Reducing or Terminating Groundwater Monitoring at Solid Waste Landfills

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Waste & Materials Management
P. O. Box 7921
Madison, WI 53707-7921

Summary: This guidance is for people or municipalities that want to reduce or stop groundwater sampling or eliminate specific wells and/or parameters from the monitoring program at a solid waste landfill. It describes how a request should be prepared and submitted and how the Department of Natural Resources (DNR) will review the request.

If you have been sampling groundwater around a landfill four times a year ("quarterly"), which is typically only at older closed landfills, and there are no water quality issues or concerns, then submitting a request to modify the sampling to twice a year ("semi-annually") may be a favorable approach for you. Semi-annual sampling is the standard frequency established in ch. NR 507, Wis. Adm. Code. Sampling less often than semi-annual is possible in certain situations. The DNR will make the decision based on how big your landfill is, what the local geology is like, how long you have been sampling groundwater, what the sampling results show and other factors.

Elimination of redundant or unnecessary monitoring wells or specific monitoring parameters is also possible in certain situations.

This guidance (Publication WA-1013, revised 2019) replaces previous guidance dated 1997, 2003, 2006, and 2014 on reducing monitoring frequency near landfills.

The DNR website has additional resources on landfill monitoring:

- Collecting and analyzing Wisconsin landfill environmental monitoring data
  http://dnr.wi.gov/topic/Landfills/Monitor.html

- Relevant Wisconsin administrative codes and statutes, including NR 500 and NR 140
  http://dnr.wi.gov/topic/Waste/Laws.html

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Introduction

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Subject to s. 289.31(7), Wis. Stat. and ch. NR 507, Wis. Adm. Code, the Department of Natural Resources (DNR) may require landfill owners to monitor groundwater quality to assure the safety of those who drink that water now or in the future. Although there is an expense to gather and analyze water samples, the goal is to protect human health and the environment. At the same time, landfill owners should not have to collect more information than is necessary to assure groundwater quality.

How often, where, and for which parameters groundwater around a landfill is sampled depends on the landfill's DNR approval, which is a legally enforceable document. This could be an approval of a plan of operation, closure plan or groundwater monitoring plan. The approval requires the landfill owner to take samples periodically to look for possible changes in groundwater quality. This is called "detection monitoring." Sampling carried out to assess the degree of impacts of a landfill known to have polluted groundwater is called "assessment monitoring." See, s. NR 507.19, Wis. Adm. Code.

Before 1996, the DNR normally required detection monitoring every 3 months (that is, 4 times a year or "quarterly"). Since 1996, when the DNR upgraded its landfill design standards, the normal sampling frequency for new landfills has been every 6 months (that is, "semi-annually"). Sampling for older landfills remained as approved; however, because most of them did not have design features, such as clay liners, to protect water quality.

The goal is to have a monitoring program that is appropriate for the facility. The standard is to follow the requirements of ch. NR 507, Wis. Adm. Code; however, the DNR may approve alternate requirements that are appropriate for the facility.

As a landfill owner, if you want to sample your landfill less often or not at all, you must first ask the DNR to modify your approval in writing. You may ask the DNR to allow you to:

- Change the sampling from 4 times a year to 2 times a year, typically in spring and fall;
- Change the sampling to anything less than twice a year;
- Eliminate specific monitoring wells;
- Eliminate specific monitoring parameters or parameter groups;
- A combination of the above; or
- Stop sampling altogether.

Generally speaking:

- If you are doing quarterly detection monitoring and the substances being found in the water samples are not increasing, the DNR may allow you to reduce the monitoring frequency from quarterly to semi- annual. This is possible at most solid waste landfills. However, please note that parameters may be added to the monitoring program to meet the minimum parameter requirements in ch. NR 507, Wis. Adm. Code, for the types of waste disposed at the landfill. For example, if the closed landfill accepted municipal solid waste (MSW), the DNR would require annual sampling of volatile organic compounds (VOCs) to be added to the monitoring program, if the monitoring program does not already include VOCs. Annual VOC monitoring is a current requirement for MSW landfills.
- If detection monitoring over many years indicates that the landfill is unlikely to contaminate groundwater, it may be possible to reduce the sampling frequency to annual sampling. Reduction of the sampling frequency to every two years or even less frequent is possible under special circumstances.
- In cases where the DNR approves less than annual monitoring, the DNR would likely still require that groundwater elevations continue to be measured on a yearly basis. The purpose of collecting groundwater elevation measurements would be to ensure that the wells continue to be inspected at least annually. Checking water levels requires that the locked well cover be opened, and the PVC well casing cap be removed to lower a tape into the well, which aids in knowing if the well is functioning.
- If the volume and type of waste, hydrogeologic conditions and long-term groundwater quality data at a site have shown that the facility does not and is not expected to pose a threat to human health or the environment, the DNR

may allow you to stop monitoring the landfill. This situation is rare, but possible.

- If specific monitoring wells provide no useful purpose as part of the groundwater monitoring array because they are redundant or add no useful groundwater quality or groundwater flow information, the DNR may approve abandonment of those wells while monitoring continues at other wells. Monitoring well abandonment procedures need to follow s. NR 141.25, Wis. Adm. Code, requirements.
- Sometimes wells may provide good groundwater elevation data to supplement the understanding of groundwater flow direction because of their location and screened interval, even if sampling for groundwater quality does not provide added value. In these cases, the DNR may approve that only groundwater elevation measurements be collected from those wells.
- If specific groundwater parameters or parameter groups no longer provide a useful purpose the DNR may approve the removal of the parameter(s) from the required monitoring list.

This guidance focuses on how to propose changes in groundwater monitoring frequency, parameters, and the number of wells sampled. Appendix G briefly touches on other monitoring such as landfill gas and leachate. If you are considering any changes beyond groundwater monitoring, we recommend you contact the DNR early in the process to discuss your proposed changes. We may be able to suggest things that will save you money in the long run.

Applicability to general categories of landfills

Different types of landfills may have differing monitoring requirements, depending on which laws apply. As a result, this guidance DOES NOT apply to:

- Subtitle D Landfills with semi-annual monitoring. These are landfills that accepted municipal solid waste on or after October 9, 1993; except facilities which received less than 100 tons per day on an annual basis and which ceased accepting waste prior to April 9, 1994. Subtitle D landfills are subject to Wisconsin rules consistent with federal solid waste landfill regulations (see RCRA Subtitle D, 40 CFR, Parts 257 and 258, and chapters NR 504, NR 506 and NR 507, Wis. Adm. Code). The minimum groundwater monitoring frequency for active or closed Subtitle D landfills is semi-annual (NR 507, Appendix I, Table 1, Wis. Adm. Code). 40 CFR Part 258.54 does provide for alternate sampling frequencies that are less often than semiannual for operating Subtitle D landfills, but this guidance document does not address all of the items that could pertain to such a request. Subtitle D landfills that are conducting quarterly detection monitoring and are not required to do assessment monitoring can use this guidance to reduce groundwater monitoring frequency to semi-annual. Federal rules do not allow for less than annual monitoring at designated subtitle D monitoring wells.
- Landfills under "assessment monitoring" (see ch. NR 508, Wis. Adm. Code). This guidance does not apply to sites under assessment monitoring because of impacts to groundwater.
- Landfills undergoing remediation. Although the principles in this guidance may apply to landfills undergoing remediation, the DNR will take other factors into consideration in reviewing the monitoring programs at such sites; this guidance is not intended for use in establishing monitoring programs for sites undergoing remediation.

