200		<50	<100	<200	<20	<50	<500	<20	<20	<50	<500	<20	<20	<50	<500		
alachlor	x	<0.94	<1	<0.099	<0.087	<0.19	<2	<1	<1	<0.2	<2	<0.1	<0.1	<0.19	<2	<0.093	<0.96	<0.2	<2	2	10

NOTES:
ND=Not Detected in Any Samples Collected
<# Indicates Less than Detection Limit

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TABLE V-6-2 (continued)
BACKGROUND GROUND-WATER QUALITY FOR SHALLOW MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA1S Nov-93 ug/l	GA1S Feb-94 ug/l	GA1S Apr-94 ug/l	GA1S Jul-94 ug/l	GA1S Apr-95 ug/l	GA1S Jul-95 ug/l	GA4S Nov-93 ug/l	GA4S Feb-94 ug/l	GA4S Apr-95 ug/l	GA4S Jul-95 ug/l	GA3S Nov-93 ug/l	GA3S Feb-94 ug/l	GA3S Apr-95 ug/l	GA3S Jul-95 ug/l	GA5S Nov-93 ug/l	GA5S Feb-94 ug/l	GA5S Apr-95 ug/l	GA5S Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
aldicarb	x	<0.5		<0.5		<5.0	<2.5	<0.5		<5.0	<2.5	<0.5		<5.0	<0.5	<0.5		<5.0	<2.5	3	15
aldrin	x	<0.47	<0.5	<0.05	<0.044	<0.093	<0.1	<0.51	<0.52	<0.099	<0.1	<0.05	<0.052	<0.099	<0.1	<0.046	<0.48	<0.096	<0.1		
alkalinity		889000	4900000	5270000	4670000	4890000	2140000	1480000	1540000	1610000	1590000	284000	253000	396000	366000	1660000	1010000	239000	1650000		
aluminum, dissolved	x	<200	250	<200	<200			<200	<200			<200	<200			<200	<200				
aluminum, total			2200			280	410		5700	2900	6600		17100	2300	5100		9200	4000	2500		
ammonia (as N)		881000	731000	844000	778000	804000	62800	54200	73400	83900	611000	28900	18400	15500	16300	64700	35300	78200	59800		
antimony, dissolved	x	<100	<100		<100			<100	<100			<100	<100			<100	<100				
antimony,total	x					<100	<100	<100		<100	<100	<100		<100	<100	<100		<100	<100		
arsenic, dissolved		6.7	<10	11	8.1			4	<10			2.3	4.8			<2	7.6				
arsenic, total		13	22	12	15	13	13	7.5		<2	<4	7.4	19	5.6	<4	3.5		14	11	50	200
atrazine	x	<9.4	<10	<0.99	<0.87	<0.19	<2	<10	<10	<0.2	<2	<1	<1	<0.2	<2	<0.93	<9.6	<0.2	<2	3	15
barium, dissolved		430	440	470	580			460	300			110	110			730	530				
barium, total		560				540	550	1900	850	580	840	150		260	180	710		790	800	2	2
benzene		290	160	180	160	200	170	<0.5	800	610	640	7	5	16	180	13	13		11	5	25
beryllium, dissolved	x	<5	<5		<5			<5	<5			<5	<5			<5	<5				
beryllium, total	x	<5				<5	<5	<5		<5	<5	<5		<5	<5	<5		<5	<5		
bis (chloromethyl) ether	x	<2000	<20000	<20000		<2000	<4000	<20000	<2000	<2000	<20000	<2000	<2000	<2000	<20000	<2000	<2000	<2000	<20000		
bis(2-ethylhexyl) phthalate		<10	3	<50	<10	<10	0.9	<10	26	<10	<10	<10	<10	3	20	<10	<10	2	<10		
boron, dissolved		6600	6300	6700	6200			5000	4200			820	770			4500	2700				
boron, total			6700			5900	5500			3200	3000		800	810	120		2500	4500	4400	2000	2000
bromobenzene	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
bromochloromethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
bromodichloromethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
bromoform	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
bromomethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
cadmium, dissolved	x	<10	<10	<10	<10			<10	<10			<10	<10			<10	<10				
cadmium, total	x					<10	<10	<10		<10	<10	<10		<10	<10	<10		<10	<10	5	50
calcium, dissolved		48800	51900	51500	45800			194000	222000			205000	226000			167000	216000				
calcium,total		48800	63100			42900	45400		220000	211000	217000		298000	116000	90500		228000	191000	166000		
carbofuran	x	<0.9		<0.9		<9.0	<4.5	<0.9		<9.0	<4.5			<9.0	<0.9	<0.9		<20	<4.5	40	200
carbon disulfide	x	<2	<20	<20		<2	<4	<20	<2	<2	<20	<2	<2	<2	<20	<2	<2	<2	<20		
carbon tetrachloride	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	5	25
chemical oxygen demand		1300000	1300000	1400000	1200000	1500000	1200000	280000	270000	320000	260000	56000	46000	43000	48000	340000	150000	390000	430000		
chlordane	x	<4.7	<5	<0.5	<0.44	<0.13	<0.14	<5.1	<5.2	<0.14	<0.14	<0.5	<0.52	<0.14	<0.14	<0.46	<4.8	<0.13	<0.14	2	10
chloride		3600000	3930000	3830000	3880000	3810000	3510000	240000	273000	278000	757000	230000	231000	101000	108000	430000	261000	758000	822000	200000	200000
chlorobenzene		1	<5	<5	<12	1	<1	<0.5	1	4	<5	<0.5	<0.5	0.8	<5	1	1	0.8	<5	100	500

NOTES:
ND=Not Detected in Any Samples Collected
<# Indicates Less than Detection Limit

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TABLE V-6-2 *(continued)*

BACKGROUND GROUND-WATER QUALITY FOR SHALLOW MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA1S Nov-93 ug/l	GA1S Feb-94 ug/l	GA1S Apr-94 ug/l	GA1S Jul-94 ug/l	GA1S Apr-95 ug/l	GA1S Jul-95 ug/l	GA4S Nov-93 ug/l	GA4S Feb-94 ug/l	GA4S Apr-95 ug/l	GA4S Jul-95 ug/l	GA3S Nov-93 ug/l	GA3S Feb-94 ug/l	GA3S Apr-95 ug/l	GA3S Jul-95 ug/l	GA5S Nov-93 ug/l	GA5S Feb-94 ug/l	GA5S Apr-95 ug/l	GA5S Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
manganese, dissolved		15		20	18			*810*	*1100*			*420*				*200*	*320*				
manganese, total		64	38	25	58	19	35	1000		820	1200	790	340	370	180	260		540	520	150	10000
mercury, dissolved		<0.2	<0.2	0.31	1.1			<0.2				<0.2				<0.2	<0.25				
mercury, total			<0.27			<0.2	<0.2		0.61	<0.2	<0.2		<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	2	10
methoxychlor	x	<4.7	<5	<0.5	<0.44	<0.46	<0.5	<5.1	<5.2	<0.5	<0.5	<0.5	<0.52	<0.5	<0.5	<0.46	<4.8	<0.48	<0.5	40	200
methylene chloride		0.6	<5	<5	<12	1	<1	13	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
n-butylbenzene		3	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	2	5	<0.5	<5		
n-propylbenzene		8	8	<5	<12	6	8	<5	<0.5	4	7	<0.5	<0.5	<0.5	<5	7	23	<0.5	27		
naphthalene		11.5	13.5	14	10	15	26	<7.5	15	20	54	6	<5.25	<0.5	<5	<5.25	17	11	14		
nickel, dissolved		190	170	190	150			<20	<20			<20	<20			100	53				
nickel, total		160				170	160	47		31	50	27		<20	<20	130		110	110	100	2000
nitrate	x	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	10000	100000
o-chlorotoluene	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5			
o-dichlorobenzene		2	<5	<5	<12	2	2	<5	<0.5	4	<5	2	<0.5	2	<5	<0.5	2	1	<5		
oil (hexane soluble or equivalent)		181000	<6600	<5300	<5800	<5600	6300	8900	10100	<5400	13400	<5800	<6600	<5100	<5800	<5900	<6200	<5300	7000		
p-chlorotoluene	x	<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
p-dichlorobenzene		4	<5	<5	<12	5	5	<5	<0.5	0.8	<5	0.7	<0.5	1	<5	1	1	0.8	<5	75	375
p-isopropyltoluene (Cymene)		12	14	13	13	11	13	<5	<0.5	1	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
pH		7.5	7.22	7.69	7.72	7.7	7.57	6.81	6.75	6.84	6.81	7.33	7.67	7.97	7.87	7.14	7.13	7.08	7.18		
parathion	x	<1.6	<1.5	<1.7	<1.4		<1.9	<1.7	<1.5		<2.2	<2	<1.5		<2.2	<1.5	<1.5	<2.3			
pentachlorophenol	*x*	*<0.04*		*<0.04*	*<50*	*<1*	*<1*	*<0.04*		*<1*	*<1*	*<0.04*		*<1*	*<1*	*<0.04*		*<1*	*<1*	*1*	*5*
phenol		67	56	<50	1	<10		120	65	<10		7	8.2	<10		29	13	<10		100	100
polychloridated biphenyls (PCBs	x	<9.4	<10	<0.5	<0.47	<0.93	<1	<10	<10	<0.99	<1	<1	<1	<0.99	<1	<0.93	<9.6	<0.96	<1	5	25
potassium, dissolved		586000	561000		550000			102000	91400			38800				141000	72000				
potassium, total			586000			561000	593000		93300	79500	72600		41800	28000	24600		68100	134000	142000		
sec-butylbenzene		3	<5	<5	<12	2	3	<5	<0.5	1	<5	<0.5	<0.5	<0.5	<5	2	4	<0.5	<5		
selenium, dissolved	x	<10	<10	<10	<10			<8	<10			<0.2	<10			<2	<2				
selenium, total	x	<2				<10	<10	<2		<2	<10	<2	<2	<2	<10	<2		<2	<10	50	50
silver, dissolved	x	<30	<30	<10	<10			<30	<30			<30	<30			<30	<30				
silver, total	x	<30				<10	<10	<30		<10	<10	<30		<10	<10	<30		<10	<10	50	
sodium, dissolved		2290000	2170000		2320000			266000	243000			178000	172000			539000	233000				
sodium, total			2310000			1060000	2050000		235000	232000	232000		168000	85700	75600		244000	587000	600000		
styrene		<0.5	<5	<5	<12	2	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	100	500
sulfate		<25000	<25000	<10000	<10000	<10000	<10000	459000	452000	482000	197000	600000	613000	95800	112000	135000	89400	90700	72400	400000	400000
tert-butylbenzene		<0.5	<5	<5	<12	<0.5	<1	<5	<0.5	0.7	<5	<0.5	<0.5	<0.5	<5	0.6	1	0.6	<5		
tetrachloroethylene		<0.5	<5	<5	<12	<0.5	<1	<0.5	0.6	1	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	1	<5	5	25
tetrahydrofuran		560	520	380		480	740	<1000	<100	<100	<1000	2200	930	<100	<1000	560	75	170	<1000		

NOTES:
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TABLE V-6-2 (continued)

BACKGROUND GROUND-WATER QUALITY FOR SHALLOW MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA1S	GA1S	GA1S	GA1S	GA1S	GA1S	GA4S	GA4S	GA4S	GA4S	GA3S	GA3S	GA3S	GA3S	GA5S	GA5S	GA5S	GA5S	35 IAC 620 STDS	
		Nov-93	Feb-94	Apr-94	Jul-94	Apr-95	Jul-95	Nov-93	Feb-94	Apr-95	Jul-95	Nov-93	Feb-94	Apr-95	Jul-95	Nov-93	Feb-94	Apr-95	Jul-95	Class I	Class II
		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
thallium, dissolved	x	<20	<2		<2			<10	<2			<20	<2			<10	<2				
thallium, total	x	<2				<2	<2	<10		<2	<2	<2		<2	<2	<2		<2	<2		
toluene		19	28	23	17	23	21	<0.5	1600	1200	1900	0.8	<0.5	<0.5	<5	<0.5	<0.5	3	<5	1000	2500
toxaphene	x	<9.4	<10	<0.99	<0.87	<1.9	<2	<10	<10	<2	<2	<1	<1	<2	<2	<0.93	<9.6	<1.9	<2	3	15
trans-1,2-dichloroethene		0.7	<5	<5	<12	<0.5	1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	100	500
trans-1,3-dichloropropene	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
trichloroethylene		<0.5	<5	<5	<12	<0.5	<1	25	1	5	6	<0.5	<0.5	<0.5	<5	<0.5	<0.5	1	<5	5	25
trichlorofluoromethane	x	<0.5	<5	<5	<12	<0.5	<1	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5		
vanadium, dissolved		30	28		28			<10	<10			<10	<10			18	<10				
vanadium, total		28				30	25	19	<10	<10	19	24		<10	<10	23		34	28		
vinyl acetate	x	<2	<20	<20		<2	<4	<20	<2	<2	<20	<2	<2	<2	<20	<2	<2	<2	<20		
vinyl chloride		<0.5	<5	<5	<12	<0.5	<1	26	3	12	16	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<5	2	10
xylenes		710	500	440	450	270	310	108	6	32	39	2.7	<0.5	<0.5	<5	<0.5	0.6	<0.5	<5	10000	10000
zinc, dissolved		<10	14	<10	<10			14	11			<10	<10			<10	<10				
zinc, total		64				21	28	750	220	200	530	73		100	30	310	1600	520	400	5000	10000

NOTES:
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<# Indicates Less than Detection Limit

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Table V-6-3. 122nd Street La AGQSs and MAPCs for
Shallow Zone (L, _ adient Wells)

PARAMETER	ND GW	ND LC	UNITS	PQL	35 IAC 620 STDS		Co	MPC	99% CL = AGQS = MAPC			
					Class I	Class II			GA1S	GA4S	GA3S	GA5S
1,1,1,2-tetrachloroethane	x	x	ug/L	5					5	5	5	5
1,1,1-trichloroethane		x	ug/L	5	200	1000			6	6	6	6
1,1,2,2-tetrachloroethane	x	x	ug/L	5					5	5	5	5
1,1,2-trichloroethane	x	x	ug/L	5					5	5	5	5
1,1-dichloroethane			ug/L	5			2.6	2.6E-06	12	12	12	12
1,1-dichloroethene		x	ug/L	5	7	35			6	6	6	6
1,1-dichloropropene	x	x	ug/L	5					5	5	5	5
1,2,3-trichlorobenzene	x	x	ug/L	5					5	5	5	5
1,2,3-trichloropropane	x	x	ug/L	5					5	5	5	5
1,2,4-trichlorobenzene	x		ug/L	5			52	5.2E-05	5	5	5	5
1,2,4-trimethylbenzene		x	ug/L	5					141	141	141	141
1,2-dibromo-3-chloropropane	x	x	ug/L	5					5	5	5	5
1,2-dichloroethane	x	x	ug/L	5	5	25			5	5	5	5
1,2-dichloropropane	x	x	ug/L	5	5	25			5	5	5	5
1,3,5-trimethylbenzene			ug/L	5			12	1.2E-05	29	29	29	29
1,3-dichloropropane	x	x	ug/L	5					5	5	5	5
1,4-dichloro-2-butene	x	x	ug/L	5					5	5	5	5
2,2-dichloropropane	x	x	ug/L	5					5	5	5	5
2,4,5-TP (Silvex)	x		ug/L	2	50	250	0.18	1.8E-07	2	2	2	2
2,4-D	x	x	ug/L	10	70	350			10	10	10	10
2-butanone (methylethylketone)	x		ug/L	10			44	4.4E-05	10	10	10	10
2-hexanone		x	ug/L	50					36	36	36	36
4-methyl-2-pentanone (MIBK)			ug/L	10			14	1.4E-05	10	10	10	10
BOD			ug/L				2000	2.0E-03	168746	1244644	162202	126503
DDT	x	x	ug/L	10					10	10	10	10
TDS**			ug/L		1200000	1200000	16063333	1.6E+01	12630590	4337294	3245271	8098810
TOC			ug/L				832400	8.3E-01	575910	306359	169922	354361
acetone			ug/L	10			51	5.1E-05	77	77	77	77
acrolein	x	x	ug/L	100					100	100	100	100
acrylonitrile	x	x	ug/L	100					100	100	100	100
alachlor	x	x	ug/L		2	10			10*	10*	10*	10*
aldicarb	x	x	ug/L		3	15			12.5*	12.5*	12.5*	12.5*
aldrin	x	x	ug/L						0.5*	0.5*	0.5*	0.5*
alkalinity			ug/L				5125000	5.1E+00	8651629	3270198	2512876	2811235
aluminum, dissolved	x		ug/L						265	265	265	265
aluminum, total			ug/L				337	3.4E-04	17989	17989	17989	17989
ammonia (as N), dissolved**			ug/L				605333	6.1E-01	1804605	1579102	51278	150436
ammonia (as N), total			ug/L						4Q	4Q	4Q	4Q

PARAMETER	ND GW	ND LC	UNITS	PQL	35 IAC 620 STDS		Co	MPC	99% CL = AGQS = MAPC			
					Class I	Class II			GA1S	GA4S	GA3S	GA5S
antimony,total	x	x	ug/L	30					30	30	30	30
arsenic, dissolved**			ug/L						21	**2Q**	**2Q**	**2Q**
arsenic, total			ug/L	10	50	200	24	2.4E-05	27	27	27	27
atrazine	x	x	ug/L		3	15			10*	10*	10*	10*
barium, dissolved			ug/L						995	995	995	995
barium, total			ug/L	0.02	2	2	638	6.4E-04	1898	1898	1898	1898
benzene			ug/L	5	5	25	17	1.7E-05	864	864	864	864
beryllium, total	x		ug/L	3					3	3	3	3
bis (chloromethyl) ether	x	x	ug/L	1000					1000	1000	1000	1000
bis(2-ethylhexyl) phthalate			ug/L	10			71	7.1E-05	28	28	28	28
boron, dissolved**			ug/L						7659	**2Q**	**2Q**	**2Q**
boron, total			ug/L		2	2	12062	1.2E-02	9793	9793	9793	9793
bromobenzene	x	x	ug/L	5					5	5	5	5
bromochloromethane	x	x	ug/L	5					5	5	5	5
bromodichloromethane	x	x	ug/L	5					5	5	5	5
bromoform	x	x	ug/L	5					5	5	5	5
bromomethane	x	x	ug/L	10					10	10	10	10
cadmium, dissolved**	x		ug/L						50*	**2Q**	**2Q**	**2Q**
cadmium, total	x		ug/L	1	5	50	11	1.1E-05	1	1	1	1
calcium, dissolved			ug/L						385325	385325	385325	385325
calcium,total			ug/L				134500	1.3E-01	387205	387205	387205	387205
carbofuran	x	x	ug/L	10	40	200			10	10	10	10
carbon disulfide	x	x	ug/L	100					100	100	100	100
carbon tetrachloride	x	x	ug/L	5	5	25			5	5	5	5
chemical oxygen demand			ug/L				3033333	3.0E+00	2031431	2031431	2031431	2031431
chlordane	x	x	ug/L	10	2	10			10	10	10	10
chloride, dissolved**			ug/L				6433400	6.4E+00	5589200	573904	772125	3185261
chloride, total			ug/L		200000	200000			**4Q**	**4Q**	**4Q**	**4Q**
chlorobenzene			ug/L	5	100	500	20	2.0E-05	6	6	6	6
chlorodibromomethane	x	x	ug/L	5					5	5	5	5
chloroethane			ug/L	5			12	1.2E-05	32	32	32	32
chloroform	x	x	ug/L	5					5	5	5	5
chloromethane	x	x	ug/L	10					10	10	10	10
chromium, dissolved			ug/L						133	133	133	133
chromium, total			ug/L	10	100	100	191	1.9E-04	126	126	126	126
cis-1,2-dichloroethene			ug/L	5	70	200	2.7	2.7E-06	10	10	10	10
cis-1,3-dichloropropene	x	x	ug/L	5					5	5	5	5
cobalt, dissolved			ug/L						28	28	28	28

Table V-6-3. 122nd Street La AGQSs and MAPCs for Shallow Zone (Upgradient Wells)

PARAMETER	ND GW	ND LC	UNITS	PQL	35 IAC 620 STDS Class I	35 IAC 620 STDS Class II	Co	MPC	99% CL = AGQS = MAPC GA1S	GA4S	GA3S	GA5S
cobalt, total			ug/L	10	1000	1000	14	1.4E-05	18	18	18	18
copper, total			ug/L	10	650	650	65	6.5E-05	96	96	96	96
cyanide, total**			ug/L	200	200	600	26	2.6E-05	40	19	129	12
di-n-butyl phthalate	x	x	ug/L	10					10	10	10	10
dibromomethane	x	x	ug/L	5					5	5	5	5
dichlorodifluoromethane	x	x	ug/L	5					5	5	5	5
dieldrin	x	x	ug/L	10					10	10	10	10
diethyl phthalate		x	ug/L	10					19	19	19	19
dimethyl phthalate	x	x	ug/L	10					10	10	10	10
endrin	x	x	ug/L	20					20	20	20	20
ethylbenzene		x	ug/L	5	700	1000			200	200	200	200
ethylene dibromide (EDB)	x	x	ug/L	5					5	5	5	5
fluoride			ug/L		4000	4000	4550	4.6E-03	2332	2332	2332	2332
heptachlor	x	x	ug/L	10	0.4	2			10	10	10	10
heptachlor epoxide	x	x	ug/L	10	0.2	1			10	10	10	10
hexachlorobutadiene	x	x	ug/L	10					10	10	10	10
iodomethane	x	x	ug/L	5					5	5	5	5
iron, dissolved**			ug/L						12064	**2Q**	**2Q**	**2Q**
iron, total			ug/L		5000	5000	3933	3.9E-03	167105	167105	167105	167105
isophorone	x	x	ug/L	10					10	10	10	10
isopropylbenzene (Cumene)			ug/L	5			5.5	5.5E-06	22	22	22	22
lead, dissolved**			ug/L						**1Q**	**2Q**	**2Q**	**2Q**
lead, total			ug/L	2	7.5	100	91	9.1E-05	407	407	407	407
lindane		x	ug/L	10	0.2	1			0.3	0.3	0.3	0.3
m-dichlorobenzene	x	x	ug/L	5					5	5	5	5
magnesium, dissolved			ug/L						298346	298346	298346	298346
magnesium, total			ug/L				455500	4.6E-01	299023	299023	299023	299023
manganese, dissolved**			ug/L						292684	**2Q**	**2Q**	**2Q**
manganese, total			ug/L		150	10000	537	5.4E-04	1422	1422	1422	1422
mercury, dissolved			ug/L						1	1	1	1
mercury, total		x	ug/L	2	2	10			1	1	1	1
methoxychlor	x	x	ug/L	10	40	200			10	10	10	10
methylene chloride			ug/L	5			6.8	6.8E-06	10	10	10	10
n-butylbenzene		x	ug/L	5					6	6	6	6
n-propylbenzene			ug/L	5			6	6.0E-06	26	26	26	26
naphthalene			ug/L	5			73	7.3E-05	47	47	47	47
nickel, dissolved			ug/L						305	305	305	305
nickel, total			ug/L	150	100	2000	253	2.5E-04	259	259	259	259

Table V-6-3. 122nd Street L[illegible] AGQSs and MAPCs for Shallow Zone (Upgradient Wells)

PARAMETER	ND GW	ND LC	UNITS	PQL	35 IAC 620 STDS		Co	MPC	99% CL = AGQS = MAPC			
					Class I	Class II			GA1S	GA4S	GA3S	GA5S
nitrate, dissolved**	x		ug/L				56	5.6E-05	500	500	500	500
nitrate, total			ug/L		10000	100000			**4Q**	**4Q**	**4Q**	**4Q**
o-chlorotoluene	x	x	ug/L	5					5	5	5	5
o-dichlorobenzene			ug/L	2			8.5	8.5E-06	6	6	6	6
oil (hexane soluble or equivalent)			ug/L				74250	7.4E-02	222943	222943	222943	222943
p-chlorotoluene	x		ug/L	5			3.1	3.1E-06	5	5	5	5
p-dichlorobenzene			ug/L	5	75	375	13	1.3E-05	7	7	7	7
p-isopropyltoluene (Cymene)			ug/L	5			11	1.1E-05	20	20	20	20
pH**			ug/L				7.5	7.5E-06	8.26	6.99	9.14	7.34
parathion	x	x	ug/L	10					10	10	10	10
pentachlorophenol	x	x	ug/L	50	1	5			50	50	50	50
phenol**			ug/L	10	100	100	97	9.7E-05	153	**1Q**	**1Q**	**1Q**
polychloridated biphenyls (PCBs)	x		ug/L	200	5	25	8.6	8.6E-06	200	200	200	200
potassium, dissolved			*ug/L*						*1058018*	*1058018*	*1058018*	*1058018*
potassium, total			ug/L				601500	6.0E-01	855140	855140	855140	855140
sec-butylbenzene		x	ug/L	5					6	6	6	6
selenium, total	x	x	ug/L	20	50	50			20	20	20	20
silver, total	x		ug/L	10	50		36	3.6E-05	10	10	10	10
sodium, dissolved			ug/L						3989255	3989255	3989255	3989255
sodium, total			ug/L				4040000	4.0E+00	2824035	2824035	2824035	2824035
styrene		x	ug/L	10	100	500			5	5	5	5
sulfate, dissolved**			ug/L				114	1.1E-04	570276	742032	962996	3275204
sulfate, total			ug/L		400000	400000			**4Q**	**4Q**	**4Q**	**4Q**
tert-butylbenzene		x	ug/L	5					5	5	5	5
tetrachloroethylene		x	ug/L	5	5	25			5	5	5	5
tetrahydrofuran			ug/L	1E+06			296	3.0E-04	1852	1852	1852	1852
thallium, total	x	x	ug/L	10					10	10	10	10
toluene			ug/L	5	1000	2500	57	5.7E-05	1876	1876	1876	1876
toxaphene	x	x	*ug/L*	*10*	*3*	*15*			10	10	*10*	*10*
trans-1,2-dichloroethene			ug/L	5	100	500	2.7	2.7E-06	5	5	5	5
trans-1,3-dichloropropene	x	x	ug/L	5					5	5	5	5
trichloroethylene		x	ug/L	5	5	25			18	18	18	18
trichlorofluoromethane	x	x	ug/L	5					5	5	5	5
vanadium, dissolved			*ug/L*						*50*	*50*	*50*	*50*
vanadium, total			ug/L	40			25	2.5E-05	39	39	39	39
vinyl acetate	x	x	ug/L	10					10	10	10	10
vinyl chloride		x	ug/L	2	2	10			23	23	23	23
xylenes			ug/L	5	10000	10000	183	1.8E-04	758	758	758	758

Table V-6-3. 122nd Street L AGQSs and MAPCs for
Shallow Zone (L, ,adient Wells)

PARAMETER	ND GW	ND LC	UNITS	PQL	35 IAC 620 STDS		Co	MPC	99% CL = AGQS = MAPC			
					Class I	Class II			GA1S	GA4S	GA3S	GA5S
zinc, dissolved**			ug/L						30	2Q	2Q	2Q
zinc, total			ug/L	20	5000	10000	288	2.9E-04	1515	1515	1515	1515

NOTES:
ND GW = Not detected in ground water
ND LC = Not detected in leachate
99% CL = 99% Confidence Limit
Co = Average leachate concentration
MPC = Model predicted concentration. For Co equal to 1ug/L, MPC at the edge of the zone of attentuation equals 1x 10^{-6} ug/L.
PQL = Practical Quantitation Limit
MAPC = Maximum Allowable Predicted Concentration
AGQS = Applicable Ground-Water Quality Standard
1Q = Data for one more quarter needed to establish background
2Q = Data for two more quarters needed to establish background
3Q = Data for three more quarters needed to establish background
4Q = Data for four quarters needed to establish background
99% CL of TDS, TOC, Sulfate, Chloride, and Sulfate based on data from 1988 to 1995
* Indicates parameter not detected and no established PQL so MAPC/AGQS set equal to 5 times the method detection limit.
** Indicates from IEPA List G1; other parameters are from IEPA List G2.

Table V-6-4. 122nd Street Landfill: Routine Indicator Parameters, Deep Monitoring Well G15D

DATE	TOC	TDS	Alkalinity	Chloride	Sulfate
Jan-88	NA	340	NA	46.0	10.0 u
Apr-88	1.8	310	230	48.0	10.0 u
Jul-88	2.0	278	197	48.6	7.2
Nov-88	3.0	433	227	48.0	67.2
Feb-89	2.0	330	237	50.4	5.0 u
May-89	3.0	323	230	48.8	5.0 u
Jul-89	3.1	320	150	48.2	5.0 u
Oct-89	NA	NA	NA	NA	NA
Jan-90	NA	NA	NA	NA	NA
Apr-90	NA	NA	NA	NA	NA
Jul-90	3.2	420	183	78.0	315.0
Oct-90	2.9	398	204	79.0	22.0
Jan-91	5.6	390	194	83.0	27.9
Apr-91	4.3	386	222	80.0	22.9
Jul-91	5.4	348	212	59.0	7.4
Oct-91	3.9	336	238	52.0	9.6
Jan-92	5.2	348	220	70.0	5.0 u
Apr-92	4.2	322	224	61.0	5.0 u
Jul-92	5.2	334	229	47.0	5.0 u
Oct-92	3.6	338	231	36.0	5.0 u
Jan-93	4.0	302	245	89.0	5.0 u
Apr-93	4.3	292	231	35.0	5.0 u
Jul-93	3.4	294	228	37	5.0 u
Nov-93	3.4	408	236	31	5.0 u
Feb-94	7.5	2390	114	253	208
Apr-94	4.3	450	216	109	48.7
Jul-94	3.8	380	239	62	5.0 u
Oct-94	3.6	354	233	55.6	5.0 u
Feb-95	3	306	241	37.9	5.0 u
Apr-95	3.3	380	239	42.7	5.0 u
Jul-95	4.6	370	246	44.7	5.0 u
Oct-95	4	332	252	36.4	5.0 u
Jan-96	14	3290	115	1380	532
May-96	9.8	1590	162	509	195
Jul-96	7.3	840	199	402	108
Count, N	31	32	31	32	32
MEAN	4.5	560.4	213.7	128.4	50.7
STDEV	2.4	653.0	35.5	251.4	113.9
99% CL (mg/L)	11	2190	302	756	335

Notes:

1. NA: No Data Available
2. u: non-detect, parameter below the specified method detection limit.

TABLE V-6-5

BACKGROUND GROUND-WATER QUALITY FOR DEEP MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA4D Nov-93 ug/l	GA4D Feb-94 ug/l	GA11D Nov-93 ug/l	G13D Nov-93 ug/l	R15D Apr-94 ug/l	R15D Jul-94 ug/l	R15D Apr-95 ug/l	R15D Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
1,1,1,2-tetrachloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,1,1-trichloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	200	1000
1,1,2,2-tetrachloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,1,2-trichloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,1-dichloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,1-dichloroethene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	7	35
1,1-dichloropropene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,2,3-trichlorobenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,2,3-trichloropropane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,2,4-trichlorobenzene	x	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5		
1,2,4-trimethylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,2-dibromo-3-chloropropane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,2-dichloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	25
1,2-dichloropropane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	25
1,3,5-trimethylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,3-dichloropropane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1,4-dichloro-2-butene	x	<3	<3			<3		<3	<2		
2,2-dichloropropane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
[illegible] TP (Silvex)	x	<0.5		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	50	250
[illegible]	x	<0.1		<0.1	<100	<10	<0.10	<10	<10	70	350
2-butanone (methyl ethyl ketone)	x	<2	<2	<2	<2	<2		<2	<2		
2-hexanone	x	<2	<2	<2	<2	<2		<2	<2		
4-methyl-2-pentanone (MIBK)	x	<2	<2	<2	<2			<2	<2		
BOD		14000	12000	4000	36000	19000	17000	12000	20000		
DDT	x	<0.085	<0.093	<0.11	<0.1	<0.099	<0.094	<9.1	<10		
TDS		285000	306000	482000	378000	450000	380000	380000	370000	1200000	1200000
TOC		2900	2750	3150	1900	4300	3800	3300	4600		
acetone		<2	6	<2	<2	<2		<2	<2		
acrolein	x	<160	<160	<160	<160	<160		<160	<160		
acrylonitrile	x	<20	<20	<20	<20	<20		<50	<50		
alachlor	x	<0.085	<0.093	<0.085	<0.1	<0.099	<0.094	<0.18	<2	2	10

Notes:

ND=Not Detected in Any Sample Collected

<# Indicates Less than Detection Limit

TABLE V-6-5 (continued)

BACKGROUND GROUND-WATER QUALITY FOR DEEP MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA4D Nov-93 ug/l	GA4D Feb-94 ug/l	GA11D Nov-93 ug/l	G13D Nov-93 ug/l	R15D Apr-94 ug/l	R15D Jul-94 ug/l	R15D Apr-95 ug/l	R15D Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
aldicarb	x	<0.5		<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	3	15
aldrin	x	<0.042	<0.046	<0.053	<0.052	<0.050	<0.047	<0.091	<0.1		
alkalinity		170000	169000	258000	230000	216000	239000	239000	246000		
aluminum, dissolved	x	<200	<200	<200	<200	<200	<200				
aluminum, total			11000			4700	5400	10300	7400		
ammonia (as N)		700	420	410	6400	1200	1100	570	550		
antimony, total	x	<100		<100	<100			<100	<100		
arsenic, dissolved	x	<2		<2	<2	<2	<2				
arsenic, total		2.8	<2	<2	<2	4.2	<2	15	14	50	200
atrazine	x	<0.85	<0.93	<1.1	<1	<0.99	<0.94	<0.18	<2	3	15
barium, dissolved		<50	<50	<50	<50	53	<50				
barium, total		70	<50	82	70			63	56	2000	2000
benzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	25
beryllium, total	x	<5		<5	<5			<5	<5		
bis (chloromethyl) ether	x	<2000	<2000	<2000		<2000		<2000	<2000		
bis(2-ethylhexyl) phthalate		<10	<10	<10	<10	<10	8	40	7		
boron, dissolved		1600	1600	1900	1800	2300	2400				
boron, total			1700					2300	2100	2000	2000
obenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
ochloromethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
bromodichloromethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
bromoform	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
bromomethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
butyl benzyl phthalate	x	<10	<10	<10	<10	<10	<10	<10	<10		
cadmium, dissolved		<10		<10	<10	<10	<10				
cadmium, total	x	<10	<10	<10	<10			<10	<10	5	50
calcium, dissolved		17900	18400	46800	15700	44200	29600				
calcium, total			43400					82400	76300		
carbofuran	x	<0.9		<0.8	<0.9	<0.9	<0.9	<0.9	<0.9	40	200
carbon disulfide	x	<2	<2	<2	<2	<2		<2			
carbon tetrachloride	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	25
chemical oxygen demand		15000	15000	13000	52000	15000	13000	7000	9000		
chlordane	x	<0.42	<0.46	<0.53	<0.52	<0.50	<0.47	<0.13	<0.14	2	10
chloride		45000	51000	57000	55000	109000	62000	42700	44700	200000	200000
chlorobenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	100	500
chlorodibromomethane	x	<0.5	<0.5	<0.5	<0.5						
chloroethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		

Notes:

ND=Not Detected in Any Sample Collected

<# Indicates Less than Detection Limit

TABLE V-6-5 (continued)

BACKGROUND GROUND-WATER QUALITY FOR DEEP MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA4D Nov-93 ug/l	GA4D Feb-94 ug/l	GA11D Nov-93 ug/l	G13D Nov-93 ug/l	R15D Apr-94 ug/l	R15D Jul-94 ug/l	R15D Apr-95 ug/l	R15D Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
chloroform	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
chloromethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
chromium, dissolved	x	<20	<20	<20	<20	<20	<20				
chromium, total		24	<20	32	<20			<20	<20	100	100
cis-1,2-dichloroethene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	70	200
cis-1,3-dichloropropene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
cobalt, dissolved	x	<20		<20	<20	<20	<20				
cobalt, total		<20	<20	22	<20			21	<20	1000	1000
copper, dissolved	x	<20		<20	<20	<20	<20				
copper, total		21	<20	53	27			52	42	650	650
cyanide	x	<10	<10	<5	<10	<5	<10	<10	<10	200	600
di-n-butyl phthalate		<10	<10	<5	<10	<10	3	<10	<10		
dibromomethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
dichlorodifluoromethane	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
dieldrin	x	<0.085	<0.093	<0.11	<0.1	<0.099	<0.094	<0.046	<0.05		
diethyl phthalate	x	<10	<10	<10	<10	<10	<10		<10		
dimethyl phthalate	x	<10	<10	<10	<10	<10	<10		<10		
endrin	x	<0.085	<0.093	<0.11	<0.1	<0.099	<0.094	<0.55	<0.06		
ethylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	700	1000
ethylene dibromide (EDB)	x	<0.5	<0.5	<0.5	<0.5						
fluoride		930	920	1100	1300	980	950	960	930	4000	4000
heptachlor	x	<0.042	<0.046	<0.053	<0.052	<0.050	<0.047	<0.027	<0.03	0.4	2
heptachlor epoxide	x	<0.042	<0.046	<0.053	<0.052	<0.050	<0.047	<0.046	<0.05	0.2	1
hexachlorobutadiene	x	<10	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
iodomethane	x	<2	<2	<2	<2	<2		<2	<2		
iron, dissolved		<30	<30	<30	<30	52	100				
iron, total			14300				10300	29700	24000	5000	5000
isophorone	x	<10	<10	<10	<10				<10		
isopropylbenzene (Cumene)	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
lead, dissolved	x	<2	<2	<2	<2	<2	<2				
lead, total		25	14	18	6.7		18	22	22	7.5	100
lindane	x	<0.042	<0.046	<0.053	<0.052	<0.050	<0.047	<0.036	<0.04	0.2	1
m-dichlorobenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
magnesium, dissolved		6600	6600	20600	6400	11400	8900				
magnesium, total			19800					41900	37600		
manganese, dissolved		16	15	170	<10	27	17				
manganese, total		22	220	1000	320		18	570	520	150	10000
mercury, dissolved	x	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				

Notes:

ND=Not Detected in Any Sample Collected

<# Indicates Less than Detection Limit

TABLE V-6-5 (continued)

BACKGROUND GROUND-WATER QUALITY FOR DEEP MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA4D Nov-93 ug/l	GA4D Feb-94 ug/l	GA11D Nov-93 ug/l	G13D Nov-93 ug/l	R15D Apr-94 ug/l	R15D Jul-94 ug/l	R15D Apr-95 ug/l	R15D Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
mercury, total	x							<0.2	<0.2	2	10
methoxychlor	x	<0.42	<0.46	<0.53	<0.52	<0.50	<0.47		<0.5	40	200
methylene chloride	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
n-butylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
n-propylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
naphthalene	x	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5		
nickel, dissolved	x	<20	<20	<20	<20	<20	<20				
nickel, total		22	<20	46	<20			44	33	100	2000
nitrate	x	<100	<100	<100	<100	<100	<100	<100	<100	10000	100000
o-chlorotoluene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
o-dichlorobenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
oil (hexane soluble or equivalent)	x	<6100	<6200	<5700	<6000	<5200	<5100	<5300	<5000		
p-chlorotoluene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
p-dichlorobenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	75	375
p-isopropyltoluene (Cymene)	x	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5		
pH		7.71	7.66	7.67	8.32	8.05	8.21	8.2	8.16		
parathion	x	<1.7	<1.7	<1.6	<1.8	<1.6	<0.5	<1.9	<2		
pentachlorophenol	x	<0.04		<40	<40	<0.04	<0.4	<1.0	<1	1	5
[illegible]ol		25	<5	<5	22	<10	<10	<10		100	100
[illegible]loridated biphenyls (PCBs)	x	<0.85	<0.93	<1.1	<1	<0.99	<0.94	<0.91	<1	5	25
potassium, total			6200	6800	4300		4500	7000	6000		
sec-butylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
selenium, dissolved	x	<2	<2	<2	<2	<2	<2				
selenium, total	x	<2	<2	<2	<2			<2	<10	50	50
silver, dissolved	x	<30	<30	<30	<30	<10	<10				
silver, total	x	<30	<30	<30	<30			<10	<10	50	
sodium		77900	73000	87600	86700		96000	86000	77300		
styrene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100	500
sulfate		<5	<5	104000	9400	48700	<5000	<5000	<5000	400000	400000
tert-butylbenzene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
tetrachloroethylene		<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	25
tetrahydrofuran	x	<100	<100	<100	<100	<100		<100	<100		
Thallium, dissolved	x	<10		<10	<10						
thallium, total	x	<2	<2	<2	<2		<2	<0.2	<2		
toluene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1000	2500
toxaphene	x	<0.85	<0.93	<1.1	<1	<0.99	<0.94	<1.8	<2	3	15
trans-1,2-dichloroethene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100	500

Notes:

ND=Not Detected in Any Sample Collected

<# Indicates Less than Detection Limit

TABLE V-6-5 (continued)

BACKGROUND GROUND-WATER QUALITY FOR DEEP MONITORING WELLS
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND	GA4D Nov-93 ug/l	GA4D Feb-94 ug/l	GA11D Nov-93 ug/l	G13D Nov-93 ug/l	R15D Apr-94 ug/l	R15D Jul-94 ug/l	R15D Apr-95 ug/l	R15D Jul-95 ug/l	35 IAC 620 STDS Class I ug/l	Class II ug/l
trans-1,3-dichloropropene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
trichloroethylene	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	25
vanadium, dissolved	x	<10	<10	<10	<10		<10				
vanadium, total		20		35	17			25	19		
vinyl acetate	x	<2	<2	<2	<2	<2		<2	<2		
vinyl chloride	x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	10
xylenes	x	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	10000	10000
zinc, dissolved	x	<10		<10	<10	<10	<10				
zinc, total		45	<10	89	46		24	58	51	5000	10000

Notes:

ND=Not Detected in Any Sample Collected

<# Indicates Less than Detection Limit

Table V-6-6. Analytical Methods for 122nd Street Landfill.

PARAMETER/PARAMETER GROUP	ANALYTICAL METHOD
Volatile Organic Compounds (VOCs)	SW-846 8240/8260
Semi-Volatile Organic Compounds (SVOCs) and Base Neutral Acids (BNAs)	SW-846 8270
Mercury	SW-846 7470/7471
Metals (other than mercury)	SW-846 6010
Metals with specific methods (if low detection limits required then GFAA may be used according to following methods)	
antimony	SW-846 6010/7041
arsenic	SW-846 6010/7060
cadmium	SW-846 6010/7131
chromium	SW-846 6010/7191
lead	SW-846 6010/7421
selenium	SW-846 6010/7740
silver	SW-846 6010/7761
thallium	SW-846 6010/7841
Cyanide	EPA 335.2
Pesticides/PCBs	SW-846 8080
Parathion	8141/8140
Carbamate	EPA 531.1
Herbicides (chlorinated acids)	EPA 515.1/SW-846 8150
TOX	SW-846 9020A
TOC	EPA 415.1
BOD	EPA 405.1
COD	HACH 8000
Oil & Grease	EPA 413.1
TDS	EPA 160.1
Ammonia	EPA 350.2
Nitrate	EPA 353.2
pH	EPA 150.1
Bicarbonate	Standard method 2320B
Sulfate	EPA 375.4
Chloride	EPA 325.2
Fluoride	EPA 340.2

TAB -6-7

MAXIMUM ALLOWABLE PREDICTED CONCENTRATIONS AND
APPLICABLE GROUND-WATER QUALITY STANDARDS UPPERMOST AQUIFER
LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND GW	ND LC	UNIT	99% CL	PQL	MAPC	AGQS	Co	MPC	35 IAC 620 STDS	
										Class I	Class II
1,1,1,2-tetrachloroethane	x	x	ug/l		5	5	5				
1,1,1-trichloroethane	x	x	ug/l		5	5	5			200	1000
1,1,2,2-tetrachloroethane	x	x	ug/l		5	5	5				
1,1,2-trichloroethane	x	x	ug/l		5	5	5				
1,1-dichloroethane	x		ug/l		5	5	5	2.6	2.6E-08		
1,1-dichloroethene	x	x	ug/l		5	5	5			7	35
1,1-dichloropropene	x	x	ug/l		5	5	5				
1,2,3-trichlorobenzene	x	x	ug/l		5	5	5				
1,2,3-trichloropropane	x	x	ug/l		5	5	5				
1,2,4-trichlorobenzene	x		ug/l		5	5	5	52	5.2E-07		
1,2,4-trimethylbenzene	x	x	ug/l		5	5	5				
1,2-dibromo-3-chloropropane	x	x	ug/l		5	5	5				
1,2-dichloroethane	x	x	ug/l		5	5	5			5	25
1,2-dichloropropane	x	x	ug/l		5	5	5			5	25
1,3,5-trimethylbenzene	x		ug/l		5	5	5	12	1.2E-07		
1,3-dichloropropane	x	x	ug/l		5	5	5				
1,4-dichloro-2-butene	x	x	ug/l		5	5	5				
2,2-dichloropropane	x	x	ug/l		5	5	5				
2,4,5-TP (Silvex)	x		ug/l		2	2	2	0.18	1.8E-09	50	250
2,4-D	x	x	ug/l		10	10	10			70	350
2-butanone (methyl ethyl ketone)	x		ug/l		10	10	10	44	4.4E-07		
2-hexanone	x	x	ug/l		50	50	50				
4-methyl-2-pentanone (MIBK)	x		ug/l		10	10	10	14	1.4E-07		
BOD			ug/l	35069		35069	35069	2000	2.0E-05		
DDT	x	x	ug/l		10	10	10				
TDS			ug/l	2189790		2189790	2189790	16063333	1.6E-01	1200000	1200000
TOC			ug/l	10554		10554	10554	832400	8.3E-03		
acetone	x		ug/l		10	10	10	51	5.1E-07		
acrolein	x	x	ug/l		100	100	100				
acrylonitrile	x	x	ug/l		100	100	100				

TAB 6-7

MAXIMUM ALLOWABLE PREDICTED CONCENTRATIONS AND APPLICABLE GROUND-WATER QUALITY STANDARDS UPPERMOST AQUIFER LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND GW	ND LC	UNIT	99% CL	PQL	MAPC	AGQS	Co	MPC	35 IAC 620 STDS	
										Class I	Class II
alachlor	x	x	ug/l			10*	10*			2	10
aldicarb	x	x	ug/l			2.5*	2.5*			3	15
aldrin	x	x	ug/l			0.5*	0.5*				
alkalinity			ug/l	302310		302310	302310	5125000	5.1E-02		
aluminum, total			ug/l	19690		19690	19690	337	3.4E-06		
ammonia (as N), dissolved			ug/l	2597		2597	2597	605333	6.1E-03		
ammonia (as N), total			ug/l			**4Q**	**4Q**				
antimony, total	x	x	ug/l		30	30	30				
arsenic, dissolved	x		ug/l			**2Q**	**2Q**				
arsenic, total			ug/l	44	10	44	44	24	2.4E-07	50	200
atrazine	x	x	ug/l			10*	10*			3	15
barium, total			ug/l		0.02	**2Q**	**2Q**	638	6.4E-06	2	2
benzene	x		ug/l		5	5	5	17	1.7E-07	5	25
beryllium, total	x	x	ug/l		3	3	3				
bis (chloromethyl) ether	x	x	ug/l		1000	1000	1000				
bis(2-ethylhexyl) phthalate			ug/l	100	10	100	100	71	7.1E-07		
boron, dissolved			ug/l	2914		**2Q**	**2Q**	12062	1.2E-04	2	2
boron, total			ug/l			**2Q**	**2Q**				
bromobenzene	x	x	ug/l		5	5	5				
bromochloromethane	x	x	ug/l		5	5	5				
bromodichloromethane	x	x	ug/l		5	5	5				
bromoform	x	x	ug/l		5	5	5				
bromomethane	x	x	ug/l		10	10	10				
butyl benzyl phthalate	x		ug/l		5	5	5	25	2.5E-07		
cadmium, dissolved	x		ug/l			**2Q**	**2Q**				
cadmium, total	x		ug/l		1	**2Q**	**2Q**	11	1.1E-07	5	50
calcium, total			ug/l	186804		**2Q**	**2Q**	134500	1.3E-03		
carbofuran	x	x	ug/l		10	10	10			40	200
carbon disulfide	x	x	ug/l		100	100	100				
carbon tetrachloride	x	x	ug/l		5	5	5			5	25

TAE -6-7

MAXIMUM ALLOWABLE PREDICTED CONCENTRATIONS AND APPLICABLE GROUND-WATER QUALITY STANDARDS UPPERMOST AQUIFER LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND GW	ND LC	UNIT	99% CL	PQL	MAPC	AGQS	Co	MPC	35 IAC 620 STDS	
										Class I	Class II
chemical oxygen demand			ug/l	29539		29539	29539	3033333	3.0E-02		
chlordane	x	x	ug/l		10	10	10			2	10
chloride, dissolved			ug/l	755585		755585	755585	6433400		2000000	2000000
chloride, total			ug/l			4Q	4Q				
chlorobenzene	x		ug/l		5	5	5	20	2.0E-07	100	500
chloroethane	x		ug/l		5	5	5	12	1.2E-07		
chloroform	x	x	ug/l		5	5	5				
chloromethane	x	x	ug/l		10	10	10				
chromium, total	x		ug/l		10	2Q	2Q	191	1.9E-06	100	100
cis-1,2-dichloroethene	x		ug/l		5	5	5	3	2.7E-08	70	200
cis-1,3-dichloropropene	x	x	ug/l		5	5	5				
cobalt, total			ug/l	41	10	2Q	2Q	14	1.4E-07	1000	1000
copper, total			ug/l	139	10	2Q	2Q	65	6.5E-07	650	650
cyanide, total	x		ug/l		200	200	200	26	2.6E-07	200	600
di-n-butyl phthalate		x	ug/l	10	10	10	10				
dibromomethane	x	x	ug/l		5	5	5				
dichlorodifluoromethane	x	x	ug/l		5	5	5				
dieldrin	x	x	ug/l		10	10	10				
diethyl phthalate	x	x	ug/l		10	10	10				
dimethyl phthalate	x	x	ug/l		10	10	10				
endrin	x	x	ug/l		20	20	20				
ethylbenzene	x	x	ug/l		5	5	5			700	1000
fluoride			ug/l	1061		1061	1061	4550	4.6E-05	4000	4000
heptachlor	x	x	ug/l		10	10	10			0.4	2
heptachlor epoxide	x	x	ug/l		10	10	10			0.2	1
hexachlorobutadiene	x	x	ug/l		10	10	10				
iodomethane	x	x	ug/l		5	5	5				
iron, dissolved			ug/l			2Q	2Q				
iron, total			ug/l	101526		1Q	1Q	3933	3.9E-05	5000	5000
isophorone	x	x	ug/l		10	10	10				

TAB -6-7

MAXIMUM ALLOWABLE PREDICTED CONCENTRATIONS AND APPLICABLE GROUND-WATER QUALITY STANDARDS UPPERMOST AQUIFER LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND GW	ND LC	UNIT	99% CL	PQL	MAPC	AGQS	Co	MPC	35 IAC 620 STDS	
										Class I	Class II
isopropylbenzene (Cumene)	x		ug/l		5	5	5	6	5.5E-08		
lead, dissolved	x		ug/l			**2Q**	**2Q**				
lead, total			ug/l	39	2	**1Q**	**1Q**	91	9.1E-07	7.5	100
lindane	x	x	ug/l		10	10	10			0.2	1
m-dichlorobenzene	x	x	ug/l		5	5	5				
magnesium, total			ug/l	112324		**2Q**	**2Q**	455500	4.6E-03		
manganese, dissolved			ug/l			**4Q**	**4Q**				
manganese, total			ug/l	2825		2825	2825	537	5.4E-06	150	10000
mercury, total	x	x	ug/l		2	**2Q**	**2Q**			2	10
methoxychlor	x	x	ug/l		10	10	10			40	200
methylene chloride	x		ug/l		5	5	5	7	6.8E-08		
n-butylbenzene	x	x	ug/l		5	5	5				
n-propylbenzene	x		ug/l		5	5	5	6	6.0E-08		
naphthalene	x		ug/l		5	5	5	73	7.3E-07		
nickel, total			ug/l	111	150	**2Q**	**2Q**	253	2.5E-06	100	2000
nitrate, dissolved			. ug/l			50	50				
nitrate, total	x		ug/l			**4Q**	**4Q**	56	5.6E-07	10000	100000
o-chlorotoluene	x	x	ug/l		5	5	5				
o-dichlorobenzene	x		ug/l		2	2	2	9	8.5E-08		
oil (hexane soluble or equivalent)	x		ug/l			5805	5805	74250	7.4E-04		
p-chlorotoluene	x		ug/l		5	5	5	3	3.1E-08		
p-dichlorobenzene	x		ug/l		5	5	5	13	1.3E-07	75	375
p-isopropyltoluene (Cymene)	x		ug/l		5	5	5	11	1.1E-07		
pH			ug/l	9		9	9	8	7.5E-08		
parathion	x	x	ug/l		10	10	10				
pentachlorophenol	x	x	ug/l		50	50	50			1	5
phenol, total	x		ug/l		10	**1Q**	**1Q**	97	9.7E-07	100	100
polychloridated biphenyls (PCBs)	x		ug/l		200	200	200	9	8.6E-08	5	25
potassium, total			ug/l	15953		15953	15953	601500	6.0E-03		
sec-butylbenzene	x	x	ug/l		5	5	5				

MAXIMUM ALLOWABLE PREDICTED CONCENTRATIONS AND APPLICABLE GROUND-WATER QUALITY STANDARDS UPPERMOST AQUIFER LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND GW	ND LC	UNIT	99% CL	PQL	MAPC	AGQS	Co	MPC	35 IAC 620 STDS	
										Class I	Class II
selenium, total	x	x	ug/l		20·	2Q	2Q			50	50
silver, total	x		ug/l		10	2Q	2Q	36	3.6E-07	50	
sodium			ug/l	161691		161691	161691	4040000	4.0E-02		
styrene	x	x	ug/l		10	10	10			100	500
sulfate, dissolved			ug/l	334818		334818	334818	114	1.1E-06	400000	400000
sulfate, total			ug/l			4Q	4Q				
tert-butylbenzene	x	x	ug/l		5	5	5				
tetrachloroethylene	x	x	ug/l		5	5	5			5	25
tetrahydrofuran	x		ug/l		100000	100000	100000	296	3.0E-06		
thallium, total	x	x	ug/l		10	1Q	1Q				
toluene	x		ug/l		5	5	5	57	5.7E-07	1000	2500
toxaphene	x	x	ug/l		10	10	10			3	15
trans-1,2-dichloroethene	x		ug/l		5	5	5	2.7	2.7E-08	100	500
trans-1,3-dichloropropene	x	x	ug/l		5	5	5				
trichloroethylene	x	x	ug/l		5	5	5			5	25
trichlorofluoromethane	x	x	ug/l		5	5	5				
vanadium, total			ug/l	99	40	2Q	2Q	25	2.5E-07		
vinyl acetate	x	x	ug/l		10	10	10				
vinyl chloride	x	x	ug/l		2	2	2			2	10
xylenes	x		ug/l		5	5	5	183	1.8E-06	10000	10000
zinc, dissolved	x		ug/l			2Q	2Q				
zinc, total			ug/l	189	20	1Q	1Q	288	2.9E-06	5000	10000

NOTES:

ND GW =Not detected in ground water

ND LC = Not detected in leachate

Co = Leachate Concentration

MPC = Model Predicted Concentration. For Co equal to 1 ug/L, MPC at the edge of the zone of attenuation equals 1 x 10^{-8} ug/L.

