

Guidance for Ground Water Monitoring Plan Design



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Guidance For Ground Water Monitoring Plan Design

1.0 Introduction

“Design of a ground water monitoring plan is variable and dependent on the complexity of the site hydrogeology, type of facility, and method and characteristics of the discharge.” Rule 62-520.600(3), F.A.C.

This document provides guidance for development of a Ground Water Monitoring Plan (GWMP) for a permitted wastewater facility. Subjects to be covered include the basic components and organization of a GWMP, information needed to design a successful GWMP and specific ground water monitoring provisions by program. The target audience of this document is technical: facility consultants, geologists, engineers and Florida Department of Environmental Protection (DEP) permitting staff.

A Ground Water Monitoring Plan provides information to the State of Florida and the general public about what a facility does, or will do, to ensure compliance with applicable ground water quality standards. The plan provides reasonable assurance that ground water standards will be met at the edge of the facility's zone of discharge or point of compliance, as applicable. By developing a GWMP, the permittee evaluates the facility's operations, discharges, and the actual and potential environmental risk posed by any discharges from the facility. The result is a clear understanding of what is expected of the facility by DEP.

The applicant is urged to arrange a pre-application meeting with the Department to clarify the information needs for the ground water monitoring plan at an early stage in the application process.

2.0 Basic Components of a Ground Water Monitoring Plan

“Any information submitted as part of a permit application does not have to be resubmitted as part of the ground water monitoring plan.” Rule 62-520.600(3), F.A.C.

This section covers the items that are required under Chapter 62-520, F.A.C. to be part of a Ground Water Monitoring Plan. It also describes sources of information to be considered in the development of a GWMP and introduces basic methods sometimes used to characterize site hydrogeology.

The basic components of a ground water monitoring plan are listed in Chapter 62-520, F.A.C. the Ground Water Rule (See Table 1). Unless otherwise specified in program-specific department rules, the installation owner is directed to “provide the department with a plan containing findings and recommendations for ground water monitoring derived from site-specific information.” Table 1 lists the basic components of a GWMP. Any information that was submitted with the permit application does not have to be duplicated in the monitoring plan.

Table 1: Basic Components of a Ground Water Monitoring Plan, Rule 62-520.600(3), F.A.C.

- (a) Describe the physical and hydrogeologic characteristics of the facility and surrounding area, including:
 - 1. Direction and rate of ground water flow and ambient ground water characteristics;
 - 2. Primary and secondary porosity, and horizontal and vertical permeability for the receiving aquifer(s);
 - 3. The depth to, and lithology of, the first confining bed(s);
 - 4. Vertical permeability, thickness, competence, and extent of any confining beds; and
 - 5. Topography, soil information, and surface water drainage systems surrounding the site;
- (b) Show the locations of the proposed monitoring wells labeled as background, intermediate, or compliance well;
- (c) Provide construction and development details of the monitoring wells;
- (d) Provide a water sampling and chemical analysis protocol;
- (e) Provide a water sampling schedule;
- (f) Demonstrate the quality of the receiving ground water prior to discharge;
- (g) Indicate how to determine natural background (where available) or background quality of the ground water in the vicinity of the site and any deviations in the quality of the receiving ground water in the downgradient monitoring wells;
- (h) Show the locations of all surface waters and their classifications including springs within a one mile radius of the site, and on-site sinkholes with depths exceeding the seasonal high water table or that are perched; and
- (i) Identify the location and use of all wells within 500 feet of the site and all wells within the installation property boundary.

The GWMP must be signed and sealed by the professional geologist or professional engineer who prepared or approved it. Any data collection and reporting must meet the requirements of Chapter 62-160, F.A.C., the Quality Assurance rule. When the plan is approved by the Department, it becomes part of the facility permit.

2.1 Organization of a Ground Water Monitoring Plan

The following is a brief description of the basic parts and organization of a ground water monitoring plan.

2.1.1 Introduction

The introduction should be a brief narrative providing the facility name and address and a statement of the facility's function and purpose. The goals of the plan should be stated as well as plan type (i.e. a new, a revision, or a supplemental plan). If a ground water monitoring history exists, pertinent information such as the monitoring timeline and aquifer(s) and parameters monitored should be provided.

2.1.2 Hydrogeologic and Physical Characteristics

One of the basic components of the GWMP listed in Rule 62-520.600(3) is a description of the hydrogeologic and physical characteristics of the facility and surrounding area. Basic information about the site hydrogeology and the activities at the facility is needed in order to be able to determine whether a ground water monitoring plan will successfully detect changes in water quality at the site on a long-term basis. Some, if not all, of this information may also be required as part of the facility permit application. If so, any information submitted as part of a permit application does not have to be resubmitted as part of the ground water monitoring plan.

All of the following information may not be needed to characterize the hydrogeology at every facility. More complex sites with complicated geologic settings, surrounding potential sources of contamination, active flow regimes and nearby ground water users may need more information to adequately show how the monitoring plan will detect movement of contamination from the site zone of discharge. Simpler facilities with uncomplicated hydrogeology and no nearby facilities to complicate the monitoring plan may require less information to arrive at the ideal GWMP. The applicant is strongly urged to arrange a pre-application meeting with the appropriate District permitting office to identify the information needs for the GWMP.

2.1.2.1 Hydrogeological and Physical Data

The geologic and hydrologic conditions must be identified and quantified to the extent possible to (1) predict ground water flow paths, (2) identify potential receptors of those parameters being monitored, and (3) support an adequate GWMP. The following information should be included as part of the GWMP:

1. Direction and rate of ground water flow and ambient ground water characteristics;
2. Porosity and horizontal and vertical permeability for the receiving aquifer(s);
3. The depth to, and lithology of, the first confining bed(s);
4. Vertical permeability, thickness, competence, and extent of any confining beds; and
5. Topography, soil information, and surface water drainage systems surrounding the site.

Additional information may also be needed to accurately characterize the site hydrogeology. Along with the lateral extent of the confining unit, there should be some estimate on the degree of interconnectivity between aquifers (in other words, how effective the confining unit is), along with supporting information or data. Evidence for the lateral continuity of confining units should be provided. Information about site topography, drainage, and soil types may also be useful.