This guidance DOES apply to detection monitoring at:

- Small size construction and demolition (C&D) waste landfills which are designed for disposal of no more than 50,000 cubic yards of C&D waste. Monitoring at these landfills is regulated under s. NR 503.09, Wis. Adm. Code.
- Intermediate size C&D waste landfills which are designed for disposal of more than 50,000 cubic yards but no more than 250,000 cubic yards of C&D waste. Monitoring at these landfills is regulated under s. NR 503.10, Wis. Adm. Code.
- Large size C&D waste landfills which are designed for disposal of more than 250,000 cubic yards of C&D waste. Monitoring at these landfills is regulated under ss. NR 507.15 (1) and NR 507.19, Wis. Adm. Code.
- Industrial waste landfills. Monitoring at these landfills is regulated under ss. NR 507.15(1) and NR 507.19, Wis. Adm. Code.
- Municipal waste landfills that ceased accepting municipal solid waste prior to October 9, 1993, including both "approved" and "non-approved" landfills. Monitoring at these landfills is regulated under ss. NR 507.15 (1) and NR 507.19, Wis. Adm. Code. An "approved facility" is one with an approved plan of operation under s. 289.30, Wis. Adm. Code or a solid waste disposal facility initially licensed within 3 years prior to May 21, 1978, whose owner successfully applies, with 2 years after May 21, 1978, for a determination by the DNR, that the facility's design and plan of operation comply substantially with the requirements necessary for plan of operation approval

under s. 289.30, Wis. Stats.

- Municipal waste landfills which received less than 100 tons per day on an annual basis and which ceased accepting solid waste prior to April 9, 1994. Monitoring at these landfills is regulated under ss. NR 507.15 (1) and NR 507.19, Wis. Adm. Code.
- Subtitle D landfills that are monitoring quarterly because of a DNR approval requirement that goes beyond the federal rules.

DNR recommendations about monitoring frequency

Sections NR 503.09 (6) (f), NR 503.10 (7) (e) and NR 507.19 (2), Wis. Adm. Code require a minimum sampling frequency of semi-annual (every six months) monitoring at active and closed landfills, unless the DNR approves a different sampling frequency in writing. Generally, the DNR will not approve a sampling frequency that is less than semi-annual at active landfills; however, it may consider a request to reduce sampling at a closed landfill.

NOTE: Asking DNR to review a plan modification to reduce or terminate sampling will result in close DNR evaluation of your site and the existing groundwater conditions. In some cases, this process could result in DNR finding additional groundwater concerns. This may prevent the DNR from approving a request to reduce monitoring; however, in order to support a future request, the DNR may ask for or recommend additional groundwater monitoring parameters or wells for a period of time to ensure that any outstanding groundwater quality concerns are addressed. The DNR may request additional sample rounds or other substances to be checked, such as emerging contaminants, depending on the waste types accepted and observed concentrations of the substances analyzed.

The DNR recommends the following groundwater monitoring frequencies at landfills (see Appendix A.)

1. **At most closed landfills, groundwater should be sampled at least twice a year (semi-annually), typically in the spring and fall.** Sampling twice a year gives the best picture of how groundwater quality changes over time.
2. **At some closed landfills, it may be possible to cut sampling back to once a year**. These would include sites with many years of groundwater monitoring data and that meet the general criteria for reducing monitoring (see next sections).
3. At select closed landfills, it may be possible to cut sampling to every two years or even less frequent. These would include sites with many years of groundwater monitoring data and that meet the general criteria for reducing monitoring and even some of the criteria for terminating monitoring. For any sampling frequency that is less than annual, the proposed monitoring plan should include provisions to demonstrate, at a minimum, annual observations and maintenance of monitoring devices.

   Reasons for annual observations include: (1) landfill owners might forget or fail to sample if funds for sampling or observation are not included in their budgets every year, and (2) wells may fall into disrepair or be lost when monitoring wells are sampled less than annually. The demonstration could be collecting annual groundwater elevations to show that someone representing the landfill unlocked and opened the outer protective pipe cap and removed the well casing top, combined with an inspection checklist showing that certain aspects of the well were looked at.

Termination of groundwater monitoring – closed landfills

Termination of groundwater monitoring for closed landfills is appropriate only where future groundwater contamination is extremely unlikely. **Additionally, continued groundwater monitoring for a considerable time (typically at least five years) after a gas or a leachate collection system has been turned off, at those landfills having such systems, is important to ensure there are no groundwater impacts that may result from turning off these systems.**

Here are some lines of evidence that would indicate future groundwater contamination may be unlikely:

Groundwater monitoring quality at the facility

- There are at least five years of groundwater monitoring data from one or more wells that are located down gradient from the closed landfill and screened at an appropriate depth.
- No wells currently show increasing or high variability in concentrations of substances in groundwater due to the landfill. If there are abnormal detections of substances, the request should explain why the substance is not coming from the landfill, providing the evidence and likely source (e.g. chloride in a well located adjacent to a salt shed). This applies to substances which have Public Health or Public Welfare groundwater quality standards or indicator parameter preventive action limits (PALs) under NR 140, Wis. Adm. Code, as well as other substances in groundwater that have the potential to exceed a PAL or enforcement standard (ES). NOTE: Indicator parameters (e.g. specific conductance), which exhibit increasing trends may be indicative of increasing concentrations of one or more other parameters that do have an NR 140 groundwater standard. Also, there may be fluctuations in concentrations between sampling events with some highs and some lows; therefore, it is important to look at the overall current trend.
- The landfill owner has performed all remedial actions that the DNR has required at the site.
- There are no exceedances of NR 140, Wis. Adm. Code public health or public welfare PALs or ES attributed to the landfill in the past 5 years.
- Down gradient and up gradient groundwater monitoring wells have similar chemistry.
- Groundwater sampling results demonstrate that any concentration exceeding an NR 140 ES is due to background or other conditions not related to the landfill, or that contaminant levels have decreased or stabilized at a low level and do not pose a threat to human health or the environment. Background conditions are considered those which are naturally occurring or not caused by the landfill.

Geology and hydrogeology

- The geologic and hydrogeologic conditions near the landfill would be suitable to support natural attenuation or restrict contamination migration (for example, distance between the groundwater table and waste is significant; soils are fine-grained, e.g. clay soils, and would inhibit contaminant movement; etc.).

Landfill characteristics and features

- The landfill volume is very small (less than 250,000 cubic yards).
- The landfill has a cap that is well maintained and in good working order.
- The types of waste received by the landfill were known and limited in variability.
- Wastes accepted did not include significant amounts of liquid or industrial waste.
- Wastes at the landfill were periodically burned, thereby destroying generally mobile contaminants such as volatile organic compounds (VOCs) and reducing the potential for gas generation. NOTE: Metals may still be a concern.
- There are few private wells near the landfill, and it is unlikely that private wells will be installed near the landfill in the future, for example, because the land surrounding the landfill is designated or zoned for non-residential use.

The DNR will evaluate proposals to terminate monitoring with caution. If monitoring stops and wells are removed, it becomes much harder to tell if a closed landfill is contaminating groundwater. If there are any indications of groundwater contamination or impacts to a receptor (e.g. water supply well) that may be coming from the landfill in the future, the DNR can ask the landfill owner to conduct a groundwater investigation by installing new wells and possibly resume routine groundwater monitoring, under the provisions of s. NR 507.04 and s. NR 507.15 (1), Wis. Adm. Code. Older landfills may be more likely to pollute groundwater if they do not have liners and leachate collection systems, if they are located close to the groundwater table or bedrock surface, or if soils are course grained such as gravel or sandy soils (which could allow contaminants to infiltrate more readily). Having a long history of groundwater monitoring data showing few, to no groundwater quality standard exceedances and no increasing concentration trends raises the confidence level that the potential for future contamination is low.

General guidelines for proposing changes to the approved monitoring program

If you want to reduce or stop monitoring, reduce the number of wells monitored, or eliminate specific monitoring parameters, you should be prepared to show all of the following.

