

# MINNESOTA POLLUTION CONTROL AGENCY

## REMEDY DECISION DOCUMENT

### Washington County Landfill Lake Elmo, Minnesota

#### PURPOSE

This Remedy Decision Document (RDD) presents the selected remedy or response actions to address groundwater contamination, primarily from perfluorochemicals (PFCs), at the Washington County Landfill (the Landfill) in Lake Elmo, Minnesota. The RDD summarizes the facts and determinations which support the decision by the Minnesota Pollution Control Agency (MPCA) in selecting the remedy.

The goal of the selected remedy is to protect public health, safety, and the environment in a manner that is not only protective, but is both reasonable and cost effective. To help achieve this, the MPCA used criteria that are used for selecting remedies under the federal Superfund law, the Comprehensive Environmental Response and Compensation Act or CERCLA, 42 U.S.C. Section 9601 *et seq.* These criteria are also consistent with criteria used to select remedies under the State Superfund law, the Minnesota Environmental Response and Liability Act or MERLA, Minn. Stat. Section 115B.01 *et seq.* These criteria may be summarized as follows:

- overall protection of human health and the environment;
- compliance with applicable or relevant and appropriate requirements;
- long-term effectiveness and performance;
- reduction of toxicity, mobility, or volume through treatment;
- short-term effectiveness;
- implementability;
- cost; and
- public acceptance.

The MPCA considered all relevant information from previous investigations of the Landfill including monitoring data as well as data from special studies. The objective of the remedy is to mitigate human exposure to contaminants from the Landfill and to control the source of contamination to the ground water at and from the Landfill.

The MPCA Commissioner, upon consideration of the evaluation criteria, comments from the public, and facts about the site, has determined that the remedy set forth in this RDD is reasonable and necessary to protect the public health and welfare and the environment from the release and threatened release of hazardous substances, pollutants or contaminants from the site as required by MERLA and the Landfill Cleanup Act, Minn. Stat. Sections 115B.39-445.

## SITE DESCRIPTION

The Washington County Landfill is a closed, unlined landfill that contains approximately 2.57 million cubic yards of mixed municipal solid waste. The Landfill was permitted by the MPCA and is located in the City of Lake Elmo in Washington County, Minnesota (see Figure 1). The permitted area is 110 acres while the waste footprint comprises about 35 acres. Response actions previously implemented to address releases at and from the Landfill include an active gas extraction system used to control the migration of landfill gas, a ground-water treatment system used to contain and treat releases of volatile organic compounds (VOCs) to the ground water, and provision of carbon treatment or connection to a public water supply for residences with wells affected by ground water contamination from the Landfill.



Figure 1. Location of the Washington County Landfill

Land use adjacent to the site is a mix of open space/park, agricultural, and residential. Many residents living near the Landfill historically obtained their potable water from private, individual wells that are completed in the drift and bedrock aquifers. Lakes and streams exist in the vicinity of the site. Bedrock beneath the site is highly fractured and ground-water flow, although complex, is to the south and southeast in the surficial or drift aquifer and southward in the Prairie du Chien bedrock aquifer. Public access to the Landfill is prohibited.

## **SITE HISTORY**

The Washington County Landfill was the first mixed municipal solid waste (MSW) disposal facility permitted by the MPCA. Washington and Ramsey counties operated the Landfill. The Landfill began accepting wastes in 1969 and discontinued operations in 1975 when the site was closed and a cover system was installed. Volatile organic compounds (VOCs) and metals were discovered in site monitoring wells and nearby residential wells in 1981. Ramsey and Washington counties installed a pump and treat system near the southeast corner of the waste fill to address the groundwater contamination in 1984.

The site was listed as a federal and state Superfund site from 1984 to 1995. During this time, residents west of the Landfill were hooked up to the municipal water supply from the City of Oakdale in response to the VOC contamination. In 1995, after enactment of the Landfill Cleanup Act, the MPCA's Closed Landfill Program (CLP) took over the site's cleanup and long-term care. At that time, the CLP took additional steps to address ground-water contamination by improving the Landfill's cover and groundwater treatment system. In addition, the Landfill's gas collection system was improved to address off-site migration of methane.