Ambient ground water characteristics describe ground water quality at the facility. This information could include sampling data from on-site monitoring wells, water quality data from nearby wells or relevant ambient water quality information from published reports.

Potentiometric surface maps for all affected aquifers should be prepared or requirements made for their preparation, to support estimated groundwater flow directions. Some estimate for seasonal variation for groundwater flow should be made. An estimate of vertical groundwater flow rate and (especially) direction should be provided.

2.1.2.2 Information about the Facility and Its Surroundings

The GWMP, or the associated facility permit application, should also include enough information about the disposal process at the site to allow a reviewer to determine whether the GWMP is adequate to detect any possible contaminant movement from the site. The following items provide information about the facility and the surrounding area:

1. History of usage and activity on the site;

2. Disposal rate and frequency;
3. Chemical composition of the wastewater;
4. Microbiological characteristics of the wastewater;
5. Method of discharge;
6. Storage pond volume;
7. Dimensions of land application and reuse systems;
8. Disposal or reuse system water balance;
9. Present and anticipated discharge volume and seepage rate to the receiving ground water; and physical, chemical, and microbiological characteristics of the leachate;
10. Type and location of waste disposal sites within the installation; and
11. Sources of contamination located within a one-mile radius of the site.

Additional information about the type and location of waste disposal sites within the installation may also be helpful in designing a ground water monitoring plan, including any known locations of releases, estimates of quantity/volume of material released, date of release and constituents likely to be found in the released material (or likely to be released from a disposal site).

2.1.3 Monitoring Well Information

The following information items are required in Rule 62-520.600 as part of the Ground Water Monitoring Plan:

1. Show locations of Existing and Proposed Monitoring Wells

Provide a map of the facility which clearly shows the following:

- The legal boundaries of the facility;
- The locations and identifiers of all existing and proposed monitoring wells; and
- Map scale and north arrow.

Wells should be labeled according to purpose, i.e. background, intermediate or compliance.

2. Provide Construction and Development Details of Monitoring Wells

Provide information about the construction details of existing and/or proposed monitoring wells. This information should include:

- Well depth;
- Screened interval(s);
- Well diameter;
- Casing materials;
- Filter pack; and
- Well Identifier.

Provide information about well development methods. Well development is particularly important for monitoring wells to remove any drilling fluids and to ensure adequate capacity for sampling. This information should include:

- Well development method (surge pump, compressed air, etc.);
- Well development date;
- Development duration;
- Pumping rate;
- Maximum drawdown;
- Turbidity (if measured);
- Water appearance (color and odor) at start of development; and
- Water appearance (color and odor) at end of development.

To assist in the design, construction and development of monitoring wells, use of the Department's Monitoring Well Design and Construction Manual (2008) is recommended.

2.1.4 Ground Water Sampling Plan

Rule 62-520.600 requires that the Ground Water Monitoring Plan provide a water sampling and chemical analysis protocol and provide a water sampling schedule. An important part of any ground water monitoring plan is the sampling plan. The Department's Quality Assurance Rule, Chapter 62-160, F.A.C. applies to samples collected as part of a Ground Water Monitoring Plan. There are provisions for laboratory certification, field and laboratory procedures and sample collection.

1. Chemical Analysis Protocol

The GWMP shall include a statement that the facility will use a laboratory accredited by the National Environmental Laboratory Accreditation Program (NELAP) and certified by the Department of Health.

2. Water Sampling Protocol

The proposed purging and sampling methods and equipments shall follow the methods and equipment suggested in the Standard Operating Procedure of DEP pursuant to Chapter 62-160, F.A.C. The specific SOP that covers ground water sampling can be found at the DEP Laboratories Internet site at: <https://floridadep.gov/dear/quality-assurance/content/dep-sops>.

3. Water Sampling Schedule

Unless provided by DEP as part of the facility permit, the GWMP should include a sampling schedule.

2.1.5 Demonstrate the Quality of the Receiving Ground Water Prior to Discharge

One of the basic components of a Ground Water Monitoring Plan listed in Rule 62-520.600, F.A.C. is a demonstration of the quality of the receiving ground water prior to discharge. This information is very important in determining whether any contaminants are already present at the site. Ground water at the site should be classified as defined in Chapter 62-520, F.A.C. Information related to ambient and site background ground water quality should be provided if available. Any site-specific ground water quality data should be summarized and include the timeline of monitoring, parameters monitored, and any significant information regarding the concentrations of those parameters.

2.1.6 Determining Background Water Quality and any Deviations in the Quality of the Receiving Ground Water

According to Rule 62-520.600, F.A.C. the GWMP must indicate how the quality of the receiving ground water was determined. The GWMP should differentiate between natural background quality (if unaffected by human activities) and existing background quality of the ground water (if natural background no longer exists). The GWMP must also indicate how any water quality deviations will be determined in the downgradient monitoring wells. For example, ground water parameters that must be monitored could be graphed as a function of time or various statistical analyses could be applied.

2.1.7 Surface Waters

The GWMP must include a topographic map showing the locations of all surface waters and their classifications within a one-mile radius of the site, including springs. On site sinkholes with depths exceeding the seasonal high water table or that are perched must also be shown on the map. This essentially includes sinkholes that contain water.

2.1.8 Wells

The GWMP must identify all wells within 500 feet of the site and all wells within the installation property. It may also be useful in the design of the GWMP to identify other water supply wells, wellfields or monitoring wells that are or could be affected by the site or facility discharge. Useful information may include construction details (such as well depth), aquifer tapped by the well,

2.2 Information Sources

Although much of the information used to develop a ground water monitoring plan is site-specific, there is useful information available from statewide and regional sources. Table 2 summarizes some of these sources.

Additional information that may be useful in design of the ground water monitoring plan may be contained within the permit application, if a permit is associated with the GWMP. Additional information may be available from previous monitoring at the site. Depending upon the permitting program, the following information may be available:

- Waste disposal rate and frequency, chemical composition, method of discharge, pond volume, spray-field dimension, or other applicable site specific information;
- Toxicity of waste;
- Present and anticipated discharge volume and seepage rate to the receiving ground water; and physical, chemical, and microbiological characteristics of the leachate;
- Disposal or reuse system water balance;
- Present and reasonably expected future pollution sources located within one mile radius of the site;
- Site specific economic and feasibility considerations;
- Chronological information on water levels in the monitor wells and water quality data on water supplies collected from the water supply and monitor wells;
- Type and number of waste disposal facilities within the installation;
- Chronological information on surface water flows and water quality upstream and downstream from the site;
- Construction and operation details of disposal facilities; and
- History of construction and land development in the vicinity of the site.

