



Permit

State of Arkansas

Department of Pollution Control and Ecology

GREAT LAKES CHEMICAL CORPORATION
CENTRAL PLANT
P.O. Box 7020
EL DORADO, AR 71731-7020

UIC PERMIT 11-U
CSN 70-0012

Pursuant to the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, (A.C.A. 8-4-101 et seq.) and the Arkansas Underground Injection Control (UIC) Code. This permit is being issued to GREAT LAKES CHEMICAL CORPORATION (hereinafter called the Permittee) to construct two (2) new Class I hazardous waste disposal wells at the following location:

Hazardous waste disposal well, WDW #5, located in Section 2, Township 18 South, Range 16 West, and well, WDW #6, located in Section 11, Township 18 South, Range 16 West, near the Great Lakes Chemical Corporation (GLCC) Central Plant. The GLCC Central Plant is located approximately 1 mile south of the city of El Dorado, in Union County, Arkansas.

The Permittee shall comply with all the terms and conditions of this permit. This permit consists of the conditions contained herein and the applicable standards and specific facility conditions developed in accordance with the Arkansas Underground Injection Control (UIC) Code and the provisions of Title 40, Code of Federal Regulations (40 CFR) Parts 144, 146 and 124, as specified in the permit. Applicable State and Federal Regulations are those which are in effect on the date of issuance of the permit, such Federal Regulations adopted by reference in Section 3 of the Arkansas Underground Injection Control (UIC) Code (See 40 CFR 144.52 (b)(2) and Attachment 1).

This permit is based on the condition that all information submitted application dated June 25, 1992 is complete and the facility (well systems) will be operated as specified in the application. Any misrepresentations found in this information may be grounds for the termination or modification of this permit (see 40 CFR 144.39, 144.40, and 144.41) and possible enforcement action.

This permit is effective as of December 16, 1994 and shall remain in effect until December 15, 2004 unless revoked and reissued, or terminated (40 CFR 144.39 and 144.40) or continued in accordance with the Arkansas UIC Code.

Issued this 16th day of November, 1994

ARKANSAS DEPARTMENT OF POLLUTION CONTROL & ECOLOGY

by: *Larry Wilson*
- Acting Director

PART I

STANDARD CONDITIONS

I. A. EFFECT OF PERMIT

The Permittee is authorized to construct two (2) hazardous waste disposal injection wells, WDW #5 and WDW #6, in accordance with the conditions set forth in this permit. Injection of any wastes not authorized under this permit is strictly prohibited.

Compliance with this permit constitutes, for purposes of enforcement, compliance with Part C of the Safe Drinking Water Act (SDWA) and the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended). Issuance of this permit does not convey any property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property; any invasion of other private rights, or any infringement of State or local law or regulations. Compliance with the terms of this permit does not constitute a defense to any action brought under the provisions of the Water and Air Pollution Control Act (Act 472 of 1949, as amended) or any other law governing protection of public health or the environment for any imminent and substantial endangerment to human health or the environment.

I. B. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person, including the Permittee, or upon the Director's initiative. However, modification, revocation and reissuance, or termination of this permit shall be allowed only under the conditions set forth in Part I. Section B. 1. through 3. below. All requests for modification (except for minor modifications as specified under 40 CFR 144.41) revocation and reissuance, or termination shall be in writing and shall contain facts or reasons supporting the request.

1. Modification or Revocation and Reissuance of Permit

The Director may modify, or revoke and reissue, this permit either at the request of any interested person (including the Permittee) upon the Director's initiative or, if he or she determines, based upon receipt of any information, that one or more of the causes specified under 40 CFR 144.39(a) or 144.39(b) for modification, revocation and reissuance, or both, exists. If cause exists, the Director may modify, revoke or reissue this permit accordingly, subject to the limitations of 40 CFR

144.41(c) and may request an updated application if necessary. When a permit is modified, only the conditions subject to modification are reopened. Except as provided by 40 CFR 144.41, modification or revocation and reissuance of this permit by the Director shall be in accordance with 40 CFR 144.39.

If a permit is revoked and reissued the entire permit is reopened and subject to revision and the permit issued for a new term. If cause does not exist then the Director shall not modify, revoke and reissue the permit. If a permit modification satisfies the criteria of 40 CFR 144.41 for minor modifications the permit may be modified without a draft permit or public review.

2. Termination of Permit

The Director may terminate this permit during its term or deny a permit renewal application for this permit for the following causes:

- (a) Noncompliance by the Permittee with any condition of the permit;
- (b) The Permittee's failure in the application or during the permit issuance process to disclose fully all relevant facts, or the Permittee's misrepresentation of any relevant facts at any time;
- (c) A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.

The Director shall follow the applicable procedures in 40 CFR Part 124 in terminating any permit under this section.

3. Minor Modifications to the Permit

Upon the consent of the Permittee, the Director may modify a permit to make corrections or allowances for changes in the permitted activity as specified in 40 CFR 144.41 without following the procedures of 40 CFR Part 124. Any permit modification not processed as a minor modification under 40 CFR 144.41 must be made for cause and comply with the procedures of 40 CFR 124.5 and 144.39.

I. C. DURATION OF PERMIT

This permit shall remain effective for a period not to exceed ten (10) years unless terminated for causes specified in 40 CFR 144.40.

I. D. CONTINUATION OF EXPIRING PERMIT

This permit and all conditions therein shall remain in effect beyond the permit's expiration date if the Permittee has submitted a timely, complete application and through no fault of the Permittee, the Director has not issued a new permit as set forth in Act 472 and/or the Arkansas UIC Code. Permits continued under the conditions in this section remain fully enforceable and are subject to those actions specified in 40 CFR 144.37(c).

I. E. TRANSFER OF PERMITS

This permit is nontransferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the Permittee and incorporate other requirements as may be required under the SDWA (see 40 CFR 148.33). In some cases modification, reissuance or revocation may be mandatory.

1. Transfers by Modification

This permit may be transferred by the Permittee to a new owner or operator if the permit has been modified or revoked and reissued pursuant to 40 CFR 144.39(b)(2), or a minor modification made under 40 CFR 144.41(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Safe Drinking Water Act.

I. F. DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee must comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit under 40 CFR 144.34. Any permit noncompliance may constitute a

violation of Act 472 (or 1949 as amended) and the Safe Drinking Water Act (SDWA) and maybe grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application.

2. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the Permittee must submit a new application for a new permit at least one hundred eighty (180) days before this permit expires.

3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. Duty to Mitigate

The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

5. Duty to Provide Information

The Permittee shall furnish to the Director within a reasonable time, any relevant information which the Director may utilize to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Director upon request copies of records required to be kept by this permit.

6. Proper Operation and Maintenance

The Permittee shall at all times properly install, operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes the timely modification of any permit or any treatment operation related to compliance with this permit, in addition to effective performance, adequate financial assurance, adequate operator staffing and training, and adequate

laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of a back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

7. Inspection and Entry

The Permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

(a) **Entry**

Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

(b) **Access to Records**

Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

(c) **Inspection**

Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit;

(d) **Sampling for Compliance**

Sample or monitor, at reasonable times, for the purposes of assuring compliance with this permit or as otherwise authorized by Act 472, or the SDWA any substances or parameters or any location covered by this permit.

8. Monitoring Reports

(a) **Monitoring**

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(b) Records

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original chart recordings, computer disks for continuous monitoring instrumentation, copies of all reports and records required by this permit, and records of all data used to complete the application for this permit for a period of at least three (3) years from the date of the sample, measurement, report, or application. This period may be extended by request of the Director at any time and will be automatically extended during the course of any unresolved enforcement action regarding this facility.

The Permittee shall also retain records on the nature and composition of all injected fluids until three (3) years after the completion of any plugging and abandonment procedures specified under 40 CFR 146.71 and Part IV, Section A. of this permit. The Director may require the owner or operator to deliver the records to the Director at the conclusion of the retention periods.

(c) Content of Monitoring Records

i) Monitoring Equipment Records

Records generated from continuous monitoring equipment shall include the following information:

- (A) Injection pressure maximum, minimum; injection rate maximum, minimum and average; annulus pressure maximum, minimum; total injection volume and/or any other pertinent information monitored by the Permittee.

9. Reporting Requirements

(a) Notification of Facility Alterations or Additions:

The Permittee shall notify the Director as soon as possible of any planned physical alterations or additions to the permitted facility which may have an impact on compliance with this permit.

(b) Anticipated Noncompliance

The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with the permit requirements established herein.

(c) Monitoring Reports

Monitoring results shall be reported at the intervals specified in Part III, Section C. of this permit.

(d) Noncompliance Reporting

The Permittee shall report to the Director all noncompliance incidents including those that may endanger health or the environment, including any monitoring or other information which indicated that any contaminant may cause an endangerment to a USDW, or any noncompliance with a permit condition or malfunction of the injection system may cause fluid migration into or between USDWs. This information shall be provided orally within 24 hours of the time the Permittee becomes aware of the noncompliance circumstances. A written submission shall be provided within 5 days of the time the Permittee becomes aware of the circumstances surrounding the noncompliance incident.

