

MEMORANDUM

Department of Environmental Quality
Waste Division

SUBJECT: **Guidance Memo No. 04-2005** Sanitary Landfill Siting Relative to a Public Water Supply Intake or Reservoir

TO: Waste Compliance and Permitting Managers, Groundwater Manager and staff

FROM: Karen Jackson Sismour
Director, Waste Division

DATE: [Signed 08/23/2005]

I. Introduction

Code of Virginia §10.1-1408.4, containing provisions for the siting of a sanitary landfill in the vicinity of a surface water or groundwater public water supply intake or reservoir, became effective on July 1, 1999. Legislation passed during the 2005 session of the General Assembly updated these provisions. The legislation reduces the distance that a sanitary landfill can be sited from any existing public water supply intake or reservoir.

The purpose of this guidance is to develop procedures and criteria for the protection of a public water supply or a reservoir in the vicinity of a sanitary landfill. The guidance provides landfill design elements that must be provided in order to site a landfill between one and three miles upgradient of a surface water or groundwater public water supply intake or reservoir. If a permit application for a new municipal solid waste (MSW) (sanitary) landfill provides the required design elements, then the director may approve siting of a new solid waste management facility that is located one to three miles upgradient of a public water supply intake or reservoir. Sufficient information must be provided demonstrating that a sanitary facility is greater than three miles away, or is downgradient from a public water supply or reservoir in order to avoid the additional design requirements under the law. Also, a new sanitary facility cannot be sited closer than a one mile radius of a public water supply intake or reservoir.

II. Background

Prior to the most recent amendment of §10.1-1408.4 in 2005, a sanitary landfill could not be constructed within five miles upgradient of a groundwater or surface water supply intake or reservoir. The 2005 legislation reduced this distance and prohibits the construction of a landfill closer than one mile upgradient of an existing surface water or groundwater public water supply intake or reservoir. If a sanitary landfill is proposed greater than one mile but within three miles

upgradient of any existing public water supply intake or reservoir, the landfill must meet certain additional conditions. Also, the director must consult with the Commissioner of Health in protecting against groundwater and surface water contamination.

Code of Virginia, §10.1-1408.4 does not address the issue of siting sanitary landfills relative to privately owned wells for potable water supply at residences. Therefore, this guidance does not cover buffer distances to water supply wells for private residences. However, the current regulatory requirements in 9 VAC 20-80-250 already provide for the protection of water supply wells at private residences.

The new Code of Virginia requirements contain exemptions allowing a new landfill to be constructed a shorter distance from an existing surface water or groundwater public water supply intake or reservoir in the Counties of Mecklenburg and Halifax if the director determines that such a distance would not be detrimental to human health or the environment.

III. Definitions

The definitions in §32.1-167 of the Code of Virginia and Title 42 of the US Code apply to the implementation of the new provisions of §10.1-1408.4 of the Code of Virginia.

“Community water system” means a waterworks which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. Water sources for these systems can be either surface water or groundwater. Waterworks are classified by the Virginia Department of Health and listed on the Agency web page.

“Karstic aquifer” means an aquifer that contains sinkholes, caverns, and conduit flow.

“New solid waste management facility” means a facility or a portion of a facility that was not included in a previous determination of site suitability (Part A approval).

“Public water system (waterworks)” means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals. Such term includes (i) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (ii) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

“[Public] Water supply” means water that has been taken into a waterworks from all wells, streams, springs, lakes, and other bodies of surface waters (natural or impounded), but the term “water supply” shall not include any waters above the point of intake of such waterworks.

“Public Water Supply Identification Number (PWS-ID)” means all public water supplies that are registered with EPA and the Virginia Department of Health for the purpose of water testing and monitoring and are subject to levels of regulation based on their size of service. The PWS-ID

number refers to the water system. The water intake point is part of the water system.

“Reservoir” means a body of water that is intended to collect and store surface water for use in a public water supply treatment and distribution as potable drinking water. The body of water may be a natural or artificial lake. The horizontal extent of the reservoir is the mean high water level in the body of water. The distance determination in this guidance is from mean high water level (HWL) in the impoundment or at the water intake point, whichever is closer to the proposed landfill.

“Gradient” means the highest elevation (water level) in the groundwater monitoring well at the proposed landfill, compared to the elevation (water level) of the groundwater supply intake or reservoir.