Table 2: Some Information Sources for Ground Water Monitoring Plans

Ground Water Monitoring Plan Component	Potential Data Sources
62-520.600(3)(a) Hydrogeologic and Physical Characteristics of the facility and surrounding area.	U.S. Geological Survey reports http://www.usgs.gov/ Florida Geological Survey reports https://floridadep.gov/division-content/FGS (reports) https://floridadep.gov/fgs/data-maps (data and maps) Water Management District reports and data Drinking Water reports and data webpage
62-520.600(3)(a)(1) Direction and rate of ground water flow and ambient ground water characteristics.	Water Management District reports and data Drinking Water reports and data webpage Florida Geological Survey Special Publication #34, "Background Hydro-geochemistry" floridadep.gov/fgs/data-maps/content/fgs-publications EPA STORET data retrieval website: http://www.epa.gov/storet/dbtop.html
62-520.600(3)(a)(2) Primary and secondary porosity and horizontal and vertical permeability for the receiving aquifer(s)..	Water Management District reports and data Drinking Water reports and data webpage
62-520.600(3)(a)(3) The depth to, and lithology of, the first confining bed(s).	Water Management District reports and data Drinking Water reports and data webpage Florida Geological Survey Special Publication #32, "Hydrogeologic Framework" floridadep.gov/fgs/data-maps/content/fgs-publications
62-520.600(3)(a)(4) Vertical permeability, thickness, competence, and extent of any confining beds.	Water Management District reports and data http://www.dep.state.fl.us/water/waterpolicy/districts.htm Florida Geological Survey Special Publication #32, "Hydrogeologic Framework" floridadep.gov/fgs/data-maps/content/fgs-publications
62-520.600(3)(a)(5) Topography, Soil information, and surface water drainage systems surrounding the site.	Natural Resource Conservation Service county soil surveys http://soils.usda.gov/survey/printed_surveys/state.asp?state=Florida&abbr=FL

Ground Water Monitoring Plan Component	Potential Data Sources
62-520.600(3)(b) Show the locations of proposed monitoring wells.	Site specific
62-520.600(3)(c) Construction and Development details.	Site specific
	Use of the Department’s Monitoring Well Design and Construction Manual (2008) is recommended in developing monitoring ground water monitoring well specifications.
62-520.600(3)(d) Water Sampling and chemical analysis protocol.	DEP Standard Operating Procedures for ground water sampling https://floridadep.gov/dear/quality-assurance/content/dep-sops .
	DEP General laboratory Standard Operating Procedures https://floridadep.gov/dear/quality-assurance/content/dep-sops
62-520.600(3)(e) Water sampling schedule.	Specific to facility and to applicable permitting requirements
62-520.600(3)(f) Demonstrate the quality of the receiving water prior to discharge.	Water Management District reports and data Drinking Water reports and data webpage
	Florida Geological Survey Special Publication #34, “Background Hydro-geochemistry” floridadep.gov/fgs/data-maps/content/fgs-publications
	EPA STORET data retrieval website: http://www.epa.gov/storet/dbtop.html
62-520.600(3)(g) Indicate how to	Site specific

Ground Water Monitoring Plan Component	Potential Data Sources
determine natural background or background quality of the ground water in the vicinity of the site and any deviations in the quality of the receiving ground water in the downgradient monitoring wells.	A useful discussion of the determination of background in soils can be found at https://floridadep.gov/waste , <u>Guidance for Comparing Background and Site Chemical Concentrations in Soil</u> , DEP, Bureau of Waste Cleanup, March 2008.
62-520.600(3)(h) Proximity to surface waters including springs within a one-mile radius of the site and on-site sinkholes with depths exceeding the seasonal high water table or are perched.	Florida Geological Survey springs inventory https://floridadep.gov/division-content/FGS
	Site information, including aerial photographs and topographic maps
62-520.600(3)(i) Identify all wells within 500 feet of the site and all wells within the installation property boundary.	Water Management Districts or delegated county health departments Drinking Water reports and data webpage
	Site specific information

Additional Useful Information

Soils information	Natural Resource Conservation Service county soil surveys https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
DEP Geographic Information Systems data	DEP Geo spatial resources https://floridadep.gov/otis/enterprise-application-services/gis

Information about facility and surrounding area, including potential pollution sources located in the vicinity of the site	DEP Map Direct https://ca.dep.state.fl.us/mapdirect/
Site topography	US Geological Survey Topographic maps http://www.usgs.gov/pubprod/maps.html

2.3 Methods

Methods are tools that may be useful in providing site specific hydrogeologic information in specific conditions and circumstances. For instance, a fracture trace analysis may be an appropriate tool to use in evaluating the potential for conduits in karstic limestone in Wakulla County. It would be of limited use in evaluating a monitoring plan for the Sand-and-Gravel aquifer in Escambia County.

The following sections summarize a few of the methods that may be useful in developing a ground water monitoring plan for a facility in Florida.

2.3.1 Fracture Trace Analysis

A fracture trace is a confirmed pattern observed through remote sensing (aerial photography or satellite imagery) that owes its origin to jointing or fracturing in the underlying soils, sediments, or bedrock. Many times, fracture traces are zones of weakness in the underlying rock and preferential flow pathways for water and contaminants. This type of analysis would be appropriate in an area of karst topography, where sinkhole formation may occur along fracture traces. Fracture traces are also called “lineaments” and “photo-linear features.”

An example of a detailed fracture trace analysis conducted by the US Army Corps of Engineers in South Florida as part of the Comprehensive Everglades Restoration Plan can be found at http://www.evergladesplan.org/pm/projects/project_docs/pdp_asr_combined/013_007_asr_lineament_dtmt.pdf.

