Record of Decision Amendment

Groundwater Operable Unit

Onalaska Municipal Landfill Superfund Site

September 2012

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Figures

Attachments

List of Acronyms

1,1-DCA	1,1-Dichloroethane
Agencies	WDNR and EPA, collectively
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
COCs	Contaminants of Concern
DMZ	Design Management Zone
EPA	United States Environmental Protection Agency
ES	Enforcement Standard
ESD	Explanation of Significant Differences
ICs	Institutional Controls
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MNA	Monitored Natural Attenuation
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OML	Onalaska Municipal Landfill
PALs	Preventative Action Limits
ppb	Parts per Billion
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision

RSLs	Regional Screening Levels
SSC	State Superfund Contract
TCE	Trichloroethene
TMBs	Trimethylbenzenes
TMV	Toxicity, Mobility or Volume
VOCs	Volatile Organic Compounds
WACL	Wisconsin Alternative Concentration Limits
WDNR	Wisconsin Department of Natural Resources

Record of Decision Amendment, Groundwater Operable Unit
Onalaska Municipal Landfill Superfund Site
Town of Onalaska, La Crosse County, Wisconsin

Part I: DECLARATION

Site Name and Location

Onalaska Municipal Landfill Superfund Site
La Crosse County
Onalaska, Wisconsin

Statement of Basis and Purpose

This Record of Decision Amendment (ROD Amendment) for the Onalaska Municipal Landfill (OML) Superfund site in the Town of Onalaska, La Crosse County, Wisconsin, selects and explains an Amended Remedy that makes changes to parts of the original remedy for the Groundwater Operable Unit of the site, described in a 1990 Record of Decision (1990 ROD). The remedy for the Landfill Operable Unit of the site is not affected by this amendment. The Wisconsin Department of Natural Resources (WDNR) is the lead agency for activities at the site; the United States Environmental Protection Agency (EPA) is the support agency. The actions described in this document are taken pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601-9675, and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal bases for amending the groundwater remedy for this site. The information supporting the Agencies' decision on the Amended Remedy is contained in the Administrative Record file. WDNR and EPA are jointly signing this ROD Amendment.

Description of Amended Remedy

As explained below, the Amended Remedy is being adopted in response to new information that was obtained since the original ROD was issued on August 14, 1990. This new information was obtained during full-scale remediation activities and during extensive data collection and evaluation conducted as part of the remedial action for the Groundwater Operable Unit of the site. The groundwater monitoring program implemented in 1995 included quarterly collection of groundwater samples from monitoring wells, extraction wells, and nearby residential wells as shown in Figure 1. From 1997 to 2004, sampling was conducted semi-annually, and from 2005 to the present, sampling has continued at various frequencies (but no less frequently than annually), depending upon well locations and results. Groundwater monitoring results and rationales for changes to the groundwater monitoring program are documented in annual and semi-annual reports. New groundwater monitoring data and analyses show that:

1. The original 1990 ROD and a September 2000 Explanation of Significant Differences (ESD) identified State of Wisconsin Preventive Action Limits (PALs) as the groundwater cleanup standards outside the point of standards application. The point of standards application is any point within the property boundaries beyond the three-dimensional design management zone (DMZ), as well as any point of present groundwater use beyond the property boundaries. However, under current implementation of Wisconsin Administrative Code NR 140, the Wisconsin Enforcement Standard (ES) is also considered an applicable groundwater cleanup level for human health and welfare. The range of acceptable responses when an ES is exceeded includes the collection and evaluation of data to determine whether natural attenuation can be effective to restore groundwater quality within a reasonable period of time, as demonstrated by a stable or receding groundwater plume. This ROD Amendment documents compliance with NR 140 as the groundwater cleanup objective for the site beyond the DMZ instead of compliance with the Wisconsin PALs. NR 140 is described in detail in Section 3 of the Decision Summary (Part II) of this ROD Amendment.

2. A November 2001 ESD allowed for the temporary shutdown of the groundwater extraction and treatment system as part of a pilot test to determine whether monitored natural attenuation (MNA) was occurring at the site. The results of post-shutdown groundwater monitoring conducted since that time support the permanent shutdown of the system and designation of MNA as the final remedy for volatile organic compounds (VOCs) in groundwater.

3. Two private water-supply wells in close proximity to the landfill have historically shown consistent concentrations of manganese in the groundwater far exceeding a newly-promulgated ES for that compound and groundwater concentrations approaching the ES for arsenic. It is appropriate to designate replacement of these two private water-supply wells as an interim remedy for inorganics in groundwater.

