FESHM 8011: Groundwater Protection: Excavations and Wells

Revision History

Author	Description of Change	Revision Date
Chris Greer	• Title and text changes to include non-monitoring well impact on groundwater zones; • Updated the chapter to reflect the change of D/S/C ESH Groups to Division Safety Officer due to the centralization of the ESH&Q section • Changes in the personnel responsibilities due to the ESH&Q centralization • Added references to the Environmental Review Form (ERF) and Groundwater Management Plan (GMP); • Moved the detailed well criteria to a GMP appendix	February 2016
Geoff Eargle	Minor editorial changes only.	Revision 1 December, 2010

TABLE OF CONTENTS

1.0 INTRODUCTION 2
2.0 DEFINITIONS 2
3.0 SPECIAL RESPONSIBILITIES 3
3.1 Environment, Safety, Health & Quality (ESH&Q) Section/Environmental Protection Group 3
3.2 Division Safety Officer/Project Lead 4
4.0 EXCEPTIONS 4
5.0 PROCEDURES 4
6.0 REFERENCES 5

1.0 INTRODUCTION

The purposes of this chapter are to provide a brief overview of the groundwater zones at Fermi National Accelerator Laboratory (Fermilab) and to refer the personnel responsible for activities that may impact these groundwater zones to the processes related to Fermilab's Environmental Review Form (ERF) and Groundwater Management Plan (GMP) to ensure the protection of groundwater resources at Fermilab. Such activities include, but are not limited to, excavations ten or more feet below ground surface (ft bgs), installation of borings for geotechnical or cathodic protection purposes and installation of geothermal or groundwater monitoring or supply wells.

For a more in-depth presentation of the groundwater zones at Fermilab see the Groundwater Management Plan (DocDB ID: ESHQ-doc-1689, version 2). Multiple groundwater zones (aquifers) are regularly monitored at Fermilab, ranging from only several feet deep to more than 400 feet below the ground surface (Figure 1). Groundwater zones in the glacial sediments are characterized by the State of Illinois as Class II non-resource groundwater. A water-table aquifer exists within the Yorkville Member Resedimented Facies at about 5-15 ft below ground surface, with an intermittent saturated zone near the top of the Yorkville Member Facies B unit between 30 and 45 ft bgs. The top of the Class I aquifer (a resource groundwater, with more stringent quality standards) is in the fractured dolostone bedrock surface, known as the Joliet Formation.

Excavations and borings that are deeper than ten feet below ground surface have the potential to impact the water-table aquifer and the deeper aquifers, depending on the maximum depth of the work. Additionally, while the groundwater zones in the glacial sediments at Fermilab have been generally characterized as Class II resources, one of the criteria that Illinois EPA uses to classify aquifers as Class I resources is a depth ten feet or more below ground surface. For these reasons, excavations or borings greater than ten feet below ground surface should be noted for further groundwater review on the ERF. Excavations or borings that penetrate multiple aquifer zones have the potential to allow groundwater to migrate vertically between aquifer zones, creating a potential pathway to cross-contaminate deeper aquifers that are more sensitive to impacts and have more strict quality standards. Of particular concern at Fermilab is penetration of Facies B and C of the Yorkville clay till units, which are typically between 30 and 50 feet bgs and serve as a protective barrier above the Class I groundwater resources in deep glacial and bedrock units. The GMP includes specifications for borings and wells to ensure that they are properly designed to prevent vertical migration between aquifers. Excavations at Fermilab do not typically exceed 30 ft bgs and would require additional groundwater review during the planning stage of the project.

2.0 DEFINITIONS

"Groundwater" means underground water which occurs within the near-surface saturated zone or within geologic materials where the fluid pressure in the pore space is equal to or greater than atmospheric pressure.

"Saturated Zone(s)" refers to the zone(s) below the water table, which is the boundary where fluid pressure in the pores of a porous medium is exactly 1 atmosphere. The location of this surface is revealed by the level at which water stands in a shallow monitoring well open along its length and penetrating the surface deposits just deeply enough to encounter standing water in the bottom.

"Excavation" means removal of earthen material for purposes such as utility work, building construction, enclosure work, etc.

"Boring" means an excavation of limited diameter that is drilled, cored, driven, dug, or otherwise constructed which penetrates the saturated zone. Open borings may result in degraded water quality within the saturated zone by acting as a conduit for contamination.

"Monitoring Well" means any well intended for the purpose of determining ground water quality or quantity.

"Geothermal Well" means any well intended for the purpose of transferring heat to or from the subsurface via piping and thermal backfill.

"Cathodic Protection Boring/Well or Deep Anode Well" means any well intended for the purpose of structural corrosion protection via piping, wiring and/or conductive backfill.

"Supply Well" means any well intended for the purpose of pumping groundwater to the surface for either potable or non-potable use.

