MODULE IV - GROUNDWATER MONITORING

IV.A. POST-CLOSURE GROUNDWATER MONITORING

IV.A.1. Hazardous constituents have been released from the M-136 LTTAs, the M-508 Photographic Waste Discharge Site and other waste management sites at the facility. The Permittee shall monitor groundwater in the impacted aquifers as described in this Module and Attachment 3. The Permittee shall maintain compliance with R315-264-90 Groundwater Protection during the post-closure care period as defined in Condition IV.A.6.

IV.A.2. The Permittee shall maintain a groundwater monitoring system. The monitoring well system consists of all wells dedicated to monitoring the release of hazardous constituents from M-136, M-508 and other waste management sites at the facility. The monitoring well system shall consist of the wells, piezometers and springs specified in Table 4-A of Attachment 4. The monitoring well, piezometer and spring locations are also presented in Attachment 4, Plates 1A and 1B.

IV.A.3. The Area of Compliance is defined as all monitoring wells, piezometers and springs located within impacted aquifers and displaying concentrations that exceed the Groundwater Protection Standard as defined in section IV.C. of this Permit module.

IV.A.4. The Permittee shall implement the corrective action program, as described in Module V, upon exceedance of the Groundwater Protection Standard within the Area of Compliance.

IV.A.5. 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.

IV.A.6. The Permittee shall monitor the groundwater throughout the post-closure care period. If any of the Groundwater Protection Standards, or approved Alternate Concentration Limits, are still exceeded after thirty (30) years, the Permittee shall continue corrective action as specified in Condition V.F.

IV.A.7. The Permittee shall maintain a searchable data base so that a complete record of the chemical and well specific groundwater monitoring data, collected in accordance with this Module, is available.

IV.B. REQUIRED PROGRAM

IV.B.1. The Permittee shall monitor groundwater, in accordance with Section IV.B., for the hazardous constituents listed below in Table IV-1.

IV.B.1.a. The groundwater quality assessment, completed by the Permittee, determined the hazardous constituents listed in Table IV-1 below were released at the site, entered the impacted aquifer, and have been detected beyond the compliance point. Some constituents have been detected beyond the facility boundary. The Permittee shall monitor the groundwater for the constituents listed in Table IV-1 as specified in the Sampling and Analysis Plan, Attachment 3.

TABLE IV-1

CONSTITUENTS AND GROUNDWATER PROTECTION STANDARD

Constituent	GWPS (ug/L)	Constituent	GWPS (ug/L)
1,1-Dichloroethene	7.0 [1]	Trans-1,2-dichloroethene	100 [1]
1,1-Dichloroethane	2.8[2]	Trichloroethene	5.0 [1]
1,2-Dichloroethane	5.0 [1]	Trichlorofluoromethane	5,200 [2]
1,1,1-Trichloroethane	200 [1]	Vinyl Chloride	2.0 [1]
1,1,2-Trichloroethane	5.0 [1]	Xylene	10,000 [1]
Acetone	14,000 [2]	Arsenic	10 [1]
Benzene	5.0 [1]	Barium	2,000 [1]
Carbon Tetrachloride	5.0 [1]	Beryllium	4.0 [1]
Chlorobenzene	100 [1]	Chromium (total)	100[1]
Chloroform	80[2,3]	Chromium VI	0.035[2]
Cis-1,2-Dichloroethene	70 [1]	Cobalt	6[2]
Methyl Ethyl Ketone (2-Butanone)	5,600[2]	Molybdenum	100[2]
Methylene Chloride	5 [1]	Perchlorate	14[2]
Tetrachloroethene	5.0 [1]	Nitrate	10,000 [1]
Toluene	1,000 [1]	RDX	0.7[2]
		HMX	1,000[2]

1 Maximum Contaminant Levels (MCLs), EPA, 2017
2 EPA Regional Screening Levels (RSLs) for Tapwater, June 2017
3 The MCL for chloroform applies to the Total Trihalomethanes, which also include bromodichloromethane, bromoform, and dibromochloromethane

IV.B.2. The Permittee shall collect and analyze samples from the groundwater monitoring system at least annually as described below:

IV.B.2.a. Thirty (30) days prior to the collection of samples, the Permittee shall submit an annual Groundwater Monitoring Plan to the Director for approval. The monitoring plan shall include a list of monitoring wells and springs proposed for sampling, the constituents that will be sampled for in each well, a map highlighting the well locations, and the rationale for the proposed well selections and constituents.

