

**Hazardous Waste "Part B" Operating Permit Application  
Groundwater Monitoring Module**

**Add the permit application module information below where designated in the base checklist (sequentially).**

**E. ► GROUNDWATER MONITORING**

E-1      Exemption from Groundwater Protection Requirements: 40 CFR 270.14(c)

If a waiver from the Subpart F groundwater monitoring requirements is requested, the owner or operator must demonstrate that one of the following (E-1b or E-1c) applies to the facility.

E-1a      [Reserved for Waste Piles]

E-1b ► Landfill: 40 CFR 264.90(b)(2)

Demonstrate that the landfill is designed and operated to meet the conditions specified in D-6b(4).

E-1c ► No Migration: 40 CFR 264.90(b)(4)

Demonstrate that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the requested unit (including the closure period) and the post-closure care period. (Predictions must be based on assumptions that maximize the rate of liquid migration). The demonstration must be certified by a qualified geologist or geotechnical engineer.

**If a waiver is requested under E-1, delete the remainder of section E. If the waiver is denied, the remainder of section E will need to be addressed.**

E-2      Interim Status Groundwater Monitoring Data: 40 CFR 270.14(c)(1), 265.90 through 265.94

Existing facilities must provide a summary of the groundwater monitoring data obtained during the interim status periods, including:

E-2a      Description of Wells: 40 CFR 265.91

A copy of the topographic map provided for Section 270.14(b) on which the location and identification on each interim status monitoring well is indicated. An indication of which wells are downgradient of the disposal area, and which are upgradient.

Details of the design and construction of each interim status monitoring well (e.g., screen and casing depths, water levels at time of drilling, any water level changes within 24 hours, filter pack and sealing materials placement, dates of construction, boring logs, etc.).

E-2b ►

Description of Sampling/Analysis Procedures: 40 CFR 265.92

A copy of the facility's groundwater sampling and analysis plan [required under §265.92(a)] that includes the procedures used and the protocol followed in:

- sample collection,
- sample preservation and shipment,
- analytical procedures,
- chain-of-custody.

Provide a complete Quality Assurance Project Plan (QAPP) for the groundwater sampling and analysis plan. Guidelines for developing the QAPP are found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846), Chapter One.

E-2c ►

Monitoring Data: 40 CFR 265.92

Provide all interim status monitoring results, including the following:

- Copies of each quarterly (from first year) analytical results for each well;
- Copies of subsequent (annual or semi-annual) analytical results for each well;
- Copies of any notifications of significant change in analysis parameters made to IDEM pursuant to 40 CFR 265.93;
- Results of groundwater surface elevation measurements for each sampling event; and
- Calculations of the initial background arithmetic mean and variance for each indicator parameter based on replicated measurements from upgradient wells during the first year;

E-2d

Statistical Procedures: 40 CFR 265.93

Provide information relating to statistical procedures, including the following:

- A description of the statistical procedures used (if applicable) in processing the data submitted (as in the use of a Student's t-test and the level of significance used); and
- Results of statistical comparison between upgradient and downgradient well sampling results and first year background values for each indicator parameter;

E-2e

Groundwater Assessment Plan: 40 CFR 265.93(d)(2)

If required, based on statistical comparison results, provide the specific plan for a groundwater quality assessment program along with results from implementation of the plan. Where required, include results of the following determinations made under the groundwater quality assessment (considering at a minimum, the hazardous constituents listed in Appendix VIII to 40 CFR Part 261):

- Whether hazardous waste or hazardous waste constituents have entered the groundwater;
- The rate and extent of migration of hazardous waste or hazardous waste constituents in the groundwater; and
- The concentrations of hazardous waste or hazardous waste constituents in the groundwater.