The information to be included in the written submission should be as follows:

- i) The exact nature of the noncompliance incident and the cause of the resulting noncompliance; the period of noncompliance, including exact dates and times and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

(e) Other Noncompliance Reports

The Permittee shall report all instances of noncompliance not reported under Part I, Section F.9 (e) of this permit at the time monthly reports are submitted. This notification shall contain the information listed in Part I, Section F.9.(d)(i) above.

(f) **Other Information**

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or the corrected information to the Director.

(g) **Requirements Prior to Commencing Injection**

The Permittee may not commence injection of waste into any new injection well until:

- i) The Permittee has submitted to the Director by certified mail or hand delivery, a letter signed by the Permittee and a **Registered Professional Engineer** stating that the injection well and associated surface facilities have been installed according to the plans, specifications and construction standards set forth in this permit; and
 - (A) The Director has inspected and/or otherwise reviewed the new well completion records and finds they are in compliance with the conditions and construction requirements set forth in this permit; and/or
 - (B) The Director has either waived inspection of the injection well and associated surface facilities or has not, within 15 days of receiving the notice under Part I, Section F.9(g)(i)(A) above, notified the Permittee of his or her intent to inspect the injection well, in which case prior inspection or review is waived and the Permittee may commence injection. The Director shall include, in any notification of intent to inspect, a reasonable time period in which he or she will inspect the well.

(h) **Notification of Conversion or Abandonment**

The Permittee shall notify the Director, in writing before the commencement of conversion, recompletion, modification and/or abandonment of a well.

10. Signatory Requirement

All applications, reports, or other information requested by the Director shall be signed and certified as required by 40 CFR 144.32.

11. Confidential Information

The Permittee may claim as confidential any information required to be submitted by this permit in accordance with 40 CFR 144.5, with the exception of the name and address of any applicant or Permittee, and information which deals with the existence, absence, or level of contaminants in drinking water. Such information shall be held in confidence by the Department.

I. G. ESTABLISHING PERMIT CONDITIONS

In addition to the conditions required in 40 CFR 144.51, the Director shall establish conditions, as required on a case-by-case basis under 40 CFR 144.36 (duration of permits), 144.53(a) (schedules of compliance), 40 CFR 144.54 (monitoring). Permits for operators of hazardous waste injection wells shall include conditions meeting the requirements of 40 CFR 144.14 (requirements for wells injecting hazardous waste), 40 CFR 144.52 (a)(7) and (a)(9), and Subpart G of Part 146. A permit for other wells shall contain the requirements of 40 CFR 144.52 (1) through (8) when applicable.

The Director shall impose on a case-by-case basis such additional conditions as are necessary to prevent the migration of fluids into a USDW, in addition to conditions required in all permits, to provide for and assure compliance with all applicable requirements of the SDWA and 40 CFR Parts 144, 145, 146, and 124.

I. H. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

I. I. CORRECTIVE ACTION PLAN

The Permittee shall ensure that the requirements of 40 CFR 144.55 and 146.07 are met and carried out as specified therein.

I. J. CORRECTIVE ACTION PLAN FOR WELLS IN THE AREA OF REVIEW

For the purposes of Class I hazardous waste wells this section covering corrective action for wells in the area of review shall apply to the exclusion of 40 CFR 144.55 and 146.07. If any information is received by the Director, such as in the Annual Report filed by the Permittee, that new artificial penetrations have been located within the area of review, the Permittee, shall be required to submit the following information:

- (a) Determine whether the wells are properly completed or plugged;
- (b) A description of each well or type of well and any records of its plugging or completion.
- (c) For wells that the Director determines are improperly plugged, completed or abandoned or for which plugging or completion information is unavailable, the Permittee shall submit a plan consisting of such steps or modification as are necessary to prevent the movement of fluids into a USDW. This plan shall be submitted according to the guidelines in 40 CFR 146.64 (c).
- (d) The Director may require under 40 CFR 146.64 pressure limitations in lieu of plugging.
- (e) The Permittee shall be required to comply with all other applicable conditions concerning corrective action for wells within the area of review in 144.64 (a) through (e).

PART II
SPECIFIC CONDITIONS

II. A. CONSTRUCTION REQUIREMENTS FOR NEW HAZARDOUS WASTE WELLS

1. Approved Plans and Specifications

Each new Class I hazardous waste injection wells shall be constructed and completed to prevent the movement of fluids into or between USDW's or into any unauthorized zones.

Except as specifically required in the terms of this permit, drilling and completion of each new well (WDW #5 and WDW #6) shall be done in accordance with the plans and specifications submitted with the permit application. Any proposed changes to the plans and specifications must be submitted in writing and be approved prior to implementation by the Director as providing protection equivalent to or greater than the original design criteria and standards approved in this permit.

2. Commencement of Construction

New well construction may not commence until a valid UIC permit has first been issued by the Department, containing construction requirements. The well shall be in compliance with all the applicable State Permit provisions and with 40 CFR Part 146 prior to commencing injection operations.

3. Casing and Cementing

Each new Class I hazardous well to be constructed (WDW #5 & WDW #6) shall be designed for the life expectancy of each well including the post-closure care period. The casing and cementing program shall be designed to prevent the movement of fluid into or between USDW's and to prevent potential leaks of fluids from the well.

Surface casing - The Permittee shall set at least one surface casing string, which at a minimum, extends 50 feet into the confining bed below the lowermost formation that contains a USDW.

This surface casing string must be cemented by circulating cement back to the surface using a minimum of 120% of the calculated volume necessary to fill the annular space.

The Director may require an additional 50% of the calculated cement volume be available, if geologic conditions or other circumstances warrant it during cementing activities.

Long string casing - The Permittee shall set at least one long casing string which extends from the surface to below the injection zone. The longstring casing itself shall be of a quantity and quality to withstand normal operating conditions, for the estimated life expectancy of that well. A sufficient number of centralizers shall be utilized to facilitate effective circulation of cement along the casing string. The long string casing is to be cemented by circulating cement back to the surface in one or more stages using a minimum of 120% of the calculated volume necessary to fill the annular space.

The Director may require an additional 50% of the calculated cement volume be available, if geologic or other circumstances warrant it during cementing activities.

- (a) The permittee shall set and cement surface and long string casings to the minimum subsurface depth as follows:

<u>Well #</u>	<u>Surface Casing</u>	<u>Long String Casing</u>
WDW #5	0' to 1430' <+/->*	0' to 5125' <+/->*
WDW #6	0' to 1430' <+/->*	0' to 5220' <+/->*

*surface casing shall be set and cemented 50 feet into the confining bed below the lowermost formation containing a USDW.

- (b) Cementing shall be by the following method with cement used to fill the annular space between the borehole and the casing to the surface:

Surface Casing

<u>Well #</u>	<u>Cementing Method</u>	<u>Type and Grade of Cement</u>
WDW #5 & WDW #6	<u>Surface Casing</u> - Circulation to surface w/ 50% excess*	Lead Cement: Class H Lite Cement w/ 3% CaCl Tail Cement: Class H plus 1% CaCl

Longstring Casing

<u>Well #</u>	<u>Cementing Method</u>	<u>Type and Grade of Cement</u>
WDW #5 &	<u>Long String</u> - circulation to surface w/ Class H	Lead Cement: Class H Lite Cement w/3% CaCl
WDW #6	cement w/ 50% excess, in 2 stages*	Tail Cement: Class H plus 1% CaCl

*(All cement volumes shall be calculated after running an open hole caliper log to determine the volume of excess cement needed to insure cement returns to the surface using types or grades of cements listed or equivalents)

- (c) Cement injection for both surface and longstring casing shall be from the bottom of the borehole upwards and shall continue until recirculated cement returns at the surface are equivalent in density to the cement injected.
- (d) Cementing of the long string casing will occur in two stages with the DV tool set at an optimum depth in accordance with caliper log estimations for required cement volumes.
- (e) The long string casing cement shall include a tail slurry resistant to degradation and penetration by the injected waste, and of sufficient quantity to fill the annular space to the surface.

4. Well Construction Materials

Each new hazardous waste well shall be constructed with materials designed with sufficient structural strength to with stand the design life of the well. In addition, the casing shall be able to withstand the maximum tensile stress which may be experienced at any point along the length of the casing during construction, operation and/or closure of the well. Each well shall constructed using materials approved in this permit.

Construction requirements for WDW #5 and #6 shall be as follows:

Injection Well WDW #5

<u>Casing and Tubing Specifications</u>	<u>Depth to be Set</u>
Surface casing - 10 3/4" J or K 55, 45.5 lb/ft*	0' to 1430' <+/->
Long String - 7" N-80, 26 lb/ft*	0' to 5220' <+/->
Tubing - 5 1/2" N-80, 20/23 lb/ft*	0' to 3667' <+/-> (*or equivalent pipe)

Injection Well WDW #6

<u>Casing and Tubing Specifications</u>	<u>Depth to be Set</u>
Surface casing - 10 3/4" K or J-55, 45.5 lb/ft*	0' to 1430' <+/->
Long String - 7" N-80, 26 lb/ft*	0' to 5220' <+/->
Tubing - 5 1/2" N-80, 20/23 lb/ft*	0' to 3762' <+/-> (*or equivalent pipe)

5. Packer Specifications

All Class I hazardous waste wells shall dispose of fluids through tubing with a packer set at a point immediately above the injection zone as specified in Part V, Section C.3. The packer shall be designed for expected service.