99% CL = 99% Confidence Limit

PQL = Practical Quantitation Limit

MAXIMUM ALLOWABLE PREDICTED CONCENTRATIONS AND APPLICABLE GROUND-WATER QUALITY STANDARDS UPPERMOST AQUIFER LAND AND LAKES 122ND STREET LANDFILL

PARAMETER	ND GW	ND LC	UNIT	99% CL	PQL	MAPC	AGQS	Co	MPC	35 IAC 620 STDS	
										Class I	Class II

MAPC = Maximum Allowable Predicted Concentration

AGQS = Applicable Ground-Water Quality Standard

* Indicates 5 Times Method Detection Limit as no PQL Defined

1Q = Data for One Additional Quarter Needed to Establish Background

2Q = Data for two Additional Quarters Needed to Establish Background

3Q = Data for three Additional Quarters Needed to Establish Background

4Q = Data for four Additional Quarters Needed to Establish Background

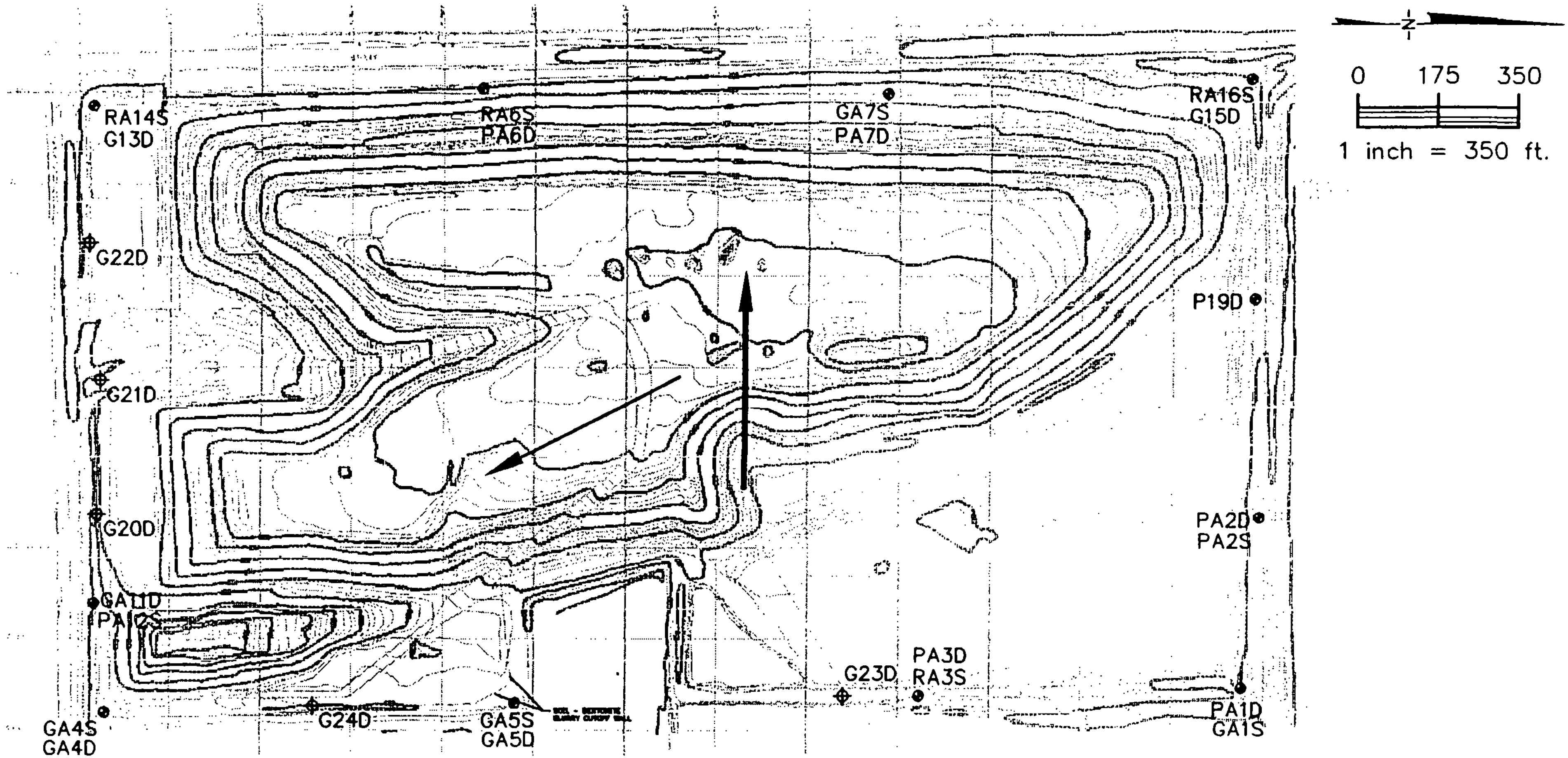
TABLE V-6-8
QUARTERLY GROUND-WATER MONITORING PARAMETERS
LAND AND LAKES 122ND STREET LANDFILL

FIELD	FILTERED	UNFILTERED
Bottom of well elevation (ft, NGVD)	Ammonia (as N)	Phenol (Total)
Depth to water (ft. below land surface)	Chloride	Total Organic Carbon (TOC)
Depth to water (ft. from measuring pt.)	Sulfate	Total Organic Halogens (TOX)
Elevation of ground-water surface (ft. MSL)	TDS	
pH (unfiltered)	Iron	
Specific Conductance (umhos/cm, unfiltered)	Manganese	
Temperature of sample (deg F)		

Notes:
Field = Field Measurements
Filtered = Field-filtered samples
Unfiltered = Samples not field filtered

TABLE V-6-9
ANNUAL GROUND-WATER MONITORING PARAMETERS
LAND AND LAKES 122ND STREET LANDFILL

ORGANICS	INORGANICS (unfiltered)
Acetone	Ammonia
Benzene	Arsenic
Chlorobenzene	Barium
Chloroethane	Boron
o-Chlorotoluene	Cadmium
p-Chlorotoluene	Chemical Oxygen Demand
Chlorodibromomethane	Chloride
p-Dichlorobenzene	Chromium
Dichloromethane	Fluoride
Ethylbenzene	Iron
Isopropylbenzene	Lead
p-Isopropyltoluene	Manganese
Methyl Ethyl Ketone (2-Butanone)	Nickel
4-Methyl-2-Pentanone	Nitrate
Naphthalene	Potassium
Phenols	Silver
n-Propylbenzene	Sulfate
Tetrahydrofuran	TDS
Toluene	
Xylenes (m, o, p)	
1,1-Dichloroethane	
1,2,4-Trimethylbenzene	
cis-1,2-Dichloroethylene	
trans-1,2-Dichloroethylene	
1,2-Dichloroethane	
1,2-Dichloropropane	
1,3-Dichloropropene	
1,3,5-Trimethylbenzene	
TOC	
TOX	



LEGEND

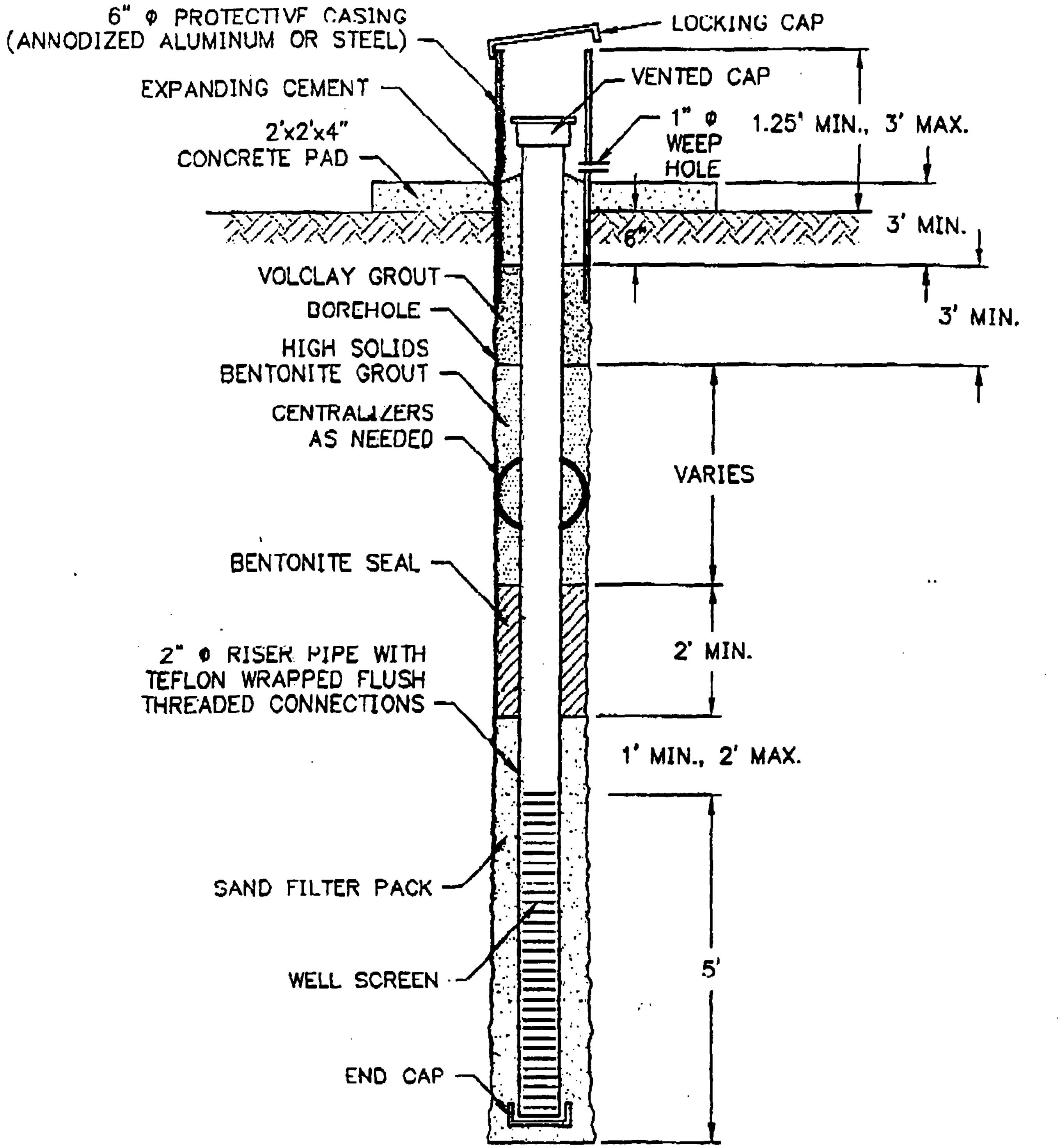
GA4S GA4D	EXISTING MONITORING WELL LOCATIONS
P19D	PIEZOMETER LOCATIONS
G20D	NEW MONITORING WELL LOCATIONS
→	FLOW DIRECTION IN THE SHALLOW UNIT
→	FLOW DIRECTION IN THE DEEP AQUIFER

122ND STREET LANDFILL: LOCATION OF MONITORING WELLS

GEOSYNTEC CONSULTANTS

FIGURE NO.	V-6-1
PROJECT NO.	FE2226
DOCUMENT NO.	
PAGE NO.	

2226F007 19960805 1353R0



WELL CONSTRUCTION DETAIL FOR PROPOSED MONITORING WELLS

GEOSYNTEC CONSULTANTS

FIGURE NO.	V-6-2
PROJECT NO.	FE2263
DOCUMENT NO.	
PAGE NO.	

2263F008 199512151209MR

ATTACHMENT 9

Table 1. Field Hydraulic Conductivity Values from Literature for Dolton Sand and Silurian Dolomite Aquifer

Unit	Hydraulic Conductivity (cm/s)	Type of Test	Reference
Shallow Calumet Acuifer: Dolton Sand, Parkland Sand	7.4E-04 to 1.0E-02	Slug Test	Baker/TSA, 1984 Geosciences Research Asso. Inc., 1987 Cravens and Roadcap, 1991 Kay et al., 1995
	< 3.5E-04	Slug Test	Kay et al., 1995
	1.90E-04	Slug Test	Lissa Grassel, Waste Management of North America, written comunication with Kay et al. (1995)
Silurian Devonian Aquifer: Dolomite, Limestone	7.0E-06 to 3.9E-04	Slug Test	Woodward-Clyde Consultants, 1984 Geosciences Research Asso. Inc., 1987 Ecology and Environment, 1990 Eldridge Eningering Assoc., 1990 Luci Alteiri, written communication with Kay et al. (1995)
	2.20E-05	Water-Pressure Test	TARP Project, Harza Engineering Co., 1972

Notes: 1. The Above Referenced Tests were Performed in the Lake Calumet Area of Northeastern Illinois.

2. "<" = Less Than.

3. Detailed References can be Found in the Reference List

2

Land and Lakes Company

' N. Northwest Highway
P.O. Box 778
Park Ridge, Illinois 60068-0778

(847) 825-5000
Fax (847) 825-0887

June 20, 1996

FEDERAL EXPRESS
9400666435

Mr. Edwin Bakowski, P.E.
Manager, Permit Section
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Post Office Box 19276
Springfield, Illinois 62794-9276

Re: Land and Lakes #3
#0316000034 - Cook County
Log #1995-060

Land and Lakes Company Response to City of Chicago Department of Environment Comments dated April 20, 1995 and July 11, 1995 to the IEPA Regarding the February, 1995 Significant Modification for Land and Lakes #3

Dear Mr. Bakowski:

This document responds to comments submitted to the Illinois Environmental Protection Agency (IEPA or Agency) regarding the above-referenced permit application by Commissioner Henry Henderson of the City of Chicago Department of Environment (DOE) on April 20, 1995 and July 11, 1995. Land and Lakes Company (LALC) received the DOE comments through the Freedom of Information Act.

This document has been prepared to assist the IEPA in its review of the above-referenced application and directly addresses the DOE comments. LALC is confident that the IEPA will evaluate the merits of the February, 1995 Significant Modification (SIGMOD) and addendas, including the February, 1996 Addendum, and act appropriately.

The DOE comments were prepared by Patrick Engineering, Inc. (PEI). The PEI comments consisted of text with appendixes. LALC's response to these comments has been prepared by GeoSyntec Consultants, EnviroResources, Inc. and LALC. LALC has formatted this document so that exact text from the April 20, 1995 and July 11, 1995 DOE comments is presented in italics and the LALC response to this text is presented in bold. The LALC response to the April, 1995 DOE comments is attached as Attachment C to this document. The LALC response to the July, 1995 DOE comments is attached as Attachment D to this document.

In its review of LALC's SIGMOD, the DOE erroneously claims that the design and operation of the LALC 122nd Street landfill is regulated not only by applicable state and federal regulations, but also by the City of Chicago's Environmental Control Ordinance. This is not the case, and the DOE fails to inform the IEPA of a Judgement Order entered by the Circuit Court of Cook County in a lawsuit filed by LALC against the City of Chicago in 1994 captioned Land and Lakes Company, et al. v. Henry L. Henderson, et. al No. 94 CH 02093, Circuit Court of Cook County, County Department, Chancery Division (the "Land and Lakes case"). In that Judgement Order, the Circuit Court held that the IEPA, and not the City, has sole permitting and regulatory authority over waste management facilities, such as LALC's 122nd Street Landfill. Thus, the DOE claim that LALC's 122nd Street Landfill is regulated by the City of Chicago Environmental Control Ordinance is erroneous by virtue of the Circuit Court's Judgement Order. A copy of the Circuit Court's Judgement Order is attached as Attachment A to this document. A copy of the DOE permit for this facility reflecting these facts is included as Attachment B to this document.

As discussed above, the IEPA has final authority over the permits issued for Land and Lakes #3. Therefore, if the IEPA has any questions or requires any additional information regarding the SIGMOD application or this document, please contact me. I am available by phone at (847) 825-5000 or would be happy to attend a meeting in Springfield at the Agency's convenience.

Very truly yours,

Jay S. Goldstein
Environmental Director

JSG:sls

Enclosure

ATTACHMENT A

Circuit Court Judgement Order

Dated September 27, 1994

IN THE CIRCUIT COURT OF COOK COUNTY, ILLINOIS
COUNTY DEPARTMENT, CHANCERY DIVISION

LAND AND LAKES COMPANY, et al.,	)	
Plaintiffs,	)	
vs.	)	No. 94 ch 2093
HENRY L. HENDERSON, et al.,	)	
Defendants.	)	

FINDINGS OF FACT, MEMORANDUM OF LAW AND ORDER

INTRODUCTION

Plaintiffs, Land and Lakes Company and Stony Island Reclamation Company (hereinafter "Land and Lakes"), commenced the instant action on March 8, 1994 following a decision by the City of Chicago (the "City") Department of Environment (the "DOE") on March 7 to deny plaintiffs an operating permit on a 27 acre portion of their 79 acre 122nd Street sanitary landfill facility (the "122nd Street Facility"). The City, through the Department of Environment, denied the operating permit based upon Section 11-4-1520(F) of the Environmental Protection and Control Ordinance, commonly known as the landfill moratorium ordinance (the "moratorium").

Land and Lakes filed a six-count Verified Complaint for Declaratory Judgment, Injunctive Relief, and Damages against the City of Chicago and Henry L. Henderson, the Commissioner of the Department of Environment. Land and Lakes seeks a preliminary and permanent injunction restraining the City and Commissioner Henderson from interfering with its landfill operations on the basis of the moratorium. At the preliminary hearing, the Court took evidence on Counts I, III, IV and V of the Verified Complaint. Count I of Land and Lakes' Verified Complaint seeks a declaration that the moratorium does not apply to the 122nd Street Facility because that facility, in its entirety, has been properly zoned for sanitary landfill use since 1982. Count III seeks a declaration that the moratorium is preempted by the laws of the State of Illinois and the rules and regulations of the Illinois Environmental Protection Agency ("IEPA"). Count IV alleges that the moratorium violates Land and Lakes' procedural due process rights under the United States Constitution and the Illinois Constitution as it deprives Land and Lakes of a protectable property interest without a fair hearing. Count V alleges that the moratorium violates Land and Lakes' substantive due process rights under the United States Constitution and Illinois Constitution because it is unintelligibly vague and because it has been applied in an arbitrary and capricious fashion by defendants.

In addition to the Verified Complaint, Land and Lakes also filed a Motion for Temporary Restraining Order and a Motion for Expedited Discovery on March 8, 1994. This Court heard the Motion for Temporary Restraining Order on said date with both Land and Lakes and the City present through their counsel. Having determined that Land and Lakes raised a fair question with respect to each of the necessary showings for temporary injunctive relief, this Court entered a temporary restraining order on March 8, 1994 which enjoined the City from interfering with Land and Lakes' sanitary landfill operations at 122nd

Street. The Court further granted Land and Lakes' motion for Expedited Discovery on March 8, 1994, in order to prepare for a preliminary injunction hearing.

On April 13, 1994, the City filed its Answer and Affirmative Defenses to the Verified Complaint and a seven-count First Amended Counterclaim. Subsequently, on July 7, 1994, the City voluntarily dismissed Counts III, IV and V of the counterclaim. In Counts I and II of its counterclaim, the City seeks a determination that Land and Lakes has illegally expanded its landfill within the meaning of the moratorium and that a public nuisance has resulted from Land and Lakes' alleged illegal operations on the 27 acre parcel. Counts VI and VII of the counterclaim seek a declaration that the moratorium is constitutional and that it applies to the 27 acre parcel. The City also had filed a Motion for Preliminary Injunction which seeks an order requiring Land and Lakes to cease landfill operations on the 27 acre parcel.

The defendants, the City of Chicago and Henry L. Henderson, contend that in order to operate a landfill in the City of Chicago, Land and Lakes must obtain a zoning permit, an annual City of Chicago operating permit from the Department of Environment, and IEPA development and operating permits.

They contend further that in October, 1993, Land and Lakes knowingly began dumping garbage on the 27 acre parcel at the 122nd Street site without a permit from the City of Chicago. That at no time has Land and Lakes received a permit or other written approval from the City of Chicago authorizing the dumping of garbage in the 27 acre parcel.

They contend further that the Chicago City Council has the authority to regulate sanitary landfills within the City and has set forth a system for regulating landfills that adequately protects the public health and welfare, including a permitting program. The City Council has expressly delegated the oversight and management of sanitary landfills, including the property to issue operating permits, to the Department of Environment. Sec. 11-4-020; 2-30-030(16). The Department of Environment which has been in existence since Jan. 1, 1992 and has the expertise to perform its delegated functions. They contend that prior to January, the Department of Consumer Services and the Bureau of Inspectional Services had the authority to issue sanitary landfill permits.

They further contend that the Municipal Code defines "sanitary landfills" as a facility originally permitted under Ch. 11-4 and operating, prior to Jan. 1, 1985, for the disposal of waste on land. Sec. 11-4-120.

They further contend that a landfill operator cannot begin accepting waste without first obtaining a written permit from the Commissioner of the Department of Environment. "No changes, additions, expansions or extensions" to any landfill can be made "without having obtained a written permit from the Commissioner." Sec. 11-4-250.

They further contend that the IEPA provides for the exercise of authority by the City and the State in the area of environmental regulation and permitting. 415 ILCS 5/1 et seq.

They further contend that the Delegation Agreement between the State of Illinois and the City recognizes and encourages local regulation of landfills. The Delegation Agreement recognizes that Chicago is a home rule unit of government that has distinct but concurrent authority to regulate environmental matters within the City of Chicago. With regard to permitting, they contend that the Delegation Agreement provides only that "the issuance of Agency permits shall remain "the sole discretion and responsibility of the agency."

They state that Sec. 5(C) of the Standard Conditions routinely attached to IEPA development and operating permits requires compliance with all local ordinances and is not limited to zoning approvals.

They further contend that according to the Illinois Solid Waste Management Act and the City's Solid Waste Management Plan landfilling is the least favored alternative for solid waste management, after waste reduction, recycling and incineration. 415 ILCS 20/2 ("B").

The City contends that in 1984, the City Council passed a moratorium prohibiting the Commissioner of the Department of Consumer Services from accepting, considering, or taking action on an application for a permit for the expansion of any sanitary landfills. They contend that since that time the moratorium has been renewed and is currently in effect until February 1, 1996.

They contend that the moratorium currently prohibits the Commissioner of the Department of Environment from issuing a permit to an operator who seeks to establish a new landfill or expand an existing landfill. Sec 11-4-1520(F).

From August 2nd to August 12, 1994, the Court held an evidentiary hearing on the pending request for injunctive relief. Closing arguments were heard and trial briefs were submitted by both sides wherein both sides offered their Suggested Findings of Facts, Memorandum of Law, and Suggested Orders.

The Court had the opportunity to hear the testimony of a myriad of witnesses, the opportunity to observe their demeanor and weigh their credibility, and further the Court had the benefit of reviewing of the evidence that was admitted. The March 8, 1994 TRO has remained in full force and effect throughout the proceedings until further order of this Court.

FINDINGS OF FACT

Based upon all of the evidence and considering same in its totality, and having reviewed all of the pleadings, and reviewing the Court's copious notes the following Findings of Fact are made:

1. Land and Lakes Company is a corporation duly organized and existing under the laws of the State of Illinois, with its principal place of business located at 123 North Northwest Highway, Park Ridge, Illinois. Land and Lakes is in the waste disposal business and has operated landfills in the City of Chicago for over 20 years.

2. Stony Island Reclamation Company ("Stony Island") is also a corporation duly organized and existing under the laws of the State of Illinois. Stony Island is the legal owner of a 79-acre parcel of real property bounded by East 118th Street on the north, South Stony Island Avenue on the west, East 122nd Street on the south and an irregular line 133 feet west of and parallel to South Paxton Avenue on the east (hereinafter the "122nd Street Facility"). Stony Island leases the 122nd Street Facility to Land and Lakes, which has operated a sanitary landfill on the subject premises for over approximately 15 years.

3. The City of Chicago is a municipal corporation duly organized and existing under the laws of the State of Illinois with its principal place of business located in Cook County at 121 North LaSalle Street, Chicago, Illinois.

4. The DOE is an agency of the City of Chicago. The Commissioner of the DOE is Henry L. Henderson. The DOE exercises authority over the permitting and policing of sanitary landfills within the City of Chicago.

5. The 122nd Street facility is situated in the Southeast Industrial District, an area which is heavily industrial and which is comprised primarily of waste disposal facilities serving the City of Chicago and other area vendors. The subject parcel is substantially removed from any residential developments.

6. The 122nd Street Facility has been zoned in its entirety for use as a sanitary landfill since 1982. Specifically, 53 acres on the western portion of the 122nd Street Property were initially zoned for use as a sanitary landfill pursuant to a

Resolution by the Zoning Board of Appeals of the City of Chicago. ("ZBA"), Cal. No. 256-76-S adopted January 13, 1977 and amended on February 17, 1977, October 21, 1977 and March 16, 1979.

7. The remaining 27 acres were originally zoned as M3-3 Heavy Manufacturing. On or about September 20, 1982, Land and Lakes applied to the Zoning Administrator of the City of Chicago for variation of the originally permitted use for these 27 acres. The ZBA considered the application and found that the proposed use would serve the City's public need, remediate prior environmental conditions, provide a productive use of the land leading to reclamation and would protect the public health, safety and welfare. Based on these findings, the ZBA issued a variance for the special use of the 27 acre parcel as a sanitary landfill on October 15, 1982. The October 15, 1982 special use variance remains in full force and effect.

8. On or about February 24, 1984, the City Council for the City of Chicago first passed an amendment to the Environmental Protection and Control Ordinance (the "Ordinance"), which imposed a moratorium on the creation of the new sanitary landfills and on the "expansion" of existing landfills (the "moratorium"). The moratorium has been renewed from time to time over the last ten years.

9. The term "expansion" in the moratorium is a term of art which is not defined in the Ordinance or by any rules and regulations.

10. As of February 24, 1984, only two landfill operators owned parcels of land within the City of Chicago which were

properly zoned for sanitary landfill use, but as yet unpermitted for operation as a sanitary landfill by the Department of Consumer Services, the immediate predecessor of DOE. These operators were Land and Lakes and Waste Management, of Illinois, Inc. ("Waste Management") which owned, and still owns, a large sanitary landfill facility on 138th Street commonly known as the C.I.D. complex.

11. Following enactment of the moratorium in 1984, the City granted to Waste Management several increases in the permitted boundaries of certain existing landfills located in the C.I.D. Complex known as Area 2 and Area 3.

12. On January 31, 1986, Jesse D. Madison, Commissioner of the Department of Consumer Services, issued a permit to Waste Management which increased the capacity of Area 3 by 103 acres and authorized operations on the entire 173 acres of Area 3 zoned for landfill use. However, at no time before the moratorium did the City issue a permit which authorized operation on more than a 70 acre portion of Area 3. In fact, the City authorized operations only on a 25 acre portion of Area 3 in 1980 and 1981, and only on a 70 acre portion of Area 3 from 1982 through 1985. Donald Galley, the Chief Permitting Officer who originated the January 21, 1986 permit for approval by Commissioner Madison, recommended issuance of the permit because Waste Management had secured zoning for the entire 173 acre parcel before enactment of the moratorium.

13. On May 30, 1986, Commissioner Madison also issued a permit addendum to Waste Management which increased the permitted

maximum elevation on a portion of Area 3 to + 166 feet CCD, although the permitted elevation for Area 3 never exceeded +110 feet CCD before the moratorium. The addendum stated an intent not to increase the permitted waste capacity of Area 3. The addendum resulted in an increase of the actual waste capacity of the landfill.

14. On December 30, 1993, Commissioner Henderson issued an operating permit to Waste Management which increased the permitted maximum elevation for Area 2 of the CID complex by 20 feet, from +60 feet CCD to +80 feet CCD. In contrast to Commissioner Madison's 1986 addendum on Area 3, this permit served to increase the permitted waste capacity of the landfill.

15. The City has not applied the moratorium in a uniform fashion and, in doing so, has created several different interpretations of the moratorium to attempt to justify the Waste Management increases. First, Don Galley, the Chief Permitting Officer under Commissioner Madison, testified the City did not apply the moratorium to previously zoned landfills. Second, in connection with the vertical expansion of Area 2, the City applied the moratorium to allow an increase in the permitted waste capacity of an existing landfill. Third, and in contrast, in connection with the vertical expansion of Area 3, the City applied the moratorium to prohibit any increase in permitted waste capacity of an existing landfill.

16. Based on the foregoing, the moratorium is unconstitutionally vague and has been arbitrarily and disparately applied: (1) the term "expansion" is a term of art that is not

defined in the ordinance; (2) there are no rules, regulations or standards to define the moratorium; and, (3) the DOE has applied the moratorium inconsistently over the last 10 years resulting in no less than three different interpretations of the term "expansion" and disparate application of the moratorium.

17. Therefore, the moratorium cannot apply to landfills which secured a special use variance from the ZBA before enactment of the moratorium, because to do so would be unconstitutional. Accordingly, the moratorium does not apply to Land and Lakes in as much as it secured a special use variance for the entire 122nd Street Facility in 1982, two years before enactment of the moratorium.

18. After obtaining the October 15, 1982 special use variance from the Zoning Board of Appeals, Land and Lakes developed and prepared the 27 acres for operation as a sanitary landfill at considerable expense.

19. On September 29, 1987, the Illinois Environment Protection Agency ("IEPA") issued to Land and Lakes a supplemental permit which authorized development of the entire 122nd Street Facility as a sanitary landfill, including the 27 acre parcel. The City does not issue development permits for a landfill facility. The City, through the Department of Environment permits only the operation of a landfill.

20. On October 1, 1993, the IEPA issued Land and Lakes another supplemental operating permit which authorized actual landfill operation on the 27 acre parcel previously developed in accordance with the September 29, 1987, IEPA developmental

permit. Pursuant to state law, the City received written notice in July, 1993 that Land and Lakes sought this IEPA operating permit and, therefor, was aware of Land and Lakes intent to operate in the 27 acres.

21. The IEPA permits issued to Land and Lakes are in full force and effect at this time. Moreover, pursuant to the Delegation Agreement entered into between the IEPA and DOE, the IEPA has expressly retained its authority to permit the development and operation of landfills in the state.

22. Section 11-4-1520(A) and (C) set forth the requirements for a permit application for a sanitary landfill. Once the provisions of Section 11-4-1520(A) and (C) are met, the Commissioner is mandated to issue a sanitary landfill permit.

23. No rules, regulations or uniform standards have been promulgated to delineate the provisions of Section 11-4-1520(A) and (C). Commissioner Henderson admitted that the DOE and the ordinances are "evolving" and that the information required of applicants under Sections 11-4-1520(A) and (C) have increased without published regulations. Section 11-4-1520(A) and (C), therefore, are unconstitutionally vague on their face and as applied.

24. Moreover, there is no provision in the ordinance to provide an applicant either notice or a hearing relating to an adverse decision on an application.

25. Land and Lakes submitted an application under Section 11-4-1520(A) and (C) (then Chapter 17-6.4(A) and (C)) to the Department of Consumer Services in 1990. The City issued an

operating permit to Land and Lakes in response to the 1990 permit application. In 1991 and 1992, Land and Lakes similarly filed applications which sought a permit to operate the entire 122nd Street Facility. The City retained the $20,000 annual permit fee paid by Land and Lakes in 1991 and 1992, but did not act on the permit applications.

26. On or about September 30, 1993, Land and Lakes submitted an application (the "Application") to the DOE for an operating permit for the entire 122nd Street Facility, including the 27 acre parcel.

27. The Application was complete and met all of the requirements of Section 11-4-1520 of the Ordinance. Land and Lakes, therefore, had a legitimate claim of entitlement to an operating permit on the entire 122nd Street facility.

28. In October of 1993, with appropriate zoning from the City of Chicago, all requisite permits from the IEPA, knowledge by the City that it intended to conduct such operations and permit application pending before the DOE, Land and Lakes began disposing of waste on the 27 acre portion of the 122nd Street facility.

29. The waste received in the 27 acre parcel largely came from the City, which delivered substantial volumes of municipal waste to the site pursuant to a waste disposal contract between Land and Lakes and the Department of Streets and Sanitation.

30. The City was aware of Land and Lakes use of the 27 acre parcel to dispose of waste and never objected. City Inspector, David Tellez, an employee of the DOE, observed the disposal

activities ongoing on the 27 acre parcel in October, 1993 during a regular field inspection. Mr. Tellez reported these activities directly to the DOE in written inspection reports in October and thereafter. Mr. Tellez had previously reported Land and Lakes' development of the 27 acre parcel and its stated intentions to use the parcel for waste disposal in inspection reports submitted to his superiors between January, 1993 and October, 1993.

31. No enforcement actions were taken by the City or the DOE relative to the disposal activities on the 27 acre parcel following receipt of Mr. Tellez's observations and written reports. In fact, the City continued to dispose of waste in the 27 acre parcel through mid-July 1994.

32. Based on the foregoing, Land and Lakes had a legitimate claim of entitlement to an operating permit on the 122nd Street Facility and, contrary to Defendants' claim, Land and Lakes activities did not constitute a nuisance.

33. The City's first response to Land and Lakes' September 30, 1993 permit application was a January 20, 1994, letter from Commissioner Henderson requiring eighteen additional categories of information from Land and Lakes before he would act on the application. This letter sought specific information not required in Sections 11-4-1520(A) and (C). Commissioner Henderson issued the letter to plaintiffs with knowledge that the moratorium would lapse on February 1, 1994 and to forestall litigation until after the moratorium was reenacted.

34. In contrast, Commissioner Henderson granted a permit to Waste Management in 1993 with a condition that information

required under Section 11-4-1520, but missing in the application, be submitted after issuance of the permit.

35. On January 31, 1994, while Land and Lakes' application was pending before the DOE, Commissioner Henderson submitted amended moratorium language for enactment by the City Council which provided as follows:

> [C]ommissioner shall not issue or modify any permit subject to the restrictions in section 11-4-1520(F) to any person including any applicant whose application was pending prior to the passage of this ordinance.

36. <u>On February 1, 1994, Land and Lakes' application was the only Sanitary Landfill Permit Application pending before Commissioner Henderson, and thus the only application affected by the amended language.</u>

37. The day before the City Council reenacted the moratorium, on February 8, 1994, William Abolt, Assistant Commissioner of the DOE, instructed David Tellez to issue a citation against Land and Lakes for alleged unpermitted waste disposal in the 27 acres. That same day, Commissioner Henderson directed that Mr. Tellez be recalled before he issued the citation because he did not wish to invite or commence litigation with Land and Lakes. Further, Commissioner Henderson did not wish to alert Land and Lakes that the moratorium had lapsed and was not a ban to issuing an operating permit.

38. On February 1, 1994, the moratorium lapsed. No moratorium was thereafter in effect in the City from February 2, 1994 through February 9, 1994. On February 9, 1994, the City Council passed the amended moratorium ordinance proffered by Commissioner Henderson.

39. From February 2, 1994 through February 9, 1994, Land and Lakes' permit application was not prohibited by the moratorium. The application was complete and satisfied the requirements of Section 11-4-1520. Land and Lakes was entitled to a permit at this time and the DOE's failure to issue a permit was arbitrary and capricious.

40. On March 7, 1994, after the moratorium was reenacted, Commissioner Henderson notified Mr. James Cowhey of Land and Lakes that he had denied the application for an operating permit for the 27 acre parcel solely on the basis of the moratorium.

41. Neither Land and Lakes nor Stony Island were given any prior notice by Commissioner Henderson of his decision to deny the application on the basis of the moratorium alone, nor of any pre-deprivation or post-deprivation hearing to address the efficacy of that decision.

42. Land and Lakes has demonstrated a strong likelihood of success on the merits. In fact, it has prevailed on the merits and is entitled to a permanent injunction.

43. Without the ability to utilize the 122nd Street Facility as a landfill, Land and Lakes will suffer irreparable harm for which there is no adequate legal remedy. Land and Lakes will certainly lose its present and future livelihood should injunctive relief not be granted.

44. Granting injunctive relief to Land and Lakes will not harm the public interest in a clean and safe environment.

45. The foregoing findings demonstrate Land and Lake's threatened injury outweighs the potential harm or inconvenience the City claims it will suffer.

MEMORANDUM OF LAW

In order to secure a preliminary injunction a party seeking such injunction must demonstrate that: 1) a substantial likelihood of success on the merits exists; 2) it has no adequate remedy at law; 3) it is subject to immediate, irreparable injury; and 4) in the absence of preliminary relief, it will incur greater injury than would be received by the objectors if the relief were granted. Kable Printing Co. v. Mount Morris Bookbinders Union Local 65-B, 63 Ill.2d 514 (1976).

In showing a substantial likelihood of success on the merits, "a party is not required to make out a case which will in all events warrant relief at the final hearing." M.B.L. (USA) Corp. v. Diekman, 112 Ill.App.3d 229; 445 N.E.2d 928 (1st Dist. 1983). Rather, a party need only demonstrate that a "fair question as to the basis for permanent relief exists." Id., 445 N.E.2d at 422; Earthline Corp. v. Mauzy, 68 Ill.App.3d 304 (4th Dist. 1979). This Court finds that in this case, the facts support and require entry of a preliminary injunction in favor of Land and Lakes.

Additionally, this Court supports plaintiffs' argument that the Moratorium Ordinance cannot be interpreted to apply to the Land and Lakes 122nd Street facility without causing a violation of plaintiffs' procedural due process rights.

Land and Lakes in entitled to a preliminary injunction because the moratorium, as applied by the City, violates procedural due process. "Procedural Due Process" imposes constraints on governmental decisions which deprive individuals of liberty or property interest within the meaning of the due process clause of the Fifth or Fourteenth Amendment. Matthews v. Eldridge, 424 U.S. 319, 332 (1976). The Supreme Court has consistently held that a hearing is required before an individual is deprived of a property interest. Id. at 333. The fundamental requisite of due process is an opportunity to be heard at a meaningful time and in a meaningful manner. Goldberg v. Kelly, 397 U.S. 254, 267 (1970). Here, the ordinance, Chapter 11-4 includes no provision for notice or hearing to protect an applicant's property interest. Thus, the plaintiffs correctly point out, the Ordinance is unconstitutional.

This Court further finds that Land and Lakes has been deprived of a "protectable property interest" within the meaning of the Due Process Clauses of the Illinois and U.S. Constitution. There is no more basic protected property interest than the ownership of real property interest than the ownership of real property. Certainly, the law has progressed to include as protectable interests under the due process clause rights held in property are beyond actual ownership of real estate, chattel or money. See, e.g., Board of Regents of State College v. Roth, 408 U.S. 564, 571 (1972). However, as the Seventh Circuit only recently has reemphasized, in establishing a protected right under this first element of a procedural due process claim, an owner of real property is presumptively "entitled to contend that the City's regulation of that land deprived it of property without due process." River Park, Inc. v. City of Highland Park, No. 93-3017, at 3(7th Cir. 1994).

Moreover, plaintiffs have a protectable property interest in an operating permit because the permit section provides no discretion to the City to issue permits once the applicant satisfied the ordinance's express requirements. See, e.g., Martell v. Mauzy, 511 F. Supp. 729 (N.D. Ill. 1981). This Court agrees with plaintiffs that they met all of the permitting requirements in Sec. 11-4-1520(A) and (C).

Land and Lakes is also entitled to a preliminary injunction because the evidence establishes that the moratorium ordinance is unconstitutionally vague and has been inconsistently construed and applied by the City of Chicago. First, the term "expansion" is undefined so that the moratorium cannot be applied in a uniform fashion. Moreover, no rules or regulations have been promulgated to define the term "expansion". This potent ambiguity renders the moratorium unconstitutionally vague. This Court agrees with the plaintiffs that the ordinance is not definite enough to prevent ambiguous application by City officials. Smithfield Concerned Citizens for Fair Zoning the Town of Smithfield, 719 F. Supp. 75 (D.R.I. 1989).

Beyond its facial ambiguity, the moratorium ordinance also has been applied arbitrarily by the City of Chicago. See e.g., Browning Ferris Indust. of St. Louis v. City of Maryland Heights, 1340, 1348 (E.D. Mo. 1990). This arbitrary application of the moratorium readily exposes the unconstitutionally vague nature of the ordinance. The evidence adduced at the injunction hearing established that the DOE permitted several increases in the horizontal and vertical boundaries of Waste Management's landfills using mutually exclusive interpretations of the moratorium.

Finally, this Court fully supports plaintiff's contention that the moratorium ordinance cannot be applied to Land and Lakes' 122nd Street facility because Land and Lakes submitted a complete permit application to the City of Chicago during a period in which the moratorium was not in force and effect.

This Court finds that the City's contention that no permit could be issued in the February 2 through February 9 period of time because Land and Lakes had not submitted a complete application must be rejected for two reasons. First, the permit application section of the Environmental Control Ordinance, Sec. 11-4-1520(A) and (C), is unconstitutionally vague. Second the evidence established that Land and Lakes permit application met the requirement of Sec. 11-4-1520. Thus, plaintiffs correctly argue that the moratorium ordinance is inapplicable to Land and Lake's 122nd Street Facility because the permit was submitted to the City during a period in which the moratorium was not in effect.

The plaintiff, Land and Lakes, has requested that this Court enter a permanent injunction against the City and DOE enjoining them from applying the Moratorium Ordinance to Land and Lakes' 122nd Street Facility and requiring plaintiffs to submit any further permit applications to the DOE under Sec. 11-4-1520(A) and (C) of the Environmental Protection and Control Ordinance. Further, plaintiffs request this Court order the DOE to issue a permit to the plaintiffs to operate the 122nd Street Facility consistent with Land and Lakes' IEPA operating permits.

In addition, they pray that this Court should permanently enjoin defendants from interfering with plaintiffs continued use, development and operation of the 122nd Street Facility as a sanitary landfill based on any permitting provisions of the ordinance. Moreover, they pray that this Court should enter judgment in favor of the plaintiffs and against defendants on Counts I, II, IV and V of plaintiff's complaint and on Counts I, II, VI and VII of defendants' counterclaim.

ORDER

Based on all of the evidence received at the preliminary injunction hearing of the Emergency otion for TRO and Second Amended Complaint of plaintiffs Land and Lakes Company and Stony Island Reclamations Company ("plaintiffs") and the Motion for Preliminary Injunction of defendants, Henry L. Henderson, in his official capacity as Commissioner of the DOE and the City of Chicago (collectively, "defendants") the Court being fully advised and having made Findings of Fact and Conclusions of Law incorporated by reference herein, the Court does hereby Order as follows:

1. Defendants are permanently enjoined from applying the Moratorium Ordinance, Title 11, Municipal Code of Chicago, Section 11-4-1520(F), to plaintiffs' entire 79 acre sanitary landfill located at 122nd Street and Stony Island Avenue (hereinafter, the "122nd Street Facility").

2. Plaintiffs are entitled to a permit from the City to operate its entire 122nd Street Facility as a sanitary landfill in accordance with their IEPA operating permits, and the City shall issue forthwith a permit to plaintiffs to operate the 122nd Street Facility that is consistent with the plaintiffs' IEPA operating permit.

3. Defendants are permanently enjoined from requiring plaintiffs to submit any further permit applications to the DOE under section 11-4-1520(A) and (C) of the Environmental Protection And Control Ordinance, Title 11, Municipal Code of Chicago, Section 11-4-010 et seq. ("Ordinance"), as currently enacted or applied until further order of Court.

4. Defendants are permanently enjoined from interfering with plaintiffs' continued use, development and operation of the 122nd Street Facility as a sanitary landfill based on any permitting provisions of the Ordinance.

5. Judgment is hereby entered in favor of plaintiffs and against defendants as to Count I (declaratory judgment), Count II (pre-emption), Count IV (violation of procedural due process), and Count V (violation of substantive due process) of plaintiffs' complaint. Count II (estoppel) and Count VI (taking) are

dismissed without prejudice with leave to reinstate if necessary. Only Count VII (breach of contract) is extant.

6. Judgment is entered against defendants and in favor of plaintiffs as to Counts I, II, VI and VII of defendants' counterclaim.

7. Defendants' Motion for Preliminary Injunction is hereby denied with prejudice.

8. This cause is set for status as to Count VII on November 15, 1994 at 10:00 a.m.

SEP 27 1994

129

ENTER

JUDGE

ATTACHMENT B

Land and Lakes #3

Department of Environment Operating Permit

Dated December 27, 1994

City of Chicago
Richard M. Daley, Mayor

Department of Environment

Henry L. Henderson
Commissioner

Room 600A
320 North Clark Street
Chicago, Illinois 60610
(312) 744-7606 (Voice)
(312) 744-3586 (TT/TDD)
(312) 744-6451 (FAX)

RECEIVED
JAN 03 1995
Ans'd..........

December 27, 1994

Mr. James Cowhey
President
Land and Lakes Company
123 N. Northwest Highway
Park Ridge, IL 60068

Re: Permit to Operate Sanitary landfill
at 122nd Street, Chicago, Illinois

Dear Mr. Cowhey:

Pursuant to Court Order dated September 27, 1994, permit is hereby granted by the City of Chicago Department of Environment to Land and Lakes Company ("Land and Lakes") to operate a sanitary landfill within the corporate limits of the City of Chicago at Land and Lakes' facility (the "Land and Lakes Facility") located at 122nd Street and Stony Island. The Land and Lakes Facility is a 79-acre parcel of real property bounded by 118th Street on the north, South Stony Island Avenue on the west, East 122nd Street on the south, and an irregular line 133 feet west of and parallel to South Paxton Avenue on the east. This permit is issued pursuant to, and solely because of, the Memorandum of Law and Order entered by the Honorable Judge Albert Green on September 27, 1994 in the case captioned, Land and Lakes and Stony Island Reclamation Company v. Henry L. Henderson, in his official capacity as Commissioner of the Department of Environment, and the City of Chicago, No 94 CH 2093 (the "Land and Lakes Case"), currently pending in the Circuit Court of Cook County.

This permit authorizes the operation of the Land and Lakes Facility as a sanitary landfill consistent with the terms and conditions of the development and operating permits issued previously by the Illinois Environmental Protection Agency to Land and Lakes for the Land and Lakes Facility, and any additional such permits to issue.

Although this permit allows for the operation of the Land and Lakes Facility as a sanitary landfill until further order of Court, it does not suspend the requirement of the filing of the annual fee and evidence of a bond for the year 1994 as set forth in Sections 11-4-130 and 11-4-370 of the Municipal Code of the City of Chicago.

The issuance of this permit, pursuant to Court Order, does not waive any right of the Department of the Environment or any other City department to take appropriate action against the Land and Lakes Facility in order to protect the health, welfare and safety of the public.

CITY OF CHICAGO
DEPARTMENT OF ENVIRONMENT

Henry L. Henderson

HENRY L. HENDERSON,
COMMISSIONER

cc: Susan J. Herdina
Chief Assistant Corporation Counsel

William R. Quinlan

ATTACHMENT C

LALC RESPONSE TO COMMENTS

DATED APRIL 19, 1995

SUBMITTED BY THE DOE TO

THE IEPA REGARDING LOG #1995-060

Deficiencies in the SIGMOD Permit Application include, but are not limited to:

1. *The application fails to demonstrate that the unit is equipped with a system to effectively drain leachate from the unit as required by 35 IAC 814.302(b)(1). Since all cells are hydraulically connected, the entire landfill must be considered a single unit. Inspections of the site and information included in the application indicate that the leachate levels in the landfill are approximately 50 feet above the liner invert. The leachate collection system included in the application is designed to handle leachate from Cell VI. This system is not effective for removing leachate from the rest of the unit.*

The February, 1995 Application for Significant Modification and all subsequent Addenda to this application ("SIGMOD") is in full compliance with the applicable regulations. An effective leachate collection system that meets the requirements of 35 IAC 814.302(b)(1) is in place at the landfill. In addition, a leachate recovery model was developed for the 122nd Street Landfill to model the effect of extraction of leachate from leachate French drains and leachate manholes. This leachate recovery model, which is described in detail in Attachment 7, (Part V, Section 4) to the February, 1996 Addendum to the SIGMOD, is based on principles of conservation of mass and superposition and uses equations for flow through saturated and unsaturated soils. The model establishes that the unit is equipped with the French drains and leachate manholes that are an effective leachate collection system in full compliance with 35 IAC 814.302(b)(1).

2. *The Post-Closure Care Plan does not include provisions for the removal and treatment of leachate from the unit. The cost estimates for Post-Closure Care do not account for leachate removal and treatment as well. This can be a significant cost after closure and should be included in the post-closure care costs.*

The SIGMOD is in compliance with the applicable regulations. The Post-Closure Care Plan includes provisions for the removal and treatment of leachate from the unit. In addition all appropriate and required post-closure care costs are presented in Attachment 39 to the February, 1996 Addendum to the SIGMOD.

3. *The application does not include the results of a test liner installation at the site as required by 35 IAC 811.507. The application states that a test liner is not required; however, the liner design for Cell VI is unique to the site. Therefore a test liner cannot be omitted under 35 IAC 811.507(b) because the materials and method of construction of this liner is different than any of the other liners on-site.*

The SIGMOD is in compliance with the applicable regulations. Section 811.507 (b) states:

> **"Construction of a test fill or the requirements for an additional test fill may be omitted if a full-scale liner or a test fill has been previously constructed in compliance with this subsection and documentation is available to demonstrate that the previously constructed liner meets the requirements of subsection (a)"**

LALC completed the initial portion of Cell VI. The installation of this lining system was in compliance with liner design and CQA requirements set forth in the SIGMOD and meets the requirements of 35 IAC 811.507(a). The installation of the initial portion of Cell VI was a full-scale liner that complied with the requirements of 35 IAC 811.507 (b).

4. *Numerous deficiencies have been identified in the Ground-Water Impact Assessment. Details of these deficiencies can be found in later sections of this report and in Appendix B.*

The SIGMOD is in compliance with the applicable regulations. A comprehensive analysis of the Ground-Water Impact Assessment is contained in Attachment 7 (Part V) to the February, 1996 Addendum to the SIGMOD.

5. *The application contains the definition of the Zone of Attenuation that is not consistent with 35 IAC 810.103. The modeling was conducted with a 100 foot Zone of Attenuation; however, the distance between the edge of the waste and the property boundary is significantly less than 100 feet. The actual distance*

between the waste boundary and the property boundary should be used for modeling purposes.

The SIGMOD is in compliance with the applicable regulations. The measured distance between the waste boundary and the property boundary is 50 feet. The width of zone of attenuation used in the ground-water modeling is 50 ft (15 m). Refer to Attachment 7 (Part V, Figures V-5-1 to V-5-3) to the February, 1996 Addendum to the SIGMOD.

6. *The application proposes a monitoring system where all wells are located at or near the compliance boundary (property boundary). This does not comply with 35 IAC 811.318 (b) which requires wells to be established "within half the distance from the edge of the potential source of discharge to the edge of the zone of attenuation". The placement of the wells in the proposed system defeats the purpose of ground-water modeling and the development of MAPC's and will be incapable of detecting a release until migration outside the compliance boundary is imminent.*

The SIGMOD is in compliance with applicable regulations. A complete discussion of the ground-water monitoring system is presented in Attachment 7 (Section 6.3.2.3) to the February, 1996 Addendum to the SIGMOD. The ground-water monitoring wells are located near the compliance boundary because of the narrow (50 ft (15m)) zone of attenuation available at the site. The MAPCs have been <u>conservatively</u> set equal to the AGQSs, rather than using the higher MAPCs determined by ground-water modeling utilizing a larger zone of attenuation. The approach, presented in Section 6.3.2.3, is <u>very conservative</u>.

7. *Inaccuracies in the simulations for slope stabilities have resulted in inflated factors of safety. Analysis of these simulations and corrected simulations indicate that the factor of safety for slope stability is as low as 0.29 for some sections. Additionally, no uplift calculations were included to verify bottom stability. Analysis of data included in the application indicate that uplift may be a problem during construction of the liner system. Details of these analyses are included in a later section and in Appendix C.*

The SIGMOD is in compliance with the applicable regulations.

Slope Stability

The slope stability analyses presented by Patrick Engineering Inc. (PEI) are long-term stability analyses using inaccurate and unrealistic assumptions regarding the pore water pressures present in the slope. In addition the results of these analyses are irrelevant for the Cell VI excavation side slopes because the Cell VI excavation side slopes are short-term slopes, not long-term slopes. The Cell VI excavation side slopes will be fully supported through the placement of waste (i.e., Cell VI will be filled to ground level) long before conditions consistent with long-term slope stability analyses are operative. The parameters used in the PEI analyses are not appropriate for the analyses which were performed. The PEI analyses used ultraconservative long-term strength parameters to calculate short-term safety factors. The PEI analyses are not consistent with good judgement, engineering practice, or IEPA regulatory requirements. The extreme nature of the PEI analyses can be illustrated by considering the side slope that would be required to satisfy the regulatory requirements according to the methodology presented by PEI. Based on the PEI methodology, side slopes not steeper than 6 horizontal to 1 vertical (6H:1V) would be required to obtain a factor of safety of 1.5 under static conditions (the side slope required under earthquake conditions would be even flatter). The results of these PEI analyses are obviously in error, particularly in view of the fact that, from a stability standpoint, the soil conditions at the site are excellent as evidenced by the numerous landfill cells that have been successfully constructed at the site during the past 25 years.

During the design of Cell VI, GeoSyntec considered the stability of all slopes present (including the north slope of the excavation). Consistent with generally accepted engineering practice, only the results for the most critical slopes (i.e., those with the lowest factors of safety) were presented in the SIGMOD. As discussed above, because the excavation side slopes for Cell VI will not be exposed over the long term (they will be fully supported over the long term because of waste placement), only short-term stability analyses are relevant for the excavation side slopes. The short-term stability calculations presented in the SIGMOD

indicate that even for the most critical case, the Cell VI excavation side slopes have a factor of safety of 1.8 under static conditions and 1.5 under earthquake conditions. These safety factors exceed the minimum regulatory requirements presented in 35 IAC Section 811.304(d).

Excavation Bottom Uplift Stability

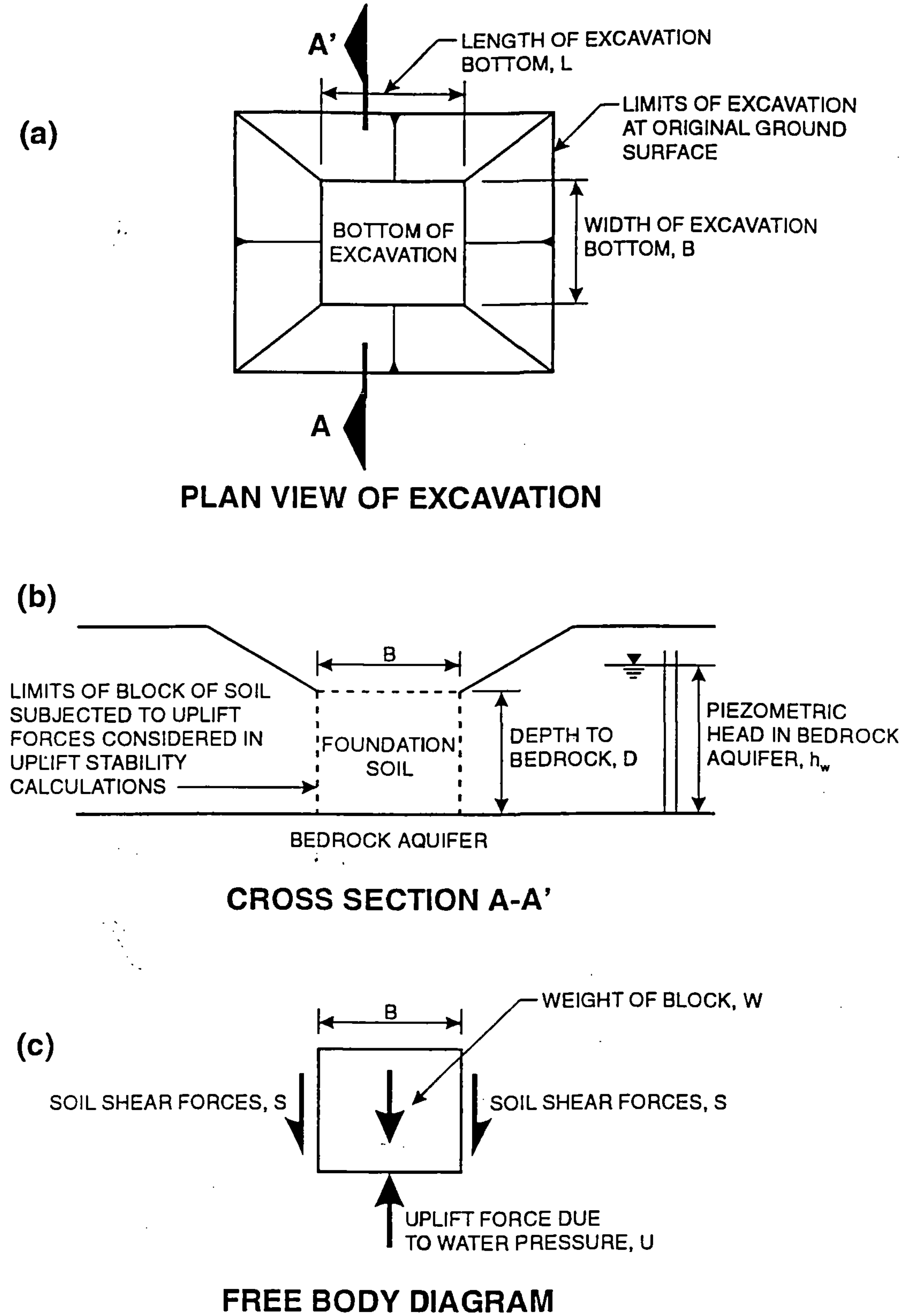
The uplift stability calculations presented by PEI are unrealistic. This is because the PEI uplift stability calculations do not consider the contribution of the strength of the soil.

