MODULE V - GROUNDWATER MONITORING

V.A. POST-CLOSURE GROUNDWATER MONITORING

V.A.1. The Permittee shall monitor groundwater in the impacted aquifer as described below, and in a manner that will monitor the release of hazardous constituents from the Industrial Waste Lagoon, TNT Washout Ponds, Sanitary Landfill/Pesticide Disposal Area and Industrial Area Groundwater Sources in compliance with Utah Admin. Code R315-8-6 during the compliance period as defined in Condition V.C.4.

V.A.2. Certain solid waste management units (SWMUs) may be subject to certain provisions of this Module. The Director shall determine which SWMUs may be subject to some or all of the provisions of this Module. The Permittee shall comply with the provisions of Utah Admin. Code R315-8-6.12.

V.A.3. The Permittee shall follow all of the provisions listed under Utah Admin. Code R316-8-6, Groundwater Protection, and as defined by the conditions of this permit. The present compliance point wells are listed in Condition V.A.4.

V.A.3.a. The Area of Compliance is defined as all monitoring wells located within the impacted aquifer and displaying concentrations above those specified in Module V, Table V-2.

V.A.4. The Permittee shall maintain a groundwater monitoring system. The monitoring well system consists of all A, B, C, D, N, P, and T- series wells dedicated to monitoring the release of hazardous constituents from the Industrial Waste Lagoon and Industrial Area contaminant sources, except those that have been abandoned in accordance with the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986, and subsequent addenda. The monitoring well system, piezometers, and the compliance point monitoring well locations are presented in Attachment 1.

V.A.5. The Permittee shall monitor and record the concentration of Trichloroethylene (TCE) and the other constituents listed in Condition V.B.1.a. in the impacted aquifer, and shall submit maps to show the concentration of TCE in this aquifer as specified in Condition V.F.1.

V.A.6. The Permittee shall maintain a GIS capable and searchable data base in order to maintain a record of groundwater related and chemical specific well data.

V.B. REQUIRED PROGRAM

V.B.1. The Permittee shall conduct a monitoring and response program as follows for the Industrial Waste Lagoon subject to these provisions:

V.B.1.a. The Permittee has completed a groundwater quality assessment. This assessment indicated that the following hazardous constituents listed in Table V-1 below, were released from the Industrial Waste Lagoon, entered the impacted aquifer, and have been detected beyond the compliance point and beyond the north boundary of the Tooele Army Depot, Tooele, Utah. The Permittee must provide for the monitoring of volatile compounds as specified in the CDQMP (Volume II, Attachment 2), for compounds listed in table V-1.

TABLE V-1

Carbon Tetrachloride	1,1-Dichloroethane
1,2-Dichloroethene	Methylene Chloride
Chloroform	Tetrachloroethene
1,1-Dichloroethene	1,1,2 -Trichloroethane
1,1,1 -Trichloroethane	1,4-Dioxane
Trichloroethylene	1,2-Dichloroethane

V.B.1.b. Because the groundwater protection standard under Utah Admin. Code R315-8-6 and Condition V.C. has been exceeded, the Permittee has undertaken a groundwater quality assessment program, and implemented a corrective action program as defined under Utah Admin. Code R315-8-6.11, and Module VI. The purpose of this corrective action program is to remove the hazardous waste constituents above from the groundwater.

V.B.1.c. The Permittee shall also monitor the groundwater for the purpose of evaluating the presence of 1,4-dioxane. Monitoring will focus on groundwater contamination originating near building 619 and 609 located on the former Tooele Army Depot Industrial Area. Monitoring will be conducted annually during the fall event in selected monitoring wells.

V.B.1.d. The Permittee shall monitor the groundwater for the purpose of evaluating RDX at SWMU 10/11 biannually.

V.B.1.e. The Permittee may apply for an Alternate Concentration Limit (ACL). This petition may be submitted if,

V.B.1.e.i. The corrective action described in Modules VI through VIII fails to meet the groundwater protection standard defined in Condition V.C., and after the Permittee has demonstrated that all other feasible methods have been used to meet the groundwater protection standard, or

V.B.1.e.ii. If, in accordance with Utah Admin. Code R315-101, a risk assessment concludes that a contaminant concentration greater than the concentration limits specified in Condition V.C., Table V-2, poses no unacceptable risk to human health or the environment.

V.B.1.f. If submitted, the Director shall determine the appropriateness of any ACL petition and either accept, or reject, the proposed concentration level. If the Director determines that the level is appropriate, the Permittee shall initiate a modification to the permit in accordance with Condition I.E.3.

V.B.1.g. Upon termination of any instituted corrective action program under Utah Admin. Code R315-8-6.11., the Permittee shall initiate and maintain a detection monitoring program under Utah Admin. Code R315-8-6.9. and Condition V.E.