Based upon this newly-obtained information, WDNR and EPA have determined that it is appropriate to modify the 1990 ROD remedy by selecting the Amended Remedy described in this ROD Amendment. The Amended Remedy includes the following components:

- Permanently shutting down the groundwater extraction and treatment system and allowing MNA to treat the remaining VOCs;
- Replacing two private drinking water wells with new wells advanced into the deeper, uncontaminated portion of the aquifer;
- Changing the current groundwater cleanup standards from PALs to the federal Maximum Contaminant Levels (MCLs) and/or state ESs (whichever is more stringent); and
- Placing long-term institutional controls (ICs) on the real estate parcel on which the landfill itself is situated.

Statutory Determinations

The amended remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, is cost effective, and employs permanent solutions to the maximum extent practicable.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews are necessary to ensure that the remedy is, or will be, protective of human health and the environment. Five-year reviews were conducted in 1998, 2003, and 2008 subsequent to the initiation of the remedial action in 1994. The next five-year review is scheduled to be completed in 2013.

ROD Amendment Data Certification Checklist

The following information is included in the Decision Summary (Part II) of this amendment to the 1990 Record of Decision. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern
- Cleanup levels established for chemicals of concern and the basis for these levels
- The use of a pilot test to determine whether MNA would occur effectively without the aid of a pump and treat system for VOCs
- Key factors that led to selecting the remedy

Authorizing Signature

This ROD amendment documents a fundamental change to the remedy selected in the August 1990 ROD. This amendment was developed by WDNR, with the assistance of EPA. The Director of the Superfund Division, EPA Region 5, has been delegated the authority to approve this decision document.

Richard C. Karl, Director
Superfund Division
EPA Region 5

9.24.12
Date

Mark F. Giesfeldt, Director
WDNR Remediation and Redevelopment Program

9/20/12
Date

PART II: DECISION SUMMARY

The Decision Summary provides a description of the site-specific factors and analyses that triggered the need for an amended remedy at the OML site. It includes an overview of the site characteristics, the alternatives evaluated, and an analysis of those options. It also identifies the Amended Remedy and explains how the remedy fulfills statutory and regulatory requirements.

1. Introduction to the Site and Statement of Purpose

Site Name, Location, and Description

The OML Superfund site is located in La Crosse County, Wisconsin. The 11-acre site, which is owned by the Town of Onalaska, includes the 7-acre landfill and is situated 400 feet east of the Black River, near the confluence of the Mississippi and Black Rivers, as noted in Figure 1.

The area surrounding the site is generally rural, although several residences are located within 500 feet to the north and to the south of the landfill. A subdivision of about 50 homes is located about 1.25 miles southeast of the site. Agricultural lands are located south of the landfill, and intermittent woods and grasslands border the site to the east. A railroad line runs west-northwest approximately 200 feet north of the northern extent of the waste. North of the rail line there is a state recreational bike trail developed on old railroad bed. There is a public canoe landing on the Black River about 500 feet north of the landfill.

WDNR is the lead agency for this National Priorities List Site and EPA is the support agency. The EPA CERCLIS Identification Number for the site is WID980821656.

Statement of Purpose

This decision document amends the August 1990 ROD for the OML Superfund site and selects an Amended Remedy. This ROD Amendment was developed in accordance with the requirements of CERCLA, as amended by Superfund Amendments and Reauthorization Act, and the NCP. Specifically, this decision document has been prepared in compliance with CERCLA Section 117 and NCP Section 300.435(c)(2)(ii). This decision document explains the factual and legal bases for amending the groundwater remedy for this site. The information supporting the Agencies' decision on the Amended Remedy is contained in the Administrative Record file, and this ROD Amendment will be added to the Administrative Record file.

Circumstances that Led to the ROD Amendment

WDNR and EPA decided to issue this ROD Amendment because both Agencies believe that the remedial action objectives for VOC-contaminated groundwater at the site can be met more cost-effectively through the Amended Remedy instead of the remedy selected in the August 1990 ROD. In 1998, EPA determined that the soil bioremediation component of the remedy was no longer effective, after oxygen uptake studies showed that active aeration was no longer required to maintain aerobic conditions sufficient for biological degradation of hydrocarbons in subsurface soils. In 2001, EPA issued an ESD that included the initiation of a pilot study to

deactivate the groundwater pumping system at the site in order to evaluate the effectiveness of MNA as a more cost-effective remedy and to verify that the VOC plume would not expand in the absence of a pump-and-treat remedy. Based on the results of that study and others, described in more detail below, WDNR and EPA have decided to amend the groundwater remedy for the site.