A model of the uplift stability problem is illustrated in Figure 1 to this document. Figure 1a shows a plan view of an excavation with an excavation bottom width, B, and an excavation bottom length, L. A cross section of the excavation is shown in Figure 1b which defines the limits of the block of soil (i.e., the limits of the free body) considered in uplift stability calculations. Figure 1c defines the forces acting on the block of soil. The weight of the block of soil, W, and the soil shear forces, S, act downward and therefore resist uplift. The force, U, due to the water pressure in the bedrock aquifer, acts upward and therefore promotes uplift.

The factor of safety against uplift is defined by:

$$FS = \frac{\Sigma F_R}{\Sigma F_u} \quad \text{(Equation 1)}$$

where:
- FS = factor of safety against uplift (dimensionless);
- ΣF_R = sum of the forces resisting uplift (lb); and
- ΣF_u = sum of the forces promoting uplift (lb).



MODEL OF UPLIFT STABILITY PROBLEM: (a) PLAN VIEW OF EXCAVATION; (b) CROSS SECTION A-A'; AND (c) FORCES ACTING ON BLOCK OF SOIL

GEOSYNTEC CONSULTANTS

FIGURE NO.	1
PROJECT NO.	FE2226
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PAGE NO.	

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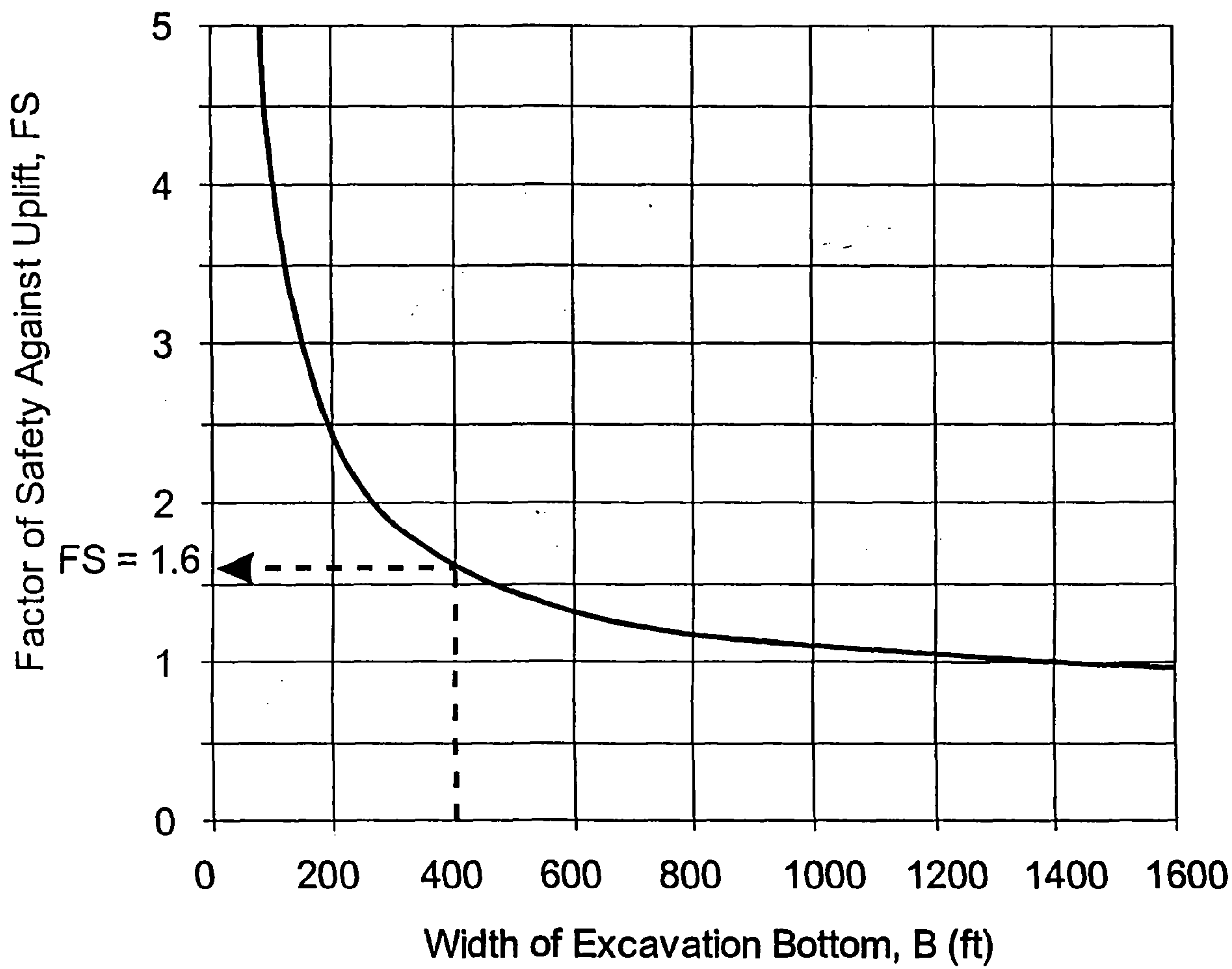

FACTOR OF SAFETY AGAINST UPLIFT

GEOSYNTEC CONSULTANTS

FIGURE NO.	2
PROJECT NO.	FE2226
DOCUMENT NO.	
PAGE NO.	

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Substituting the forces acting on the block of soil shown in Figure 1c into Equation 1 gives:

$$FS = \frac{W + S}{U} \qquad \text{(Equation 2)}$$

where:

FS	=	factor of safety against uplift (dimensionless);
W	=	weight of the soil block (lb);
S	=	soil shear forces acting on the vertical faces of the block (lb); and
U	=	uplift force due to water pressure acting on the bottom surface of the block (lb).

The weight of the block of soil, W, is given by:

$$W = B\ L\ D\ \gamma_s \qquad \text{(Equation 3)}$$

where:

B	=	excavation bottom width (ft);
L	=	excavation bottom length (ft);
D	=	depth to bedrock below excavation bottom (ft); and
γ_s	=	total unit weight of the soil (lb/ft^3).

A conservative estimate of the shear forces, S, acting on the vertical faces of the block is given by:

$$S = 2\ c_u\ (BD + LD) \qquad \text{(Equation 4)}$$

where: c_u = **short-term, undrained soil shear strength (lb/ft^2).**

The uplift force due to the water pressure in the bedrock aquifer is given by:

$$U = h_w\ \gamma_w\ BL \qquad \text{(Equation 5)}$$

where:

h_w	=	piezometric head above the top of bedrock in the bedrock aquifer (ft); and
γ_w	=	unit weight of water (lb/ft^3).

Substituting Equations 3, 4, and 5 into Equation 2 gives:

$$FS = \frac{D}{h_w \gamma_w}\left(\gamma_s + 2c_u\left(\frac{1}{L} + \frac{1}{B}\right)\right) \qquad \text{(Equation 6)}$$

For the case of a square excavation bottom (i.e., L = B), Equation 6 reduces to:

$$FS = \frac{D}{h_w \gamma_w}\left(\gamma_s + \frac{4c_u}{B}\right) \qquad \text{(Equation 7)}$$

According to the engineering drawings presented in the SIGMOD, Cell VI will be developed in at least two phases: Phase 1 and Phase 2. Uplift stability calculations have been performed for both phases and Phase 1 was found to be more critical (lower FS), therefore only the calculations for Phase 1 are presented herein. Based on the engineering drawings and the design report presented in the SIGMOD, the following parameter values are selected for Phase 1:

D	=	**20 ft**
h_w	=	**58 ft**
B	=	**L = 400 ft (square bottom)**
γ_s	=	**135 lb/ft**^{3}
γ_w	=	**62.4 lb/ft**^{3}

In addition, it should be noted that the soil at and below the base of the excavation is very hard till (Valparaiso Till) with standard penetration test (SPT) N-values typically greater than 50. GeoSyntec has performed unconfined compressive strength tests on samples of Valparaiso Till and the results of these tests indicate the till has an undrained shear strength, c_u, in excess of 15,000 psf. Hence, c_u = 15,000 psf is used in the uplift stability calculations.

The results of the calculations are presented in Figure 2 to this document for a range of excavation bottom widths, B. As shown in Figure 2 to this document, the calculated factor of safety against uplift for Phase 1 (B = 400 ft) is 1.6, which is satisfactory. Since Phase 1 is the critical phase, the calculated factor of safety

against uplift is satisfactory for all phases of Cell VI construction. Therefore, there is no reason to expect problems related to uplift stability for Cell VI.

Figure 2 to this document also shows that as the size of the excavation bottom increases (i.e., as B increases), the factor of safety decreases. This is because the contribution to the factor of safety from the soil shear strength (i.e., the term 4 c_u/B in Equation 7) decreases as the size of the excavation bottom increases. If B is infinite, the contribution to the factor of safety from the soil shear strength reduces to zero and the calculated FS is 0.75. As mentioned above, this is the case considered in the PEI uplift stability calculations: i.e., zero contribution to uplift stability due to the soil shear strength. In the case of Cell VI, because the area of the excavation bottom is not very large and the shear strength of the soil at and below the excavation bottom is significant, the PEI uplift stability calculations are overly conservative and inappropriate for design of the excavation. This is supported by the calculations presented above, the fact that the first phase of Cell VI was recently constructed without experiencing any problems with respect to uplift stability, and geotechnical experience in the region.

8. *Information in the application and in IEPA files indicates that prior liner construction may not have been completed in accordance with the permits issued for the construction. Data on the construction of these liners is important to the Ground-Water Impact Assessment and to the certification of the entire landfill. Details of the liner certification are discussed in a later section and in Appendix D.*

The SIGMOD is in compliance with the applicable regulations. All documentation regarding liners previously constructed at the 122nd Street facility has been submitted in the form of operating permit applications to the IEPA. Operating permits cannot be issued by the IEPA unless liners are constructed in accordance with IEPA development permits. An operating permit was obtained for every portion of the site that has received waste to date. Therefore, the IEPA has previously determined by the issuance of operating permits that all prior liner construction is in compliance with appropriate permit conditions.

9. *Surface-water discharges from the facility have exceeded permitted levels on a regular basis. The application does not contain any additional storm water control features that would rectify this situation. Potential solutions to this problem may include retention/settling ponds and/or pretreatment of stormwater effluent. A discussion of the stormwater system is included in a later section and in Appendix E.*

The SIGMOD is in compliance with the applicable regulations. LALC is actively engaged with the IEPA to implement a three-phase plan to improve surface-water quality at the 122nd Street landfill, with IEPA input and approval. Specifically, Phase I of the three-phase plan focused on improved erosion controls and management of solids, and included placement of additional silt fencing and haybales, installation of improved erosion controls on the inlets and outlets of downdrains, and re-contouring and vegetation of the 122nd Street Landfill. Phase I is complete. Phase II of the plan was coordinated with the IEPA Bureau of Land and involved placement of final cover on the east and south slopes of the 122nd Street Landfill, and engineering design of sedimentation/detention basins. Vegetation of the east and south slopes will take place in the spring of 1996. Phase III of the plan involves monitoring and management of the measures set forth and implemented in Phase I and Phase II of the plan. Phase III of the plan will commence upon the completion of Phases I and II. This three-phase plan will continue to improve surface-water quality discharged at the 122nd Street Landfill.

During the last two years, LALC and its consultants have also been engaged in discussions with the IEPA to address the fact that the existing NPDES permit for the 122nd Street Landfill is inappropriate in form and content for storm water runoff from a final cover system. The 1 June 1993 CH_2M Hill report entitled: *Evaluation of Storm Water Permitting* and subsequent submittals to the IEPA requested that the IEPA terminate the existing NPDES permit and cover the LALC 122nd Street Landfill facility under a permit appropriate to storm water. These discussions are on-going. In addition, as discussed with IEPA, LALC has a significant concern that surface-water quality at the 122nd Street Landfill is adversely affected by neighboring facilities and roadways.

Land and Lakes Company

`3 N. Northwest Highway
P.O. Box 778
Park Ridge, Illinois 60068-0778

(708) 825-5000
Fax (708) 825-0887

April 19, 1996

Mr. Edwin C. Bakowski, P.E.
Manager, Permit Section
Illinois Environmental Protection Agency
Bureau of Land
2200 Churchill Street
Springfield, Illinois 62794-9276
Attention: Mr. Ronald Steward

Federal Express
#6707739043

Re: Land and Lakes #3
#0316000034 - Cook County
Addendum to Application for Significant Modification
Log #1995-060

Dear Mr. Bakowski:

In accordance with conversations between Mr. Ron Steward of the Illinois Environmental Protection Agency and representatives of Land and Lakes Company, this letter and its attachments are an addendum to the above-referenced Application for Significant Modification.

Attached is one original and three copies of the Design Criteria Memorandum and Design Drawings No. 1 - 7 for a Landfill Gas Recovery System for the Land and Lakes #3 facility prepared by SCS Engineers.

If you have any questions, please do not hesitate to call.

Very truly yours,

Jay S. Goldstein
Environmental Director

JSG:bmj

Enclosures

DESIGN CRITERIA MEMORANDUM

PRELIMINARY DESIGN
LANDFILL GAS RECOVERY SYSTEM
122ND STREET LANDFILL
CHICAGO, ILLINOIS

Prepared for:

Zahren Alternative Power Corporation
124 Sills Road
P.O. Box 7
Yaphank, New York 11980
(516) 924-5627

Land and Lakes Company
123 N. Northwest Highway
P.O. Box 778
Park Ridge, Illinois 60068
(708) 825-5000

Prepared by:

SCS Engineers
2060 Reading Road
Cincinnati, Ohio 45202
(513) 421-5353

JAMES J. WALSH
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

File No. 0595037
April 18, 1996

CONTENTS

DESIGN CRITERIA MEMORANDUM

PRELIMINARY DESIGN
LANDFILL GAS RECOVERY SYSTEM
122ND STREET LANDFILL
CHICAGO, ILLINOIS

INTRODUCTION

This Landfill Gas (LFG) Collection System Design Criteria Memorandum for the Land and Lakes 122nd Street Landfill in Chicago, Illinois, has been prepared for Zahren Alternative Power Corporation as specified in the proposal scope of services dated January 15, 1996. This memorandum along with the LFG collection system design drawings, constitutes the design documents for the wellfield and piping network for the LFG collection system.

BACKGROUND

The 122nd Street landfill site presently has a passive gas system with passive gas flares. These flares are located mainly on the western slope of the landfill, approximately half way down the slope. There are three gas flares along the southern slope of the landfill. The information on the construction of the gas flares was reported from Land and Lakes Company. The gas flares were constructed to a depth of approximately 30 to 40 ft, in an 18-inch borehole. In the borehole, a 6-inch diameter PVC pipe was installed from the bottom of the borehole to approximately 8 to 10 ft above ground. The pipe was perforated (or slotted) to within 4 or 5 ft of the surface. On top of the pipe (above ground), there is a wind shield and a shut-off valve. The existing passive flares will be properly abandoned upon the construction and operation of the LFG system.

PROPOSED LFG SYSTEM DESCRIPTION AND OBJECTIVES

The purpose of the proposed LFG collection system is to extract LFG from the landfill and to control off-site migration of the landfill gas in accordance with 35 Illinois Administrative Code (IAC) Section 811.311 (d)(3). The LFG may be used to fuel internal combustion engine generators, which could generate electricity for sale to a utility, or be used directly by a medium Btu user, such as a boiler or kiln. The proposed LFG collection system is comprised of vertical extraction wells, collection piping to transport the LFG from the wellfield to a condensate handling system, the blower/flare unit, and eventually to the end-user.

Based on information obtained during field observations and review of existing data, SCS developed design criteria for the LFG collection system. The design criteria was developed for the following:

- Vertical extraction well depth and spacing.
- LFG system sizing.

The well system was designed with all the wells being placed within the landfill limits of solid waste, in accordance with 35 IAC 811.311 (d)(1). The vertical well spacing was design based on the projected radius of influence that each well will exert on the landfill. The spacing and layout of the well system was designed to maximize collection of the landfill gas, and to minimize the potential for off-site migration of landfill gas, in accordance with 35 IAC 811.311 (d)(2).

The radius of influence was calculated in two different ways, depending on the part of the landfill in which the wells were being placed. For the existing cells (Cells 1 through 5), the radius of influence was calculated using a well depth equal to the difference between the existing surface elevation and the average elevation of the leachate. A pipe will be placed in that borehole, equal to 1 ft less than the depth calculated above. The pipe will have the bottom two-thirds slotted, and the top one-third solid. The borehole will be backfilled with gravel around the slotted portion of the pipe, a soil/bentonite plug above the gravel, more soil backfilled around the solid pipe, and another soil/bentonite plug.

For wells being designed for future Cell 6, the radius of influence was calculated using a well depth equal to three quarters of the difference between the final grade elevation and the bottom of waste elevation. The remaining design criteria is the same for these wells as for the wells designed for the existing cells. The pipe material will be Schedule 80 PVC pipe to meet the requirements of 35 IAC 811.311 (d)(5).

The final cover system for various parts of the landfill is: The western slope has 2 ft of clay and 6 inches of topsoil placed prior to September 18, 1990, per 35 IAC 807 regulations. The south and east slopes, along with most of the top area will receive a cap consisting of 3 ft of clay, 2.5 ft of protective soil, and 6 inches of topsoil. The cap over Cell 6 will receive 1 ft of clay cover, 1 40-mil flexible membrane liner, 2.5 ft of protective soil, and 6 inches of topsoil. For those areas where wells will be drilled into the existing cap (west slope, south slope, and some of the east slope), the cap will be replaced with the identical configuration as described above. For those areas where there is not a cap system presently in place, the well heads will be protected from damage, and the capping system will be placed around the wells, when the cap is installed for that area. In accordance with 35 IAC 811.311(d)(9), under no circumstances will the gas collection system compromise the integrity of the liner, leachate collection, or cover system.

The vertical extraction wells are connected together by HDPE header system and condensate management system. The header system is designed to transport the landfill gas to a blower/flare facility for processing. From this facility, the gas can either be destroyed by a candle flare, or transported to an end-user for consumption. The header system was laid out to run with the natural slope of the final grading plan at a minimum slope of 3 percent. The same minimum slope requirement was used for laying out the well laterals that connect the wells to the header system. At low points along the header system, and at the blower/flare station, condensate knockout devices are to be installed for the removal of condensate from the system. For low points located within the limits of solid waste, the condensate will be returned to the landfill. For the condensate knockout at the blower/flare station, the condensate will be returned to the landfill or managed separately in accordance with the requirements of 35 IAC 811.311(d)(8).

For sizing of the header system, flow rates were calculated for each well. The flow rate was calculated using the volume of the zone of influence from each well. The flow rate was then subjected to a factor of safety of 50 percent. The flow rate was then input at the appropriate points along the header system. The header sizing was then determined based on limiting the velocity in the header system. The limiting velocities are 2,400 ft per minute (fpm) when the gas flow and the condensate flow are in the same direction, and 1,200 fpm when the gas flow and the condensate flow are in the opposite direction. In accordance with 35 IAC 811.312(d), representative flow rate measurements shall be made of gas flow into treatment or combustion devices. The portion of the gas collection system used to convey the gas collected from one or more units for processing and disposal shall be tested to be airtight to prevent the leaking of gas from the collection system or entry of air into the system in accordance with 35 IAC 811.311(d)(10).

In accordance with 35 IAC 811.311(d)(4), the gas collection system is designed to function for the entire design period. However, as stated in 35 IAC 811.311(d)(4), in the design period there may be changing gas flow rates and compositions. Additional vertical extraction wells may be added to the existing system to accommodate these changes. In anticipation of this, the header system and blower/flare system has been designed to accommodate flow from at least three times the number of wells currently designed for the facility. Therefore, at any time during the design period, vertical extraction wells may be added to the system up to the design capacity. In accordance with 35 IAC 811.311(d)(11), the gas collection system shall be operated until the waste has stabilized enough to no longer produce methane in quantities that exceed the minimum allowable concentrations stated in 35 IAC 811.311(a)(1), (a)(2), and (a)(3).

The gas collection system has been designed and constructed to withstand all landfill operating conditions, including settlement, in accordance with 35 IAC 811.311(d)(6). In accordance with 35 IAC 811.311(d)(5), all materials and equipment used in construction of the system shall be rated by the manufacturer as safe for use in hazardous or explosive environments and shall be resistant to corrosion by constituents of the landfill gas.

The blower/flare facility was designed to handle the total amount of landfill gas generated from the entire facility. When used for the on-site combustion of landfill gas, the flare shall meet the general control device requirements of new source performance standards adopted pursuant to Section 9.1(b) of the Act. As required by 35 IAC 811.312(c), no gas will be discharged directly to the atmosphere unless treated or burned on site prior to discharge in accordance with a permit issued by the Agency pursuant to 35 IAC 200 through 245.

If the gas is combusted on site in a device other than flares, it will be done in accordance with the requirements of 35 IAC 811.312(f). If the landfill gas is transported off site to a gas processing facility, it will be done in accordance with the requirements of 35 IAC 811.312(g).

		0.2952E+02	0.3688E-08		
		0.3034E+02	0.3690E-08		
		0.3116E+02	0.3692E-08		
		0.3198E+02	0.3693E-08		
		0.3280E+02	0.3693E-08		
0.9000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3661E+04	0.0000E+00
		0.1640E+01	-0.5530E-02		
		0.3280E+01	-0.2490E-02		
		0.4920E+01	-0.9434E-03		
		0.6560E+01	-0.3009E-03		
		0.8200E+01	-0.8081E-04		
		0.9840E+01	-0.1840E-04		
		0.1148E+02	-0.3667E-05		
		0.1312E+02	-0.6980E-06		
		0.1476E+02	-0.1511E-06		
		0.1640E+02	-0.4740E-07		
		0.1804E+02	-0.2550E-07		
		0.1968E+02	-0.1870E-07		
		0.2132E+02	-0.9899E-08		
		0.2296E+02	0.3331E-08		
		0.2378E+02	0.3335E-08		
		0.2460E+02	0.3339E-08		
		0.2542E+02	0.3343E-08		
		0.2624E+02	0.3346E-08		
		0.2706E+02	0.3349E-08		
		0.2788E+02	0.3351E-08		
		0.2870E+02	0.3354E-08		
		0.2952E+02	0.3355E-08		
		0.3034E+02	0.3357E-08		
		0.3116E+02	0.3358E-08		
		0.3198E+02	0.3358E-08		
		0.3280E+02	0.3358E-08		
0.9000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3661E+04	0.0000E+00
		0.1640E+01	-0.3720E-02		
		0.3280E+01	-0.1704E-02		
		0.4920E+01	-0.6531E-03		
		0.6560E+01	-0.2099E-03		
		0.8200E+01	-0.5649E-04		
		0.9840E+01	-0.1279E-04		
		0.1148E+02	-0.2492E-05		
		0.1312E+02	-0.4455E-06		
		0.1476E+02	-0.8145E-07		
		0.1640E+02	-0.1580E-07		
		0.1804E+02	-0.2461E-08		
		0.1968E+02	0.5713E-09		
		0.2132E+02	0.2069E-08		
		0.2296E+02	0.3248E-08		
		0.2378E+02	0.3249E-08		
		0.2460E+02	0.3249E-08		
		0.2542E+02	0.3249E-08		
		0.2624E+02	0.3249E-08		
		0.2706E+02	0.3250E-08		
		0.2788E+02	0.3250E-08		
		0.2870E+02	0.3250E-08		
		0.2952E+02	0.3250E-08		
		0.3034E+02	0.3250E-08		
		0.3116E+02	0.3251E-08		
		0.3198E+02	0.3251E-08		

		0.3280E+02	0.3251E-08		
TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.9500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3689E+04	0.0000E+00
		0.1640E+01	0.9764E-01		
		0.3280E+01	0.4625E-01		
		0.4920E+01	0.1839E-01		
		0.6560E+01	0.6145E-02		
		0.8200E+01	0.1720E-02		
		0.9840E+01	0.4008E-03		
		0.1148E+02	0.7706E-04		
		0.1312E+02	0.1208E-04		
		0.1476E+02	0.1488E-05		
		0.1640E+02	0.1083E-06		
		0.1804E+02	-0.2821E-07		
		0.1968E+02	-0.3189E-07		
		0.2132E+02	-0.1759E-07		
		0.2296E+02	0.3732E-08		
		0.2378E+02	0.3739E-08		
		0.2460E+02	0.3745E-08		
		0.2542E+02	0.3751E-08		
		0.2624E+02	0.3756E-08		
		0.2706E+02	0.3760E-08		
		0.2788E+02	0.3764E-08		
		0.2870E+02	0.3767E-08		
		0.2952E+02	0.3770E-08		
		0.3034E+02	0.3772E-08		
		0.3116E+02	0.3773E-08		
		0.3198E+02	0.3774E-08		
		0.3280E+02	0.3774E-08		
0.9500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3689E+04	0.0000E+00
		0.1640E+01	0.2096E-01		
		0.3280E+01	0.1000E-01		
		0.4920E+01	0.3996E-02		
		0.6560E+01	0.1338E-02		
		0.8200E+01	0.3741E-03		
		0.9840E+01	0.8646E-04		
		0.1148E+02	0.1622E-04		
		0.1312E+02	0.2352E-05		
		0.1476E+02	0.2020E-06		
		0.1640E+02	-0.3463E-07		
		0.1804E+02	-0.4306E-07		
		0.1968E+02	-0.3451E-07		
		0.2132E+02	-0.1887E-07		
		0.2296E+02	0.3340E-08		
		0.2378E+02	0.3347E-08		
		0.2460E+02	0.3354E-08		
		0.2542E+02	0.3359E-08		
		0.2624E+02	0.3365E-08		
		0.2706E+02	0.3369E-08		
		0.2788E+02	0.3374E-08		
		0.2870E+02	0.3377E-08		
		0.2952E+02	0.3380E-08		
		0.3034E+02	0.3382E-08		
		0.3116E+02	0.3384E-08		
		0.3198E+02	0.3384E-08		

		0.3280E+02	0.3385E-08		
0.9500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3689E+04	0.0000E+00
		0.1640E+01	-0.5636E-02		
		0.3280E+01	-0.2612E-02		
		0.4920E+01	-0.1025E-02		
		0.6560E+01	-0.3410E-03		
		0.8200E+01	-0.9620E-04		
		0.9840E+01	-0.2312E-04		
		0.1148E+02	-0.4837E-05		
		0.1312E+02	-0.9389E-06		
		0.1476E+02	-0.1951E-06		
		0.1640E+02	-0.5556E-07		
		0.1804E+02	-0.2697E-07		
		0.1968E+02	-0.1829E-07		
		0.2132E+02	-0.9112E-08		
		0.2296E+02	0.3054E-08		
		0.2378E+02	0.3058E-08		
		0.2460E+02	0.3062E-08		
		0.2542E+02	0.3065E-08		
		0.2624E+02	0.3068E-08		
		0.2706E+02	0.3071E-08		
		0.2788E+02	0.3073E-08		
		0.2870E+02	0.3075E-08		
		0.2952E+02	0.3076E-08		
		0.3034E+02	0.3078E-08		
		0.3116E+02	0.3079E-08		
		0.3198E+02	0.3079E-08		
		0.3280E+02	0.3079E-08		
.9500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3689E+04	0.0000E+00
		0.1640E+01	-0.3794E-02		
		0.3280E+01	-0.1791E-02		
		0.4920E+01	-0.7115E-03		
		0.6560E+01	-0.2386E-03		
		0.8200E+01	-0.6755E-04		
		0.9840E+01	-0.1618E-04		
		0.1148E+02	-0.3330E-05		
		0.1312E+02	-0.6156E-06		
		0.1476E+02	-0.1115E-06		
		0.1640E+02	-0.2107E-07		
		0.1804E+02	-0.3525E-08		
		0.1968E+02	0.4218E-09		
		0.2132E+02	0.2056E-08		
		0.2296E+02	0.2983E-08		
		0.2378E+02	0.2983E-08		
		0.2460E+02	0.2983E-08		
		0.2542E+02	0.2983E-08		
		0.2624E+02	0.2983E-08		
		0.2706E+02	0.2984E-08		
		0.2788E+02	0.2984E-08		
		0.2870E+02	0.2984E-08		
		0.2952E+02	0.2984E-08		
		0.3034E+02	0.2984E-08		
		0.3116E+02	0.2984E-08		
		0.3198E+02	0.2984E-08		
		0.3280E+02	0.2984E-08		
TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE

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0.1000E+03	0.2730E+04	0.0000E+00	0.1730E+00	0.3716E+04	0.0000E+00
		0.1640E+01	0.9942E-01		
		0.3280E+01	0.4838E-01		
		0.4920E+01	0.1990E-01		
		0.6560E+01	0.6927E-02		
		0.8200E+01	0.2036E-02		
		0.9840E+01	0.5026E-03		
		0.1148E+02	0.1036E-03		
		0.1312E+02	0.1763E-04		
		0.1476E+02	0.2424E-05		
		0.1640E+02	0.2336E-06		
		0.1804E+02	-0.1481E-07		
		0.1968E+02	-0.2970E-07		
		0.2132E+02	-0.1635E-07		
		0.2296E+02	0.3554E-08		
		0.2378E+02	0.3560E-08		
		0.2460E+02	0.3566E-08		
		0.2542E+02	0.3571E-08		
		0.2624E+02	0.3576E-08		
		0.2706E+02	0.3580E-08		
		0.2788E+02	0.3583E-08		
		0.2870E+02	0.3586E-08		
		0.2952E+02	0.3589E-08		
		0.3034E+02	0.3591E-08		
		0.3116E+02	0.3592E-08		
		0.3198E+02	0.3593E-08		
		0.3280E+02	0.3593E-08		
.1000E+03	0.2746E+04	0.0000E+00	0.3667E-01	0.3716E+04	0.0000E+00
		0.1640E+01	0.2135E-01		
		0.3280E+01	0.1048E-01		
		0.4920E+01	0.4331E-02		
		0.6560E+01	0.1511E-02		
		0.8200E+01	0.4439E-03		
		0.9840E+01	0.1090E-03		
		0.1148E+02	0.2205E-04		
		0.1312E+02	0.3559E-05		
		0.1476E+02	0.3980E-06		
		0.1640E+02	-0.1142E-07		
		0.1804E+02	-0.4123E-07		
		0.1968E+02	-0.3340E-07		
		0.2132E+02	-0.1766E-07		
		0.2296E+02	0.3182E-08		
		0.2378E+02	0.3189E-08		
		0.2460E+02	0.3195E-08		
		0.2542E+02	0.3200E-08		
		0.2624E+02	0.3205E-08		
		0.2706E+02	0.3210E-08		
		0.2788E+02	0.3214E-08		
		0.2870E+02	0.3217E-08		
		0.2952E+02	0.3219E-08		
		0.3034E+02	0.3221E-08		
		0.3116E+02	0.3223E-08		
		0.3198E+02	0.3224E-08		
		0.3280E+02	0.3224E-08		
0.1000E+03	0.2762E+04	0.0000E+00	-0.1033E-01	0.3716E+04	0.0000E+00
		0.1640E+01	-0.5731E-02		

		0.3280E+01	-0.2725E-02		
		0.4920E+01	-0.1105E-02		
		0.6560E+01	-0.3823E-03		
		0.8200E+01	-0.1128E-03		
		0.9840E+01	-0.2852E-04		
		0.1148E+02	-0.6266E-05		
		0.1312E+02	-0.1253E-05		
		0.1476E+02	-0.2551E-06		
		0.1640E+02	-0.6660E-07		
		0.1804E+02	-0.2891E-07		
		0.1968E+02	-0.1802E-07		
		0.2132E+02	-0.8515E-08		
		0.2296E+02	0.2909E-08		
		0.2378E+02	0.2913E-08		
		0.2460E+02	0.2916E-08		
		0.2542E+02	0.2920E-08		
		0.2624E+02	0.2922E-08		
		0.2706E+02	0.2925E-08		
		0.2788E+02	0.2927E-08		
		0.2870E+02	0.2929E-08		
		0.2952E+02	0.2930E-08		
		0.3034E+02	0.2931E-08		
		0.3116E+02	0.2932E-08		
		0.3198E+02	0.2933E-08		
		0.3280E+02	0.2933E-08		
0.1000E+03	0.2779E+04	0.0000E+00	-0.6770E-02	0.3716E+04	0.0000E+00
		0.1640E+01	-0.3862E-02		
		0.3280E+01	-0.1872E-02		
		0.4920E+01	-0.7691E-03		
		0.6560E+01	-0.2684E-03		
		0.8200E+01	-0.7958E-04		
		0.9840E+01	-0.2009E-04		
		0.1148E+02	-0.4360E-05		
		0.1312E+02	-0.8396E-06		
		0.1476E+02	-0.1532E-06		
		0.1640E+02	-0.2841E-07		
		0.1804E+02	-0.4915E-08		
		0.1968E+02	0.1929E-09		
		0.2132E+02	0.1993E-08		
		0.2296E+02	0.2835E-08		
		0.2378E+02	0.2835E-08		
		0.2460E+02	0.2835E-08		
		0.2542E+02	0.2836E-08		
		0.2624E+02	0.2836E-08		
		0.2706E+02	0.2836E-08		
		0.2788E+02	0.2836E-08		
		0.2870E+02	0.2836E-08		
		0.2952E+02	0.2837E-08		
		0.3034E+02	0.2837E-08		
		0.3116E+02	0.2837E-08		
		0.3198E+02	0.2837E-08		
		0.3280E+02	0.2837E-08		

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.1050E+03	0.2730E+04	0.0000E+00	0.1730E+00	0.3742E+04	0.0000E+00
		0.1640E+01	0.1010E+00		

		0.3280E+01	0.5040E-01		
		0.4920E+01	0.2139E-01		
		0.6560E+01	0.7731E-02		
		0.8200E+01	0.2376E-02		
		0.9840E+01	0.6184E-03		
		0.1148E+02	0.1356E-03		
		0.1312E+02	0.2486E-04		
		0.1476E+02	0.3749E-05		
		0.1640E+02	0.4300E-06		
		0.1804E+02	0.8779E-08		
		0.1968E+02	-0.2650E-07		
		0.2132E+02	-0.1522E-07		
		0.2296E+02	0.3434E-08		
		0.2378E+02	0.3440E-08		
		0.2460E+02	0.3445E-08		
		0.2542E+02	0.3450E-08		
		0.2624E+02	0.3455E-08		
		0.2706E+02	0.3459E-08		
		0.2788E+02	0.3462E-08		
		0.2870E+02	0.3465E-08		
		0.2952E+02	0.3467E-08		
		0.3034E+02	0.3469E-08		
		0.3116E+02	0.3470E-08		
		0.3198E+02	0.3471E-08		
		0.3280E+02	0.3471E-08		
0.1050E+03	0.2746E+04	0.0000E+00	0.3667E-01	0.3742E+04	0.0000E+00
		0.1640E+01	0.2171E-01		
		0.3280E+01	0.1092E-01		
		0.4920E+01	0.4661E-02		
		0.6560E+01	0.1689E-02		
		0.8200E+01	0.5192E-03		
		0.9840E+01	0.1346E-03		
		0.1148E+02	0.2913E-04		
		0.1312E+02	0.5140E-05		
		0.1476E+02	0.6805E-06		
		0.1640E+02	0.2734E-07		
		0.1804E+02	-0.3727E-07		
		0.1968E+02	-0.3222E-07		
		0.2132E+02	-0.1665E-07		
		0.2296E+02	0.3075E-08		
		0.2378E+02	0.3081E-08		
		0.2460E+02	0.3087E-08		
		0.2542E+02	0.3092E-08		
		0.2624E+02	0.3097E-08		
		0.2706E+02	0.3101E-08		
		0.2788E+02	0.3105E-08		
		0.2870E+02	0.3108E-08		
		0.2952E+02	0.3110E-08		
		0.3034E+02	0.3112E-08		
		0.3116E+02	0.3114E-08		
		0.3198E+02	0.3115E-08		
		0.3280E+02	0.3115E-08		
0.1050E+03	0.2762E+04	0.0000E+00	-0.1033E-01	0.3742E+04	0.0000E+00
		0.1640E+01	-0.5816E-02		
		0.3280E+01	-0.2832E-02		
		0.4920E+01	-0.1184E-02		
		0.6560E+01	-0.4245E-03		
		0.8200E+01	-0.1307E-03		

		0.9840E+01	-0.3461E-04		
		0.1148E+02	-0.7974E-05		
		0.1312E+02	-0.1652E-05		
		0.1476E+02	-0.3356E-06		
		0.1640E+02	-0.8159E-07		
		0.1804E+02	-0.3151E-07		
		0.1968E+02	-0.1795E-07		
		0.2132E+02	-0.8058E-08		
		0.2296E+02	0.2810E-08		
		0.2378E+02	0.2813E-08		
		0.2460E+02	0.2816E-08		
		0.2542E+02	0.2819E-08		
		0.2624E+02	0.2822E-08		
		0.2706E+02	0.2824E-08		
		0.2788E+02	0.2826E-08		
		0.2870E+02	0.2828E-08		
		0.2952E+02	0.2829E-08		
		0.3034E+02	0.2830E-08		
		0.3116E+02	0.2831E-08		
		0.3198E+02	0.2832E-08		
		0.3280E+02	0.2832E-08		
0.1050E+03	0.2779E+04	0.0000E+00	-0.6770E-02	0.3742E+04	0.0000E+00
		0.1640E+01	-0.3924E-02		
		0.3280E+01	-0.1949E-02		
		0.4920E+01	-0.8258E-03		
		0.6560E+01	-0.2989E-03		
		0.8200E+01	-0.9251E-04		
		0.9840E+01	-0.2451E-04		
		0.1148E+02	-0.5598E-05		
		0.1312E+02	-0.1127E-05		
		0.1476E+02	-0.2099E-06		
		0.1640E+02	-0.3862E-07		
		0.1804E+02	-0.6782E-08		
		0.1968E+02	-0.1383E-09		
		0.2132E+02	0.1899E-08		
		0.2296E+02	0.2731E-08		
		0.2378E+02	0.2731E-08		
		0.2460E+02	0.2731E-08		
		0.2542E+02	0.2731E-08		
		0.2624E+02	0.2732E-08		
		0.2706E+02	0.2732E-08		
		0.2788E+02	0.2732E-08		
		0.2870E+02	0.2732E-08		
		0.2952E+02	0.2732E-08		
		0.3034E+02	0.2732E-08		
		0.3116E+02	0.2732E-08		
		0.3198E+02	0.2733E-08		
		0.3280E+02	0.2733E-08		

N O T I C E

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*                                                *
*                                                *
*                                                *
*      M I G R A T E   S I M U L A T I O N       *
*                                                *
*             ANALYSIS      COMPLETED            *
*                                                *
*           TIME       -       17:32:43          *
*           EXECUTION TIME      3:31:19          *
*                                                *
*                                                *
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4

		0.9840E+01	0.3392E-05		
		0.1148E+02	-0.2440E-07		
		0.1312E+02	-0.9987E-07		
		0.1476E+02	-0.5273E-07		
		0.1640E+02	-0.4131E-07		
		0.1804E+02	-0.3987E-07		
		0.1968E+02	-0.3972E-07		
		0.2132E+02	-0.3800E-07		
		0.2296E+02	0.6776E-08		
		0.2378E+02	0.6803E-08		
		0.2460E+02	0.6828E-08		
		0.2542E+02	0.6850E-08		
		0.2624E+02	0.6870E-08		
		0.2706E+02	0.6888E-08		
		0.2788E+02	0.6904E-08		
		0.2870E+02	0.6917E-08		
		0.2952E+02	0.6928E-08		
		0.3034E+02	0.6936E-08		
		0.3116E+02	0.6942E-08		
		0.3198E+02	0.6945E-08		
		0.3280E+02	0.6947E-08		
0.5500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.2932E+04	0.0000E+00
		0.1640E+01	-0.4451E-02		
		0.3280E+01	-0.1521E-02		
		0.4920E+01	-0.4019E-03		
		0.6560E+01	-0.8114E-04		
		0.8200E+01	-0.1289E-04		
		0.9840E+01	-0.1869E-05		
		0.1148E+02	-0.3352E-06		
		0.1312E+02	-0.8467E-07		
		0.1476E+02	-0.3177E-07		
		0.1640E+02	-0.2181E-07		
		0.1804E+02	-0.2053E-07		
		0.1968E+02	-0.2039E-07		
		0.2132E+02	-0.1996E-07		
		0.2296E+02	0.3571E-08		
		0.2378E+02	0.3585E-08		
		0.2460E+02	0.3597E-08		
		0.2542E+02	0.3609E-08		
		0.2624E+02	0.3619E-08		
		0.2706E+02	0.3628E-08		
		0.2788E+02	0.3636E-08		
		0.2870E+02	0.3643E-08		
		0.2952E+02	0.3648E-08		
		0.3034E+02	0.3652E-08		
		0.3116E+02	0.3655E-08		
		0.3198E+02	0.3657E-08		
		0.3280E+02	0.3658E-08		
0.5500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.2932E+04	0.0000E+00
		0.1640E+01	-0.2970E-02		
		0.3280E+01	-0.1027E-02		
		0.4920E+01	-0.2730E-03		
		0.6560E+01	-0.5502E-04		
		0.8200E+01	-0.8579E-05		
		0.9840E+01	-0.1169E-05		
		0.1148E+02	-0.1863E-06		
		0.1312E+02	-0.3767E-07		
		0.1476E+02	-0.6274E-08		

0.1640E+02	0.1525E-09
0.1804E+02	0.1054E-08
0.1968E+02	0.1170E-08
0.2132E+02	0.3470E-09
0.2296E+02	0.2262E-08
0.2378E+02	0.2256E-08
0.2460E+02	0.2250E-08
0.2542E+02	0.2245E-08
0.2624E+02	0.2240E-08
0.2706E+02	0.2236E-08
0.2788E+02	0.2233E-08
0.2870E+02	0.2230E-08
0.2952E+02	0.2227E-08
0.3034E+02	0.2226E-08
0.3116E+02	0.2224E-08
0.3198E+02	0.2223E-08
0.3280E+02	0.2223E-08

ANALYSIS FOR TIME PERIOD 12

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.6000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3184E+04	0.0000E+00
		0.1640E+01	0.7854E-01		
		0.3280E+01	0.2850E-01		
		0.4920E+01	0.8083E-02		
		0.6560E+01	0.1751E-02		
		0.8200E+01	0.2838E-03		
		0.9840E+01	0.3355E-04		
		0.1148E+02	0.2674E-05		
		0.1312E+02	0.5975E-07		
		0.1476E+02	-0.4985E-07		
		0.1640E+02	-0.4096E-07		
		0.1804E+02	-0.3863E-07		
		0.1968E+02	-0.3838E-07		
		0.2132E+02	-0.3610E-07		
		0.2296E+02	0.5011E-08		
		0.2378E+02	0.5021E-08		
		0.2460E+02	0.5030E-08		
		0.2542E+02	0.5038E-08		
		0.2624E+02	0.5045E-08		
		0.2706E+02	0.5051E-08		
		0.2788E+02	0.5057E-08		
		0.2870E+02	0.5061E-08		
		0.2952E+02	0.5065E-08		
		0.3034E+02	0.5068E-08		
		0.3116E+02	0.5070E-08		
		0.3198E+02	0.5071E-08		
		0.3280E+02	0.5071E-08		
0.6000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3184E+04	0.0000E+00
		0.1640E+01	0.1680E-01		
		0.3280E+01	0.6125E-02		
		0.4920E+01	0.1739E-02		

		0.6560E+01	0.3745E-03		
		0.8200E+01	0.5920E-04		
		0.9840E+01	0.6268E-05		
		0.1148E+02	0.2007E-06		
		0.1312E+02	-0.1188E-06		
		0.1476E+02	-0.6403E-07		
		0.1640E+02	-0.4355E-07		
		0.1804E+02	-0.4013E-07		
		0.1968E+02	-0.3975E-07		
		0.2132E+02	-0.3822E-07		
		0.2296E+02	0.6635E-08		
		0.2378E+02	0.6654E-08		
		0.2460E+02	0.6672E-08		
		0.2542E+02	0.6688E-08		
		0.2624E+02	0.6703E-08		
		0.2706E+02	0.6715E-08		
		0.2788E+02	0.6726E-08		
		0.2870E+02	0.6736E-08		
		0.2952E+02	0.6744E-08		
		0.3034E+02	0.6749E-08		
		0.3116E+02	0.6754E-08		
		0.3198E+02	0.6756E-08		
		0.3280E+02	0.6757E-08		
0.6000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3184E+04	0.0000E+00
		0.1640E+01	-0.4583E-02		
		0.3280E+01	-0.1642E-02		
		0.4920E+01	-0.4653E-03		
		0.6560E+01	-0.1030E-03		
		0.8200E+01	-0.1818E-04		
		0.9840E+01	-0.2846E-05		
		0.1148E+02	-0.5105E-06		
		0.1312E+02	-0.1255E-06		
		0.1476E+02	-0.4219E-07		
		0.1640E+02	-0.2375E-07		
		0.1804E+02	-0.2077E-07		
		0.1968E+02	-0.2041E-07		
		0.2132E+02	-0.2035E-07		
		0.2296E+02	0.6279E-08		
		0.2378E+02	0.6295E-08		
		0.2460E+02	0.6310E-08		
		0.2542E+02	0.6323E-08		
		0.2624E+02	0.6335E-08		
		0.2706E+02	0.6346E-08		
		0.2788E+02	0.6355E-08		
		0.2870E+02	0.6363E-08		
		0.2952E+02	0.6370E-08		
		0.3034E+02	0.6375E-08		
		0.3116E+02	0.6378E-08		
		0.3198E+02	0.6380E-08		
		0.3280E+02	0.6381E-08		
0.6000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3184E+04	0.0000E+00
		0.1640E+01	-0.3061E-02		
		0.3280E+01	-0.1111E-02		
		0.4920E+01	-0.3169E-03		
		0.6560E+01	-0.7019E-04		
		0.8200E+01	-0.1221E-04		
		0.9840E+01	-0.1820E-05		
		0.1148E+02	-0.2945E-06		

0.1312E+02	-0.6160E-07
0.1476E+02	-0.1268E-07
0.1640E+02	-0.1141E-08
0.1804E+02	0.8774E-09
0.1968E+02	0.1154E-08
0.2132E+02	0.1736E-09
0.2296E+02	0.4943E-08
0.2378E+02	0.4946E-08
0.2460E+02	0.4950E-08
0.2542E+02	0.4953E-08
0.2624E+02	0.4956E-08
0.2706E+02	0.4958E-08
0.2788E+02	0.4960E-08
0.2870E+02	0.4962E-08
0.2952E+02	0.4964E-08
0.3034E+02	0.4965E-08
0.3116E+02	0.4966E-08
0.3198E+02	0.4966E-08
0.3280E+02	0.4966E-08

ANALYSIS FOR TIME PERIOD 13

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.6500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3439E+04	0.0000E+00
		0.1640E+01	0.8117E-01		
		0.3280E+01	0.3081E-01		
		0.4920E+01	0.9313E-02		
		0.6560E+01	0.2199E-02		
		0.8200E+01	0.3986E-03		
		0.9840E+01	0.5428E-04		
		0.1148E+02	0.5279E-05		
		0.1312E+02	0.2639E-06		
		0.1476E+02	-0.4858E-07		
		0.1640E+02	-0.4353E-07		
		0.1804E+02	-0.3907E-07		
		0.1968E+02	-0.3840E-07		
		0.2132E+02	-0.3646E-07		
		0.2296E+02	0.7481E-08		
		0.2378E+02	0.7495E-08		
		0.2460E+02	0.7507E-08		
		0.2542E+02	0.7518E-08		
		0.2624E+02	0.7528E-08		
		0.2706E+02	0.7537E-08		
		0.2788E+02	0.7544E-08		
		0.2870E+02	0.7551E-08		
		0.2952E+02	0.7556E-08		
		0.3034E+02	0.7560E-08		
		0.3116E+02	0.7563E-08		
		0.3198E+02	0.7564E-08		
		0.3280E+02	0.7565E-08		
0.6500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3439E+04	0.0000E+00
		0.1640E+01	0.1736E-01		

		0.3280E+01	0.6625E-02		
		0.4920E+01	0.2006E-02		
		0.6560E+01	0.4719E-03		
		0.8200E+01	0.8389E-04		
		0.9840E+01	0.1057E-04		
		0.1148E+02	0.6563E-06		
		0.1312E+02	-0.1222E-06		
		0.1476E+02	-0.7952E-07		
		0.1640E+02	-0.4773E-07		
		0.1804E+02	-0.4076E-07		
		0.1968E+02	-0.3980E-07		
		0.2132E+02	-0.3828E-07		
		0.2296E+02	0.8589E-08		
		0.2378E+02	0.8618E-08		
		0.2460E+02	0.8643E-08		
		0.2542E+02	0.8667E-08		
		0.2624E+02	0.8687E-08		
		0.2706E+02	0.8706E-08		
		0.2788E+02	0.8722E-08		
		0.2870E+02	0.8735E-08		
		0.2952E+02	0.8746E-08		
		0.3034E+02	0.8755E-08		
		0.3116E+02	0.8761E-08		
		0.3198E+02	0.8765E-08		
		0.3280E+02	0.8766E-08		
0.6500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3439E+04	0.0000E+00
		0.1640E+01	-0.4732E-02		
		0.3280E+01	-0.1771E-02		
		0.4920E+01	-0.5337E-03		
		0.6560E+01	-0.1282E-03		
		0.8200E+01	-0.2483E-04		
		0.9840E+01	-0.4197E-05		
		0.1148E+02	-0.7622E-06		
		0.1312E+02	-0.1833E-06		
		0.1476E+02	-0.5801E-07		
		0.1640E+02	-0.2737E-07		
		0.1804E+02	-0.2134E-07		
		0.1968E+02	-0.2048E-07		
		0.2132E+02	-0.2009E-07		
		0.2296E+02	0.5711E-08		
		0.2378E+02	0.5731E-08		
		0.2460E+02	0.5750E-08		
		0.2542E+02	0.5768E-08		
		0.2624E+02	0.5783E-08		
		0.2706E+02	0.5797E-08		
		0.2788E+02	0.5808E-08		
		0.2870E+02	0.5819E-08		
		0.2952E+02	0.5827E-08		
		0.3034E+02	0.5833E-08		
		0.3116E+02	0.5838E-08		
		0.3198E+02	0.5841E-08		
		0.3280E+02	0.5841E-08		
0.6500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3439E+04	0.0000E+00
		0.1640E+01	-0.3163E-02		
		0.3280E+01	-0.1199E-02		
		0.4920E+01	-0.3644E-03		
		0.6560E+01	-0.8765E-04		
		0.8200E+01	-0.1681E-04		

		0.9840E+01	-0.2733E-05		
		0.1148E+02	-0.4541E-06		
		0.1312E+02	-0.9566E-07		
		0.1476E+02	-0.2215E-07		
		0.1640E+02	-0.3502E-08		
		0.1804E+02	0.4766E-09		
		0.1968E+02	0.1069E-08		
		0.2132E+02	0.4497E-09		
		0.2296E+02	0.2504E-08		
		0.2378E+02	0.2503E-08		
		0.2460E+02	0.2503E-08		
		0.2542E+02	0.2503E-08		
		0.2624E+02	0.2502E-08		
		0.2706E+02	0.2502E-08		
		0.2788E+02	0.2502E-08		
		0.2870E+02	0.2502E-08		
		0.2952E+02	0.2502E-08		
		0.3034E+02	0.2502E-08		
		0.3116E+02	0.2502E-08		
		0.3198E+02	0.2502E-08		
		0.3280E+02	0.2502E-08		

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.7000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3517E+04	0.0000E+00
		0.1640E+01	0.8495E-01		
		0.3280E+01	0.3363E-01		
		0.4920E+01	0.1077E-01		
		0.6560E+01	0.2745E-02		
		0.8200E+01	0.5484E-03		
		0.9840E+01	0.8446E-04		
		0.1148E+02	0.9725E-05		
		0.1312E+02	0.7326E-06		
		0.1476E+02	-0.1759E-07		
		0.1640E+02	-0.4365E-07		
		0.1804E+02	-0.3942E-07		
		0.1968E+02	-0.3825E-07		
		0.2132E+02	-0.3090E-07		
		0.2296E+02	0.7942E-08		
		0.2378E+02	0.7957E-08		
		0.2460E+02	0.7972E-08		
		0.2542E+02	0.7985E-08		
		0.2624E+02	0.7996E-08		
		0.2706E+02	0.8006E-08		
		0.2788E+02	0.8015E-08		
		0.2870E+02	0.8023E-08		
		0.2952E+02	0.8029E-08		
		0.3034E+02	0.8034E-08		
		0.3116E+02	0.8037E-08		
		0.3198E+02	0.8039E-08		
		0.3280E+02	0.8040E-08		
0.7000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3517E+04	0.0000E+00
		0.1640E+01	0.1818E-01		
		0.3280E+01	0.7240E-02		
		0.4920E+01	0.2324E-02		
		0.6560E+01	0.5911E-03		
		0.8200E+01	0.1166E-03		