E-3

General Hydrogeologic Information: 40 CFR 270.14(c)(2)

Identify the uppermost aquifer and any hydraulically interconnected underlying aquifers (i.e., all likely subsurface flow paths for hazardous constituents that may leak from the facility), and describe their hydrogeologic properties (e.g., hydraulic gradient, groundwater flow, rate and direction); provide the supporting data used to identify this information (i.e., the information obtained from hydrogeologic investigations of the facility area). This identification must include a report written by a qualified hydrogeologist on the hydrogeologic characteristics of the facility property supported by at least the drilling logs of on-site borings and wells and the available professional literature. Include a description of the regional geologic and hydrogeologic setting. In addition, include the following site-specific data:

- An analysis of topographic or geomorphic features that might influence the groundwater flow system;
- A classification and description of the hydrogeologic properties (hydraulic conductivity, porosity, texture, thickness, etc.) of all of the hydrogeologic units found at the site (i.e., the aquifers and any intervening saturated and unsaturated units);
- Using the §270.14(b)(19) topographic map as a base, isopach and structural contour maps and/or geologic cross sections showing the extent of the hydrogeologic units contained in the uppermost aquifer, and any intervening aquitards or other units within the facility boundary; and
- A description of the field methods used in the study, and a summary of which data were collected by each method.

E-4 ►

Topographic Map Requirements: 40 CFR 270.14(c)(2), (3), (4)(i)

Unless exempt from groundwater monitoring requirements, include the following information on the topographic map:

- Groundwater flow direction and rate (isometric graph);
- Point of compliance;
- Groundwater monitoring wells;
- The extent of any plume (horizontal and vertical);
- Hazardous waste management area; and
- Property boundary.

The following required information may be incorporated into the topographic map if possible, or at least should be discussed in the text:

- Boundaries of uppermost aquifer; and
- Underlying interconnect between uppermost aquifer and lower aquifer.

(Although many of these items can be shown on a single map, it is allowable to use additional maps to display some of the information. Presentation of all this information on a single map may sacrifice clarity.)

E-5 ►

Containment Plume Description: 40 CFR 270.14(c), (2), (4) and (7)(ii); Part 261, Appendix VIII

For existing facilities suspected of contaminating groundwater, provide a description of any plume of contamination that has entered the groundwater from a regulated unit at the time the application is submitted that:

- Delineates the extent of the plume on the topographic map of 40 CFR 270.14(b)(19);
- Identifies the concentration of each constituent listed in Appendix VIII of Part 261 throughout the plume or identifies the maximum concentrations of each Appendix VIII constituent in the plume; and
- Delineates the vertical extent of the plume in cross section.

This requirement is applicable to all existing facilities where interim status monitoring shows the presence of hazardous constituents downgradient from the regulated units, unless it can be proven that such constituents are coming from another source. In addition, this requirement may be applied to other existing facilities where interim status monitoring data are non-existent or deficient if these facilities are suspected of contaminating groundwater, or if the Regional Administrator determines that a facility's interim status monitoring program is incapable of determining whether hazardous constituents have entered the groundwater from a regulated unit.

NOTE: In some cases, contaminant plumes may be defined under groundwater quality assessment programs carried out during the interim status period as required by 40 CFR 265.93(d). Normally, such assessment programs do not address the complete list of Appendix VIII constituents as required under 40 CFR 270.14(c)(4). Additional monitoring will be required to identify the concentration of each Appendix VIII constituent in the plume.

E-6

General Monitoring Program Requirements: 40 CFR 270.14(c)(5), 264.97, 264.90(b)(4)

Provide detailed plans and an engineering report describing the proposed groundwater monitoring program to meet the general groundwater monitoring requirements. The following information is required:

E-6a

Description of Wells: 40 CFR 264.97(a), (b), (c)

- Number of wells;
- Locations;
- Depths;
- Materials of construction (casing, screens, etc.);
- Assurance of unaffected background groundwater measurement; and
- Assurance of compliance point groundwater measurement.

E-6b ► Description of Sampling/Analysis Procedures: 40 CFR 264.97(d), (e), (f)

- Sample collection methods;
- Sample preservation/shipment;
- Analytical procedures;
- Chain-of-custody;
- Documentation of proper sampling and analysis procedures; and
- Procedure for determination of groundwater elevation with each sample.

Provide a complete Quality Assurance Project Plan (QAPP) for the groundwater sampling and analysis plan. Guidelines for developing the QAPP are found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846), Chapter One.