Site Characteristics

The site is adjacent to the Upper Mississippi River Wildlife and Fish Refuge, which contains a wide variety of wildlife. The area is used for fishing, hiking, and other recreational purposes, and is a known nesting area for turtles, including several threatened species.

The sand and gravel aquifer beneath the landfill serves as the primary source of drinking water for area residents. One residential well, located southwest of the landfill, was found to exceed the federal drinking-water standard for barium during the Remedial Investigation (RI) and was replaced with a deep, uncontaminated well in 1983. Two private wells located near the landfill currently exceed a recently-promulgated state ES for manganese and state PALs for arsenic.

Geological Setting: The site geology consists of approximately 135 to 140 feet of unconsolidated glacio-fluvial and alluvial sand and gravels that were deposited as glacial outwash in an eroded bedrock valley. The underlying bedrock is sandstone.

Hydrogeological Units: Groundwater depth is approximately 15 feet below ground surface (bgs) and rises to approximately 11 feet bgs during periods of natural seasonal fluctuation. In-situ testing in several site monitoring wells determined that hydraulic conductivity at the site averages 0.039 centimeters/second. The hydraulic gradient is approximately 0.0006 (unitless). Average groundwater flow velocity has been estimated to range between 55 and 110 feet per year, with an estimated average of approximately 70 feet per year.

Interpreted Groundwater Flow Directions: Groundwater flow direction has been found to be predominantly to the south-southwest, with springtime periods of high river stage causing flow to the south-southeast. Recent groundwater flow maps, including data from two well nests constructed in 2006, also show the potential for occasional flow to the west-northwest during periods of low river stage.

2. Site History, Contamination, and Selected Remedy

The OML site was mined as a sand and gravel quarry in the early 1960s, after which the Town of Onalaska began to use the former quarry as a municipal landfill. For a time, both municipal and chemical wastes were disposed at the landfill. In 1978, WDNR determined that the landfill operation did not meet state solid waste codes and ordered the town to close the landfill by September 1980. After disposal operations ceased, the town capped the landfill in June 1982.

In September 1982, WDNR sampled four landfill monitoring wells and several nearby residential wells for compliance with drinking-water standards. The investigation documented that the sand and gravel aquifer beneath the landfill serves as the primary source of drinking

water for area residents and that groundwater contamination had occurred within and around the site. EPA placed the site on the National Priorities List in September 1984.

Beginning in 1988, EPA, in consultation with WDNR, conducted an RI. The major findings of the RI included:

- The landfill is the source of groundwater contamination. A groundwater contaminant plume consisting of organic and inorganic compounds had migrated at least 800 feet from the southwestern edge of the landfill. The leading edge of the contaminant plume appeared to be discharging into nearby wetlands and the adjacent Black River.
- The upper groundwater aquifer consists primarily of sand and is approximately 135 feet thick. Local residents utilize this aquifer as a primary source of drinking water. The upper 10 feet to 20 feet of the aquifer contained the highest levels of contaminants, with lower concentrations found at depths of 50 feet to 70 feet.
- The predominant organic compounds of concern included toluene, xylene, 1,1-dichloroethane (1,1-DCA), and trichloroethene (TCE), based upon concentrations and potential impacts to human health and the environment.
- Site soils located above the water table and adjacent to the southwestern edge of the landfill were contaminated with naphtha solvents derived from the landfill. The contaminated soil zone occurred from 11 feet to 15 feet bgs and up to 150 feet from the landfill. Soil samples indicated that total petroleum hydrocarbon levels of up to 550 milligrams per kilogram were present and were a continual source of groundwater contamination.
- The original landfill cap had deteriorated and did not meet the landfill closure regulations in effect at the time the landfill closed.
- Magnetometer anomalies, as well as site records, suggested that up to 1,000 55-gallon drums were likely to have been disposed in the landfill. Although several crushed and empty drums were found in the landfill during excavation of test pits, the RI could not ascertain whether the drums were concentrated in any one area, although it may be likely that many of the drums would be in the same condition as the drums that were found in the test pits.
- The average depth to the water table and the depth of waste disposal are 15 feet. As a result, it is likely that refuse is periodically in direct contact with groundwater. Soil below the water table does not appear to be greatly affected by landfill contaminants.
- Potential long-term exposure to low levels of VOCs through the use of private wells in contaminated groundwater and plausible adverse discharges of contaminants to the wetlands and Black River down-gradient of the landfill were identified as the principal threats to human health and the environment.