1. The proposed change to the monitoring program does not present a threat to public health and welfare or the environment. A DNR hydrogeologist will review the landfill history, hydrogeology, and monitoring data.
2. The facility has an adequate monitoring network. This means that a sufficient number of wells are in locations and at depths needed to detect groundwater contamination near the landfill and the wells were constructed properly and are in good condition. If this is not the case and there are concerns with potential groundwater quality standard exceedances or not having wells properly located to detect contamination between the landfill and a receptor, then you may need to upgrade and repair the wells before submitting your request to reduce monitoring. If there are wells located in waste, then additional wells may be needed that are installed outside of waste, to know if contamination has moved beyond the limits of waste. The wells located in waste may need to be properly filled and sealed. If you are unsure of the adequacy of the monitoring well network, request a preliminary review (see "How to Propose Changes to the Monitoring Program" below).
3. The data have been regularly submitted to the DNR and are reliable and complete. This includes maps, well locations, well construction logs, groundwater monitoring data and other information. In particular, DNR staff will carefully evaluate data on VOCs to determine data reliability (see Appendix D, "Quality Assurance Considerations for VOCs"). If data are unreliable, you may need to take more samples before the DNR can review your request.
4. The landfill is not a significant source of ongoing groundwater contamination. Any of the following would be evidence of significant groundwater contamination:
    - Increasing concentrations of a contaminant which exceeds PALs defined in NR 140 for public health or public welfare standards. Note that the DNR hydrogeologist may require analysis for select health and welfare-based parameters (such as VOCs and metals) prior to reducing or terminating groundwater monitoring at a landfill.
    - Increasing trend of VOC ES or PAL exceedances in the groundwater after the landfill has been closed for a minimum of five years. This time limit may be increased if an analysis of the flow system shows that groundwater moves very slowly and therefore contaminants may not have reached the monitoring wells yet.
    - Significant current differences in water quality when comparing up gradient or background wells with down gradient wells, where the difference cannot be reasonably attributed to other factors, such as soil/rock type, natural variability or other sources of groundwater contamination.

Following these guidelines will help the DNR evaluate a request for reducing terminating monitoring and will increase the likelihood that the DNR will approve the changes you propose.

How to propose changes to the monitoring program

The DNR must approve changes in monitoring before you implement them. Here are some things you should know about proposing changes in monitoring frequency, number of monitoring points, or parameters.

Preliminary reviews: The DNR strongly recommends that you contact the DNR hydrogeologist assigned to your facility for a preliminary review of your proposal before spending time and money compiling the information needed for a formal plan modification request. To find out which DNR staff member is assigned to your landfill, locate your DNR regional office at: https://dnr.wi.gov/Contact/OfficeLocations.html

You may already have much of the necessary information in reports previously prepared for the site. However, for some closed sites, records may be incomplete or outdated and you should provide the information in Appendix B for the DNR to review. The DNR will provide a preliminary review and opinion. There is no fee for the preliminary review.

Plan modifications: If your plan of operation, groundwater monitoring plan or closure plan specifies a monitoring frequency, you must obtain written DNR approval before you implement any change in monitoring. To initiate the approval process, you must submit a formal plan modification request to the DNR for approval to amend this plan.

All submittals should follow the general submittal requirements detailed in s. NR 500.05, Wis. Adm. Code, regarding the contents, format, number of copies, size of visuals, etc. For a detailed listing of the information to be submitted with your plan modification request, please refer to Appendix C.

Upon receiving your plan modification proposal, the DNR will send an invoice to cover the cost of reviewing the plan, based on the plan review fees listed in s. NR 520, Wis. Adm. Code, Table 3.

Expedited plan modifications: **If your landfill is an "approved facility" under s. 289.01 (3), Wis. Stats.**, Wisconsin's solid waste rules outline a process by which certain relatively simple plan modifications may be submitted to the DNR. If the DNR does not object within thirty days after it receives the expedited proposal, the proposed modifications are considered to be approved automatically (see s. NR 514.09, Wis. Adm. Code). These expedited plan modifications are subject to reduced plan review fees and cannot be used for a "non-approved facility" as defined in s. 289.01 (24), Wis. Stats.

Except as noted below, the expedited plan modification process may apply to reductions of monitoring frequency from quarterly to semi-annually at a closed landfill where the DNR determines there is low potential risk of adverse impacts on public health or the environment. The information to be submitted under the expedited plan modification process is the same as for a formal plan modification and is listed in Appendix C.

An expedited plan modification request may be appropriate for the following examples:

- A proposal to eliminate one or more redundant monitoring wells from the approved monitoring program.
- A proposal to eliminate one or more parameters not required under ch. NR 507, Wis. Adm. Code from the approved monitoring program.

The expedited plan modification does not apply to the following proposals based on s. NR 514.09 (1), Wis. Adm. Code:

- A proposal to change monitoring at a small or intermediate size construction and demolition waste landfill, because these landfills are regulated under ch. NR 503, not ch. NR 514, Wis. Adm. Code.
- A change that would result in a violation of a statute or administrative rule, or an existing written condition (other than the condition specifying monitoring frequency) contained in a DNR approval document.
- A proposal that would require the DNR more than 8 hours to review, under s. NR 514.09 (1) (b) 9., Wis. Adm. Code.
- A proposal that would require the DNR to issue an exemption from a specific code requirement, under s. NR 500.08 (4), Wis. Adm. Code.
- A proposal that poses a potential risk to public health or the environment, under s. NR 514.09 (1) (a) 10., Wis. Adm. Code.
- A proposal that would reduce monitoring frequency to less than the minimum required by administrative code (i.e., semiannually), under s. NR 514.09 (1) (b) 4., Wis. Adm. Code. (This request needs to be processed as a regular plan modification.)
- A proposal to terminate monitoring, under s. NR 514.09 (1) (b) 3., Wis. Adm. Code. (This request needs to be processed as a regular plan modification.)
- A single proposed plan modification which includes multiple requests. For example, a proposal to change the number of monitoring wells, monitoring parameters, approve PALs, grant exemptions to groundwater standards, or change other aspects of sampling and landfill operation at the same time you request a reduction in monitoring frequency. These more complicated proposals take longer to review and should be submitted as formal plan modifications rather than expedited plan modifications.

If in doubt, please contact the DNR staff assigned to your landfill before submitting the proposal for expedited plan review. If the DNR denies to your request for an expedited review, you will have the option of requesting a formal plan

modification and the DNR would send an invoice for the appropriate plan review fee before reviewing your proposal. In any case, you should contact the DNR hydrogeologist assigned to your facility prior to submitting a proposed expedited plan modification.

Guidance contact: Plan Review Hydrogeologist at DNRWasteMaterials@wisconsin.gov
Wisconsin Department of Natural Resources
Waste and Materials Management Program WA/5
P.O. Box 7921
Madison, WI 53707-7921

Appendix A

Table 1: Groundwater monitoring frequencies for various landfill categories

Landfill Type	Applicable Code Provisions	Minimum Monitoring Frequencies	Expedited Plan Review may be used to reduce:
Subtitle D Municipal landfills	NR 507.15(2), and NR 507.19, Wis. Adm. Code	Semi-Annually. DNR may approve other frequencies. * For designated subtitle D wells DNR may not approve less than annual monitoring during the active life and during the 40-year post closure period.	From quarterly to semi-annually
Small Size Construction & Demolition Waste landfills (less than or equal to 50,000 c.y.)	NR 503.09(5), Wis. Adm. Code	Semi-annually. DNR may approve other frequencies.	Not Allowed
Intermediate Size Construction & Demolition Waste landfills (more than 50,000 c.y. but less than or equal to 250,000 c.y.)	NR 503.10(7), Wis. Adm. Code	Semi-annually. DNR may approve other frequencies.	Not Allowed
Large Size Construction & Demolition Waste landfills (more than 250,000 c.y.)	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annually. DNR may approve other frequencies.	From quarterly to semi-annually
Operating Industrial landfills	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annually. DNR may approve other frequencies.	From quarterly to semi-annually
Closed Industrial landfills	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annually. DNR may approve other frequencies.	From quarterly to semi-annually
Closed Non-Subtitle D Municipal landfills (see "Applicability" for description)	NR 507.15(1), and NR 507.19, Wis. Adm. Code	Semi-annually. DNR may approve other frequencies.	From quarterly to semi-annually