2.3.2 Geophysical Methods

Geophysical methods use the earth’s properties, such as magnetism, electrical conductance and gravity, to provide information about the subsurface. Geophysical instruments can be applied to the ground surface, as with ground-penetrating radar, or run down a well, as in borehole logging. A starting point for additional information is the U.S. Geological Survey Geophysical Technology Transfer website at <http://water.usgs.gov/ogw/bgas/g2t.html>.

Geophysical methods are often used to provide the information needed for both the permit application and design of the ground water monitoring plan. For example, in the Southwest District, the surface geophysical method terrain conductivity was used at two phosphogypsum stacks systems to help characterize the site geology and hydrogeology and to identify and delineate ground water contamination. This information was then used in designing an appropriate ground water monitoring plan. Other geophysical methods including ground penetrating radar, microgravity and seismic have been used in permitting

numerous existing and new phosphogypsum stack systems and clay settling areas by helping to identify geological hazards such as sinkholes, areas of instability, preferential seepage pathways, and in determining the depth and thickness of strata. This information can also be used to design a ground water monitoring plan.

Surface geophysics allows relatively fast and cost effective data acquisition over large three dimensional areas. However, there is no single, universally applicable surface geophysical method, and some methods are quite site specific in their performance. Best professional judgment should always be considered in the utilization and selection of the appropriate method.

2.3.3 Ground Water Models

Ground water models use mathematical equations or computer programs to simulate the movement of ground water and contaminants. Ground water flow models are useful in determining how much water an aquifer can safely yield or how quickly ground water moves from one formation to another. Ground water transport models simulate the movement and dispersion of contaminants. In areas of complex geology, a ground water model may provide the information needed to design the facility and the ground water monitoring plan.

A good basic discussion of ground water models can be found at the State of Michigan's Department of Environmental Quality Ground Water Modeling website at http://www.michigan.gov/deq/0,1607,7-135-3313_21698---,00.html .

Two and three-dimensional ground water flow and solute transport modeling has been conducted at many phosphogypsum stacks to predict future hydraulic head, seepage/recharge rates, flow vectors, travel times, and constituent movements and concentrations in the permitting of horizontal and vertical zones of discharge. The establishment of zones of discharge is a necessary component to designing a ground water monitoring plan. Ground water flow modeling has also been used at another phosphogypsum stack with impacts in the Florida aquifer to help design and monitor a pump-and-treat ground water remediation and monitoring system.

Ground water modeling requires accurate and detailed inputs, as well as successful calibration and verification to produce realistic predictions. Best professional judgment should always be considered in the use and selection of ground water models. The selection of the appropriate modeling software depends on many factors, such as the budget (some software is public domain) and goals of the project and the level of detail required. Software such as MODFLOW and SOLUTE has been popular, as well as pre and post processing software such as Visual MODFLOW and Groundwater Vistas.

2.3.4 Ground Water Tracer Study

A ground water tracer study uses the presence or absence of an indicator to track the flow of ground water. Commonly used tracers include fluorescent dyes, glass micro beads, temperature and non-hazardous microbial tracers (bacteriophages). The tracer is applied to the system at a starting point and samples are collected at intervals in down gradient wells and springs. Ground water tracer studies are used to map complex flow patterns in karst topography and can be used to determine whether or not a facility has the potential to affect downgradient springs or water users. Ground water tracer studies can also be used to determine time of travel from a potential source to a down gradient point.

Examples of ground water tracer studies conducted in Florida include the Northwest Florida Water Management District study "Preliminary Ground Water Basin Delineation For The Spring Lake Spring Group Jackson County, Florida" at <http://www.nwfwmd.state.fl.us/pubs/wrsr03-02/wrsr03-02.pdf> and the U. S. Geological Survey's Florida Keys Groundwater Seepage & Flow Data webpage at <http://sofia.usgs.gov/exchange/shinn/>.

3.0 Specific Ground Water Monitoring Provisions by Program

"This chapter contains the generally applicable ground water provisions. Other rule chapters for specific types of installations may have other requirements for ground water discharges applicable to those installations." Rule 62-520.300(4), F.A.C.

This section lists specific ground water monitoring requirements by program. Many programs regulate discharges or potential discharges to ground water.

3.1 Provisions Applicable to All Programs

3.1.1 Location, Design and Construction of Monitoring Wells

- To assist in the design and construction of monitoring wells, it is recommended that permittees use the Department's Monitoring Well Design and Construction Manual, (2007). (62-520.600(e), F.A.C.)
- Before the installation of any monitoring well, the permittee shall give at least 72 hours notice to the appropriate permitting program at the Department's District office that issued the permit. (62-520.600(f), F.A.C.)
- Before construction of new ground water monitoring wells, a soil boring shall be made at each new monitoring well location in order to properly determine

monitoring well specifications such as well depth, screen interval, screen slot and filter pack. (62-520.600(g), F.A.C.)

- Within 30 days after installation of any monitoring well, a properly scaled figure depicting monitoring well locations (active and abandoned) with identification numbers shall be submitted to the appropriate permitting program at the Department's District office that issued the permit. The figure also shall include the monitoring well, top of casing and ground surface elevations referenced to North American Vertical Datum (NAVD 1988) to the nearest 0.01 foot, along with monitoring well location latitude and longitude to the nearest 0.1 seconds. (62-520.600(h), F.A.C.)
- Within 30 days after installation of the monitoring wells, well completion reports and soil boring/lithologic logs shall be sent to the appropriate permitting program at the Department's District office that issued the permit. (62-520.600(i), F.A.C.)
- Within 60 days after completion of construction of the monitoring wells, all piezometers and wells that are not reasonably expected to be used are to be plugged and abandoned in accordance with subsection 62-532.500(4), F.A.C. The permittee shall submit a written report to the Department's District or Tallahassee permitting program providing verification of the plugging program including the well abandonment log. (62-520.600(j), F.A.C.)
- If any monitoring well becomes damaged or inoperable, the permittee shall notify the Department's District or Tallahassee permitting program within two business days and a detailed written report shall follow within seven days. The written report shall detail what problem has occurred and remedial measures that have been taken to prevent recurrence. All monitoring well design and replacement shall be approved by the Department before installation. (62-520.600(k), F.A.C.)