Based on the findings of the RI, EPA completed a feasibility study in 1989 that evaluated

remedial alternatives to address migration of the groundwater contaminant plume. EPA then issued a ROD in 1990, calling for the following actions:

- Installation of a landfill cap in accordance with federal and state requirements;
- Installation of an air injection system within the area of soil contamination to enhance the bioremediation of organic contaminants;
- Installation of a groundwater extraction and treatment system to capture and treat organic contaminants in the groundwater immediately down-gradient of the landfill;
- Implementation of a groundwater, surface water, and sediment monitoring program to ensure the adequacy of the cleanup; and
- Implementation of ICs at the site, including deed restrictions limiting surface and groundwater use at the site, in conjunction with state regulations governing groundwater use within 1200 feet of landfills and development on landfills.

Operation of the soil bioremediation and groundwater extraction and treatment systems commenced in 1994 in the unsaturated soils above an area of non-aqueous phase liquid (NAPL) discovered during the RI. The soil bioremediation system operated in that area until February 1997 and was discontinued in 1998 after oxygen uptake studies showed that active aeration was no longer required to maintain aerobic conditions sufficient for biological degradation of hydrocarbons in subsurface soils.

A priority pollutant scan in 1999 detected groundwater contaminants for which analyses had not previously been conducted, most notably trimethylbenzenes (TMBs). In 2006, monitoring wells MW-16 and MW-17 were constructed in the area of previously-observed NAPL to fill data gaps in groundwater quality monitoring in that source area. Soil sampling was conducted in conjunction with the construction of these wells, including the area identified during soil bioremediation studies as the most contaminated area within the bioremediation target zone. Soil sampling showed residual soil contamination below concentrations indicative of petroleum product in soil pores, but above concentrations that could act as an ongoing source of impact to the groundwater.

Soil gas sampling for VOCs was also conducted at that time from selected landfill gas monitoring wells and one "air" well from the soil bioremediation system. Results from this sampling have been compared to vapor action levels that are consistent with WDNR guidance. (Non-carcinogen regional screening levels [RSLs] are based on a hazard index of 1. RSLs for carcinogens in *indoor air* are based on a 1-in-100,000 excess lifetime cancer risk. The default attenuation factor for *deep soil gas* to indoor air is 0.01, so a multiplier of 100 is applied to the indoor air RSL). No exceedances were observed.

The groundwater extraction and treatment system was shut down on November 26, 2001, to study the effectiveness of MNA as a more cost-effective alternative remedy for VOC-contaminated groundwater. A statistical MNA evaluation entitled "*Evaluation of Monitored*

Natural Attenuation as a Containment Remedy for the Onalaska Municipal Landfill Site, Onalaska, Wisconsin" (MNA Evaluation) was completed in 2008 and stated that data were insufficient at that time to determine whether the two remaining VOCs, TMBs and naphthalene, would degrade to acceptable levels in groundwater beyond the existing groundwater monitoring system. Therefore, the study could not conclude whether MNA would be an appropriate final groundwater remedy for VOCs at the site. Since then, however, continued monitoring and analysis at the site show that nearly all VOCs have remained well below cleanup standards. The only remaining VOC found above standards – TMB – demonstrates a stable to decreasing trend as shown in Figure 2.

3. Basis for the Document

Applicable Groundwater Cleanup Standards

The original 1990 ROD and 2000 ESD required that groundwater contamination be remediated to meet the federal MCLs/Maximum Contaminant Level Goals (MCLGs) beyond the waste boundary, in accordance with the NCP, and the more restrictive State of Wisconsin PALs beyond the DMZ boundary. However, it should be noted that NR 140 establishes a two-tiered system of groundwater quality standards that are to be followed, i.e. the PAL and the ES.

NR 140 provides that PALs are to be used as an indicator of potential groundwater contamination problems and that they are applicable groundwater cleanup standards unless it is shown that compliance is not technically and economically feasible. Section NR 140.02(3) states,

> "Preventive action limits serve to inform the department of potential groundwater contamination problems, establish the level of groundwater contamination at which the department is required to commence efforts to control the contamination and provide a basis for design and management practice criteria in administrative rules. Preventive action limits are applicable both to controlling new releases of contamination as well as to restoring groundwater quality contaminated by past releases of contaminants. Although a preventive action limit is not intended to always require remedial action, activities affecting groundwater must be regulated to minimize the level of substances to the extent technically and economically feasible, and to maintain compliance with the preventive action limits unless compliance is not technically and economically feasible."

Table 5 of NR 140 provides a range of responses that may be taken or required if a PAL is exceeded. This range of responses includes 'No Action.' A PAL exemption may be granted where it is shown that compliance with PALs is not technically or economically feasible.