“Waterworks” means a system that serves piped water for drinking or domestic use to (i) the public, (ii) at least 15 connections, or (iii) an average of 25 individuals for at least 60 days out of the year. The term "waterworks" shall include all structures, equipment and appurtenances used in the storage, collection, purification, treatment and distribution of pure water except the piping and fixtures inside the building where such water is delivered.

“Upgradient” means the elevation (mean sea level) of the lowest portion of the proposed landfill property is higher than the elevation (MSL) closest to the surface water intake point or ground water intake point or water elevation at the reservoir and groundwater flow is away from the landfill toward the public water supply.

IV. Guidance

1.0 Applicability

Facilities that are between one and three miles of a public water supply intake or reservoir must provide the following information:

- Information demonstrating that the facility is upgradient or downgradient of the public water supply intake or reservoir. If the sanitary facility is downgradient of the public water supply intake or reservoir and greater than one mile away, no further information or demonstration is necessary.
- Information demonstrating the facility meets the requirements for alternative liner systems.
- A liner design that includes the installation of two synthetic liners with leachate collection systems installed above and below the uppermost (primary) liner.
- A groundwater monitoring plan which provides for quarterly groundwater monitoring of all groundwater wells between the landfill and the water supply intake. The groundwater monitoring plan must also provide for the results of the quarterly monitoring events to be reported to the department within 15 days of the facility owner or operator receiving the results of the laboratory analysis.
- A groundwater monitoring system which includes a maximum horizontal well spacing for downgradient monitoring wells in accordance with 9 VAC 20-80-300.A.3.f or 250 feet,

whichever is less.

- A list of groundwater protection standards that will be used to determine if statistically significant increases have occurred (i.e., a release may have occurred).
- Other information that may be deemed necessary by the director of DEQ in consultation with the Commissioner of Health to protect human health and the environment.

2.0 Demonstrations

The following information and demonstrations must be provided which address the applicable provisions of §10.1-1408.4 of the Code of Virginia. Information is required in the listed following areas.

2.1 Water Supply and Reservoir Locations

Information must be provided on the location of surface water and groundwater public water supply intakes and reservoirs within 3 miles of the facility. All existing surface or groundwater public water supply intakes (surface water or wellhead) or reservoirs (the closer of the mean water level or intake), that have a PWS-ID, within three (3) miles [measured straight-line horizontal on a scale map] of the perimeter of the proposed property boundary for a new sanitary landfill must be identified. The information could be based on:

- A review of available maps, logs, and reports.
- An aerial reconnaissance of an area within a three mile radius of the site, including aerial photo analysis.
- A ground reconnaissance based on walking portions of the area to verify locations public water supply intakes and reservoirs.
- The Virginia Department of Health may be contacted to provide all reservoirs used to collect water for a public water supply intake point.
- All Public Water Supplies that are registered with EPA and the Virginia Department of Health and have a PWS-ID number. These records are maintained at the Virginia Department of Health. A listing of the water supplier's addresses is located at http://www.vdh.state.va.us/dw/ListingWaterworks_Owners_ww.asp. Exact locations of the Public Water Supplies can be obtained from the Director of Technical Services at the Virginia Department of Health.

Determine, from the information obtained for each public water supply intake or reservoir, if the landfill is upgradient or downgradient. If the landfill is upgradient of a public water supply or reservoir and between one and three miles from same, the following additional demonstrations under Sections 2.2-2.4 of this guidance are required. If the proposed sanitary landfill is downgradient of all public water supply intakes and reservoirs and greater than one mile away, no further demonstration is needed.

2.2 Liner Design Requirements

All new sanitary landfills with new disposal cells or phases must have two synthetic liners with a leachate collection system above and below the uppermost (primary) liner. The liners could meet the minimum liner design as follows:

- Base preparation to protect the liner by preventing liner failure through subsidence or structural failure of the liner system.
- A lower liner consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
- An upper component consisting of a minimum 30-mil flexible membrane liner (FML). If high-density polyethylene (HDPE) is used as an FML, it shall be at least 60-mil thick. The FML component shall be:
 - Installed in direct and uniform contact with the compacted soil liner;
 - Placed in accordance with an approved construction quality control/quality assurance program submitted with the design plans; and
 - Placed with a minimum of two percent slope for leachate drainage.
- A witness or monitoring zone placed above the lower liner consisting of a minimum of single geonet layer or a 12-inch thick drainage layer composed of material with a hydraulic conductivity of 1×10^{-3} cm/sec or greater with a network of perforated pipe for the aggregate option only. The witness zone must be monitored in accordance with the permit and the liquid must be managed as leachate.
- An upper liner consisting of at least a minimum 30-mil flexible membrane liner (FML). If high-density polyethylene (HDPE) is used as an FML, it shall be at least 60-mil thick.
- A leachate collection system above the upper liner that meets the provisions of 9 VAC 20-80-290.
- The liner must be placed with a minimum of two-percent slope for leachate drainage.

