Monitoring Well Completion Report Requirements

Introduction

The Monitoring Well Completion Report requirements that are addressed in this attachment are based on the EPA RCRA Groundwater Monitoring Technical Enforcement Guidance Document (OSWER-9950.1, November 1992), and subsequent addenda. The Monitoring Well Completion Reports shall, at a minimum, consist of the four following components:

1. A boring log that documents well drilling and associated sampling;

2. A well construction log and well construction diagram ("as built");

3. Well survey information for locations and elevations of the newly completed wells, with a map showing the well locations, and

4. 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 below.

Additional Information

In addition to the four main components, the Well Completion Reports shall include a description of the purpose of the new wells (e.g. definition of the extent of groundwater contamination plumes) and a discussion on deviations from the Monitoring Well Installation Plan.

In addition, Monitoring Well Completion Reports shall include sections on geology and hydrogeology. Well Completion Reports submitted by Thiokol in the past have included cross-sections, fence diagrams, and summary discussions on the geology and hydrogeology of the new wells. If pump or slug tests are conducted, the test data should be submitted with calculations for transmissivity, hydraulic conductivity and groundwater flow rates.

Boring Logs and Field Records

Drilling logs and field records should be prepared detailing the following information:

· The lithology or pedology (i.e., geologic or soil classification) of each geologic and soil unit in the unsaturated and saturated zones, including the confining layer. The classification system used for lithologic and pedologic descriptions should be a system described in the literature, and should be summarized or referenced in the permit application. For example, soils may be described

using the Unified Soil Classification System, and rock may be described using the classification schemes of Dunham (1962) for carbonates, Pettijohn et al. (1972) for sandstones, Potter et al. (1980) for shales, and the common textural and compositional classification schemes for igneous and metamorphic rock (e.g., rhyolite, granite, basalt, schist, slate, marble, gneiss, etc.). Examples of these classifications schemes are presented in Appendix 2;

· Descriptions of the structural features encountered. As applicable, this should include a description of planar features (e.g., bedding planes, graded bedding), lineations, and other features related to vegetation, and discontinuities. The orientation of these features should be measured and described when possible;

· Moisture content (saturated, moist, dry), degree of weathering, color (referenced to standardized colors when possible (e.g., Munsell color for moist soil and unconsolidated materials)), and stain (e.g., presence of mottles, $Fe_2 0_3$), as applicable;

· If a field monitoring device (e.g., FID, PID) is used, the data from these measurements, including sampling method, background and sample concentrations, probe type, span setting, and calibration gas type and concentration, should be provided to EPA as part of the boring log or field record;

· Depth to the water table;

· Depth to water-bearing unit(s) and vertical extent of each water-bearing unit;

· Depth of borehole and reason for termination of borehole;

· Depth, location, and identification of any evidence of contamination (e.g., odor, staining) encountered in borehole;

· Observations made during drilling (e.g., advance rate, water loss); and

· Observations made during soil, unconsolidated material, or rock sampling (e.g., blow counts, sample recovery).

The subsurface boring log should contain at least the information identified with an "X" in the Table below (Aller et al., 1989 provide an example format for a field boring log).

TABLE 3
FIELD BORING LOG INFORMATION

General

- x *Project (facility) name*
- x *Hole name/number*
- x *Date started and finished*
- x *Geologist's name*
- x *Driller's name*
- • Sheet number
- x *Hole location; map and elevation (surveyed)*
- x *Rig type, bit size/auger size, hammer type*
- x *Sampling equipment used*
- x *Classification scheme used for soils (e.g., USDA textural classification system, or unified soil classification system)*
- x *Classification scheme used for rocks (see Appendix 2 for examples)*

Information Columns

- x *Depth of borehole*
- x *Sample depth/number/type*
- x *Blow counts and advance rate*
- x *Percent sample recovery*
- x *Narrative description*
- x *Depth to saturation (nearest 0.01 foot)*

Narrative Description

- Geologic Observations (include depth, description):
  - x *soil/unconsolidated material/rock type*
  - x *color and stain*
  - x *texture*
  - x *gross petrology*
  - • friability
  - x *moisture content*
  - x *degree of weathering*
  - x *presence of carbonate minerals*
  - x *fractures*
  - x *solution cavities*
  - x *bedding, formation boundaries*
  - x *discontinuities: e.g., foliation*
  - x *water-bearing zones*
  - x *dip of bedding, foliations, etc.*
  - • fossils, with a taxonomic identification (i.e., brachiopod, trilobite, etc.)
  - x *sedimentary structures*
  - x *presence of organic matter*
  - x *odor*
  - x *suspected contaminants*

- Drilling Observations:
  - x *loss of circulation*
  - x *advance rates*
  - • rig chatter
  - x *depth to water table or saturation*
  - x *drilling difficulties*
  - x *changes in drilling method or equipment*
  - x *readings from detective equipment, if any*
  - x *amount of water yield or loss with depth*
  - x *amounts and types of any drilling fluids used*
  - x *presence of running sands*
  - x *caving/hole stability*
  - x *reason for termination of borehole*

- Other Remarks:
  - • equipment failures
  - x *possible contamination of soil/groundwater*
  - x *deviations from drilling plan*
  - x *weather*

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x Indicates items that the owner/operator should record, at a minimum.

Well Construction Log and Diagram

In accordance with Condition VI.B.5, all documents pertaining to the design, construction, and development of RCRA monitoring wells shall be kept by the Permittee in the facility operating record and submitted as part of the operating permit. The well construction log and well construction diagram should present the following information (including dimensions, as appropriate):

· Well name/number;
· Date/time of well construction;
· Borehole diameter and well casing diameter;
· Well depth (±0.1 ft);
· Casing length;
· Casing materials;
· Casing and screen joint type;
· Screened interval(s);
· Screen materials;
· Screen slot size/design;
· Filter pack material and size;
· Filter pack volume (calculated and actual);
· Filter pack placement method;
· Annular sealant composition;
· Annular seal placement method;
· Annular sealant volume (calculated and actual);
· Surface sealant composition;
· Surface seal placement method;
· Surface sealant volume (calculated and actual);
· Surface seal and well apron design/construction;
· Well development procedure and ground-water turbidity measured at the completion of well development;
· Type and design/construction of protective casing;
· Well cap and lock;

The owner/operator should document that the following well completion activities were performed appropriately:

· Selection of construction materials for the casing and screen;
· Selection of the well diameter, screen length, and screen slot size;
· Selection and emplacement of the appropriate filter pack;
· Selection and emplacement of the annular sealants;
· Providing proper security of the well; and
· Adequately developing the well.

Monitoring Well Survey Information and Map

· Ground surface elevation (±0.01 ft);
· Survey reference point elevation (±0.01 ft) on well casing;
· Top of monitoring well casing elevation (±0.01 ft);
· Top of protective steel casing elevation (±0.01 ft); and
· Surveyed well locations; and
· Map showing new monitoring well locations.

Groundwater Flow Model Update Summary

A summary shall be included that discusses how the groundwater flow model shall be updated based on the data obtained from the installation of the new wells. Examples of the type of information that may be discussed include: presence of contamination (if data is available when report is prepared); geology and hydrology (if not discussed in other sections of the report); potentiometric surface; implications regarding the groundwater flow and transport model; receptors or threats to human health and the environment; etc.