The ES is an applicable groundwater compliance standard for substances of health or welfare concern in the groundwater beyond the boundaries of the DMZ. For the majority of the contaminants found at the OML site, the ESs are numerically equivalent to the federal MCLs.

However, there are several new COCs not listed in the 1990 ROD (i.e., manganese, naphthalene, TMBs, and iron) that do not have MCLs. There are also several contaminants that were listed in the 1990 ROD (specifically toluene, xylenes, and 1,1-DCA) where the ES is more stringent than the federal MCL. The NCP requires that the more stringent of the cleanup levels be used when both the state and federal agencies have identified these as Applicable or Relevant and Appropriate Requirements (ARARs). Therefore, at the OML site, the MCLs are the cleanup standards except for those contaminants that do not have an MCL or that have a more stringent ES. For the purpose of clarity and to avoid confusion, this ROD Amendment will generally discuss the change in cleanup levels by referring to the change from "PALs to ESs" - acknowledging that MCLs are the cleanup standards in those cases where the MCL and the ES are equivalent, and ESs are the cleanup standards in those cases where an MCL does not exist or where the ES is more stringent than the MCL.

Table 6 of NR 140 provides a range of responses that may be taken or required if an ES is exceeded. This range of responses does not include 'No Action.' One of the response options in Table 6 of NR 140 requires the collection and evaluation of data to determine whether natural attenuation can be effective to restore groundwater quality within a reasonable period of time, as demonstrated by a stable or receding groundwater plume.

Under current implementation of NR 140, cases involving contaminated soil and/or groundwater are routinely closed by the WDNR Remediation and Redevelopment Program using the ES as the basis for closure. Section NR 140.22 specifies compliance with PALs only to the extent that this compliance is technically and economically feasible. WDNR has concluded since the mid-1990s that groundwater quality compliance with PALs at contaminant discharge sites in the state is, in many cases, not technically or economically feasible.

Both PALs and ESs apply to the OML site, in order to comply with Wisconsin groundwater quality standards. As stated above, the intent of the 1990 ROD was for the groundwater beyond the DMZ boundary to meet PALs. However, the compliance requirement should not have been explicitly designated as the PAL; it should have been designated as general compliance with NR 140.

The 1990 ROD also identified Wisconsin Alternative Concentration Limits (WACLs) as alternative groundwater cleanup standards:

> "If, during the implementation of the remedy, it becomes apparent that it is technically impracticable to achieve the Ground-water Cleanup Standards, including any WACL established as discussed above, then the U.S. EPA, in consultation with the State, may then consider the use of alternate methods of controlling the ground-water contaminant plume or source to achieve the standards. If those alternate methods are found not to attain Ground-water Cleanup Standards (including any WACL established), then a CERCLA waiver may be considered."

WACLs may be calculated where the background concentration of a substance in a well unaffected by the facility exceeds either a PAL or an ES. Calculation of WACLs for persistently elevated inorganic concentrations was recommended in the 2008 Five-Year Review, based on the long-held assumption that the area north of the landfill is up-gradient with respect to groundwater flow and is therefore unaffected by the facility. Recent groundwater flow maps, however, including data from two well nests constructed in 2006, show the potential for flow to the west-northwest as shown in Figure 3. The potential for a component of flow to the north weakens the assumptions that the area north of the landfill is consistently up-gradient and that this area adequately represents background conditions unaffected by the facility.

MNA of VOCs

A January 1990 federal EPA report entitled "*Evaluation of Ground Water Extraction Remedies*" states:

> "Limitations on the effectiveness of ground-water extraction generally occur in the source areas where contaminant concentrations in the saturated soil are high and/or non-aqueous phase liquids are present. In those areas where concentrations remain above cleanup goals and extraction has reached a point of limited effectiveness, enhancement methods such as biodegradation may be considered. Finally, containment and institutional controls should be implemented over those portions of the ground water that remain above levels that reflect the beneficial uses of the ground water."

In the case of the OML site, small amounts of non-aqueous phase naphtha solvents were observed floating on the water table in the area southwest of the landfill during the RI. The soil bioremediation system operated in that area until February 1997 and was discontinued in 1998, after soil gas data showed that the system no longer contributed to the cleanup. No NAPLs have been observed in subsequent sampling. Those areas where concentrations now remain above cleanup standards are limited to recalcitrant TMBs in source areas near where non-aqueous phase naphtha liquids were previously observed during the RI. This can be seen in Figure 1. It is therefore apparent that the original pump-and-treat remedy, together with soil bioremediation, has already achieved applicable groundwater cleanup standards for those chemicals of concern (COCs) which are amenable to such treatment under the redox conditions observed at the site.