IV.B.2.b. The Permittee shall collect and analyze samples from Shotgun and Pipe Springs semiannually, once in the Spring and once in the Fall. The Permittee shall submit the analytical results for spring samples collected in the Fall with the Annual Groundwater Monitoring Report (Condition IV.E.2). The results for the spring samples collected in the Spring shall be submitted to the Director in writing by the Permittee within ninety (90) days of collecting the samples.

IV.B.3. The Permittee shall not implement the proposed Groundwater Monitoring Plan without Director written approval. The Director may, upon written notification to the Permittee, require any or all of the monitoring wells, springs or piezometers listed in Table 1 of Attachment 4 be sampled for any or all of the constituents listed in Table IV-1.

IV.C. GROUNDWATER PROTECTION STANDARD

IV.C.1. The concentrations listed for each hazardous waste constituent in Table IV-1 shall comprise the groundwater protection standard. The Permittee shall sample and analyze the groundwater monitoring system for these constituents, as described in Condition IV.B.

IV.C.2. The Permittee may apply for Alternate Concentration Limits (ACL). A petition may be submitted if:

IV.C.2.a. The approved corrective measures, as described in Modules V and VI, fail to meet the groundwater protection standard defined by Condition IV.C.1., (Table IV-1) and the Permittee has demonstrated that all other technically feasible methods have been used to meet the concentration limits, or

IV.C.2.b. A risk assessment, conducted in accordance with R315-101, concludes that a contaminant concentration greater than the groundwater protection standard poses no unacceptable risk to human health or the environment.

IV.C.3. 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.2.

IV.C.4. The Permittee may request to have one or more constituents removed from the groundwater monitoring constituent list (Table IV-1). The Director shall determine if it is appropriate to remove constituent(s), based on the rationale provided by the Permittee and monitoring results. If the Director determines that it is appropriate to remove constituents as requested, the Permittee shall initiate a modification to the permit in accordance with Condition I.E.2.

IV.C.5. The Permittee shall use the SW-846 test methods and detection limits listed in

Table 1 of Attachment 3 to analyze groundwater samples. If an alternate test method is proposed, the Permittee shall request a permit modification in accordance with Condition I.E.2. If, at any time during the duration of this permit, the Director determines that the test methods specified in Attachment 3 are not sensitive enough to produce the required results, the Director may require the Permittee to use alternate test methods. If the Director requires a change to the test method(s), the Permittee shall modify the permit.

IV.D. GROUNDWATER MONITORING REQUIREMENTS

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

IV.D.1.a. The groundwater monitoring system shall consist of the wells, piezometers and springs specified in Table 1 of Attachment 4.

IV.D.1.b. Existing monitoring wells shall be maintained in a fully operational condition for the duration of this permit. The Permittee shall notify the Director within seven days when a well is no longer properly functioning (including the presence of sandy or silty materials that impacts the well function and cracked or broken casings). The Director must approve in writing the conditions for replacement or correction of improperly operating well(s).

IV.D.1.c. The Permittee shall measure the total depth of all groundwater monitoring wells that are completed in unconsolidated sediments (listed in Table 2, Attachment 3) every five years. Total well depth measurements shall be compared to the original total depths for each well and submitted to the Director with the Annual Groundwater Monitoring Report in the year following total well depth measurements. If a problem is observed, the Permittee shall follow the procedures described above in Condition IV.D.1.b. regarding notification and corrective procedures.

IV.D.1.d. The permanent removal of any wells in the groundwater monitoring system (Table 1, Attachment 4) shall be approved by the Director in writing. A request for the removal of wells shall constitute a permit modification.

IV.D.1.e. The Permittee shall install additional groundwater monitoring wells to maintain compliance with this Module if subsurface conditions significantly change after permit issuance. 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 exceed the groundwater protection standard concentration limits, as defined in Section IV.C. of this Module, in the furthest most hydraulically down-gradient monitoring well(s), the Permittee shall install additional groundwater monitoring wells further down-gradient.