V.C. GROUNDWATER PROTECTION STANDARD

V.C.1. The Permittee shall monitor the groundwater, as specified in Condition V.A. to determine whether the corrective action program outlined in Module VI through VIII of this permit is effective in removing hazardous waste constituents from the groundwater and to determine compliance with the groundwater protection standard under Utah Admin. Code R315-8-6.3.

V.C.2. The hazardous waste constituents listed in Table V-2 below, and their approved concentration limits comprise the groundwater protection standard. If alternate concentration limits are approved per Condition V.B.1.d., the Permittee shall initiate a permit modification in accordance with Condition I.E.3. of this permit to incorporate the approved alternate concentrations limits into the Groundwater Protection Standard.

V.C.3. Required SW-846 test methods and detection limits are listed below. If an alternate test method is to be proposed for use, the Permittee shall request a permit modification as specified in Condition I.G.13.c. If, at any time during the duration of this permit, the Director determines that the test methods specified in Table V-2 are not sensitive enough to produce the required results, the Director shall require the Permittee to use alternate test methods (e.g. EPA Method SW846 500 or 600 series test methods). If the Director requires a change to the test method(s), the Permittee shall modify the permit.

V.C.4. As indicated by Utah Admin. Code R315-8-7, the post-closure care period for the Industrial Waste Lagoon is at least 30 years from the most recently issued permit. If any of the groundwater protection standards in Condition V.C. above are still exceeded after 30 years, the Permittee shall continue corrective action.

V.D. GROUNDWATER MONITORING REQUIREMENTS

V.D.1. General Requirements: The Permittee shall comply with the following general requirements for groundwater monitoring:

V.D.1.a. The groundwater monitoring system shall consist of the wells specified in Attachment 1. A permit modification to account for new wells, after installation has been

completed (including slug-testing), will be submitted on an annual basis, prior to April 15, as specified in Table V-4, updating Attachment 1.

TABLE V-2

HAZARDOUS WASTE CONSTITUENT ug/l	TEST METHOD	CONCENTRATION LIMIT ug/l	LOQ*
Carbon Tetrachloride	8260	5.0	1.0
Chloroform	8260	100.0	1.0
1,1-Dichloroethane	8260	170.0	1.0
1,2-Dichloroethane	8260	5.0	1.0
1,1-Dichloroethene	8260	7.0	1.0
1,2-Dichloroethene	8260	1.0	1.0
Methylene Chloride	8260	5.0	5.0
Tetrachloroethene	8260	5.0	1.0
1,1,1-Trichloroethane	8260	200.0	1.0
1,1,2-Trichloroethane	8260	5.0	1.0
Trichloroethene	8260	5.0	1.0
1,4-dioxane	8270SIM	35.00**	1.0

* labs report estimated (J-flagged) detects to LOD

** response level for drinking water systems California Department Public Health

V.D.1.b. All monitoring wells shall be constructed in accordance with the provisions in R315-8-6.8(c) and Condition V.D.2.

V.D.1.c. The groundwater monitoring program shall include sampling and analysis procedures defined in Utah Admin. Code R315-8-6.8(d) and (e). The CDQMP is provided as Attachment 2.

V.D.1.d. The Permittee shall follow the requirements for measurement of the groundwater surface elevation of Utah Admin. Code R315-8-6.8(f).

V.D.1.e. The Permittee shall notify the Director as required by Conditions I.L. and V.A.4. in writing at least 30 days prior to any sampling event required under this permit. The Permittee shall provide a listing of monitoring wells proposed for sampling, a map highlighting their location and the rationale for their selection shall be made as part of this notification.

V.d.1.f. The Permittee may add or remove existing wells or install new wells as part of the monitoring well system only upon modification approval of the Director.

V.D.1.g. The Permittee shall at all times maintain a monitoring well system as specified in Condition V.D.1.a. The monitoring wells and the piezometers listed in Condition V.A.4., may not be removed without modification approval of the Director.

V.D.1.h. The Director may, upon notification to the Permittee, require any of the A, B, C, D, N, P, and T- series wells presently installed, to be added to the semi-annual monitoring well system sampling event, in response to the Permittee's proposed well listing as stated in Conditions V.A.4 and V.D.1.g.

V.D.1.i. The Permittee shall provide for the proper disposal of contaminated groundwater generated during groundwater monitoring well sampling and during the development of new monitoring wells. The Permittee shall dispose of the water as specified in Condition VII.E.3.

V.D.2. Well Location Installation and Construction

V.D.2.a. The Permittee shall locate, install, construct, and maintain new groundwater monitoring wells as specified below;

V.D.2.a.i. Well construction shall follow the techniques described in the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986 and subsequent addenda and Master Workplan for Solid Waste Management Unit 58. All monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing shall be screened or perforated, and packed with gravel or sand where necessary, to enable collection of groundwater samples. The annular space, the space between the bore hole and well casing above the sampling depth must be sealed with bentonite grout to prevent contamination of samples and the groundwater.