In November 2001, EPA issued a second ESD based on results from Long-Term Remedial Action sampling which showed significantly reduced levels of contaminants and limited exposure pathways. The ESD allowed for the temporary shutdown of the groundwater extraction and treatment system, in order to evaluate the effectiveness of MNA as a more cost-effective remedy and to verify that the VOC plume would not expand in the absence of a pump-and-treat remedy.

After six years of MNA monitoring, the 2008 MNA Evaluation report analyzed long-term groundwater monitoring data and assessed the effectiveness of MNA as a containment remedy at

the site. The MNA Evaluation concluded that while MNA might be an appropriate final remedy for the site, the data were insufficient to determine whether TMBs and naphthalene would degrade to acceptable levels in groundwater beyond the existing groundwater monitoring system.

Since the 2008 MNA Evaluation was conducted, three additional years of semi-annual groundwater monitoring have been conducted. Analysis of data followed EPA's 1999 MNA guidance, "*Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites*" and followed the three-tiered approach to evaluate MNA as a remedy option at the site. Generalizing, the three lines of evidence are 1) data showing a decreasing trend of contamination, 2) geologic and hydrogeologic data to demonstrate that indirect natural attenuation processes will reduce contaminants, and 3) data from field studies which directly demonstrate natural attenuation process are occurring. WDNR, in conjunction with EPA, evaluated all three lines of evidence and determined that evidence is adequate to show that MNA effectively works at the OML site, as described below.

Support for First Tier -- The trend of decreasing contaminant mass and decreasing concentrations of contaminants over time at the OML site are consistent with what would be expected due to natural attenuation processes. TMBs are now the only VOCs which persist above the ES, and overall TMB trends appear stable to slightly decreasing as illustrated in Figure 2. Although some concentrations of TMBs spike above the ES on a seasonal basis, this is due to river stages and only occurs in near-source wells at or within the boundaries of the DMZ in the area where non-aqueous phase contamination was identified during the RI. According to calculations of mass flux through this area, as compared to estimates of total mass present, mass in the source area is degrading at a rate such that concentrations of TMBs at its down-gradient boundary should reach the ES within approximately 54 years. Based upon this modeling, the assumption can also be made that the federal MCL standard will be met at the landfill waste boundary within a reasonable amount of time through MNA processes. A statistical spreadsheet illustrating the modeling results and the timeframe to reach cleanup standards is attached as Attachment 1.

TMB concentrations outside the DMZ attenuate to below the ES within a short distance from the DMZ boundary, based on concentrations below the PAL (and most below detection) in all wells outside the DMZ. Most significantly, of the eight VOCs that were identified in the original 1990 ROD as COCs, none have exceeded NR 140 ESs in any site wells since April 2004. Selected monitoring wells and private water-supply wells are routinely sampled for the full list of VOCs, including all carcinogenic daughter products that could be caused from the degradation of the VOCs found at the site. None have been confirmed outside of the DMZ or the waste boundary since 2005.

Site data has also been compared to state water quality criteria applicable to surface waters. Water quality criteria are based on protection from long- and short-term impacts to fish and other aquatic life, wildlife and human health. No VOCs approaching state water quality criteria have been detected outside the DMZ or the waste boundary.

Support for Second and Third Tier -- Geologic and hydrogeologic data on redox parameters collected from the existing monitoring well network are influenced by the highly reducing conditions associated with the landfill. Consequently, the data are insufficient to demonstrate that indirect natural attenuation processes will reduce contaminants. However, field data directly demonstrate that natural attenuation processes are occurring. The 2008 MNA Evaluation report compared site data to major ion concentrations indicative of redox conditions elsewhere in the sand and gravel aquifer of the Black River watershed. The report states,

> "Collectively, these data are consistent with a scenario in which all of the monitoring wells at the Onalaska site, with the exception of MW-1S, MW-1SR, and MW-1M are influenced by the reducing redox conditions typically observed down-gradient of landfills. . . Both (TMBs and naphthalene) are more recalcitrant under reducing conditions, although their degradation under nitrate-reducing and sulfate-reducing conditions has been demonstrated. In fact, stability of the TMBs under reducing conditions is sufficient that they have been used as conservative tracers for other more degradable petroleum compounds."

The report also states,

> ". . . It is possible that further down-gradient of the DMZ, redox conditions dominated by the natural, more oxidizing background geochemistry are present, thereby enabling degradation of the TMBs and naphthalene . . . But there are no monitoring data available with which to test this theory."