		0.9840E+01	0.1710E-04		
		0.1148E+02	0.1587E-05		
		0.1312E+02	-0.4004E-07		
		0.1476E+02	-0.8090E-07		
		0.1640E+02	-0.5024E-07		
		0.1804E+02	-0.4134E-07		
		0.1968E+02	-0.3970E-07		
		0.2132E+02	-0.3274E-07		
		0.2296E+02	0.7130E-08		
		0.2378E+02	0.7147E-08		
		0.2460E+02	0.7163E-08		
		0.2542E+02	0.7177E-08		
		0.2624E+02	0.7189E-08		
		0.2706E+02	0.7200E-08		
		0.2788E+02	0.7210E-08		
		0.2870E+02	0.7218E-08		
		0.2952E+02	0.7225E-08		
		0.3034E+02	0.7230E-08		
		0.3116E+02	0.7234E-08		
		0.3198E+02	0.7236E-08		
		0.3280E+02	0.7237E-08		
0.7000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3517E+04	0.0000E+00
		0.1640E+01	-0.4943E-02		
		0.3280E+01	-0.1927E-02		
		0.4920E+01	-0.6138E-03		
		0.6560E+01	-0.1581E-03		
		0.8200E+01	-0.3310E-04		
		0.9840E+01	-0.5915E-05		
		0.1148E+02	-0.1045E-05		
		0.1312E+02	-0.2283E-06		
		0.1476E+02	-0.6760E-07		
		0.1640E+02	-0.2987E-07		
		0.1804E+02	-0.2186E-07		
		0.1968E+02	-0.2051E-07		
		0.2132E+02	-0.1701E-07		
		0.2296E+02	0.6439E-08		
		0.2378E+02	0.6450E-08		
		0.2460E+02	0.6460E-08		
		0.2542E+02	0.6469E-08		
		0.2624E+02	0.6478E-08		
		0.2706E+02	0.6485E-08		
		0.2788E+02	0.6491E-08		
		0.2870E+02	0.6497E-08		
		0.2952E+02	0.6501E-08		
		0.3034E+02	0.6504E-08		
		0.3116E+02	0.6507E-08		
		0.3198E+02	0.6508E-08		
		0.3280E+02	0.6509E-08		
0.7000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3517E+04	0.0000E+00
		0.1640E+01	-0.3309E-02		
		0.3280E+01	-0.1308E-02		
		0.4920E+01	-0.4203E-03		
		0.6560E+01	-0.1086E-03		
		0.8200E+01	-0.2260E-04		
		0.9840E+01	-0.3930E-05		
		0.1148E+02	-0.6469E-06		
		0.1312E+02	-0.1241E-06		
		0.1476E+02	-0.2776E-07		

0.1640E+02	-0.5018E-08
0.1804E+02	0.1116E-09
0.1968E+02	0.9412E-09
0.2132E+02	0.8467E-09
0.2296E+02	0.6067E-08
0.2378E+02	0.6071E-08
0.2460E+02	0.6075E-08
0.2542E+02	0.6078E-08
0.2624E+02	0.6082E-08
0.2706E+02	0.6084E-08
0.2788E+02	0.6087E-08
0.2870E+02	0.6089E-08
0.2952E+02	0.6090E-08
0.3034E+02	0.6092E-08
0.3116E+02	0.6093E-08
0.3198E+02	0.6093E-08
0.3280E+02	0.6093E-08

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.7500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3564E+04	0.0000E+00
		0.1640E+01	0.8821E-01		
		0.3280E+01	0.3639E-01		
		0.4920E+01	0.1226E-01		
		0.6560E+01	0.3342E-02		
		0.8200E+01	0.7265E-03		
		0.9840E+01	0.1243E-03		
		0.1148E+02	0.1640E-04		
		0.1312E+02	0.1560E-05		
		0.1476E+02	0.5404E-07		
		0.1640E+02	-0.4078E-07		
		0.1804E+02	-0.3972E-07		
		0.1968E+02	-0.3752E-07		
		0.2132E+02	-0.2645E-07		
		0.2296E+02	0.5834E-08		
		0.2378E+02	0.5845E-08		
		0.2460E+02	0.5855E-08		
		0.2542E+02	0.5864E-08		
		0.2624E+02	0.5872E-08		
		0.2706E+02	0.5879E-08		
		0.2788E+02	0.5886E-08		
		0.2870E+02	0.5891E-08		
		0.2952E+02	0.5895E-08		
		0.3034E+02	0.5898E-08		
		0.3116E+02	0.5901E-08		
		0.3198E+02	0.5902E-08		
		0.3280E+02	0.5903E-08		
0.7500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3564E+04	0.0000E+00
		0.1640E+01	0.1889E-01		
		0.3280E+01	0.7842E-02		
		0.4920E+01	0.2651E-02		
		0.6560E+01	0.7216E-03		
		0.8200E+01	0.1555E-03		
		0.9840E+01	0.2577E-04		
		0.1148E+02	0.3008E-05		
		0.1312E+02	0.1204E-06		
		0.1476E+02	-0.7392E-07		

		0.1640E+02	-0.5250E-07		
		0.1804E+02	-0.4206E-07		
		0.1968E+02	-0.3908E-07		
		0.2132E+02	-0.2815E-07		
		0.2296E+02	0.5290E-08		
		0.2378E+02	0.5301E-08		
		0.2460E+02	0.5312E-08		
		0.2542E+02	0.5322E-08		
		0.2624E+02	0.5330E-08		
		0.2706E+02	0.5338E-08		
		0.2788E+02	0.5345E-08		
		0.2870E+02	0.5350E-08		
		0.2952E+02	0.5355E-08		
		0.3034E+02	0.5358E-08		
		0.3116E+02	0.5361E-08		
		0.3198E+02	0.5362E-08		
		0.3280E+02	0.5363E-08		
0.7500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3564E+04	0.0000E+00
		0.1640E+01	-0.5123E-02		
		0.3280E+01	-0.2078E-02		
		0.4920E+01	-0.6954E-03		
		0.6560E+01	-0.1906E-03		
		0.8200E+01	-0.4286E-04		
		0.9840E+01	-0.8144E-05		
		0.1148E+02	-0.1448E-05		
		0.1312E+02	-0.2932E-06		
		0.1476E+02	-0.7988E-07		
		0.1640E+02	-0.3290E-07		
		0.1804E+02	-0.2253E-07		
		0.1968E+02	-0.2027E-07		
		0.2132E+02	-0.1432E-07		
		0.2296E+02	0.4911E-08		
		0.2378E+02	0.4917E-08		
		0.2460E+02	0.4923E-08		
		0.2542E+02	0.4929E-08		
		0.2624E+02	0.4934E-08		
		0.2706E+02	0.4938E-08		
		0.2788E+02	0.4942E-08		
		0.2870E+02	0.4945E-08		
		0.2952E+02	0.4948E-08		
		0.3034E+02	0.4950E-08		
		0.3116E+02	0.4951E-08		
		0.3198E+02	0.4952E-08		
		0.3280E+02	0.4952E-08		
0.7500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3564E+04	0.0000E+00
		0.1640E+01	-0.3434E-02		
		0.3280E+01	-0.1414E-02		
		0.4920E+01	-0.4775E-03		
		0.6560E+01	-0.1315E-03		
		0.8200E+01	-0.2947E-04		
		0.9840E+01	-0.5495E-05		
		0.1148E+02	-0.9250E-06		
		0.1312E+02	-0.1666E-06		
		0.1476E+02	-0.3514E-07		
		0.1640E+02	-0.6842E-08		
		0.1804E+02	-0.3540E-09		
		0.1968E+02	0.8046E-09		
		0.2132E+02	0.1419E-08		

		0.2296E+02	0.4868E-08		
		0.2378E+02	0.4869E-08		
		0.2460E+02	0.4870E-08		
		0.2542E+02	0.4871E-08		
		0.2624E+02	0.4871E-08		
		0.2706E+02	0.4872E-08		
		0.2788E+02	0.4873E-08		
		0.2870E+02	0.4873E-08		
		0.2952E+02	0.4873E-08		
		0.3034E+02	0.4874E-08		
		0.3116E+02	0.4874E-08		
		0.3198E+02	0.4874E-08		
		0.3280E+02	0.4874E-08		

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.8000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3600E+04	0.0000E+00
		0.1640E+01	0.9102E-01		
		0.3280E+01	0.3905E-01		
		0.4920E+01	0.1378E-01		
		0.6560E+01	0.3984E-02		
		0.8200E+01	0.9331E-03		
		0.9840E+01	0.1750E-03		
		0.1148E+02	0.2588E-04		
		0.1312E+02	0.2906E-05		
		0.1476E+02	0.1948E-06		
		0.1640E+02	-0.3140E-07		
		0.1804E+02	-0.3961E-07		
		0.1968E+02	-0.3638E-07		
		0.2132E+02	-0.2322E-07		
		0.2296E+02	0.4824E-08		
		0.2378E+02	0.4834E-08		
		0.2460E+02	0.4842E-08		
		0.2542E+02	0.4850E-08		
		0.2624E+02	0.4857E-08		
		0.2706E+02	0.4863E-08		
		0.2788E+02	0.4868E-08		
		0.2870E+02	0.4873E-08		
		0.2952E+02	0.4877E-08		
		0.3034E+02	0.4879E-08		
		0.3116E+02	0.4881E-08		
		0.3198E+02	0.4883E-08		
		0.3280E+02	0.4883E-08		
0.8000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3600E+04	0.0000E+00
		0.1640E+01	0.1951E-01		
		0.3280E+01	0.8423E-02		
		0.4920E+01	0.2983E-02		
		0.6560E+01	0.8626E-03		
		0.8200E+01	0.2008E-03		
		0.9840E+01	0.3684E-04		
		0.1148E+02	0.5050E-05		
		0.1312E+02	0.3945E-06		
		0.1476E+02	-0.5231E-07		
		0.1640E+02	-0.5369E-07		
		0.1804E+02	-0.4280E-07		
		0.1968E+02	-0.3804E-07		
		0.2132E+02	-0.2475E-07		

		0.2296E+02	0.4298E-08		
		0.2378E+02	0.4308E-08		
		0.2460E+02	0.4317E-08		
		0.2542E+02	0.4325E-08		
		0.2624E+02	0.4332E-08		
		0.2706E+02	0.4339E-08		
		0.2788E+02	0.4344E-08		
		0.2870E+02	0.4349E-08		
		0.2952E+02	0.4353E-08		
		0.3034E+02	0.4356E-08		
		0.3116E+02	0.4358E-08		
		0.3198E+02	0.4359E-08		
		0.3280E+02	0.4360E-08		
0.8000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3600E+04	0.0000E+00
		0.1640E+01	-0.5278E-02		
		0.3280E+01	-0.2224E-02		
		0.4920E+01	-0.7779E-03		
		0.6560E+01	-0.2255E-03		
		0.8200E+01	-0.5408E-04		
		0.9840E+01	-0.1094E-04		
		0.1148E+02	-0.2000E-05		
		0.1312E+02	-0.3864E-06		
		0.1476E+02	-0.9642E-07		
		0.1640E+02	-0.3661E-07		
		0.1804E+02	-0.2336E-07		
		0.1968E+02	-0.1979E-07		
		0.2132E+02	-0.1232E-07		
		0.2296E+02	0.3920E-08		
		0.2378E+02	0.3926E-08		
		0.2460E+02	0.3931E-08		
		0.2542E+02	0.3935E-08		
		0.2624E+02	0.3939E-08		
		0.2706E+02	0.3943E-08		
		0.2788E+02	0.3946E-08		
		0.2870E+02	0.3948E-08		
		0.2952E+02	0.3951E-08		
		0.3034E+02	0.3952E-08		
		0.3116E+02	0.3953E-08		
		0.3198E+02	0.3954E-08		
		0.3280E+02	0.3954E-08		
0.8000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3600E+04	0.0000E+00
		0.1640E+01	-0.3542E-02		
		0.3280E+01	-0.1516E-02		
		0.4920E+01	-0.5357E-03		
		0.6560E+01	-0.1561E-03		
		0.8200E+01	-0.3742E-04		
		0.9840E+01	-0.7471E-05		
		0.1148E+02	-0.1311E-05		
		0.1312E+02	-0.2295E-06		
		0.1476E+02	-0.4547E-07		
		0.1640E+02	-0.9080E-08		
		0.1804E+02	-0.9259E-09		
		0.1968E+02	0.7215E-09		
		0.2132E+02	0.1849E-08		
		0.2296E+02	0.3839E-08		
		0.2378E+02	0.3839E-08		
		0.2460E+02	0.3840E-08		
		0.2542E+02	0.3840E-08		

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
		0.2624E+02	0.3840E-08		
		0.2706E+02	0.3841E-08		
		0.2788E+02	0.3841E-08		
		0.2870E+02	0.3841E-08		
		0.2952E+02	0.3841E-08		
		0.3034E+02	0.3841E-08		
		0.3116E+02	0.3841E-08		
		0.3198E+02	0.3842E-08		
		0.3280E+02	0.3842E-08		

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.8500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3632E+04	0.0000E+00
		0.1640E+01	0.9349E-01		
		0.3280E+01	0.4158E-01		
		0.4920E+01	0.1532E-01		
		0.6560E+01	0.4669E-02		
		0.8200E+01	0.1168E-02		
		0.9840E+01	0.2375E-03		
		0.1148E+02	0.3877E-04		
		0.1312E+02	0.4960E-05		
		0.1476E+02	0.4442E-06		
		0.1640E+02	-0.9813E-08		
		0.1804E+02	-0.3846E-07		
		0.1968E+02	-0.3503E-07		
		0.2132E+02	-0.2087E-07		
		0.2296E+02	0.4458E-08		
		0.2378E+02	0.4466E-08		
		0.2460E+02	0.4474E-08		
		0.2542E+02	0.4481E-08		
		0.2624E+02	0.4487E-08		
		0.2706E+02	0.4493E-08		
		0.2788E+02	0.4497E-08		
		0.2870E+02	0.4501E-08		
		0.2952E+02	0.4505E-08		
		0.3034E+02	0.4507E-08		
		0.3116E+02	0.4509E-08		
		0.3198E+02	0.4510E-08		
		0.3280E+02	0.4510E-08		
0.8500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3632E+04	0.0000E+00
		0.1640E+01	0.2005E-01		
		0.3280E+01	0.8978E-02		
		0.4920E+01	0.3320E-02		
		0.6560E+01	0.1013E-02		
		0.8200E+01	0.2524E-03		
		0.9840E+01	0.5052E-04		
		0.1148E+02	0.7845E-05		
		0.1312E+02	0.8246E-06		
		0.1476E+02	-0.7275E-08		
		0.1640E+02	-0.5253E-07		
		0.1804E+02	-0.4339E-07		
		0.1968E+02	-0.3684E-07		
		0.2132E+02	-0.2228E-07		
		0.2296E+02	0.3979E-08		
		0.2378E+02	0.3987E-08		
		0.2460E+02	0.3995E-08		
		0.2542E+02	0.4003E-08		

		0.2624E+02	0.4009E-08		
		0.2706E+02	0.4015E-08		
		0.2788E+02	0.4020E-08		
		0.2870E+02	0.4024E-08		
		0.2952E+02	0.4028E-08		
		0.3034E+02	0.4030E-08		
		0.3116E+02	0.4032E-08		
		0.3198E+02	0.4034E-08		
		0.3280E+02	0.4034E-08		
0.8500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.3632E+04	0.0000E+00
		0.1640E+01	-0.5412E-02		
		0.3280E+01	-0.2361E-02		
		0.4920E+01	-0.8608E-03		
		0.6560E+01	-0.2623E-03		
		0.8200E+01	-0.6675E-04		
		0.9840E+01	-0.1435E-04		
		0.1148E+02	-0.2730E-05		
		0.1312E+02	-0.5177E-06		
		0.1476E+02	-0.1193E-06		
		0.1640E+02	-0.4129E-07		
		0.1804E+02	-0.2433E-07		
		0.1968E+02	-0.1922E-07		
		0.2132E+02	-0.1093E-07		
		0.2296E+02	0.3624E-08		
		0.2378E+02	0.3629E-08		
		0.2460E+02	0.3633E-08		
		0.2542E+02	0.3637E-08		
		0.2624E+02	0.3641E-08		
		0.2706E+02	0.3644E-08		
		0.2788E+02	0.3647E-08		
		0.2870E+02	0.3649E-08		
		0.2952E+02	0.3651E-08		
		0.3034E+02	0.3653E-08		
		0.3116E+02	0.3654E-08		
		0.3198E+02	0.3654E-08		
		0.3280E+02	0.3655E-08		
0.8500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.3632E+04	0.0000E+00
		0.1640E+01	-0.3636E-02		
		0.3280E+01	-0.1612E-02		
		0.4920E+01	-0.5944E-03		
		0.6560E+01	-0.1823E-03		
		0.8200E+01	-0.4643E-04		
		0.9840E+01	-0.9892E-05		
		0.1148E+02	-0.1825E-05		
		0.1312E+02	-0.3197E-06		
		0.1476E+02	-0.6026E-07		
		0.1640E+02	-0.1195E-07		
		0.1804E+02	-0.1617E-08		
		0.1968E+02	0.6607E-09		
		0.2132E+02	0.2020E-08		
		0.2296E+02	0.3524E-08		
		0.2378E+02	0.3524E-08		
		0.2460E+02	0.3524E-08		
		0.2542E+02	0.3525E-08		
		0.2624E+02	0.3525E-08		
		0.2706E+02	0.3525E-08		
		0.2788E+02	0.3526E-08		
		0.2870E+02	0.3526E-08		

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
		0.2952E+02	0.3526E-08		
		0.3034E+02	0.3526E-08		
		0.3116E+02	0.3526E-08		
		0.3198E+02	0.3527E-08		
		0.3280E+02	0.3527E-08		
0.9000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.3661E+04	0.0000E+00
		0.1640E+01	0.9568E-01		
		0.3280E+01	0.4398E-01		
		0.4920E+01	0.1686E-01		
		0.6560E+01	0.5391E-02		
		0.8200E+01	0.1431E-02		
		0.9840E+01	0.3125E-03		
		0.1148E+02	0.5564E-04		
		0.1312E+02	0.7940E-05		
		0.1476E+02	0.8539E-06		
		0.1640E+02	0.3264E-07		
		0.1804E+02	-0.3522E-07		
		0.1968E+02	-0.3357E-07		
		0.2132E+02	-0.1905E-07		
		0.2296E+02	0.4071E-08		
		0.2378E+02	0.4078E-08		
		0.2460E+02	0.4085E-08		
		0.2542E+02	0.4091E-08		
		0.2624E+02	0.4097E-08		
		0.2706E+02	0.4102E-08		
		0.2788E+02	0.4106E-08		
		0.2870E+02	0.4110E-08		
		0.2952E+02	0.4112E-08		
		0.3034E+02	0.4115E-08		
		0.3116E+02	0.4116E-08		
		0.3198E+02	0.4117E-08		
		0.3280E+02	0.4118E-08		
0.9000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.3661E+04	0.0000E+00
		0.1640E+01	0.2053E-01		
		0.3280E+01	0.9505E-02		
		0.4920E+01	0.3659E-02		
		0.6560E+01	0.1172E-02		
		0.8200E+01	0.3102E-03		
		0.9840E+01	0.6702E-04		
		0.1148E+02	0.1153E-04		
		0.1312E+02	0.1459E-05		
		0.1476E+02	0.7271E-07		
		0.1640E+02	-0.4709E-07		
		0.1804E+02	-0.4360E-07		
		0.1968E+02	-0.3565E-07		
		0.2132E+02	-0.2038E-07		
		0.2296E+02	0.3644E-08		
		0.2378E+02	0.3652E-08		
		0.2460E+02	0.3659E-08		
		0.2542E+02	0.3666E-08		
		0.2624E+02	0.3671E-08		
		0.2706E+02	0.3677E-08		
		0.2788E+02	0.3681E-08		
		0.2870E+02	0.3685E-08		

conductivity test results, I would request that the applicant be required to construct a test liner prior to constructing the Cell VI liner in order to demonstrate that materials used for liner construction will have permeability values less than or equal to 1 x 10^{-7} cm/sec.

As part of the Construction Quality Assurance program, I would request that the applicant perform hydraulic conductivity tests on samples obtained from the constructed test liner and from the constructed Cell VI liner. Samples should be relatively undisturbed and obtained using the ASTM D1587 method. Hydraulic conductivity testing should be performed using the ASTM D5084 method (modified triaxial with back pressure). In addition, remolded samples should be obtained to perform hydraulic conductivity tests on any clay materials imported from off-site sources. Again, testing should be performed using the ASTM D5084 method.

The SIGMOD is in compliance with applicable regulations. Attachment 7 (Part V, Section 2.6.4) to the February, 1996 Addendum to the SIGMOD provides a comprehensive discussion regarding hydraulic conductivity. Hydraulic conductivity values for the relevant geologic formations were obtained through laboratory analysis of samples collected from soil borings and from single well aquifer tests. Triaxial permeability testing was conducted to evaluate the hydraulic conductivity of the bottom liner of the landfill cells. The soil balance calculations indicate that there are sufficient volumes of suitable soil material available on-site to construct the lining system for Cell VI.

- *Ground-Water Monitoring. The application proposes a ground-water monitoring system in which all monitoring wells are located at or near the property boundary. This does not comply with 35 IAC 811.318(b) which requires wells to be established "within half the distance from the edge of the potential source of discharge to the edge of the zone of attenuation". More* *specifically for this site, within half the distance between the edge of the waste boundary and the property boundary.*

In addition, no downgradient monitoring wells are located at the eastern facility boundary within the bedrock aquifer. Further, the detection monitoring program has been developed using incorrect background ground-water quality data and the proposed monitoring well location will not detect a potential leachate migration within certain pathways.

The SIGMOD is in compliance with the applicable regulations. A complete discussion of the ground-water monitoring system is discussed in Attachment 7 (Part V, Section 6.3.2.3) to the February, 1996 Addendum to the SIGMOD. The wells are located near the compliance boundary because of the narrow (50 ft. (15 m) zone of attenuation available at the site. The MAPCs have been <u>conservatively</u> set equal to the AGQSs, rather than using the higher MAPCs normally determined by ground-water modeling utilizing a larger zone of attenuation. The approach presented in Section 6.3.2.3 provides a conservative factor of safety given the site conditions.

The SIGMOD is in compliance with the applicable regulations. The ground-water monitoring system for the landfill is discussed in detail in Attachment 7 (Part V, Section 6.2) to the February 1996 Addendum to the SIGMOD.

The SIGMOD is in compliance with the applicable regulations. The calculation of MAPCs and AGQSs are discussed in Attachment 7 (Part V, Section 6.3.2 and Tables V-6-4 and V-6-5) to the February, 1996 Addendum to the SIGMOD.

The SIGMOD is in compliance with the applicable regulations. The detection monitoring program is discussed in detail in Attachment 7 (Part

V, Section 6.3.3.) to the February, 1996 Addendum to the SIGMOD. Attachment 7 provides a comprehensive discussion of the overall ground-water monitoring program, background ground-water quality data and monitoring well locations.

- *<u>Ground-Water Impact Assessment</u>. The ground-water modeling performed as part of the assessment, was conducted using a 100-foot zone of attenuation. The actual zone of attenuation for this site as measured as the distance between the edge of the waste boundary and the property boundary, is a value significantly less than 100 feet. Specifically, in some areas this value is about 50 feet.*

The SIGMOD is in compliance with the applicable regulations. The measured distance between the waste boundary and the property boundary is 50 feet. The zone of attenuation used in the ground-water modeling is 50 feet. A comprehensive analysis of the ground-water modeling is contained in Attachment 7 (Part V) to the February, 1996 Addendum to the SIGMOD.

The lithology presented on the site soil profiles has been oversimplified. Specifically, sand and silt layers that exist within the clay units are not reflected. This oversimplification affects the ground-water impact assessment. Specifically, by not representing an accurate account of the media in which potential contaminant pathways may exist.

The SIGMOD is in compliance with applicable regulations. The lithology at the facility was simulated very conservatively to evaluate constituent migration. A comprehensive analysis of the ground-water modeling is contained in Attachment 7 (Part V) of the February, 1996 Addendum to the SIGMOD.

- *<u>Ground-Water Quality Standards.</u> Sampling for initial water quality was conducted semi-annually, not quarterly as required. Also, ground-water quality* *is reportedly impacted by off-site contamination sources such that the background concentrations sampled may not be representative of downgradient ground-water quality. Such a situation would create maximum contaminant levels based on contamination outside the landfill, and landfill leakage would therefore go undetected.*

The SIGMOD is in compliance with the applicable regulations. A discussion of ground-water sampling is found in Attachment 7 (Part V, Section 6) to the February, 1996 Addendum to the Significant Modification. Quarterly ground-water monitoring information is provided in Attachment 7 (Part V, Tables V-6-1 and V-6-2) to the February, 1996 Addendum to the SIGMOD. Supplemental analytical results are also provided in Attachment 7 (Part V, Appendix V-6-A) to the February, 1996 Addendum to the SIGMOD.

- *Post-Closure Care Requirements. The proposed post-closure inspection and sampling schedules do not comply with the required minimum sampling periods. Landfill gas monitoring is proposed at quarterly intervals instead of monthly intervals during the post-closure care period. In accordance with 35 IAC 811.310(c), monthly sampling is required during the first five years of post-closure care, with the potential for reduction to quarterly sampling after five years.*

Gas monitoring at the facility will be conducted on a monthly basis for a minimum of five years after closure. This program is described in Attachment 16 (Section 6.6.4.) to the February, 1996 Addendum to the SIGMOD.

Also, it has been proposed that leachate would be sampled quarterly during the first five years of post-closure and annually thereafter. In accordance with 35 IAC 811.309(g) leachate must be sampled on a quarterly basis, and may be reduced to a frequency of once per year only for monitored constituents not *detected.*

The SIGMOD is in compliance with applicable regulations. Leachate monitoring at the facility will be monitored quarterly. The frequency may be reduced to once per year for any parameter not detected in the leachate. This is discussed in Attachment 9 (Section 6.5.2) to the February, 1996 Addendum to the Significant Modification.

The Post-Closure Care cost estimate provided in the application does not include the costs for quarterly leachate sampling and gas monitoring, and does not include costs for leachate removal and treatment.

The SIGMOD is in compliance with applicable regulations. Attachment 39 (Appendix VIII-F) to the February, 1996 Addendum to the Significant Modification provides costs for quarterly leachate sampling and gas monitoring, and costs for leachate removal and treatment.

- *Surface Water Requirements. The site is currently operating under an approved NPDES permit but has not been able to meet all of the permit conditions. The three stormwater outfalls which discharge into the Lake Calumet and the Dead Stick Pond, have regularly discharged constituents exceeding the regulated discharge limitation standards.*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 9 to 10 of Attachment C to this response to DOE comments, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

- ***Foundation Stability.*** *The applicant did not provide an analysis of bottom liner stability against hydrostatic uplift. Patrick Engineering performed this analysis using data contained in the application. The results of this analysis indicate that the potential for hydrostatic uplift exists at the site if excavations are conducted in accordance with the permit application drawings.*

Based on a review of the applicant's slope stability analyses, the following inaccuracies were found:

- *the water table and bedrock piezometric levels were not considered in the analyses;*
- *the Dolton Sand layer was not represented in the model prepared for the analyses;*
- *a limited search area was used for potential failure planes;*
- *analyses were conducted only for the west and east excavation slopes. The north excavation slope warrants much concern, and an analysis of this slope was not included. The cause for concern for this north slope is due to the close proximity of the Paxton Landfill to the north edge of the waste boundary, which will in effect act as a surcharge on the excavated north slope.*

Due to these inaccuracies, Patrick Engineering performed independent modeling of select slopes to determine what the factors of safety for static conditions would be with the inclusion of this information. The result of this analysis indicates that the potential for slope failure exists along the west and north excavation slopes. More specifically, the factors of safety against slope failure calculated from this analysis were less than 1.0. In accordance with 35 IAC 811.304(d), the required minimum static factor of safety is 1.5.

The SIGMOD is in compliance with applicable regulations. LALC

Response to DOE Comments dated April, 1995 (Attachment C to this document) contains a comprehensive discussion of the GeoSyntec slope stability evaluation and excavation bottom uplift stability. There are no slope stability or bottom uplift problems at this facility. The required factors of safety are met.

- *Construction Quality Assurance*. *The applicant has not provided a minimum testing frequency as part of the Construction Quality Assurance Plan. Specifically, for the liner and final cover systems, I would therefore request that the applicant provide this information.*

The SIGMOD is in compliance with applicable regulations. The minimum testing frequencies are found in Attachment 21 (Tables VIIB-2 through VIIB-9) to the February, 1996 Addendum to the Significant Modification Permit Application.

3

GEOSYNTEC CONSULTANTS JUN 03 1996

30 May 1996

Mr. Ken Lovett
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Springfield, Illinois 62706

RE: Land Lakes #3
#0316000034/Cook County
Addendum to Log # 1995-060

Dear Mr. Lovett:

In response to Illinois Environmental Protection Agency's (IEPA) comments [No. B. 1. (b) and B. 1. (c)] dated May 14, 1996, diskettes containing input and output files of constituent migration simulation and hardcopies of baseline model predictions for shallow and deep aquifers for the 122nd Street Landfill are enclosed with this letter. Also enclosed are revised Tables V-5-2, V-5-4, and V-5-11. Please replace the tables in the Addendum to Permit Application for SIGMOD, 122nd Street Landfill, dated Feb. 1996, with these revised tables.

If you need any additional information or clarification, please contact either of the undersigned at (561) 995-0900.

Sincerely,

Miles V. Khire, Ph.D.
Assistant Project Engineer

Joseph T. Angley, Ph.D., CHMM
Senior Project Engineer

Enclosures
Copies to: Eileen Sheliga (EnviroResources)
Jay Goldstein (Land and Lakes Company)

FE2263/files2.doc

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Boca Raton, FL
Huntington Beach, CA

Table V-5-11
Ranges of Hydrogeologic Parameters for Sensitivity Analyses: Two Dimensional Analytical Transport Modeling (MIGRATE) for Lemont Till and Silurian Dolomite Aquifer

PARAMETER	LEMONT TILL	SILURIAN DOLOMITE
Hydraulic Conductivity [cm/s]	5.8×10^{-9} to 1×10^{-7}	1×10^{-5} to 4.7×10^{-4}
Effective Porosity	0.22 to 0.45	0.01 to 0.05
Vertical Darcy Velocity [ft/day (cm/s)]	Time Dependent (See Table V-5-2)	0
Horizontal Darcy Velocity (Upgradient of Landfill) [ft/day (cm/s)]	0	1.4×10^{-4} to 6.5×10^{-3} (4.8×10^{-8} to 2.3×10^{-6})
Horizontal Hydrodynamic Dispersion Coefficient [ft^2/day (cm^2/s)]	1.4×10^{-5} to 5.6×10^{-4} (1.5×10^{-7} to 6.0×10^{-6})	3.7×10^{-3} to 1.9×10^{-2} (4×10^{-5} to 2.1×10^{-4})
Vertical Hydrodynamic Dispersion Coefficient [ft^2/day (cm^2/s)]	1.4×10^{-5} to 5.6×10^{-4} (1.5×10^{-7} to 6.0×10^{-6})	0.3 to 4.5 (3.2×10^{-3} to 4.8×10^{-2})

Note: Lemont till and Silurian dolomite layers are shown in Figure V-5-3.

Table V-5-4
Input Parameters Used in Two-Dimensional Analytical Constituent Transport Modeling Using MIGRATE for the Lower Lemont Till Unit and Silurian Dolomite Aquifer

PARAMETER	LEMONT TILL	SILURIAN DOLOMITE
Hydraulic Conductivity [cm/s]	1.4×10^{-8}	2.4×10^{-4}
Layer Thickness [ft (m)]	23 (7)	10 (3)
Number of Sublayers	23	12
Effective Porosity	0.335	0.03
Horizontal Darcy Velocity (Upgradient of Landfill) [ft/day (cm/s)]	0	3.4×10^{-3} (1.2×10^{-6}) (Downgradient Darcy velocity in Table V-5-2)
Vertical Darcy Velocity [ft/day (cm/s)]	Time Dependent (see Table V-5-2)	0
Horizontal Dispersivity [ft (m)]	NA[1]	4 (1.2)
Vertical Dispersivity [ft (m)]	NA[1]	High Value[2]
Horizontal Hydrodynamic Dispersion Coefficient [ft^2/day (cm^2/s)]	1.8×10^{-4} (1.9×10^{-6})	1.3×10^{-2} (1.4×10^{-4})
Vertical Hydrodynamic Dispersion Coefficient [ft^2/day (cm^2/s)]	1.8×10^{-4} (1.9×10^{-6})	3.0 (3.2×10^{-2})
Distribution Coefficient	0	0
Half-Life	0	0

Notes: 1. NA = Not Applicable.
2. High value of dispersivity reflected in hydrodynamic dispersion coefficient.
3. Conceptual model is shown in Figure V-5-3.

Table V-5-2
122nd Street Landfill: Darcy Velocities in Side Liner and Lemont Till for Baseline Models (continued)

ELAPSED TIME (years)	AVERAGE LEACHATE ELEVATION (ft)	HORIZONTAL VELOCITY IN SIDE LINER (cm/s)	VERTICAL VELOCITY IN LEMONT TILL (cm/s)	DOWNGRADIENT HORIZONTAL VELOCITY IN SILURIAN DOLOMITE AQUIFER (cm/s)
60	575.68	-1.0E-07	-2.6E-09	1.2E-06
62	575.75	-1.0E-07	-2.6E-09	1.2E-06
64	575.81	-1.0E-07	-2.6E-09	1.2E-06
66	575.87	-1.0E-07	-2.5E-09	1.2E-06
68	575.94	-1.0E-07	-2.5E-09	1.2E-06
70	576.00	-1.0E-07	-2.4E-09	1.2E-06
72	576.05	-9.9E-08	-2.4E-09	1.2E-06
74	576.10	-9.9E-08	-2.4E-09	1.2E-06
76	576.15	-9.9E-08	-2.3E-09	1.2E-06
78	576.19	-9.8E-08	-2.3E-09	1.2E-06
80	576.24	-9.8E-08	-2.3E-09	1.2E-06
82	576.28	-9.7E-08	-2.3E-09	1.2E-06
84	576.32	-9.7E-08	-2.2E-09	1.2E-06
86	576.37	-9.6E-08	-2.2E-09	1.2E-06
88	576.42	-9.6E-08	-2.2E-09	1.2E-06
90	576.45	-9.6E-08	-2.2E-09	1.2E-06
92	576.49	-9.5E-08	-2.1E-09	1.2E-06
94	576.53	-9.5E-08	-2.1E-09	1.2E-06
96	576.55	-9.4E-08	-2.1E-09	1.2E-06
98	576.58	-9.4E-08	-2.1E-09	1.2E-06
100	576.62	-9.4E-08	-2.1E-09	1.2E-06
102	576.65	-9.4E-08	-2.0E-09	1.2E-06
104	576.67	-9.3E-08	-2.0E-09	1.2E-06
105	576.68	-9.3E-08	-2.0E-09	1.2E-06

Notes:
1. Average water table elevation in Dolton Sand and Fill Unit assumed equal to 586 ft.
2. Elevations of potentiometric surface in the Silurian dolomite aquifer assumed equal to 567 ft for 0 - 5 years and 580 ft for 6 - 105 years.
3. Average leachate elevation was calculated by weighting the leachate elevation in each cell with respect to the area of cell.
4. Negative horizontal velocity indicates flow into the landfill.
5. For 1-D baseline model, average hydraulic conductivity of side liner selected as 1×10^{-7} cm/s.
6. For 2-D baseline model average hydraulic conductivity of Lemont till selected as 1.4×10^{-8} cm/s.
7. Downgradient horizontal velocity in Silurian dolomite aquifer was calculated by adding seepage rate from the landfill to the upgradient horizontal velocity in the aquifer (1.2×10^{-6} cm/s).

Table V-5-2
122nd Street Landfill: Darcy Velocities in Side Liner and Lemont Till for Baseline Models

ELAPSED TIME (years)	AVERAGE LEACHATE ELEVATION (ft)	HORIZONTAL VELOCITY IN SIDE LINER (cm/s)	VERTICAL VELOCITY IN LEMONT TILL (cm/s)	DOWNGRADIENT HORIZONTAL VELOCITY IN SILURIAN DOLOMITE AQUIFER (cm/s)
0	594.00	8.0E-08	1.6E-08	5.4E-06
1	590.56	4.6E-08	1.4E-08	4.9E-06
2	588.94	2.9E-08	1.3E-08	4.6E-06
3	587.78	1.8E-08	1.3E-08	4.5E-06
4	586.93	9.3E-09	1.2E-08	4.3E-06
5	586.27	2.7E-09	1.2E-08	4.2E-06
6	585.02	-9.8E-09	3.1E-09	2.0E-06
7	583.99	-2.0E-08	2.4E-09	1.8E-06
8	583.13	-2.9E-08	1.9E-09	1.7E-06
9	582.38	-3.6E-08	1.4E-09	1.6E-06
10	581.73	-4.3E-08	1.1E-09	1.5E-06
12	580.58	-5.4E-08	3.6E-10	1.3E-06
14	579.70	-6.3E-08	-1.9E-10	1.2E-06
16	578.97	-7.0E-08	-6.3E-10	1.2E-06
18	578.31	-7.7E-08	-1.0E-09	1.2E-06
20	577.72	-8.3E-08	-1.4E-09	1.2E-06
22	577.17	-8.8E-08	-1.7E-09	1.2E-06
24	576.67	-9.3E-08	-2.0E-09	1.2E-06
26	576.22	-9.8E-08	-2.3E-09	1.2E-06
28	575.82	-1.0E-07	-2.5E-09	1.2E-06
30	575.46	-1.1E-07	-2.8E-09	1.2E-06
32	575.15	-1.1E-07	-3.0E-09	1.2E-06
34	574.87	-1.1E-07	-3.1E-09	1.2E-06
36	574.91	-1.1E-07	-3.1E-09	1.2E-06
38	574.96	-1.1E-07	-3.1E-09	1.2E-06
40	575.02	-1.1E-07	-3.0E-09	1.2E-06
42	575.08	-1.1E-07	-3.0E-09	1.2E-06
44	575.14	-1.1E-07	-3.0E-09	1.2E-06
46	575.21	-1.1E-07	-2.9E-09	1.2E-06
48	575.27	-1.1E-07	-2.9E-09	1.2E-06
50	575.34	-1.1E-07	-2.8E-09	1.2E-06
52	575.41	-1.1E-07	-2.8E-09	1.2E-06
54	575.47	-1.1E-07	-2.8E-09	1.2E-06
56	575.54	-1.0E-07	-2.7E-09	1.2E-06
58	575.61	-1.0E-07	-2.7E-09	1.2E-06

Input and Output Files for Deep Aquifer Simulation Using MIGRATE

File Name	File Description
BAELINE.*	baseline model
K_LT_LOW.*	Sensitivity for low hydraulic conductivity of Lemont till
K_LT_HGH.*	Sensitivity for high hydraulic conductivity of Lemont till
K_SD_LOW.*	Sensitivity for low hydraulic conductivity of Sil. dolomite aquifer
K_SD_HGH.*	Sensitivity for high hydraulic conductivity of Sil. dolomite aquifer
N_LT_LOW.*	Sensitivity for low effective porosity of Lemont till
N_LT_HGH.*	Sensitivity for high effective porosity of Lemont till
N_SD_LOW.*	Sensitivity for low effective porosity of Sil. dolomite aquifer
N_SD_HGH.*	Sensitivity for high effective porosity of Sil. dolomite aquifer
DH_LT_LO.*	Sensitivity for low horizontal dispersion coeff. of Lemont till
DH_LT_HI.*	Sensitivity for high horizontal dispersion coeff. of Lemont till
DH_SD_LO.*	Sensitivity for low horizontal dispersion coeff. of Sil. dolomite aquifer
DH_SD_HI.*	Sensitivity for high horizontal dispersion coeff. of Sil. dolomite aquifer
DV_LT_LO.*	Sensitivity for low vertical dispersion coeff. of Lemont till
DV_LT_HI.*	Sensitivity for high vertical dispersion coeff. of Lemont till
DV_SD_LO.*	Sensitivity for low vertical dispersion coeff. of Sil. dolomite aquifer
DV_SD_HI.*	Sensitivity for high vertical dispersion coeff. of Sil. dolomite aquifer

Notes:
1. *.inp = input file
2. *.out = output file

Input and Output Files for Shallow Aquifer Simulation Using POLLUTE

File Name	File Description
BAELINE.*	baseline model
K_SL_LOW.*	Sensitivity for low hydraulic conductivity of side liner
K_SL_HGH.*	Sensitivity for high hydraulic conductivity of side liner
N_SL_LOW.*	Sensitivity for low effective porosity of side liner
N_SL_HGH.*	Sensitivity for high effective porosity of side liner
N_DS_LOW.*	Sensitivity for low effective porosity of Dolton sand
N_DS_HGH.*	Sensitivity for high effective porosity of Dolton sand
D_SL_LOW.*	Sensitivity for low dispersion coefficient of side liner
D_SL_HGH.*	Sensitivity for high dispersion coefficient of side liner
D_DS_LOW.*	Sensitivity for low dispersion coefficient of Dolton sand
D_DS_HGH.*	Sensitivity for high dispersion coefficient of Dolton sand

Notes:
1. *.in = input file
2. *.ou = output file

Hardcopy Output Files

The hardcopies of the baseline model predictions for the shallow and deep aquifers are attached. The POLLUTE and MIGRATE models do not list units in the output file. However, the parameters in the hardcopies of POLLUTE and MIGRATE ouput have the following units.

POLLUTE Hardcopy Output

Hydrodynamic Dispersion Coefficient:	m^2/yr
Porosity:	dimensionless
Dry Density:	g/cm^3
Layer Thickness, Depth:	m
Concentration:	mg/L
Time:	yr
Darcy Velocity:	m/yr

MIGRATE Hardcopy Output

Time:	yr
Layer Thickness, Depth, Distance:	ft
Concentration:	mg/L
Dispersion Coefficient:	ft^2/yr
Porosity:	dimensionless
Dry Density:	kg/m^3
Darcy Velocity:	ft/yr

Digital Input and Output Files

Input and output files for the constituent transport simulations can be found on the three 3.5 in. diskettes. The files for simulations using the models POLLUTE and MIGRATE are under separate directories, POLLUTE and MIGRATE, respectively. The input and output files can be identified using the description of the files listed in the attached tables.

N O T I C E

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NO RESPONSIBILITY IS ASSUMED FOR ANY ERRORS, MISTAKES OR MISREPRESENTATIONS THAT MAY OCCUR FROM THE USE OF THIS COMPUTER PROGRAM. THE USER ACCEPTS FULL RESPONSIBILITY FOR ASSESSING THE VALIDITY AND APPLICABILITY OF THE RESULTS OBTAINED WITH THIS PROGRAM FOR ANY SPECIFIC CASE.