The liner described above meets the provisions of the legislation and would not require an alternate liner design approval as required in 9 VAC 20-80-780, since the lower composite liner meets the provisions of 9 VAC 20-80-250 B 9 (Subtitle D). Any alternative to the above design would be required to have an alternate line design approval according to the provisions of 9 VAC 20-80-780 and must meet the provisions of the legislation including the requirement for two synthetic liners with a leachate collection system above and below the primary liner.

2.3 Additional Element of the Groundwater Monitoring Plan

A groundwater monitoring plan which provides for quarterly groundwater monitoring of all groundwater wells between the landfill and the water supply intake(s) [including the water supply intake(s)] is necessary. The groundwater monitoring plan must also require that the results of the quarterly monitoring events be reported to the department within 15 days of when the facility owner or operator receives the results of the laboratory analysis. The groundwater monitoring plan shall include groundwater protection standards that are to be used for the facility. These groundwater protection standards are required prior to the facility receiving waste and are to be included in the facility permit. Including this information in the facility permit and before the facility receives waste will assist with eliminating future delays caused by GPS being approved by DEQ. If a facility is determined to be causing groundwater contamination, the facility will notify the Director of the Department of Environmental Quality (DEQ) and the Director of Technical Services at the Virginia Department of Health in Richmond within 15 days.

2.4 Other Information

Other information that may be deemed necessary by the Director of DEQ in consultation with the Commissioner of Health to protect human health and the environment may be required.

At a minimum, information will be provided on the groundwater time of travel between the landfill and a public water supply intake or reservoir. Time of travel calculations will estimate the time it would take for groundwater discharges from the landfill to reach any existing public water supply intake or reservoir. The following information must be supplied for the time of travel calculations:

- The hydraulic conductivity and the gradient between the sanitary landfill and the public water supply or reservoir must be characterized in order to perform the required calculation.
 - Site-specific environmental investigation of the property based on borings and wells installed across the site should be included.
 - Available information and field testing data may be utilized, as appropriate.
- A certified report prepared by a qualified groundwater scientist that describes soils, geology, meteorology and hydrology between the proposed site and the public water supply.
 - Hydrogeologic maps and field data may be used to determine the permeability of the aquifer; however, the calculation for the time of travel must be based, at least in part, on actual measured values.
 - A pumping test or slug test must be completed within 1000' of the public water supply, as defined by this guidance, and within the major geologic formations that exist between the proposed facility and the water supply system.
 - The depth of the testing must be compatible with the pumping depth of a public water supply system extraction well(s) or the bottom elevation of a reservoir or surface water intake.
- The gradient between the landfill and the public water supply or reservoir should be calculated by using the landfill base grade elevation and the elevation (MSL) of the public water supply intake or the mean water elevation of the reservoir.
- In geographic areas where karst development is known or suspected and, based in the geologic formations between the sanitary landfill and the public water supply intake or reservoir, the hydraulic conductivity of karstic aquifers must be considered to be extremely high. The groundwater time of travel calculation shall be modified as noted below to treat any karstic aquifer as being immediately connected to a public water supply intake or reservoir.

The groundwater time of travel must allow adequate time for a release from the new sanitary facility to be detected, confirmed, and the permit amended for groundwater corrective action before the plume of contamination migrates to the public water supply. Also, the time for the completion of groundwater corrective action and the time necessary for the public water supply to react to the release must be considered. An owner/operator of a public water supply system (water works) may wish to provide alternate water supplies, such as moving the intake,

installation of alternate water supply wells, or water treatment. With consideration of the above discussion, it is believed that the appropriate groundwater time of travel is 25 years.

If the groundwater time of travel between the upgradient landfill and the public water supply intake is 25 years or **greater** and the distance is between 1 and 3 miles, the facility may be sited with the noted conditions. However, if the time of travel is **less** than 25 years and the landfill is 3 miles or closer to the public water supply, then the landfill cannot be sited. Where karstic aquifers exist or are suspected to exist, there must be at least 25 years of travel time between the proposed sanitary landfill and the karstic aquifer in order to site a new sanitary facility.