Ground water and landfill gas concerns appeared to be under control. However, in 2004 the CLP learned that 3M had disposed of sludges and other wastes containing perfluorochemicals (PFCs) in the Landfill in the early 1970s. PFCs are a family of chemicals manufactured by the 3M Company in Minnesota. In 2004 PFCs were detected in the ground water at the Landfill. At MPCA's request, the Minnesota Department of Health (MDH) established health risk levels for PFCs in drinking water. Sampling of over 500 residential wells by MDH and the MPCA resulted in over 150 residents receiving notices from the MDH advising them not to consume their water because of PFC concentrations.

### **PFCs**

PFCs made by the 3M Company have been used for decades to make products that resist heat, oil, stains, grease, and water. Common uses include nonstick cookware, stain-resistant carpets and fabrics, firefighting foam, coating for photographic film, industrial applications, and coatings for packaging such as milk cartons, cosmetic additives, and many other products. The chemical structure of PFCs makes them extremely long lasting and highly mobile in ground water. Until very recently there were no regulations or health based standards set for PFCs or wastes containing PFCs. Minnesota is the first State to use its cleanup authority under State law to take or require others to take response actions for releases of PFCs to the environment.

Six different PFC compounds have been detected in ground water monitoring wells at the Landfill. Three of them – perfluorooctane sulfate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanoic acid (PFBA) – are of concern. 3M phased out

manufacture of PFOS and PFOA in 2002. PFOS and PFOA are bioaccumulative (stay in the body for relatively long periods after ingestion) and persistent (do not break down in the body or the environment). PFCs are associated with elevated risks of certain adverse health effects in humans. Less is known about PFBA although it is much less bioaccumulative than the other two. The MDH has established Health Risk Limits by rule for PFOS (0.3 ug/l (micrograms per liter)) and PFOA (0.5 ug/l) and a less formally adopted Health Based Value for PFBA (7 ug/l).

## **DESCRIPTION OF PROBLEM**

PFOA has been detected in the ground water at concentrations ranging from 82 ug/l at the Landfill to 0.3 ug/l in wells downgradient from the Landfill. PFOS has been detected at the Landfill at levels significantly lower than PFOA, ranging in concentrations from 0.2 to 1.7 ug/l. PFOS has not been detected in the ground water outside the Landfill. PFBA has been detected at concentrations ranging from 0.2 ug/l to 461 ug/l in monitoring wells at and near the Landfill and has been detected in residential wells near the Landfill at concentrations between no detection and 12 ug/l.

Unlike currently operating landfills, the Washington County Landfill does not have an engineered liner and leachate collection system, and some of the waste is believed to be in contact with the ground water. Therefore, the Landfill continues to be a source of ground-water contamination.

A ground-water pump and treat system was implemented in 1984 at the Landfill to control further degradation of ground water by releases of VOCs. The system included a spray irrigator to treat VOCs removed from the ground water at the Landfill. This system effectively controlled and treated the ground water for VOCs. However, the system was implemented before disclosure and detection of PFC contamination at the Landfill and it is not effective at controlling or removing PFCs from the ground water. In fact, additional ground water monitoring determined that the pump and treat system may have inadvertently played a role in the movement of PFC contaminants in the ground water. The water table underneath the spray irrigation area was artificially raised by the discharge, resulting in a mounding effect in the ground water that may have increased the movement of PFCs off site; particularly to the east.

Information recently discovered about the early operation of the ground-water pump and treatment system operated by the Landfill operators indicates that the system at one time discharged the pumped and untreated ground water through a storm sewer into Eagle Point Lake located southeast of the Landfill. Some PFCs currently found in Eagle Lake may have been transported to Eagle Point Lake in this manner; although some PFCs in Eagle Point Lake are believed to have originated at the 3M Oakdale Disposal Site and were transported to the lake by Raleigh Creek.