APPENDIX I

https://docs.legis.wisconsin.gov/code/admin_code/nr/500/507_i

Table 1

DETECTION GROUNDWATER MONITORING FOR LANDFILLS ACCEPTING MUNICIPAL SOLID WASTE - See PDF for table

Table 2

DETECTION GROUNDWATER MONITORING FOR LANDFILLS ACCEPTING WASTE TYPES OTHER THAN MUNICIPAL SOLID WASTE - See PDF for table

Table 3

BASELINE GROUNDWATER MONITORING
PUBLIC HEALTH AND WELFARE PARAMETERS
NOT INCLUDED AS DETECTION MONITORING PARAMETERS - See PDF for table

Appendix B

Information to provide with a request for a preliminary review

The DNR recognizes that many landfill owners may not have readily available all the information suggested below to support a request to reduce or terminate groundwater monitoring, reduce the number of monitoring wells, or eliminate specific monitoring parameters. We suggest you plan ahead before requesting monitoring reductions to spread out the workload and costs to obtain this information over a time frame that is manageable within your needs. This may include:

- Sampling for the additional suggested parameters when you currently have your wells sampled, such as once a year, will spread out the added laboratory costs. Note that if you currently sample for chemical oxygen demand (COD), contact the hydrogeologist assigned to your facility to see if you can terminate COD monitoring in exchange for VOC monitoring, which will help minimize costs.

  NOTE: While still required in the administrative code and many existing groundwater monitoring plans, COD may be less useful for detection monitoring than other parameters such as VOCs and dissolved organic carbon (DOC). The analytical results for COD may be highly variable and the analysis method itself generates a mercury laden hazardous waste. If COD does not appear to be a useful parameter at your landfill the DNR will drop COD from your list of required monitoring parameters and substitute VOCs (for municipal solid waste landfills or industrial landfills with wastes containing VOCs) or DOC. If you are already sampling for VOCs, the DNR may allow you to drop COD monitoring without adding another parameter.
- Finding or having prepared ground water elevation contour maps.
- Preparing a history of the landfill, such as year opened and closed, types of waste accepted, estimated volume of waste disposed, whether waste was permitted to be burned and if so during which years.

The DNR's opinion on the likelihood of modifying the approved monitoring program will be based on the information you submit, current code and statute requirements, and information in the DNR's file including previously submitted monitoring results.

Requests for preliminary review to reduce quarterly to semiannual monitoring

The preliminary review should start with a phone call to your DNR site contact. When you ask the DNR for a preliminary opinion on the potential to reduce monitoring from quarterly to semiannual at your facility, the DNR contact may suggest you submit some or all of the following information for DNR review. (NOTE: These are not legal requirements but are listed here because they will assist the DNR in evaluating requests for reduction or termination of monitoring frequency and in most cases increase the probability they can be granted.)

If information is not available or is an estimate, this should be indicated in the submittal.

1. A description of your proposed monitoring program (wells to be sampled and for which parameters) and how it differs from your existing monitoring program and the minimum requirements in administrative code. Presentation in a table is preferred.
2. A list of any DNR-approved conditions related to the existing monitoring program and a request to modify them (if applicable).
3. An evaluation of the monitoring network at the site, with specific attention given to:
   a. the locations of the up-gradient and down-gradient wells and direction of groundwater flow;
   b. the condition of the wells; and
   c. an identification of any repairs or improvements needed to ensure that the monitoring network is capable of accurately characterizing groundwater quality as it might be affected by the facility.
4. An evaluation of any monitoring for VOCs or other public health or public welfare parameters at the landfill, including the most recent results and noting values exceeding groundwater PAL or ES standards. Note that annual analysis of VOCs will be included as part of the sampling plan for municipal solid waste landfill sites performing semiannual sampling. Other parameters, such as those listed in Table 2 below, may be added.

5. Any other information that you believe is relevant to your request or that may provide an update to the information in the DNR's files. All monitoring data not already sent to the DNR must be submitted in proper up loadable format for the GEMS database. Note: The DNR may request additional information, such as items listed in Appendix C, if the reviewer determines that it is needed.

Requests for preliminary review to reduce to less than semiannual monitoring

When you ask the DNR for a preliminary opinion on the potential to reduce monitoring from semiannual to annual or less than annual monitoring, or to terminate monitoring at your facility, we suggest you submit for DNR review the following information, in addition to the information suggested for reducing from quarterly to semiannual monitoring:

1. A current, adequately-scaled map (or aerial photo or other mapping applications, such as Google™ Maps, MapQuest™ or Bing™ Maps) that accurately depicts all of the following:
    a. the limits of waste and property boundaries of the landfill;
    b. the location of all monitoring wells, gas monitoring probes and leachate head wells;
    c. the location of all private water supply wells within 1,200 feet of the landfill;
    d. the location of all public water supply wells and high-capacity wells within one-half mile of the landfill;
    e. the location of any structures on or near (within 300 feet of) the landfill;
    f. the zoning of land within 1,200 feet of the landfill and a key describing allowed uses under the current zoning ordinance; and,
    g. the location of surface water features such as wetlands within 300 ft. and navigable waters (e.g., streams, ponds and lakes) within 1,000 ft.
2. A summary of well conditions including heaved well or protective casings, broken or bent well casings, damaged surface seals or sediment observed in well samples.
3. Any information on monitoring of public health and public welfare parameters at the landfill should be provided, such as the last time such testing was performed, how often samples were analyzed, and any VOC testing results and associated quality assurance information. If public health and public welfare parameters have been monitored routinely, summarize the historical trends, list values exceeding groundwater standards, and for VOCs, discuss how the samples meet the quality assurance considerations in Appendix D.

To help support a reduction in groundwater monitoring to less than semiannual, the DNR suggests that you evaluate groundwater quality for select health related parameters. This can be accomplished before a monitoring frequency request is made. Table 2 below lists suggested additional parameters, if they are not already being sampled, to analyze based on landfill type. Contact the DNR Hydrogeologist assigned to the landfill to discuss the course of action may be best for your landfill. The DNR may request additional sample rounds or other substances to be checked depending on the waste types accepted and observed concentrations of the substances analyzed. This may include emerging contaminants, such as per- and polyfluoroalkyl substances (PFAS) or polybrominated diphenylethers (PBDE flame retardants), which do not fall under current monitoring and regulatory programs but may be candidates for future regulation once more is known about their toxicity and health effects. The DNR may consider these substances during the development stage and upon adoption of groundwater quality standards in chapter NR 140, Wis. Adm. Code, and other regulatory and monitoring requirements when evaluating requests to reduce or terminate monitoring. The consideration of emerging contaminants may be a factor for requests to significantly reduce the monitoring frequency or to terminate monitoring.

Some landfills may already be monitoring for some of the Table 2 parameters or have acceptable (recent) historic data. For parameters with only two rounds of sampling, please conduct four additional rounds if one of the first two rounds has a result attaining or exceeding the chapter NR 140, Wis. Adm. Code preventive action limit (PAL) for that parameter. Monitoring of public health and welfare related substances provides a direct measurement of substances that may be released by a landfill which may affect water quality or the health of a person drinking the water. Appendix D outlines quality assurance considerations for VOC samples.