3.0 SPECIAL RESPONSIBILITIES

3.1 Environment, Safety, Health & Quality (ESH&Q) Section/Environmental Protection Group

1. Determine if excavations, borings and wells meet the requirements of this chapter and, if not, request modification or abandonment.

2. Provide consultation for, and review all proposed projects requiring excavation or boring deeper than ten feet bgs to characterize the geologic materials within the saturated zone or the installation of a monitoring well.

3. Conduct inspections of any monitoring wells installed by other Division/Sections during and after construction.

4. Maintain a centralized database of monitoring wells.

5. Maintain a monitoring well maintenance program.

6. Be responsible for all monitoring wells incorporated into the site-wide monitoring well network.

7. Coordinate the required notification to the County Department of Public Health for any monitoring well abandonment.

8. Provide the appropriate Division Safety Officer/Project Lead with a report of any inspection of a monitoring well that requires action.

3.2 Division Safety Officer/Project Lead

1. Notify the ESH&Q Section (Chief Safety Officer, who will refer to the Environmental Protection Group) prior to the installation of any monitoring well. Within 60 days of the adoption of this chapter, supply the Chief Safety Officer with the location of all monitoring wells within their jurisdictions.

2. Coordinate all projects requiring excavation, drilling of a soil boring or installation of a well below ten feet bgs with the Chief Safety Officer.

3. Supply the Chief Safety Officer with a copy of the Drill Log and Well Completion Report of any monitoring well.

4. Supply the Chief Safety Officer with a copy of any key used to secure the above ground protective casing of a monitoring well.

5. Notify the Chief Safety Officer prior to abandoning any monitoring well.

6. Supply the Chief Safety Officer with any information requested by the ESH&Q Section to fulfill inspection or maintenance requirements.

4.0 EXCEPTIONS

Soil borings are for the characterization of subsurface materials only and shall not be used to fulfill the purposes of a monitoring well. Borings must be closed immediately after drilling, before the drill rig is pulled off of the hole. Borings extending below ten feet bgs shall be properly grouted.

5.0 PROCEDURES

All new excavation work, borings and wells constructed at Fermilab shall comply with the requirements of this chapter and the referenced documents, particularly the review criteria in the ERF and the monitoring well design and construction details in the GMP. Monitoring wells currently maintained and monitored will be modified, if possible, to meet applicable requirements. If a currently

managed monitoring well is determined by the Chief Safety Officer to be unable to meet these requirements, it will be abandoned within 30 days.

Managers of projects that require the installation of monitoring wells shall consult with the ESH&Q Section prior to installation of the wells. This consultation will be initiated by an environmental review (via the ERF process) of any proposed subsurface exploration by the Chief Safety Officer. The proposed project will be evaluated and authorization to proceed with the well installation and/or comments on the project will be forwarded back to the project manager. The Chief Safety Officer shall then be notified prior to the construction of any new monitoring well. After completion of construction, the responsible Division/Section/Project will supply the ESH&Q Section with a copy of the Drill Log and Well Completion Report, along with any pertinent project plan/design information, so that it can be included in the centralized Monitoring Well Database and the Well Maintenance Program. A copy of the key used to secure the above ground protective casing of any monitoring well shall be supplied to the ESH&Q Section during the project so that the monitoring well can be inspected. Any monitoring well determined to be useful after project completion will be incorporated into the site-wide monitoring well network and will be transferred to the ESH&Q Section. Any monitoring well included in the site-wide network will become the sole responsibility of the ESH&Q Section and will be secured by an ESH&Q Section lock. Otherwise, the monitoring well shall be abandoned by the responsible Division/Section/Project according to regulations.

An inspection of all monitoring wells constructed by other Divisions/Sections/Projects shall be conducted, after completion as well as periodically during the project period, by the ESH&Q Section. The Division/Section/Project shall supply all records requested by the Chief Safety Officer necessary to meet the inspection requirements. Pertinent performance information includes: well depth measurements, well development information, piezometric measurements, etc. A report of review findings requiring action will be forwarded to the Division/Section/Project from the Chief Safety Officer.

All monitoring wells shall be included in the ESH&Q Section's Well Maintenance Program. The program will consist of periodic (annually at minimum) checking of performance and construction records as well as making sure the well is clearly visible, the well is accessible, the security system is operating adequately, well identification markers are adequate, checking for loss of integrity of the surface seal, and confirming that the well efficiency or performance has not changed significantly.

6.0 REFERENCES

1. Title 77: Public Health, Chapter I: Department of Public Health, Subchapter r: Water and Sewage, Part 920: Illinois Water Well Construction Code. 2000.

2. Ordinance Number Ord. 04-199, 5-11-2004. State of Illinois, County of Kane, Water Supplies/Wells. 2004.

3 Ordinance Article 18-4. DuPage County Health Department Private Water Supply Ordinance. 2003