The Minnesota Geological Survey completed a downhole logging project in the Tablyn Park and Lake Elmo Heights neighborhoods in 2007. This study showed that the bedrock

aquifers are highly fractured. The study detailed the complicated flow in the St. Peter and Prairie du Chien aquifers and showed that complete capture of contaminated ground water in the bedrock through installation of additional pump-out wells could not be guaranteed. Flow was measured in 22 of the 185 wells logged. The results indicated that there are no consistent flow patterns between adjacent wells. For example, an uncontaminated well in the midst of two contaminated wells had no vertical flow while the flow in the contaminated wells was both downward and upward.

In addition, pumping rates required to remove and treat PFC contaminated ground water in the drift or surficial aquifer would need to increase significantly in order to achieve an increased level of PFC capture around the Landfill. Some contaminants could continue to flow into fractures outside the pump-out system's capture zone. Also, increased pumping would likely dewater the drift aquifer and interfere with residential water supplies. In addition, managing the large volume of treated ground water would be a challenge. Disposal of pump out water in Eagle Point Lake would have consequences to Horseshoe Lake that would need to be tracked throughout the Valley Branch watershed to the St. Croix River.

Studies completed by DuPont, 3M and APME on the PFCs of concern at the Landfill have indicated that they do not readily adsorb to the soil matrix (DuPont LOI Monitoring /Modeling Experts meeting with EPA-October 22, 2003, 3M 1978 PRZM modeling and 2003 APME studies). This characteristic was also verified at the Washington County Landfill. A soil boring completed through the former spray irrigation area at the Landfill showed PFCs had percolated through the soil down to a depth of 26 feet below the ground surface. The concentration detected at all levels was typically within the same order of magnitude for PFBA (range from 0.874 to 22.9 ng/g (nanograms per liter)) and PFOA (1.24 to 22.3 ng/g).

#### **PFC-RELATED RESPONSE ACTIONS TAKEN TO DATE**

Starting in 2005, the MPCA offered residents that received MDH drinking water advisories bottled water and granular activated carbon (GAC) filters to assure a safe supply of drinking water. 3M provided funding for the City of Lake Elmo to extend municipal water to over 200 homes in the area affected by the contamination. Currently, 52 residents without connection to the municipal water supply have a GAC filter system and an additional three residents are receiving bottled water. The MPCA continues to sample residential wells routinely and maintains the GAC filters in these homes.

To reduce the mounding effect in the ground water in the former ground-water discharge area, the discharge for the spray irrigation system was moved about 250 yards further southwest in November 2006.

## EVALUATION OF REMEDIES

The MPCA hired an engineering consulting firm to conduct a Remedy Feasibility Assessment in 2007 in order to evaluate possible remedies to address the contamination at the Landfill. The remedy options included:

- no additional action;
- plasma torch (treatment and destruction of waste and contaminants in the Landfill);
- forcemain (transport contaminated ground water at the site to sanitary lift station);
- pump and treat (to capture, remove and treat contaminated ground water);
- dig & truck (excavation and off-site disposal of waste in the Landfill); and
- dig & line (excavation of waste in the Landfill and containment in a new engineered (lined) facility on –site).

These alternatives were evaluated using criteria adopted by the U.S. Environmental Protection Agency for assessing cleanup remedies at Superfund sites, including:

- overall protection of human health and the environment;
- compliance with applicable or relevant and appropriate requirements;
- long-term effectiveness and performance;
- reduction of toxicity, mobility, or volume through treatment;
- short-term effectiveness;
- implementability; and
- cost.

Each alternative was scored against each of the criteria. When MPCA has used this approach in Superfund, it has required all remedies to meet the first two “threshold criteria” and generally tries to identify the remedy that provides the “best balance” of the next five criteria, and uses public acceptance as a “modifying criterion.