Table 2: Additional parameters

Parameter, filtered, except unfiltered for VOCs	Municipal Solid Waste Landfill		Construction and Demolition Waste Landfill		Coal Ash Landfill		Foundry Sand Landfill		Papermill Sludge Landfill	
	Suggested minimum number of sample rounds to support modified frequency									
	Annual or Less	Termination	Annual or Less	Termination	Annual or Less	Termination	Annual or Less	Termination	Annual or Less	Termination
VOCs[1]	2	4	2	4	0	0	2[2]	2[2]	2[2]	2[2]
Sulfate	2	4	2	4	2	4	2	4	2	4
Arsenic	2	4	2	4	2	4	2	4	0	0
Chromium (total)	2	4	2	4	2	4	2	4	0	0
Lead	2	4	2	4	0	2	2	4	0	0
Mercury	0	2	0	2	2	4	0	2	0	0
Boron	2	4	2	4	2	4	2	4	0	0
Manganese	0	0	2	4	2	4	2	4	0	0
Strontium	0	0	0	0	0	2	0	2	0	0
Molybdenum	0	0	0	0	2	4	2	4	0	0
Ammonia Nitrogen	0	0	0	0	0	0	0	0	2	4
Nitrate + Nitrite (as N)	0	0	0	0	0	0	0	0	2	4
Emerging Contaminants	2	4	2	4	2	4	0	0	2	4

Footnotes:

1. Annual or every sampling event analysis of VOCs will be added to a plan modification that reduces monitoring from quarterly to semi-annually, annually, or less than annually. Likewise, less than annual, annual, or semi-annual analysis of those respective parameters listed in Table 2 may be added to C&D and industrial landfills.

2. VOCs would be required if they are used as a part of industrial processes or if additional other wastes were disposed at the industrial landfill, otherwise they would not be required at industrial landfills. For example, VOCs would not be expected in coal ash, and analysis for VOCs in groundwater would not generally be necessary.

Appendix C

Information to include in a plan modification request to modify an approved monitoring program

Plan modification requests to reduce monitoring to annual, eliminate specific monitoring wells, or parameters should be discussed with the DNR hydrogeologist before they are prepared and submitted. Requests to terminate monitoring should not be made if evidence of groundwater contamination is shown by ES exceedances, increasing PAL exceedances, or unstable concentrations of health or welfare related substances.

Requests to modify the monitoring plan

If you choose to pursue a plan modification you should prepare the request according to the general submittal requirements in s. NR 500.05, Wis. Adm. Code, and this appendix. The DNR will send you an invoice for the plan modification review fee, in accordance with s. NR 520, Wis. Adm. Code, Table 3. If you believe your request is of a simpler nature that should not require all of the below supporting information, please contact your DNR reviewer to determine what information should be supplied.

Requests to eliminate specific monitoring wells

Please submit all of the following information with your request to eliminate specific monitoring wells. Including this information will assist the DNR in evaluating requests for eliminating monitoring wells and in most cases increase the probability they can be granted. If any of the information is included in past reports you have already submitted to the DNR, you may refer to those reports. However, if any referenced report does not accurately reflect current conditions, you should describe the current conditions and update plan sheets, if necessary.

1. All of the information and maps requested in Appendix B above.
2. List the specific wells being proposed to eliminate and explain why.
3. An analysis of all historic groundwater monitoring data to identify specific parameter that may impact groundwater quality and identify any trends. (time vs concentration plots)
4. Review location of any water supply well within 1,200 feet of the landfill and discuss the potential for development of, and new water supply well installations on, within 1,200 feet of the landfill.
5. Assess the effectiveness of a specific monitoring point to provide pertinent and representative groundwater quality data relative to the landfill.
    a. Does the monitoring point provide appropriate coverage of up-gradient, down-gradient, or side-gradient conditions?
    b. Is the monitoring point too far away (or too close) to the landfill to provide adequate representation of the ground water at the landfill?
    c. Is the monitoring point redundant to other monitoring points providing similar information?
    d. Does the monitoring point pose a specific safety hazard to sample (i.e. it is located below grade in a confined space or otherwise puts the sampler in harm's way).
6. Note that Subtitle-D designated monitoring wells may be replaced with a new well that becomes part of the monitoring program if they are broken or cannot be sampled; however, Subtitle-D wells cannot be removed from the monitoring program without a replacement.
7. A discussion on site specific geology. Is it complex or straight forward?
8. Do the subject wells monitor the regional drinking water aquifer or a perched or localize aquifer?

Requests to eliminate specific monitoring parameters

Please submit all of the following information with your request to eliminate specific monitoring parameters. Including this information will assist the DNR in evaluating requests for reduction of parameter lists and in most cases increase the probability they can be granted. If any of the information is included in past reports you have already submitted to the DNR, you may refer to those reports. However, if any referenced report does not accurately reflect current conditions, you should describe the current conditions and update plan sheets, if necessary.

1. All of the information and maps requested in Appendix B above.

2. List the parameter(s) or parameter group (e.g. metals) you are requesting to eliminate from the monitoring program.
3. An analysis of all historic groundwater monitoring data to characterize groundwater quality and identify any trends to include the following:
    a. Describe the monitoring history, including the number of samples collected to date; how the samples were collected for various parameters, detection limits used, compliance with monitoring requirements, what, if any, quality assurance/quality control (QA/QC) samples were taken and an interpretation of QA/QC results. See also Appendices D and E.
    b. Assess landfill impacts by comparing background or up-gradient groundwater conditions to down-gradient conditions and by plotting concentrations vs. time for the wells. Please note that an increasing trend in concentration is not the only indicator of groundwater contamination. Most computer spreadsheet programs offer simple graphing and least-squares regression routines to determine whether a statistical trend exists in a data set. Outliers in the dataset should be determined and removed before any analysis is performed.
    c. Answer these questions: Are there PAL or ES exceedances in groundwater? (yes, no or maybe)? If maybe, what information is needed to determine if it is or isn't? Note: A contamination evaluation should not be limited to only public health parameters. Public welfare and indicator parameters can also be used to determine if a landfill is contaminating groundwater. If indicator parameter PALs have been established for the landfill, please compare the analytical results to the established PALs.

Requests to reduce monitoring frequency

Please submit all of the following information with your request to eliminate specific monitoring parameters. Including this information will assist the DNR in evaluating requests for reduction of parameter lists and in most cases increase the probability they can be granted. If any of the information is included in past reports you have already submitted to the DNR, you may refer to those reports. However, if any referenced report does not accurately reflect current conditions, you should describe the current conditions and update plan sheets, if necessary.

1. All of the information and maps requested in Appendix B above.
2. Describe the proposed monitoring frequency.
3. An analysis of all historic groundwater monitoring data to identify specific parameter that may impact groundwater quality and identify any trends (time vs concentration plots).
4. Review location of any water supply well within 1,200 feet of the landfill and discuss the potential for development of, and new water supply well installations on, within 1,200 feet of the landfill.

Requests to terminate monitoring

If you choose to pursue a formal plan modification to terminate groundwater monitoring at your facility, you should prepare the plan according to the general submittal requirements in s. NR 500.05, Wis. Adm. Code, and this appendix.

Please submit all of the following information with your request to terminate monitoring. Including these will assist the DNR in evaluating requests for termination of monitoring and in most cases increase the probability they can be granted. If any of the information is included in past reports you have already submitted to the DNR, you may refer to those reports. However, if any referenced report does not accurately reflect current conditions, you should describe the current conditions and update plan sheets, if necessary.

