3745-510-231 **Uppermost aquifer system and significant zones of saturation.**

The report on the hydrogeologic investigation identified in rule 3745-510-100 of the Administrative Code shall include clearly labeled and tabbed pages for the section titled "Uppermost Aquifer System and Significant Zones of Saturation," and shall include the following:

(A) A report on the regional aquifer including the following:

(1) A description of the regional aquifer based on publicly available information including the following:

(a) The identification and average yield.

(b) The direction of ground water flow.

(c) The identification of recharge and discharge areas.

(d) The identification of the regional stratigraphy, including any regional stratigraphic or structural features (such as bedrock surface, bedrock dip, or joint systems), that may influence the ground water flow system.

(e) A description of the regional and local geomorphology including but not limited to the location of surface water, floodplains, and all topographic features that may influence the ground water flow system at the facility.

(2) The Ohio department of natural resources, division of soil and water, ground water resource maps or other appropriate regional hydrogeologic data.

(3) A map showing the location of the facility with respect to the limits of any drinking water source protection area for a public water system using ground water including the area surrounding a public water supply well that will provide water from an aquifer to the well as delineated or endorsed by Ohio EPA under Ohio's wellhead protection or source water assessment and protection programs. If the limits of any subject drinking water source protection area for a public water system are not in the vicinity of the facility, a statement to that fact will be sufficient.

(4) A map showing the location of the facility and all water supply wells within one mile of the facility. The public and private wells shall be denoted differently.

(5) A description of the uppermost aquifer system and any significant zone of saturation above the uppermost aquifer system at the facility, including the following:

(a) The depth and lateral and vertical extents of the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(b) Temporal fluctuations in ground water levels for a period of at least one year on a quarterly basis to determine the seasonal effects on ground water flow directions.

(c) An interpretation of the ground water flow system, including hydraulic conductivity, rate of flow, average yield, direction of flow, vertical and lateral components of flow including hydraulic gradient, and interconnections between and within the uppermost aquifer system and any significant zone of saturation above the uppermost aquifer system. This interpretation shall be described in both narrative and map form.

(d) Identification and characterization of recharge and discharge areas within the boundaries of the facility. This shall include all relationships of ground water with seeps, springs, streams, or other surface water features.

(e) Yield of the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(f) The results of sampling and analyzing the quality of the ground water in the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(6) A description of the site investigation activities, including field testing and laboratory testing, directly related to identifying, locating, and characterizing the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(7) Cross sections that clearly show the identification, extent, and characteristics of the following:

(a) Consolidated stratigraphic units.

(b) Unconsolidated stratigraphic units.

(c) Uppermost aquifer system.

(d) Significant zones of saturation above the uppermost aquifer system.

(e) At least one cross section shall depict the deepest excavation or proposed excavation.

(8) Summary logs and drawings to identify, locate, and characterize the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(9) Summary of results from field tests and laboratory tests used to identify, locate, and characterize the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system. If a field or laboratory test result was not used, include reasoning for excluding the result from consideration.

(B) Results from the site investigation including the following:

(1) A brief description of each field test method and each laboratory test method used to characterize the geologic and hydrogeologic properties for the purpose of investigating the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(2) Information and results from each field test that was conducted, including completed, failed, or incomplete results. An explanation shall be provided for any test results that were not used. The results shall include the following information:

(a) Quality assurance and quality control testing conducted to verify the accuracy and precision of testing methods and equipment.

(b) The results of data validation.

(c) The characterization of each specimen used in each test.

(d) Intermediate data produced during testing.

(e) The final results of each test.

(3) All figures, drawings, or references used and marked to show how they relate to the characterization of the geologic and hydrogeologic properties.

(4) Logs, including field notes and other pertinent information, from sites investigated to obtain information, data, or samples used to identify, locate, and characterize the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system. As appropriate for the method, logs shall include the following:

(a) A description of where information, data, or samples were obtained, including, as appropriate, the following:

(i) The location of each site with northings and eastings referenced to the facility grid system or referenced to the following if a facility grid system was not established:

(a) Horizontally to the "1927 North American Datum," "1983 North American Datum," or "State Plane Coordinate System."