II. B. DRILLING AND COMPLETION REQUIREMENTS FOR NEW HAZARDOUS WASTE WELLS

1. Prior Notification

The Permittee shall notify the ADPC&E UIC Coordinator, State Permits Branch, Water Division at least seventy-two (72) hours prior to beginning drilling, recompletion or any workover operations of any well and again at least forty-eight (48) hours prior to beginning any well cementing operations, casing or annulus pressure testing or any other mechanical integrity testing activities on any well permitted herein.

2. Logging Requirements

At a minimum, the following logs shall be run during the drilling and completion of the new wells. The Permittee shall ensure that a descriptive report interpreting the results of these logs and tests is prepared by a knowledgeable log analyst and submitted to the Director in the completion report.

(a) **Well Bore Deviation**

- (i) The maximum point at which a well penetrates the injection formation shall not unreasonably vary from the vertical drawn from the center of the borehole at the surface. Deviation in excess of three (3) degrees from the vertical drawn from the center of the borehole at the surface shall require the Department be notified and approval granted by the Director prior to continuing well construction operations. Deviation checks on the hole shall be performed at sufficiently frequent intervals, depending on the lithology of the strata being penetrated, to assure that deviation of more than three (3) degrees does not occur and that vertical avenues for fluid migration are not created during drilling.

(b) **Log Requirements for Surface Casing:**

- i) Dual Induction resistivity, spontaneous potential and caliper logs before the casing is installed;
- ii) Cement bond log, and a variable density log or a cement evaluation log may be run with a casing pressure test to be performed after the casing is set and cemented;

(c) **Log requirements for Intermediate and/or Longstring casings:**

- i) Dual Induction resistivity, spontaneous potential, gamma ray and caliper logs before the casing is installed;
- ii) Cement bond log and variable density log or a cement evaluation log, a radioactive tracer survey, and/or a temperature log and a casing pressure test after the casing is set and cemented.

iii) The Director may allow the use of alternatives to the above logs when an alternative will provide equivalent or better information.

(d) For either Part II, Section B.2.(b)(ii) or (c)(ii) above, if cement bond logs, or mechanical integrity tests indicate that the cement job quality is poor or inadequate in a particular zone or that fluid movement may occur behind the casing, then a squeeze job or other method approved by the Director may be employed to properly seal off this zone and/or improve the overall quality of the cement job.

3. Cores and Core Analysis

Full-hole cores and/or sidewall cores shall be taken from selected intervals or formations of the injection zone(s) and the lowermost formation(s) comprising the confining zone(s). Sidewall cores shall be taken at sufficient intervals to yield representative data for selected formations of the injection zone(s) and the lowermost formation(s) overlying confining zone. Core analysis shall include a determination of permeability, porosity, and bulk density. Results of all core analysis, the subsequent compatibility testing and any adverse reactions related to the compatibility testing that was performed shall be reported to the Department within ninety (90) days of the date of well completion as required under Part II, Section B.7.(b).

4. Compatibility Testing

Compatibility testing shall be performed by subjecting the core samples to a typical injection disposal waste stream at downhole formation temperature conditions for a period of time adequate to determine if any geochemical reaction products are generated that might adversely impact the receiving formation or well operations. Representative samples of injection formation fluids shall be obtained and tests shall be conducted that mix formation waters and waste stream fluids under conditions as near as possible to actual downhole formation fluid conditions. Results of all subsequent compatibility testing and any adverse reactions related to the compatibility testing that was performed shall be reported to the Department within ninety (90) days of the date of well completion as required under Part II, Section B.7.(b).

5. Pressure Testing of Casing, Tubing and Packer

Casings, tubing and packer shall be tested as follows:

<u>Well #</u>	<u>Surface Casing</u>	<u>Long String Casing</u>	<u>Tubing & Casing Annulus</u>
WDW #5	1350 psi	1350 psi	1350 psi
WDW #6	for 1 hour	for 1 hour	for 1 hour

*(or wells will be tested at 100 psi over the maximum permitted injection pressure with \pm or \rightarrow 5% pressure variance during testing)

- (a) The Permittee must successfully pass the required casing or annulus pressure test, for each well, prior to the commencement of injection disposal operations. In addition, casing and annulus pressure test results must be submitted or reported to the Department for review and approval prior to the commencement of injection disposal operations.

6. Additional Requirements

- (a) After completion of the well a casing, tubing, packer and annulus pressure test shall be performed and mechanical integrity demonstrated. This testing shall be conducted in accordance with Part II, Section B.5.
- (b) Injectivity testing shall also be performed to determine optimum well injection capacity and injection interval reservoir characteristics.
- (c) Prior to performing the injectivity tests above, bottom-hole pressure, bottom hole temperature, fracture pressure, and static fluid level shall be determined and a representative composite sample of formation water from each of the proposed injection formations obtained and analyzed. This analysis shall, in part, consist of sampling for pH, specific conductivity, total chlorides and total dissolved solids.

7. Completion Reports

- (a) Within ninety (90) days after new well completion, the Permittee shall submit to the Director a report on the drilling and completion history for WDW #5 & WDW #6 including casing and cementing records and copies of all well logs run. The drilling history shall include a complete and accurate record of the depth, thickness, and character of strata penetrated. The Permittee shall integrate data obtained into adjusted formation pressure increase calculations, fluid front radius calculations, cross-sections of the disposal zone.
- (b) The results of injectivity tests performed on the well and the results of compatibility tests performed with formation fluid samples and core samples obtained during the drilling operations. All fluid compatibility tests are to be included in the completion report.
- (c) The following well logs shall also be submitted with the completion report:
 - i) Surface casing - SP, Caliper, Dual Induction Resistivity, CBL/VDL logs with cement log analysis. Noise and temperature or Oxygen Activation logs, if run, may be required in some instances by the Department;
 - ii) Long String Casing - SP, Caliper, Dual Induction Resistivity, CBL/VDL with cement log analysis;
 - iii) Radioactive Tracer Survey log;
 - iv) Core Analysis information including injection formation porosities, permeabilities and any other information relative to the injection zone formation properties.

8. Certification of Construction

The Permittee shall include in the completion report for each new well constructed certification by a **Registered Professional Engineer** that WDW #5 and #6 have been constructed according to the specifications contained in this permit and in accordance with existing Federal regulations governing Class I hazardous waste well construction activities. This construction certification shall be approved by the Director, prior to the commencement of injection operations.

PART III
SPECIFIC CONDITIONS

III. A. OPERATIONAL REQUIREMENTS FOR EACH HAZARDOUS WASTE WELL

1. Waste to be Injected into WDW #5 & #6

Great Lakes Chemical will be permitted to inject the following wastestreams* into the Hosston Formation:

- 1) Effluent from the existing process water treatment plant (PWTP);
- 2) Effluent from the groundwater treatment plant (GWTP);
- 3) Leachate Treatment Plant (LTP) effluent; and
- 4) Tail Brine (debrominated Smackover brine).

Because of the extreme differences in treatment prior to deep well disposal - primarily solids removal and pH adjustment - the PWTP and GWTP streams may be segregated for disposal into designated wells.

Any wastestream not authorized to be stored, processed, treated, disposed or otherwise handled as stipulated in this permit are not approved for injection at this time.

The Permittee shall be required to submit an application to modify Permit 11-U if any new process wastestreams are brought on-line and/or any additional wastestreams are generated that are to be routed to the injection disposal wells. The Permittee shall have received approval from the Director, for the modification request, prior to the commencement of injection disposal. The Permittee shall also be required to make application to modify Permit 11-U if there is any significant change in the volume or strength of the wastestreams currently authorized for disposal as permitted herein.

Typical Analysis of Waste Stream to be Injected

(See Appendix I)

2. Formation Permitted For Injection

The injection zone must have sufficient porosity, permeability, thickness and areal extent to prevent migration of fluids into a USDW. Injection must also be into a formation which is beneath the lowermost formation, containing, within 1/4 mile of the well bore, an underground source of drinking water. Permitted injection intervals in Permit 11-U shall be confined to the formation intervals noted below:

WDW #5 Injection Formation: **Hosston Formation**

WDW #6 Injection Formation: **Hosston Formation**

*(Estimated depths provided, actual depths to be provided in completion report)

3. Authorization of Specific Injection Intervals

Fluid disposal into a permitted injection interval other than those authorized by the Department shall be considered an unauthorized injection violation under 40 CFR 144.11 and subject the Permittee to possible enforcement action.

The Permittee shall receive authorization, from the Department, prior to commencing disposal into specific injection intervals within permitted injection zones. The Permittee will receive authorization from the Department to utilize specific injection interval(s) within a permitted injection zone, on a well by well basis, at the discretion of the Department.

The injection intervals authorized at this time are as follows:

<u>WDW #5</u>	<u>Injection Interval</u>	<u>Injection Depths*</u>
	Upper & Lower Hosston	3725' - 5075' +/-
<u>WDW #6</u>	<u>Injection Interval</u>	<u>Injection Depths*</u>
	Upper & Lower Hosston	3820' to 5170' +/-

*(Estimated depths provided, actual depths to be provided in completion report)

III. B. OPERATIONAL REQUIREMENTS FOR EACH WELL

1. Operational Parameters

The Permittee shall control injection such that the injection pressure at the wellhead does not exceed a calculated maximum. This is to assure that pressure build-up in the injection zone, during injection does not initiate new fractures or propagate existing fractures in the injection zone.