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*************************************************
*                                               *
*                                               *
*                                               *
*     P O L L U T E   S I M U L A T I O N       *
*                                               *
*            ANALYSIS      COMPLETED            *
*                                               *
*            TIME     -     17:27: 9            *
*            EXECUTION TIME     0:38            *
*                                               *
*                                               *
*************************************************
```

0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 32

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1050E+03	0.00000E+00	0.10000E+01	0.52659E-01
	0.25000E+00	0.23960E-01	
	0.50000E+00	0.57516E-03	
	0.75000E+00	0.14774E-04	
	0.10000E+01	0.12281E-05	
	0.12500E+01	0.89085E-06	
	0.15000E+01	0.89461E-06	
	0.17500E+01	0.90758E-06	
	0.20000E+01	0.91935E-06	
	0.22500E+01	0.92966E-06	
	0.25000E+01	0.93876E-06	
	0.27500E+01	0.94660E-06	
	0.30000E+01	0.95305E-06	
	0.40000E+01	0.97158E-06	
	0.50000E+01	0.98752E-06	
	0.60000E+01	0.99539E-06	
	0.70000E+01	0.99850E-06	
	0.80000E+01	0.99957E-06	
	0.90000E+01	0.99989E-06	
	0.10000E+02	0.99997E-06	
	0.11000E+02	0.99999E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

0.25000E+01	0.90200E-06
0.27500E+01	0.91443E-06
0.30000E+01	0.92471E-06
0.40000E+01	0.95438E-06
0.50000E+01	0.97993E-06
0.60000E+01	0.99259E-06
0.70000E+01	0.99762E-06
0.80000E+01	0.99932E-06
0.90000E+01	0.99983E-06
0.10000E+02	0.99996E-06
0.11000E+02	0.99999E-06
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 31

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1000E+03	0.00000E+00	0.10000E+01	0.52655E-01
	0.25000E+00	0.23943E-01	
	0.50000E+00	0.57234E-03	
	0.75000E+00	0.14483E-04	
	0.10000E+01	0.11763E-05	
	0.12500E+01	0.85887E-06	
	0.15000E+01	0.86717E-06	
	0.17500E+01	0.88343E-06	
	0.20000E+01	0.89811E-06	
	0.22500E+01	0.91104E-06	
	0.25000E+01	0.92248E-06	
	0.27500E+01	0.93238E-06	
	0.30000E+01	0.94053E-06	
	0.40000E+01	0.96398E-06	
	0.50000E+01	0.98417E-06	
	0.60000E+01	0.99415E-06	
	0.70000E+01	0.99811E-06	
	0.80000E+01	0.99946E-06	
	0.90000E+01	0.99986E-06	
	0.10000E+02	0.99997E-06	
	0.11000E+02	0.99999E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 29

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.9000E+02	0.00000E+00	0.10000E+01	0.52240E-01
	0.25000E+00	0.22399E-01	
	0.50000E+00	0.49354E-03	
	0.75000E+00	0.11405E-04	
	0.10000E+01	0.98192E-06	
	0.12500E+01	0.77094E-06	
	0.15000E+01	0.79177E-06	
	0.17500E+01	0.81652E-06	
	0.20000E+01	0.83884E-06	
	0.22500E+01	0.85869E-06	
	0.25000E+01	0.87643E-06	
	0.27500E+01	0.89189E-06	
	0.30000E+01	0.90474E-06	
	0.40000E+01	0.94225E-06	
	0.50000E+01	0.97455E-06	
	0.60000E+01	0.99061E-06	
	0.70000E+01	0.99699E-06	
	0.80000E+01	0.99915E-06	
	0.90000E+01	0.99979E-06	
	0.10000E+02	0.99995E-06	
	0.11000E+02	0.99999E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 30

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.9500E+02	0.00000E+00	0.10000E+01	0.52619E-01
	0.25000E+00	0.23817E-01	
	0.50000E+00	0.55642E-03	
	0.75000E+00	0.13477E-04	
	0.10000E+01	0.10927E-05	
	0.12500E+01	0.81913E-06	
	0.15000E+01	0.83326E-06	
	0.17500E+01	0.85344E-06	
	0.20000E+01	0.87162E-06	
	0.22500E+01	0.88770E-06	

0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 28

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.8500E+02	0.00000E+00	0.10000E+01	0.51895E-01
	0.25000E+00	0.21136E-01	
	0.50000E+00	0.44512E-03	
	0.75000E+00	0.99543E-05	
	0.10000E+01	0.87884E-06	
	0.12500E+01	0.71318E-06	
	0.15000E+01	0.74079E-06	
	0.17500E+01	0.77069E-06	
	0.20000E+01	0.79783E-06	
	0.22500E+01	0.82218E-06	
	0.25000E+01	0.84411E-06	
	0.27500E+01	0.86331E-06	
	0.30000E+01	0.87931E-06	
	0.40000E+01	0.92665E-06	
	0.50000E+01	0.96755E-06	
	0.60000E+01	0.98800E-06	
	0.70000E+01	0.99616E-06	
	0.80000E+01	0.99892E-06	
	0.90000E+01	0.99974E-06	
	0.10000E+02	0.99994E-06	
	0.11000E+02	0.99999E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

0.15000E+01	0.60678E-06
0.17500E+01	0.64799E-06
0.20000E+01	0.68626E-06
0.22500E+01	0.72142E-06
0.25000E+01	0.75374E-06
0.27500E+01	0.78246E-06
0.30000E+01	0.80684E-06
0.40000E+01	0.88132E-06
0.50000E+01	0.94669E-06
0.60000E+01	0.98011E-06
0.70000E+01	0.99365E-06
0.80000E+01	0.99825E-06
0.90000E+01	0.99958E-06
0.10000E+02	0.99991E-06
0.11000E+02	0.99998E-06
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 27

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.8000E+02	0.00000E+00	0.10000E+01	0.51842E-01
	0.25000E+00	0.20960E-01	
	0.50000E+00	0.42520E-03	
	0.75000E+00	0.88507E-05	
	0.10000E+01	0.76973E-06	
	0.12500E+01	0.64455E-06	
	0.15000E+01	0.67898E-06	
	0.17500E+01	0.71454E-06	
	0.20000E+01	0.74710E-06	
	0.22500E+01	0.77659E-06	
	0.25000E+01	0.80339E-06	
	0.27500E+01	0.82711E-06	
	0.30000E+01	0.84708E-06	
	0.40000E+01	0.90658E-06	
	0.50000E+01	0.95839E-06	
	0.60000E+01	0.98455E-06	
	0.70000E+01	0.99506E-06	
	0.80000E+01	0.99863E-06	
	0.90000E+01	0.99967E-06	
	0.10000E+02	0.99993E-06	
	0.11000E+02	0.99999E-06	
	0.12000E+02	0.10000E-05	

0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

. .LYSIS FOR TIME PERIOD 25

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.7000E+02	0.00000E+00	0.10000E+01	0.51143E-01
	0.25000E+00	0.18528E-01	
	0.50000E+00	0.33276E-03	
	0.75000E+00	0.61170E-05	
	0.10000E+01	0.52798E-06	
	0.12500E+01	0.47574E-06	
	0.15000E+01	0.52193E-06	
	0.17500E+01	0.56841E-06	
	0.20000E+01	0.61236E-06	
	0.22500E+01	0.65338E-06	
	0.25000E+01	0.69169E-06	
	0.27500E+01	0.72630E-06	
	0.30000E+01	0.75609E-06	
	0.40000E+01	0.84842E-06	
	0.50000E+01	0.93095E-06	
	0.60000E+01	0.97400E-06	
	0.70000E+01	0.99169E-06	
	0.80000E+01	0.99772E-06	
	0.90000E+01	0.99946E-06	
	0.10000E+02	0.99989E-06	
	0.11000E+02	0.99998E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 26

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0 7500E+02	0.00000E+00	0.10000E+01	0.51188E-01
	0.25000E+00	0.18668E-01	
	0.50000E+00	0.34747E-03	
	0.75000E+00	0.69069E-05	
	0.10000E+01	0.64328E-06	
	0.12500E+01	0.56574E-06	

0.90000E+01	0.99910E-06
0.10000E+02	0.99983E-06
0.11000E+02	0.99997E-06
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 24

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.6500E+02	0.00000E+00	0.10000E+01	0.50526E-01
	0.25000E+00	0.16487E-01	
	0.50000E+00	0.27108E-03	
	0.75000E+00	0.47153E-05	
	0.10000E+01	0.40429E-06	
	0.12500E+01	0.37964E-06	
	0.15000E+01	0.42887E-06	
	0.17500E+01	0.47902E-06	
	0.20000E+01	0.52765E-06	
	0.22500E+01	0.57414E-06	
	0.25000E+01	0.61840E-06	
	0.27500E+01	0.65882E-06	
	0.30000E+01	0.69413E-06	
	0.40000E+01	0.80731E-06	
	0.50000E+01	0.91070E-06	
	0.60000E+01	0.96601E-06	
	0.70000E+01	0.98911E-06	
	0.80000E+01	0.99704E-06	
	0.90000E+01	0.99931E-06	
	0.10000E+02	0.99986E-06	
	0.11000E+02	0.99998E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	

0.50000E+00	0.21152E-03
0.75000E+00	0.31747E-05
0.10000E+01	0.19371E-06
0.12500E+01	0.18785E-06
0.15000E+01	0.23159E-06
0.17500E+01	0.27977E-06
0.20000E+01	0.33024E-06
0.22500E+01	0.38196E-06
0.25000E+01	0.43426E-06
0.27500E+01	0.48444E-06
0.30000E+01	0.53050E-06
0.40000E+01	0.69008E-06
0.50000E+01	0.84827E-06
0.60000E+01	0.94018E-06
0.70000E+01	0.98064E-06
0.80000E+01	0.99480E-06
0.90000E+01	0.99883E-06
0.10000E+02	0.99978E-06
0.11000E+02	0.99996E-06
0.12000E+02	0.99999E-06
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 23

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.6000E+02	0.00000E+00	0.10000E+01	0.50489E-01
	0.25000E+00	0.16377E-01	
	0.50000E+00	0.26029E-03	
	0.75000E+00	0.41571E-05	
	0.10000E+01	0.29443E-06	
	0.12500E+01	0.28017E-06	
	0.15000E+01	0.32882E-06	
	0.17500E+01	0.37999E-06	
	0.20000E+01	0.43127E-06	
	0.22500E+01	0.48170E-06	
	0.25000E+01	0.53103E-06	
	0.27500E+01	0.57725E-06	
	0.30000E+01	0.61854E-06	
	0.40000E+01	0.75458E-06	
	0.50000E+01	0.88342E-06	
	0.60000E+01	0.95491E-06	
	0.70000E+01	0.98549E-06	
	0.80000E+01	0.99608E-06	

	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 21

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.5000E+02	0.00000E+00	0.10000E+01	0.49875E-01
	0.25000E+00	0.14479E-01	
	0.50000E+00	0.20433E-03	
	0.75000E+00	0.28796E-05	
	0.10000E+01	0.12547E-06	
	0.12500E+01	0.10975E-06	
	0.15000E+01	0.14333E-06	
	0.17500E+01	0.18388E-06	
	0.20000E+01	0.22896E-06	
	0.22500E+01	0.27757E-06	
	0.25000E+01	0.32913E-06	
	0.27500E+01	0.38079E-06	
	0.30000E+01	0.43009E-06	
	0.40000E+01	0.61006E-06	
	0.50000E+01	0.80124E-06	
	0.60000E+01	0.91955E-06	
	0.70000E+01	0.97371E-06	
	0.80000E+01	0.99297E-06	
	0.90000E+01	0.99845E-06	
	0.10000E+02	0.99971E-06	
	0.11000E+02	0.99996E-06	
	0.12000E+02	0.99999E-06	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 22

IE	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.5500E+02	0.00000E+00	0.10000E+01	0.49905E-01
	0.25000E+00	0.14562E-01	

0.50000E+01	0.66273E-06
0.60000E+01	0.85295E-06
0.70000E+01	0.95048E-06
0.80000E+01	0.98687E-06
0.90000E+01	0.99721E-06
0.10000E+02	0.99952E-06
0.11000E+02	0.99993E-06
0.12000E+02	0.99999E-06
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 20

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
C 00E+02	0.00000E+00	0.10000E+01	0.49337E-01
	0.25000E+00	0.12898E-01	
	0.50000E+00	0.17050E-03	
	0.75000E+00	0.26969E-05	
	0.10000E+01	0.12524E-06	
	0.12500E+01	0.60515E-07	
	0.15000E+01	0.75872E-07	
	0.17500E+01	0.10438E-06	
	0.20000E+01	0.13978E-06	
	0.22500E+01	0.18079E-06	
	0.25000E+01	0.22685E-06	
	0.27500E+01	0.27522E-06	
	0.30000E+01	0.32375E-06	
	0.40000E+01	0.51667E-06	
	0.50000E+01	0.74122E-06	
	0.60000E+01	0.89186E-06	
	0.70000E+01	0.96423E-06	
	0.80000E+01	0.99049E-06	
	0.90000E+01	0.99794E-06	
	0.10000E+02	0.99963E-06	
	0.11000E+02	0.99994E-06	
	0.12000E+02	0.99999E-06	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	

			INTO SOIL
0.3500E+02	0.00000E+00	0.10000E+01	0.50975E-01
	0.25000E+00	0.17706E-01	
	0.50000E+00	0.48878E-03	
	0.75000E+00	0.36069E-04	
	0.10000E+01	0.48097E-05	
	0.12500E+01	0.69202E-06	
	0.15000E+01	0.99726E-07	
	0.17500E+01	0.26069E-07	
	0.20000E+01	0.26748E-07	
	0.22500E+01	0.41783E-07	
	0.25000E+01	0.64348E-07	
	0.27500E+01	0.92879E-07	
	0.30000E+01	0.12647E-06	
	0.40000E+01	0.29500E-06	
	0.50000E+01	0.56597E-06	
	0.60000E+01	0.80059E-06	
	0.70000E+01	0.93134E-06	
	0.80000E+01	0.98185E-06	
	0.90000E+01	0.99622E-06	
	0.10000E+02	0.99937E-06	
	0.11000E+02	0.99991E-06	
	0.12000E+02	0.99999E-06	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 19

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.4000E+02	0.00000E+00	0.10000E+01	0.49452E-01
	0.25000E+00	0.13184E-01	
	0.50000E+00	0.20707E-03	
	0.75000E+00	0.64067E-05	
	0.10000E+01	0.56089E-06	
	0.12500E+01	0.90520E-07	
	0.15000E+01	0.39738E-07	
	0.17500E+01	0.47733E-07	
	0.20000E+01	0.69417E-07	
	0.22500E+01	0.98684E-07	
	0.25000E+01	0.13454E-06	
	0.27500E+01	0.17486E-06	
	0.30000E+01	0.21806E-06	
	0.40000E+01	0.40878E-06	

0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 17

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.3000E+02	0.00000E+00	0.10000E+01	0.54176E-01
	0.25000E+00	0.28736E-01	
	0.50000E+00	0.17216E-02	
	0.75000E+00	0.22596E-03	
	0.10000E+01	0.36377E-04	
	0.12500E+01	0.55061E-05	
	0.15000E+01	0.73266E-06	
	0.17500E+01	0.87272E-07	
	0.20000E+01	0.14978E-07	
	0.22500E+01	0.13422E-07	
	0.25000E+01	0.23340E-07	
	0.27500E+01	0.39203E-07	
	0.30000E+01	0.60798E-07	
	0.40000E+01	0.19077E-06	
	0.50000E+01	0.45892E-06	
	0.60000E+01	0.73690E-06	
	0.70000E+01	0.90757E-06	
	0.80000E+01	0.97582E-06	
	0.90000E+01	0.99513E-06	
	0.10000E+02	0.99923E-06	
	0.11000E+02	0.99990E-06	
	0.12000E+02	0.99999E-06	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 18

TIME	DEPTH	CONCENTRATION	TOTAL FLUX

0.25000E+01	0.11225E-08
0.27500E+01	0.24058E-08
0.30000E+01	0.62864E-08
0.40000E+01	0.49527E-07
0.50000E+01	0.24997E-06
0.60000E+01	0.59352E-06
0.70000E+01	0.85621E-06
0.80000E+01	0.96499E-06
0.90000E+01	0.99375E-06
0.10000E+02	0.99915E-06
0.11000E+02	0.99991E-06
0.12000E+02	0.99999E-06
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 16

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.2500E+02	0.00000E+00	0.10000E+01	0.60562E-01
	0.25000E+00	0.55298E-01	
	0.50000E+00	0.65211E-02	
	0.75000E+00	0.11602E-02	
	0.10000E+01	0.20565E-03	
	0.12500E+01	0.31852E-04	
	0.15000E+01	0.41523E-05	
	0.17500E+01	0.45030E-06	
	0.20000E+01	0.41502E-07	
	0.22500E+01	0.55291E-08	
	0.25000E+01	0.59705E-08	
	0.27500E+01	0.12172E-07	
	0.30000E+01	0.22823E-07	
	0.40000E+01	0.10710E-06	
	0.50000E+01	0.35032E-06	
	0.60000E+01	0.66553E-06	
	0.70000E+01	0.88106E-06	
	0.80000E+01	0.96963E-06	
	0.90000E+01	0.99417E-06	
	0.10000E+02	0.99913E-06	
	0.11000E+02	0.99990E-06	
	0.12000E+02	0.99999E-06	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 14

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1800E+02	0.00000E+00	0.10000E+01	0.79153E-01
	0.25000E+00	0.14194E+00	
	0.50000E+00	0.31369E-01	
	0.75000E+00	0.68632E-02	
	0.10000E+01	0.12564E-02	
	0.12500E+01	0.18247E-03	
	0.15000E+01	0.20605E-04	
	0.17500E+01	0.17912E-05	
	0.20000E+01	0.11922E-06	
	0.22500E+01	0.61935E-08	
	0.25000E+01	0.52578E-09	
	0.27500E+01	0.96748E-09	
	0.30000E+01	0.30718E-08	
	0.40000E+01	0.34693E-07	
	0.50000E+01	0.22005E-06	
	0.60000E+01	0.57663E-06	
	0.70000E+01	0.85544E-06	
	0.80000E+01	0.96693E-06	
	0.90000E+01	0.99455E-06	
	0.10000E+02	0.99933E-06	
	0.11000E+02	0.99994E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 15

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.2000E+02	0.00000E+00	0.10000E+01	0.71181E-01
	0.25000E+00	0.10701E+00	
	0.50000E+00	0.20503E-01	
	0.75000E+00	0.42842E-02	
	0.10000E+01	0.78484E-03	
	0.12500E+01	0.11765E-03	
	0.15000E+01	0.14093E-04	
	0.17500E+01	0.13350E-05	
	0.20000E+01	0.99726E-07	
	0.22500E+01	0.62871E-08	

0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 13

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1600E+02	0.00000E+00	0.10000E+01	0.88056E-01
	0.25000E+00	0.18487E+00	
	0.50000E+00	0.45891E-01	
	0.75000E+00	0.10318E-01	
	0.10000E+01	0.18539E-02	
	0.12500E+01	0.25513E-03	
	0.15000E+01	0.26402E-04	
	0.17500E+01	0.20339E-05	
	0.20000E+01	0.11591E-06	
	0.22500E+01	0.48956E-08	
	0.25000E+01	0.22651E-09	
	0.27500E+01	0.31937E-09	
	0.30000E+01	0.13026E-08	
	0.40000E+01	0.23026E-07	
	0.50000E+01	0.19256E-06	
	0.60000E+01	0.56329E-06	
	0.70000E+01	0.85774E-06	
	0.80000E+01	0.96987E-06	
	0.90000E+01	0.99549E-06	
	0.10000E+02	0.99951E-06	
	0.11000E+02	0.99996E-06	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

0.15000E+01	0.24045E-04
0.17500E+01	0.12121E-05
0.20000E+01	0.40755E-07
0.22500E+01	0.90816E-09
0.25000E+01	0.14664E-10
0.27500E+01	0.13367E-10
0.30000E+01	0.12352E-09
0.40000E+01	0.79408E-08
0.50000E+01	0.14621E-06
0.60000E+01	0.55382E-06
0.70000E+01	0.87473E-06
0.80000E+01	0.97863E-06
0.90000E+01	0.99754E-06
0.10000E+02	0.99980E-06
0.11000E+02	0.99999E-06
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 12

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1400E+02	0.00000E+00	0.10000E+01	0.97834E-01
	0.25000E+00	0.23777E+00	
	0.50000E+00	0.64247E-01	
	0.75000E+00	0.14538E-01	
	0.10000E+01	0.25052E-02	
	0.12500E+01	0.31676E-03	
	0.15000E+01	0.28863E-04	
	0.17500E+01	0.18753E-05	
	0.20000E+01	0.86245E-07	
	0.22500E+01	0.27967E-08	
	0.25000E+01	0.76745E-10	
	0.27500E+01	0.79080E-10	
	0.30000E+01	0.45504E-09	
	0.40000E+01	0.14174E-07	
	0.50000E+01	0.16748E-06	
	0.60000E+01	0.55450E-06	
	0.70000E+01	0.86365E-06	
	0.80000E+01	0.97374E-06	
	0.90000E+01	0.99651E-06	
	0.10000E+02	0.99967E-06	
	0.11000E+02	0.99998E-06	
	0.12000E+02	0.10000E-05	

0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

. .LYSIS FOR TIME PERIOD 10

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1000E+02	0.00000E+00	0.10000E+01	0.11250E+00
	0.25000E+00	0.33657E+00	
	0.50000E+00	0.96465E-01	
	0.75000E+00	0.19707E-01	
	0.10000E+01	0.26718E-02	
	0.12500E+01	0.23233E-03	
	0.15000E+01	0.12695E-04	
	0.17500E+01	0.42957E-06	
	0.20000E+01	0.88992E-08	
	0.22500E+01	0.11194E-09	
	0.25000E+01	0.97589E-12	
	0.27500E+01	0.13371E-11	
	0.30000E+01	0.23816E-10	
	0.40000E+01	0.39041E-08	
	0.50000E+01	0.13014E-06	
	0.60000E+01	0.56612E-06	
	0.70000E+01	0.89223E-06	
	0.80000E+01	0.98430E-06	
	0.90000E+01	0.99850E-06	
	0.10000E+02	0.99990E-06	
	0.11000E+02	0.10000E-05	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 11

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1200E+02	0.00000E+00	0.10000E+01	0.10681E+00
	0.25000E+00	0.29322E+00	
	0.50000E+00	0.83255E-01	
	0.75000E+00	0.18388E-01	
	0.10000E+01	0.29167E-02	
	0.12500E+01	0.32093E-03	

0.90000E+01	0.99955E-06
0.10000E+02	0.99998E-06
0.11000E+02	0.10000E-05
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 9

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.9000E+01	0.00000E+00	0.10000E+01	0.11466E+00
	0.25000E+00	0.35954E+00	
	0.50000E+00	0.10250E+00	
	0.75000E+00	0.19686E-01	
	0.10000E+01	0.23826E-02	
	0.12500E+01	0.17551E-03	
	0.15000E+01	0.76919E-05	
	0.17500E+01	0.19717E-06	
	0.20000E+01	0.29165E-08	
	0.22500E+01	0.24657E-10	
	0.25000E+01	0.13276E-12	
	0.27500E+01	0.29854E-12	
	0.30000E+01	0.81380E-11	
	0.40000E+01	0.26645E-08	
	0.50000E+01	0.12929E-06	
	0.60000E+01	0.59043E-06	
	0.70000E+01	0.90967E-06	
	0.80000E+01	0.98871E-06	
	0.90000E+01	0.99911E-06	
	0.10000E+02	0.99996E-06	
	0.11000E+02	0.10000E-05	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	

0.50000E+00	0.10369E+00
0.75000E+00	0.15924E-01
0.10000E+01	0.13341E-02
0.12500E+01	0.58361E-04
0.15000E+01	0.12901E-05
0.17500E+01	0.14049E-07
0.20000E+01	0.74251E-10
0.22500E+01	0.19095E-12
0.25000E+01	0.28257E-15
0.27500E+01	0.53733E-14
0.30000E+01	0.46675E-12
0.40000E+01	0.99941E-09
0.50000E+01	0.13649E-06
0.60000E+01	0.66258E-06
0.70000E+01	0.94717E-06
0.80000E+01	0.99579E-06
0.90000E+01	0.99982E-06
0.10000E+02	0.10000E-05
0.11000E+02	0.10000E-05
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 8

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.8000E+01	0.00000E+00	0.10000E+01	0.11571E+00
	0.25000E+00	0.38052E+00	
	0.50000E+00	0.10581E+00	
	0.75000E+00	0.18577E-01	
	0.10000E+01	0.19297E-02	
	0.12500E+01	0.11420E-03	
	0.15000E+01	0.37496E-05	
	0.17500E+01	0.66903E-07	
	0.20000E+01	0.63860E-09	
	0.22500E+01	0.32343E-11	
	0.25000E+01	0.96621E-14	
	0.27500E+01	0.48825E-13	
	0.30000E+01	0.22413E-11	
	0.40000E+01	0.17016E-08	
	0.50000E+01	0.13085E-06	
	0.60000E+01	0.62176E-06	
	0.70000E+01	0.92811E-06	
	0.80000E+01	0.99259E-06	

0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 6

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.6000E+01	0.00000E+00	0.10000E+01	0.11121E+00
	0.25000E+00	0.39625E+00	
	0.50000E+00	0.94289E-01	
	0.75000E+00	0.11844E-01	
	0.10000E+01	0.72632E-03	
	0.12500E+01	0.20597E-04	
	0.15000E+01	0.25882E-06	
	0.17500E+01	0.14022E-08	
	0.20000E+01	0.32839E-11	
	0.22500E+01	0.34560E-14	
	0.25000E+01	0.27164E-17	
	0.27500E+01	0.33412E-15	
	0.30000E+01	0.65487E-13	
	0.40000E+01	0.51918E-09	
	0.50000E+01	0.14849E-06	
	0.60000E+01	0.71477E-06	
	0.70000E+01	0.96571E-06	
	0.80000E+01	0.99812E-06	
	0.90000E+01	0.99996E-06	
	0.10000E+02	0.10000E-05	
	0.11000E+02	0.10000E-05	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 7

IE	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.7000E+01	0.00000E+00	0.10000E+01	0.11475E+00
	0.25000E+00	0.39414E+00	

0.50000E+01	0.21164E-06
0.60000E+01	0.85457E-06
0.70000E+01	0.99401E-06
0.80000E+01	0.10000E-05
0.90000E+01	0.10000E-05
0.10000E+02	0.10000E-05
0.11000E+02	0.10000E-05
0.12000E+02	0.10000E-05
0.13000E+02	0.10000E-05
0.14000E+02	0.10000E-05
0.15000E+02	0.10000E-05
0.16000E+02	0.10000E-05
0.17000E+02	0.10000E-05
0.18000E+02	0.10000E-05
0.19000E+02	0.10000E-05
0.20000E+02	0.10000E-05
0.21000E+02	0.10000E-05
0.22000E+02	0.10000E-05
0.23000E+02	0.10000E-05
0.24000E+02	0.10000E-05
0.25000E+02	0.10000E-05
0.26000E+02	0.10000E-05
0.27000E+02	0.10000E-05
0.28000E+02	0.10000E-05

ANALYSIS FOR TIME PERIOD 5

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
)00E+01	0.00000E+00	0.10000E+01	0.10416E+00
	0.25000E+00	0.37847E+00	
	0.50000E+00	0.75972E-01	
	0.75000E+00	0.69646E-02	
	0.10000E+01	0.26483E-03	
	0.12500E+01	0.38781E-05	
	0.15000E+01	0.20749E-07	
	0.17500E+01	0.40780E-10	
	0.20000E+01	0.31130E-13	
	0.22500E+01	0.12902E-16	
	0.25000E+01	0.16190E-19	
	0.27500E+01	0.92922E-17	
	0.30000E+01	0.51192E-14	
	0.40000E+01	0.22396E-09	
	0.50000E+01	0.17168E-06	
	0.60000E+01	0.78013E-06	
	0.70000E+01	0.98213E-06	
	0.80000E+01	0.99950E-06	
	0.90000E+01	0.10000E-05	
	0.10000E+02	0.10000E-05	
	0.11000E+02	0.10000E-05	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.3000E+01	0.00000E+00	0.10000E+01	0.82891E-01
	0.25000E+00	0.29715E+00	
	0.50000E+00	0.28571E-01	
	0.75000E+00	0.67391E-03	
	0.10000E+01	0.29969E-05	
	0.12500E+01	0.26487E-08	
	0.15000E+01	0.54020E-12	
	0.17500E+01	0.22768E-15	
	0.20000E+01	0.81155E-18	
	0.22500E+01	0.14709E-20	
	0.25000E+01	0.99586E-24	
	0.27500E+01	0.19656E-22	
	0.30000E+01	0.50260E-18	
	0.40000E+01	0.89944E-11	
	0.50000E+01	0.28676E-06	
	0.60000E+01	0.93312E-06	
	0.70000E+01	0.10000E-05	
	0.80000E+01	0.10000E-05	
	0.90000E+01	0.10000E-05	
	0.10000E+02	0.10000E-05	
	0.11000E+02	0.10000E-05	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 4

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.4000E+01	0.00000E+00	0.10000E+01	0.94993E-01
	0.25000E+00	0.34812E+00	
	0.50000E+00	0.53399E-01	
	0.75000E+00	0.29957E-02	
	0.10000E+01	0.53516E-04	
	0.12500E+01	0.27243E-06	
	0.15000E+01	0.40185E-09	
	0.17500E+01	0.18697E-12	
	0.20000E+01	0.58820E-16	
	0.22500E+01	0.85276E-19	
	0.25000E+01	0.18414E-21	
	0.27500E+01	0.51514E-19	
	0.30000E+01	0.13807E-15	
	0.40000E+01	0.65791E-10	

0.17000E+02	0.00000E+00
0.18000E+02	0.00000E+00
0.19000E+02	0.00000E+00
0.20000E+02	0.00000E+00
0.21000E+02	0.00000E+00
0.22000E+02	0.00000E+00
0.23000E+02	0.00000E+00
0.24000E+02	0.00000E+00
0.25000E+02	0.00000E+00
0.26000E+02	0.00000E+00
0.27000E+02	0.00000E+00
0.28000E+02	0.00000E+00

ANALYSIS FOR TIME PERIOD 2

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.2000E+01	0.00000E+00	0.10000E+01	0.66516E-01
	0.25000E+00	0.21258E+00	
	0.50000E+00	0.77480E-02	
	0.75000E+00	0.24063E-04	
	0.10000E+01	0.72335E-08	
	0.12500E+01	0.37401E-12	
	0.15000E+01	0.15349E-14	
	0.17500E+01	0.64433E-17	
	0.20000E+01	0.80680E-20	
	0.22500E+01	0.27961E-23	
	0.25000E+01	0.68275E-27	
	0.27500E+01	0.37202E-25	
	0.30000E+01	0.50471E-22	
	0.40000E+01	0.15678E-12	
	0.50000E+01	0.44997E-06	
	0.60000E+01	0.10000E-05	
	0.70000E+01	0.10000E-05	
	0.80000E+01	0.10000E-05	
	0.90000E+01	0.10000E-05	
	0.10000E+02	0.10000E-05	
	0.11000E+02	0.10000E-05	
	0.12000E+02	0.10000E-05	
	0.13000E+02	0.10000E-05	
	0.14000E+02	0.10000E-05	
	0.15000E+02	0.10000E-05	
	0.16000E+02	0.10000E-05	
	0.17000E+02	0.10000E-05	
	0.18000E+02	0.10000E-05	
	0.19000E+02	0.10000E-05	
	0.20000E+02	0.10000E-05	
	0.21000E+02	0.10000E-05	
	0.22000E+02	0.10000E-05	
	0.23000E+02	0.10000E-05	
	0.24000E+02	0.10000E-05	
	0.25000E+02	0.10000E-05	
	0.26000E+02	0.10000E-05	
	0.27000E+02	0.10000E-05	
	0.28000E+02	0.10000E-05	

ANALYSIS FOR TIME PERIOD 3

TIME DEPTH CONCENTRATION TOTAL FLUX

14	0.1600E+02	0.1800E+02	-.2200E-01	0.0000E+00
15	0.1800E+02	0.2000E+02	-.2400E-01	0.0000E+00
16	0.2000E+02	0.2500E+02	-.2600E-01	0.0000E+00
17	0.2500E+02	0.3000E+02	-.3000E-01	0.0000E+00
8	0.3000E+02	0.3500E+02	-.3300E-01	0.0000E+00
9	0.3500E+02	0.4000E+02	-.3500E-01	0.0000E+00
20	0.4000E+02	0.4500E+02	-.3500E-01	0.0000E+00
21	0.4500E+02	0.5000E+02	-.3400E-01	0.0000E+00
22	0.5000E+02	0.5500E+02	-.3400E-01	0.0000E+00
23	0.5500E+02	0.6000E+02	-.3300E-01	0.0000E+00
24	0.6000E+02	0.6500E+02	-.3300E-01	0.0000E+00
25	0.6500E+02	0.7000E+02	-.3200E-01	0.0000E+00
26	0.7000E+02	0.7500E+02	-.3200E-01	0.0000E+00
27	0.7500E+02	0.8000E+02	-.3100E-01	0.0000E+00
28	0.8000E+02	0.8500E+02	-.3100E-01	0.0000E+00
29	0.8500E+02	0.9000E+02	-.3050E-01	0.0000E+00
30	0.9000E+02	0.9500E+02	-.3000E-01	0.0000E+00
31	0.9500E+02	0.1000E+03	-.3000E-01	0.0000E+00
32	0.1000E+03	0.1050E+03	-.3000E-01	0.0000E+00

The Parameters used to Invert the Laplace Transform are
TAU = 0.700E+01 N = 20 SIG = 0.000E+00 RNU = 0.200E+01

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS AND TIMES

A[illegible]LYSIS FOR TIME PERIOD 1

TIME	DEPTH	CONCENTRATION	TOTAL FLUX INTO SOIL
0.1000E+01	0.00000E+00	0.10000E+01	0.43994E-01
	0.25000E+00	0.88784E-01	
	0.50000E+00	0.90676E-04	
	0.75000E+00	0.65658E-09	
	0.10000E+01	0.73776E-12	
	0.12500E+01	0.10393E-13	
	0.15000E+01	0.33911E-16	
	0.17500E+01	0.20531E-19	
	0.20000E+01	0.19191E-23	
	0.22500E+01	0.16318E-26	
	0.25000E+01	0.64722E-29	
	0.27500E+01	0.98792E-32	
	0.30000E+01	0.34132E-35	
	0.40000E+01	0.58537E-43	
	0.50000E+01	0.00000E+00	
	0.60000E+01	0.00000E+00	
	0.70000E+01	0.00000E+00	
	0.80000E+01	0.00000E+00	
	0.90000E+01	0.00000E+00	
	0.10000E+02	0.00000E+00	
	0.11000E+02	0.00000E+00	
	0.12000E+02	0.00000E+00	
	0.13000E+02	0.00000E+00	
	0.14000E+02	0.00000E+00	
	0.15000E+02	0.00000E+00	
	0.16000E+02	0.00000E+00	

THE VARIATION IN PROPERTIES WITH TIME

TIME PERIODS WITH THE SAME SOURCE AND VELOCITY

Period	Start Time	No. of Steps	Time Step	Source Conc.	Rate of change	Height of Leachate	Volume Collected
1	0.0000E+00	1	0.1000E+01	0.1000E+01			
2	0.1000E+01	1	0.1000E+01	0.1000E+01			
3	0.2000E+01	1	0.1000E+01	0.1000E+01			
4	0.3000E+01	1	0.1000E+01	0.1000E+01			
5	0.4000E+01	1	0.1000E+01	0.1000E+01			
6	0.5000E+01	1	0.1000E+01	0.1000E+01			
7	0.6000E+01	1	0.1000E+01	0.1000E+01			
8	0.7000E+01	1	0.1000E+01	0.1000E+01			
9	0.8000E+01	1	0.1000E+01	0.1000E+01			
10	0.9000E+01	1	0.1000E+01	0.1000E+01			
11	0.1000E+02	1	0.2000E+01	0.1000E+01			
12	0.1200E+02	1	0.2000E+01	0.1000E+01			
13	0.1400E+02	1	0.2000E+01	0.1000E+01			
14	0.1600E+02	1	0.2000E+01	0.1000E+01			
15	0.1800E+02	1	0.2000E+01	0.1000E+01			
16	0.2000E+02	1	0.5000E+01	0.1000E+01			
17	0.2500E+02	1	0.5000E+01	0.1000E+01			
18	0.3000E+02	1	0.5000E+01	0.1000E+01			
19	0.3500E+02	1	0.5000E+01	0.1000E+01			
20	0.4000E+02	1	0.5000E+01	0.1000E+01			
21	0.4500E+02	1	0.5000E+01	0.1000E+01			
22	0.5000E+02	1	0.5000E+01	0.1000E+01			
23	0.5500E+02	1	0.5000E+01	0.1000E+01			
24	0.6000E+02	1	0.5000E+01	0.1000E+01			
25	0.6500E+02	1	0.5000E+01	0.1000E+01			
26	0.7000E+02	1	0.5000E+01	0.1000E+01			
27	0.7500E+02	1	0.5000E+01	0.1000E+01			
28	0.8000E+02	1	0.5000E+01	0.1000E+01			
29	0.8500E+02	1	0.5000E+01	0.1000E+01			
30	0.9000E+02	1	0.5000E+01	0.1000E+01			
31	0.9500E+02	1	0.5000E+01	0.1000E+01			
32	0.1000E+03	1	0.5000E+01	0.1000E+01			

Period	Start Time	End Time	Darcy Velocity (flux)	Dispersivity	Base Velocity (flux)
1	0.0000E+00	0.1000E+01	0.2500E-01	0.0000E+00	
2	0.1000E+01	0.2000E+01	0.1400E-01	0.0000E+00	
3	0.2000E+01	0.3000E+01	0.9300E-02	0.0000E+00	
4	0.3000E+01	0.4000E+01	0.5600E-02	0.0000E+00	
5	0.4000E+01	0.5000E+01	0.2900E-02	0.0000E+00	
6	0.5000E+01	0.6000E+01	0.8400E-03	0.0000E+00	
7	0.6000E+01	0.7000E+01	-.3100E-02	0.0000E+00	
8	0.7000E+01	0.8000E+01	-.6300E-02	0.0000E+00	
9	0.8000E+01	0.9000E+01	-.9100E-02	0.0000E+00	
10	0.9000E+01	0.1000E+02	-.1100E-01	0.0000E+00	
11	0.1000E+02	0.1200E+02	-.1300E-01	0.0000E+00	
12	0.1200E+02	0.1400E+02	-.1700E-01	0.0000E+00	
13	0.1400E+02	0.1600E+02	-.2000E-01	0.0000E+00	

```
*************************************************
*                                               *
*                                               *
*     P O L L U T E v 6   S I M U L A T I O N   *
*                                               *
*               RUN DATE -   26- 5-96           *
*               TIME     -   17:26:31           *
*                                               *
*               REVISION - 1994/03/01           *
*                                               *
*                    VERSION 6.0.1              *
*                                               *
* COPYRIGHT(c) R.K. ROWE & J.R. BOOKER  1983-1994 *
*                                               *
*  LICENSED USER: miLES                         *
*                                               *
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********************************************************************************
#VAR 122nd Street Landfill: POLLUTE 1-D Simulation
********************************************************************************
```

THE VARIABLE VELOCITY AND/OR CONCENTRATION OPTION #VAR
HAS BEEN USED.
NOTE THAT THE ACCURACY OF THE CALCULATIONS WITH THIS OPTION
WILL DEPEND ON THE NUMBER OF SUBLAYERS USED

PROPERTIES OF THE MATRIX

LAYER NO.	NO. OF SUBLAYER	COEFFICIENT HYDRODYNAMIC DISPERSION	MATRIX POROSITY	DISTRIBUTION/ PARTITIONING COEFFICIENT	DRY DENSITY	LAYER THICKNESS
1	12	0.60000E-02	0.33500	0.0000E+00	1.9000	0.3000E+01
2	15	0.20000E-01	0.38000	0.0000E+00	1.9000	0.1500E+02
3	10	0.20000E-01	0.38000	0.0000E+00	1.9000	0.1000E+02

The TOP and BOTTOM BOUNDARY CONDITIONS
are defined by CODES Top = 2 Bottom = 4
See below for details

```
CODE       TOP                        BOTTOM
 1 =      Zero Flux                   Zero Flux
 2 =      C = Const.                 C = Const2.
 3 =      Finite Mass            Fixed Outflow Velocity
 4 =                             Infinite Bottom Layer
```

There is no Radioactive or Biological Decay being Considered

```
1

                 *************************************************
                 *                                               *
                 *                                               *
                 *     M I G R A T E   S I M U L A T I O N       *
                 *                                               *
                 *             RUN DATE -    23- 5-96            *
                 *             TIME     -    14: 1:24            *
                 *                                               *
                 *             REVISION - 1995/15/02             *
                 *                                               *
                 *                    MIGRATE                    *
                 *                                               *
                 *                  VERSION 9.0.0                *
                 *                                               *
                 * COPYRIGHT  R.K. ROWE & J.R. BOOKER  1985-1995 *
                 *                                               *
                 *                                               *
                 *************************************************


 ***************************************************************************
  #VAR 122nd Street Landfill: Transient Simulation
 ***************************************************************************

 ______________________________________________________________________________

                               TIME-VARYING PROPERTIES GROUP    1

 START TIME              =          0.0000
 END TIME                =          5.0000
 NUMBER OF INCREMENTS =                 1


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.1404E+04

 WIDTH OF BASE OF LANDFILL IS BETWEEN       139.4357< X < 2668.9633
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN     63.9763< X < 2744.4226


 THE INITIAL SOURCE CONCENTRATION                =    0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~

 B[illegible] BOUNDARY CONDITION DEFINED BY
 AN IMPERMEABLE BASE(I.E. ZERO FLUX)

                              PROPERTIES OF THE MATRIX
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LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0166	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	5.5871	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 2

START TIME = 5.0000
END TIME = 10.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0124	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	4.4490	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 3

START TIME = 10.0000
END TIME = 15.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

SET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

E BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF.		POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY		THICKNESS
	VERT.	HORZ.				HORZ.	VERT.	
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	0.0010	1.64
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.5520	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 4

START TIME = 15.0000
END TIME = 20.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0004	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 5

START TIME = 20.0000
END TIME = 25.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

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SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY
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BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX
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LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0014	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 6

START TIME = 25.0000

END TIME = 30.0000
NUMBER OF INCREMENTS = 1

FACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0022	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 7

ART TIME = 30.0000
D TIME = 35.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8

TIME-VARYING PROPERTIES GROUP 8

START TIME = 35.0000
END TIME = 40.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY
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SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY
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. E BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX
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LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0032	1.6
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.8

20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 9

START TIME = 40.0000
END TIME = 45.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY
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SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY
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BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX
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LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64

15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 10

START TIME = 45.0000
END TIME = 50.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

[illegible] SET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64

10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0031	1.64
5	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 11

START TIME = 50.0000
END TIME = 55.0000
NUMBER OF INCREMENTS = 1

RFACE BOUNDARY
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SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY
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BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64

5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0029	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 12

[illegible]RT TIME = 55.0000
[illegible] TIME = 60.0000
NUMBER OF INCREMENTS = 1

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

BASE BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

LAYER	DISPERSION COEFF. VERT.	DISPERSION COEFF. HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	ADV. VELOCITY VERT.	THICKNESS

1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
[illegible]	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0028	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	[illegible]	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
24	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
25	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

TIME-VARYING PROPERTIES GROUP 13

START TIME = 60.0000
END TIME = 105.0000
NUMBER OF INCREMENTS = 9

SURFACE BOUNDARY

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0

OFFSET OF CENTER OF LANDFILL 1 IS 0.1404E+04

WIDTH OF BASE OF LANDFILL IS BETWEEN 139.4357< X < 2668.9633
WIDTH OF SURFACE OF LANDFILL IS BETWEEN 63.9763< X < 2744.4226

THE INITIAL SOURCE CONCENTRATION = 0.1000E+01

BASE BOUNDARY

[illegible] BOUNDARY CONDITION DEFINED BY
AN IMPERMEABLE BASE(I.E. ZERO FLUX)

PROPERTIES OF THE MATRIX

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LAYER	DISPERSION COEFF. VERT.	HORZ.	POROSITY	ADSORPTION COEFF.	DENSITY	ADV. VELOCITY HORZ.	VERT.	THICKNESS
1	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
2	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
3	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
4	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
5	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
6	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
7	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
8	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
9	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
10	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
11	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
12	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
13	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
14	.645E-01	.645E-01	0.335	0.000E+00	1900.000	0.0000	-0.0021	1.64
15	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
16	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
17	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
18	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
19	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
20	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
21	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
22	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
23	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
[illegible]	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82
26	.109E+04	.475E+01	0.030	0.000E+00	1900.000	1.2416	0.0000	0.82

INTEGRATION PARAMETERS

THE PARAMETERS USED TO INVERT THE LAPLACE TRANSFORM ARE
TAU =0.700E+01 N = 11 SIG =0.000E+00 RNU =0.100E+01

A FINE INTEGRATION LEVEL HAS BEEN CHOSEN WITH THE FOLLOWING GAUSS QUADRATURE PARAMETERS:

GAUSSIAN INTEGRATION SUBINTERVAL SIZE = 0.187E-02
NUMBER OF SUBINTERVALS = 48
NUMBER OF SAMPLE POINTS USED PER STEP = 20

RESULTS

ANALYSIS FOR TIME PERIOD 1

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS, LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
~~	~~~~~~~~~	~~~~~~~~~	~~~~~~~~~~~~~	~~~~~~~~~~	~~~~~~~~~~~
0.5000E+01	0.2730E+04	0.0000E+00	0.1730E+00	0.3213E+03	0.0000E+00
		0.1640E+01	0.1288E-01		
		0.3280E+01	0.2578E-04		
		0.4920E+01	0.9822E-09		
		0.6560E+01	-0.5478E-13		
		0.8200E+01	-0.1458E-14		
		0.9840E+01	-0.4580E-17		
		0.1148E+02	0.2255E-19		
		0.1312E+02	0.1332E-22		
		0.1476E+02	0.1296E-25		
		0.1640E+02	0.7581E-28		
		0.1804E+02	-0.2195E-30		
		0.1968E+02	0.1806E-33		
		0.2132E+02	-0.7176E-35		
		0.2296E+02	-0.9211E-39		
		0.2378E+02	-0.8729E-39		
		0.2460E+02	-0.8243E-39		
		0.2542E+02	-0.7766E-39		
		0.2624E+02	-0.7308E-39		
		0.2706E+02	-0.6879E-39		
		0.2788E+02	-0.6489E-39		
		0.2870E+02	-0.6144E-39		
		0.2952E+02	-0.5852E-39		
		0.3034E+02	-0.5619E-39		
		0.3116E+02	-0.5449E-39		
		0.3198E+02	-0.5346E-39		
		0.3280E+02	-0.5311E-39		
0.5000E+01	0.2746E+04	0.0000E+00	0.3667E-01	0.3213E+03	0.0000E+00
		0.1640E+01	0.2736E-02		
		0.3280E+01	0.5478E-05		
		0.4920E+01	0.2087E-09		
		0.6560E+01	-0.1171E-13		
		0.8200E+01	-0.3109E-15		
		0.9840E+01	-0.9854E-18		
		0.1148E+02	0.4830E-20		
		0.1312E+02	0.2842E-23		
		0.1476E+02	0.2750E-26		
		0.1640E+02	0.1608E-28		
		0.1804E+02	-0.4651E-31		
		0.1968E+02	0.3924E-34		
		0.2132E+02	-0.1529E-35		
		0.2296E+02	-0.8487E-39		
		0.2378E+02	-0.8534E-39		
		0.2460E+02	-0.8562E-39		
		0.2542E+02	-0.8573E-39		
		0.2624E+02	-0.8572E-39		
		0.2706E+02	-0.8562E-39		
		0.2788E+02	-0.8547E-39		
		0.2870E+02	-0.8528E-39		
		0.2952E+02	-0.8510E-39		
		0.3034E+02	-0.8493E-39		
		0.3116E+02	-0.8480E-39		
		0.3198E+02	-0.8471E-39		

		0.3280E+02	-0.8469E-39		
0.5000E+01	0.2762E+04	0.0000E+00	-0.1033E-01	0.3213E+03	0.0000E+00
		0.1640E+01	-0.7654E-03		
		0.3280E+01	-0.1530E-05		
		0.4920E+01	-0.5829E-10		
		0.6560E+01	0.3201E-14		
		0.8200E+01	0.8564E-16		
		0.9840E+01	0.2626E-18		
		0.1148E+02	-0.1310E-20		
		0.1312E+02	-0.7816E-24		
		0.1476E+02	-0.7718E-27		
		0.1640E+02	-0.4522E-29		
		0.1804E+02	0.1313E-31		
		0.1968E+02	-0.7758E-35		
		0.2132E+02	0.3850E-36		
		0.2296E+02	-0.7635E-39		
		0.2378E+02	-0.7864E-39		
		0.2460E+02	-0.8074E-39		
		0.2542E+02	-0.8263E-39		
		0.2624E+02	-0.8432E-39		
		0.2706E+02	-0.8582E-39		
		0.2788E+02	-0.8711E-39		
		0.2870E+02	-0.8819E-39		
		0.2952E+02	-0.8908E-39		
		0.3034E+02	-0.8978E-39		
		0.3116E+02	-0.9027E-39		
		0.3198E+02	-0.9056E-39		
		0.3280E+02	-0.9066E-39		
5000E+01	0.2779E+04	0.0000E+00	-0.6770E-02	0.3213E+03	0.0000E+00
		0.1640E+01	-0.5036E-03		
		0.3280E+01	-0.1008E-05		
		0.4920E+01	-0.3839E-10		
		0.6560E+01	0.2134E-14		
		0.8200E+01	0.5685E-16		
		0.9840E+01	0.1777E-18		
		0.1148E+02	-0.8773E-21		
		0.1312E+02	-0.5192E-24		
		0.1476E+02	-0.5069E-27		
		0.1640E+02	-0.2966E-29		
		0.1804E+02	0.8594E-32		
		0.1968E+02	-0.2425E-35		
		0.2132E+02	0.2020E-36		
		0.2296E+02	-0.6401E-39		
		0.2378E+02	-0.6592E-39		
		0.2460E+02	-0.6769E-39		
		0.2542E+02	-0.6932E-39		
		0.2624E+02	-0.7081E-39		
		0.2706E+02	-0.7214E-39		
		0.2788E+02	-0.7330E-39		
		0.2870E+02	-0.7430E-39		
		0.2952E+02	-0.7512E-39		
		0.3034E+02	-0.7577E-39		
		0.3116E+02	-0.7623E-39		
		0.3198E+02	-0.7651E-39		
		0.3280E+02	-0.7660E-39		

ANALYSIS FOR TIME PERIOD 2

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS, LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.1000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.6274E+03	0.0000E+00
		0.1640E+01	0.3386E-01		
		0.3280E+01	0.1430E-02		
		0.4920E+01	0.8326E-05		
		0.6560E+01	-0.3879E-07		
		0.8200E+01	-0.3845E-07		
		0.9840E+01	-0.3846E-07		
		0.1148E+02	-0.3846E-07		
		0.1312E+02	-0.3846E-07		
		0.1476E+02	-0.3846E-07		
		0.1640E+02	-0.3846E-07		
		0.1804E+02	-0.3846E-07		
		0.1968E+02	-0.3845E-07		
		0.2132E+02	-0.3727E-07		
		0.2296E+02	0.4806E-08		
		0.2378E+02	0.4832E-08		
		0.2460E+02	0.4855E-08		
		0.2542E+02	0.4876E-08		
		0.2624E+02	0.4894E-08		
		0.2706E+02	0.4910E-08		
		0.2788E+02	0.4924E-08		
		0.2870E+02	0.4936E-08		
		0.2952E+02	0.4945E-08		
		0.3034E+02	0.4953E-08		
		0.3116E+02	0.4958E-08		
		0.3198E+02	0.4961E-08		
		0.3280E+02	0.4962E-08		
0.1000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.6274E+03	0.0000E+00
		0.1640E+01	0.7199E-02		
		0.3280E+01	0.3033E-03		
		0.4920E+01	0.1171E-05		
		0.6560E+01	-0.4807E-07		
		0.8200E+01	-0.3983E-07		
		0.9840E+01	-0.3983E-07		
		0.1148E+02	-0.3983E-07		
		0.1312E+02	-0.3983E-07		
		0.1476E+02	-0.3983E-07		
		0.1640E+02	-0.3983E-07		
		0.1804E+02	-0.3983E-07		
		0.1968E+02	-0.3983E-07		
		0.2132E+02	-0.3871E-07		
		0.2296E+02	0.4462E-08		
		0.2378E+02	0.4489E-08		
		0.2460E+02	0.4514E-08		
		0.2542E+02	0.4536E-08		
		0.2624E+02	0.4556E-08		
		0.2706E+02	0.4574E-08		
		0.2788E+02	0.4590E-08		
		0.2870E+02	0.4603E-08		
		0.2952E+02	0.4614E-08		
		0.3034E+02	0.4622E-08		

		0.3116E+02	0.4628E-08		
		0.3198E+02	0.4632E-08		
		0.3280E+02	0.4633E-08		
1000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.6274E+03	0.0000E+00
		0.1640E+01	-0.2006E-02		
		0.3280E+01	-0.8562E-04		
		0.4920E+01	-0.1106E-05		
		0.6560E+01	-0.2823E-07		
		0.8200E+01	-0.2048E-07		
		0.9840E+01	-0.2049E-07		
		0.1148E+02	-0.2049E-07		
		0.1312E+02	-0.2049E-07		
		0.1476E+02	-0.2049E-07		
		0.1640E+02	-0.2049E-07		
		0.1804E+02	-0.2049E-07		
		0.1968E+02	-0.2049E-07		
		0.2132E+02	-0.1993E-07		
		0.2296E+02	0.4275E-08		
		0.2378E+02	0.4289E-08		
		0.2460E+02	0.4303E-08		
		0.2542E+02	0.4315E-08		
		0.2624E+02	0.4326E-08		
		0.2706E+02	0.4336E-08		
		0.2788E+02	0.4345E-08		
		0.2870E+02	0.4353E-08		
		0.2952E+02	0.4359E-08		
		0.3034E+02	0.4364E-08		
		0.3116E+02	0.4367E-08		
		0.3198E+02	0.4369E-08		
		0.3280E+02	0.4370E-08		
0.1000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.6274E+03	0.0000E+00
		0.1640E+01	-0.1323E-02		
		0.3280E+01	-0.5660E-04		
		0.4920E+01	-0.7045E-06		
		0.6560E+01	-0.2978E-08		
		0.8200E+01	0.1087E-08		
		0.9840E+01	0.1079E-08		
		0.1148E+02	0.1079E-08		
		0.1312E+02	0.1079E-08		
		0.1476E+02	0.1079E-08		
		0.1640E+02	0.1079E-08		
		0.1804E+02	0.1079E-08		
		0.1968E+02	0.1079E-08		
		0.2132E+02	0.1076E-08		
		0.2296E+02	0.4326E-08		
		0.2378E+02	0.4326E-08		
		0.2460E+02	0.4326E-08		
		0.2542E+02	0.4326E-08		
		0.2624E+02	0.4326E-08		
		0.2706E+02	0.4327E-08		
		0.2788E+02	0.4327E-08		
		0.2870E+02	0.4327E-08		
		0.2952E+02	0.4328E-08		
		0.3034E+02	0.4328E-08		
		0.3116E+02	0.4328E-08		
		0.3198E+02	0.4328E-08		
		0.3280E+02	0.4328E-08		

ANALYSIS FOR TIME PERIOD 3

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.1500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.8946E+03	0.0000E+00
		0.1640E+01	0.4365E-01		
		0.3280E+01	0.4277E-02		
		0.4920E+01	0.1298E-03		
		0.6560E+01	0.8512E-06		
		0.8200E+01	-0.4067E-07		
		0.9840E+01	-0.3850E-07		
		0.1148E+02	-0.3846E-07		
		0.1312E+02	-0.3846E-07		
		0.1476E+02	-0.3846E-07		
		0.1640E+02	-0.3846E-07		
		0.1804E+02	-0.3846E-07		
		0.1968E+02	-0.3845E-07		
		0.2132E+02	-0.3618E-07		
		0.2296E+02	0.9706E-08		
		0.2378E+02	0.9734E-08		
		0.2460E+02	0.9759E-08		
		0.2542E+02	0.9782E-08		
		0.2624E+02	0.9803E-08		
		0.2706E+02	0.9821E-08		
		0.2788E+02	0.9837E-08		
		0.2870E+02	0.9850E-08		
		0.2952E+02	0.9861E-08		
		0.3034E+02	0.9869E-08		
		0.3116E+02	0.9875E-08		
		0.3198E+02	0.9879E-08		
		0.3280E+02	0.9880E-08		
0.1500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.8946E+03	0.0000E+00
		0.1640E+01	0.9290E-02		
		0.3280E+01	0.9086E-03		
		0.4920E+01	0.2591E-04		
		0.6560E+01	-0.5095E-07		
		0.8200E+01	-0.4528E-07		
		0.9840E+01	-0.3990E-07		
		0.1148E+02	-0.3983E-07		
		0.1312E+02	-0.3983E-07		
		0.1476E+02	-0.3983E-07		
		0.1640E+02	-0.3983E-07		
		0.1804E+02	-0.3983E-07		
		0.1968E+02	-0.3982E-07		
		0.2132E+02	-0.3795E-07		
		0.2296E+02	0.7549E-08		
		0.2378E+02	0.7580E-08		
		0.2460E+02	0.7608E-08		
		0.2542E+02	0.7634E-08		
		0.2624E+02	0.7657E-08		
		0.2706E+02	0.7677E-08		
		0.2788E+02	0.7695E-08		
		0.2870E+02	0.7710E-08		

		0.2952E+02	0.7722E-08		
		0.3034E+02	0.7731E-08		
		0.3116E+02	0.7738E-08		
		0.3198E+02	0.7742E-08		
		0.3280E+02	0.7744E-08		
0.1500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.8946E+03	0.0000E+00
		0.1640E+01	-0.2581E-02		
		0.3280E+01	-0.2550E-03		
		0.4920E+01	-0.9419E-05		
		0.6560E+01	-0.2678E-06		
		0.8200E+01	-0.2534E-07		
		0.9840E+01	-0.2055E-07		
		0.1148E+02	-0.2049E-07		
		0.1312E+02	-0.2049E-07		
		0.1476E+02	-0.2049E-07		
		0.1640E+02	-0.2049E-07		
		0.1804E+02	-0.2049E-07		
		0.1968E+02	-0.2048E-07		
		0.2132E+02	-0.1969E-07		
		0.2296E+02	0.4648E-08		
		0.2378E+02	0.4666E-08		
		0.2460E+02	0.4683E-08		
		0.2542E+02	0.4698E-08		
		0.2624E+02	0.4712E-08		
		0.2706E+02	0.4724E-08		
		0.2788E+02	0.4735E-08		
		0.2870E+02	0.4743E-08		
		0.2952E+02	0.4751E-08		
		0.3034E+02	0.4756E-08		
		0.3116E+02	0.4760E-08		
		0.3198E+02	0.4763E-08		
		0.3280E+02	0.4764E-08		
0.1500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.8946E+03	0.0000E+00
		0.1640E+01	-0.1705E-02		
		0.3280E+01	-0.1690E-03		
		0.4920E+01	-0.6162E-05		
		0.6560E+01	-0.1417E-06		
		0.8200E+01	-0.1833E-08		
		0.9840E+01	0.1036E-08		
		0.1148E+02	0.1079E-08		
		0.1312E+02	0.1079E-08		
		0.1476E+02	0.1079E-08		
		0.1640E+02	0.1079E-08		
		0.1804E+02	0.1080E-08		
		0.1968E+02	0.1087E-08		
		0.2132E+02	0.9612E-09		
		0.2296E+02	0.2443E-08		
		0.2378E+02	0.2442E-08		
		0.2460E+02	0.2442E-08		
		0.2542E+02	0.2442E-08		
		0.2624E+02	0.2442E-08		
		0.2706E+02	0.2442E-08		
		0.2788E+02	0.2442E-08		
		0.2870E+02	0.2442E-08		
		0.2952E+02	0.2442E-08		
		0.3034E+02	0.2442E-08		
		0.3116E+02	0.2442E-08		
		0.3198E+02	0.2442E-08		

0.3280E+02 0.2442E-08

ANALYSIS FOR TIME PERIOD 4

CULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.2000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.1157E+04	0.0000E+00
		0.1640E+01	0.5109E-01		
		0.3280E+01	0.7569E-02		
		0.4920E+01	0.4890E-03		
		0.6560E+01	0.1199E-04		
		0.8200E+01	0.1451E-07		
		0.9840E+01	-0.4000E-07		
		0.1148E+02	-0.3848E-07		
		0.1312E+02	-0.3846E-07		
		0.1476E+02	-0.3846E-07		
		0.1640E+02	-0.3846E-07		
		0.1804E+02	-0.3845E-07		
		0.1968E+02	-0.3842E-07		
		0.2132E+02	-0.3611E-07		
		0.2296E+02	0.8950E-08		
		0.2378E+02	0.8965E-08		
		0.2460E+02	0.8979E-08		
		0.2542E+02	0.8991E-08		
		0.2624E+02	0.9002E-08		
		0.2706E+02	0.9012E-08		
		0.2788E+02	0.9021E-08		
		0.2870E+02	0.9028E-08		
		0.2952E+02	0.9033E-08		
		0.3034E+02	0.9038E-08		
		0.3116E+02	0.9041E-08		
		0.3198E+02	0.9043E-08		
		0.3280E+02	0.9044E-08		
0.2000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.1157E+04	0.0000E+00
		0.1640E+01	0.1088E-01		
		0.3280E+01	0.1611E-02		
		0.4920E+01	0.1016E-03		
		0.6560E+01	0.1900E-05		
		0.8200E+01	-0.9716E-07		
		0.9840E+01	-0.4235E-07		
		0.1148E+02	-0.3987E-07		
		0.1312E+02	-0.3983E-07		
		0.1476E+02	-0.3983E-07		
		0.1640E+02	-0.3983E-07		
		0.1804E+02	-0.3983E-07		
		0.1968E+02	-0.3980E-07		
		0.2132E+02	-0.3803E-07		
		0.2296E+02	0.9728E-08		
		0.2378E+02	0.9757E-08		
		0.2460E+02	0.9783E-08		
		0.2542E+02	0.9807E-08		
		0.2624E+02	0.9828E-08		
		0.2706E+02	0.9847E-08		

		0.2788E+02	0.9864E-08		
		0.2870E+02	0.9877E-08		
		0.2952E+02	0.9889E-08		
		0.3034E+02	0.9897E-08		
		0.3116E+02	0.9904E-08		
		0.3198E+02	0.9908E-08		
		0.3280E+02	0.9909E-08		
0.2000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.1157E+04	0.0000E+00
		0.1640E+01	-0.3015E-02		
		0.3280E+01	-0.4485E-03		
		0.4920E+01	-0.3147E-04		
		0.6560E+01	-0.1340E-05		
		0.8200E+01	-0.9130E-07		
		0.9840E+01	-0.2264E-07		
		0.1148E+02	-0.2053E-07		
		0.1312E+02	-0.2049E-07		
		0.1476E+02	-0.2049E-07		
		0.1640E+02	-0.2049E-07		
		0.1804E+02	-0.2049E-07		
		0.1968E+02	-0.2046E-07		
		0.2132E+02	-0.1987E-07		
		0.2296E+02	0.6816E-08		
		0.2378E+02	0.6837E-08		
		0.2460E+02	0.6855E-08		
		0.2542E+02	0.6872E-08		
		0.2624E+02	0.6887E-08		
		0.2706E+02	0.6900E-08		
		0.2788E+02	0.6912E-08		
		0.2870E+02	0.6922E-08		
		0.2952E+02	0.6930E-08		
		0.3034E+02	0.6936E-08		
		0.3116E+02	0.6941E-08		
		0.3198E+02	0.6943E-08		
		0.3280E+02	0.6944E-08		
0.2000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.1157E+04	0.0000E+00
		0.1640E+01	-0.1996E-02		
		0.3280E+01	-0.2981E-03		
		0.4920E+01	-0.2077E-04		
		0.6560E+01	-0.8148E-06		
		0.8200E+01	-0.4019E-07		
		0.9840E+01	-0.2884E-09		
		0.1148E+02	0.1049E-08		
		0.1312E+02	0.1079E-08		
		0.1476E+02	0.1079E-08		
		0.1640E+02	0.1079E-08		
		0.1804E+02	0.1081E-08		
		0.1968E+02	0.1109E-08		
		0.2132E+02	0.7631E-09		
		0.2296E+02	0.3916E-08		
		0.2378E+02	0.3915E-08		
		0.2460E+02	0.3914E-08		
		0.2542E+02	0.3914E-08		
		0.2624E+02	0.3913E-08		
		0.2706E+02	0.3912E-08		
		0.2788E+02	0.3912E-08		
		0.2870E+02	0.3911E-08		
		0.2952E+02	0.3911E-08		
		0.3034E+02	0.3911E-08		

		0.3116E+02	0.3911E-08
		0.3198E+02	0.3911E-08
		0.3280E+02	0.3910E-08

' ˋLYSIS FOR TIME PERIOD 5

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS, LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.2500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.1415E+04	0.0000E+00
		0.1640E+01	0.5678E-01		
		0.3280E+01	0.1083E-01		
		0.4920E+01	0.1087E-02		
		0.6560E+01	0.5257E-04		
		0.8200E+01	0.9806E-06		
		0.9840E+01	-0.4674E-07		
		0.1148E+02	-0.3908E-07		
		0.1312E+02	-0.3846E-07		
		0.1476E+02	-0.3846E-07		
		0.1640E+02	-0.3846E-07		
		0.1804E+02	-0.3845E-07		
		0.1968E+02	-0.3840E-07		
		0.2132E+02	-0.3605E-07		
		0.2296E+02	0.7342E-08		
		0.2378E+02	0.7354E-08		
		0.2460E+02	0.7365E-08		
		0.2542E+02	0.7375E-08		
		0.2624E+02	0.7384E-08		
		0.2706E+02	0.7392E-08		
		0.2788E+02	0.7399E-08		
		0.2870E+02	0.7405E-08		
		0.2952E+02	0.7410E-08		
		0.3034E+02	0.7413E-08		
		0.3116E+02	0.7416E-08		
		0.3198E+02	0.7418E-08		
		0.3280E+02	0.7418E-08		
0.2500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.1415E+04	0.0000E+00
		0.1640E+01	0.1210E-01		
		0.3280E+01	0.2310E-02		
		0.4920E+01	0.2288E-03		
		0.6560E+01	0.1003E-04		
		0.8200E+01	-0.3720E-07		
		0.9840E+01	-0.6370E-07		
		0.1148E+02	-0.4074E-07		
		0.1312E+02	-0.3984E-07		
		0.1476E+02	-0.3983E-07		
		0.1640E+02	-0.3983E-07		
		0.1804E+02	-0.3982E-07		
		0.1968E+02	-0.3978E-07		
		0.2132E+02	-0.3805E-07		
		0.2296E+02	0.8669E-08		
		0.2378E+02	0.8695E-08		
		0.2460E+02	0.8718E-08		
		0.2542E+02	0.8740E-08		

		0.2624E+02	0.8759E-08		
		0.2706E+02	0.8775E-08		
		0.2788E+02	0.8790E-08		
		0.2870E+02	0.8802E-08		
		0.2952E+02	0.8813E-08		
		0.3034E+02	0.8820E-08		
		0.3116E+02	0.8826E-08		
		0.3198E+02	0.8829E-08		
		0.3280E+02	0.8830E-08		
0.2500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.1415E+04	0.0000E+00
		0.1640E+01	-0.3345E-02		
		0.3280E+01	-0.6387E-03		
		0.4920E+01	-0.6703E-04		
		0.6560E+01	-0.4239E-05		
		0.8200E+01	-0.2891E-06		
		0.9840E+01	-0.4254E-07		
		0.1148E+02	-0.2126E-07		
		0.1312E+02	-0.2050E-07		
		0.1476E+02	-0.2049E-07		
		0.1640E+02	-0.2049E-07		
		0.1804E+02	-0.2048E-07		
		0.1968E+02	-0.2044E-07		
		0.2132E+02	-0.2006E-07		
		0.2296E+02	0.6598E-08		
		0.2378E+02	0.6618E-08		
		0.2460E+02	0.6636E-08		
		0.2542E+02	0.6653E-08		
		0.2624E+02	0.6667E-08		
		0.2706E+02	0.6680E-08		
		0.2788E+02	0.6692E-08		
		0.2870E+02	0.6701E-08		
		0.2952E+02	0.6709E-08		
		0.3034E+02	0.6715E-08		
		0.3116E+02	0.6719E-08		
		0.3198E+02	0.6722E-08		
		0.3280E+02	0.6723E-08		
0.2500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.1415E+04	0.0000E+00
		0.1640E+01	-0.2218E-02		
		0.3280E+01	-0.4256E-03		
		0.4920E+01	-0.4454E-04		
		0.6560E+01	-0.2698E-05		
		0.8200E+01	-0.1559E-06		
		0.9840E+01	-0.1265E-07		
		0.1148E+02	0.5699E-09		
		0.1312E+02	0.1067E-08		
		0.1476E+02	0.1079E-08		
		0.1640E+02	0.1080E-08		
		0.1804E+02	0.1086E-08		
		0.1968E+02	0.1129E-08		
		0.2132E+02	0.5019E-09		
		0.2296E+02	0.3939E-08		
		0.2378E+02	0.3940E-08		
		0.2460E+02	0.3941E-08		
		0.2542E+02	0.3942E-08		
		0.2624E+02	0.3943E-08		
		0.2706E+02	0.3944E-08		
		0.2788E+02	0.3945E-08		
		0.2870E+02	0.3945E-08		