3.1.2 Quality Assurance

- All field sampling organizations shall follow the applicable collection and quality control protocols and requirements described in DEP-SOP-001/01 (February 1, 2004), which is incorporated by reference in Rule 62-160.800, F.A.C., unless specifically exempted by the rules of a particular Department program. (62-160.210 (1), F.A.C.)
- Except as provided in subsections 62-160.300(2), (3), (4) and (5), F.A.C., or other Title 62 rules, all laboratories generating environmental data for submission to the Department or for use in Department-regulated or Department-sponsored activities shall hold certification from the DOH ELCP. Such certification shall be for all matrix/test method/analyte(s) combinations being measured. The matrix of a sample is defined to be the condition under

which the laboratory originally receives the sample, and shall be classified according to the NELAC Field of Accreditation Matrix groups defined by subsection 62-160.120(16), F.A.C. . (62-160.300(1), F.A.C.)

- DEP-SOP-001/01 FS 2200 Groundwater Sampling requires a precision of plus or minus 0.01 foot in measurements of water levels in monitoring wells. This supersedes the 0.1 foot precision indicated in some program rules.

3.2 Domestic Wastewater Treatment Facilities Using Land Application Systems

- Domestic wastewater treatment facilities that are designed so that some or all of the reclaimed water or effluent may enter ground water, unless exempt by Rule 62-520.600, F.A.C., are required to provide ground water monitoring to assess the effect upon ground waters. (62-601.300(3), 62-601.700(1), 62-520.600, F.A.C.)
- Sampling and monitoring data shall be collected and analyzed in accordance with Rule 62-4.246, Chapters 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate. (Chapter 62-620.610(18), F.A.C.)
- Sampling schedules for parameters to be monitored by domestic wastewater facilities are included in the wastewater facility permit. Ground water monitoring results for domestic wastewater facilities are reported to the Department in the Groundwater Monitoring Report - Part D of Form 62-620.910(10) in accordance with the permit. The ground water monitoring report shall be completed and submitted in a timely manner so as to be received by the Department by the date specified in the permit. (62-601.500(1) and 62-601.300(3)(b) and (c), F.A.C.)
- Unless exempted by the Department, for projects 100,000 gpd or larger, a minimum of 3 wells must be monitored: background, intermediate, and compliance. Additional wells may be needed to ensure adequate and reliable monitoring data. (62-520.600(6), F.A.C.)
- The Department shall exempt a facility from installing a background or intermediate well when not practicable or necessary because of site hydrogeology, effluent quality, site location, or surrounding land use. (62-520.600(6), F.A.C.)
- For all new domestic wastewater facilities with less than 100,000 gpd design capacity which discharge to ground water and which have filed a complete permit application after July 1, 1994, one downgradient monitoring well is required. (62-520.600(10), F.A.C.)

- Where reclaimed water is applied to multiple public access reuse sites permitted under Part III of Chapter 62-610, F.A.C., one or more of the sites (representative of each site's hydrogeological characteristics, soil characteristics, vegetative cover, and reclaimed water application method, etc.) shall be selected by the applicant and approved by the Department as the model site(s) for monitoring of the ground water. (Rule 62-601.700(3), F.A.C.)
- Provisions for monitoring ground water quality adjacent to unlined system storage ponds shall be incorporated into the ground water monitoring plan. Unless exempted by the Department, a ground water monitoring well is required adjacent to unlined storage ponds. (As applicable, 62-610.414(6), 62-610.463(3)(b), 62-610.514(2), 62-610.573(2), 62-610.656(2), F.A.C.)
- An engineering report shall be submitted in support of permit applications for new or expanded reuse or land application projects and for certain modifications of existing systems. The engineering report includes information on land use requirements, soils information, hydrogeologic survey, land management and project evaluation. (Note: Specific requirements for submittal and contents are included in 62-610.310, F.A.C.) Requirements for the hydrogeologic survey include:
 1. Hydrogeologic data necessary to evaluate the capability of the proposed project to perform successfully at the site on a long-term basis shall be provided. A proposed ground water monitoring plan, if applicable, meeting the requirements of Chapters 62-520 and 62-601, F.A.C., shall be provided. This information shall include, but not be limited to, geophysical information concerning known "solution openings" and sinkhole features within one mile of the site; the identification (with applicable geologic sections), extent or continuity, and hydrologic characterization of aquifers and confining zones underlying the site (i.e., horizontal and vertical hydraulic conductivities, porosity, thickness); head relationships between aquifer systems; and information on the annual range of ground water elevations at the proposed site.
 2. The direction and rate of existing ground water movement (and the points of discharge) shall be shown on maps of the area. Similar information regarding conditions anticipated as a result of the project shall be provided.
 3. Information on potable and non-potable water supply wells (and monitoring wells, as appropriate) identified in subparagraph 62-610.310(3)(a)2, F.A.C., including the depth, length of casing, cone of depression and geophysical surveys of the wells (if available) shall be provided.

4. The proposed ground water monitoring system shall also be described and displayed. Background water quality data shall be provided.
 5. Flood prone areas on the proposed site and within 0.5 mile of the site shall be located on a map. Discussion of flooding frequencies and magnitude shall be included.
 6. For projects described in subsection 62-610.310(2), F.A.C., the Department shall accept an abbreviated report from the permittee covering the hydrogeologic characteristics at the proposed site, based upon the best available information, in lieu of the more detailed hydrogeologic information requirements described in paragraph 62-610.310(3)(c), F.A.C.
 7. For overland flow projects involving alternative secondary pre-application treatment levels, determinations of the required number of core samples, representative hydraulic conductivity values, and aquitard extent or continuity shall be included in the engineering report.
 8. For rapid-rate and absorption field projects, a ground water mounding analysis based on site-specific information shall be included. This analysis shall demonstrate acceptable long-term hydraulic performance of the system. (Rule 62-610.310, F.A.C.)
- A ground water monitoring program shall be established by the permittee and approved by the Department, pursuant to Chapter 62-601 and Rule 62-520.600, F.A.C. (unless otherwise exempted). (Rule 62-610.412, F.A.C.)
 - The manual referenced in paragraph 62-610.300(1) (d), F.A.C., contains general technical guidance regarding the design and construction of monitoring wells and ground water sampling procedures. Ground water test wells resulting from hydrogeologic exploratory programs, background water quality determinations or other requirements shall be approved by the Department for use as part of the compliance monitoring well system if the permittee provides reasonable assurances in the engineering report and ground water monitoring plan that the well meets the requirements of Rule 62-520.600, F.A.C., and that the well construction is such that migration of fluids from the surface to subsurface formations or between subsurface formations will not occur. (Rule 62-610.412, F.A.C.)
 - Ground water sampling parameters for monitoring background and receiving water quality will be established by the Department based upon the quality of reclaimed water to be discharged, site specific soil and hydrogeologic characteristics, and other considerations, in accordance with Chapter 62-601 and Rule 62-520.600, F.A.C. Water levels shall be recorded before evacuating wells for sample collection. Elevation references shall include the