The Permittee shall operate WDW #5 and #6 according to the following criteria:

OPERATIONAL PARAMETERS FOR WDW #5 and WDW #6

Maximum Instantaneous Injection Rate Per Well...290 gpm
Maximum Surface Injection Pressure.....1250 psi
Maximum Monthly Injection Volume.....290 X 1440 X
days/month
Annular Fluid.....Corrosion inhibited water
pH.....4 to 10
Minimum Annulus Pressure.....Greater Than Injection
Pressure Through Tubing
by at least 100 psi at all
times

1270
1575
28
25
197
1970

III. C. REPORTING REQUIREMENTS FOR EACH WELL

1. Monthly Reporting Requirements

The Permittee shall submit **Monthly Reports** (within 20 working days after the end of the month) to the Director containing the following information:

- (a) Results of continuous monitoring for each well including injection pressure maximum, minimum; injection flow rate maximum, minimum and average; annulus pressure maximum, minimum; temperature and pH value of injected fluids and the injection volume totals for the month;
- (b) Calculated monthly averages for injection pressure, annulus pressure and injection rate shall also be reported.

- (c) A description of any event which occurs during well operations that results in noncompliance with the operational parameters set forth in this permit. A description of any event which triggers an alarm or shut down device and a description of the action taken by the Permittee to correct the problem. Notification of any significant rise or fall in annulus pressure.

2. Annual Reporting Requirements

The Permittee shall submit to the Director an Annual Report (by March 1st of the following year) containing the following information:

- (a) Results of continuous monitoring for each well including injection pressure maximum, minimum; injection flow rate maximum, minimum and average; annulus pressure maximum, minimum; temperature and pH of the injected fluids and injection volume totals for the reporting year and to date; Calculated averages for injection pressure, annulus pressure and flow rate shall also be included.
- (b) A description of any event which exceeds the operating parameters for annulus pressure or injection pressure as specified in this permit. A description of any event which triggers an alarm or shutdown device and the action taken. Any significant change in the annular fluid volume.
- (c) Documentation of all noncompliance incidents, any violations, excursions for that reporting year; documentation of workovers, well testing, well stimulations or any other pertinent information concerning well operations for that reporting year, for each well;
- (d) The Permittee shall analyze injected fluids according to the timetable and guidelines approved in the Waste Analysis Plan (Part III, Section D.10). This analysis shall include the physical, chemical and other relevant characteristics of the injection fluids and be submitted in the Annual Report.

- (e) Included in the Annual report shall be a discussion covering all aspects of well operations for the preceding year such as well stimulations (amounts, volumes, dates) workovers, shut downs and equipment failures etc. Also included should be a discussion of and reasons for any excursions from permitted operational parameters, any violations and action taken to correct the violation(s).
- (f) Discussion of the types of tests done to insure the mechanical integrity of each permitted well during the preceding year, including the dates and times of those tests and certification by the Permittee that each well has demonstrated mechanical integrity for the preceding year;
- (g) The results and dates of any other tests or work performed on either well during the preceding year;
- (h) The Annual Report shall include a direct measurement of bottom-hole pressure (see Part III, Section D.9.) and/or in accordance with 40 CFR 146.68 (e)(1) or a calculation of bottom-hole pressure using the specific gravity of the fluid in the well bore and the static fluid level. A discussion of pressure effects of disposal operations upon the injection zones and specific injection intervals and the calculation of pressure build-up within the injection interval(s).
- (i) An estimation of the distance, of the injected fluid front from the wellbore.
- (j) To the extent such information is reasonably available, the report shall also include:
 - i) Locations of newly constructed and/or newly discovered wells within a 2 mile area of review, if such wells were not included in the technical report accompanying the permit application or in later reports;
 - ii) Locations of newly constructed or new wells identified that penetrate through or to within 300 feet of the top of the permitted injection zone for WDW #5 and WDW #6;

iii) Wells found to be located within the area of review must be addressed with appropriate Corrective Action under Part I, Section J. of this permit.

(k) The Permittee shall notify the Director within twenty-four (24) hours of any change in well operations or in well equipment monitoring parameters which could reasonably be attributed to a leak or other failure in well equipment.

4. Completion Report

Within ninety (90) days after well completion, the Permittee shall submit to the Director a report on the drilling and completion history for the well including casing and cementing records and copies of all well logs run. The drilling history shall include a complete and accurate record of the depth, thickness, and character of strata penetrated.

III. D. TESTING AND MONITORING REQUIREMENTS FOR EACH HAZARDOUS WASTE WELL

1. Parameters to be Measured by Continuous Recorders

The following parameters shall be measured with an appropriate continuous recording device housed in a weatherproof enclosure:

- (a) Injection tubing pressure, annulus pressure, injection tubing flow rate, injection volume;
- (b) Any other parameters as requested by the Permittee or as specified in this permit.

2. Instrumentation

The Permittee shall ensure that instrumentation required to meet the continuous recording and other monitoring requirements under this permit is installed, properly maintained and properly calibrated at all times;

3. Monitoring of Injected Wastes

Testing and monitoring of the injected wastes shall at a minimum include:

- (a) The Permittee shall be required to monitor the injected wastes. The Permittee shall develop and follow an ADPC&E approved Waste Analysis Plan (Part III, Section D.10.) that describes the frequency and the procedures to be carried out to obtain a detailed chemical and physical analysis of a representative sample of the waste, including the quality assurance procedures used.

4. Corrosion Monitoring

The Permittee shall demonstrate that the wastestreams injected will be compatible with the well materials in which it will be in contact and submit to the Director the methodology used in making that determination. Compatibility for the purposes of this requirement is established if contact with the waste fluids will not cause the well materials to fail.

- (a) If the Director does determine corrosion monitoring is warranted, the Permittee shall be required to initiate continuous corrosion monitoring of the construction materials used in the well for wells injecting corrosive waste. If it is determined corrosion monitoring is not required the Director may waive the corrosion monitoring requirements of this section.

Such corrosion testing may include the following:

- i) Placing coupons of well construction materials in contact with the waste stream; or
 - ii) Routing the waste stream through a loop of well construction materials; or
 - iii) Using an alternate method approved by the Director.
- (b) The Permittee shall monitor the materials for loss of mass, thickness, cracking, pitting or any other signs of corrosion on an annual basis to ensure the well components meet the minimum standards for material strength and performance set forth in 40

CFR 146.65 (b). Results of corrosion monitoring shall be submitted to the Department as a part of the Mechanical Integrity Testing section in the Annual Report.

5. Mechanical Integrity Testing

The Permittee shall maintain mechanical integrity of each injection well at all times. An injection well has mechanical integrity if there is no significant leak in the casing or tubing (above the packer) or no leak at the packer and/or there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the wellbore.

Mechanical integrity shall be demonstrated for each hazardous waste disposal well once every year for the life of the well. The demonstration of mechanical integrity shall consist of running the following tests:

Annual Testing Requirements for Class I
Hazardous Waste Wells WDW #5 & #6

- (a) Pass a yearly annulus pressure test to be witnessed by a representative of the Department. Testing may also be witnessed by a Registered Professional or any other individual selected by the Permittee and approved in advance by the Department.
- (b) Pass a yearly radioactive tracer (RAT) test to be witnessed by a representative of the Department. RAT testing may also be witnessed a Registered Professional or by any other individual selected by the Permittee and approved in advance by the Department. RAT tests shall be conducted according to guidelines set forth and approved by the Department. Failure to comply with ADPC&E recommended RAT test procedures may result in a RAT test being rerun.
- (c) Once each year, the Permittee shall monitor the pressure buildup in the injection zone which includes a shut down of the well for a time sufficient to conduct a valid observation of the fall off pressure curve;
- (d) The Director may require such tests whenever the well is worked over, the well tubing is removed, packer is replaced or based on any information received by the Director indicating additional Mechanical Integrity Tests may be warranted.

Tests to be Conducted Every Five Years for
Class I Hazardous Waste Wells WDW #5 & #6

- (a) An approved Noise or Temperature log, Oxygen Activation log or other approved log shall be run at least once every five years to test for fluid movement along the borehole;
- (b) Casing Inspection logs shall be run at least once every five years unless the Director waives this requirement due to well construction or other factors which limit the tests reliability;
- (c) Any other test approved by the Director in accordance with the procedures used in 40 CFR 148.8(d) may also be used. The results of these tests, including interpretive analysis for each test shall be submitted to the Department within sixty (60) working days of completion of any required mechanical integrity testing;

6. Loss of Mechanical Integrity

If a loss of mechanical integrity occurs during well operations or is indicated during mechanical integrity testing and/or annulus pressure testing the Permittee shall do the following:

- (a) Immediately cease injection of waste fluids;
- (b) Take all steps necessary to determine whether or not there has been a release of hazardous waste or hazardous waste constituents into any unauthorized zone;
- (c) Notify the Director within 24 hours after the loss of mechanical integrity is discovered;
- (d) Notify the Director when injection is expected to resume; and
- (e) Restore and demonstrate mechanical integrity to the satisfaction of the Director prior to resuming the injection of waste fluids;
- (f) The Permittee shall notify the Director and obtain approval prior to conducting any well workover.