0.2952E+02	0.3946E-08
0.3034E+02	0.3946E-08
0.3116E+02	0.3946E-08
0.3198E+02	0.3947E-08
0.3280E+02	0.3947E-08

ANALYSIS FOR TIME PERIOD 6

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.3000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.1671E+04	0.0000E+00
		0.1640E+01	0.6132E-01		
		0.3280E+01	0.1391E-01		
		0.4920E+01	0.1867E-02		
		0.6560E+01	0.1393E-03		
		0.8200E+01	0.5243E-05		
		0.9840E+01	0.1053E-07		
		0.1148E+02	-0.4296E-07		
		0.1312E+02	-0.3865E-07		
		0.1476E+02	-0.3846E-07		
		0.1640E+02	-0.3845E-07		
		0.1804E+02	-0.3844E-07		
		0.1968E+02	-0.3837E-07		
		0.2132E+02	-0.3616E-07		
		0.2296E+02	0.8211E-08		
		0.2378E+02	0.8227E-08		
		0.2460E+02	0.8241E-08		
		0.2542E+02	0.8255E-08		
		0.2624E+02	0.8266E-08		
		0.2706E+02	0.8277E-08		
		0.2788E+02	0.8286E-08		
		0.2870E+02	0.8293E-08		
		0.2952E+02	0.8299E-08		
		0.3034E+02	0.8304E-08		
		0.3116E+02	0.8308E-08		
		0.3198E+02	0.8310E-08		
		0.3280E+02	0.8310E-08		
0.3000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.1671E+04	0.0000E+00
		0.1640E+01	0.1308E-01		
		0.3280E+01	0.2969E-02		
		0.4920E+01	0.3957E-03		
		0.6560E+01	0.2809E-04		
		0.8200E+01	0.6511E-06		
		0.9840E+01	-0.1027E-06		
		0.1148E+02	-0.4717E-07		
		0.1312E+02	-0.4011E-07		
		0.1476E+02	-0.3983E-07		
		0.1640E+02	-0.3983E-07		
		0.1804E+02	-0.3982E-07		
		0.1968E+02	-0.3975E-07		
		0.2132E+02	-0.3800E-07		
		0.2296E+02	0.8429E-08		
		0.2378E+02	0.8457E-08		

		0.2460E+02	0.8482E-08		
		0.2542E+02	0.8505E-08		
		0.2624E+02	0.8526E-08		
		0.2706E+02	0.8544E-08		
		0.2788E+02	0.8560E-08		
		0.2870E+02	0.8573E-08		
		0.2952E+02	0.8584E-08		
		0.3034E+02	0.8593E-08		
		0.3116E+02	0.8599E-08		
		0.3198E+02	0.8603E-08		
		0.3280E+02	0.8604E-08		
0.3000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.1671E+04	0.0000E+00
		0.1640E+01	-0.3607E-02		
		0.3280E+01	-0.8163E-03		
		0.4920E+01	-0.1127E-03		
		0.6560E+01	-0.9802E-05		
		0.8200E+01	-0.7545E-06		
		0.9840E+01	-0.9594E-07		
		0.1148E+02	-0.2689E-07		
		0.1312E+02	-0.2073E-07		
		0.1476E+02	-0.2049E-07		
		0.1640E+02	-0.2049E-07		
		0.1804E+02	-0.2047E-07		
		0.1968E+02	-0.2040E-07		
		0.2132E+02	-0.1986E-07		
		0.2296E+02	0.5434E-08		
		0.2378E+02	0.5452E-08		
		0.2460E+02	0.5468E-08		
		0.2542E+02	0.5483E-08		
		0.2624E+02	0.5497E-08		
		0.2706E+02	0.5508E-08		
		0.2788E+02	0.5519E-08		
		0.2870E+02	0.5528E-08		
		0.2952E+02	0.5535E-08		
		0.3034E+02	0.5540E-08		
		0.3116E+02	0.5544E-08		
		0.3198E+02	0.5547E-08		
		0.3280E+02	0.5548E-08		
0.3000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.1671E+04	0.0000E+00
		0.1640E+01	-0.2395E-02		
		0.3280E+01	-0.5453E-03		
		0.4920E+01	-0.7528E-04		
		0.6560E+01	-0.6385E-05		
		0.8200E+01	-0.4433E-06		
		0.9840E+01	-0.4344E-07		
		0.1148E+02	-0.3127E-08		
		0.1312E+02	0.9086E-09		
		0.1476E+02	0.1076E-08		
		0.1640E+02	0.1081E-08		
		0.1804E+02	0.1094E-08		
		0.1968E+02	0.1163E-08		
		0.2132E+02	0.6487E-09		
		0.2296E+02	0.3012E-08		
		0.2378E+02	0.3010E-08		
		0.2460E+02	0.3007E-08		
		0.2542E+02	0.3005E-08		
		0.2624E+02	0.3003E-08		
		0.2706E+02	0.3002E-08		

0.2788E+02	0.3000E-08
0.2870E+02	0.2999E-08
0.2952E+02	0.2998E-08
0.3034E+02	0.2997E-08
0.3116E+02	0.2997E-08
0.3198E+02	0.2996E-08
0.3280E+02	0.2996E-08

ANALYSIS FOR TIME PERIOD 7

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.3500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.1924E+04	0.0000E+00
		0.1640E+01	0.6492E-01		
		0.3280E+01	0.1669E-01		
		0.4920E+01	0.2760E-02		
		0.6560E+01	0.2789E-03		
		0.8200E+01	0.1623E-04		
		0.9840E+01	0.3982E-06		
		0.1148E+02	-0.4859E-07		
		0.1312E+02	-0.3979E-07		
		0.1476E+02	-0.3850E-07		
		0.1640E+02	-0.3845E-07		
		0.1804E+02	-0.3843E-07		
		0.1968E+02	-0.3834E-07		
		0.2132E+02	-0.3589E-07		
		0.2296E+02	0.6200E-08		
		0.2378E+02	0.6212E-08		
		0.2460E+02	0.6223E-08		
		0.2542E+02	0.6232E-08		
		0.2624E+02	0.6241E-08		
		0.2706E+02	0.6249E-08		
		0.2788E+02	0.6255E-08		
		0.2870E+02	0.6261E-08		
		0.2952E+02	0.6266E-08		
		0.3034E+02	0.6269E-08		
		0.3116E+02	0.6272E-08		
		0.3198E+02	0.6273E-08		
		0.3280E+02	0.6274E-08		
0.3500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.1924E+04	0.0000E+00
		0.1640E+01	0.1385E-01		
		0.3280E+01	0.3569E-02		
		0.4920E+01	0.5872E-03		
		0.6560E+01	0.5758E-04		
		0.8200E+01	0.2739E-05		
		0.9840E+01	-0.1050E-06		
		0.1148E+02	-0.6510E-07		
		0.1312E+02	-0.4179E-07		
		0.1476E+02	-0.3990E-07		
		0.1640E+02	-0.3983E-07		
		0.1804E+02	-0.3980E-07		
		0.1968E+02	-0.3972E-07		
		0.2132E+02	-0.3785E-07		

		0.2296E+02	0.7247E-08		
		0.2378E+02	0.7268E-08		
		0.2460E+02	0.7288E-08		
		0.2542E+02	0.7305E-08		
		0.2624E+02	0.7321E-08		
		0.2706E+02	0.7335E-08		
		0.2788E+02	0.7347E-08		
		0.2870E+02	0.7357E-08		
		0.2952E+02	0.7365E-08		
		0.3034E+02	0.7372E-08		
		0.3116E+02	0.7376E-08		
		0.3198E+02	0.7379E-08		
		0.3280E+02	0.7380E-08		
0.3500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.1924E+04	0.0000E+00
		0.1640E+01	-0.3813E-02		
		0.3280E+01	-0.9761E-03		
		0.4920E+01	-0.1644E-03		
		0.6560E+01	-0.1833E-04		
		0.8200E+01	-0.1651E-05		
		0.9840E+01	-0.2012E-06		
		0.1148E+02	-0.4350E-07		
		0.1312E+02	-0.2220E-07		
		0.1476E+02	-0.2056E-07		
		0.1640E+02	-0.2049E-07		
		0.1804E+02	-0.2046E-07		
		0.1968E+02	-0.2038E-07		
		0.2132E+02	-0.1996E-07		
		0.2296E+02	0.6281E-08		
		0.2378E+02	0.6297E-08		
		0.2460E+02	0.6311E-08		
		0.2542E+02	0.6324E-08		
		0.2624E+02	0.6336E-08		
		0.2706E+02	0.6346E-08		
		0.2788E+02	0.6355E-08		
		0.2870E+02	0.6363E-08		
		0.2952E+02	0.6369E-08		
		0.3034E+02	0.6374E-08		
		0.3116E+02	0.6377E-08		
		0.3198E+02	0.6380E-08		
		0.3280E+02	0.6380E-08		
0.3500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.1924E+04	0.0000E+00
		0.1640E+01	-0.2534E-02		
		0.3280E+01	-0.6537E-03		
		0.4920E+01	-0.1102E-03		
		0.6560E+01	-0.1210E-04		
		0.8200E+01	-0.1016E-05		
		0.9840E+01	-0.1050E-06		
		0.1148E+02	-0.1332E-07		
		0.1312E+02	-0.9034E-10		
		0.1476E+02	0.1027E-08		
		0.1640E+02	0.1083E-08		
		0.1804E+02	0.1106E-08		
		0.1968E+02	0.1185E-08		
		0.2132E+02	0.4306E-09		
		0.2296E+02	0.4938E-08		
		0.2378E+02	0.4939E-08		
		0.2460E+02	0.4941E-08		
		0.2542E+02	0.4942E-08		

0.2624E+02	0.4944E-08
0.2706E+02	0.4945E-08
0.2788E+02	0.4946E-08
0.2870E+02	0.4947E-08
0.2952E+02	0.4948E-08
0.3034E+02	0.4948E-08
0.3116E+02	0.4949E-08
0.3198E+02	0.4949E-08
0.3280E+02	0.4949E-08

ANALYSIS FOR TIME PERIOD 8

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.4000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.2176E+04	0.0000E+00
		0.1640E+01	0.6802E-01		
		0.3280E+01	0.1926E-01		
		0.4920E+01	0.3726E-02		
		0.6560E+01	0.4721E-03		
		0.8200E+01	0.3754E-04		
		0.9840E+01	0.1644E-05		
		0.1148E+02	-0.3050E-07		
		0.1312E+02	-0.4324E-07		
		0.1476E+02	-0.3879E-07		
		0.1640E+02	-0.3846E-07		
		0.1804E+02	-0.3842E-07		
		0.1968E+02	-0.3834E-07		
		0.2132E+02	-0.3626E-07		
		0.2296E+02	0.7788E-08		
		0.2378E+02	0.7802E-08		
		0.2460E+02	0.7815E-08		
		0.2542E+02	0.7826E-08		
		0.2624E+02	0.7836E-08		
		0.2706E+02	0.7845E-08		
		0.2788E+02	0.7853E-08		
		0.2870E+02	0.7859E-08		
		0.2952E+02	0.7865E-08		
		0.3034E+02	0.7869E-08		
		0.3116E+02	0.7872E-08		
		0.3198E+02	0.7874E-08		
		0.3280E+02	0.7874E-08		
0.4000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.2176E+04	0.0000E+00
		0.1640E+01	0.1452E-01		
		0.3280E+01	0.4122E-02		
		0.4920E+01	0.7952E-03		
		0.6560E+01	0.9874E-04		
		0.8200E+01	0.7030E-05		
		0.9840E+01	0.4419E-07		
		0.1148E+02	-0.9279E-07		
		0.1312E+02	-0.4737E-07		
		0.1476E+02	-0.4032E-07		
		0.1640E+02	-0.3984E-07		
		0.1804E+02	-0.3979E-07		

		0.1968E+02	-0.3971E-07		
		0.2132E+02	-0.3817E-07		
		0.2296E+02	0.8675E-08		
		0.2378E+02	0.8703E-08		
		0.2460E+02	0.8729E-08		
		0.2542E+02	0.8753E-08		
		0.2624E+02	0.8774E-08		
		0.2706E+02	0.8792E-08		
		0.2788E+02	0.8808E-08		
		0.2870E+02	0.8822E-08		
		0.2952E+02	0.8833E-08		
		0.3034E+02	0.8842E-08		
		0.3116E+02	0.8848E-08		
		0.3198E+02	0.8852E-08		
		0.3280E+02	0.8853E-08		
0.4000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.2176E+04	0.0000E+00
		0.1640E+01	-0.3989E-02		
		0.3280E+01	-0.1122E-02		
		0.4920E+01	-0.2198E-03		
		0.6560E+01	-0.2983E-04		
		0.8200E+01	-0.3157E-05		
		0.9840E+01	-0.3876E-06		
		0.1148E+02	-0.7567E-07		
		0.1312E+02	-0.2705E-07		
		0.1476E+02	-0.2093E-07		
		0.1640E+02	-0.2050E-07		
		0.1804E+02	-0.2045E-07		
		0.1968E+02	-0.2037E-07		
		0.2132E+02	-0.1999E-07		
		0.2296E+02	0.5573E-08		
		0.2378E+02	0.5593E-08		
		0.2460E+02	0.5612E-08		
		0.2542E+02	0.5629E-08		
		0.2624E+02	0.5644E-08		
		0.2706E+02	0.5657E-08		
		0.2788E+02	0.5669E-08		
		0.2870E+02	0.5679E-08		
		0.2952E+02	0.5687E-08		
		0.3034E+02	0.5693E-08		
		0.3116E+02	0.5698E-08		
		0.3198E+02	0.5700E-08		
		0.3280E+02	0.5701E-08		
0.4000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.2176E+04	0.0000E+00
		0.1640E+01	-0.2654E-02		
		0.3280E+01	-0.7532E-03		
		0.4920E+01	-0.1479E-03		
		0.6560E+01	-0.1987E-04		
		0.8200E+01	-0.2002E-05		
		0.9840E+01	-0.2173E-06		
		0.1148E+02	-0.3214E-07		
		0.1312E+02	-0.3256E-08		
		0.1476E+02	0.7639E-09		
		0.1640E+02	0.1073E-08		
		0.1804E+02	0.1119E-08		
		0.1968E+02	0.1203E-08		
		0.2132E+02	0.6098E-09		
		0.2296E+02	0.2390E-08		
		0.2378E+02	0.2389E-08		

0.2460E+02	0.2388E-08
0.2542E+02	0.2387E-08
0.2624E+02	0.2386E-08
0.2706E+02	0.2385E-08
0.2788E+02	0.2384E-08
0.2870E+02	0.2384E-08
0.2952E+02	0.2383E-08
0.3034E+02	0.2383E-08
0.3116E+02	0.2383E-08
0.3198E+02	0.2383E-08
0.3280E+02	0.2383E-08

ANALYSIS FOR TIME PERIOD 9

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS, LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.4500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.2428E+04	0.0000E+00
		0.1640E+01	0.7093E-01		
		0.3280E+01	0.2171E-01		
		0.4920E+01	0.4757E-02		
		0.6560E+01	0.7194E-03		
		0.8200E+01	0.7262E-04		
		0.9840E+01	0.4552E-05		
		0.1148E+02	0.8175E-07		
		0.1312E+02	-0.4836E-07		
		0.1476E+02	-0.3981E-07		
		0.1640E+02	-0.3851E-07		
		0.1804E+02	-0.3840E-07		
		0.1968E+02	-0.3833E-07		
		0.2132E+02	-0.3603E-07		
		0.2296E+02	0.5945E-08		
		0.2378E+02	0.5961E-08		
		0.2460E+02	0.5975E-08		
		0.2542E+02	0.5988E-08		
		0.2624E+02	0.6000E-08		
		0.2706E+02	0.6010E-08		
		0.2788E+02	0.6019E-08		
		0.2870E+02	0.6026E-08		
		0.2952E+02	0.6032E-08		
		0.3034E+02	0.6037E-08		
		0.3116E+02	0.6040E-08		
		0.3198E+02	0.6042E-08		
		0.3280E+02	0.6043E-08		
0.4500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.2428E+04	0.0000E+00
		0.1640E+01	0.1515E-01		
		0.3280E+01	0.4652E-02		
		0.4920E+01	0.1018E-02		
		0.6560E+01	0.1517E-03		
		0.8200E+01	0.1429E-04		
		0.9840E+01	0.5248E-06		
		0.1148E+02	-0.1171E-06		
		0.1312E+02	-0.5922E-07		
		0.1476E+02	-0.4181E-07		

		0.1640E+02	-0.3993E-07		
		0.1804E+02	-0.3978E-07		
		0.1968E+02	-0.3970E-07		
		0.2132E+02	-0.3791E-07		
		0.2296E+02	0.5614E-08		
		0.2378E+02	0.5635E-08		
		0.2460E+02	0.5654E-08		
		0.2542E+02	0.5671E-08		
		0.2624E+02	0.5687E-08		
		0.2706E+02	0.5701E-08		
		0.2788E+02	0.5712E-08		
		0.2870E+02	0.5722E-08		
		0.2952E+02	0.5731E-08		
		0.3034E+02	0.5737E-08		
		0.3116E+02	0.5742E-08		
		0.3198E+02	0.5744E-08		
		0.3280E+02	0.5745E-08		
0.4500E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.2428E+04	0.0000E+00
		0.1640E+01	-0.4154E-02		
		0.3280E+01	-0.1261E-02		
		0.4920E+01	-0.2785E-03		
		0.6560E+01	-0.4428E-04		
		0.8200E+01	-0.5452E-05		
		0.9840E+01	-0.6942E-06		
		0.1148E+02	-0.1293E-06		
		0.1312E+02	-0.3771E-07		
		0.1476E+02	-0.2223E-07		
		0.1640E+02	-0.2058E-07		
		0.1804E+02	-0.2044E-07		
		0.1968E+02	-0.2037E-07		
		0.2132E+02	-0.2005E-07		
		0.2296E+02	0.4401E-08		
		0.2378E+02	0.4413E-08		
		0.2460E+02	0.4423E-08		
		0.2542E+02	0.4433E-08		
		0.2624E+02	0.4441E-08		
		0.2706E+02	0.4449E-08		
		0.2788E+02	0.4455E-08		
		0.2870E+02	0.4461E-08		
		0.2952E+02	0.4465E-08		
		0.3034E+02	0.4469E-08		
		0.3116E+02	0.4471E-08		
		0.3198E+02	0.4473E-08		
		0.3280E+02	0.4473E-08		
0.4500E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.2428E+04	0.0000E+00
		0.1640E+01	-0.2767E-02		
		0.3280E+01	-0.8482E-03		
		0.4920E+01	-0.1880E-03		
		0.6560E+01	-0.2971E-04		
		0.8200E+01	-0.3532E-05		
		0.9840E+01	-0.4076E-06		
		0.1148E+02	-0.6340E-07		
		0.1312E+02	-0.9900E-08		
		0.1476E+02	-0.1249E-09		
		0.1640E+02	0.1009E-08		
		0.1804E+02	0.1127E-08		
		0.1968E+02	0.1196E-08		
		0.2132E+02	0.2269E-09		

0.2296E+02	0.4209E-08
0.2378E+02	0.4207E-08
0.2460E+02	0.4205E-08
0.2542E+02	0.4203E-08
0.2624E+02	0.4202E-08
0.2706E+02	0.4200E-08
0.2788E+02	0.4199E-08
0.2870E+02	0.4198E-08
0.2952E+02	0.4198E-08
0.3034E+02	0.4197E-08
0.3116E+02	0.4197E-08
0.3198E+02	0.4196E-08
0.3280E+02	0.4196E-08

ANALYSIS FOR TIME PERIOD 10

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.5000E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.2679E+04	0.0000E+00
		0.1640E+01	0.7363E-01		
		0.3280E+01	0.2406E-01		
		0.4920E+01	0.5832E-02		
		0.6560E+01	0.1017E-02		
		0.8200E+01	0.1241E-03		
		0.9840E+01	0.1010E-04		
		0.1148E+02	0.4208E-06		
		0.1312E+02	-0.4804E-07		
		0.1476E+02	-0.4222E-07		
		0.1640E+02	-0.3876E-07		
		0.1804E+02	-0.3841E-07		
		0.1968E+02	-0.3834E-07		
		0.2132E+02	-0.3640E-07		
		0.2296E+02	0.6291E-08		
		0.2378E+02	0.6300E-08		
		0.2460E+02	0.6308E-08		
		0.2542E+02	0.6315E-08		
		0.2624E+02	0.6321E-08		
		0.2706E+02	0.6326E-08		
		0.2788E+02	0.6331E-08		
		0.2870E+02	0.6335E-08		
		0.2952E+02	0.6338E-08		
		0.3034E+02	0.6341E-08		
		0.3116E+02	0.6343E-08		
		0.3198E+02	0.6344E-08		
		0.3280E+02	0.6344E-08		
0.5000E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.2679E+04	0.0000E+00
		0.1640E+01	0.1573E-01		
		0.3280E+01	0.5160E-02		
		0.4920E+01	0.1250E-02		
		0.6560E+01	0.2158E-03		
		0.8200E+01	0.2511E-04		
		0.9840E+01	0.1558E-05		
		0.1148E+02	-0.1096E-06		

		0.1312E+02	-0.7766E-07		
		0.1476E+02	-0.4554E-07		
		0.1640E+02	-0.4029E-07		
		0.1804E+02	-0.3979E-07		
		0.1968E+02	-0.3971E-07		
		0.2132E+02	-0.3850E-07		
		0.2296E+02	0.8771E-08		
		0.2378E+02	0.8796E-08		
		0.2460E+02	0.8819E-08		
		0.2542E+02	0.8840E-08		
		0.2624E+02	0.8858E-08		
		0.2706E+02	0.8875E-08		
		0.2788E+02	0.8889E-08		
		0.2870E+02	0.8901E-08		
		0.2952E+02	0.8911E-08		
		0.3034E+02	0.8919E-08		
		0.3116E+02	0.8924E-08		
		0.3198E+02	0.8928E-08		
		0.3280E+02	0.8929E-08		
0.5000E+02	0.2762E+04	0.0000E+00	-0.1033E-01	0.2679E+04	0.0000E+00
		0.1640E+01	-0.4307E-02		
		0.3280E+01	-0.1393E-02		
		0.4920E+01	-0.3393E-03		
		0.6560E+01	-0.6143E-04		
		0.8200E+01	-0.8662E-05		
		0.9840E+01	-0.1169E-05		
		0.1148E+02	-0.2124E-06		
		0.1312E+02	-0.5622E-07		
		0.1476E+02	-0.2546E-07		
		0.1640E+02	-0.2091E-07		
		0.1804E+02	-0.2045E-07		
		0.1968E+02	-0.2037E-07		
		0.2132E+02	-0.2027E-07		
		0.2296E+02	0.7011E-08		
		0.2378E+02	0.7034E-08		
		0.2460E+02	0.7054E-08		
		0.2542E+02	0.7073E-08		
		0.2624E+02	0.7090E-08		
		0.2706E+02	0.7105E-08		
		0.2788E+02	0.7118E-08		
		0.2870E+02	0.7129E-08		
		0.2952E+02	0.7138E-08		
		0.3034E+02	0.7145E-08		
		0.3116E+02	0.7150E-08		
		0.3198E+02	0.7153E-08		
		0.3280E+02	0.7154E-08		
0.5000E+02	0.2779E+04	0.0000E+00	-0.6770E-02	0.2679E+04	0.0000E+00
		0.1640E+01	-0.2872E-02		
		0.3280E+01	-0.9389E-03		
		0.4920E+01	-0.2298E-03		
		0.6560E+01	-0.4145E-04		
		0.8200E+01	-0.5698E-05		
		0.9840E+01	-0.7110E-06		
		0.1148E+02	-0.1124E-06		
		0.1312E+02	-0.2097E-07		
		0.1476E+02	-0.2256E-08		
		0.1640E+02	0.7700E-09		
		0.1804E+02	0.1115E-08		

0.1968E+02	0.1185E-08
0.2132E+02	0.5724E-09
0.2296E+02	0.3497E-08
0.2378E+02	0.3501E-08
0.2460E+02	0.3505E-08
0.2542E+02	0.3508E-08
0.2624E+02	0.3511E-08
0.2706E+02	0.3514E-08
0.2788E+02	0.3516E-08
0.2870E+02	0.3518E-08
0.2952E+02	0.3520E-08
0.3034E+02	0.3521E-08
0.3116E+02	0.3522E-08
0.3198E+02	0.3523E-08
0.3280E+02	0.3523E-08

ANALYSIS FOR TIME PERIOD 11

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

TIME	LATERAL DISTANCE	DEPTH	CONCENTRATION	TOTAL MASS INTO SOIL	TOTAL MASS INTO BASE
0.5500E+02	0.2730E+04	0.0000E+00	0.1730E+00	0.2932E+04	0.0000E+00
		0.1640E+01	0.7619E-01		
		0.3280E+01	0.2633E-01		
		0.4920E+01	0.6946E-02		
		0.6560E+01	0.1363E-02		
		0.8200E+01	0.1942E-03		
		0.9840E+01	0.1942E-04		
		0.1148E+02	0.1194E-05		
		0.1312E+02	-0.2364E-07		
		0.1476E+02	-0.4611E-07		
		0.1640E+02	-0.3946E-07		
		0.1804E+02	-0.3846E-07		
		0.1968E+02	-0.3835E-07		
		0.2132E+02	-0.3628E-07		
		0.2296E+02	0.7869E-08		
		0.2378E+02	0.7888E-08		
		0.2460E+02	0.7906E-08		
		0.2542E+02	0.7922E-08		
		0.2624E+02	0.7936E-08		
		0.2706E+02	0.7949E-08		
		0.2788E+02	0.7960E-08		
		0.2870E+02	0.7969E-08		
		0.2952E+02	0.7976E-08		
		0.3034E+02	0.7982E-08		
		0.3116E+02	0.7986E-08		
		0.3198E+02	0.7989E-08		
		0.3280E+02	0.7990E-08		
0.5500E+02	0.2746E+04	0.0000E+00	0.3667E-01	0.2932E+04	0.0000E+00
		0.1640E+01	0.1629E-01		
		0.3280E+01	0.5652E-02		
		0.4920E+01	0.1492E-02		
		0.6560E+01	0.2905E-03		
		0.8200E+01	0.4000E-04		

APPENDIX B

DETAILED GROUND-WATER REVIEW

The ground-water review comments provided by PEI are presented in italics and the response is presented in bold text.

As noted in the main report, this appendix provides further detail regarding the deficiencies noted within the Ground-Water Impact Assessment and the proposed ground-water modeling program. The appendix is divided by major categories which mirror the subcategories within the main text.

Report Review. The following sections detail each deficiency noted in the Ground-Water Protection Evaluation Report or referenced Appendix from that report. The deficiencies are categorized by the major areas of deficiency discussed previously in this report. Each item includes a reference to where in the report the deficiency was observed, the document or item from the report and a description of why the document or item is deficient. The description also provides a reference to the applicable 35 Ill. Adm. Code regulation or IEPA guidance document.

Hydrogeologic Input Data. The following 14 items were noted as deficient pertaining to the hydrogeologic data used in the ground-water impact assessment. Failure to use accurate site specific data or conservative estimates of hydrogeologic data may result in overestimating the proposed design's ability to protect the ground water.

> *"The maps cover a time period ranging from 1988 to 1994." (Section 2.6.3, Ground-Water Flow Direction, Page, V-15).*

The referenced maps do not provide four consecutive potentiometric maps to depict seasonal variations in ground water. It should be noted the maps included in the application are useful to illustrate the impact of the adjacent industrial pumpage on ground-water flow at the site. [35 IAC Sections 811.315(e)(1)(H) and 812.414(g)].

The SIGMOD is in compliance with applicable regulations. Four consecutive quarters of potentiometric maps are included in Attachment 7 (Part V, Section 2.6.3, Figures V-2-35 to V-2-38) to the February, 1996 Addendum to the SIGMOD.

"... from single well aquifer tests (slug tests) performed on the monitoring wells." and "average value of 8.2×10^{-4} *cm/s for the Dolton Sand and Fill Unit, and an average value of* 9.5×10^{-5} *cm/s for the uppermost aquifer." (Section 2.6.4, Hydraulic Conductivity, Page V-17).*

The tests referenced do not provide the test results, test methods, analytical methods used to estimate hydraulic conductivity or test data. [35 IAC Sections 811.315(d)(1)(D), 812.314(g), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. The test results, test methods, and analytical methods used to estimate hydraulic conductivity are discussed in Attachment 7 (Part V, Section 2) to the February, 1996 Addendum to the SIGMOD.

"The flow direction and hydraulic gradients in the shallow unconfined ground-water flow system at the 122nd Street Landfill are primarily determined by the neighboring surface water levels and infiltration." (Section 4.2.1, Hydrogeologic Conceptualization. Page V-24).

The surface water bodies influencing the flow are not identified and no site specific data is provided in the application. In addition, no discussion regarding the influence of the landfill on shallow ground-water flow is provided. Since the landfill does not have a leachate collection system and the hydrogeologic report indicates nearby surface water bodies impact ground-water flow, the landfill would be expected to have a significant impact on ground-water flow in the Dolton Sand. As a result, leachate levels from the landfill should be collected and incorporated in the report. Predicted leachate levels from analyses of the proposed landfill cover and leachate collection system design should be used in the ground-water impact assessment and incorporated in the report. [35 IAC Section 811.317(a), 811.317(c)(7) and 812.316(b)].

The report should also address what will be done with any ground water which may be pumped from the Dolton Sand during excavation. Since the ground water appears to be significantly impacted by the site or neighboring uses, Land and Lakes should indicate if water will be treated prior to release into a surface water, stored, or treated as leachate.

The SIGMOD is in compliance with applicable regulations. The surface water bodies influencing flow and site specific information are provided in Attachment 7 (Part V, Sections 2, 4, and 5) to the February, 1996 Addendum to the SIGMOD. All remaining excavations are in areas where there is pre-existing waste. All water that contacts pre-existing waste is treated as leachate.

"Results of the laboratory and field permeability tests are presented in Table V-1." (4.3.2 Hydraulic Conductivity, Page V-40).

The input parameters used were derived from data not included in the report. Specifically the slug test data and some of the laboratory test data was omitted. The site specific laboratory data used was obtained from liner certification. As result, no test data was obtained from the hydrogeologic units not requiring certification under the Section 807 permit. The data used also does not account for the granular deposit present in the geologic unit outside the certified 10 foot in-situ liner thickness. [35 IAC Section 811.315(d)(1)(D), 811.317(c)(7), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. The input parameters are listed in Table V-5-4 and the slug and laboratory conductivity test data are listed in Table V-24 of Attachment 7 (Part V, Section 5) to the February, 1996 Addendum to the SIGMOD.

"The vertical permeability of the bedrock confining unit below the principle

aquifer is assumed to be zero." (4.3.2 Hydraulic Conductivity, Page V-40).

The hydrogeologic report indicated the majority of the ground-water flow occurred within the upper 10 to 40 feet of the aquifer due to karst and weathering of the bedrock. As a result it is unlikely the entire Silurian dolomite aquifer should be modeled as a zero flow confining unit. [35 IAC Section 811.315(d)(1)(D), 811.317(c)(7), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. As per the IEPA form LPC-PA2, mixing in the Silurian dolomite aquifer is conservatively assumed to occur only in upper 10 ft (referred as "mixing depth"). As discussed in Attachment 7 (Part V, Section 5.4) to the February, 1996 Addendum to the SIGMOD, to simulate this conservative scenario, the lower boundary was assumed to be impermeable. Refer to Attachment 7 (Part V Section 5.6) to the February, 1996 Addendum to the SIGMOD for further details.

"... the thickness of the Silurian dolomite uppermost aquifer is selected as 500 ft." (4.3.3 Model Layer Thickness, Page V-41).

The hydrogeologic report indicated the majority of the ground-water flow occurred within the upper 10 to 40 feet of the aquifer due to karst and weathering of the bedrock. As a result, the uppermost aquifer should be modeled as 10 to 40 feet thickness as presented in the hydrogeologic report. [35 IAC Section 811.315(d)(1)(D), 811.317(c)(7), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. As per the IEPA form LPC-PA2, mixing in the Silurian dolomite aquifer is conservatively assumed to occur only in upper 10 ft (referred as "mixing depth"). Refer to Attachment 7 (Part V, Section 5.6) to the February, 1996 Addendum to the SIGMOD for further details.

"In the clay confining unit, longitudinal and transverse dispersivity values of 10 ft. and 2 ft., respectively, were selected as input for analytical modeling." (4.3.5 Dispersivity, Page V-42).

The method used to estimate the proposed dispersivity values was not presented. Generally accepted methods to estimate these input values based upon scale are available or alternative methods based upon site specific data could be used. [35 IAC Section 811.317(c)(7) and (8); and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. The hydraulic conductivity of the confining unweathered glacial till (lower Lemont till) is less than 1.4 x 10^{-8} cm/s. Under the low hydraulic gradients existing at the site, ground-water velocities through the confining glacial till are also low [Attachment 7 (Part V, Table V-5-2) to the February, 1996 Addendum to the SIGMOD]. Under these conditions, constituent transport primarily occurs due to molecular diffusion (Rowe 1987). Hence, as explained in Section 5.6 of Attachment 7 (Part V), February, 1996 Addendum to the SIGMOD, a typical conservative diffusion coefficient of 1.9 x 10^{-6} cm^2/s was used as

the hydrodynamic dispersion coefficient for the clay confining unit.

"IEPA permits for the Landfill required at least 15 to 25 feet of clay with a maximum permeability of 1 x 10^{-7} cm/s be verified prior to placement of waste." (4.3.6 Seepage from Landfill Units, Page V-43).

This statement is false. The IEPA permit required 10 feet of compacted clay to meet the above referenced specifications. Other granular deposits were reported in the lower clay unit in liner certification test borings. In addition, waste was placed into cell areas prior to liner certification by the operator. [35 IAC Section 811.317(a)(1)(B) and 812.316(b)].

The SIGMOD is in compliance with applicable regulation. The field boring data indicate that the thickness of clay below the landfill varied from 18 ft to 28 ft [Attachment 7(Part V, Figures V-2-13 to V-2-17 and Table V-4-3) to the February, 1996 Addendum to the SIGMOD.]

"With a porosity of 0.3 which is a typical value for clayey deposits, the pore velocity through the clay liner can be calculated as 2.1 x 10^{-4} ft/d." (4.3.6 Seepage from Landfill Units, Page V-44).

The porosity used in the pore velocity (or seepage velocity) calculation is based upon the water content. The water content or total porosity should not be used to calculate the seepage velocity. Effective porosity is used to calculate seepage velocity. In a clay material, the total porosity may be 30%, but the effective *porosity may be as low as 3 to 5%. This would result in a six to ten time increase in the seepage velocity through the liner. [35 IAC Section 811.317(c)(7) and (8); and 812.316(b)].*

The SIGMOD is in compliance with applicable regulations. This comment is inaccurate for undisturbed, unweathered clays which do not have a significant secondary porosity. Clays which do not have a significant secondary porosity have an effective porosity which is equal to the total porosity. For further details, refer to Attachment 7 (Part V, Section 5) to the February, 1996 Addendum to the SIGMOD.

"The representative hydraulic gradient in the shallow aquifer is approximately 0.0028. In this uppermost hydrogeologic unit, the landfill cells are surrounded by a recompacted clay layer with a thickness of 20 ft." (Section 4.3.6, Page V-44).

The application does not specify how the gradients used in the calculation were obtained. An estimate of the gradient in the Dolton Sand across the landfill in the latest potentiometric map was .005. The IEPA permitted cell separation layer is required to be surrounded by a 10 ft. compacted clay liner in the Dolton Sand. The construction documentation of the liner is also minimal. The hydrogeologic report also reported the sideliner had no apparent impact on the ground-water flow in the Dolton Sand and Fill. [35 IAC Section 811.317(c)(7), 812.314(h), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. The hydraulic

gradient across the compacted clay layer adjacent to the shallow Dolton Sand and Fill Unit is equal to the difference between elevation of leachate inside the landfill cells and the elevation of the water table in the Dolton Sand and Fill Unit, divided by the thickness of the compacted clay layer (10 ft) [refer to Attachment 7 (Part V, Figures V-5-2 and V-2-13 to V-2-17) to the February, 1996 Addendum to the SIGMOD].

"The hydraulic conductivity of the recompacted clay liner is assumed to be 4.5 x 10^{-7} *and the porosity is assumed to be 0.3. Based on these values, the pore velocity through the recompacted clay liner is estimated to be approximately 4.2 x* 10^{-6} *ft/d." (Section 4.3.6, Page V-44).*

The porosity used to calculate the seepage velocity is the same as the moisture content from the liner certification geotechnical tests. An effective porosity as low as 3 to 5% could be expected in a clay till. Site specific data should be used to calculate the pore or seepage velocity. This could result in a six to ten times increase in the estimate velocity. [35 IAC Section 811.317(c)(7), 812.314(h), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. This comment is not accurate for undisturbed, unweathered clays which do not have a significant secondary porosity. Clays which do not have a significant secondary porosity have an effective porosity which is equal to the total porosity. See Attachment 7 (Part V, Section 5) to the February, 1996 Addendum to the SIGMOD for further details.

"A conservative estimate of effective porosity assumed for the Silurian dolomite is 0.03, which is based on an estimate reported by Prickett and others." (Section 4.3.6, Page V-44).

The porosity estimated for the dolomite of 3% may be typical of the porosity of an unweathered dolomite. However, the upper 10 to 40 feet of the bedrock was reported in the hydrogeologic report to be weathered or karst. A significantly higher porosity is likely for a weathered or karst dolomite. Porosity estimates of the material should have been obtained from samples collected from the site. As higher flow velocity in the aquifer may result in an unrealistic dilution of contaminants entering the aquifer from the landfill. [35 IAC Section 811.317(c)(7) and (8); 812.314(h), and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. Literature supports that the typical effective porosity of dolomite is 3 to 5 percent (Croff et al. 1985). The simulation of constituent migration through the unweathered glacial till and the Silurian dolomite aquifer indicated that the constituent front does not reach the Silurian dolomite aquifer. Consequently, the effect of porosity on constituent transport through the Silurian dolomite aquifer is insignificant. This argument is supported by the sensitivity analysis presented in Attachment 7 (Part V, Section 5.11) to the February, 1996 Addendum to the SIGMOD. The sensitivity analysis indicates that the porosity of the aquifer does not have a significant effect on the migration of constituents. In addition, a conservative mixing depth

of 10 ft was used. Consequently, dilution of leachate constituents as predicted by the modeling will be realistic as described in detail in Attachment 7 (Part V, Sections 5) to the February, 1996 Addendum to the SIGMOD, and Roadcap et al (1993).

Entire Section. (Section 4.4.3, Results for Migration of Constituents through the Clay Liner in the Shallow Aquifer, Page V-58).

The discussion of the results of the ground-water impact assessment for the migrations of contaminants through the clay liner in the shallow aquifer does not evaluate the impact diffusion has on contaminant migration. In addition to previous comments regarding the calculation of gradients, porosity, liner thickness and seepage (pore) velocity. [35 IAC 811.317(a)(1), 811.317(c)(7) and (8), 812.316(h)].

The SIGMOD is in compliance with applicable regulations. A discussion of ground-water impact, diffusion, and other pertinent factors is presented in Attachment 7 (Part V, Sections 5.6.1.4, 5.6.2.4, and 5.10) to the February, 1996 Addendum to the SIGMOD.

"Retardation factors were calculated assuming organic fraction of .005, a porosity of .3 and a bulk density of 1.82 g/cm^3...". (Section 4.4.4, Evaluation of Predicted Constituent Concentrations at the Compliance Boundary, Page V-60).

These are assumptions which should have been based upon data obtained from the site studies. [35 IAC Section 811.317(c)(7)].

The SIGMOD is in compliance with applicable regulations. Retardation of leachate constituents was conservatively neglected in the modeling of the migration of leachate constituents. A detailed discussion on modeling is found in Attachment 7 (Part V, Section 5) to the February, 1996 Addendum to the SIGMOD.

Initial Ground-Water Quality Data. The following deficiency was noted in determining the initial ground-water quality at the landfill. Failure to adequately characterize the downgradient ground-water quality in all potential contaminant migration pathways may result in the contamination of ground water above background recommendations beyond the zone of attenuation.

"Comprehensive background sampling was performed on selected monitoring wells in November 1993 and February 1994 to evaluate background water quality...". (Section 3.1, Overview, Page V-19).

Sampling for initial water quality was conducted semi-annually, not quarterly as is specified in the regulations. All the samples used to estimate initial water quality were collected from upgradient wells. Many of these wells were reported in the hydrogeologic report to have been impacted by offsite contaminant sources. The Dolton Sand and Fill Unit was reportedly significantly impacted by these offsite sources. As a result, the statistical database, the MAPCs and the AGQSs may have *been biased with data from samples collected in proximity to other contaminant sources. The data may not represent water quality on the downgradient side of the landfill. The water quality downgradient of the landfill may have lower concentration of background contaminants since it is located farther from the other offsite sources of contamination [35 IAC Sections 811.320(d) and 812.317(l)].*

The SIGMOD is in compliance with applicable regulations. Ground-water sampling was conducted quarterly. Sample results are found in Attachment 7 (Part V, Section 6, Appendix V-6-A) to the February, 1996 Addendum to the SIGMOD. The background wells (GA1S, GA4S, GA5S, and RA3S) used to estimate initial water quality for the Dolton Sand and Fill Unit were selected based on regional and site ground-water flow directions. To meet the goal of a ground-water monitoring program, upgradient water quality must be established for comparison to downgradient water quality.

<u>Physical and Chemical Characteristics of Leachate</u>. The following deficiencies were noted in the ground-water impact assessments characterization of leachate at the landfill. Many of the deficiencies resulted in the modeling of hydraulic properties and a chemical composition of the leachate which underestimated the impact of the facility on ground water.

"... the entire landfill volume has been assumed to be saturated, extending from an elevation of 535 ft. up to the elevation of the water table." (Section 4.3.6, Seepage from Landfill Units, Page V-43).

This estimate does not consider the possibility of a leachate mound in the landfill and should be based upon site specific data collected during the hydrogeologic investigation [35 IAC Section 811.317(a)(1)(A), 811.317(a)(1)(B), 811.317(c)(7) and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. An analysis of the leachate levels in the landfill is presented in Attachment 7 (Part V, Section 4.2.1) to the February, 1996 Addendum to the SIGMOD. In the model, it was conservatively assumed that the waste is saturated up to an elevation of 594 ft NGVD (refer to Section 4.2.1). Furthermore, considering the low recharge rates from the intermediate and final covers shown in Attachment 7 (Appendix V-4-B) to the February, 1996 Addendum to the SIGMOD, mounding of leachate inside the landfill cells can be assumed to be negligible.

Same as previous. "... the vertical gradient within the landfill is 1.25." (Section 4.3.6, Seepage from Landfill Units, Page V-43).

The vertical gradient should be calculated from site specific data or from data obtained from the landfill design. [35 IAC Section 811.317(a)(1)(A), 811.317(a)(1)(B), 811.317(c)(7) and 812.316(b)].

Vertical hydraulic gradients in the unweathered glacial till unit (lower Lemont till) were calculated using the leachate elevations inside the landfill. Specifically, vertical hydraulic gradients in the unweathered

glacial till were calculated by dividing the difference in head between the leachate in the landfill and the ground water in the Silurian dolomite aquifer by the thickness of the unweathered glacial till unit. Attachment 7 (Part V, Section 5.6) to the February, 1996 Addendum to the SIGMOD discusses calculation of hydraulic gradients in detail.

"Results for chemical constituents detected in leachate samples collected in February were combined with the results for leachate samples collected previously to this sampling event to determine average leachate concentrations for the 122nd Street Landfill." (Section 4.3.7, Leachate Constituents and Concentrations, Page V-45).

First the leachate samples collected previously were samples collected from leachate ponds or the source was not identified. These samples should not be used to characterize the impact of leachate on ground water because the chemical composition may have been altered by exposure to the surface conditions (dilution, volatilization etc.). An insufficient number of leachate samples were collected to account for variations in quality across the site, the IEPA default leachate concentrations should be used unless sufficient data is collected using accepted procedures. [35 IAC Section 811.317(a)(2), and 811.317(c)(7) and (8); 812.316(b)].

The SIGMOD is in compliance with applicable regulations. Leachate constituents do not reach the Silurian dolomite aquifer. This is discussed in Attachment 7 (Part V, Section 5.10) to the February, 1996 Addendum to

the SIGMOD. Therefore, leachate analysis is not germane with respect to ground-water modeling.

<u>*Ground-Water Modeling Procedures*</u>. *The following deficiencies were noted regarding the ground-water modeling performed as part of the ground-water impact assessment. It appears that many of the methods used to model the site hydrogeology and design are not consistent with the methods specified or provide the documentation required to meet the regulations or IEPA guidance.*

"In the numerical modeling phase of the study, the existing multilayer three-dimensional ground-water flow model 'Steady Layered Aquifer Model 3-D (SLAM3D) was calibrated to the field data to evaluate the following: (I) to determine the predominant ground-water flow pathways at the 122nd Street Landfill; (ii) to develop the velocity fields to be used in the partial tracking analysis phase of the study; and (iii) to evaluate the effect of the existing soil-bentonite slurry cutoff wall on the ground-water migration pathways within and around the site." (Section 4.2, Ground-Water Flow and Constituent Transport Models, Page V-23).

The model selected does not appear to have been approved by the IEPA. The application does not provide documentation that the model(s) used meet the regulatory and IEPA requirements. [35 IAC Sections 811.317(c)(1), (2) and (3), 812.316(a), (f) and (g)].

The SIGMOD is in compliance with applicable regulations. The constituent migration models MIGRATE and POLLUTE developed by Rowe et al.

(1994, 1995) were used for evaluating constituent migration from the landfill. These computer models are approved by the IEPA. As explained in Attachment 7 (Part V, Section 5.3) to the February, 1996 Addendum to the SIGMOD, the models POLLUTE and MIGRATE meet the IEPA requirements [35 IAC Sections 811.317© (1), (2) and (3), 812.316 (a), (f) and (g)].

"... the overall system at the site is typical multiaquifer system and the numerical models selected to evaluate the ground-water flow pathways in this system need to address the three-dimensional nature of this configuration." (Section 4.2.1, Hydrogeologic Conceptualization, Page V-24).

The selected models do not appear to be the best models to represent conditions at the site. Alternate models may provide better documentation. [35 IAC Section 811.317(c)(1), (2), and (3); 812.316(a) and (f)].

The SIGMOD is in compliance with applicable regulations. The one-dimensional constituent transport model, POLLUTE, was used to simulate migration of leachate constituents through the compacted clay side liner into the Dolton Sand and Fill Unit. The two dimensional constituent transport model, MIGRATE, was used to simulate migration of leachate constituents through the unweathered glacial till and the Silurian dolomite aquifer. These models were selected because they have been approved by the IEPA and are suitable to simulate conditions at the site.

"Specific details concerning the formulation of the code SLAM3D are described in reports by Aral [1990] and Tang and Aral [1992], which are referenced at the end of this report." (Section 4.2.2.1, Overview, Page V-25).

The Ground-Water Impact Assessment must provide documentation that the model used meets specified criteria. [35 IAC Section 811.316(c)(1), (2), and (3); 812.316(a) and (f)].

The SIGMOD is in compliance with applicable regulations. The constituent transport models POLLUTE and MIGRATE used for the ground-water impact assessment meet the regulatory criteria [35 IAC Section 811.316(C), (1), (2), and (3); 812.316 (a) and (f)].

"... infiltration rate into the unconfined aquifer layer." (Section 4.2.2.2, Governing Equations for Ground-Water Flow Analysis, Page V-26).

This information was not used in the model. Infiltration rates should be estimated from an analysis of the proposed landfill cover and leachate collection system (i.e. HELP). [35 IAC Section 811.317(a)(1) and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. Infiltration rates for the intermediate and final covers were estimated using the HELP model. A leachate flow model was developed to analyze infiltration through intermediate and final covers, leachate recovery

from leachate French drain and leachate manholes, and seepage of leachate through intermediate berms, etc. The details of the leachate flow model are presented in Attachment 7 (Part V, Section 4) to the February, 1996 Addendum to the SIGMOD.

"... the hydrogeologic conditions within the site will not be influenced by the boundary conditions." (Section 4.2.2.4, Boundary Conditions, Page V-28).

The hydrogeologic report indicated the Dolton Sand Unit was influenced by surface water. Using steady state boundary conditions in the model may be an over generalization if a finite element method is to be used. [35 IAC Section 811.317(c)(1), (2) and (3); and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. The boundary conditions for the constituent transport model are discussed in Attachment 7 (Part V, Section 5.4) to the February, 1996 Addendum to the SIGMOD. For the one-dimensional modeling of constituent migration through the Dolton Sand and Fill Unit, a constant concentration upper boundary and an infinite thickness lower boundary were used. For the two-dimensional modeling of constituent migration through the unweathered glacial till and the Silurian dolomite aquifer, a constant concentration upper boundary and an impermeable lower boundary were used. These boundary conditions are appropriate and conservative.

"The analytical approach described in this section and used in the following sections are based on computational procedures and used ... are based on computational procedures and computer codes described in USEPA and USGS manuals which are public domain literature." (4.2.4 Analytical Solute Transport Models, Page V-32).

The applicant does not discuss the applicability or discuss which models are used to obtain the results used to demonstrate the proposed design passes the ground-water impact assessment. [35 IAC Section 811.317(c)(3) and 812.316(a) and (f)].

The SIGMOD is in compliance with applicable regulations. The constituent transport models POLLUTE and MIGRATE developed by Rowe el al. (1995) were used for the ground-water impact assessment. These models are described in detail in Attachment 7 (Part V, Section 5.3) to the February, 1996 Addendum to the SIGMOD.

"The critical condition evaluated in this scenario is the magnitude of this concentration at the property boundaries after 100-year time period." (Section 4.4.1.1, Results for Vertical Migration of Constituents, Page V-50).

First the time frame is 100 years after the projected closure data of the landfill. The model should be ran for 100 years plus the projected life of the landfill. [35 IAC Section 811.317(b)]. Also note the application fails to illustrate where the edge of the Zone of Attenuation (ZOA) is located. [35 IAC Section 812.317(a)].

The SIGMOD is in compliance with applicable regulations. The models POLLUTE and MIGRATE were used to simulate constituent migration for 105 years. The simulation results for the period of 105 years are presented in Section 5.10 of the Attachment 7 (Part V) to the February, 1996 Addendum to the SIGMOD.

Entire Section. (Section 4.4.2, Sensitivity Analysis, Page V-55).

The sensitivity analyses is incomplete and does not address the impact of significant changes in the input parameters on the output results used to demonstrate the design passes the ground-water impact assessment. [35 IAC Section 811.317(c)(5) and 812.316(c)].

The SIGMOD is in compliance with applicable regulations. Sensitivity analyses are presented in Attachment 7 (Part V, Section 5.11) to the February, 1996 Addendum to the SIGMOD. These sensitivity analyses are complete and meet the requirements of 35 IAC 811.317(c)(5) and 812.316(c).

1-D contaminant transport in the uppermost aquifer. (Figure V-48).

Model was only run for 10 years instead of 100 years. [35 IAC Section 811.317(b) and 812.316(d)].

The SIGMOD is in compliance with applicable regulations. The models POLLUTE and MIGRATE were run to simulate constituent migration for

105 years. The results are presented in Attachment 7 (Part V, Section 5.10) to the February, 1996 Addendum to the SIGMOD.

"Consistent with the original design and the existing permit requirements, the existing landfill does not include a leachate drainage and collection system." (5.1, Leachate Drainage and Collection System, Page VI-34).

The two proposed conditions for the leachate collection system:

1) Connecting the proposed Cell VI to existing Cell V by removal of the north wall of Cell V down to the base elevation of approximately 535 ft. MSL; and

2) Not lining the west wall of the excavation for the proposed Cell VI (immediately adjacent to the existing landfill) were not the conditions modeled for the site Ground-Water Impact Assessment. In addition, leachate collection is required and passive leachate drainage through refuse (between Cells VI and V) and through the low permeability in-situ liner separating Cell 1 and VI (see Engineering Cross Sections A-A[1], Figure VI-2) may not be effective. Land and Lakes provided no documentation that the proposed system would be effective. [35 IAC Sections 811.317(a)(1) and 812.316(b)].

The SIGMOD is in compliance with applicable regulations. A discussion of the existing leachate collection system is found in Attachment 7 (Part V, Sections 4 and 5) to the February, 1996 Addendum to the SIGMOD. This discussion demonstrates that an effective leachate collection system is in place.

Calibrated ground-water flow in uppermost aquifer. (Figures V-63, 66, 70, 73).

The figures illustrate a scenario which contradicts the last potentiometric map in Figure V-14. The present ground-water flow direction is toward the southeast.

The SIGMOD is in compliance with applicable regulations. A discussion of ground-water flow direction and potentiometric maps are presented in Attachment 7 (Part V, Section 2) to the February, 1996 Addendum to the SIGMOD.

<u>Calculation of Maximum Allowable Predicted Concentrations (MAPC) and Acceptable Ground-Water Quality Standards (AGQS)</u>. *The following deficiencies were noted in calculating the MAPCs and AGQSs, and in demonstrating the ground-water impact assessment passed.*

- *Section 4.4.4, "Evaluation of Predicted Constituent Concentrations at the Compliance Boundary", V-60, does not address that observed ammonia/TOC concentrations in uppermost aquifer already exceed MAPC AGQS from model.*

The SIGMOD is in compliance with applicable regulations. TOC concentrations do not exceed the calculated MAPC/AGQS. During the November 1993 sampling event, ammonia in well G13D exceeded the MAPC; however, this was an isolated event and there are no further

indications of exceedances.

- *Section 5.3.2, Background Monitoring, Page V-72, does not include MAPCs calculated for each well. The application states that wells will be located at the compliance boundary and the MAPCs will be equal to the AGQS or the background level. This conflicts with 35 IAC 811.318(b).*

The SIGMOD is in compliance with applicable regulations. A complete discussion of the ground-water monitoring system is presented in Attachment 7, (Part V, Section 6.3.2.3) to the February, 1996 Addendum to the SIGMOD. The wells are located near the compliance boundary because of the narrow (50 ft (15 m) zone of attenuation available at the site. The MAPCs have been conservatively set equal to the AGQSs, rather than using the higher MAPCs normally determined by ground-water modeling utilizing a larger zone of attenuation. The approach presented in Attachment 7 (Part V, Section 6.3.2.3) provides a conservative factory of safety given the site conditions. The locations of the monitoring wells (as described in Attachment 7 (Part V, Section 6.2.1) meet the requirements of 35 IAC 811.318(b) because the wells are: (I) located downgradient with respect to ground-water flow and are capable of detecting any discharges from the landfill; (ii) located in stratigraphic horizons that could serve as contaminant migration pathways; (iii) located within the zone of attenuation (not halfway between edge of potential discharge and edge of zone of attenuation due to space limitations); and (iv) at least one well is at the edge of the zone of attenuation and downgradient with respect to ground-water

flow.

- *Table V-3 and V-4 Surrogate modeling comparison for shallow sand and fill unit/uppermost aquifer. In estimating the ratio of leachate concentration to background water quality concentration, the PQL was used as the background water quality concentration even if the actual background water quality concentration was below the PQL.*

The SIGMOD is in compliance with applicable regulations. A complete discussion of the surrogate modeling is discussed in Attachment 7 (Part V, Section 5.9 and Tables V-5-6 and V-5-7) to the February, 1996 Addendum to the SIGMOD. The concentration ratios used for surrogate modeling comparison were calculated using the background water quality concentration (when constituents were detected in ground water) or the PQL (when the constituents were not detected in ground water).