The dig and line option received the most-favorable (lowest) score. Details about the evaluation can be found in *Remedy Feasibility Assessment, Washington County Landfill, Lake Elmo, Minnesota, (SEH No. A-MNPCA0802.00), November 15, 2007*. Based on the feasibility assessment, the MPCA selected the Dig & Line option as the preferred remedy because it:

- effectively contains the source of contamination over the long term;
- offers a long-term remedy for both PFCs and VOCs;
- does not transfer pollutants to other locations; and
- is cost effective.

The MPCA concluded that a pump and treat system is not an appropriate remedy for the Landfill because:

- bedrock aquifers in the vicinity of the Landfill are extremely fractured, making complete capture of contaminated water not feasible;
- a significantly large volume of ground water would have to be pumped, treated and discharged for an indeterminate amount of time. Given the expected long term nature of this action this would be costly and result in the loss of the ground water resource and have potentially adverse affects on any receiving surface water body because of the large water volumes involved; and
- pumping the drift aquifer would likely dewater residential wells in the area.

## **PUBLIC COMMENT**

The MPCA held several public meetings in Lake Elmo to share information about the cleanup options as well as its preferred remedy. Agency staff twice presented information to individual City of Lake Elmo council members in early December 2007. A public information meeting for residents owning property near the Landfill was held in January 2008. Information was presented to Lake Elmo citizens and council members at a City Council meeting workshop and a follow-up City Council meeting in mid January. A larger public meeting was held at Oak Land Junior High School in February 2008 to present the agency’s preferred “Dig and Line” remedy for public comment.

The public was invited to comment on the preferred remedy and a public comment period was established from February 14 through March 15, 2008. Seven persons/entities submitted written comments. These comments were mostly concerned about:

- the continued potential for contaminated ground water migrating off site;
- opening up the Landfill and disturbing the waste may create new exposures to the public;
- 3M should bear all costs for the cleanup; and
- permanence of the remedy.

A summary of the comments from the public as well as the MPCA’s response to those comments can be found in *Summary of Public Comments and MPCA Response, MPCA Remedy Selection for the Washington County Landfill, June 18, 2008.*

## **SELECTED REMEDY – DIG & LINE**

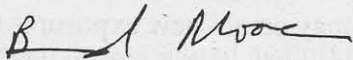
After considering the evaluation of remedy alternatives, comments from the public, and the information gathered through the MPCA’s environmental investigations, including monitoring data and special studies, as well as follow-up meetings with, and a site visit to, a plasma torch testing facility, the MPCA has determined the Dig & Line option provides for overall protection of public health and welfare and the environment, complies with applicable or relevant and appropriate requirements and provides the most cost-effective long-term remedy.

The Dig & Line remedy will consist of excavating the Landfill's waste and placing it in a new facility with a triple liner and leachate collection system in the approximate location of the current landfill. This process will take approximately 3 years to complete. Leachate that accumulates will be recirculated back through the waste.

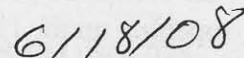
This option will effectively contain the source of PFC and VOC waste and remove it from the ground-water pathway. As a result, human exposure to contaminants via drinking water sources and the continued degradation of the ground water resource will be mitigated.

The MPCA understands that there is a slight chance that PFC concentrations in the ground water could temporarily increase when remedy construction begins; primarily due to shutting down the existing ground-water VOC pump and treat system in order to construct the new waste cells. In response, the MPCA will install additional ground water monitoring wells and sample both monitoring and residential wells with greater frequency in the area. If it appears that residential wells might be impacted by higher levels of PFCs that exceed the HRLs or HBVs, the MPCA will install GAC filters on private wells if not already present.

In conclusion, pursuant to the Landfill Cleanup Act, Minn. Stat. Section 115B.40, subd. 1, the Dig & Line alternative has been determined by the MPCA to be reasonable and necessary to protect the public health and welfare and the environment from releases and threatened releases of PFCs and VOCs to the environment at and from the Washington County Landfill.



Brad Moore  
Commissioner  
Minnesota Pollution Control Agency



Date