1. All of the information and maps requested in Appendix B above.
2. A description of the landfill, including:
    a. landfill size, that is, the number of acres filled
    b. depth of waste below ground surface
    c. volume of waste disposed (including daily cover)
    d. waste types
    e. years of operation
    f. history of operation and ownership
    g. whether or not waste was burned at the site
    h. landfill design, including any liner, cap, and leachate and gas collection systems

i. time since closure
j. type and thickness of final cover
k. depth to groundwater
l. soil types (for landfill cover soils and soils expected to be beneath the base of the landfill)

3. Up-to-date, adequately scaled groundwater table contour maps of the site, showing all of the following:
   a. the elevation of the static water table
   b. groundwater contours (equipotential lines)
   c. perpendicular streamlines indicating groundwater flow direction
   d. the high water table
   e. the low water table
   f. maximum variance in ground water flow direction, based on the historical groundwater elevation data collected at the site, and show the flow direction at the high and low water table elevations
   g. an analysis of the 3-dimensional groundwater flow system at the site (i.e., horizontal and vertical flow directions and gradients), including an estimate of vertical and horizontal groundwater velocity. Show your calculations.
4. Copies of well and boring logs for the monitoring wells on the site, indicating the geologic characteristics and the depth and screened interval of each well.
5. An analysis of all historic groundwater monitoring data to characterize groundwater quality and identify any trends.
   a. Describe the monitoring history, including the number of samples collected to date, how the samples were collected for various parameters, detection limits used, compliance with monitoring requirements, what quality assurance/quality control (QA/QC) samples were taken and an interpretation of QA/QC results. See also Appendices D and E.
   b. Assess landfill impacts by comparing background or up-gradient groundwater conditions to down-gradient conditions and by plotting concentrations vs. time for the wells. Please note that an increasing trend in concentration is not the only indicator of groundwater contamination. Most computer spreadsheet programs offer simple graphing and least-squares regression routines to determine whether a statistical trend exists in a data set. Outliers in the dataset should be determined and removed before any analysis is performed.
   c. Answer these questions: Are there PAL or ES exceedances in groundwater (yes, no or maybe)? If maybe, what information is needed to determine if it is or isn't? NOTE: A contamination evaluation should not be limited to only public health parameters; public welfare and indicator parameters can also be used to determine if a landfill is contaminating groundwater. If indicator parameter PALs have been established for the landfill, please compare the analytical results to the established PALs.
6. The DNR strongly suggests you submit analytical data from all groundwater monitoring wells for the public health and public welfare parameters as indicated in Appendix B to support and conduct a more thorough groundwater quality evaluation of the facility. In addition, to help support your proposal, we suggest you consider sampling each down-gradient or side-gradient private, high capacity, and public water supply well within 1,200 feet of the landfill at least once for the parameters listed the table in Appendix B. The groundwater monitoring wells should be sampled at least three to six months apart to account for seasonal variations. All analytical data must be submitted in electronic format acceptable to the DNR.
7. A copy of an affidavit of site registry (Form #4400-67, See Appendix H) showing that the landfill's existence has been recorded in the county Registrar of Deeds' office. This is an official deed notice to inform future property owners of the existence of the solid waste landfill.
8. Certification that a professional geologist has prepared the report where any interpretation of geology/hydrogeology is necessary and/or a professional engineer has prepared the report where any evaluation of engineering features is necessary, in accordance with s. NR 500.05(4)(b), Wis. Adm. Code.
9. Results of available hydraulic conductivity testing to support your estimate of groundwater flow velocity and travel time to the nearest down-gradient well.
10. A discussion of the potential for development of, and new water supply well installations on, land within 1,200 feet of the landfill.

Appendix D

Quality control and quality assurance considerations for volatile organic compounds (VOCs)

Your landfill's groundwater monitoring program may have been approved before the importance of VOC sampling was recognized. Therefore, there may be little or no VOC data for the DNR to review along with your request to reduce or terminate monitoring. Depending on the type of reduction desired, you may need to gather more VOC samples before you submit your plan modification to the DNR. Given the very limited amount of VOC data being requested and the importance of the decision being made, it is essential that both the VOC sampling and the analyses be reliable. If samples are collected improperly or the quality of sampling results is poor, the data may be unusable and could falsely show you have or don't have a problem. If so, the DNR will ask you to take more samples before considering your request to reduce or terminate monitoring.

When writing contracts for groundwater monitoring consider the requirements of chs. NR 140 and NR 149, Wis. Adm. Code for sampling methodology and lab certification. Any data that was obtained not using these methods may not be considered reliable.

This appendix will guide you in your selection of laboratories and consultants.

Sampling

Section NR 507.16, Wis. Adm. Code establishes minimum sampling requirements to follow and s. NR 140.16, Wis. Adm. Code establishes minimum required sampling and analytical methods for groundwater sampling by citing the procedures to follow that are contained the DNR *Groundwater Sampling Desk Reference* (PUBL-DG-037-96) and the *Groundwater Sampling Field Manual* (PUBL-DG-038-96) [available at https://dnr.wi.gov/topic/drinkingwater/publications.html].

The preferred sample collection method is low flow pumping; however, other methods may be acceptable. If low flow pumping is not practicable, bailers for collecting samples may be used with care. If a bailer is used, care should be made not to agitate the water while lowering the bailer into the water and samples should be collected from the bottom decanting device of the bailer, especially for VOC sampling.
Laboratories typically supply sample bottles, preservatives and shipping instructions. For VOC samples to be valid, the bottle must be filled completely with no air space remaining. The samples must be cooled immediately to below 4 degrees Celsius utilizing cubed ice. "Blue ice" or other ice/cold packs are strongly discouraged, since they do not cool samples below 4 degrees Celsius. If samples are not sufficiently cooled, the analysis may be invalid and additional sampling may be needed. Remember to include one trip blank per cooler.

The DNR *Groundwater Sampling Desk Reference* states that collecting and analyzing field duplicate samples should be done at a rate of one duplicate for every ten or fewer samples collected (if you have three wells a duplicate sample should be obtained at least every three or four sampling events). The best wells to collect duplicate samples from would be a down gradient well where the parameters being analyzed for have been previously detected.

Analyses

In selecting a laboratory for these analyses, choose a lab that meets all of the analytical requirements contained in chs. NR 507, NR 140 and NR 149, Wis. Adm. Code which include the following credentials and capabilities:

- Currently certified or registered for volatile organics under ch. NR 149, Wis. Adm. Code
- The methods used can detect VOCs at or below the ch. NR 140, Wis. Adm. Code, PALs, where possible. It may not be possible to achieve the PAL detection level for all of the compounds with NR 140 PALs. See the discussion below.
- Blanks demonstrate that laboratory contamination is under control
- Ability to report quality control data (surrogates, lab control spikes, matrix spikes, duplicates, blanks)

- Quality control recoveries are generally within 70 to 130%. Recovery rates are affected by the responsiveness of the specific compounds, as well as the matrix (soil, water) and analytical method
- Ability to report data to the DNR's groundwater and environmental monitoring system (GEMS) database electronically

Certification

Be sure to obtain a written copy of the lab's certifications for your records.

Method detection limits for VOCs

As you select a laboratory, consider whether their VOC method is capable of detecting the target substances at or below their respective PALs, when possible. Laboratories should be able to provide a list of their method detection limits (MDLs) or limits of detection (LODs). Note that MDLs are the result of a statistical calculation and are not the same as a measure of the accuracy of a result. MDLs, LODs and limits of quantitation (LOQs) shall be determined according to s. NR 149.11 (5), Wis. Adm. Code. Section NR 140.16 (2), Wis. Adm. Code establishes analytical methodology requirements which govern minimum MDLs, LODs and LOQs that need to be met. The following substances have PALs that are usually below laboratory MDLs or LODs:

Table 3: Substances with PALs that are usually near and possibly below laboratory MDLs or LODs:

Substance	**CAS Number**	**PAL (μg/L)**	**Target MDL (μ g/L)**
Bromodichloromethane	75-27-4	0.06	0.15
Bromofo	75-25-2	0.44	0.15
Chlorofo	67–66–3	0.6	0.15
1,2-Dibromoethane	106–93–4	0.005	0.15
1,2-Dibromo-3-Chloropropane	96–12–8	0.02	0.15
1,3-Dichloropropene(cis & trans)	10061-01-5 10061-02-6	0.02	0.15
1,1,2,2-Tetrachloroethane	79-34-5	0.02	0.15
Vinyl chloride	75-01-4	0.02	0.15

DNR recognizes that few laboratories are capable of achieving detection limits below the PALs for these substances. Remember that s. NR 507.26, Wis. Adm. Code, requires all results be reported to the laboratory's method detection limit, even in cases where the laboratory's method detection limit is lower than the PAL.