E-6c ► Procedures for Establishing Background Quality: 40 CFR 264.97(a)(1), (g)

- Groundwater samples must be representative of background quality not affected by releases from the regulated unit;
- Background groundwater quality must be established for each monitoring parameter or constituent;
- Procedures for establishing background quality may include wells not hydraulically upgradient of the waste management area where:
  - upgradient cannot be determined due to hydrogeologic conditions,
  - other wells provide background groundwater quality that is representative or more representative of background than upgradient wells.

E-6d ► Statistical Procedures: 40 CFR 264.97(h); (i)(1), (5) and (6)

Provide a description of the statistical procedures that will be used in evaluating groundwater monitoring data. The following statistical methods [E-6d(1) - (5)] have been approved by IDEM for use in evaluating groundwater monitoring data for each hazardous constituent. The description provided must demonstrate compliance with the following performance standards:

- Testing should be conducted separately from each hazardous constituent in each well;
- Method should be appropriate for distribution of chemical parameters or hazardous constituents. More than one method may be needed if distributions differ;
- Method must account for data below the detection limit;
- Any practical quantification limit (PQL) used in the method shall be the lowest concentration level within levels of precision and accuracy for routine lab operations; and
- Method shall include procedures to control or correct for seasonal and spatial variability and temporal correlation in data.

E-6d(1) Parametric Analysis of Variance (ANOVA): 40 CFR 264.97(h)(1), (i)(2)

ANOVA followed by multiple comparisons procedures:

- Include estimation and testing of contrasts between each compliance well's mean and the background mean levels for each constituent.
- If using individual well comparison procedure, Type 1 error level of no less than 0.01 shall be maintained. If using multiple comparison procedure, Type 1 error level no less than 0.05 for each testing period must be used.

E-6d(2) Non-parametric ANOVA (Based on Ranks): 40 CFR 264.97(h)(2), (i)(2)

ANOVA based on Ranks followed by multiple comparison procedures:

- Estimation and testing of each compliance well's median and background median levels for each constituent.
- If using individual well comparison procedures, Type 1 error level of no less than 0.01 shall be maintained. If using multiple comparison procedure, Type 1 error level no less than 0.05 for each testing period must be used.

E-6d(3) Tolerance or Predication Interval Procedure: 40 CFR 264.97(h)(3), (i)(4)

- Establish interval for each constituent based on distribution of background data;
- Compare level of each constituent in each compliance well to the upper tolerance or prediction limit; and
- Prepare levels of confidence and/or percentage of the population that the interval must contain considering number of samples in the background data base, data distribution, and range of concentration values for each constituent of concern.

E-6d(4) Control Chart Approach: 40 CFR 264.97(h)(4), (i)(3)

- Control limits for each constituent; and
- Specify type of control chart and associated parameter values.

E-6d(5) Alternative Approach: 40 CFR 264.97(h)(5), (i)

An alternative approach can be proposed that complies with all performance standards set in 264.97(i).

E-7 ► Detection Monitoring Program: 40 CFR 270.14(c)(6), 264.91(a)(4), 264.98

Provide sufficient information, supporting data, and analysis documenting the absence of hazardous constituents in the groundwater to support the implementation of a detection monitoring program at the present time.

E-7a ► Indicator Parameters, Waste Constituents, Reaction Products to be Monitored:  
40 CFR 270.14(c)(6)(i), 264.98(a)

Supply a list of indicator parameters, waste constituents, or reaction products that can provide a reliable indication of the presence of hazardous constituents in the groundwater. Provide the following information:

- Type, quantity, and concentrations of constituents expected in wastes managed at the regulated unit(s);
- Mobility, stability, persistence of waste constituents, or their reaction products, expected in the unsaturated zone;
- Detectability of indicator parameters, waste constituents, or their reaction products in the groundwater (including the expected method detection limits (MDLs) or practical quantitation limits (PQLs)); and
- Concentrations or values and coefficients of variation of proposed parameters in the background groundwater.

E-7b Groundwater Monitoring System: 40 CFR 270.14(c)(6)(ii), 264.97(a)(2), (b), (c); 264.98(b)

Describe the individual elements of the monitoring system to be used during detection monitoring. Identify the number, location, and depth of each well, and describe the well construction materials.