Groundwater monitoring conducted subsequent to the 2008 MNA Evaluation now demonstrates that the current monitoring well network is adequate to conclude that the VOC plume is stable or receding. Average groundwater flow velocity beneath the site was estimated during the RI to range between 55 and 110 feet per year, with an estimated average of 70 feet per year. Down-gradient monitoring well nests MW-6 and MW-8 are well within 550 feet of respective up-gradient source areas, representing a distance over which contaminants at even the slowest rate of flow would be expected to travel in the ten years since cessation of groundwater extraction. Yet, no PAL exceedances for any VOCs (including TMBs and naphthalene) have been measured in either well nest since 2005.

In summary, active treatment and MNA have already addressed most VOCs in site groundwater. The results of nearly ten years of post-shutdown groundwater monitoring support the permanent shutdown of the system and designation of MNA as a final remedy for VOCs in groundwater.

Private Well Replacement for Inorganics in Groundwater

Long-term groundwater monitoring results confirm reducing conditions typically observed down-gradient of landfills. Reducing conditions beneath the landfill appear to exacerbate the solubility and persistence of inorganic contamination in groundwater at the site, as would be expected under observed redox conditions. Barium exceeds PALs in many site wells and

exceeds the ES in one mid-depth well beyond the boundary of the DMZ (MW-6M). Iron and manganese continue to exceed PALs and/or ESs in nearly all site wells, including private water-supply wells. Iron is a substance of public welfare concern, and although found at concentrations above the ES, it poses minimal health risks. However, recent changes to state groundwater standards for manganese indicate the need for replacement of two private water-supply wells in close proximity to the landfill.

In January 2011, a number of changes were made to NR 140. One of these changes was the adoption of a new public health ES for manganese, which had previously been considered a public welfare parameter. Per Ch. 160 of the Wisconsin Statutes, the new health-based manganese standard is based upon a recommendation from the Wisconsin Department of Health and Family Services, Division of Public Health. Wisconsin's new ES for manganese is 300 parts per billion (ppb), equivalent to the EPA federal lifetime health advisory level, and the PAL is now 60 ppb. This newly-promulgated standard represents a new ARAR that must be met. This new ES has long been far exceeded in many site monitoring wells and in two private wells located near the waste mass. In twelve rounds of sampling conducted since September 2004, manganese concentrations in the two private water-supply wells have been above the current standard for safe drinking water. The same two wells also have shown concentrations approaching the ES for arsenic.

With respect to inorganics, the intent of this ROD Amendment is to only address the two private water-supply wells that have elevated metals contamination above health-based limits. Except for addressing these two private wells, metals contamination in groundwater is not addressed in this ROD Amendment and will be addressed through additional investigatory work and, if needed, in a future decision document. This ROD Amendment is therefore interim in nature for inorganics in groundwater because the Agencies do not yet know whether additional actions need to be taken to address inorganic contamination in the groundwater.

Based on the information presented above and included in the Administrative Record file for the site, groundwater data continue to support permanent shutdown of the existing groundwater extraction and treatment system.

Institutional Controls

Institutional controls were a component of the original 1990 ROD. The ROD stated that institutional controls including: (1) deed restrictions limiting surface and groundwater use at the site, and (2) state regulations governing groundwater use within 1200 feet of landfills and the development of landfills, would be relied on. The 1990 ROD did not specifically address or include objectives to prevent interference with the landfill cap (except routine maintenance), nor prohibit any uses of the area such as for residential, commercial or industrial purposes. To address some of these issues, a Declaration of Restriction on Use of Real Property was recorded on April 14, 1997, at the office of the La Crosse County Register of Deeds. This restriction applies to three parcels west, south, and east of the landfill property. The Declaration of

Restriction prohibits use of groundwater underlying the three parcels, any activity that may interfere with the remedy, any construction not approved by EPA, and any residential use of the properties. As part of the 2008 Five-Year Review conducted at the site, an IC evaluation was conducted and found that the real estate parcel on which the landfill itself is located does not have any long-term ICs associated with it. As a requirement of this ROD Amendment, a long-term IC document will be recorded declaring restrictions on the landfill property itself, similar to those required by a 1996 Partial Consent Decree with the Town of Onalaska. Additional evaluations may be conducted in the future to ensure implementation of any additional long-term ICs needed at the site.