top of the well casing and land surface at each well site (NGVD allowable) at a precision of plus or minus 0.1 foot. (Rule 62-610.412, F.A.C.) (Note: DEP-SOP-001/01 FS 2200 Groundwater Sampling requires a precision of plus or minus 0.01 foot).

- For reuse and land application projects that are required to monitor ground water, the following parameters shall be analyzed for each monitoring well. (Note: Parameters may be added or deleted on a case by case basis in accordance with Rule 62-601.300(6), F.A.C.) The field parameters shall be sampled per DEP-SOP-00/01.

Table 3: Ground Water Monitoring Parameters

Parameter	Compliance Well Limit	Units	Sample Type
Ground Water Level Relative to NGVD	Report	feet	In-situ
Nitrogen, Nitrate, Total (as N)	10	mg/L	Grab
Solids, Total Dissolved (TDS)	500	mg/L	Grab
Arsenic, Total Recoverable	10	ug/L	Grab
Chloride (as Cl)	250	mg/L	Grab
Cadmium, Total Recoverable	5	ug/L	Grab
Chromium, Total Recoverable	100	ug/L	Grab
Lead, Total Recoverable	15	ug/L	Grab
Coliform, Fecal	4	#/100mL	Grab
pH	6.5-8.5	s.u.	In-situ
Sulfate, Total	250	mg/L	Grab
Turbidity	Report	NTU	Grab

62-520.600(11)(b), 62-601.300(3), 62-601.700(4) and Figure 3 of 62-601, F.A.C.

- The monitoring parameters listed above for reuse and land application systems may be increased based on the reclaimed water or effluent analysis report required by Rule 62-601.300(4), F.A.C. Any of the parameters listed for reuse and land application systems (except for nitrate, total dissolved solids, and water level) may be eliminated from the monitoring schedule if the reclaimed water or effluent analysis report shows concentrations less than the drinking water standards established for that parameter in Chapter 62-550, F.A.C. (62-601.300(3)(a), F.A.C.)
- Minimum requirements for sampling locations, parameters, frequencies, and compositing specifications may be increased or reduced depending upon site-specific requirements, the water quality of surface and ground waters, the hydrogeology of the area, the levels of treatment, the reliability of the facility, and the levels of disinfection provided. (62-601.300(6), F.A.C.)

3.3 Demineralization Concentrate (Chapter 62-620, F.A.C.)

- Except for facilities that discharge concentrate solely using underground injection wells for disposal, as provided in subparagraph 62-620.625(6)(a)6, F.A.C., a facility that discharges demineralization concentrate to groundwater under this chapter shall establish a groundwater monitoring plan in accordance with the requirements of Rule 62-520.600, F.A.C. The groundwater monitoring plan shall include an evaluation of background water quality in the receiving water. Dimensions for the zone of discharge shall be in accordance with the requirements of rules 62-520.400 and .410, F.A.C. (Subparagraph 62-620.625 (6) (a) 7, F.A.C.)
- Small water utility businesses that discharge demineralization concentrate to groundwater, and which meet the criteria referenced in subparagraph 62-620.625(6)(b)1, F.A.C., shall not be required to have more than: one upgradient, one downgradient intermediate, and one downgradient compliance monitoring well. (Rule 62-620.625 (6) (b)2, F.A.C.)

3.4 Animal Feeding Operations (AFOs)

(Chapter 62-670, F.A.C., 04/17/2008 Draft)

- Ground Water Discharges

(a) AFOs with individual wastewater permits and Concentrated Animal Feeding Operations (CAFOs) shall monitor ground water as follows:

1. Large and Medium AFOs shall monitor quarterly for orthophosphate, nitrate as nitrogen, and nitrite as nitrogen; and annually for fecal coliform;
2. Small AFOs shall monitor annually for orthophosphate, nitrate as nitrogen, and nitrite as nitrogen and fecal coliform.

(b) Ground water monitoring requirements shall be specified in the facility's individual wastewater permit.

(c) The permittee may request a reduction in ground water monitoring requirements based on site-specific monitoring data.

- Additional Monitoring.

(a) AFOs with individual permits and all CAFOs shall collect representative samples of material to be land applied from each source of manure, litter or process wastewater effluent as follows.

1. AFOs shall sample manure, litter or process wastewater effluent prior to land application once per year. The sample(s) shall be analyzed for total Kjeldhal nitrogen (TKN), total ammonia, and total phosphorus.
 2. CAFOs shall sample manure, litter or process wastewater effluent prior to land application two times per year. The samples shall be analyzed for total Kjeldhal nitrogen (TKN), total ammonia, and total phosphorus.
- (b) Representative soil samples from each land application area shall be collected and analyzed once every five years for phosphorus.
- AFOs applying for an individual wastewater permit and all CAFOs applying for a permit that includes ground water discharge, shall submit a ground water monitoring plan in accordance with the requirements of Chapter 62-520, F.A.C., as a part of the wastewater permit application.
 - Location of Monitoring Wells. Wells shall be located as follows:
 - (a) One upgradient well located as close as possible to the operation, without being affected by the discharge, to determine the background, or natural background quality where available, of the ground water (background well);
 - (b) One well at the edge of the zones of discharge downgradient from the site (compliance well);
 - (c) One well within the zone of discharge designed to detect the chemical, physical, and microbiological (if applicable) characteristics of the discharge plume (intermediate well); and
 - (d) Such other wells as are dictated by the complexity of the hydrogeology of the site, the magnitude and direction of the plume or the likelihood of threat to the public health, to ensure adequate and reliable monitoring data in generally accepted engineering or hydrogeological practice. Where multiple land application areas are being used, one or more of the areas (which are representative of the hydrogeological characteristics, soil characteristics, vegetative cover, and application method of all the areas) shall be selected by the applicant for review and approval by the Department as representative area(s) for monitoring of the ground water.