IV.D.1.f. Upon notification by the Director in writing, or as a result of an enforcement 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.

IV.D.1.g. The Permittee shall not add or remove any groundwater monitoring wells without prior written approval of the Director. The Permittee shall submit to the Director an application for a permit modification (for Attachment 4) within ninety (90) days of when new wells are added to or removed from the groundwater monitoring system.

IV.D.2. The Permittee shall locate, install, construct, and maintain new groundwater monitoring wells as specified below:

IV.D.2.a. Well construction shall follow the techniques described in the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, November 1992, or most current, approved edition. 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, depending on the formation, to enable collection of groundwater samples. The annular space, the space between the bore hole and well casing above the sampling depth, shall be sealed with bentonite grout to prevent contamination of samples and the groundwater.

IV.D.2.b. 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.

IV.D.2.c. The Permittee shall submit monitoring well completion reports within ninety (90) days after completion of any new wells installed. These reports shall, at a minimum, consist of the following components: a boring log that documents well drilling and associated sampling; a well construction log and well construction diagram ("as built"); well survey information for locations and elevations of the newly completed wells, the results of pump tests or slug tests, and a summary that discusses how the groundwater flow model shall be updated based on the data obtained from the installation of the new wells. The detailed information that shall be included for each of the four components is outlined in Attachment 5.

IV.D.2.d. The Permittee shall properly dispose all contaminated groundwater generated during groundwater monitoring well sampling and during the development of new monitoring wells.

IV.D.2.e. The Permittee shall permanently remove wells from the monitoring well system in accordance with the plugging and abandonment procedures described in the

Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, November 1992, and subsequent addenda and as specified in Condition IV.D.1.d. above.

IV.D.3. The Permittee shall include and maintain sampling and analysis procedures in the groundwater monitoring program that are designed to ensure reliable monitoring results. As required by R315-264-97(d), the program shall include procedures and techniques for:

IV.D.3.a. sample collection;

IV.D.3.b. sample preservation and shipment;

IV.D.3.c. analytical procedures;

IV.D.3.d. chain-of-custody control; and

IV.D.3.e. quality assurance and quality control.

IV.D.4. The sampling and analytical methods must be appropriate for groundwater sampling and accurately measure hazardous waste constituents in groundwater samples, as required by R315-264-97(e).

IV.D.5. The Permittee shall use the following techniques and procedures when obtaining samples and analyzing samples from the groundwater monitoring wells, piezometers and springs:

IV.D.5.a. The Permittee shall collect, preserve, and transport all samples from monitoring wells, piezometers and springs in accordance with the procedures specified in the Sampling and Quality Assurance Project Plans, presented in Attachment 3;

IV.D.5.b. Changes to the sampling or analysis procedures specified in Attachment 3, Module IV, or Module V, shall require a permit modification;

IV.D.5.c. The Permittee shall ensure all samples will be analyzed according to the test methods shown in Table 1 of the Groundwater Sampling and Analysis Plan, Attachment 3, or an equivalent EPA-approved method that has been pre-approved, by the Director in writing as per Condition I.G.13. In addition:

IV.D.5.c.i. All major analytical peaks greater than 25% of the peak height of the closest internal standard shall be identified using the most current National Bureau of Standards (NBS) Library. The quantity of these compounds shall be estimated and reported based upon the closest internal standard;

IV.D.5.c.ii. Any major analytical peak found during the analysis may become a target parameter for that constituent.

IV.D.5.c.iii. All data shall be collected and validated as outlined in the Sampling and Quality Assurance Project Plans contained in Attachment 3. The Permittee shall resample all wells from which data is rejected.

IV.D.5.c.iv. The Director may request at any time all laboratory QA/QC documentation and supporting data on any sampling episode in the previous 5 years. 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 Permittee at the Promontory facility and made available within fifteen (15) working days of request throughout the post-closure care period.

IV.D.5.c.v. All samples shall be tracked and controlled using the chain-of-custody procedures specified in the Sampling and Quality Assurance Project Plans contained in Attachment 3.