(b) Vertically to the "1929 or 1988 North American Vertical Sea Level Datum" as identified on the USGS 7.5 minute (topographic) map.

(ii) The surface elevation of each site to the nearest tenth of a foot.

(iii) The depth interval of all samples collected, including those submitted for laboratory testing.

(b) Information related to the subsurface investigatory method, including, as appropriate, the following:

(i) The diameter, or width and length at the surface, of the boring.

(ii) The total depth of the boring.

(iii) The total depth of the well.

(iv) The inside diameter of the well casing.

(v) The top-of-casing elevation used for water level measurement reference surveyed to the nearest hundredth foot.

(vi) The screened interval depth and elevation, the screen slot size, and the inside diameter of the screen.

(vii) A description of construction materials and the elevations at which all construction materials were placed including at a minimum the following:

(a) Sand pack.

(b) Grout.

(c) Well seal.

(c) The top and bottom elevations for each consolidated and unconsolidated stratigraphic unit.

(d) Information or data on the characteristics, composition, and features for each consolidated and unconsolidated stratigraphic unit including the following:

(i) For unconsolidated stratigraphic units, the textural classification using the Unified Soil Classification System (USCS), as described in ASTM D2487 as described in rule 3745-500-03 of the Administrative Code.

(ii) For consolidated stratigraphic units, the rock type (such as limestone, dolomite, coal, shale, siltstone, or sandstone).

(iii) Color.

(iv) Moisture content.

(v) Stratigraphic features (such as layering, interbedding, and weathering).

(vi) Fracturing, jointing, and other types of secondary porosity.

(vii) Any visible accessory minerals (such as pyrite, calcite, or gypsum).

(viii) Lateral extent.

(ix) The depth to saturation.

(x) The depth to the static water level in the boring.

(e) Information or data on the hydraulic conductivity according to the following:

(i) For each saturated unconsolidated stratigraphic unit, two field measurements of hydraulic conductivity or at least one measurement per saturated unconsolidated stratigraphic unit for each twenty acres, whichever is more.

(ii) For each unconsolidated stratigraphic unit from which an undisturbed sample can be collected, two laboratory measurements of vertical hydraulic conductivity or at least one measurement per unconsolidated stratigraphic unit for each twenty acres, whichever is more.

(iii) For each saturated consolidated stratigraphic unit, two field measurements of hydraulic conductivity or at least one measurement per saturated consolidated stratigraphic unit for each twenty acres, whichever is more.

(iv) When laboratory measurements of vertical hydraulic conductivity are obtained for unconsolidated stratigraphic units that are wholly or partially saturated, the vertical hydraulic conductivity shall be

compared to the field hydraulic conductivity to evaluate the extent to which near-vertical fractures may be contributing to ground water flow through the unit.

(v) Hydraulic conductivity data shall be interpreted with respect to the primary and secondary porosity features and the stratigraphic and structural features of the investigated units that are observed or are reasonably expected to occur in the investigated units.

(f) Variations in texture, saturation, stratigraphy, structure, or mineralogy exhibited by each stratigraphic unit that could influence ground water flow or quality in the uppermost aquifer system or any significant zone of saturation above the uppermost aquifer.

(g) The geomorphology at the facility including but not limited to surface water or topographic features that may influence ground water flow in the uppermost aquifer system or any significant zone of saturation above the uppermost aquifer.

(h) All structural geologic features beneath the facility that may influence ground water flow in the uppermost aquifer system or in any significant zone of saturation above the uppermost aquifer system.

(5) Results of sampling and analyzing the ground water from the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system.

(6) All well logs and, where applicable, the decommissioning records for public water supply wells and private water supply wells within one mile of the facility.