3.5 Injection Wells and Aquifer Storage and Recovery (ASR)

- These facilities require ground water monitoring but have their own unique requirements. Refer to Chapter 62-528, F.A.C., for more information.

3.6 Generic Permits (Chapter 62-621, F.A.C.)

As an alternative to individual permits, the Department may use a generic permit to regulate a category of wastewater facilities or activities. A generic permit applies to a category of wastewater facilities or activities only if they all involve the same or substantially similar types of operations, with similar discharges, effluent limitations, operating conditions and monitoring requirements. Some generic conditions require ground water monitoring or the development of a ground water monitoring plan.

- **[Rule 62-621.300\(1\)](#), F.A.C. Generic Permit for Discharges from Medium Dairies**

A Ground Water Monitoring Plan is not required. However, AFOs covered under this generic permit shall install one groundwater monitoring well to evaluate trends (“trend well”) in ground water quality in the water table aquifer. A site plan showing the proposed location of the trend well shall be submitted with the Notice of Intent. A revised site plan shall be submitted after the monitoring well is installed if the location is different from proposal. The monitoring well shall be located within or immediately outside and hydraulically downgradient of the wetted area. The well casing shall be at least 2-inch inside diameter and shall be constructed such that a water quality sample representative of the groundwater beneath the wetted area can be collected. The location and construction of the monitoring well shall be approved by the department prior to installation and shown on a site plan prepared by the Permittee. A soil boring shall be completed at the time of well installation. The Permittee shall monitor groundwater from the well two times annually for pH, orthophosphate, fecal coliforms and total nitrate-nitrite as nitrogen. The Permittee shall report the data obtained from monitoring to the Department.

- **[Rule 62-621.500\(1\)\(a\)](#), F.A.C. Generic Permit for Discharges from Fresh Citrus Fruit Packinghouses to Percolation Ponds**

Provides specific design, operational and monitoring requirements for discharges from fresh citrus fruit packinghouses to percolation ponds.

1. A Ground Water Monitoring Plan shall be prepared and submitted to the Department along with the request for coverage. The Ground Water Monitoring Plan shall contain the information specified in Rule 62-520.600(3), F.A.C., with the following exceptions:

- a. The sampling and chemical analysis protocol shall be as described in Part II.D of this permit.
- b. Description of background water quality shall be limited to the parameters listed in Part II.E.4 of this permit.

2. The location of monitoring wells to be installed shall be as specified by Rule 62-520.600(6)(a) through (c), F.A.C., with prior approval of the Department.
3. Plan approval. Within 90 days of the date of the Department's receipt of a completed monitoring plan, or at the time of permit coverage or denial, whichever is appropriate, the Department shall either approve or deny the monitoring plan.
4. Implementation of monitoring program. The permittee shall begin the monitoring program based upon the plan 30 days before placing the land application system into operation such that one set of samples is obtained prior to operation of the land application system.

Part II. Ground Water Requirements

1. Facilities shall monitor ground water in accordance with Rule 62-520.600, F.A.C., as specified **in Attachment A** of the Department's letter authorizing use of the generic permit.
2. All ground water quality criteria specified in Chapter 62-520, F.A.C., shall be met at the edge of the zone of discharge. The zone of discharge for this project shall extend horizontally 100 feet from the application site or to the facility's property line, whichever is less, and vertically to the base of the surficial aquifer.
3. The ground water minimum criteria specified in Rule 62-520.400, F.A.C., shall be met within the zone of discharge.
4. During the period of operation authorized by this permit, the permittee shall continue to sample ground water at the monitoring well identified **in Attachment A** of the Department's letter authorizing use of the generic permit and **on the DMR**, in accordance with this permit and the approved ground water monitoring plan prepared in accordance with Rule 62-520.600, F.A.C.
5. The following parameters shall be analyzed semi-annually for the monitoring well identified **in Attachment A** of the Department's letter authorizing use of the generic permit and **on the DMR**.

Parameter	Compliance Well Limit	Units	Sample Type
Ground Water Level Relative to NGVD	Report	Feet	In-situ
Nitrogen, Nitrate, Total (as N)	10	MG/L	Grab

Solids, Total Dissolved (TDS)	500	MG/L	Grab
Arsenic, Total Recoverable	10	UG/L	Grab
Chloride (as Cl)	250	MG/L	Grab
Cadmium, Total Recoverable	5	UG/L	Grab
Chromium, Total Recoverable	100	UG/L	Grab
Lead, Total Recoverable	15	UG/L	Grab
Coliform, Fecal	4	#/100 ML	Grab
pH	6.5-8.5	SU	In-situ
Sulfate, Total	250	MG/L	Grab
Turbidity	Report	NTU	Grab
Specific Conductance	Report	UMHO/CM	grab

6. If the concentration for any constituent listed above in the natural background quality of the ground water is greater than the stated maximum, or in the case of pH is also less than the minimum, the representative natural background quality shall be the prevailing standard.

7. In accordance with Part D of DEP Form 62-620.910(10), F.A.C., water levels shall be recorded before evacuating the well for sample collection. Elevation references shall include the top of the well casing and land surface at the well site (NAVD allowable) at a precision of plus or minus 0.1 foot. (Note: DEP-SOP-001/01 FS 2200 Groundwater Sampling requires a precision of plus or minus 0.01 foot).

8. The ground water monitoring well shall be purged prior to sampling to obtain representative samples.

9. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department as being more representative of ground water conditions.

10. Ground water monitoring parameters shall be analyzed in accordance with Rule 62-620.610(18), F.A.C.

11. All piezometers and wells not part of the approved ground water monitoring plan are to be plugged and abandoned in accordance with Rule 62-532.500(4), F.A.C., unless there is intent for their future use.