IV.D.5.c.vi. In case of loss of sample integrity (e.g. breakage, loss), resampling shall take place within seven days of the loss of sample integrity.

IV.D.6. The Permittee shall determine the groundwater surface elevation in all monitoring wells listed in Table 4-A, Attachment 4 annually. The Permittee shall determine the groundwater surface elevation in the piezometers listed in Table 4-A, Attachment 4, on an as needed basis as determined by the Director.

IV.D.7. The Permittee shall maintain a record of the piezometer locations and mark the locations of piezometers in the field so that they may be found as needed.

IV.D.8. The Permittee shall, on an annual basis, construct maps of the potentiometric surface, based on the groundwater surface elevation data collected as described in Condition IV.D.6. If, based on annual monitoring, the Director determines that additional potentiometric data is needed, the Permittee shall install additional monitoring wells or piezometers.

IV.D.9. The Permittee shall determine the groundwater flow rate and direction in the impacted aquifers based on groundwater surface elevation measurements. An updated potentiometric map shall be submitted to the Director on an annual basis as specified in Condition IV.E.2.

IV.D.10. If the Director receives information indicating that the surveyed well casing elevations of the wells in the groundwater monitoring system, as specified in Condition IV.A.2., exceed 0.01 feet from a fixed datum the Permittee shall resurvey any or all of these well casing elevations.

IV.D.11. The Permittee shall submit plume maps, as specified in Section IV.E. to show the concentration of hazardous constituents detected in impacted aquifers. Plume maps shall be submitted for the following constituents: trichloroethene, 1,1,1-trichloroethane, 1,1-dichloroethene, 1,1-dichloroethane, cis-1,2-dichloroethene, chloroform and perchlorate.

IV.E. REPORTING AND RECORD KEEPING

IV.E.1. The Permittee shall keep a record of all monitoring, testing and analytical data obtained pursuant to the groundwater monitoring requirements contained in this Module. This data shall be managed as part of the Operating Record until closure of the facility in accordance with R315-264-73(b)(6).

IV.E.2. The Permittee shall submit to the Director, for approval, annual Groundwater Monitoring Reports compiling the results of groundwater monitoring and assessing the effectiveness of the corrective action program. These reports shall be submitted no later than March 15 of each year and shall contain the following information:

IV.E.2.a. An Introduction and list of wells describing the monitoring that was conducted, a summary of the analytical results and a description of the QA/QC results;

IV.E.2.b. Results of sample analysis including the concentration of hazardous constituents, units of measurement, well or spring sampled, date sample was collected, the EQL and MDL;

IV.E.2.c. Results of sample analysis for samples collected in the Fall from Pipe and Shotgun Springs;

IV.E.2.d. QA/QC information including Case Narratives from the laboratory and Data Validation Reports as described in Section D2 of the QAPP (Attachment 3);

IV.E.2.e. Measurements of static water levels as directed by Condition IV.D.6.;

IV.E.2.f. Potentiometric surface maps of the impacted aquifer(s). This map shall indicate the rate and direction of groundwater flow, as indicated by Conditions IV.D.8. and IV.D.9.

IV.E.2.g. Groundwater Monitoring Well Inspection Checklist (Attachment 2);

IV.E.2.h. Total monitoring well depth data in the year following total well depth measurements for wells listed in Table 2, Attachment 3, as directed by Condition IV.D.1.c.

IV.E.2.i. Plume maps showing contaminant concentrations of the impacted aquifers, as directed by Condition IV.D.11.;

IV.E.2.j. Results of annual model recalibration and a summary analysis of annual model results, as directed by Conditions V.E.2. and IV.E.3.;

IV.E.2.k. Identification of potential "hot spots"meriting attention for further evaluation (subsequent report will identify trends if any anomalies persist and propose corrective action or modification to the system).

IV.E.3. If new groundwater surface or contaminant data does not show any discernable differences from the previous groundwater model calibration, and if the previous groundwater model calibration was deemed satisfactory by the Director, the Permittee may petition the Director to postpone the groundwater model recalibration for one year.

IV.E.4. The annual groundwater monitoring reports identified in Conditions IV.E.2. through IV.E.2.k. shall also be submitted electronically. Data submitted electronically shall be in a format approved by the Director.