Title 20 Chapter 9 NMAC
Groundwater Monitoring Report Requirements

The following information **must** be included in the detection monitoring report, as required by the Solid Waste Rules:

- the constituents and parameter tested
- the test method (U.S. EPA or equivalent) for each constituent and parameter
- the ground water protection standard for each constituent detected (if a numeric standard has been established);
- the method detection limit (MDL) for each constituent;
- the practical quantitation limit (PQL) for each constituent and parameter
- the well number and location for each sample
- the laboratory ID sample number
- chain of custody documentation
- the date sampled
- the date received at the laboratory
- the date analysis commenced
- flow direction detail (potentiometric surface map)
- flow velocity calculations
- depth to water within 0.01 inches, including historical data
- results, with constituent or parameter, chemical abstract system number, concentration with units, approved AML, ground water protection standard, PQL, qualifier code (e.g., J, B, U, etc.), well number, and sample date
- sample preservation (field data)
- field blank results, and trip blank results
- quality assurance/quality control summary report (laboratory blanks, spike recoveries, etc.)
- anomaly report (non-conformance with quality assurance/quality control plan, corrective actions, etc.)
- laboratory review (signature and date)
- an updated ground water elevation contour map for the facility or, if ground water elevation data is insufficient to contour, then the ground water elevation for each monitoring well, prior to purging, reported on a well location map
- the approved background concentration levels; and
- a certification by a qualified ground water scientist that AMLs have or have not been exceeded.

Groundwater Monitoring Report Acceptable Format

Our review found that the report prepared for your facility was poorly organized and hard to follow. The Bureau finds the following standardized format for Annual Groundwater Monitoring Reports acceptable. We strongly recommend that this format be used in all future reports prepared:

1) **Cover Letter**

2) **Introduction**

   a) **Site Description and Background**

   This section would include: years of operation, when closed or when closure is proposed; where landfill is located (township, range, section); landfill acreage; information on owner and operator, and a map of where, with respect to a municipality, the landfill is located.

   b) **Hydrogeologic Setting**

   This section would include: type of geology that underlies the landfill as well as regional geology (what formation, type of sediment, and thickness of formation); depth at which groundwater occurs; potential effects on groundwater due to surrounding activities and what this means to groundwater under the landfill site.

   c) **Annual Report Contents**

   This section includes: purpose of the report; what regulations it fulfills.

   d) **Definitions**

   This section would include the definitions used throughout the report such as PQL, GWPS, baseline, AMLs, etc.

3) **Field Program and Monitoring Results**

   a) **Monitoring Well Network**

   This section includes: number of wells onsite; which wells are upgradient or downgradient; what types of wells they are (detection, characterization); if there are wells off site that are being monitored for contaminants; a clear, uncluttered, site map which shows the locations of monitoring wells.

   b) **Groundwater Elevation Measurements** (reference section 20.9.9.10(D) NMAC for requirements)

   This section includes: when, during the sampling event, and how were the elevations taken; if there are fluctuations from one sampling event to another or year to year; if the depth to water in the aquifer is declining or not; site maps for the current sampling events and at least two previous sampling events with groundwater contours and flow direction arrows; table showing the summary of monitoring well construction details, for example:

Well I.D	Coordinates	Total depth of boring (ft bgs)	Bottom of screen (ft bgs)	Top of screen (ft bgs)	Ground elevation (ft NGVD)	Top of casing (ft NGVD)
MW - #	N = # E = #					

This section should also include description of any problems (dry well, broken casing, inoperable pump, etc.); and table of all historical and current groundwater measurement data, for example:

Date	MW - #	MW - #	MW - #	MW - #
5/15/2005				
12/9/2005				
11/16/2006				
11/20/2007				

c) Groundwater Gradient and Flow Velocity

This section includes: by which method the hydraulic conductivity and effective porosity were established; what are their values; and how was groundwater flow velocity calculated. Include actual calculations.

d) Groundwater Sampling (for background groundwater quality concentrations and AMLs see 20.9.9.10 NMAC)