E-7c Background Groundwater Concentration Values for Proposed Parameters: 40 CFR 270.14(c)(6)(iii), 264.98(c), 264.97(g)(1), (2)

Demonstrate that the following procedures will be used:

- Use of appropriate groundwater monitoring system, to establish background specifying number and type of samples for each hazardous constituent appropriate for the statistical test employed;
- Sampling procedure shall be a sequence of at least four samples from each well in the entire system at an interval assuring an independent sample relative to the uppermost aquifer's effective porosity, hydraulic conductivity, hydraulic gradient and fate and transport characteristics of the potential contaminants but at least semi-annually; or
- Alternative sampling procedure to be approved by IDEM.

E-7d ► Proposed Sampling and Analysis Procedures: 40 CFR 270.14(c)(6)(iv); 264.97(f); 264.98(d), (e), (f)

Provide a description of the proposed sampling and analysis procedures, including the following information:

- Documentation of proper sampling and analysis procedures;
- Procedures for determining groundwater elevation;
- Procedures for determining statistically significant increase for any monitored parameter;
- At least four samples from each compliance and background well semi-annually; and
- Procedure for annual determination of uppermost aquifer flow rate and direction.

Provide a complete [Quality Assurance Project Plan](#) (QAPP) for the groundwater sampling and analysis plan of the detection monitoring program. Guidelines for developing the QAPP are found in "[Test Methods for Evaluating Solid Waste, Physical/Chemical Methods](#)" (SW-846), Chapter One.

E-7e [Statistically Significant Increase in Any Constituent or Parameter Identified at Any Compliance Point Monitoring Well](#): 40 CFR 264.98(g), 264, Appendix IX

Document that the following procedures will be implemented if there is statistically significant evidence of contamination for any constituent or parameter is at any compliance point monitoring well:

- Notify IDEM of this finding in writing within seven (7) days;
- Immediately sample all wells for Appendix IX list (Part 264) constituents, and if necessary, resample within one month and repeat analysis for the those compounds detected;
- Submit a compliance monitoring plan meeting the requirements of 264.99 within 90 days;
- Submit engineering feasibility plan within 180 days for a corrective action program unless all constituents identified are listed in 264.94 Table 1 and their concentrations do not exceed respective values in that table or ACLs have been approved; and
- If appropriate, submit a demonstration that a source other than the regulated unit caused the contamination.

E-8 [Compliance Monitoring Program](#): 40 CFR 270.14(c)(7), 264.99

If the presence of hazardous constituents has been detected in the groundwater at the point of compliance at the time of permit application, submit the following information.

E-8a [Description of Monitoring Program](#)

E-8a(1) ► [Waste Description](#): 40 CFR 270.14(c)(7)(i)

Provide description of the wastes previously handled at the facility. This description must include:

- Historical records of volumes, types (including EPA ID number, if applicable), and chemical composite of wastes placed in units in the waste management area;
- The results of any direct sampling of the waste (see "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods," SW-846);
- A list of constituents that are reasonably expected to be in or derived from the waste; and
- Identification of dominant constituents expected to be present, and their relative abundance.

If it is expected that some constituents may form a separate, immiscible fluid, the composition of this fluid and its viscosity and density must be included in the application.

E-8a(2) ► Characterization of Contaminated Groundwater: 40 CFR 270.14(c)(7)(ii)

Provide a characterization of the contaminated groundwater including the concentration of identified hazardous constituents. For each well at the point of compliance, and for each background well, provide the following information:

- Concentrations of each constituent in Appendix VIII of 40 CFR Part 261;
- Concentrations of major anions and cations; and
- Concentrations of the constituents listed in Table 1 of §264.94, if not already determined by the above.

E-8a(3) ► Hazardous Constituents to be Monitored in Compliance Program: 40 CFR 270.14(c)(7)(iii), 264.99(a)(1), 264.98(g)(3)

Specify the hazardous constituents for which the owner/operator to monitor and present a rationale for selecting these constituents. The owner/operator may resample within one month and repeat analysis for constituents detected. Constituents identified in both analyses will form basis for compliance monitoring plan.