Whenever the Permittee obtains evidence that there may have been a release of injected waste into an unauthorized zone they shall:

- (a) The Permittee shall immediately cease injection of waste fluids, and;
 - i) Notify the Director within 24 hours of obtaining such evidence;
 - ii) Take all necessary steps to characterize the extent of any release;
 - iii) Comply with any remediation plan specified by the Director;
 - iv) Implement any remediation plan approved by the Director, and;
 - v) Where such a release is into a USDW currently serving as a water supply, place a notice in a newspaper of general circulation.

- (b) The Director may allow the Permittee to continue injection and/or resume injection prior to completing clean-up or other remedial action if the Permittee can demonstrate that continued injection operation of that well will not endanger a USDW.

7. Annulus Testing Requirements

Unless an alternative to a packer has been approved under 40 CFR 146.12 (c) the annulus between the tubing and protection casing for each Class I well shall be filled with a fluid approved by the Director.

Each well shall be required to pass an annulus pressure test as follows:

- (a) Annulus pressure testing for WDW #5 and WDW #6 shall be conducted after each workover involving tubing removal and/or packer placement and after each well shut-down in excess of thirty (30) days;
- (b) In addition, WDW #5 and WDW #6 must also pass an annulus pressure test at least once a year;

- (c) An approved annulus pressure test shall consist of pressuring the annulus to 100 psi above the permitted injection pressure for that well and holding that pressure for one hour with a maximum allowable pressure variation plus or minus 3% on the initial recorded pressure.

8. Annulus Pressure Monitoring System

The Permittee in accordance with the requirements of 40 CFR 146.67 (c) shall be required to install and maintain a positive annulus pressure monitoring system which maintains an annulus pressure at least 100 psi greater than the injection pressure for each hazardous waste well. Under the requirements of this section the Permittee shall be required to maintain an annulus pressure that exceeds the operating injection pressure, unless the Director determines that such a requirement might harm the integrity of the well.

The following additional conditions concerning annulus pressure monitoring must also be met:

- (a) The annulus must be fluid filled. The fluid in the annulus shall be noncorrosive or shall contain a corrosion inhibitor.
- (b) The pressurized annulus shall be continuously monitored at all times for possible leaks. Automatic alarm and/or shut-off systems shall be installed to sound when well pressures are lowered or exceed a rate and/or gradient specified in the permit.
- (c) If an automatic alarm or shut-down is triggered, the Permittee shall immediately investigate and identify as expeditiously as possible the cause of the alarm or shut-off. If upon investigation, the well appears to lack mechanical integrity the Permittee shall:
 - i) Cease injection of waste fluids unless authorized by the Director to continue or resume injection; and
 - ii) Take all steps necessary to determine the presence or absence of a leak; and
 - iii) Notify the Director, within 24 hours after the alarm or shut-down.

9. Bottom-Hole-Pressure Testing

The Permittee shall submit in the Annual Report results of bottom hole pressure surveys for WDW #5 and WDW #6. These surveys shall be performed after shutting in each well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with 40 CFR 146.68 (e)(1) and in accordance with the Falloff Pressure Test Guidelines developed by the EPA.

10. Waste Analysis Plan

The Permittee shall monitor the injected wastes according to an approved Waste Analysis Plan (40 CFR 146.68(a)) that describes the testing frequency and procedures to be carried out to assure GLCC is in compliance with current Land Ban Restrictions and BDAT waste treatment standards through physical and chemical analysis of a representative sample of the waste fluid.

At a minimum the plan shall include the following:

- (a) The parameters for which the waste will be analyzed and the rationale for selection of these parameters;
- (b) The test methods that will be used for these parameters, and;
- (c) The sampling method to be used to obtain a representative sample of the waste fluid to be analyzed;
- (d) The proposed wastestream sampling frequency.

The Permittee shall repeat the analysis of the injected wastes as described in the Waste Analysis Plan (WAP), at the frequencies specified in the plan and when process changes occur that may significantly alter the characteristics of the wastestream. The Permittee shall be required to periodically review the WAP and if needed update and revise the WAP to ensure the plan remains accurate and the analysis remains representative for current Land Ban Restrictions and BDAT treatment standards.

PART IV
SPECIFIC CONDITIONS

IV. A. WELL CLOSURE, PLUGGING AND ABANDONMENT

1. **Closure Plan Requirements**

The Permittee of hazardous waste injection wells shall prepare, maintain and comply with a closure plan for each hazardous waste well that meets the requirements of 40 CFR 146.71 (d) and is acceptable to the Director. The obligation to implement the closure plan survives the termination of the permit or the cessation of injection activities. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.

The following information shall be submitted as required:

- (a) The Permittee shall submit a hazardous waste well closure plan within 180 days of the proposed plugging and abandonment date. The proposed Closure Plan shall be approved by the Director prior to commencement of well closure activities.
- (b) The Permittee shall submit any proposed significant revision to the method of closure to the Director for approval before issuing a Notice of Intent to Close;
- (c) The Closure Plan shall assure financial resources as required in 40 CFR 144.52(a)(7) or other applicable regulations;
- (d) The Permittee shall notify the Director at least sixty (60) working days before commencement of closure of the well. At the discretion of the Director a shorter period may be allowed.
- (e) Within 60 working days after completing well closure the Permittee shall under the requirements of 146.71(c) submit a Closure Report containing all relevant information concerning the well closure.

2. Plugging and Abandonment Plans

The Permittee shall prepare, maintain, comply with and submit a well closure plan which meets the requirements of 40 CFR 146.71 for each new hazardous waste well. Such a plan shall to be approved by the Director. Upon final abandonment of each hazardous well the Permittee shall ensure each well is plugged in accordance with the requirements in the approved plugging and abandonment plan.

Hazardous waste injection wells (WDW #5 & WDW #6) must be closed after cessation of operations for a period of two (2) years according to the requirements of 40 CFR 146.71 (a) through (d), unless the Permittee can describe the procedures taken to ensure the well will not endanger USDWs during the period of temporary abandonment.

Any proposed changes to plugging and abandonment plans must be approved by the Director after the Permittee demonstrates that the changes will provide protection equivalent to or greater than the original plugging design criteria and standards.

Prior to commencing plugging activities for any well, the Permittee shall give the ADPC&E written or verbal notification of the intent to begin plugging at least seventy two (72) hours prior to beginning plugging operations. Mechanical integrity of the well shall be verified, to the satisfaction of the Director, prior to commencement of plugging operations.

3. Plugging and Abandonment of Existing Class I Wells

The Permittee shall be required properly plug and abandon Class I hazardous waste wells WDW #3 and WDW #4 within two years of the date of expiration for UIC Permit 2-U. The Permittee shall follow the approved plugging and abandonment plan submitted in the original application request or the Permittee may wish to submit an amended or revised plugging and abandonment plan to the Department for approval. Plugging and abandonment plans shall be designed and conducted according to requirements found in 40 CFR 146.71.

Prior to commencing plugging activities the Permittee shall give the ADPC&E written or verbal notification of the intent to begin plugging at least seventy two (72) hours prior to beginning plugging operations. Mechanical integrity for each well to be plugged well shall be verified, to the satisfaction of the Director, prior to commencement of plugging operations.

IV. B. POST CLOSURE CARE

The Permittee shall prepare, maintain and comply with a plan for post closure care which meets the requirements of paragraph (b) of 40 CFR 146.72 which is acceptable to the Director. The obligation to implement the post-closure care plan survives the termination of this permit or the cessation of injection activities. The requirement to maintain an approved plan is directly enforceable regardless of whether the requirement is a permit condition. The post-closure plans should include the information requested under 40 CFR 146.72 (a) through (c).

The Permittee shall comply with 40 CFR 146.72 post closure care requirements for Class I hazardous waste wells WDW #3 and WDW #4. The Permittee shall prepare, maintain, comply with a post closure plan submitted to and approved by the Director.

V. C. FINANCIAL ASSURANCE

1. Cost Estimate for Plugging and Abandonment

The Permittee shall demonstrate and maintain financial responsibility for post closure care by utilizing a trust fund, a surety bond, letter of credit, financial test and/or an insurance or corporate guarantee that meets the specifications or mechanisms and instruments revised as appropriate to cover closure and post closure care in 40 CFR 144, Subpart F. The amount of funds available shall be no less than the amount identified in 146.72(a)(4)(vi). The Permittee must prepare a written estimate, in current dollars of the cost of plugging the injection well, in accordance with the plugging and abandonment (P&A) plan as specified in 40 CFR 144.28 and 144.51. The plugging and abandonment cost estimate must be equal to the cost of plugging and abandonment at the point in the facility operating life when the extent and manner of its operation would make plugging and abandonment the most expensive as indicated by its plugging and abandonment plan.

The Permittee must adjust the plugging and abandonment cost estimate for inflation annually. The estimate shall be updated during the first quarter of each calendar year. The adjustment must be made as specified in 40 CFR 144.62(b)(1) and (2). In addition the Permittee must comply with the requirements of 40 CFR 144.62 (c) and (d).

2. Financial Assurance For Plugging and Abandonment

The Permittee is required to maintain financial responsibility and resources to close, plug and abandon the underground injection operation in a manner approved by the Director. The Permittee shall show evidence of such financial responsibility to the Director by the submission of a surety bond or other adequate assurance for each Class I nonhazardous well and by meeting the requirements of 40 CFR 144.63 governing Financial Assurance for each Class I hazardous waste disposal well or other materials which may be acceptable to the Director.