Part IV. Monitoring and Reporting Requirements

5. If a ground water monitoring well becomes damaged or cannot be sampled for some reason, the permittee shall notify the Department immediately and a written report shall follow within seven days detailing the circumstances and remedial measures taken or proposed. Repair or replacement of the monitoring well shall be approved in advance by the Department.

6. The permittee shall provide verbal notice to the Department as soon as practical after discovery of a sinkhole within an area used for the management or application of wastewater, or reclaimed water. The permittee shall immediately implement measures appropriate to control the entry of contaminants, and shall detail these measures to the Department in a written report within 7 days of the sinkhole discovery.

- **Rule 62-621.500(2)(b), F.A.C. Generic Permit for Domestic Wastewater Facilities that Discharge to Rapid-Rate Infiltration Basin and Absorption Field Systems**

Same as Rule 62-621.500(2)(a), F.A.C. Generic Permit for Domestic Wastewater Facilities that Discharge to Slow-Rate/Restricted Access Land Application Systems above.

3.7 Dredging Operations

A Ground Water Monitoring Plan may be required for some dredging operations. Many of these projects are proposed in saltwater bodies where sediments are dredged and transported as slurry using the salt water to upland areas for disposal. Most of the disposal systems are unlined and use perimeter intercepting drains to collect the salt water running off from the disposal area.

The ERP permits issued for such operations call for addressing all surface and groundwater quality issues. Implementation of groundwater monitoring may be required. Please refer to the specific District permitting office for more information.

3.8 Ground Water Monitoring Plans Not Associated with a Permit

In some cases, a ground water monitoring plan may be required for a facility or activity that is not otherwise required to obtain an operating permit. For example, theme parks use large quantities of salt water in aquarium and other operations. Since salt water is not a wastewater by definition, these facilities do not have wastewater permits. Saltwater releases can be addressed by implementing GWMPs at release sites.

Other examples of facilities that may require a ground water monitoring plan without an associated permit include fertilizer mixing facilities and truck rental vehicle washing facilities. For those ground water monitoring plans without an associated ground water discharge permit, a letter of approval, denial, or request for modification will be sent to the applicant with a notice of rights for an administrative hearing (62-520.600(4), F.A.C.) Please refer to the specific District permitting office for more information.

4.0 Department Permitting Contacts

The Department's district offices conduct most permitting and compliance activities for those facilities located within their boundaries. For information about ground water monitoring at specific wastewater facilities in Florida, please contact the appropriate District Office.

Central District

Office.....**407-894-7555**

3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Northeast District

Office.....**904-807-3300**

7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

Northwest District

Office.....**850-595-8380**

160 Government Center
Pensacola, Florida 32502-5794

South District

Office.....**239-332-6975**

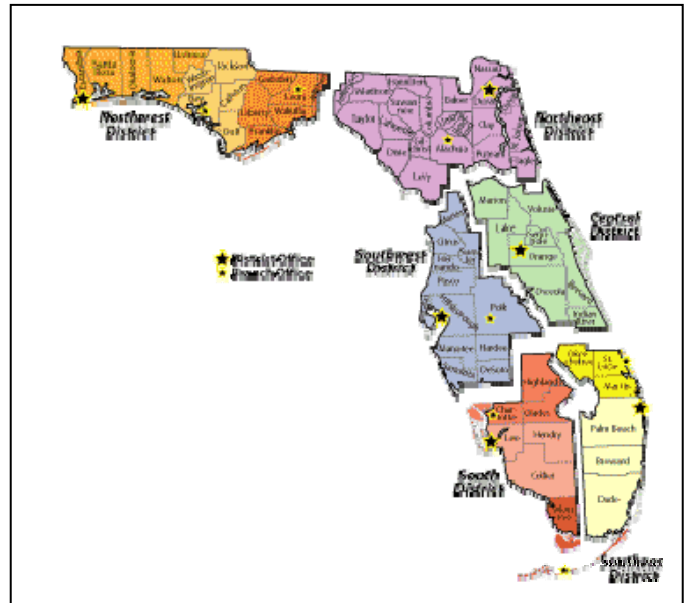
P.O. Box 2549
Ft. Myers, Florida 33901

Southeast District Office.....**561-681-6743**

400 North Congress Avenue
West Palm Beach, Florida 33401

Southwest District Office.....**813-632-7600**

13051 N. Telecom Parkway
Temple Terrace, FL 33637-0926



The following is a list of DEP wastewater program contacts in Tallahassee. For questions about onsite wastewater systems (AKA Septic Systems), please contact the Department of Health's Bureau of Onsite Sewage.

Ground Water Regulatory's Underground Injection Control (UIC) Program

.....**850-245-8644**

2600 Blair Stone Road, MS 3530
Tallahassee, Florida 32399-2400

Wastewater Management.....850-245-8664

2600 Blair Stone Road, MS 3535
Tallahassee, Florida 32399-2400

Compliance Evaluation.....850-245-8567

2600 Blair Stone Road, MS 3550
Tallahassee, Florida 32399-2400

Compliance Reports, Data Control, Data Entry, DMR's, Enforcement, Self-monitoring , WAFR

Domestic Wastewater.....850-245-8605

2600 Blair Stone Road, MS 3540
Tallahassee, Florida 32399-2400

Biosolids/Residuals/Sludge, Collection/Transmission Systems, Constructed Wetlands, Delegated Local Wastewater Programs, Land Application, NPDES, Domestic Package Plants, Domestic Wastewater Permitting, POTW, Pretreatment, Reuse/Reclaimed Water, Wastewater Wetlands

Industrial Wastewater.....850-245-8589

2600 Blair Stone Road, MS 3545
Tallahassee, Florida 32399-2400

Agriculture/Animal Feeding Operations, Car Wash, Concrete Batch Plants, Dairy Farms, General Permits, Industrial NPDES, Industrial Permitting, Power Plants

**Department of Health's
Bureau of Onsite Sewage.....850-245-4070**

4052 Bald Cypress Way, Bin #A08
Tallahassee, Florida 32399-1713
also: Local County Health Departments