V.D.2.a.ii. The Permittee shall construct and maintain new monitoring wells and piezometers in accordance with plans and specifications to be submitted to the Director for approval. The Director will approve in writing the following: number, location, depth, and design of all new wells and piezometers prior to installation. Installation of new monitoring wells and piezometers shall constitute a permit modification. The Permittee shall follow the procedures specified in Condition I.E.2. for permit modifications.

V.D.2.a.iii. Additional groundwater monitoring wells shall be installed to maintain compliance with Condition V.A.3.a. if subsurface conditions significantly change. Such changes may include, but are not limited to, water level elevation or apparent flow direction changes, or detection of one of the hazardous constituents in a monitoring well. If hazardous waste constituents exceeding the groundwater protection standard concentration limits, as defined in Condition V.C., are detected in the furthest most hydraulically downgradient monitoring well(s), the Director may require the Permittee to install additional groundwater monitoring wells further downgradient.

V.D.2.a.iv. Upon notification by the Director in writing or as a result of a compliance action, the Permittee may be required to install and sample additional wells at any time during the post-closure or compliance periods if new information or unforeseen circumstances reveal a need for additional monitoring to protect human health and the environment.

V.D.2.a.v. The Permittee shall submit monitoring well completion reports within 90 days after completion of the wells installed after permit issuance. These reports shall include boring logs, sieve analysis (grain size), standard penetration tests, analytical tests performed on soils (Atterberg limits, etc.), water level elevations, groundwater contour maps, well development results including recharge rates, cross sections or fence diagrams, pump tests or slug test, as well as all other data.

V.D.2.a.vi. Existing monitoring wells shall be maintained in a fully operational condition. The Permittee shall notify the Director within seven (7) days when a well is no longer properly functioning (including the presence of sandy or silty materials, and cracked or broken casings). The Director shall approve the conditions for replacement or correction of improperly operating well(s). Replacement of an existing well that has been damaged or rendered inoperable, without change to location, design, or depth of the well shall constitute a change to a permit condition and shall require a permit modification as specified by Condition I.E.2.

V.D.2.a.vii. The Permittee shall determine once every 12 months the depth to the bottom of all groundwater monitoring wells, and report the findings by October 15 of every year. If a problem is observed, the Permittee shall follow the procedures described above in Condition V.D.2.a.iv. regarding notification and corrective procedures.

V.D.2.a.viii. The Director shall approve the permanent removal of any wells listed in Attachment 1, or any wells installed after permit issuance. A request for the removal or installation of wells shall constitute a request for a permit modification as specified by Condition I.E.2.

V.D.2.a.ix. The Permittee shall permanently remove wells from the monitoring well system in accordance with conditions specified in Condition V.D.2.a.vi. Well plugging and abandonment methods shall be submitted to the Director 30 days prior to the date the wells are removed from the monitoring program.

V.D.3. Sampling and Analysis Procedures

V.D.3.a. The Permittee shall include and maintain consistent sampling and analysis procedures in the groundwater monitoring program that are designed to ensure reliable monitoring results of groundwater quality below the Industrial Waste Lagoon, TNT Washout Ponds, Sanitary Landfill/Pesticide Disposal Area, and Industrial Area Groundwater Sources. As required by Utah Admin. Code R315-8-6.8(d), the program shall include procedures and techniques for:

V.D.3.a.i. sample collection;

V.D.3.a.ii. sample preservation and shipment;

V.D.3.a.iii. analytical procedures;

V.D.3.a.iv. chain-of-custody control; and

V.D.3.a.v. quality assurance and quality control.

V.D.3.b. The sampling and analytical methods must be appropriate for groundwater sampling and accurately measure hazardous waste constituents in groundwater samples, as required by Utah Admin. Code R315-8-6.8(e).

V.D.3.c. The Permittee shall use the following techniques and procedures when obtaining samples and analyzing samples from the groundwater monitoring wells and for obtaining and analyzing samples from the corrective action systems:

V.D.3.c.i. Samples from monitoring wells shall be collected by the techniques described in the CDQMP.

V.D.3.c.ii. All samples shall be preserved and transported in accordance with the procedures specified in the CDQMP.

V.D.3.c.iii. Any change to the sampling or analysis procedures specified in the CDQMP, Attachment 2, Module V, and Module VI through VIII,shall constitute a request for a permit modification as specified by Condition I.E.2.

V.D.3.c.iv. All samples shall be analyzed according to test methods delineated in Module V, Table V-2 or an equivalent EPA-approved method that has been pre-approved, by the Director as per Permit Condition I.G.13.a. In addition:

V.D.3.c.iv.A. All major peaks greater than 25% of the peak height of the closest internal standard will be identified using the most current NBS Library. The quantity of these compounds will be estimated and reported based upon the closest internal standard.