(a) **Class I Hazardous Waste Disposal Wells**

The Permittee must establish financial assurance for Class I hazardous waste wells (WDW #5 & #6). The Permittee must choose from the financial assurance options as outlined in 40 CFR 144.63 (a) through (f).

3. Financial Assurance for Post-Closure Care

The Permittee shall demonstrate and maintain financial responsibility for post closure by using a trust fund, surety bond, letter of credit, financial test or corporate guarantee that meets the specifications for the mechanisms and instruments revised as appropriate to cover closure and post-closure care in 40 CFR 144 Subpart F. The amount of funds available shall be no less than the amount identified in 40 CFR 146.72(a)(4)(vi). The obligation to maintain financial responsibility for post-closure care survives the termination of the permit or the cessation of injection activities. The requirement to maintain financial responsibility is enforceable regardless of whether the requirement is a condition of this permit.

PART V

VARIANCES, COMPLIANCE SCHEDULES, AND OTHER CONDITIONS

V. A. VARIANCES

No variances were requested by the applicant and none were granted by the Director in this permit.

V. B. COMPLIANCE SCHEDULES

No compliance schedules were established.

V. C. OTHER CONDITIONS SPECIFIC TO THIS PERMIT

1. Modification of Operational Parameters

The Permittee, using the information gathered during the well construction phase such as core samples, injectivity tests, and well logs, shall justify to the satisfaction of the Director that the operational parameters as submitted in the application are technically sound and appropriate for the requested system. The Permittee shall determine using computer models or other appropriate calculations, the accuracy of the projected fluid front radius and pressure build-up calculations within the injection interval based on the additional information gathered during well construction and testing.

If the aforementioned information indicates that the operational parameters for this system should be lowered, the Director may do so as specified in Condition I.B.1. of this permit. If the information gathered during well testing indicates the operational parameters for the system could be modified upwards, the Permittee may request the Director modify the permit under 40 CFR 144.39 or Condition I.B.3. of this permit.

The Permittee shall not commence injection operations until an evaluation based on the completion report, well testing and/or an examination of computer models has been completed, by the Department, to assist in determining the optimum operational guidelines for this system and written authorization to commence injection has been granted by the Department.

2. Modification of Authorized Injection Intervals

The Permittee, using information gathered during the new well construction phase such as core samples, injectivity testing, well logs or any other relevant information, may request the Director grant approval to modify and/or include the use of other injection intervals authorized by this permit see (Section V.3.C.(3)). Such a change shall be considered by the Director and shall be submitted as a formal request. If the information supplied by the Permittee indicates the use of an additional injection interval(s), previously authorized by this permit is warranted, the Director may, at his discretion, assign or modify which injection intervals are authorized to receive injected wastes.

3. Formation Intervals Authorized For Injection

Fluid disposed into each well shall be injected into the following specific permitted injection intervals. No other injection intervals, unless specified herein, shall be authorized for fluid disposal at this time.* The injection intervals approved for disposal, at this time are listed as follows:

<u>WDW #5</u>	<u>Injection Interval</u>	<u>Injection Depths*</u>
	Hosston Sandstone	3725' to 5075' + or -
<u>WDW #6</u>	<u>Injection Interval</u>	<u>Injection Depths*</u>
	Hosston Sandstone	3820' to 5170' + or -

*(Estimated depths provided, actual depths to be provided in completion report)

4. Maximum Allowable Surface Injection Pressure

The maximum allowable surface injection pressure (MASIP)* for each injection interval shall be as follows:

<u>Well #</u>	<u>Injection Formation</u>	<u>Injection Depth</u>	<u>MASIP*</u>
WDW #5	Hosston Sandstone	3725' to 5075'	1250
<u>Well #</u>	<u>Injection Interval</u>	<u>Injection Depth</u>	<u>MASIP*</u>
WDW #6	Hosston Sandstone	3820' to 5170'	1250

*Maximum Allowable Surface Injection Pressure for this injection interval to be determined based on testing and/or information provided by the Permittee under Part II, Section B. of this permit.

5. Placement of the Packer

The packer for each well, WDW #5 and WDW #6, shall be set within 75 feet of the top of the designated injection interval for each well. The discharge point in the injection interval shall be from tubing beneath the packer. The permittee shall utilize an extension packer with a nipple and seal assembly* set as follows:

WDW #5 - Packer Setting Depth - 3625' <+/->

WDW #6 - Packer Setting Depth - 3720' <+/->

*(or equivalent equipment approved by the Director).

6. Placement of Perforations

Selected sand units of the Lower Hosston Formation for WDW #5 and #6 within the designated disposal intervals will be the primary zones selected for perforation at this time. Additional strata within the permitted injection intervals, may be authorized for perforation by the Department, at the request of the Permittee, at a later date.

7. Designated Underground Source of Drinking Water (USDW)

Groundwater with less than 10,000 mg/l TDS (the cutoff point for USDW determination) in the region of the GLCC Central Plant has been determined to be the Cane River Formation at a depth of 900 feet. The El Dorado aquifer, the primary drinking water supply for the region is present at a depth of 350 feet below ground surface.

APPENDIX I

Waste Stream Information for WDW #5 and WDW #6

The waste stream to be injected into WDW #5 and WDW #6 will be treated effluent from the Central Plant's process water treatment plant (PWTP), groundwater treatment plant (GWTP) and landfill treatment plant (LTP). These waste streams are generated from sources throughout the Central Plant.

The effluent from the process water treatment plant (PWTP) is currently classified as hazardous because it contains leachate from pre-RCRA landfills in which hazardous wastes were previously placed. During active landfilling, spent absorbent media contaminated with Ethylene Dibromide, EDB, (EPA wastecode K118) and Methyl-Bromide (K132) were disposed. Methyl Bromide spent absorbent media, along with waste waters from the production of Methyl Bromide were also classified as hazardous. Both of these waste streams will be disposed into WDW #5 and #6.

The effluent from the ground water treatment plant (GWTP) will be generated from a series of ground water recovery wells drilled to recover shallow contaminated ground water beneath the Central Plant site. The recovered ground water will enter the GWTP from wells completed at different depths within the Cockfield Formation. The following waste codes may be applicable to the GWTP effluent: U067, K117, K131, and D028. The effluent from the proposed leachate treatment plant will have the F039 wastecode and will be disposed into WDW #5 and WDW #6. The GWTP treatment unit is included in the Central Plant's RCRA Part B Permit.

TABLE 2-A
SOURCES OF WASTE WATERS TO BE DISPOSED OF IN PROPOSED HOSSTON INJECTION WELLS


WASTE WATER	WASTE GENERATION AREA	WASTE WATER SOURCE	RCRA STATUS
Process Water Treatment Plant			
Methyl bromide K131	TBBPA	Waste water from the production of methyl bromide.	Waste water will be treated to meet standards of 40 CFR 268.40 (See Table 2-B).
West Sump	West Sump first-flush rainwater and spill defense.	Rain water runoff.	Not listed.
TBBPA	Production of tetrabromo-bisphenol-A (TBBPA). Methyl bromide is produced as a by-product.	Manufacturing process waste water.	Not listed.
OCP	Bromination of organic raw material to form products. Reaction of HBr and Ca(OH).	Manufacturing process waste water.	Not listed.
NaHS	Removal of H ₂ S from the gas associated with produced brine.	Gas treatment with NaOH.	Not listed.
Fine Chemicals (Traffic Department and P&S)	Production of a variety of alkyl and aromatic bromides in reactors followed by various product separation and purification steps.	Manufacturing process waste water.	Not listed.
TCO	Specialty chemicals produced by reactions with brominated organics.	Manufacturing process waste water.	Not listed.
BOC	Production of brominated organic compounds.	Manufacturing process waste water.	Not listed.
Engineering Laboratory Tank	Developmental and Analytical Laboratory.	Laboratory use, excludes solvents and listed wastes.	Not listed.
East Storm Pond	Rainwater from the east side of the plant.	Rainwater runoff.	Not listed.
Tank Washout Pad	Drips and rinses of non-RCRA waste code materials from traffic department.		Not listed.