Blanks

Field, trip and laboratory method blanks provide an indication of whether sampling and analysis have contaminated the samples. Several of the volatiles found in contaminated groundwater are common laboratory contaminants. Ideally, the

method blanks that laboratories analyze with samples should be free of contaminants; however, in reality laboratories have varying degrees of success in their efforts to control contamination. Methylene chloride is one of the most problematic contaminants; if detected in a blank, its detection in samples should be evaluated to determine the validity of the sample results for methylene chloride. Additional samples may need to be collected. Less commonly found laboratory contaminants include benzene, acetone, methyl ethyl ketone, ethyl benzene, toluene and xylenes.

Quality control results

As a routine quality control practice, laboratories monitor the recoveries of surrogate standards in each sample. The recovery of the surrogates is an indicator of the reliability of the results for the target compounds. When reviewing laboratory results, the DNR recommends closely examining the quality control limits. For groundwater, recoveries for surrogates and matrix spikes should generally range between 70% and 130%. Although results outside of this guideline may be acceptable, the decreased reliability may mean that additional samples beyond the recommended number of rounds may be necessary to make a determination. Ask the laboratory to report quality control results along with the sample results.

Appendix E

Table 4: VOCs and dissolved substances associated with landfill leachate

Common name	GEMS Param. No.	CAS RN	Synonyms
Acetone	81552	67–64–1	2–Propanone
Benzene	34030	71–43–2	Benzol, benzen, benzole
Bromodichloromethane	32101	75–27–4	Dichlorobromomethane
Bromoform	32104	75–25–2	Tribromomethane
Carbon disulfide	77041	75–15–0	Dithiocarbonic Anhydride
Carbon tetrachloride	32102	56–23–5	Tetrachloromethane
Chlorobenzene	34301	108–90–7	Monochlorobenzene
Chloroethane	34311	75–00–3	Ethyl chloride
Chloroform	32106	67–66–3	Trichloromethane
Dibromochloromethane	32105	124–48–1	Chlorodibromomethane
1,2–Dibromo–3–chloropropane	38437	96–12–8	DBCP
1,2–Dibromoethane	77651	106–93–4	EDB; Ethylene dibromide
o–Dichlorobenzene	34536	95–50–1	1,2–Dichlorobenzene
m–Dichlorobenzene	34566	541–73–1	1,3–Dichlorobenzene
p–Dichlorobenzene	34571	106–46–7	1,4–Dichlorobenzene 8021, 8260
Dichlorodifluoromethane	34668	75–71–8	Freon 12, Difluorodichloromethane
1,1–Dichloroethane	34496	75–34–3	
1,2–Dichloroethane	32103	107–06–2	Ethylene dichloride
1,1–Dichloroethylene	34501	75–35–4	Vinylidene chloride
cis–1,2–Dichloroethylene	77093	156–59–2	cis–1,2–Dichloroethene
Trans–1,2–Dichloroethylene	34546	156–60–5	trans–1,2–Dichloroethene
1,2–Dichloropropane	34541	78–87–5	
cis–1,3–Dichloropropylene	34704	10061–01–5	cis–1,3–Dichloropropene, Z–Dichloropropylene
Trans–1,3–Dichloropropylene	34699	10061–02–6	trans–1,3–Dichloropropene, E–Dichloropropylene
Ethylbenzene	78113	100–41–4	Phenylethane
Methyl bromide	34413	74–83–9	Bromomethane
Methyl chloride	34418	74–87–3	Chloromethane
Methylene bromide	77596	74-95-3	Dibromomethane
Methylene chloride	34423	75–09–2	Dichloromethane
Methyl ethyl ketone	81595	78–93–3	2–Butanone; MEK
Methyl tert–butyl ether	78032	1634–04–4	MTBE
Naphthalene	34696	91–20–3	Camphor Tar, Naphthalin
Styrene	77128	100–42–5	Ethenylbenzene
Tetrachloroethylene	34475	127–18–4	Tetrachloroethene; Perchloroethylene; PCE; Perc
Tetrahydrofuran	81607	109–99–9	THF
Toluene	78131	108–88–3	Methylbenzene
1,1,1–Trichloroethane	34506	71–55–6	Methylchloroform
1,1,2–Trichloroethane	34511	79–00–5	
Trichloroethylene	39180	79–01–6	Trichloroethene; TCE
Trichlorofluoromethane	34488	75–69–4	Fluorotrichloromethane, Freon 11

Common name	GEMS Param. No.	CAS RN	Synonyms
Vinyl chloride	39175	75–01–4	Chloroethene
Xylenes (total)	81551	1330–20–7	Dimethylbenzene
Sulfate, dissolved	00946	14808-79-8	
Arsenic, dissolved	01000	7440-38-2	
Cadmium, dissolved	01025	7440-43-9	
Chromium, dissolved	01030	7440-47-3	Chrome
Lead, dissolved	01049	7439-92-1	Plumbum
Mercury, dissolved	71890	7439-97-6	Quick silver
Boron, dissolved	01020	7440-42-8	
Strontium, dissolved	01080	7440-24-6	
Molybdenum, dissolved	01060	7439-98-7	

Note: Xylenes (total): This entry includes o–xylene (CAS RN 96–47–6), m–xylene (CAS RN 108–38–3), p–xylene (CAS RN 106–42–3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330–20–7).

Source: s. NR 507, Wis. Adm. Code, Appendices III and IV

Appendix F

Example proposals for groundwater monitoring

Table 5: Example of semi-annual monitoring at a closed municipal solid waste (MSW) landfill:

Closed Municipal Solid Waste Landfill – License # 0000B Semiannual Groundwater Monitoring Requirements as of date		
Monitoring Well (Point ID #)	**Frequency**	**Parameters (Parameter #s)**
MW-1 (001) MW-2 (002) MW-3 (003)	Semiannual (April & October) *(pick your months)*	00010 Temperature, Field 00094 Specific Conductance (umhos/cm @ 25 C), Field 00400 pH, Field 04189 Groundwater Elevation (ft above MSL) 00940 Chloride, Total or Dissolved 22413 Hardness, Total Filtered 39036 Alkalinity, Total Filtered
	Annual (October) *(pick your month)*	VOCs Using an EPA SW-846 or s. NR 219.04, Wis. Adm. Code method that otherwise meets s. NR 507.17(4), Wis. Adm. Code
Note sample odor (00001), color (00002) and turbidity (00003), if present. Note well broken (00004), well frozen (00005), and groundwater monitoring well dry (00006) if applicable. Unless approved otherwise, sample collection and handling should be conducted in accordance with the DNR's "Groundwater Sampling Desk Reference" and "Groundwater Sampling Field Manual", publication numbers PUBL-DG-037 96, and PUBL-DG-038 96 respectively.		

(NOTE: It may be possible to reduce monitoring of up-gradient and side-gradient wells to less than semi-annual.)

Table 6: Example of annual monitoring at a MSW landfill:

Closed Municipal Solid Waste Landfill – License # 0000C Annual Groundwater Monitoring Requirements as of date		
Monitoring Well (Point ID #)	**Frequency**	**Parameters (Parameter #s)**
MW-1 (001) MW-2 (002) MW-3 (003)	Annual (October) *(pick your month)*	00010 Temperature, Field 00094 Specific Conductance (umhos/cm @ 25 C), Field 00400 pH, Field 04189 Groundwater Elevation (ft above MSL) 00940 Chloride, Total or Dissolved 22413 Hardness, Total Filtered 39036 Alkalinity, Total Filtered 01000 Arsenic, Dissolved 01025 Cadmium, Dissolved 01030 Chromium, Dissolved 01049 Lead, Dissolved 71890 Mercury, Dissolved 00946 Sulfate, Dissolved VOCs Using an EPA SW-846 or s. NR 219.04, Wis. Adm. Code method that otherwise meets s. NR 507.17(4), Wis. Adm. Code
Note sample odor (00001), color (00002) and turbidity (00003), if present. Note well broken (00004), well frozen (00005), and groundwater monitoring well dry (00006) if applicable. Unless approved otherwise, sample collection and handling should be conducted in accordance with the DNR's "Groundwater Sampling Desk Reference" and "Groundwater Sampling Field Manual", publication numbers PUBL-DG-037 96, and PUBL-DG-038 96respectively. Arsenic, cadmium, chromium, lead, mercury, and sulfate can be removed from the monitoring requirements if no PAL exceedances occur for that parameter in 4 consecutive sampling events. The DNR may request that monitoring be resumed for these parameters prior to termination of monitoring.		