V.D.3.c.iv.B. Any major peak found during the analysis may become a target parameter.

V.D.3.c.iv.C. All data will be collected and validated as outlined in the CDQMP. The Permittee shall resample all wells from which data is rejected.

V.D.3.c.iv.D. The Director may request at any time all laboratory QA/QC documentation and supporting data on any sampling episode. The raw organics information for required sampling and analysis, including organics gas chromatographic printouts, mass spectral

analyses, and QA/QC surrogate and spiking results shall be retained by the U.S. Army Corps of Engineers, and made available at Tooele Army Depot within 72 hours of request, throughout the post-closure care period.

V.D.3.c.iv.E. All samples shall be tracked and controlled using the chain-of-custody procedures specified in the CDQMP.

V.D.3.c.iv.F. In case of loss of sample integrity (i.e. breakage, loss), resampling shall take place within seven days of the loss of sample integrity.

V.D.4. Groundwater Elevations

V.D.4.a. The Permittee shall determine the groundwater surface elevation in the wells and piezometers listed in Attachment 1 semi-annually, as listed in Table V-4. If the Director receives information indicating the need for additional measurement of groundwater surface elevations, the Director will notify the Permittee that the permit must be modified to change the frequency of monitoring of groundwater surface elevations. This change shall constitute a permit modification.

V.D.4.b. The Permittee shall, on an annual basis, construct maps of the potentiometric surface in impacted aquifer. If, based on semi-annual monitoring, as specified in Condition V.D.4.a. above, the Director determines the need for additional information, the Permittee shall be required to install additional piezometers and monitoring wells. In this case, the Director will notify the Permittee in writing that the permit must be modified as specified in Condition V.D.2.a.ii.

V.D.4.c. The Permittee shall determine the groundwater flow rate and direction in the impacted aquifer based on groundwater surface elevation measurements and on resurveyed well apron elevations. An updated potentiometric map shall be submitted to the Director with each semi-annual report as specified by Condition V.F.2, and as listed in Table V-4.

V.E. MONITORING PROGRAM AND DATA EVALUATION

V.E.1. The Permittee shall determine groundwater quality as follows:

V.E.1.a. The Permittee shall collect, preserve, and analyze groundwater samples pursuant to Permit Condition V.D.

V.E.1.b. The Permittee shall determine the groundwater flow rate and direction in the impacted aquifer at least every 12 months. This information shall be included in the annual report specified by Condition V.F.1., Table V-3, and reported as listed in Table V-4.

V.E.1.c. The Permittee shall sample on a semi-annual basis, and report as listed in Table V-4, the monitoring system wells agreed to by the Director, in accordance with the

provisions of V.A.4. These samples shall be analyzed for the presence of the hazardous constituents listed in Condition V.C.3. (Table V-2).

V.E.1.d. The Permittee shall analyze samples collected from the monitoring wells using the test methods and concentration levels listed in Condition V.C.3., Table V-2. Based on changes in technology or site conditions, the Permittee may petition the Director to modify these parameters.

V.F. REPORTING AND RECORDKEEPING

V.F.1. The Permittee shall submit an annual report on the effectiveness of the corrective action program. This report shall be submitted no later than October 15 of each year. The annual report shall contain the information and be submitted at the frequency as specified in Table V-3 below:

TABLE V-3

TYPE OF INFORMATION	FREQUENCY
Results of sample analysis including; concentration of hazardous constituents, and a summary of the QA/QC data listed in Condition V.D.3.	annual
Measurements of static water levels and total well depths.	annual
Results of annual model recalibration and a summary analysis of annual model results.	annual
Potentiometric maps of the impacted aquifer. This map shall indicate the rate and direction of groundwater flow.	annual
Contaminant concentration maps of the impacted aquifer.	annual
Tables and graphs (time series) of chemical concentrations of sampled wells, if detected at or above concentration limits.	annual
Identification of potential "hot spots" meriting attention for further evaluation.	semi-annual[1]

[1] Each annual report will identify trends if any anomalies persist and propose corrective action or modification to the system

V.F.2. The Permittee shall submit to the Director the analytical results required by Permit Conditions V.D., V.E., and the groundwater elevation data required by Condition V.D.4. in accordance with the following schedule:

TABLE V-4

Samples and data collected during the months of	Semi-annual sampling events	Results due to the Director
January-June	Jan-June	October 15
July-Dec	July-Dec.	October 15

Annual groundwater model updates, annual monitoring reports, contaminant concentration maps, as well as new monitoring well completion reports shall be submitted by October 15 of every year.

V.G. ASSURANCE OF COMPLIANCE

The Permittee shall assure that monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard are taken during the term of the permit.