E-8a(4) Concentration Limits: 40 CFR 270.14(c)(7)(iv), 264.99(a)(2), (c)(3); 264.94; 264.97(g), (h)

Specify proposed concentration limits for each hazardous constituent. (The proposed concentration limit must not exceed the value of that constituent, listed in Table 1 of §264.94, entitled Maximum Concentration of Constituents for Groundwater Protection or the present background level of that constituent in the groundwater; whatever is greater. If petitioning IDEM to establish alternate concentration limits, the owner/operator must supply the information identified in comment E-8a(5).) Specify conditions warranting special sampling procedures.

Describe procedures for establishing background concentration values for constituents that are based on:

- Use of any appropriate groundwater monitoring system;
- Data that is available prior to permit issuance;
- Data that accounts for measurement errors in sampling and analysis;
- Data that accounts for seasonal groundwater quality fluctuations; and
- Data from a minimum of four samples per well collected at least semi-annually during the compliance period.

E-8a(5) Alternate Concentration Limits: 40 CFR 270.14(c)(7)(iv), 264.99(a)(2), 264.94(b)

Provide a justification for establishing alternate concentration limits. This justification must address each of the following factors.

E-8a(5)(i) Adverse Effects on Groundwater Quality: 40 CFR 264.94(b)(1)

The potential adverse effects on groundwater quality, considering:

- The physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;
- The hydrogeological characteristics of the facility and surrounding land;
- The quantity of groundwater and the direction of groundwater flow;
- The current and future uses of groundwater in the area;
- The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;
- The potential for health risks caused by human exposure or wastes constituents;
- The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and
- The persistence and permanence of the potential adverse effects.

E-8a(5)(ii) ► Potential Adverse Effects: 40 CFR 264.94(b)(2)

The potential adverse effects on hydraulically-connected surface-water quality, considering:

- The volume and physical and chemical characteristics of the waste in the regulated unit;
- The hydrogeological characteristics of the facility and surrounding land;
- The quantity and quality of groundwater, and the direction of groundwater flow;
- The proximity of the regulated unit to surface waters;
- The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
- The existing quality of surface water, including other sources of contamination and the cumulative impact on surface-water quality;
- The potential for health risks caused by human exposure to waste constituents;
- The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and
- The persistence and permanence of the potential adverse effects.

E-8a(6) Engineering Report Describing Groundwater Monitoring System: 40 CFR 270.14(c)(7)(v), 264.95, 264.97(a)(2) and (c), and 264.99(b)

Provide detailed plans and an engineering report discussing the individual elements of the monitoring system to be used during compliance monitoring. The plans should identify the number, location, and depth of each well, and describe the casing and construction materials of wells.

Provide details supporting the representative nature of the groundwater quality at (1) background monitoring points and (2) the compliance monitoring point.

E-8a(7) ► Proposed Sampling and Statistical Analysis Procedures for Groundwater Data:  
40 CFR 270.14(c)(7)(vi), 264.97(d), (e), (f), 264.99(c), (d), (e), (f) , and (g)

Provide the following information regarding proposed sampling and statistical analysis procedures for groundwater data:

- Compliance period;
- Sample collection methods;
- Sample preservation/shipment;
- Analytical procedures;
- Chain-of-custody control;
- Documentation of proper sampling and analysis procedures;
- Procedures for determining groundwater elevation;
- Procedures for annual determination of uppermost aquifer flow rate and direction; and
- Annual testing procedures for Appendix IX constituents.

Provide a description of procedures for determining a statistically significant increase for any monitored parameters or hazardous constituents, including the following:

- Comparing compliance point using the procedures in 264.97(h) to the concentration limit developed in accordance with 264.94; and
- Collecting at least four samples from each well (compliance and background) at least semi-annually.

Provide a complete Quality Assurance Project Plan (QAPP) for the groundwater sampling and analysis plan of the compliance monitoring program. Guidelines for developing the QAPP are found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846), Chapter One.