Table 7: Example of semi-annual monitoring at a small-sized construction and demolition (C&D) landfill:

Small Sized C&D Landfill, – Monitoring ID # 0000E Annual Groundwater Monitoring Requirements as of Date		
Monitoring Well (Point ID #)	**Frequency**	**Parameters (Parameter #s)**
MW-1 (001) MW-2 (002) MW-3 (003)	Annual (April) *(pick your month)*	00094 Field Specific Conductance (umhos/cm @ 25 C) 00400 Field pH 04189 Groundwater Elevation (ft above MSL) 00941 Chloride, Dissolved 22413 Hardness, Total Filtered 39036 Alkalinity, Total Filtered 00946 Sulfate, Dissolved 01000 Arsenic, Dissolved 01025 Cadmium, Dissolved 01030 Chromium, Dissolved 01049 Lead, Dissolved 71890 Mercury, Dissolved VOCs Using an EPA SW-846 or s. NR 219.04, Wis. Adm. Code method that otherwise meets s. NR 507.17(4), Wis. Adm. Code
Note sample odor (00001), color (00002) and turbidity (00003), if present. Note well broken (00004), well frozen (00005), and groundwater monitoring well dry (00006) if applicable. Unless approved otherwise, sample collection and handling should be conducted in accordance with the DNR's "Groundwater Sampling Desk Reference" and "Groundwater Sampling Field Manual", publication numbers PUBL-DG-037 96, and PUBL-DG-038 96respectively. Arsenic, cadmium, chromium, lead, mercury, and sulfate can be removed from the monitoring requirements if no PAL exceedances occur for that parameter in 4 consecutive sampling events. The DNR may request that monitoring be resumed for these parameters prior to termination of monitoring.		

Table 8: Example of annual monitoring at a small-sized C&D landfill:

Small Sized C&D Landfill, – Monitoring ID # 0000D Semiannual Groundwater Monitoring Requirements as of Date		
Monitoring Well (Point ID #) (WUWN)	**Frequency**	**Parameters (Parameter #s)**
MW-1 (001) MW-2 (002) MW-3 (003)	Semiannual (April & October) *(pick your months)*	00094 Field Specific Conductance (umhos/cm @ 25 C) 00400 Field pH 04189 Groundwater Elevation (ft above MSL) 00941 Chloride, Dissolved 22413 Hardness, Total Filtered 39036 Alkalinity, Total Filtered 00946 Sulfate, Dissolved
	Annual (April) *(pick your month)*	VOCs Using an EPA SW-846 or s. NR 219.04, Wis. Adm. Code method that otherwise meets s. NR 507.17(4), Wis. Adm. Code
Note sample odor (00001), color (00002) and turbidity (00003), if present. Note well broken (00004), well frozen (00005), and groundwater monitoring well dry (00006) if applicable. Unless approved otherwise, sample collection and handling should be conducted in accordance with the DNR's "Groundwater Sampling Desk Reference" and "Groundwater Sampling Field Manual", publication numbers PUBL-DG-037 96, and PUBL-DG-038 96 respectively.		

Appendix G

Other considerations regarding environmental monitoring associated with some closed landfills

The items below are other environmental monitoring associated with closed landfills that may be modified but are not the subject of this guidance document.

1. Leachate Monitoring: The DNR has the authority under s. 289.30 (6), Stats., and s. NR 514.04 (6), Wis. Adm. Code, to reduce leachate head well monitoring and sampling, if such a change is justified. These measures of landfill performance have significance both for measuring impacts and for assessing the internal behavior of the waste mass. Discuss this topic with the hydrogeologist or engineer assigned to the site prior to requesting a change to leachate monitoring.
2. Landfill Gas Monitoring: The DNR has the authority under s. 289.30 (6), Stats. and s. NR 514.04 (6), Wis. Adm. Code, to reduce landfill gas monitoring, if such a change is justified. A reduction to landfill gas probe monitoring may be considered if there are not current or historical gas migration issues at the landfill. Discuss this topic with the hydrogeologist or engineer assigned to the site prior to requesting a change in gas monitoring.

   Low Hazard Waste Exemptions issued under s. 289.43 (8), Wis. Stats., that have monitoring requirements: Some early low hazardous waste grant of exemptions that were issued by the DNR for disposal of low hazardous waste may have groundwater monitoring requirements. These are not landfills but are still considered disposal facilities. Examples of these types of facilities include facilities where industrial by-products such as foundry sand or coal ash were disposed, facilities where dredged material was disposed or facilities where lightly contaminated soil was disposed. It may be possible to reduce or eliminate groundwater monitoring for a low hazardous waste grant of exemption through a revised or a new exemption issued. Discuss this topic with the hydrogeologist or engineer assigned to the area, prior to requesting a change to monitoring requirements associated with a low hazard exemption.

Appendix H

Affidavit of site registry

Document Number | AFFIDAVIT

State of Wisconsin
Department of Natural Resources
PO Box 7921
Madison, Wisconsin 53707-7921

Solid Waste Land Disposal Site Affidavit
Form 4400-067 (R 6/03)

Solid Waste Land Disposal Site location in

_____

_____
(Legal Description)

Recording Area

Name and Return Address:

PIN

REGISTER OF DEEDS:
Please return original order(s) to DNR promptly after recording.

STATE OF WISCONSIN)
) ss.
COUNTY _____)

_____,

being first duly sworn, on oath deposes and says that he/she is a

resident of _____

and is the _____ of _____
(Title) (Company or Agency)

located at _____; that
(Address)

_____ is the owner of the above-described land.

That application has been made to the State of Wisconsin Department of Natural Resources pursuant to subchapter III of chapter 289, Wis. Stats., for authorization to construct and operate a solid waste land disposal facility on the above-described land; that section 289.31(3), Wis. Stats., and section NR 500.06(4), Wis. Adm. Code, require that, prior to licensing, a notation of the existence of a solid waste land disposal site be recorded in the office of the register of deeds in each county in which a portion of the site is located.

That this affidavit is given for the purpose of indicating the existence of a solid waste land disposal facility on the above-described property.

_____
(Signature)

_____
(Printed or Typed Name)

Subscribed and sworn to before me this _____ day of _____, 20 _____

_____
(Signature)

_____
(Printed or Typed Name)

Notary Public, State of _____ My Commission expires / is _____

This document was drafted by the Wisconsin Department of Natural Resources.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
NOTICE OF FINAL GUIDANCE & CERTIFICATION

Pursuant to ch. 227, Wis. Stats., the Wisconsin Department of Natural Resources has finalized and hereby certifies the following guidance document.

DOCUMENT ID

WA-19-1013-C

DOCUMENT TITLE

Reducing or Terminating Groundwater Monitoring at Solid Waste Landfill

PROGRAM/BUREAU

Waste and Materials Management

STATUTORY AUTHORITY OR LEGAL CITATION

Ch. 289, Wis. Stats., NR 140, 503, 507, Wis. Adm. Code

DATE SENT TO LEGISLATIVE REFERENCE BUREAU (FOR PUBLIC COMMENTS)

01/13/2020

DATE FINALIZED

03/10/2020

DNR CERTIFICATION

I have reviewed this guidance document or proposed guidance document and I certify that it complies with sections 227.10 and 227.11 of the Wisconsin Statutes. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is not explicitly required or explicitly permitted by a statute or a rule that has been lawfully promulgated. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is more restrictive than a standard, requirement, or threshold contained in the Wisconsin Statutes.

Signature

3/10/2020

Date