- *Table V-2, Leachate Sample Results. The following data was either omitted or reported incorrectly on the Table used to calculate the MAPCs and AGQSs (all units ug/l):*
  - *2,4-D non-detect values (<0,1, <0,1) were omitted for NEMH#6 and SWMH#7.*
  - *Aldicarb non-detect values (<0.5, <0.5) were omitted for NEMH#6 and SWMH#7.*
  - *Antimony non-detect values (<100, <100) were omitted for NEMH#6*

and SWMH#7.

- *Boron reported as 3286 on Jan. 90 for SWMH, no chemical analyses result was located in Appendix.*
- *Carbofuran non-detect values (<0.9, <0.9) were omitted for NEMH#6 and SWMH#7.*
- *Cadmium value reported for SW pond on Jan. 89 was apparently for composite sample collected Nov. 89.*
- *Nickel detect values of 374, 419, 550 for May, 85 from south, middle and north sampling points were omitted from table.*
- *p-dichlorobenzene concentration for SWMH#7 did not report or use 28 ug/l concentration in chemical analyses report. Two results (3 and 28) using different analytical methods were reported in the sample chemical analyses.*
- *Xylene concentration used in table for NEMH#6 used 200 when chemical analyses report indicated concentration was too high (>200) to be quantified in the report.*

The SIGMOD is in compliance with applicable regulations. Leachate constituents do not reach the Silurian dolomite aquifer. This is discussed in Attachment 7 (Part V, Section 5.10) to the February, 1996 Addendum to the SIGMOD. Therefore, leachate analysis is not germane with respect to ground-water modeling.

<u>Ground-Water Monitoring Well Locations and Construction</u>. *The following deficiencies were noted regarding the ground-water monitoring network and the proposed monitoring*

well construction and test boring procedures.

"Space limitations at the landfill are such that monitoring wells are located close to or at the compliance boundary." (Section 5.3.2, Background Monitoring, Page V-72)

Wells are required within the Zone of Attenuation (35 IAC 811.318). The locations proposed in the application do not allow for the calculation of MAPCs and defeat the purpose of ground-water and contaminant transport modeling. The system as proposed is not capable of detecting a release until migration outside the compliance boundary is imminent.

The SIGMOD is in compliance with applicable regulations. A complete discussion of the ground-water monitoring system is discussed in Attachment 7 (Part V, Section 6.3.2.3) to the February, 1996 Addendum to the SIGMOD. The wells are located near the compliance boundary because of the narrow (50 ft (15 m) zone of attenuation available at the site. The MAPCs have been conservatively set equal to the AGQSs, rather than using the higher MAPCs normally determined by ground-water modeling utilizing a larger zone of attenuation. The approach presented in Section 6.3.2.3 provides a conservative factory of safety given the site conditions.

The application does not include provisions for Corrective Action. [35 IAC Section 811.324].

The SIGMOD is compliance with applicable regulations. If any of the conditions cited in 35 IAC 811.324 (a) are met, corrective action will be implemented in accordance with 35 IAC Section 811.324.

"The annular space between the well screen/casing and the drilled hole will be filled with sand filter pack from the bottom of the borehole to at least 1 ft. above the screened interval." (Section 5.2.2, Well Construction Details, Page V-70).

The proposed well construction procedure does not specify the maximum extent the sand pack will be extended above the top of the screen or below the bottom of the screen. [35 IAC Section 811.318(d)(2)]. (In addition no boring abandonment procedures were proposed.)

The SIGMOD is in compliance with applicable regulations. Attachment 7 (Part V, Section 6.2.2) to the February 7, 1996 Addendum to the SIGMOD provides a detailed description of the well construction procedures including the length of the sand filter pack.

Potentiometric Maps. (Figure No. 4 through 14).

The figures do not include the data at the monitoring locations used to *prepare the maps. [35 IAC Section 812.314(h)].*

The SIGMOD is in compliance with applicable regulations. Attachment 7 (Part V, Section 2 and Figures V-2-21 to V-2-38) to the February, 1996 Addendum to the SIGMOD provides the data regarding the monitoring locations used to prepare the potentiometric maps.

Engineering & Testing Services, Inc. Boring Logs. (Appendix VI-A Geotechnical Investigations Performed at the Site, Appendix D).

These borings, apparently drilled through refuse, were not properly grouted and were back filled with cuttings, resulting in a conduit between the landfill through the underlying in-situ liner. [35 IAC Section 811.316(b) and 812.315].

The SIGMOD is in compliance with applicable regulations. Two borings were drilled in 1991 by Engineering & Testing Services, Inc. using 3-1/4" inside diameter hollow stem augers to confirm the presence of at least 10 feet of natural clay liner beneath Phase II, Cell 3 waste unit. Each boring log contained the note on the bottom which stated, "Note: Boring backfilled with soil unless otherwise stated." The soil cuttings in this case were the cuttings from the natural clay liner which were tested to have hydraulic conductivities in the $1x10^{-8}$ cm/sec range. Thus, in accordance with Section 811.316(b), the drill holes were "backfilled with materials that are compatible with the geochemistry of the site." Each boring was terminated

at 65-foot depths from grade levels of elevation 585 ±. The bottom elevation is therefore no deeper than elevation 520, which still leaves minimum 10 ft of unweathered glacial till liner beneath the bottom of the borings.

Ground-Water Monitoring V-69 and Figure V-74.

The proposed updated monitoring network is along the south side of the site. Figure V-14 illustrates that the east side of landfill is also downgradient. An updated monitoring network is required along the east side of the landfill also. In addition, unless it can be shown that the entire landfill leachate head is below the sand and fill unit, this unit should also be monitored.

The SIGMOD is in compliance with applicable regulations. A discussion of the ground-water monitoring program is provided in Attachment 7 (Part V, Section 6.2) to the February, 1996 Addendum to the SIGMOD.

<u>Conclusion</u>. The previous section outlines some specific areas in which the Ground-Water Impact Assessment and monitoring program prepared for Land and Lakes 122nd Street Landfill by Geosyntec Consultants is deficient. These specific areas represent major flaws in the model, and raise serious doubt regarding the model's conclusion that the facility can comply with 35 IAC 814 Subpart C.

The SIGMOD is in compliance with applicable regulations. The ground-water flow and constituent transport models are in compliance with regulatory requirements. In addition, these models were developed using very conservative data and assumptions, and demonstrate that leachate constituents will not reach the underlying Silurian dolomite aquifer within the 105-year modeling period.

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ATTACHMENT D

LALC RESPONSE TO COMMENTS
DATED JULY 11, 1995
SUBMITTED BY THE DOE TO
THE IEPA REGARDING LOG #1995-060

July 11, 1995

Mr. Ronald R. Steward
Illinois Environmental Protection Agency
Division of Land Pollution Control
Permit Section
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276

Re: Land and Lakes No. 3 (122nd Street Landfill, Chicago, IL)
IEPA Log No. 1995-060
Application for Significant Modification and Addendum (dated April 14, 1995)

Dear Mr. Steward:

I have reviewed the above referenced Application for Significant Modification, and the Addendum which responds to comments from the Agency that were presented in a letter dated March 17, 1995. Based on my review and also the review performed by Patrick Engineering, I have presented a summary below of both our comments.

- ***Plugging & Sealing of Borings.*** *In accordance with 35 IAC Section 811.316 any soil borings drilled in strata exhibiting low permeabilities, that were not converted into monitoring wells must be sealed immediately so as to prevent the creation of pathways for contaminants to migrate. The applicant has not demonstrated compliance for all borings. A description of these borings follows below.*

Soil borings made by Schleede-Hampton Associates in 1994 were backfilled with bentonite chips. To ensure a proper seal, these boreholes should have been sealed with a bentonite-cement grout mixture. Bentonite chips have a tendency to bridge as they are being poured into the borehole, leaving airspace gaps at various depths and therefore a complete seal of the boring is impossible to achieve. Bentonite chips are typically used as a seal immediately above well screens, and are installed as a 1-foot thick layer immediately above the well screen. In such applications, the chips are dropped into the hole, carefully a few at a time to prevent bridging. To install these chips in boreholes that are greater than 70 feet deep in such a fashion would take a laborious effort to ensure that bridging did not occur. Therefore I would be suspicious of these holes being properly sealed.

Borings drilled in 1991 by Engineering & Testing Services, Inc. were drilled through the landfill waste and down through the landfill bottom liner. These boreholes were not sealed subsequent to drilling.

The logs of borings presenting the soil borings made by Walter H. Flood & Co. (1966 and 1972), do not report whether or not these boreholes were sealed subsequent to drilling.

The SIGMOD is in compliance with applicable regulations. Boring logs for the 1994 Schleede-Hampton Associates (SHA) borings were made by an SHA field geologist and located in the Phase II, Cell V area to confirm natural clay liner properties. According to the SHA report, B-1 was grouted with a cement bentonite slurry. Bentonite chips were used to backfill borings B2 through B4 due to sub-freezing weather conditions. The bentonite chips were carefully placed inside the 3-1/4" inner diameter hollow stem augers used to advance each boring. The field geologist took great care to assure no bridging occurred. This was done by evaluating the number of five-gallon buckets of bentonite chips used for each hole and

comparing the evaluation with a calculation of buckets required to fill bore holes. Furthermore, each of these borings were terminated at elevations 525 ft. NGVD or higher; thus at least 15 to 20 feet of low permeability natural till exists beneath each boring.

Two borings drilled in 1991 by Engineering & Testing Services, Inc. were drilled using 3-1/4" inside diameter hollow stem augers to confirm the presence of at least 10 feet of natural clay liner beneath Phase II, Cell III waste unit. Each boring log contained the note on the bottom which stated, "Note: Boring backfilled with soil unless otherwise stated." The soil cuttings in this case were the cuttings from the natural clay liner which were tested to have hydraulic conductivities in the 1 x 10^{-8} cm/sec range. Thus, in accordance with Section 811.316(b), the drill holes were "backfilled with materials that are compatible with the geochemistry of the site." Each boring was terminated at 65-foot depths from grade levels of elevation 585 ±. The bottom elevation is therefore no deeper than elevation 520, which leaves more than 10 to 15 feet of unweathered glacial till liner beneath the bottom of the borings.

Walter H. Flood and Company (1966-1972) followed normal practices in the proper sealing of borings. In addition, all of these borings have been subsequently excavated. The 1966 soil borings by Walter H. Flood and Company consisted of a total of seven (P1 through P7) shallow borings, each 10 feet in depth or less from ground surface, which was approximately elevation 585. These shallow borings were located in areas which since have been excavated to elevation 535 (e.g., bottom of cell elevation).

The 1972 soil borings by Walter H. Flood and Company consisted of three borings (P8, P9, and P10), each to depths of about 50 feet below ground surface (e.g., elevation 585) using 2-1/4" inner diameter hollow stem auger. Borings P8 and P10 were located outside the limits of refuse in the areas

where sidewall liners were subsequently constructed. Boring P9 was located in the central portion of Phase I, Cell I, which was excavated to elevation 535. The Flood report states, "Bedrock was not encountered but estimated to be 80' below grade" or 30 feet below the bottom of the borings. Excavation of Phase I, Cell I to elevation 535 coincided with the bottom elevation of P9 (e.g., 585 - 50 = 535). Therefore, Borehole P9 was completely excavated prior to placement of waste.

The SIGMOD is in compliance with the applicable regulations. Attachment 7 (Part V, Section 6) to the February, 1996 Addendum to the Significant Modification details the proper collection and use of existing ground water data.

- *<u>Leachate Drainage & Collection</u>. The application fails to demonstrate that the proposed leachate collection system will effectively drain and collect leachate from the existing cell areas of the landfill into the proposed Cell VI area. Since all cells are hydraulically connected, the entire landfill must be considered a single unit and therefore in accordance with 35 IAC 814.302(b)(1), this unit must be equipped with a system that will effectively drain and collect leachate and transport it to a leachate management system.*

  The leachate collection system proposed in the application has been designed to handle leachate from Cell VI. A demonstration that this proposed system will be effective in removing leachate from the other cell areas of the unit has not been made. It is therefore recommended that the applicant provide information and calculations which make this demonstration.

  In addition, the applicant states that the soil protective layer component of the leachate drainage system will consist of a sand material. The applicant however, does not specify a minimum value of hydraulic conductivity of this material. In accordance with 35 IAC 811.307(c), the material specified must *have a hydraulic conductivity equal to or greater than 1 x 10^{-3} cm/sec. The applicant has not demonstrated this.*

The SIGMOD is in compliance with the applicable regulations. An effective leachate collection system that meets the requirements of 35 IAC 814.302(b)(1) is in place at the landfill. A detailed discussion of this system can be found in Attachment 7 (Part V, Section 4) to the February, 1996 Addendum to the Significant Modification. The sand specified for the soil protective layer shall have a minimum hydraulic conductivity of 1 x 10^{-3} cm/s. This information is provided in Attachment 20 (Part VII, Section 02235, Part 2.01 (D) Liner Protective Layer) to the February, 1996 Addendum to the Significant Modification.

- *Liner System. The applicant states that a test liner for the Cell VI area is not required, in accordance with 811.507(b). The applicant however, has not provided any field testing results for hydraulic conductivity nor any information on the number of lifts, in accordance with 811.507(a)(5)(A). This information is required by 811.507(b) before the requirement of a test liner can be waived. If this information cannot be provided or does not meet the regulatory minimum, a test liner is required.*

  The applicant has not performed soil balance calculations in order to demonstrate that there are sufficient volumes of suitable soil material available on-site to construct the Cell VI liner system. If the applicant is intending to import a portion of the required volume from off-site sources, the applicant should provide information on these sources.

  The application indicates that hydraulic conductivity testing performed on soils that will be used to construct the Cell VI soil liner, were done on split-barrel soil samples. The split-barrel method of soil sampling produces a large shear strain disturbance in the sample and therefore samples obtained from this *method are typically not used for laboratory testing of structural properties. The thin-walled tube method sampling, in accordance with ASTM D1587, is used to obtain relatively undisturbed soil samples, suitable for laboratory testing of structural properties. ASTM D5084, which describes the standard test method for hydraulic conductivity, requires that such tests be performed on undisturbed samples obtained in accordance with ASTM D1587. Based on this information, the values of hydraulic conductivity would therefore be suspect.*

The application states that the falling head test method using a consolidometer was used for hydraulic conductivity testing. In accordance with the USEPA technical guidance document for hydraulic conductivity testing of soil liner materials (SW-925), the test method preferred for clay soils with low hydraulic conductivity is the method employing the modified triaxial apparatus with back pressure saturation (ASTM D5084). This document states that the degree of accuracy and precision is very good for this method and is most commonly used for this application. In regards to the falling head test method, this document states that this test does not provide assurance of complete saturation at the time of testing and therefore is not as accurate as the modified triaxial method. It also states that this method is <u>not</u> widely used in the evaluation of soil liners. Further, ASTM D5084 states that the falling head test is to be used on materials exhibiting hydraulic conductivities greater than those of clays or silts, or greater than 1×10^{-3} *cm/sec.*

The coefficients of hydraulic conductivity reported from hydraulic conductivity tests performed on silt and clayey silt materials were on the order of 1×10^{-7} *cm/sec. A typical value for a silt material would be about* 1×10^{-5} *cm/sec. I would therefore question the validity of these values. (Reference permeability tests performed on Bartholomew Engineering Borings B-1 and B-2, Sample Nos. S-32 and S-18, respectively).*

Based on the information presented above regarding the validity of the hydraulic

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Record Keeping Requirements	*As discussed in the facility operation plan portion of the application, information will be kept on file at the site in a three-ring binder, with the exception of information too bulky for site storage. The bulky information will be stored at the Park Ridge corporate office of the Land and Lakes Company and will be available for review during normal business hours.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.112* • *The owner or operator of a MSWLF must record and retain all information submitted to the Agency pursuant to Part 812 and 813 as it becomes available. At a minimum the following information is requested: 1) compliance with location standards; 2) inspection records, training procedures, and notification procedures; 3) gas monitoring results and remediation plans; 4) design documentation for placement of leachate or gas condensate in unit; 5) monitoring, testing, or analytical data pertaining to the ground-water monitoring program; 6) closure and post-closure care plans, and 7) cost estimates and financial assurance documents.*		
		Complies	*May Comply*	*Does Not Comply*

35 IAC 811.112, Recordkeeping Requirements for MSWLF Units, states:

> **"The owner or operator of a MSWLF unit shall record and retain near the facility in an operating record or in some alternative location specified by the Agency, the information submitted to the Agency pursuant to 35 IAC 812 and 183, as it becomes available."**

Copies of all permit applications and monitoring data are maintained at the 122nd Street Landfill offices. Therefore, the SIGMOD is in compliance with 35 IAC 811.112.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Survey Controls	*This application does not propose an inspection program.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.104* • *All boundaries should be inspected annually and should also be surveyed and clearly marked for identification by a professional land surveyor at least every 5 years. Control monuments shall be established to check vertical elevations.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. LALC has implemented a survey control program meeting the requirements of 35 IAC Section 811.104. All stakes and monuments will be inspected annually and surveyed once every five years. This program is described in Attachment 5 (Section 3.2.7) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Phasing of Operation	*The proposed excavation contains conditions which exhibit Factors of Safety below one for bottom stability against uplift and slope stability.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.107(a)* • *Waste shall be placed in a manner and rate so that mass stability is provided during all phases of the operations.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 4 through 8 of this document, the stability of the Cell VI bottom excavation has been demonstrated by uplift stability c'-ulations and has been confirmed by actual full-scale successful construction (the recent first phase of Cell . In addition, the slope stability analyses presented by PEI for the Cell VI excavation are completely irrelevant because: (I) the PEI analyses use long-term drained strength parameters for short-term loading conditions (the slopes will be fully supported by waste); (ii) the PEI analyses neglect the shear strength of the soil, which is not consistent with engineering practice; (iii) the analyses assume pore-water conditions that are not consistent with field conditions; and (iv) the results of the PEI analyses are inconsistent with construction practice. The Cell VI excavation side slopes are not long-term slopes since they will be fully supported through the placement of waste long before conditions consistent with long-term slope stability analyses are operative.

During the design of Cell VI, GeoSyntec considered the stability of all slopes present (including the north slope of the excavation). Consistent with conventional practice, only the results for the most critical slopes (i.e., those with the lowest factors of safety) are presented in the SIGMOD. As discussed above, because the excavation side slopes for Cell VI will not be exposed over the long term (they will be fully supported over the long term because of waste placement), only short-term stability analyses are relevant for the excavation side slopes. The short-term stability calculations presented in the SIGMOD demonstrate that even for the most critical case the Cell VI excavation side slopes have a factor of safety of 1.8 under static conditions and a minimum factor of safety of 1.5 under the considered earthquake conditions. These safety factors exceed the minimum regulatory requirements presented in 35 IAC Section 811.304(d).

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Noise Control	*All equipment that is powered by internal combustion engines will have mufflers installed and will be maintained in good repair. Screening berms and temporary screens will also be used, when possible, to deflect sound upward (Page IX-31).*	*Title 35 Section 814.302(a)* *Title 35 Section 811.107(h)* • *The facility shall be designed, constructed and maintained to minimize the level of equipment noise audible outside the facility.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The application is in compliance with 811.107(h). The facility meets all requirements for noise control and has never received a complaint for noise.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Litter Control	*Litter will be controlled by orienting the active face into the wind, minimizing active face, compacting waste soon after dumping and by using litter fences (Pages IX-28 to IX-29).* *The site will be checked and litter collected as necessary. Side entrance roads will be checked daily. Waste delivered in uncovered containers will not be accepted.* *Comment: The facility must be patrolled daily for litter accumulation.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.107(k)* • *Daily checks are to be made for litter accumulations followed by collection and disposal of any litter. All solid waste haulers should have covers to prevent litter, unless the nature of the solid waste cannot cause litter during transportation to the facility.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. Section 2.3 of *Part III: General Information Document* of the February, 1995 SIGMOD Application states:

> **"As required by Section 811.107(k) of 35 IAC and as discussed in detail in Section 4.2.5.1 of *Part IX: Operations Plan*, LALC will patrol the facility daily for litter accumulation..."**

LALC patrols the site on a daily basis, and collects and disposes of the litter which is collected. The SIGMOD application is in compliance with 35 IAC 811.107(k).

REGULATORY OVERVIEW				
Standard	***Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)***	***Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815***		
Salvaging	*"No scavenging will be permitted at the landfill. However, if the volume of recyclable goods is sufficient, as determined by the operator, those items may be separated from the waste to be disposed of following the standards set in Section 811.108 of 35 Ill., Adm. Code. If recycling operations are initiated, the operation procedures will be developed which will not interfere with the normal operation of the landfill." (Page IX-19).* *Comment: If recycling is conducted, the operating procedures will need to be developed and provided for review to ensure compliance.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.108* • *Salvaging may not interfere with the operations of the facility and must be performed in a safe and sanitary manner.*		
		Complies	*May Comply*	*Does Not Comply*

Recycling is not currently being performed at the 122nd Street Landfill. If recycling is initiated in the future, the IEPA will be notified in the form of a permit application. The SIGMOD complies with 35 IAC 811.108(a).

REGULATORY OVERVIEW

Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Foundation Stability	*The Application for SIGMOD does not contain proper documentation that all slopes will be stable. Review of the slope stability calculations indicates that the slopes do not provide the required minimum Factor of Safety against failure.* *The potential for hydrostatic uplift during the cell excavation was not addressed within the application, and the calculations indicate that conditions exist which could make the excavation unstable if constructed without dewatering. No plan for dewatering was included within the application.*	*Title 35 Section 814.302(d)* *Title 35 Section 811.304* • *The unit shall be designated to achieve the desired safety factors against bearing capacity failure and slope failure for static and seismic conditions in both long-and short-term conditions.* *See Sections 811.304 and 811.305*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 4 through 8 of this document, the stability of the Cell VI bottom excavation has been demonstrated by uplift stability calculations and has been confirmed by actual full-scale successful construction (the recent first phase of Cell VI). In addition, the slope stability analyses presented by PEI for the Cell VI excavation are completely irrelevant because: (I) the PEI analyses use long-term drained strength parameters for short-term loading conditions (the slopes will be fully supported by waste); (ii) the PEI analyses neglect the shear strength of the soil, which is not consistent with engineering practice; (iii) the analyses assume pore-water conditions that are not consistent with field conditions; and (iv) the results of the PEI analyses are inconsistent with construction practice. The Cell VI excavation side slopes are not long-term slopes since they will be fully supported through the placement of waste long before conditions consistent with long-term slope stability analyses are operative.

During the design of Cell VI, GeoSyntec considered the stability of all slopes present (including the north slope of the excavation). Consistent with conventional practice, only the results for the most critical slopes (i.e., those with the lowest factors of safety) are presented in the SIGMOD. As discussed above, because the excavation side slopes for Cell VI will not be exposed over the long term (they will be fully supported over the long term because of waste placement), only short-term stability analyses are relevant for the excavation side slopes. The short-term stability calculations presented in the SIGMOD demonstrate that even for the most critical case the Cell VI excavation side slopes have a factor of safety of 1.8 under static conditions and a minimum factor of safety of 1.5 under the considered earthquake conditions. These safety factors exceed the minimum regulatory requirements presented in 35 IAC Section 811.304(d).

<table>
<tr><th colspan="5">REGULATORY OVERVIEW</th></tr>
<tr><th>Standard</th><th>Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)</th><th colspan="3">Illinois Landfill Criteria
Title 35 Illinois Administrative Code Parts 810-815</th></tr>
<tr><td rowspan="2">Foundation Construction</td><td rowspan="2">As discussed under Foundation Stability, no documentation was provided indicating that the bottom would be stable with the proposed excavation. Preliminary calculations indicate that areas exist where uplift could occur.</td><td colspan="3">Title 35 Section 814.302(d)
Title 35 Section 811.305
• The foundation shall be of sufficient strength and be clean of debris or be replaced. Work with frozen soil is prohibited.

See Sections 811.304 and 811.3</td></tr>
<tr><td>Complies</td><td>May Comply</td><td>Does Not Comply</td></tr>
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REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Liner Systems	*The existing landfill has been constructed using in-situ materials for bottom and portions of sidewall liners, and a 10-foot recompacted clay sidewall liner has been constructed over sand layers. Land and Lakes has been required to submit quarterly reports of certification activities to the IEPA. Some of these reports indicate that Land and Lakes did not meet the minimum compaction standards.* *The Application for SIGMOD also indicates that many permeability tests were performed on disturbed samples. Any results obtained from these samples would be questionable.*	*Title 35 Section 814.302(e)(2)* • *All lateral expansions shall be subject to* *Title 35 Section 811.306* • *The liner and leachate collection system shall be stable during all phases of construction and operation. All new units and lateral expansions units shall be equipped with a stable leachate drainage and collection system along with a compacted earth liner. A compacted earth liner should be 5 feet thick with a hydraulic conductivity of* $1x10^{-7}$ *cm/sec, unless a composite liner with a geomembrane 60 mil thick and a 3-feet-thick compacted earth liner is used.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. All documentation regarding liners previously constructed at the 122nd Street facility has been submitted in the form of operating permit applications to the IEPA. Operating permits cannot be issued by the IEPA unless liners are constructed in accordance with IEPA development permits. An operating permit was obtained for every portion of the site that has received waste to date. Therefore, the IEPA has previously determined by the issuance of operating permits that all prior liner construction is in compliance with appropriate permit conditions.

REGULATORY OVERVIEW		
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*
Leachate Drainage System	*The specified soil protective layer consists of sand, but a minimum hydraulic conductivity is not specified.*	*Title 35 Section 814.302(e)(2)* • *All lateral expansions shall be subject to* *Title 35 Section 811.307* • *All new units and lateral expansion units must have a leachate drainage system designed to maintain a maximum head of leachate 0.3 meters above the liner. The drainage layer shall be no less than 0.3 meters thick and shall have a hydraulic conductivity equal to or greater than $1x10^{-3}$ cm/sec.*
		Complies / *May Comply* / *Does Not Comply* (shaded)

The SIGMOD is in compliance with the applicable regulations. The specification for the sand protective layer requires a minimum hydraulic conductivity of 1×10^{-3} cm/s. This information is provided in Attachment 20 (Part VII, Section 02235, Part 2.01 (D) Liner Protective Layer) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria* *Title 35 Illinois Administrative Code Parts 810-815*		
Leachate Collection System	*Land and Lakes has proposed a leachate collection system for Cell VI, the final cell developed at the facility (a lateral expansion of an existing MSWLF unit).* *The existing landfill does not have a leachate drainage and collective system. (Page VI-37).*	*Title 35 Section 814.302(e)(2)* *Title 35 Section 811.308* • *All new units and lateral expansions must have a leachate collection system that is designed and constructed to function for the entire period.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The February, 1996 Addendum to the SIGMOD demonstrates compliance with 35 IAC 811.308 for Cell VI and is in compliance with 35 IAC 814.302 (e)(2) and 35 IAC 811.308. Attachment 7 (Part V, Section 4) describes in detail the leachate collection system that is in place at the facility.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Leachate Treatment and Disposal System	*A review of the DOE records did not reveal that any leachate quality data was submitted to the DOE by Land and Lakes.* *The proposed leachate collection system for the new unit will require leachate to flow from waste and the old cells into the new cell. It is uncertain if the leachate will flow freely from the older unit.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.309* • *Leachate shall flow freely from the collection system to a leachate management system. A leachate management system consists of any of the following: 1) on-site treatment and pre-treatment, 2) storage, 3) off-site treatment, and 4) recycling. Representative samples of leachate shall be collected and tested once per quarter or once per year for any monitored constituents if not detected. Leachate collection at a MSWLF unit shall be continued for a minimum period of 30 years after closure.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. Neither the City of Chicago nor the Chicago DOE claims that LALC has not fully complied with all recordkeeping requirements regarding leachate treatment and disposal. The Chicago DOE's criticism of LALC is based on the false premise that LALC is under a legal obligation to submit leachate quality data to the Chicago DOE. In fact, LALC is not bound to provide this information to the Chicago DOE by law or by permit condition. Further, by virtue of the Circuit Court's Judgement Order of 27 September 1994, entered in the Land and Lakes case, the Chicago DOE has no authority under the Environmental Control Ordinance to require LALC to submit the data to the Chicago DOE. As set forth clearly in the Circuit Court's Judgement Order, the IEPA possesses the sole permitting authority over the operation of the 122nd Street Landfill. Consequently, the Chicago DOE's criticism regarding the leachate quality data is unfounded in law and fact.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria* *Title 35 Illinois Administrative Code Parts 810-815*		
Final Slope and Stabilization	*Land and Lakes 122nd Street Landfill has exceeded the City of Chicago's maximum permitted elevation of +60 Chicago City Datum (630 Mean Sea Level) by 30 feet.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.322* • *All slopes shall be designed to support vegetation and minimize erosion. No standing water shall be allowed anywhere on the unit.* *Title 35 Section 814.302(a)* *Title 35 Section 811.110(a), (b), and ©* • *The final slopes and contours shall blend with the surrounded topography, safely pass runoff without erosion, and minimize the need for further maintenance.* *See Section 811.110*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. This contention is without basis in law. By virtue of the Circuit Court's Judgement Order of 27 September 1994 in the Land and Lakes case, the Circuit Court has held that the IEPA possesses sole permitting authority over LALC's 122nd Street Landfill (see Judgement Order, Attachment A to this document). Consequently, neither the City nor the Chicago DOE have any authority to impose permitted heights on the operation of LALC's 122nd Sanitary Landfill that are inconsistent with the permitted heights prescribed in the IEPA permits for the facility. The IEPA permits issued for the operation of LALC's 122nd Street Landfill do not contain the permitted elevations of +60 Chicago City Datum (630 Mean Sea Level) and neither the City nor the Chicago DOE contends that LALC has violated the IEPA's permitted elevations for the operation of the 122nd Street Landfill.

In addition, the Chicago DOE's contention is erroneous as a matter of fact. This is so because there is no current operating permit issued by the Chicago DOE which contains any permitted elevations for the operation of the LALC 122nd Street Landfill. On 27 December 1994, the Chicago DOE issued LALC a permit to operate the 122nd Street Landfill, as ordered by the Circuit Court. A copy of the Chicago DOE operating permit is attached as Exhibit B. The Chicago DOE operating permit contains no standard or special conditions relating in any way to the permitted elevations for the 122nd Street Landfill. Rather, as plainly set forth in the Chicago DOE operating permit, LALC's operation of the 122nd Street Landfill is subject solely to the permits issued by the IEPA for the landfill. Consequently, there is no basis in law or fact for the Chicago DOE's contention that LALC has exceeded any permitted elevations in the operation of the 122nd Street Landfill.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Hydrogeologic Investigation	*There are multiple problem areas with the hydrogeologic investigation, including 1) apparent failure to grout borings through waste and liner, 2) failure to collect four quarters of data, and 3) improper collection of data and use of existing data.*	*Title 35 Section 814.302(a)(5)* • *Information must be collected to develop/supplement the ground-water monitoring program and establish background water quality standards.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulation. A complete discussion of the issues raised in this comment are found in Attachment 7 (Part V and Section 2.6.3 of Part V) to the February, 1996 Addendum to the SIGMOD. With respect to the plugging and sealing of the borings, the following information is provided:

> **Boring logs for the 1994 Schleede-Hampton Associates (SHA) borings were made by an SHA field geologist and located in the Phase II, Cell V area to confirm natural clay liner properties. According to the SHA report, B-1 was grouted with a cement bentonite slurry. Bentonite chips were used to backfill borings B2 through B4 due to sub-freezing weather conditions. The bentonite chips were carefully placed inside the 3-1/4" inner diameter hollow stem augers used to advance each boring. The field geologist took great care to assure no bridging occurred. This was done by evaluating the number of five-gallon buckets of bentonite chips used for each hole and comparing the evaluation with a calculation of buckets required to fill bore holes. Furthermore, each of these borings were terminated at elevations 525 ft. NGVD or higher; thus at least 11 feet of low permeability natural till exists beneath each boring.**

Two borings drilled in 1991 by Engineering & Testing Services, Inc. were drilled using 3-1/4" inside diameter hollow stem augers to confirm the presence of at least 10 feet of natural clay liner beneath Phase

II, Cell 3 waste unit. Each boring log contained the note on the bottom which stated, "Note: Boring backfilled with soil unless otherwise stated." The soil cuttings in this case were the cuttings from the natural clay liner which were tested to have hydraulic conductivities in the $1x10^{-8}$ cm/sec range. Thus, in accordance with Section 811.316(b), the drill holes were "backfilled with materials that are compatible with the geochemistry of the site." Each boring was terminated at 65-foot depths from grade levels of elevation 585 ±. The bottom elevation is therefore no deeper than elevation 520, which still leaves minimum 10 feet of unweathered glacial till liner beneath the bottom of the borings.

Walter H. Flood and Company (1966-1972) followed conventional practices in the sealing of borings. In addition, all of these borings have been subsequently excavated. The 1966 soil borings by Walter H. Flood and Company consisted of a total of seven (P1 through P7) shallow borings, each 10 feet in depth or less from ground surface, which was approximately elevation 585. These shallow borings were located in areas which since have been excavated to elevation 535 (e.g., bottom of cell elevation).

The 1972 soil borings by Walter H. Flood and Company consisted of three borings (P8, P9, and P10) to depths of about 50 feet below ground surface (e.g., elevation 585) using a 2-1/4" inner diameter hollow stem auger. Borings P8 and P10 were located outside the limits of refuse in the areas where sidewall liners were s equently constructed. Boring P9 was located in the central portion of Phase I, Cell I, which was excavated to elevation 535. The Flood report states, "Bedrock was not encountered but estimated to be 80' below grade" or 30 feet below the bottom of the borings. Excavation of Phase I, Cell I to elevation 535 coincided with the bottom elevation of P9 (e.g., 585 - 50 = 535). Therefore, Borehole P9 was completely excavated prior to placement of waste.

The SIGMOD is in compliance with the applicable regulations. Attachment 7 (Part V, Section 6) to the February, 1996 Addendum to the SIGMOD details the proper collection and use of existing ground-water data.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Plugging of Drill Holes	*Borings conducted by Engineering & Testing Services, Inc. were apparently drilled through the waste and liner and not grouted.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.316* • *All drill holes shall either be plugged or converted into monitoring wells.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations.

. .o borings were drilled in 1991 by Engineering and Testing Services, Inc. using 3-1/4" inside diameter hollow stem augers to confirm the presence of at least 10 feet of natural clay liner beneath Phase II, Cell 3 waste unit. Each boring log contained the note on the bottom which stated, "Note: Boring backfilled with soil unless otherwise stated." The soil cuttings in this case were the cuttings from the natural clay liner which were tested to have hydraulic conductivities in the 1x10^{-8} cm/sec range. Thus, in accordance with Section 811.316(b), the drill holes were "backfilled with materials that are compatible with the geochemistry of the site." Each boring was terminated at 65-foot depths from grade levels of elevation 585 ±. The bottom elevation is therefore no deeper than elevation 520, which still leaves minimum 10 feet of unweathered glacial till liner beneath the bottom of the borings. To confirm thickness of the unweathered glacial till below Phase II, Cell 3, refer to Table V-4-3 in Attachment 7 (Part V) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Ground-Water Impact Assessment	*The Ground-Water Impact Assessment does not comply with the regulations for multiple reasons, including 1) failure to use an IEPA approved model or provide sufficient documentation, 2) calibrated model conditions do not match site ground-water flow, 3) improper time periods modeled, and 4) improper boundary condition selection.*	*Title 35 Section 814.302(e)(3)* • *Any lateral expansion is subject to:* *Title 35 Section 811.317* • *A ground-water impact assessment must be prepared for all units to assess the impacts of seepage from the unit, unless the unit is closing by 1997. A contaminant transport model must be run for the facility along with a sensitivity analysis to ensure the applicable ground-water quality parameters are not exceeded within 100 years.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The Ground-Water Impact Assessment is discussed in detail in Attachment 7 (Part V, Sections 4 and 5) to the February, 1996 Addendum to the SIGMOD. The IEPA approved models, POLLUTE and MIGRATE were used. Simulations were performed for a total time period of 105 years and concentration profiles are presented at an interval of five years. The boundary conditions selected for the modeling are discussed in Attachment 7 (Part V, Section 5.4) to the February, 1996 Addendum to the SIGMOD. These boundary conditions are proper and simulate the conditions at the site conservatively. The results of the constituent transport analyses indicate that leachate constituents will not reach the Silurian dolomite aquifer within the 105-year modeling period.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Ground-Water Monitoring Systems	*The ground-water monitoring system proposed for the landfill will be sufficient. No downgradient monitoring wells are located at the eastern facility boundary within the bedrock aquifer, and monitoring in the sand and fill aquifer is also insufficient.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.318(a), (b), (c), and (d)* ● *A ground-water monitoring network shall be designed, constructed and operated to detect potential discharges to ground water. The monitoring wells shall be constructed and cased to prevent direct contamination and clogging of the screen.* *See Section 811.318(d)*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The ground-water monitoring system for the landfill is discussed in detail in Attachment 7 (Part V, Section 6.2) to the February, 1996 Addendum to the SIGMOD. Wells GA4D, GA5D, and RA3D are deep downgradient wells, which are located on the east side of the landfill. This is discussed in Attachment 7 (Part V, Section 6.2.1) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Ground-Water Sampling and Analysis Requirements	*The calculation of Maximum Allowable Predicted Concentrations (MAPC) and Acceptable Ground-Water Quality Standards (AGQS) was performed incorrectly and certain values were completely omitted.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.318(e)* • *The ground-water monitoring program shall include consistent sampling and analysis procedures to assure that monitoring results can be relied upon to provide data representative of ground-water quality in the zone being monitored.* *See Section 811.320 (d) and (e)*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The calculation of MAPCs and AGQSs are discussed in Attachment 7 (Part V, Section 6.3.2.3 and Tables V-6-4 and V-6-5) to the February, 1996 Addendum to the SIGMOD.

The MAPCs and AGQSs were determined as follows: (I) if the constituent was detected in ground water, the MAPC/AGQSs were equal to the upper 99% confidence limit of the pooled upgradient data; (ii) if the constituent was not detected in ground water, the MAPC/AGQSs were equal to the practical quantitation limit (PQL); and (iii) if the constituent was not detected in the ground water and there was no established PQL, no MAPC/AGQSs were calculated.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Detection Monitoring Program	*The detection monitoring program has been developed using incorrect background ground-water quality data and the proposed monitoring well location will not detect a potential leachate migration within certain pathways.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.319(a)* • *All monitoring points shall be sampled quarterly for at least fifteen years past closure (30 years for MSWLF units). Ground water should be analyzed for all parameters for which there exists a board established standard or which are expected to be in the leachate. An assessment monitoring program shall be implemented for any statistically significant increase.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The detection monitoring program is discussed in detail in Attachment 7 (Part V, Section 6.3.3.) to the February, 1996 Addendum to the SIGMOD. Attachment 7 (Section 6) to the February, 1996 Addendum to the SIGMOD provides a comprehensive discussion of the overall ground-water monitoring program, background ground-water quality data, and monitoring well locations.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria* *Title 35 Illinois Administrative Code Parts 810-815*		
Assessment Monitoring Program	*The IEPA has not forced the site into assessment monitoring. However, the applicable ground-water quality standards have been exceeded for some parameters.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.319(b) and ©* • *An assessment monitoring program shall confirm the source of the contamination and provide information needed to carry out a ground-water impact assessment. At a minimum, the constituents listed in 40 CFR Part 258 Appendix II must be monitored.* • *A notice must be incorporated into the operating record identifying any constituents that have been detected.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. Attachment 7 (Part V, Section 6) to the February, 1996 Addendum to the SIGMOD provides a comprehensive discussion of the overall ground-water monitoring program for the facility. Implementation of an assessment monitoring program is discussed in Section 6.3.3.3.

Some constituents were detected during comprehensive background sampling at concentrations exceeding the calculated MAPC/AGQS; however, exceedances were in upgradient monitoring wells and most likely reflect impacts from off-site sources not associated with landfilling operations. After the detection monitoring program, as described in Attachment 7 (Part V, Section 6.3.3) to the February, 1996 Addendum to the SIGMOD, is implemented, the appropriate procedures to determine if significant changes in ground-water quality have occurred will be applied to ground-water quality data collected under the detection monitoring program. These data will be used to determine the necessity of assessment monitoring.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Remedial Action	*Not currently applicable.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.319(d)* • *For landfills other than MSWLF units, a plan for remedial action must be implemented within 90 days and continue until all constituents are below the maximum concentrations.* *Title 35 Section 814.302(a)* *Title 35 Section 811.324* • *For MSWLF units, an assessment of the corrective action measures must be initiated within 14 days of the ground-water impact assessment, or a confirmed increase above the ground-water quality standards attributable to solid waste and completed within 90 days.* • *The assessment must address the effectiveness, efficiently, cost, time, and any other requirements of any potential corrective action measures.*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW					
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*			
Selection of Remedy	*Not currently applicable.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.325* • *Within 90 days of completion of the corrective action measures assessment, a remedy must be chosen which will be protective of human health and the environment, be able to attain the ground-water quality standards, and prevent further release of contamination. Any part of the corrective action measures which affects these criteria must be considered when selecting an action. A schedule for initiation and completion of the remediation must also be developed.* *See Section 811.319(d)*			
		Complies	*May Comply*	*Does Not Comply*	

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Implementation of a Corrective Action	*Not currently applicable*	*Title 35 Section 814.302(a) Title 35 Section 811.326 • A program which meets the requirements of 811.325 will be initiated according to the developed schedule. Any interim measures necessary to protect human health and the environment will be taken until initiation of the program. Notification will be made to the Agency concerning the productivity, problems or completion of the action. See Section 811.319(d)*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Ground-Water Quality Standards	*Sampling for initial water quality was conducted semi-annually, not quarterly as required. Also, ground-water quality is reportedly impacted by off-site contamination sources such that the background concentrations sampled may not be representative of downgradient ground-water quality. Such a situation would create maximum contaminant levels based on contamination outside the landfill, and landfill leakage would go undetected.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.320* • *The applicable ground-water standards should be established based on: 1) the background concentrations determined by one year of quarterly sampling, or 2) a board adjusted standard. The zone of attenuation for compliance purposes is 100 feet or the property boundary.* *See Section 811.318*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. A discussion of ground-water sampling is found in Attachment 7 (Part V, Section 6.3) to the February, 1996 Addendum to the SIGMOD. Quarterly ground-water monitoring information is provided in Attachment 7 (Tables V-6-1 and V-6-2) to the February, 1996 Addendum to the SIGMOD. Supplemental analytical results are also provided in Attachment 7 (Appendix V-6-A) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Post-Closure Care Requirements	*The post-closure inspection and sampling schedules do not comply with the required minimum sampling periods. Landfill gas monitoring is proposed at quarterly intervals during the post-closure care period. 35 IAC 811.310© requires monthly sampling during the operating life and first five years of post-closure care, with the potential for reduction to quarterly sampling after five years. Leachate, proposed to be sampled quarterly during the first five years of post-closure and annually thereafter, must be sampled quarterly during the operating life of the leachate collection system, a minimum 30 years after closure.*	*Title 35 Section 811.111* • *The operator will clean-up the site by properly disposing of any waste and removing all equipment and structures not necessary for the post-closure land use. Quarterly inspections of the final cover will take place for a minimum period of 30 years after closure for MSWLF units, unless reduced by the Board or the Agency. Any areas that do not conform to a smooth uniform final cover must be corrected.* • *The use of property after closure of an MSWLF unit is restricted to activities which will not effect the integrity of the final cover, liners systems, or other component of the containment system.*		
		Complies	*May Comply*	*Does Not Comply*

SIGMOD is in compliance with the applicable regulations. Attachment 16 (Section 6.6.4) to the February, 1996 Addendum to the SIGMOD states:

> "The interior gas monitoring wells, the perimeter gas monitoring wells, and the ambient air monitoring will be sampled on a monthly basis for a minimum of five years after closure of the landfill. The on-site buildings will be continuously monitored for a minimum of five years after closure. The sampling frequency will be reduced to quarterly sampling intervals after the five year period."

35 IAC 811.11 requires gas monitoring at a frequency which is in compliance with 35 IAC 811.310. Attachment 16 (Section 6.6.4) to the February, 1996 Addendum to the SIGMOD is in compliance with 35 IAC 811.310.

Attachment 9 (Section 6.5.2) to the February, 1996 Addendum to the SIGMOD states:

> "Leachate levels will be measured quarterly in all of the leachate manholes. Quarterly samples from the leachate pond will be analyzed for BOD_5, COD, TSS, total iron, pH, any constituent listed in the facility's NPDES permit or required by a POTW and the indicator constituents used for ground-water monitoring which are listed in Attachment 7 (Part V, Table V-6-6) to the February, 1996 Addendum to the SIGMOD. These parameters represent those required by Section 811.309(g)(2). The frequency of testing will be change to once per year for any parameter not detected in the leachate."

35 IAC 811.111 requires a leachate monitoring frequency which is in compliance with 35 IAC 811. 309. Attachment 9 (Section 6.5.2) to the February, 1996 Addendum to the SIGMOD is in compliance with 35 IAC 811.309.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Compacted Earth Liner	*GeoSyntec claims that a test liner is not required in accordance with 811.507(b). Land and Lakes has not provided any field testing results for hydraulic conductivity in accordance with Section 811.507(a)(5)(A) and information on the number of lifts, in accordance with Section 811.507(a)(5)(A). The information is required by 811.507(b) before the requirement of a test liner can be waived. If the information cannot be provided or does not meet the regulatory minimum, a test liner will be required.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.507* • *Construction of the clay liner shall be tested and inspected. A test liner shall be constructed prior to construction of the landfill liner to verify the suitability of the materials and construction procedures.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. 35 IAC 881.507 (b) states:

> **"Construction of a test fill or the requirements for an additional test fill may be omitted if a full-scale liner or a test fill has been previously constructed in compliance with this subsection and documentation is available to demonstrate that the previously constructed liner meets the requirements of subsection (a)"**

LALC completed the construction of a portion of Cell VI. The installation of this lining system was in compliance with the design and CQA requirements set forth in the SIGMOD and meets the requirements of 35 IAC 811.507(a). The initial portion of Cell VI is a full-scale liner that complies with the requirements of 35 IAC 811.507(b).

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Applicability	*Not yet Applicable*	*Title 35 Section 814.302(a)* *Title 35 Section 811.700* ● *This subpart does not apply to the State of Illinois or any local governments, provided that any other persons who conduct such a waste disposal operation provide financial assurance for closure and post-closure care.* ● *MSWLF units must demonstrate financial assurance by April 9, 1995, or within 120 days after selection of a remedy for corrective action.* ● *No person, other than the State of Illinois, shall conduct any disposal operation at a MSWLF unit, unless that person complies with the financial assurance requirements.*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Closure	*The cost estimates were prepared assuming a 30-year post-closure care period and were reduced to present value by a 4% discount rate and does not include inflation. The 4% discount rate will not be allowed as of April 1995.* *Cost estimates for cover placement appear too low.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.704* • *A written cost estimate for the closure of all parts of the facility based on premature closure and third party implementation.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The Agency has advised LALC that recent Illinois legislation allows for a 4 percent discount rate. Cover placement cost estimates reflect actual costs incurred at the facility. Attachment 39 (Appendix VIII-F) to the February, 1996 Addendum to the SIGMOD provides cost estimates for post-closure care.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Post-Closure Care	*Cost estimates were not included for quarterly leachate sampling and gas monitoring, and are not included for leachate removal and treatment.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.704* • *A written cost estimate of post-closure care based on: 1) ground-water monitoring, 2) cover placement and stabilization, 3) alternate landfill gas disposal, 4) cost estimates beyond the design period.*		
		Complies	*May Comply*	*Does Not Comply*

1 ;IGMOD is in compliance with the applicable regulations. Costs estimates for leachate sampling, gas removal and treatment, and gas monitoring are included in Attachment 39 (Appendix VIII-F) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Corrective Action	*Not Applicable.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.704* • *A detailed written estimate, in current dollars, of the cost of hiring a third party to perform the corrective action in accordance with the program required for any known release. A fund must be established to cover the corrective action costs (if the facility is triggered into corrective action).*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Revisions	*Not applicable to this permit application.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.705* • *Closure and post-closure costs shall be upgraded with each new application for permit renewal or in an increase of the cost estimate.* • *Cost estimate shall be adjusted annually during the following time period: the active life of the unit for closure, the active life and post-closure care period for post-closure, and until the corrective action program is completed in accordance with Section 811.326 for corrective action.*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Mechanisms	*Not Evaluated.*	*Title 35 Section 814.302(a)* *Title 35 Sections 811.706-811.715* • *The available mechanisms for financial assurance include: 1) a trust fund (811.710), 2) surety bond guaranteeing payment (811.711), 3) surety bond guaranteeing performance (811.712), 4) letter of credit (811.713), 5) closure insurance (811.714), 6) self insurance (811.715), 7) use of multiple financial mechanisms (811.707), 8) use of financial mechanism for multiple sites (811.708), and 9) trust fund for unrelated sites (811.709).*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria* *Title 35 Illinois Administrative Code Parts 810-815*		
Financial Assurance	*Not Evaluated*	*Title 35 Section 814.302(a)* *Title 35 Section 811.701* • *The owner or operator shall maintain financial assurance equal to or greater than the current cost estimate.*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Release	*Not Evaluated.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.702* • *The agency releases the owner or operator from financial requirements pursuant to 35 Ill. Adm. Code 813.403(b), or if alternative financial assurance is substituted.*		
		Complies	*May Comply*	*Does Not Comply*

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Application of Proceeds and Appeals	*Not Evaluated.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.703* • *The agency may enforce financial instruments or order the modification of closure and post-closure care plans.*		
		Complies	*May Comply*	*Does Not Comply*

APPENDIX B

DETAILED GROUND-WATER REVIEW AND GROUND-WATER QUALITY FIGURES

Consequently, not only are LALC and the IEPA continuing to address the efficacy of the NPDES permit issued for the 122nd Street Landfill, but LALC has also implemented a three-phase plan to improve storm water quality at the 122nd Street Landfill, with IEPA approval, pending further review of the NPDES permit.

INTRODUCTION

Background. On October 19, 1993, the Illinois Environmental Protection Agency called in the initial Application for SIGMOD for the Land and Lakes 122nd Street Landfill, in accordance with Title 35 Illinois Administrative Code 814. Land and Lakes submitted the application on May 13, 1994 and the Agency deemed the application incomplete on June 10, 1994 with a letter to Land and Lakes. Additional information was submitted on July 19, 1994 and the Agency deemed the application complete at that time. Based on conversations with the IEPA, Land and Lakes decided to pull the permit application from review and resubmit due to omissions from the application. Land and Lakes has apparently not included information about currently permitted under supplemental permits, which will be superseded by the permit issued under 35 IAC 814 Subpart C.

The revised application was submitted on February 17, 1995. This application is similar to the prior application except that additional information is included from the Supplemental Permit Application submitted on August 22, 1994.

Land and Lakes submitted the application to demonstrate compliance with Section 814 Subpart C, a section applicable to landfills which will continue operating after September of 1997. Because the facility remains open beyond 1997 but is not a new facility, it must demonstrate compliance with a selected portion of the regulations required for a new facility.

The SIGMOD is in compliance with the applicable regulations. LALC had numerous meetings with the IEPA between July, 1994 and February, 1995 regarding the 122nd Street Landfill SIGMOD. These meetings centered around the fact that all previously approved supplemental permits issued for the facility had to be addressed in the SIGMOD. As a result of these meetings, the IEPA requested that LALC withdraw, revise, and resubmit the 122nd Street Landfill SIGMOD on 17 February, 1995.

LANDFILL REGULATORY COMPLIANCE

The design and operation of the Land and Lakes 122nd Street Landfill, located at the intersection of 122nd Street and Stony Island Avenue within the City of Chicago, is regulated primarily by two sets of regulations. These two regulations are the City of Chicago Environmental Control Ordinance, and Title 35 Illinois Administrative Code Parts 810-815. Title 35 Illinois Administrative Code Parts 810-815 includes the recently enacted 40 CFR Parts 257 and 258 regulations (also called the federal "Subtitle D" regulation), since the Illinois regulatory program was approved for implementation of the federal regulations by the Environmental Protection Agency in January of 1994. Additional regulations, including additional OSHA Worker Safety Laws, Special Waste Handling Regulations and other RCRA guidelines also apply to the facility, but were not evaluated as part of this compliance assessment.

The SIGMOD is in compliance with the applicable regulations. In its review of LALC's SIGMOD, the City of Chicago Department of the Environment (DOE) erroneously claimed that the design and operation of the LALC 122nd Street Landfill is regulated not only by applicable state and federal regulations, but also by the City's Environmental Control Ordinance. This is not the case, and the DOE fails to inform the IEPA of a Judgement Order entered by the Circuit Court of Cook County in a lawsuit filed by LALC against the City of Chicago in 1994 captioned Land and Lakes Company, et al. v. Henry L. Henderson, et al., No. 94 CH 02093, Circuit Court of Cook County, County Department, Chancery Division (the "Land and Lakes case"). In that Judgement Order, the Circuit Court held that the IEPA, and not the DOE, had sole permitting and regulatory authority over waste management facilities, such as LALC's 122nd Street Landfill. A brief summary of that litigation follows.

On 7 March, 1994, the Chicago DOE denied LALC a permit to operate the 122nd Street Landfill on the grounds that the requested permit would have violated the City's purported moratorium on the expansion of existing sanitary landfills within City borders. On 8 March, 1994, LALC secured emergency relief from the court in the form of a temporary restraining order enjoining the Chicago DOE from denying LALC the operating permit and otherwise forcing LALC out of business,

pending discovery and a preliminary injunction hearing. In August 1994, the Honorable Judge Albert Green conducted a 10-day preliminary injunction hearing, and in September 1994, the Circuit Court entered a judgement in favor of LALC and against the City and Chicago DOE.

Specifically, on 27 September 1994, the Circuit Court entered a Judgement Order which ordered the Chicago DOE to issue LALC a permit to operate the 122nd Street Landfill, forthwith. In doing so, the Circuit Court found that the Chicago DOE acted arbitrarily and capriciously in denying LALC the permit to operate the 122nd Street Landfill and violated LALC's constitutional rights to due process. In addition, the Circuit Court held that the IEPA preempts the Chicago DOE in the permitting of LALC's 122nd Street Landfill. The Circuit Court also enjoined the Chicago DOE from imposing any permit conditions on the operation of LALC's 122nd Street Landfill which were inconsistent with the IEPA permits issued for that facility. Further, the Circuit Court found that the City's so-called moratorium ordinance against the expansion of existing landfills within City borders was unconstitutionally vague on its face and as applied by the City of Chicago and DOE. Also, the Circuit Court enjoined the City of Chicago and DOE from interfering with LALC's waste facilities located at 122nd Street in Stony Island. A copy of the Circuit Court's Judgement Order is attached for your review as Attachment A to this document.

Thus, the Chicago DOE claim that LALC's 122nd Street Landfill is regulated by the City of Chicago Environmental Control Ordinance is erroneous by virtue of the Circuit Court's Judgement Order. Significantly, nowhere in the Chicago DOE's review of LALC's SIGMOD does the Chicago DOE advise the IEPA of the recent litigation between the Chicago DOE and LALC and the Judgement Order entered by the Circuit Court of Cook County against the Chicago DOE in that litigation.