E-8a(8) Groundwater Protection Standard Exceeded at Compliance Point Monitoring Well: 40 CFR 264.99(h), (i)

Indicate that the following procedures will be implemented if the groundwater protection is exceeded at the compliance point monitoring well:

- Submit written notification to IDEM;
- Submit an application for permit modification to establish a corrective action program meeting the requirements of 264.100 within 180 days, including details of the program to comply with the groundwater protection standard and details of groundwater monitoring to demonstrate effectiveness of the corrective action program; or
- Submit demonstration that concentration limits were exceeded due to source other than regulated unit, or due to an error in sampling, analysis, statistical evaluation, or variation in the groundwater.

E-9 Corrective Action Program: 40 CFR 270.14(c)(8), 264.100, 264.99(l)

If hazardous constituents have been measured in the groundwater that exceed the concentration limits established under §264.94 Table 1, or if groundwater monitoring conducted at the time of permit application at the waste boundary indicates the presence of hazardous constituents from the facility in groundwater over background concentrations, the owner or operator must submit sufficient information, supporting data, and analyses to establish a corrective action program that meets the requirements of §264.100. (However, an owner or operator is not required to submit information to establish a corrective action program if he demonstrates to IDEM that alternate concentration limits will protect human health and the environment after considering the criteria listed in §264.94(b).)

Submit the following information to establish a corrective action program:

E-9a ►

Characterization of Contaminated Groundwater: 40 CFR 270.14(c)(8)(i)

Provide a characterization of the contaminated groundwater including the concentration of identified hazardous constituents. For each well at the point of compliance, and for each background well, provide the following information:

- Concentrations of each constituent in Appendix VIII of 40 CFR Part 261;
- Concentrations of major anions and cations; and
- Concentrations of the constituents listed in Table 1 of §264.94, if not already determined by the above.

E-9b

Concentration Limits: 40 CFR 270.14(c)(8)(ii), 264.99(a)(2), 264.94(b)

Specify proposed concentration limits for each hazardous constituent. (The proposed concentration limit must not exceed the present background level of that constituent in the groundwater nor may it exceed the value of that constituent, if listed in Table 1 of §264.94, entitled Maximum Concentrations of Constituents for Groundwater Protection. If you wish to petition IDEM to establish alternate concentration limits than those specified above you must supply the information identified in comment E-9c.)

E-9c

Alternate Concentration Limits: 40 CFR 270.14(c)(8)(ii), 264.99(a)(2), 264.94(b)

Provide justification for establishing alternate concentration limits. This justification must address each of the following factors:

E-9c(1)

Adverse Effects on Groundwater Quality: 40 CFR 264.94(b)(1)

Potential adverse effects on groundwater quality, considering:

- The physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;
- The hydrogeological characteristics of the facility and surrounding land;
- The quantity of groundwater and the direction of groundwater flow;
- The proximity and withdrawal rates of groundwater users;

- The current and future uses of groundwater in the area;
- The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;
- The potential for health risks caused by human exposure or waste constituents;
- The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and
- The persistence and permanence of the potential adverse effects.

E-9c(2) ► Potential Adverse Effects: 40 CFR 264.94(b)(2)

Potential adverse effects on hydraulically-connected surface-water quality; considering:

- The volume and physical and chemical characteristics of the waste in the regulated unit;
- The hydrogeological characteristics of the facility and surrounding land;
- The quantity and quality of groundwater, and the direction of groundwater flow;
- The patterns of rainfall in the region;
- The proximity of the regulated unit to surface waters;
- The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
- The existing quality of surface water, including other sources of contamination and the cumulative impact on surface-water quality;
- The potential for health risks caused by human exposure to waste constituents;
- The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;
- The persistence and permanence of the potential adverse effects.

E-9d Corrective Action Plan: 40 CFR 270.14(c)(8)(iii), 264.100(b)

A corrective action program must prevent hazardous constituents from exceeding their respective concentration limits at the compliance point, and between the compliance point and the down gradient facility property boundary.