This section should include: whether or not the site is in semi-annual or annual detection monitoring (include copy of letter approving change from semi-annual to annual status), assessment monitoring due to exceedances, or corrective action, and what caused the elevation to corrective action; if an alternate assessment monitoring list of parameters has been approved, by whom and when; what parameters are being sampled for and why; sampling method used (purging or low-flow sampling), details of sample collection volumes removed for purging or stabilization parameters for low-flow sampling; was pH, specific conductance, and temperature measured; was groundwater color, clarity, and odor observed and noted on the sampling data sheet; were the samples that were collected for metals filtered or not (NOTE: metals should be sampled for both total and dissolved (filtered and unfiltered) if water is turbid (turbidity is > 5) or groundwater from monitoring wells shows history of elevated or increasing trend in metal concentrations); discussion of how the background and site specific AMLs were obtained which will include all statistical equations used in the determination of these AMLs. This section should also include:

i) Information on whether the facility is using interwell or intrawell comparison and justification for that choice

ii) List of approved alternate assessment monitoring parameters (if applicable)

iii) Table containing field measurements of: pH, specific conductance, and temperature for each well, including historical data

iv) Table containing groundwater color, clarity, and odor for each well, including historical data (if applicable)

v) Table containing site specific AMLs which shows the baseline sampling events that were used to calculate the AMLs, averages, standard deviations, outliers, GWPS, PQL, prescriptive AML, and other relevant information, depending on the statistical methods used:

Baseline						Statistics						
Analyte	Date #1	Date #2	Date #3	Date #4	Date #5	Avg.	Std. Dev.	GWPS	PQL	UTLV	Site Specific AML	Prescriptive AML
Aluminum												
Antimony												
Arsenic												

e) Laboratory Analysis and Monitoring Parameters

This section should include: where the samples were submitted for testing; what they were tested for.

f) Laboratory and Field Quality Assurance and Quality Control

This section should include a brief discussion of:

i) sample receiving

ii) blanks, duplicates

iii) holding times

iv) laboratory control samples

v) Matrix spike and matrix spike duplicate

vi) Organics: what methods were used to test; PQLs; was any parameter found to be above the detection limits

vii) Inorganics: were the samples analyzed to acceptable PQL; did any samples need to be diluted due to high constituent concentrations and were the diluted samples adjusted; were samples for metals filtered or unfiltered.

4) **Evaluation of Analytical Results** (VOCs and inorganics can be discussed together or separately, depending on site specific situation)

   This section includes: a discussion of any constituents detected and if so, what wells had detections, were they upgradient or downgradient wells, how long have these detections occurred, what this might indicate and if the detections trigger any actions (for example confirmatory resampling. Confirmatory sampling is recommended to occur within two weeks of original sampling event.); what the detected constituents are compared to (PQLs, AMLs, CALs, MCLs) and why; have any exceedances triggered assessment monitoring status; if there are exceedances, what is the possible source; are any constituents migrating; and if there are any trends pertaining to the migration; is there any evidence of an off-site source and what this evidence is. This section also includes information about statistical treatment of data is discussed and an explanation of findings. Examples of statistical calculations must be provided.

   a) Provide a table with any VOC and/or Inorganic Constituents detections in groundwater monitoring wells with all historical and current data, highlighting or bolding the exceedances.

   b) Provide separate trend graphs of concentrations vs. sampling events for all detected VOCs and for all Inorganic Constituents that ever exceeded AMLs.

5) **Corrective Action** (if any is necessary)

   This section should address all requirements of 20.9.9.14 and 20.9.9.15 NMAC to mitigate the exceedances detected in the groundwater underlying the landfill site.

6) **Conclusions**

   This section should include the conclusions reached from the groundwater elevation measurements and analytical sampling for VOCs and Inorganic Constituents in groundwater under the landfill site.

7) **Appendices**

   a) Copies of actual field notes, field monitoring data sheets that include time, date, weather conditions, well conditions, field sampling results (i.e. temperature)

   b) Laboratory Analytical Results and Chain-of-Custody Forms

   c) Any other information related to your sampling that is not included in the main text of the report

The groundwater monitoring report, as well as all other reports submitted to the Bureau, should be either bound or otherwise secured.