TABLE 2-B

MAXIMUM CONCENTRATION LIMITS¹ FOR LISTED HAZARDOUS WASTE STREAMS GENERATED BY GREAT LAKES CHEMICAL CORPORATION'S EL DORADO PLANT

WASTE CODE	WASTE DESCRIPTION	CHEMICAL CONSTITUENT	MAXIMUM CONCENTRATION LIMIT FOR WASTEWATERS ¹ (mg/l)
D028	1,2 Dichloroethane (Ethylene dichloride)	1,2 Dichloroethane	N.A.
K117	Waste water from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethylene.	Ethylene dibromide Methyl bromide Chloroform	0.028 0.11 0.046
K118	Spent adsorbent solids from purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethylene.	Ethylene dibromide Methyl bromide Chloroform	0.028 0.11 0.046
K131	Waste water from the reactor and spent sulfuric acid from the acid dryer from the production of methyl bromide.	Methyl bromide	0.11
K132	Spent adsorbent and waste water separator solids from the production of methyl bromide.	Methyl bromide dibromomethane	0.11
U067	Ethylene dibromide (commercial chemical product, manufactured chemical intermediate, or off-specification commercial chemical product).	Ethylene dibromide dibromomethane	0.028
F039	Leachate (liquids that have percolated through land-disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under 40 CFR 261.31 Subpart D (Lists of Hazardous Wastes).	Acetone Benzene Bromodichloromethane Bromoform n-butyl alcohol Carbon tetrachloride Chloroethane Chloroform Chloromethane o-Cresol m- and p-Cresol 1,2 Dichloroethane Dibromomethane 1,2 Dichloropropane Ethylbenzene Ethyl ether Ethylene dibromide Ethylene oxide Hexachloroethane Methanol Methyl bromide Methyl ethyl ketone Methylene chloride Phenol Toluene 1,2,4 Trichlorobenzene 2,4,6 Trichlorophenol Xylene(s)	0.28 0.14 0.35 0.63 5.6 0.057 0.27 0.046 0.19 0.11 0.77 0.21 0.11 0.85 0.057 0.12 0.028 0.12 0.055 5.6 0.11 0.28 0.089 0.039 0.08 0.055 0.035 0.32

PWTP = WWTP
process water treatment plant effluent
GWTP
gw treatment plant
(gw recovery wells)
LTU
Leachate treatment unit
(from N/SIF + RCRA cell)
Arkansas Water Resources Center
Tail Brine **501-575-4403 Lab 7317**



¹ Maximum Concentration Limits are defined in 40 CFR 268.43 - Land Disposal Restrictions Treatment Standards

N.A. = Not Applicable

268.40 (1997) for universal
= 268.48 (1997)
universal treatment standard
for hazardous wastes

WASTE WATER	WASTE GENERATION AREA	WASTE WATER SOURCE	RCRA STATUS
Ground Water Treatment Plant			
Ground Water Treatment Plant Effluent D028, U067, K117, K131	Waters from recovery wells.	Ground water.	Water will be treated to meet standards of 40 CFR 268.40 (See Table 2-B).
Leachate Treatment Plant			
RCRA Cell 1 K118, K132, F039	RCRA Cell.	Leachate.	Leachate will be treated to meet standards of 40 CFR 268.40 (See Table 2-B).
N/S Landfill K118, K132, F039	North/South Landfill Leachate and Interim Ground Water Recovery System.	Leachate from french drains and recovery wells.	Leachate will be treated to meet standards of 40 CFR 268.40 (See Table 2-B).
Tail Brine			
	Benefication of minerals due to bromine production.	Not Applicable.	Not RCRA regulated.

EARTHNET LABORATORIES, INC.
 1874 Dallas Drive
 Baton Rouge, Louisiana 70806
 (504) 928-0232
 (Formerly Enviromed Laboratories, Inc.)

ORGANIC ANALYSES REPORT FORM - #7AP
VOLATILE COMPOUNDS (VOA'S)
APPENDIX III

EML Sample No.: 84034A
 Client: GREAT LAKES CHEMICAL CORP
P. O. BOX 1878
 Address: EL DORADO, AR 71731-1878
MR. LYLE HONEYCUTT
 Phone #: (501) 862-5141
 Sample I.D.: PWTP EFFLUENT/UIC

Page 1 of 2

Collected: 11/17/93 By: CLIENT Time: 000
 Received: 11/17/93 By: K. G. Time: 123
 VOAMS Anal. Date - Analyst: 11/24/93-AL
 Sample Type: WATER
 Sample Volume: 5 ml

CAS Number	Volatiles	Concentration mg/L	Det. Lmt. mg/L
75-27-4	Bromodichloromethane	ND	0.005
74-83-9	Bromomethane	0.851	0.010
56-23-5	Carbon Tetrachloride	ND	0.005
108-90-7	Chlorobenzene	ND	0.005
126-99-8	2-Chloro-1,3-butadiene	ND	0.005
124-48-1	Chlorodibromoethane	ND	0.005
75-00-3	Chloroethane	0.015	0.010
110-75-9	2-Chloroethyl vinyl ether	ND	0.005
67-66-3	Chloroform	ND	0.005
74-87-3	Chloromethane	0.009	0.010
107-05-1	3-Chloropropene	ND	0.100
106-93-4	1,2-Dibromoethane (EDB)	0.008	0.005
74-95-3	Dibromomethane	0.006	0.005
110-57-6	t-1,4-Dichloro-2-butene	ND	0.005
75-71-8	dichlorodifluoromethane	ND	0.005
75-34-3	1,1-Dichloroethane	ND	0.005
107-06-2	1,2-Dichloroethane	0.006	0.005
75-35-4	1,1-Dichloroethylene	ND	0.005
156-60-5	t-1,2-Dichloroethylene	ND	0.005
78-87-5	1,2-Dichloropropane	ND	0.005
10061-02-6	t-2,3-Dichloropropane	ND	0.005
10061-01-5	cis-1,3-Dichloropropane	ND	0.005
74-88-4	Iodomethane	ND	0.005
75-09-2	Methylene Chloride	9.00	0.005
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.005
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.005
127-18-4	Tetrachloroethene	ND	0.005
75-25-2	Tribromomethane	ND	0.005
71-55-6	1,1,1-Trichloroethane	ND	0.005

ORGANIC ANALYSES REPORT FORM - #7AP (continued)

EML Sample No.: 84034A

Page 2 of 2

CAS Number	Volatiles	Concentration mg/L	Det. Lmt. mg/L
79-00-5	1,1,2-Trichloroethane	ND	0.005
79-01-6	Trichloroethene	ND	0.005
75-69-4	Trichlorofluoromethane	ND	0.005
96-18-4	1,2,3-Trichloropropane	ND	0.005
75-01-4	Vinyl chloride	ND	0.010

Samples were analyzed using EPA Method 8240 listed in Test Methods for Evaluating Solid Waste - Physical/Chemical Methods. EPA 8240, 3rd Edition, November 1986.

ND - Not Detected.

NA - Not Analyzed/Not Applicable



Chantha Nouth
Laboratory Manager

Rev. 11/05/92

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ORGANIC ANALYSES REPORT FORM - #8AP BASE/NEUTRAL/ACID EXTRACTABLE COMPOUNDS APPENDIX III

EML Sample No.: 84034
 Client: GREAT LAKES CHEMICAL
P. O. 2878
 Address: EL DORADO, AR 71731
MR. LYLE HONEYCUTT
 Phone #: (501) 862-5141
 Sample I.D.: PWTP EFF/UIC

Page 1 of 2

Collected: 11/17/93 By: CLIENT Time: 6000
 Received: 11/27/93 By: K. G. Time: 1230
 BNAMS Anal. Date - Analyst: 12/07/93-CTN
 Sample Type: WATER
 Sample Volume: 975:1 (1)

CAS Number	Base/Neutral/Acid Extractable Compounds	Concentration mg/L (ppm)	Det. Lmt. mg/L
111-91-1	Bis(2-chloroethoxy)ethane	ND	0.010
111-44-4	Bis(2-chloroethyl)ether	ND	0.010
39638-32-9	Bis(2-chloroisopropyl)ether	ND	0.010
106-47-8	p-Chloroaniline	ND	0.010
510-15-6	Chlorobenzilate	ND	0.010
59-50-7	p-Chloro-m-cresol	ND	0.010
91-58-7	2-Chloronapthalene	ND	0.010
95-57-8	2-Chlorophenol	ND	0.010
542-76-7	3-Chloropropionitrile	ND	0.010
541-73-1	m-Dichlorobenzene	ND	0.010
95-50-1	o-Dichlorobenzene	ND	0.010
106-46-7	p-Dichlorobenzene	ND	0.010
91-94-1	3,3'-Dichlorobenzidine	ND	0.050
120-83-2	2,4-Dichlorophenol	ND	0.010
87-65-0	2,6-Dichlorophenol	ND	0.010
118-74-1	Hexachlorobenzene	ND	0.010
87-68-3	Hexachlorobutadiene	ND	0.010
77-47-4	Hexachlorocyclopentadiene	ND	0.010
67-72-1	Hexachlorocyclopentadiene	ND	0.010
70-30-4	Hexachloroprophene	ND	0.010
1888-71-7	Hexachloropropene	ND	0.010
101-14-4	4,4'-Methylenebis(2-chloroaniline)	ND	0.010
608-93-5	Pentachlorobenzene	ND	0.010
76-01-7	Pentachloroethane	ND	0.010
82-68-8	Pentachloronitrobenzene	ND	0.010
87-86-5	Pentachlorophenol	ND	0.050
23950-58-3	Pronamide	ND	0.010
95-94-3	1,2,4,5-Tetrachlorobenzene	ND	0.010
58-90-2	2,3,4,6-Tetrachlorophenol	ND	0.010

ORGANIC ANALYSES REPORT FORM - #8AP (continued)

EML Sample No.: 84034

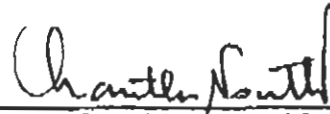
Page 2 of 2

CAS Number	Compound	Concentration mg/L (ppm)	Det. Lmt. mg/L
120-82-1	1,2,4-Trichlorobenzene	ND	0.010
95-95-4	2,4,5-Trichlorophenol	ND	0.010
88-06-2	2,4,6-Trichlorophenol	ND	0.010
126-72-7	Tris(2,3,-dibromopropyl)phosphate	ND	0.010
	BisPhenol-A	0.165	0.010

ND - Not Detected.