Provide detailed plans and an engineering report on the corrective actions proposed for the facility. This information must include identification of the compliance point, a schedule for implementation for the corrective action measures, and the following:

E-9d(1) ► Location: 40 CFR 270.14(c)(8)(iii), 264.100(b)

Maps showing the location of engineered barriers, caps, drains and wells, etc. (use the topographic map in Section B-2).

E-9d(2) ► Construction Detail: 40 CFR 270.14(c)(8)(iii), 264.100(b)

Description and engineering drawings of construction details and specifications for any proposed features to contain groundwater or redirect its flow (e.g. engineering barriers, caps, drains, wells).

E-9d(3) ► **Plans for Removing Wastes:** 40 CFR 270.14(c)(8)(iii), 264.100(b)

If proposed, plans for removing and handling of any hazardous wastes.

E-9d(4) ► **Treatment Technologies:** 40 CFR 270.14(c)(8)(iii), 264.100(b)

A description of the treatment technologies to be used for contaminated groundwater that is pumped or drained from the zone of contamination.

E-9d(5) **Effectiveness of Correction Program:** 40 CFR 270.14(c)(8)(iv), 270.14(c)(8)(iii), 264.100(b)

A prediction and sensitivity analysis on the effectiveness of corrective actions. (For example, anticipated drain flow rates, assuming a range of hydrogeological properties.)

E-9d(6) **Rejection System:** 40 CFR 270.14(c)(8)(iii), 264.100(b)

If treated ground or surface water is to be reinjected at the site, the concentration levels of all hazardous constituents to be reinjected.

E-9d(7) **Additional Hydrogeological Data:** 40 CFR 270.14(c)(8)(iii), 264.100(b)

A description and summary of any additional hydrogeological data collected for use in designing the corrective action.

E-9d(8) ► **Operation and Maintenance:** 40 CFR 270.14(c)(8)(iii), 264.100(b)

Operation and maintenance plans for the correction action measures.

E-9d(9) ► **Closure and Post-Closure Plans:** 40 CFR 270.14(c)(8)(iii), 264.100(b)

If applicable, closure and post-closure care plans for the materials used to handle hazardous wastes as part of the corrective action.

E-9e **Groundwater Monitoring Program:** 40 CFR 270.14(c)(8)(iv), 264.100(d)

Provide a description of the groundwater monitoring program that must be implemented to determine compliance with the concentration limits established under 264.94, and to determine the effectiveness of the corrective action program. Water quality monitoring must be conducted over the on-site extent of the contaminated groundwater. Submit the following information:

E-9e(1) **Description of Monitoring System:** 40 CFR 270.14(c)(7)(v), (8)

Provide a description of all elements of the groundwater monitoring system, including:

- Number of wells;
- Locations;
- Depths and screened intervals;
- Casing descriptions;
- Other well construction details; and
- Description of how the groundwater monitoring programs will demonstrate the adequacy of the corrective action.

E-9e(2) ► Description of Sampling and Analysis Procedures: 40 CFR 270.14(c)(7)(vi), (8)

Provide a description of all sampling and analysis procedures, including:

- Sampling frequency;
- Sampling collection;
- Sampling preservation and shipment;
- Analytical procedures;
- Chain-of-custody control;
- Procedures for determining groundwater elevations; and
- Procedures for annual determination of groundwater flow rate and direction.

Provide a complete [Quality Assurance Project Plan](#) (QAPP) for the groundwater sampling and analysis plan of the corrective action program. Guidelines for developing the QAPP are found in "[Test Methods for Evaluating Solid Waste, Physical/Chemical Methods](#) (SW-846), Chapter One.

E-9e(3) Monitoring Data and Statistical Analysis Procedures: 40 CFR 270.14(c)(7)(vi), (8)

Provide a description of all monitoring data and statistical analysis procedures, including:

- Procedure for establishing background concentration levels;
- Statistical procedures for comparing compliance point data to the concentration limits; and
- Statistical procedures for evaluating the effectiveness of the corrective action program between the compliance point and the property boundary.

E-9e(4) Reporting Requirements: 40 CFR 264.100(g)

Indicate that a semi-annual report will be submitted to IDEM evaluating the effectiveness of the corrective action program.