A compliance table, outlining the applicable regulations for the Land and Lakes 122nd Street Landfill from the City of Chicago and the State of Illinois has been prepared, and is included in Appendix A of this report. A brief summary of the potential compliance violations is also included in the following paragraphs. The areas in which the facility may not be in compliance include:

> *Waters/Wetlands of the U.S.* *The Wetland Map included in Appendix III-D of the Application for SIGMOD indicates that there are Wetlands located within the waste footprint of the facility. Land and Lakes indicates within the application that the areas were improperly classified excavations filled with stormwater, but provides no documentation from the U.S. Army Corps of Engineers indicating that the Corps' original assessment of the areas is incorrect, and that the Corps does not consider the areas to be jurisdictional wetlands.*

The SIGMOD is in compliance with the applicable regulations. The 122nd Street Landfill is not located within a wetland and is an operating sanitary landfill. Excavation is on-going for Cell VI. This area has already received approval from the City of Chicago Zoning Board of Appeals and an IEPA development permit, and the entire footprint of the landfill is an area where unregulated or "skip dumping" of wastes occurred prior to operation of the facility by LALC. Therefore, all areas of the facility contain waste and are not wetlands. Former active cell excavation areas that may have collected storm water for short periods of time during seasonal rainfalls no longer exist.

> *Unstable Areas.* *The landfill must be designed to achieve a specified factor of safety against bearing capacity failure and slope failure. The excavation design proposed for the new cell (Phase II Cell VI) does not satisfy this minimum factor of safety against slope failure. The cell was also not analyzed to ensure that the base of the excavation would be stable. Preliminary calculations performed by PEI indicate that the excavation could be susceptible to uplift conditions, making the excavation unstable.*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 4 through 8 of this document, the preliminary calculations performed by PEI concerning excavation base uplift stability are ultraconservative and inaccurate, and the preliminary calculations performed by PEI concerning excavation slope stability are inconsistent with good judgement, engineering practice, and the IEPA regulatory requirements. Stability calculations performed by GeoSyntec and the successful construction of the existing landfill at the site (including the recent successful construction of the first phase of Cell VI) confirm that: (I) the design of the Cell VI excavation satisfies the regulatory requirements

concerning stability; and (ii) the design is adequate from the standpoint of excavation bottom uplift stability and excavation side slope stability.

> *<u>Historic Areas.</u> The Illinois Historic Preservation Agency has notified Land and Lakes that a Phase I archaeological assessment is required for the site. Land and Lakes has not conducted the assessment, but has instead objected to the finding by the IHPA. No final documentation from the IHPA regarding their objection has been provided.*

Attachment III-B to the February, 1995 SIGMOD is a letter from Anne E. Haaker, Deputy State Historic Preservation Officer of the Illinois Historic Preservation Agency, to Mr. James Cowhey, dated July 18, 1994 stating:

> **"Our staff has reviewed the specifications under the state law and assessed the impact of the project as submitted by your office. We have determined, based on available information, that no significant historic, architectural, or archeological resources are located within the proposed project area.**
>
> **Please retain this letter in your files as evidence of compliance with the Illinois State Agency Historic Resources Preservation Act."**

This letter provides documentation that a Phase I archaeological assessment of the facility is not required, and that there are no significant historical resources within the project area.

> *<u>Water Quality Management Plan.</u> The site currently discharges stormwater runoff through three outfalls which are regulated by the NPDES permits. Monthly sampling reports, required by the permit and submitted to the IEPA, indicate that the facility has regularly exceeded the discharge limits specified within the permit. Land and Lakes claims that the exceedances are due to stormwater flow onto their property which contains high concentrations of the regulated parameters. No final conclusion from the IEPA has been provided within the permit application.*

As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address the storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

> *Explosive Gas Control.* *According to the Illinois regulations, in the event that monitored levels of explosive gases exceed maximum allowable levels, an active gas collection system must be installed. Land and Lakes does not commit to the installation of an active gas collection system under such circumstances, but states that steps will be taken to protect human health.*

The SIGMOD is in compliance with the applicable regulations. Attachment 17 (Section 6.6.5) and Attachment 18 (Section 6.7) to the February, 1996 Addendum to the SIGMOD list the actions that must be taken if any of the conditions listed in 35 IAC 811.311 (a)(1) -(a)(4) are met. As mentioned in Attachment 18 (Section 6.7) to the February 1996 Addendum to the SIGMOD, if any of the conditions listed in 35 IAC 811.311(a) are met, a landfill gas management system will be installed at the site. Protection of human health in accordance with 35 IAC 811.311(a) will be ensured. In addition, a design of an active gas collection system is included in an April, 1996 Addendum to the SIGMOD.

> *Access Requirements.* *The application does not indicate that site access can be restricted by the lockable gate at the entrance to the facility. Site access could be possible if the site is not fenced, and information about fencing or site access is not provided in the application, except that a lockable gate is provided.*

The SIGMOD is in compliance with the applicable regulations. The entire facility is completely fenced with a single, locked entrance gate and 24 hour security.

> *Surface-Water Requirements.* *As discussed previously, the facility regularly exceeds the maximum discharge limits established for stormwater by the NPDES permit.*

As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

> *<u>Record Keeping Requirements</u>. State regulations require that the owner maintain copies of reports and data, and the information be kept on the premises of the facility. Land and Lakes states that they will maintain the records, but that certain items too bulky to be kept at the facility will be stored at the corporate office, located outside the corporate limits of the City of Chicago. Inspections of the facility have shown that only a small amount of information is kept at the site and in some cases, copies of permits are not kept at the site.*

35 IAC 811.112, <u>Recordkeeping Requirements for MSWLF Units</u>, states:

> **"The owner or operator of a MSWLF unit shall record and retain near the facility in an operating record or in some alternative location specified by the Agency, the information submitted to the Agency pursuant to 35 IAC 812 and 183, as it becomes available."**

Copies of all permits are kept at the facility. The SIGMOD is in compliance with 35 IAC 811.112.

> *<u>Phasing of Operation</u>. As indicated previously, the proposed phasing of operations will create an excavation with potentially unstable slopes and bottom conditions.*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 4 through 8 of this document, the Cell VI excavation bottom and side slopes have been designed with appropriate safety factors that meet or exceed the regulatory requirements. The proposed phasing of operations will not create an excavation with potentially unstable slopes and bottom conditions.

Stability calculations performed by GeoSyntec, and the recent successful construction of the first phase of Cell VI at the site, confirm that the design of the Cell VI excavation is adequate with respect to bottom uplift stability and slope stability.

> *<u>Litter Control</u>. Land and Lakes is required by the Illinois regulations to conduct daily checks for litter accumulation, followed by daily collection and disposal of such litter. Land and Lakes indicates that the site will be checked and litter will be collected as necessary.*

Part III, Section 2.3 (j) of the February, 1995 Supplemental Permit Application states:

> **"As required by Section 811.1078(k) of 35 IAC, and as discussed in detail in Section 4.2.5.1 of Part IX: Operations Plan, LALC will patrol the facility daily for litter accumulation..."**

LALC patrols the facility on a daily basis, and collects and disposes of litter. The SIGMOD is in compliance with 35 IAC 811.107(k).

> *<u>Foundation Stability and Construction</u>. No information was provided which would indicate that the excavation base would be stable. Preliminary calculations performed by PEI indicate that the excavation base may be subject to hydrostatic uplift conditions.*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 3 through 8 of this Attachment, the preliminary calculations performed by PEI concerning excavation base uplift stability are ultraconservative and inaccurate. Stability calculations performed by GeoSyntec, and the recent successful construction of the first phase of Cell VI at the site, confirm that the design of the Cell VI excavation is adequate with respect to bottom uplift stability and slope stability.

> *<u>Leachate Collection System</u>. Land and Lakes has indicated within the Application for SIGMOD that the existing landfill does not have a leachate collection system, but has proposed one for the final cell developed. The proposed collection system will attempt to remove leachate by removing the cover from the eastern portion of the existing landfill and gravity draining leachate from the existing landfill. No documentation was provided to indicate whether this unconventional method would successfully remove leachate.*

The SIGMOD is in compliance with all applicable regulations. An effective leachate collection system that meets the requirements of 35 IAC 814.302(b)(1) exists at the facility. Attachment 7 (Part V, Section 4) to the February, 1996 Addendum to the SIGMOD provides a detailed analysis of the leachate collection and management system.

> *<u>Post-Closure Care</u>. The sampling schedules for leachate and landfill gas monitoring do not meet the minimum sampling schedules outlined by the Illinois regulations.*

The SIGMOD is in compliance with the applicable regulations. Attachment 16 (Section 6.6.4) to the February, 1996 Addendum to the SIGMOD states:

> **"The interior gas monitoring wells, the perimeter gas monitoring wells, and the ambient air monitoring will be sampled on a monthly basis for a minimum of five years after closure of the landfill. The on-site buildings will be continuously monitored for a minimum of five years after closure. The sampling frequency will be reduced to quarterly sampling intervals after the five year period."**

Attachment 9 (Section 6.5.2) to the February, 1996 Addendum to the SIGMOD states:

> **"Leachate levels will be measured quarterly in all of the leachate manholes. Quarterly samples from the leachate pond will be analyzed for BOD_5, COD, TSS, total iron, pH, any constituent listed in the facility's NPDES permit**

or required by a POTW, and the indicator constituents used for groundwater monitoring which are listed in Attachment 7 (Part V, Table V-6-6) to the February, 1996 Addendum to the SIGMOD. These parameters represent those required by Section 811.309(g)(2). The frequency of testing will be changed to once per year for any parameter not detected in the leachate."

The SIGMOD is in compliance with 35 IAC 811.309.

Test Liner. Land and Lakes claims that they do not need to construct a test liner, but have not provided the results of any field tests measuring the hydraulic conductivity of the liner. This information, if available, must be provided before the requirement for a test liner may be waived.

The SIGMOD is in compliance with the applicable regulations. 35 IAC 881.507 (b) states:

"Construction of a test fill or the requirements for an additional test fill may be omitted if a full-scale liner or a test fill has been previously constructed in compliance with this subsection and documentation is available to demonstrate that the previously constructed liner meets the requirements of subsection (a)"

LALC completed the construction of a portion of Cell VI. The installation of this lining system was in compliance with liner design and liner CQA requirements set forth in the SIGMOD and meets the requirements of 35 IAC 811.507(a). The initial portion of Cell VI is a full-scale liner that complies with the requirements of 35 IAC 811.507 (b).

Closure and Post-Closure Care Costs. The cost estimates for cover placement appear too low, and cost estimates were not included for quarterly leachate sampling, gas monitoring or leachate removal and treatment during post-closure.

The SIGMOD is in compliance with the applicable regulations. Cost estimates for leachate sampling and gas monitoring are included in Attachment 39 (Appendix VIII-F) to the February, 1996 Addendum to the SIGMOD.

GROUND-WATER QUALITY AND IMPACT ASSESSMENT REVIEW

Introduction. Ground water at the Land and Lakes 122nd Street Landfill exists in two primary units which require monitoring, the Shallow Sand and Fill Layer, and the confined bedrock aquifer. As part of the Application for SIGMOD, an applicant must demonstrate that the proposed (or existing) landfill will not cause ground-water quality beyond the zone of attenuation to exceed the applicable ground-water standards within 100 years after closure of the landfill unit. An applicant must also develop a monitoring system which will detect any discharge of contaminants from the facility prior to the contamination reaching the compliance boundary.

In order to develop this information, the IEPA has developed a specific set of guidelines which indicate the amount and type of data to be collected, and has also developed parameters on the appropriate modeling techniques by which to assess a facility's future impact on ground-water quality. On behalf of Land and Lakes, Geosyntec Consultants has developed the Ground-Water Impact Assessment (referred to as the Ground-Water Protection Evaluation Report by Geosyntec) within the Application for SIGMOD. Upon review of the Assessment and information used to prepare it, PEI has detected several areas of concern which do not comply with the existing regulations and guidance from the IEPA. This section briefly outlines the areas in which the data collection, modeling and proposed monitoring system have been found to be deficient, and a more detailed review of the specific areas is included at the beginning of Appendix B. Appendix B also contains the figures which indicate the historic ground-water quality at the site, labeled Figure B-1 through B-29.

Ground-Water Location and Flow. There are two water bearing strata identified at the site: the shallow sand and fill unit and the shallow Silurian bedrock. Based on the potentiometric maps prepared for the Application for SIGMOD and other ground-water elevation plots, the shallow ground water flows generally from east to west across the site. The upgradient shallow monitoring wells along the east side are GA1S, GA3S, GA4S, and GA5S. Shallow monitoring well GA2S, located along the north property boundary near the northeast corner of the site, is also upgradient to the landfill. The long term plots of the water elevations indicate a general increase historically in the water table near the northeast corner of the site (Figures B-1 through B-2). This may *be due to the construction of slurry walls to minimize inflow into the cells during excavation and construction.*

The shallow bedrock potentiometric levels indicate a significant historical flow toward the northwest and then a significant reduction in gradient and a flow direction to the east to southeast. This is reportedly the result of a change in pumping by an adjacent industrial ground-water user northwest of the site. This drastic change is illustrated in plots showing the ground-water elevation vs. time (Figures B-3 and B-4). The new gradient and direction is illustrated on the latest potentiometric surface maps prepared by the landfill in the SIGMOD Application (Figure B-5). It should also be noted that because of the decrease in gradient across the site, there is a reduction in the volume of water flowing under the site.

<u>Historical Ground-Water Quality</u>. Using the data provided to the Department of Law and additional information obtained through the Illinois Environmental Protection Agency (IEPA), the ground-water plots enclosed in Appendix B were prepared. These plots detail the historical ground-water quality at each monitoring point, and indicate if the water quality has changed at any location over time. The analysis also used water quality data and potentiometric surface maps prepared by the landfill in the application for SIGMOD of Permit (SIGMOD).

Both the shallow sand and fill and the bedrock aquifer have been monitored by the existing ground-water monitoring network for a limited number of indicator parameters over a period of several years. In addition to the limited routine monitoring, one-time samples from two of the wells screened in the shallow sand and fill were collected during the recent USEPA site inspection. These samples were analyzed for an extensive list of contaminants using stringent quality control procedures and documentation. Also, as part of the SIGMOD application preparation, the landfill collected ground-water samples from select monitoring wells screened in the shallow sand and fill unit, and the shallow bedrock aquifer. These samples were analyzed for an extensive list of parameters specified by the IEPA to determine initial water quality at the facility.

The chemical analyses of quarterly samples collected from monitoring wells screened in the shallow sand and fill indicate ground water of varying quality across the site (Figures B-6 through B-15). Also, a total of 10 samples were collected from 6 monitoring wells (GA1S, GA3S, GA4S, GA5S, R15S and R15S) located both hydraulically upgradient and downgradient of the landfill. These samples, collected as part of the SIGMOD application, were analyzed for an extensive list of contaminants (although the analyses for some wells were omitted from the Ground-Water Impact Assessment). The recent contaminant analyses also indicate the ground water at the site has been impacted. The ground-water contaminants consist of volatile organic compounds, semi-volatile compounds and heavy metals. These compounds were present in both ground-water samples flowing onto the site and off the site. In general, it appears the ground water in the shallow sand and fill flowing onto the site is more impacted than that flowing off the site. As result it appears the shallow sand and fill ground water at the Land and Lakes facility may have been impacted by offsite sources more significantly then from the on-site landfilling activities at this time.

The plots of the routine analyses of samples from the shallow bedrock ground-water monitoring wells generally show little contamination relative to the shallow sand and fill unit (Figures B-16 through B-25). Three of the twelve deep wells (GA4D, G11D, and G13D) were sampled and analyzed for an extensive list of contaminants as part of the SIGMOD application. No significant contaminants were detected in samples collected from these wells.

However, a review of the long term plots (Figures B-26 through B-29) indicate an increase in concentration in the presently downgradient well GA3D for residue on evaporation (ROE), chloride, sulfate and total organic carbon (TOC). Once the industrial pumping stopped adjacent to the site and well GA3D became a downgradient well to the landfill, these parameters all showed a constant increase, suggesting a potential leak from the landfill to the bedrock aquifer. In addition, the change in pumping has reduced the gradient across the site, creating less ground-water flow which might dilute contaminants released into the aquifer. Class 1 ground-water quality standards have been exceeded in these samples for ROE, chloride, and sulfate (there is no standard for TOC). Some chloride, TOC, and ROE (TDS) concentrations have already exceeded the maximum allowable predicted concentrations (MAPC) and the

Applicable Ground-Water Quality Standards (AGQS) proposed in the SIGMOD application. Elevated TOC concentrations may suggest the presence of organic contaminants which have not been analyzed in samples from GA3D.

<u>Ground-Water Protection Evaluation Report</u>. *The results of the review indicated the Report was deficient in several major areas. This section briefly outlines the major problematic areas with the report, and Appendix B provides further detailed information regarding the deficient areas and the applicable regulations.*

> *Hydrogeologic Input Data. Much of the hydrogeologic data used in the ground-water impact assessment was obtained from offsite sources (including total organic content values), overgeneralizations of limited on-site data (liner certification and laboratory hydraulic conductivity tests used to characterize the entire till) and derived from raw data not provided in the report (in-situ hydraulic conductivity test data). This data should be obtained from an on-site investigation and documented in the hydrogeologic report as specified in the regulations and IEPA guidance.*
>
> *Initial Ground-Water Quality Data. The initial ground-water quality data was collected using non-systematic methods which do not comply with the applicable regulations and IEPA guidance. Examples include the collection of data semi-annually instead of quarterly, the selected use of sampling data to exclude downgradient data in the sand and fill unit, and the collection of data in one time or semi-annual sampling events from only three wells in the uppermost aquifer. By limiting the use and selectively sampling the background water quality data, the existing site ground-water quality may not be representative of the true conditions. Using limited or upgradient well data in the shallow sand and fill unit creates a potentially poorer background water quality, since offsite contamination flowing onto the site appears to have a significant effect on water quality. Downgradient water quality is currently better than upgradient water quality, and if monitoring parameters are set to reflect only the upgradient conditions, a contaminant release from the landfill could go undetected.*

Physical and Chemical Characteristics of Leachate. No data was collected to determine the existing leachate head or to estimate the future leachate elevations in the existing areas of the landfill. Furthermore, most of the leachate samples included leachate ponds and other sampling areas only designated as north, south and middle. Samples obtained from these points are not representative of leachate quality within the landfill (having been removed from an open leachate pond subject to evaporation and precipitation) and/or were not analyzed for the complete list of parameters at detection limits specified in the regulations and guidance. The only two leachate samples which were properly collected from manholes and analyzed for the correct parameters and detection limits are inadequate to characterize the variability of the leachate, according to IEPA guidance.

Ground-Water Modeling Procedures. The ground-water modeling was not performed using an IEPA approved computer model (the modeling to demonstrate compliance did not use a computer model). The modeling failed to document that the landfill design will not result in an increase over background ground-water concentrations at the edge of the zone of attenuation for 100 years after closure, as required by the regulations.

Calculation of Maximum Allowable Predicted Concentrations and Acceptable Ground-Water Quality Standards. The leachate quality data tables used to calculate the MAPCs and AGQSs contained discrepancies with the chemical analyses results for several constituents (including nickel and xylene). The application used statistical methods for evaluating the leachate and initial water quality data with the ground-water modeling output which is inconsistent with the regulations and IEPA guidance (using PQLs as background quality instead of initial water quality data.

Ground-Water Monitoring Well Locations and Construction. The proposed downgradient ground-water monitoring well locations are inadequate to detect a release in the shallow sand unit and the shallow bedrock aquifer in accordance with the regulations and IEPA guidance. The monitoring program for the shallow sand and fill unit is not proposed to be updated to comply with the new *requirements, even though the unit remains a potential contaminant migration pathway. An updated ground-water monitoring network to comply with the new requirements is proposed along the south side of the landfill in the shallow bedrock aquifer. However, the latest potentiometric map for the aquifer shows ground-water flow toward the southeast (Figure B-5), indicating that at least a portion of the east side of the landfill is also downgradient. As a result, the monitoring network must also be updated along the east side of the landfill. Also, recent test borings were constructed through the in-situ low permeability zone which were apparently backfilled with cuttings. These borings may have compromised the unit as a low permeability layer and violated State regulations (35 IAC 811.316).*

<u>Conclusion</u>. The review indicates the ground water in the shallow sand and fill unit has been impacted by an offsite source of contamination. Based upon the existing data, it is not possible to determine the extent of contamination in this unit as result of the Land and Lakes Landfill. The uppermost aquifer was identified in the SIGMOD application as the shallow bedrock consisting of Silurian Age dolomite. The ground-water quality in the aquifer does not appear to have been impacted by any offsite sources of contamination. However, the ground-water flow direction and gradients in the aquifer have been impacted by adjacent industrial pumping. Since the pumping has stopped and the new gradients and ground-water flow directions have stabilized, some of the previously upgradient wells are now downgradient. The ground-water quality data collected since the gradients have stabilized from downgradient monitoring well GA3D indicates ground water may have been impacted by the existing landfill (See Figures B-26 through B-29)

The review of the ground-water sampling, hydrogeologic data collection and Ground-Water Impact Assessment preparation has also revealed many serious deficiencies which cloud the validity of the Assessment's conclusions. In order to have a truly representative model of the potential future conditions at the site, SIGMODs would need to be made to the existing model, both in input parameters and modeling methods used. The current Ground-Water Impact Assessment and monitoring program would need to be modified significantly, and it is uncertain if the modifications would result in a system which can meet the requirements of 35 IAC Section 814 Subpart C.

The SIGMOD is in compliance with applicable regulations. Ground-water impact in the shallow sand and fill layer and in the confined Silurian dolomite bedrock aquifer was evaluated by performing constituent transport migration simulations using the models POLLUTE and MIGRATE. The simulations were performed to evaluate ground-water impacts within 100 years after closure of the landfill unit. As discussed in Attachment 7 (Part V, Section 5.10) to the February, 1996 Addendum to the SIGMOD, the landfill will not cause exceedance of ground-water standards for the ground water beyond the zone of attenuation during 100 years after closure. A detailed discussion on ground-water flow directions in the shallow sand and fill layer and the confined Silurian dolomite bedrock aquifer is contained in Attachment 7 (Part V, Sections 2 and 5) to the February, 1996 Addendum to the SIGMOD.

Historical Ground-Water Quality

The SIGMOD is in compliance with applicable regulations. A complete discussion of historical ground-water quality is presented in Attachment 7 (Part V, Section 3 and Figures V-3-1 through V-3-10) to the February, 1996 Addendum to the SIGMOD. Specifically, references to increasing trends in monitoring well GA3D are misplaced. Monitoring well GA3D is not located adjacent to or downgradient of waste disposal cells of the 122nd Street Landfill that existed when the initial increase in concentrations were observed. Consequently, it is unlikely that concentration increases reflected operations at the 122nd Street facility. However, monitoring well GA3D is located adjacent to the Auburn Superfund Site and the Antonson Oil Lagoon Superfund Site, and is also located hydraulically downgradient of the Paxton Landfill, suggesting that the observed increases likely reflects the influence from these other potential sources. Monitoring well GA3D and GA3S were abandoned and replaced in January 1995 with monitoring wells RA3D and RA3S.

Hydrogeologic Input Data

The SIGMOD is in compliance with applicable regulations. Most of the hydrogeologic data used in the ground-water impact assessment is obtained from on-site sources. Attachment 7 (Part V, Section 5.6) to the February, 1996 Addendum to the SIGMOD discusses the hydrogeologic input data used for the ground-water impact assessment.

Initial Ground-Water Quality Data

The SIGMOD is in compliance with applicable regulations. Ground-water sampling was conducted quarterly. Updated sample results are found in Attachment 7 (Part V, Section 6, Appendix V-6-A) to the February, 1996 Addendum to the SIGMOD. The background wells (GA1S, GA4S, GA5S, and RA3S) used to estimate initial water quality for the Dolton Sand and Fill Unit were selected based on regional and site ground-water flow directions.

Chemical Characteristics of Leachate

The SIGMOD is in compliance with applicable regulations. Leachate constituents do not reach the Silurian dolomite aquifer. This is discussed in Attachment 7 (Part V, Section 5.10) to the February, 1996 Addendum to the SIGMOD. Therefore, leachate analysis is not germane with respect to ground-water modeling.

Ground-Water Modeling Procedures

The SIGMOD is in compliance with applicable regulations. Ground-water modeling was performed using the IEPA approved constituent migration models, POLLUTE and MIGRATE. The modeling documented that the concentrations of the leachate constituents will not increase above background ground-water concentrations at the edge of the zone of attenuation for 100 years after closure.

Attachment 7 (Part V, Sections 5.2.20, 5.3 and 5.10) to the February, 1996 Addendum to the SIGMOD discuss the models and present the modeling results.

Calculation of MAPCs and AGQSs

The SIGMOD is in compliance with applicable regulations. The calculation of MAPCs and AGQSs are discussed in Attachment 7 (Part V, Section 6.3.2.3 and Tables V-6-4 and V-6-5) to the February, 1996 Addendum to the SIGMOD.

The MAPCs and AGQSs were determined as follows: (i) if the constituent was detected in ground water, the MAPC/AGQSs were equal to the upper 99% confidence limit of the pooled upgradient data; (ii) if the constituent was not detected in ground water, the MAPC/AGQSs were equal to the practical quantitation limit (PQL); and (iii) if the constituent was not detected in the ground water and there was no established PQL, no MAPC/AGQSs were determined.

A complete discussion of the surrogate modeling is discussed in Attachment 7 (Part V, Section 5.9 and Tables V-5-6 and V-5-7) to the February, 1996 Addendum to the SIGMOD. The concentration ratios used for surrogate modeling were calculated using the background water quality concentrations (when constituents were detected in ground water) or the PQL (when constituents were not detected in ground water).

Ground-Water Monitoring Well Locations and Construction

The SIGMOD is in compliance with applicable regulations. A discussion of the ground-water monitoring program is provided in Attachment 7 (Part V, Section 6.2) to the February, 1996 Addendum to the SIGMOD.

STABILITY REVIEW OF PROPOSED CELL VI PHASE II

Introduction. One of the major parameters governing landfill design is stability, both of the completed landform slopes and also the sidewalls and floor of the initial excavation. As part of the design of any new cell or new landfill, the potential for instability must be evaluated prior to the start of construction to ensure several factors, including 1) Worker Safety, 2) Liner Integrity, and 3) Final Landform Stability.

Stability can be divided into several areas of concern, including 1) hydrostatic uplift (bottom instability) of the floor of any excavation, and 2) slope stability of the excavation sidewalls and the completed landfill form. Land and Lakes has provided stability analyses prepared by Geosyntec Consultants within the Supplemental Permit Application for Proposed Cell VI of Phase II (Supplemental Permit Application) of the 122nd Street Landfill. The stability analyses were the subject of an extensive review. Data used to conduct the review was obtained directly from the Supplemental Permit Application, as well as the Application for SIGMOD. The results of the review, including areas of concern, are outlined within the following sections.

<u>Hydrostatic Uplift</u>. Hydrostatic uplift can occur when confined ground-water pressures exert a larger upward pressure on the overlying soils than the weight of the soils acting downward. If the upward pressures exceed the downward pressures, the integrity of the soils above the bedrock aquifer can be compromised. Uplift may vary from a slight vertical rise in the soil layer (this rise can occur if the soils are plastic such that they may bend but not break) to a complete blow-in during which the soils crack and water may flow into a cell. With a landfill liner (especially a liner which relies on in-situ clay material without recompaction, i.e. the bottom liner at Land and Lakes 122nd Street), uplift can cause secondary features in the liner (cracks and microfissures) which will increase the hydraulic conductivity of the low permeability soils, potentially beyond the maximum regulatory limits. Depending on the extent of the uplift (which may include cracking), the soils may not reconform to original hydraulic conductivities once waste is added to the top of the liner.

Calculations for the likelihood of uplift are usually expressed in a term called a factor of safety. The factor of safety is a ratio of the downward forces (the weight of the soil) to the upward forces acting at the base of the confining layer (the hydrostatic pressure within the aquifer). A factor of safety less than one indicates that conditions exist such that some form of uplift is likely to occur. Excavations within soils where uplift conditions could jeopardize excavation operations are typically designed with a factor of safety exceeding approximately 1.2, and a factor of safety greater than one is needed to provide an error margin in the event of undocumented conditions, a rise in water levels during construction, or local abnormalities within the excavated material. Geosyntec Consultants did not include calculations determining the factor of safety against hydrostatic uplift in the SIGMOD Permit Application. In order to determine if hydrostatic uplift was of concern, Patrick Engineering Inc. performed calculations using boring logs, water levels, cross sections, and material properties included in the Supplemental Permit Application for the proposed Cell VI of Phase II. Several locations within the excavation were evaluated based on location specific data obtained from the Supplemental Permit Application. According to the attached calculations, proposed site development and geologic conditions exist where the factor of safety against uplift is below one, indicating the probability that uplift will occur and that liner integrity could be jeopardized. Uplift conditions were analyzed at four locations for the maximum excavation depth and excavation depth after liner construction (in which three feet of clay have been added over the excavation base grades). The following table summarizes the calculated factors of safety against uplift:

FACTOR OF SAFETY SUMMARY FOR HYDROSTATIC UPLIFT		
Description of Conditions	*F.S. After Excavation*	*F.S. After Liner Placement*
Drawing 4 of 23[1] and boring GA1D[2]	*1.09*	*1.21*
Section A-A[1] (Fig.III-2)[1] & boring GA2D[2]	*0.92*	*1.04*
Landfill Section A (Drawing 8 of 23)[1]	*0.75*	*0.88*
Landfill Section B (Drawing 8 of 23)[1]	*0.51*	*0.65*

Notes:
1. *Drawings and figures developed by GeoSyntec Consultants.*
2. *Boring logs included in the supplemental permit application developed by GeoSyntec Consultants.*
3. *Post excavation conditions are more critical than post liner placement conditions.*

While one may hypothesize that bottom stability could not be of concern since previous excavations at the site have been completed without documented stability problems, it is noted that the piezometric levels have increased significantly in the past four years due to the decrease in aquifer pumping by nearby industrial users. In addition, the planned excavation extends much deeper than previous excavations, resulting in a thinner (and lighter) confining layer acting downward. The higher uplift pressures caused by increased water levels in combination with the lighter confining layer results in the concern over bottom stability. For further information on the calculations and information utilized for the review, refer to Appendix C.

Slope Stability. The slopes at a waste disposal unit must be designed to stand freely without failing. Slope failure occurs when a slope is constructed too steep to support itself, and occurs for a variety of reasons. The height or depth of the slope, the angle of the slope, the properties of the soil with which the slope is constructed, and the ground-water or leachate levels all affect the stability of a slope. As with bottom stability and uplift, excavation sideslopes must be stable to protect workers conducting the excavation and also to protect the integrity of the sideliner. On a finished landfill, a slope must be stable to ensure the integrity of the final cover, which keeps rainfall from infiltrating the waste and prevents any landfill gas from uncontrolled venting to the atmosphere.

Three different slope geometries will exist in Cell VI of Phase II after excavation activities are complete. The first slope will have a slope of 1 foot horizontal to 1 foot vertical (1:1) and will be located on the west side of Cell VI, along the side of the previously developed landfill section. The second slope will be 2 feet horizontal to 1 foot vertical (2:1) along the east side of Cell VI, along the eastern facility boundary. The third slope will be 2:1 along the north side of Cell VI and the northern facility boundary. The third slope is adjacent to the Paxton Landfill, which has an above-grade 3:1 slope and could act as a surcharge on the excavated slope.

GeoSyntec Consultants conducted slope stability analyses for the west and east slopes of the excavation, and the analyzed sections were labeled Section 1 and Section 2, respectively. These analyses are included in Appendix III-D of the Supplemental Permit Application. GeoSyntec Consultants utilized the computer program XSTABL with the modified bishop method of slices for circular failure surfaces to conduct the analysis. The likelihood of a slope failure is again generally expressed in terms of a Factor of Safety, with a factor less than one indicating that conditions exist which would cause a slope failure. General practice is to provide a Factor of Safety significantly greater than 1.0, and Title 35 Illinois Administrative Code, Section 811.304(d) mandates, "The waste disposal unit shall be designed to achieve a Factor of Safety against slope failure of at least 1.5 for static conditions and 1.3 under seismic conditions." These requirements are consistent with sound engineering practices.

During a cursory review of the slope stability analysis at the request of the City, PEI noted several apparent discrepancies between field conditions and model conditions. These discrepancies, if included in the model, could reduce the factor of safety for slope stability at the site. Among the initial discrepancies noted by PEI were:

- *The omission of the water table and bedrock piezometric levels from the analysis.*
- *The omission of the Dolton Sand Layer from the model prepared for the analysis.*
- *Limited search area for potential failure planes.*
- *Lack of stability analysis for the northern slope of the excavation.*

After noting these initial discrepancies, PEI then performed independent modeling of select slopes to determine if the addition of the missing information would change the results of the analysis significantly. Input parameters for the PEI models were obtained from the data included in the Supplemental Permit Application, and the models relied on the same assumptions used within the GeoSyntec Consultants models whenever possible, except for the areas in which deficiencies were noted. Note that certain assumptions may vary, however, because GeoSyntec Consultants did not include the model input data with their permit application, the only provided output graphs which contain limited information regarding model input data (complete input and output data for the PEI model is included in Appendix C). Because of the modeling methods and input parameters, the PEI model should not be considered a final and comprehensive analysis of site conditions, but instead provides an indication if certain discrepancies detected within the GeoSyntec model represent a potentially serious concern. PEI did not analyze nor does it necessarily concur with GeoSyntec's interpretation of site hydrogeologic conditions and soil properties, and has not conducted the extensive background documentation required for a comprehensive slope stability analysis.

The PEI model, like the GeoSyntec Consultants Model, utilized the modified Bishop method of slices for circular failure surfaces, within a model called PCSTABL4. The PEI analysis examined conditions on two sections, and conducted a total of four models with varying input conditions. The first three models were developed to analyze a cross-section similar to GeoSyntec's Section 1 (the excavation slope along the existing landfill). The fourth model examined the excavation along the north excavation slope (an area not modeled by GeoSyntec), labeled as Section 3. The conditions of the four models were:

> *Section 1, Model 1. The first model was designed to analyze the stability conditions of the excavation next to the existing landfill, and also to ensure that the PEI model and the GeoSyntec model were providing similar output values. The conditions modeled are very similar to GeoSyntec's analysis for Section 1, except that the PEI model included the Dolton Sand Layer near the top of the excavation. Initially, the PEI model detected more critical failure surfaces in locations other than the failure planes indicated on the GeoSyntec model, and*

the search range had to be narrowed on the PEI model to force a failure to occur near the location of the GeoSyntec failures. Once the location of the failure plane was artificially specified within a fixed range, the model then generated the most critical failure plane for the range specified. The resulting Factor of Safety for the critical failure surface (as identified by GeoSyntec) was 1.27, compared to the 1.38 obtained by GeoSyntec.

Section 1, Model 2. The second model analyzed conditions on the same section utilizing the same cross-section developed for the first model, but added the ground-water level within the overburden and the bedrock piezometric level. The limits defining the location of the failure plane were not adjusted from the first model, again forcing the failure to occur at the same location as the GeoSyntec model. The addition of ground-water conditions substantially reduced the Factor of Safety to 1.06.

Section 1, Model 3. The third model used the same cross section developed for the first and second model, and also used the same ground-water and piezometric levels as the second model. Instead of limiting the failure plane search range, however, the failure limits were adjusted to allow the model to select the most critical failure plane, providing a more global assessment of slope stability. The resulting failure plane was located near the toe of the 1:1 slope, which was expected. The Factor of Safety for this failure plane was 0.29.

Section 3, Model 4. The final model examined the slope stability of the northern excavation slope, and was developed from the topographic, hydrogeologic and geotechnical data located in the Supplemental Permit Application. No analysis of this excavation slope was conducted by GeoSyntec, and the model was constructed to determine if the proposed excavation slope potentially be unstable. The range for the failure surface was defined to conduct a global analysis of the entire slope, extending off-site onto the Paxton Landfill, as necessary.

The factors of safety for Section 1 and Section 3 are summarized in the following table.

FACTOR OF SAFETY SUMMARY FOR SLOPE STABILITY	
Description of Conditions	*Static Factor of Safety (F.S.)*
Illinois Regulatory Standard[1].	*1.5*
GeoSyntec's static F.S. for Section 1.	*1.38*
PEI's static F.S.[2] *for the First Analysis of Section 1.*	*1.27*
PEI's static F.S.[2] *for the Second Analysis of Section 1.*	*1.06*
PEI's static F.S. for the Third Analysis of Section 1.	*0.29*
PEI's static F.S. for Section 3.	*0.7*
Notes: *1. Title 35 Ill. Admin. Code, Part 811, Section 304(d).* *2. Failure limits were specified to a limited range, and do not represent the minimum Factor of Safety for the modeled cross-section.*	

Further information, including background information and calculations, is located in Appendix C.

Slope Stability Under Seismic Conditions. The preceding analyses were performed for static conditions. In addition to static analyses, seismic conditions need to be modeled to verify that slope stability will not occur should this area be subjected to earthquake forces. Intuitively, the addition of pseudostatic forces will decrease the Factor of Safety, and because the static Factors of Safety are already below the minimum regulatory standard Factor of Safety of 1.3 for seismic conditions, the slopes as analyzed will not satisfy the safety requirements as specified in 35 Illinois Administrative Code 811.304(d).

Summary and Concerns. The following concerns have been noted during the review of the hydrostatic uplift and slope stability calculations prepared by GeoSyntec Consultants for the 122nd Street Landfill.

1. *No uplift calculations were prepared to verify bottom stability. Analyses conducted using data contained in the SIGMOD Permit Application indicate that the potential for hydraulic uplift exists at the site if excavation is conducted in accordance with the permit drawings.*

2. *GeoSyntec did not include the Dolton Sand Layer in its stability evaluation of Section 1.*

3. *GeoSyntec has excluded the shallow water table and bedrock potentiometric surface in their slope stability analyses. Based on analyses performed for this report, the Factor of Safety for the slope is reduced when the water surfaces are included in the analyses, and the resulting Factors of Safety are well below the design Factors of Safety associated with general engineering practice.*

4. *The long term Factors of Safety for Section 1 presented by both GeoSyntec and PEI are below the regulatory standard of 1.5 (Title 35 Illinois Administrative Code, 811.304(d).*

5. *The north excavation slope, modeled by PEI as Section 3, was not modeled by GeoSyntec Consultants. Based on the PEI slope stability analysis, conditions may exist where a slope failure may occur.*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 3 through 8 of this Attachment, the stability of the Cell VI excavation bottom has been demonstrated by uplift stability calculations and has been confirmed by actual full-scale construction (the recent first phase of Cell VI). In addition, the slope stability analyses presented by PEI for the Cell VI excavation are completely irrelevant because: (I) the PEI analyses use long-term drained strength parameters for short-term loading conditions; (ii) the PEI analyses neglect the shear strength of the soil, which is not consistent with engineering practice; (iii) the analyses assume pore-water conditions that are not consistent with field conditions; and (iv) the results of the analyses are inconsistent with construction practice.

During the design of Cell VI, GeoSyntec considered the stability of all slopes present (including the north slope of the excavation). Consistent with generally accepted engineering practice, only the results for the most critical slopes (i.e., those with the lowest factors of safety) are presented in the SIGMOD. As discussed above, because the excavation side slopes for Cell VI will not be exposed over the long term (they will be fully supported over the long term because of waste placement), only short-term stability analyses are relevant for the excavation side slopes. The short-term stability calculations presented in the SIGMOD demonstrate that even for the most critical case the Cell VI excavation side slopes have a minimum factor of safety of 1.8 under static conditions and a minimum factor of safety of 1.5 under earthquake conditions. These safety factors exceed the minimum regulatory requirements presented in 35 IAC Section 811.304(d).

CONSTRUCTED LINER CONDITIONS

The excavation for the Land and Lakes 122nd Street Landfill passes through the Dolton Sand Layer before keying into the less permeable tills. Because the sand layer is a highly permeable unit which is unsuitable for a liner material, the IEPA has required Land and Lakes to recompact ten feet of clay on the sidewalls between the sand layer and the waste. The supplemental permit issued in October of 1987 for the increased height and expansion eastward required:

> *Prior to placing waste material in an existing cell which has never received waste, or in an area of horizontal or vertical expansion of an existing cell, an independent registered professional engineer shall certify that the floor and/or sidewall liner or seal has been developed and constructed in accordance with approved plans and specifications. The certification procedure shall require that the independent registered professional engineer acquire the data necessary to determine that there is existing (in situ) at least ten (10) feet of clay with a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec. If this clay liner is constructed, the ten (10) foot thick soil material shall be compacted to a minimum density of 95% Standard Proctor (ASTM-D698) compacted at or above optimum moisture content, to produce a homogeneous mass that has a hydraulic conductivity of at least 1 x 10^{-7} cm/sec. Such data and certification shall be submitted to the Agency prior to placement of waste in the areas referenced above. No wastes shall be placed in those areas until the Agency has approved the certification and issued an Operating Permit.*

and also:

> *Any permeable sand or silt seam encountered in either the side walls or in the bottom of the excavation shall be over excavated and sealed with a minimum thickness of ten (10) feet of clay that has a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec., compacted to a density of 95 percent Standard Proctor compacted in 6" to 8" lifts (loose thickness).*

Note that the requirement of a "hydraulic conductivity of at least 1 x 10^{-7} cm/sec" in the first excerpt appears to be a typographical error. The original development permit (1978-2-DE) contained similar requirements, but required only a registered professional engineer to certify the excavation, not an independent engineer.

Essentially, Land and Lakes has been required since the start of landfill construction to submit the testing data from the recompacted sidewall liners and the borings to verify ten feet of in-situ clay. Despite this consistent policy which has been in effect since the development of the original landfill, the testing information for the sidewall liners and in-situ bottom liners is not readily available or conclusive. Much of the testing information obtained for this report through the documents provided by Land and Lakes, and also the IEPA file review, is only partially complete. The testing results for many locations do not meet the minimum compaction and hydraulic conductivity standards established within the permits, and no further correspondence was discovered which might indicate if deficient areas were repaired after testing. Testing results, and a figure detailing the approximate location of the areas tested, are located in Appendix D.

Table D1, located in Appendix D, contains the date when the sidewall certification and boring data was provided to the IEPA (or Land and Lakes, if no submittal to the IEPA was located), the consultant who conducted the testing, a brief description of the tests conducted, and any comments noted about the testing. When available, the date and permit number of the IEPA acceptance permit (usually an operating permit) was also added located in the table.

As can be seen on the table, most of the data provided to the IEPA indicated that the liner was not constructed in accordance with the permit requirements and should have then been reconstructed and retested.

Figure 1 of Appendix D indicates the approximate location of each liner certification, and breaks the certification into two units, 1) sidewall liner certification and 2) cell certification, which includes borings through the base of the cell. With the exception of the southern portion of the landfill and a portion of the northeast side of the original landfill, data has been collected for the sidewalls of the landfill. In the *southeast portions of the landfill (the areas more recently developed, certification data was developed which included borings and sidewall information (as outlined).*

Conclusion. Land and Lakes has been required to certify the recompacted sidewall liners over the sand and fill layers, yet the information provided indicates that certain areas of the recompacted clays are not in compliance with permit conditions. The lack of properly constructed and certified liners may bring into question the validity of the Ground-Water Impact Assessment which is based on these liner certifications. Also, the integrity of the liners is questionable due to the lack of proper construction and certification.

The SIGMOD is in compliance with the applicable regulations. All documentation regarding liners previously constructed at the 122nd Street facility has been submitted in the form of operating permit applications to the IEPA. Operating permits cannot be issued by the IEPA unless liners are constructed in accordance with IEPA development permits. An operating permit was obtained for every portion of the site that has received waste to date. Therefore, the IEPA has previously determined by the issuance of operating permits that all prior liner construction is in compliance with appropriate permit conditions.

SURFACE WATER

Surface water discharge from the 122nd Street Landfill has exceeded permitted levels regularly, as shown on the compliance table located in Appendix E.

As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been initiated by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

The Land and Lakes Company has stated on virtually all of the cover letters accompanying the monthly monitoring reports into the IEPA that the high levels and permit exceedances are due to contaminated stormwater flowing onto the 122nd Street Landfill Site. On several occasions, Land and Lakes collected samples of the "background" stormwater concentrations flowing onto the site, and indicated that the concentration of the stormwater flowing onto the site did not exceed the concentrations of parameters in stormwater flowing off-site. The dates when background concentrations exceeded NPDES discharge outfall concentrations have been denoted on the table in Appendix E.

As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

The results or utility of this "background" sampling is uncertain for several reasons, including: 1) the locations of the sampling points are never identified, and 2) while the background sampling values may exceed the discharge concentrations for certain parameters, the NPDES discharge concentrations exceed background values for other parameters. Without the locations identified, it is unclear if the same location is *regularly sampled. Furthermore, since the sampling does not conclusively demonstrate that the background concentrations do not exceed the NPDES discharge concentrations for all parameters, the statement that all permit exceedances are due to high "background" concentrations is not accurate. The fact remains that the discharge exceeds the permitted conditions.*

As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

APPENDIX A

REGULATORY OVERVIEW				
Standard	**Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)**	**Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815**		
Location Restrictions				
Wetlands/Waters of the U.S.	The Wetland Map provided in Appendix III-D indicates that there are wetlands located within the waste footprint. Comments: Sign off should be provided by the Army Corps that the areas are not considered jurisdiction wetlands.	Title 35 Section 814.302(a) Title 35 Section 811.102(e) • The facility shall not cause a violation of Section 404 of the Clean Water Act See Section 811.102(d) See Section 811.103		
		Complies	May Comply	Does Not Comply

The SIGMOD is in compliance with the applicable regulations. The 122nd Street Landfill is not located within a wetland and is an operating sanitary landfill. Excavation is on-going for Cell VI. This area has already received approval from the City of Chicago Zoning Board of Appeals and an IEPA development permit, and the entire landfill footprint is an area where unregulated or "skip dumping" of wastes occurred prior to operation of the facility by LALC. Therefore, all areas of the facility contain waste and are not wetlands. Former active cell excavation areas that may have collected storm water for short periods of time during seasonal rainfalls no longer exist.

REGULATORY OVERVIEW		
Standard	***Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)***	***Illinois Landfill Criteria*** ***Title 35 Illinois Administrative Code Parts 810-815***
Fault Areas	*The slope stability calculations included for the excavation indicate a Factor of Safety below the required 1.5 minimum for static conditions. Further analysis revealed the absence of certain conditions and improper assumptions regarding the slope stability model.* *No documentation verifying the excavation stability against uplift was included with the Application. Calculations conducted by PEI indicate that conditions exist which may cause the bottom of the proposed excavation to be unstable.*	*Title 35 Section 814.302(a)* *Title 35 Sections 811.304 and 811.305* • *Federal Regulations ban the location of new MSWLF units and lateral expansions within 200 feet of faults that have displaced during the Holocene Epoch (10,000 years), without the approval of the State.* • *The potential of earthquake and blast-induced liquefaction and its effect on the stability and integrity of this unit shall be considered and taken into account in the design.* • *The material beneath the new units and MSWLF units shall have sufficient strength to support the weight of the unit during all phases of construction and operation.* • *The solid waste disposal unit for new units and MSWLF units shall be designed to achieve a factor of safety against bearing capacity failure (2.0 static, 1.5 seismic) and slope failure (1.5 static, 1.3 seismic) for both long-term (in tens or hundreds of years) and short-term (over the design period of the facility) conditions expected at the facility.*
Seismic Impact Zones		*See C2 and C3 - Sections 811.304 and 811.305*
Unstable Areas		*Complies* | *May Comply* | *Does Not Comply* (shaded)

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 4 through 8 of this document, the stability of the Cell VI bottom excavation has been demonstrated by uplift stability calculations and has been confirmed by actual full-scale successful construction (the recent first phase of Cell VI). In addition, the slope stability analyses presented by PEI for the Cell VI excavation are completely irrelevant because: (I) the PEI analyses use long-term drained strength parameters for short-term loading conditions (the slopes will be fully supported by waste); (ii) the PEI analyses neglect the shear strength of the soil, which is not consistent with engineering practice; (iii) the analyses assume pore-water conditions that are not consistent with field conditions; and (iv) the results of the PEI analyses are inconsistent with construction practice. The Cell VI excavation side slopes are not long-term slopes since they will be fully supported through the placement of waste long before conditions consistent with long-term slope stability analyses are operative.

During the design of Cell VI, GeoSyntec considered the stability of all slopes present (including the north slope of the excavation). Consistent with generally accepted engineering practice, only the results for the most critical slopes (i.e., those with the lowest factors of safety) are presented in the SIGMOD. As discussed above, because the excavation side slopes for Cell VI will not be exposed over the long term (they will be fully supported over the long term because of waste placement), only short-term stability analyses are relevant for the excavation side slopes. The short-term stability calculations presented in the SIGMOD demonstrate that even for the most critical case the Cell VI excavation side slopes have a factor of safety of 1.8 under static conditions and a minimum factor of safety of 1.5 under the considered earthquake conditions. These safety factors exceed the minimum regulatory requirements presented in 35 IAC Section 304(d).

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Historic and Natural Areas	*Land and Lakes had not received documentation from the State Historic Preservation Office that the facility does not threaten a historic site or archaeological site. The IHPA has required a Phase I archaeological assessment. (Appendix III-B)* *Land and Lakes has received documentation from the Illinois Nature Preserves Commission indicating that no nature preserves exist on the site. (Appendix III-C)*	*Title 35 Section 814.302(a)* *Title 35 Section 811.103©* • *The facility shall not post a threat of harm or destruction to features of which a: 1) Historic Site, 2) Archaeological Site, 3) Natural Landmark, or 4) Natural Area was designated.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. Attachment III-B to the February, 1995 SIGMOD is a letter from Anne E. Haaker, Deputy State Historic Preservation Officer of the Illinois Historic Preservation Agency, to Mr. James Cowhey, dated July 18, 1994 stating:

> **"Our staff has reviewed the specifications under the state law and assessed the impact of the project as submitted by your office. We have determined, based on available information, that no significant historic, architectural, or archeological resources are located within the proposed project area.**
>
> **Please retain this letter in your files as evidence of compliance with the Illinois State Agency Historic Resources Preservation Act."**

This letter provides documentation that a Phase I archaeological assessment of the facility is not required, and that the Illinois Historic Preservation Agency has found that there are no significant historical resources at the site. The 122nd Street facility is in compliance 35 IAC 811.103 (c).

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Water Quality Management Plan	*The site is currently operating under an approved NPDES permit but has not been able to meet all of the permit conditions.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.102(f)* • *The facility shall not cause a violation of any areawide or statewide water quality management plan for non-point source pollution.*		
		Complies	*May Comply*	*Does Not Comply*

: SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Roads and Highways	*The facility is not located within 500 feet of a township or county road or state or interstate highway. The facility is screened by an approximately 8-foot-high wood fence on the southern boundary. (Page IV-4)*	*Title 35 Section 814.302(a)* *Title 35 Section 811.302©* • *A facility operating beyond 1997 that is located within 500 feet of a township or county road or state or interstate highway shall have its operations screened from view by a barrier no less than 8 feet in height.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The 122nd Street facility is not located within 500 feet of the right-of-way of a township or county road or a state or interstate highway and is in compliance with 35 IAC 811.304(c).

REGULATORY OVERVIEW		
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*
Explosive Gas Control	*In the event that the gas concentrations indicated within Section 811.311 are exceeded, the IEPA will be notified and steps will be taken to protect human health.* *Comment: In the event that the methane concentrations exceed the specified levels, a gas management system must be installed.*	*Title 35 Section 814.302(a)* *Title 35 Section 811.311* • *A landfill gas management system is required for putrescible waste landfills if: 1) methane is detected at a concentration of 50% the LEL in the air, below the ground surface, or at the point of compliance; 2) methane greater than 25% the LEL is detected in any building on or near the facility; 3) odors are detected beyond the property boundary; or 4) leachate is recycled.* • *Gas venting systems shall be utilized only as temporary mitigation until the completion of an active system.* • *If methane levels exceed the above levels, the owner or operator will notify the Agency and take steps to protect human health.* • *A gas collection system shall transport gas to a central point or points for processing.* *Title 35 Section 814.302(a)* *Title 35 Section 811.312* • *The processing of landfill gas for use is strongly recommend but is not required. No gas may be discharged directly to the atmosphere unless treated. Gas shall be treated or burned on-site prior to discharge in accordance with a permit issued pursuant to 35 Ill. Adm. Code 200-245.* *See Section 811.310* *See Sections 811.310 and 811.311* *Complies* | *May Comply* | *Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. Attachment 17 (Section 6.6.5) and Attachment 18 (Section 6.7) to the February, 1996 Addendum to the SIGMOD discuss the actions that will be taken if any of the conditions listed in 35 IAC 811.311 (a)(1) -(a)(5) are met. As mentioned in Attachment 18(Section 6.7) to the February, 1996 Addendum to the SIGMOD, if any of the conditions listed in 35 IAC 811.311(a) are met, a landfill gas management system will be installed at the site. Protection of human health in accordance with 35 IAC 811.311 (a) will be ensured. In addition, the April, 1996 Addendum to the SIGMOD includes the design of an active gas collection system.

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria* *Title 35 Illinois Administrative Code Parts 810-815*		
Open Burning/Clean Air Act	*Open burning is prohibited at the facility (Page III-12).* *The Application does not discuss any landfill gas extraction or control systems, only monitoring procedures.* *The site has a water truck on site for fire fighting if necessary, and a fire control plan is located within the application (Pages IX-49 to IX-51).*	*Title 35 Section 814.302(a)* *Title 35 Section 811.107(f)* • *Open burning is prohibited except in accordance with 35 Ill. Adm. Code 200 through 245.* *Title 35 Section 814.302(a)* *Title 35 Section 811.310, 811.311 and 811.312* • *Collected landfill gas must be combusted before release to the atmosphere, and it is recommended that it be processed for energy use.* *See Sections 811.310 and 811.311*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. The February, 1995 SIGMOD Application clearly states that open burning is prohibited and is in compliance with 811.107(f). Compliance with 35 IAC 811.310-312 is included in Attachments 10 through 18 (Sections 6.6.1, 6.6.2.1, 6.6.2.2., 6.6.2.3, 6.6.2.4, 6.6.3, 6.6.4, 6.6.5 and 6.7) to the February, 1996 Addendum to the SIGMOD.

REGULATORY OVERVIEW				
Standard	**Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)**	**Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815**		
Access Requirements	The application states that access by all vehicles shall be through a single secured site entrance (Page III-10). The application does not indicate that the entire site is secured.	Title 35 Section 814.302(a) Title 35 Section 811.109(a) • Access shall be restricted to prevent unauthorized entry at all times.		
		Complies	May Comply	Does Not Comply

The entire facility is completely fenced with a single, locked entrance gate and has 24 hour security. The SIGMOD application is in compliance with 35 IAC 811.109 (a).

REGULATORY OVERVIEW				
Standard	*Land and Lakes 122nd Street Landfill Compliance (As documented within the Application for SIGMOD)*	*Illinois Landfill Criteria Title 35 Illinois Administrative Code Parts 810-815*		
Run-On/Run-Off Control Systems and Surface Water Requirements	*The facility stormwater management system has been designed to safety convey the 100-year 24-hour storm events. (Page VIII-12)* *The facility currently discharges through three NPDES permitted outfalls. The discharge regularly exceeds the permitted discharge limits.*	*Title 35 Section 811.103* • *Run-off from disturbed areas must meet the requirements of 35 Ill. Adm. Code 304 and 309. All discharge structures shall be designed to prevent erosion and scouring.* • *Run-on from undisturbed areas shall be diverted around the disturbed areas.*		
		Complies	*May Comply*	*Does Not Comply*

The SIGMOD is in compliance with the applicable regulations. As discussed previously on pages 9 to 10 of this Attachment, substantive efforts have been taken by both LALC and the IEPA to address the deficiencies of the NPDES permit for the LALC 122nd Street Landfill. Presently, LALC is in the process of completing the implementation of a three phase plan to address storm water discharges at the facility. This plan has been approved by the IEPA Bureau of Water in conjunction with IEPA Bureau of Land.