NA - Not Analyzed/Not Applicable.

Samples were analyzed using EPA Method 3520 and 8270 listed in Test Method for Evaluating Solid Waste, Physical/Chemical Methods, EPA Manual SW-846, 3rd Edition, November 1986.

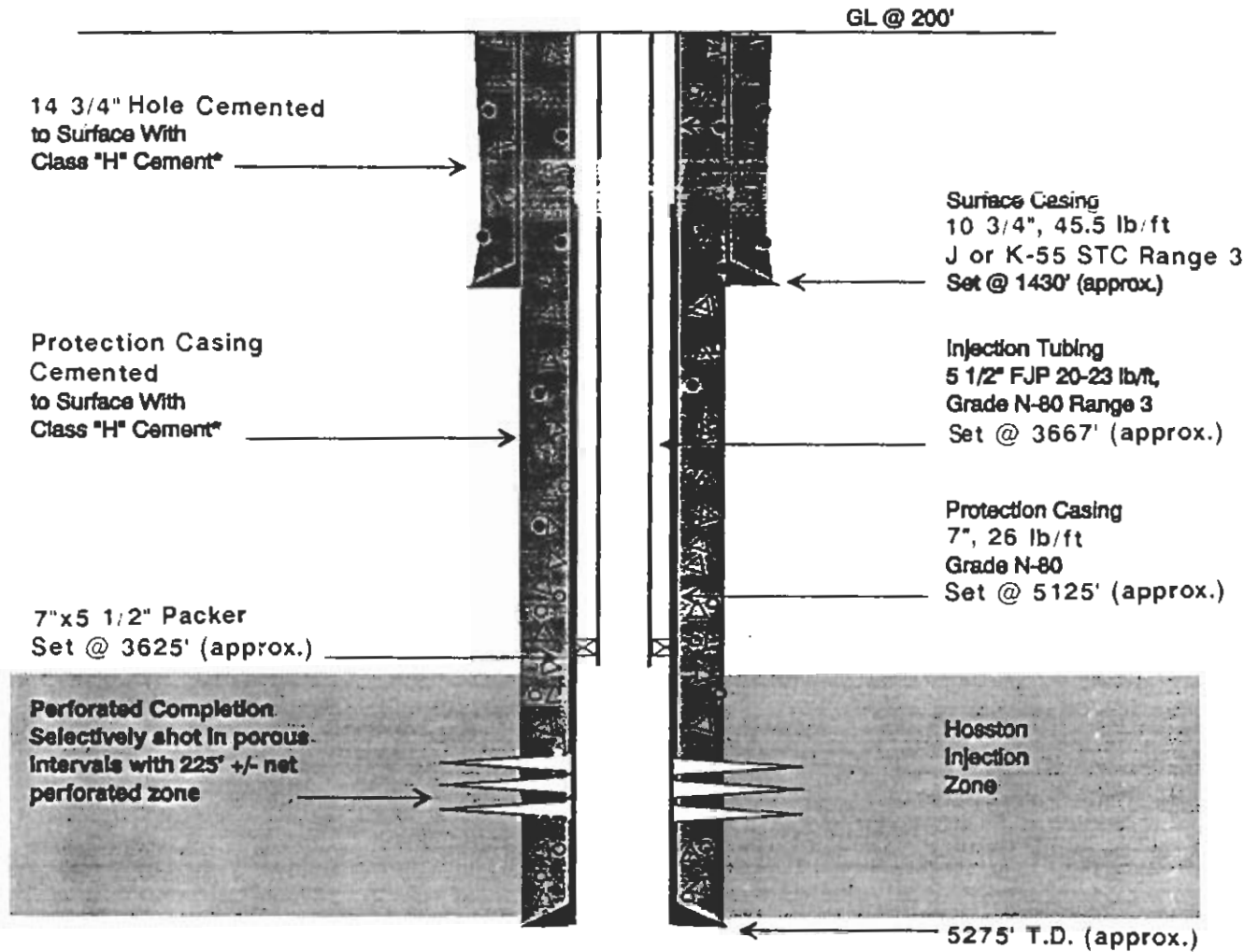


Chantha Nouth
Laboratory Manager

Appendix II

GREAT LAKES CHEMICAL CORPORATION

WDW-5



Injection Interval: 3725'-5075' (est)

- Exact Cement Volumes Calculated After Running Open Hole Caliper Log

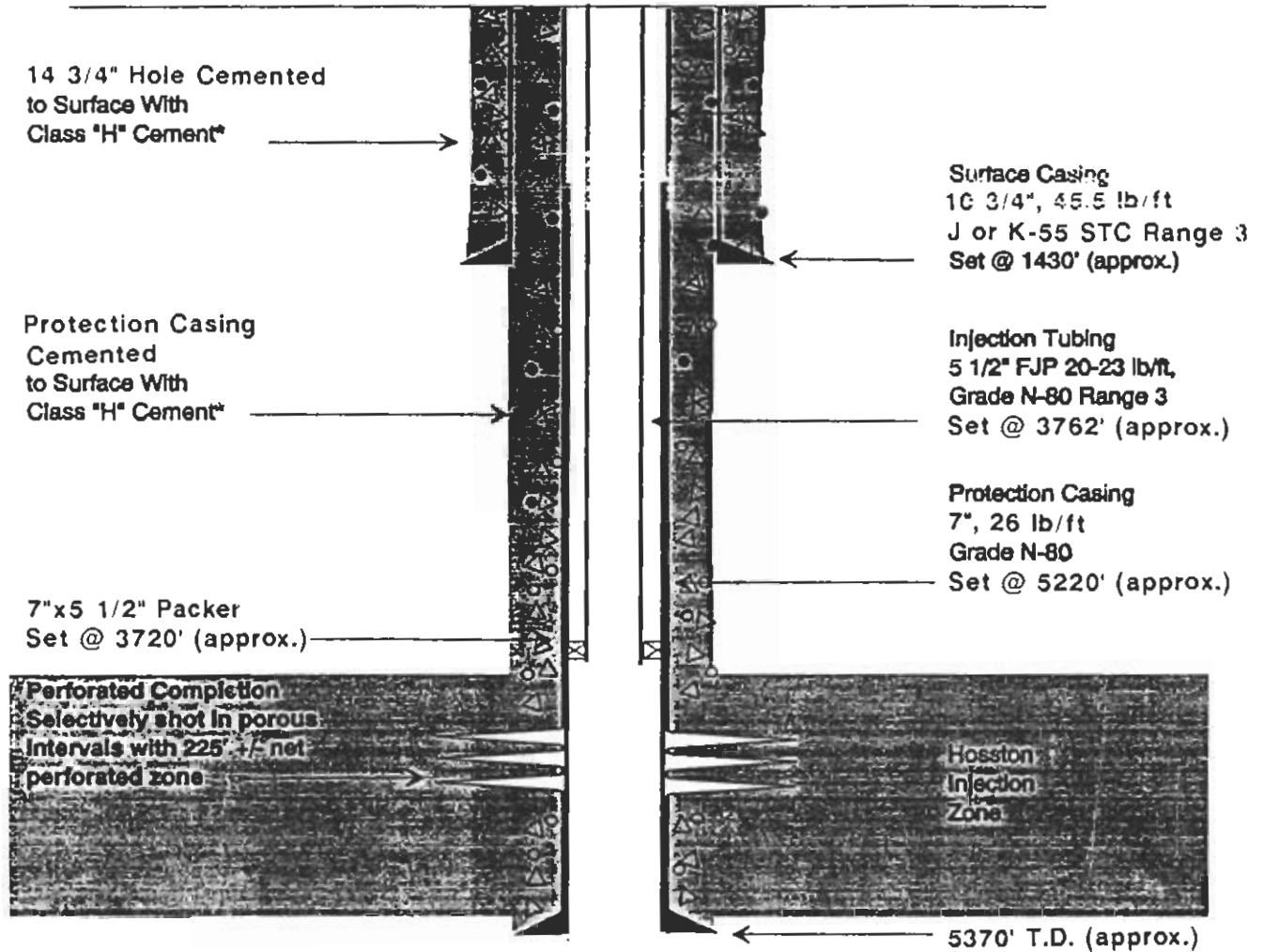
ENVIROCORP

GREAT LAKES CHEMICAL CORP.	
El Dorado, Arkansas	
Proposed Completion WDW-5	REV. 10/94
Scale: Vertical 1" = 1000' (approx.)	
GES Project # 029-001-92	Checked by: RWI
Drawn: D.M.Bilbrey	Date: 5/15/92

DESIGNER / DMB / GLCC-5 / 5-15-92

GREAT LAKES CHEMICAL CORPORATION

WDW-6



Injection Interval: 3820'-5170' (est.)

- Exact Cement Volumes Calculated After Running Open Hole Caliper Log

ENVIROCORP ®

GREAT LAKES CHEMICAL CORP.

El Dorado, Arkansas

Proposed Completion WDW-6 REV. 10/94

Scale: Vertical 1" = 1000' (approx.)

GES Project # 029-001-92

Checked by: RWI

Drawn: D.M.Bilbrey

Date: 5/15/92

DESIGNER / DMB / GLCC-5 / 5-15-92