4. Description of New Alternative

WDNR and EPA evaluated one new remedial action alternative against the existing remedy selected in the 1990 ROD. The two options are described as follows: (1) leaving the existing groundwater extraction and treatment system component of the 1990 ROD remedy in place (i.e., not amending the remedy); and (2) amending the original remedy (as described below) to address the issues discussed in Section 3 above. The Amended Remedy components were developed based on new groundwater monitoring data and analyses that were outgrowths of the remedial design and remedial actions conducted from 2002 to the present under the 1990 ROD. The two remedial action alternatives that were evaluated are further described below.

Option 1: Leave Original Remedy In Place – Restart the Groundwater Pump and Treatment System

The Original Remedy (per the 1990 ROD) included, among other things, pumping and treating the contaminated groundwater plume for various VOCs immediately down-gradient of the landfill itself. Pursuant to the ROD, an air injection system was also installed to enhance the bioremediation of the VOCs and a landfill cap was installed in accordance with federal and state requirements. The Original Remedy was fully described in the 1990 ROD. This option involves restarting the groundwater pump-and-treatment system for VOCs in groundwater.

Option 2: Amended Remedy – Monitored Natural Attenuation of VOCs in Groundwater and Replacement of Two Residential Wells

The major components of this remedial option include the following:

- Change groundwater cleanup standards from PALs to MCLs/ESs for all existing and new COCs.
- Change from a pump-and-treat remedy for VOCs to MNA, including an updated long-term groundwater monitoring program.
- Replace, with new wells screened in the deeper, uncontaminated aquifer, two nearby residential wells that have elevated levels of inorganics above health-based limits.

- Monitor annually (or at some other frequency as agreed by WDNR and EPA) to determine whether key sentinel wells show that the contaminated groundwater plume is expanding, in which case the Agencies would reevaluate the amended remedy.
- Place additional long-term ICs on the parcel of land where the landfill is located.

5. Evaluation of Alternatives and Selected Remedy

Remedial alternatives are evaluated based on the nine criteria set forth in the NCP, 40 CFR § 300.430(e)(9)(iii). A remedial alternative is first judged in terms of the threshold criteria of protecting human health and the environment, and complying with ARARs. If a proposed remedy meets these two threshold criteria, the remedial alternative is then evaluated under the balancing and modifying criteria. This section describes the Agencies' evaluation of the two remedial alternatives against each of the nine criteria.

*1. **Overall Protection of Human Health and the Environment**: Protectiveness is one of the primary requirements that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls current and potential risks posed by the site through each exposure pathway. The assessment with respect to this criterion describes how the alternative achieves and maintains protection of human health and the environment.*

Both remedial options are protective of human health and the environment, considering the compilation and analysis of groundwater monitoring data documented in annual and semi-annual groundwater monitoring reports, and including the data collected subsequent to the MNA Evaluation. No adverse effects to the water supply are anticipated under either option. Option 2 – the Amended Remedy – includes groundwater quality monitoring, private well replacement, and contingencies through which additional remedies could be implemented, if water quality should deteriorate.

*2. **Compliance with Applicable or Relevant and Appropriate Requirements**: Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4). Applicable requirements are those requirements that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those requirements that, while not applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.*

Both options would comply with ARARs. The amended remedy alternative ensures compliance with NR 140 using the Wisconsin groundwater quality ESs, as opposed to the PALs which were inappropriately cited as the cleanup standards in the 1990 ROD. As did the original remedy, the amended remedy alternative continues to include long-term monitoring to detect changes in site

groundwater quality. Under either alternative, NR 140 would require additional action if results of the long-term monitoring demonstrated further NR 140 ES exceedances outside the boundaries of the DMZ.

*3. **Long-term Effectiveness and Permanence**: This criterion reflects CERCLA's emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of alternatives with respect to this criterion evaluates the residual risks at a site after completing a remedial action or enacting a no-action alternative and includes evaluation of the adequacy and reliability of controls.*

Both alternatives meet the standards for long-term effectiveness and permanence and contribute to achieving the Remedial Action Objectives (RAOs). The original remedy option does this by pumping and treating the VOC-contaminated groundwater at the site. However, given the relatively low concentrations of contaminants remaining in the groundwater, reactivating the pump and treat system would likely not remove any significant amount of contamination from the aquifer. MNA processes have also been at work under the original remedy. The amended remedy alternative would rely on MNA to reduce the residual VOCs in groundwater over time, which will provide for long-term effectiveness and permanence.

*4. **Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment**: This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment with respect to this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ and is specific to evaluating how treatment reduces TMV.*

Long-term groundwater monitoring data have shown that a significant reduction in TMV through treatment has already been achieved via operation of the groundwater extraction and treatment system under the 1990 ROD. Additional reductions of VOCs via natural attenuation processes have been observed since shutdown of the system and are expected to continue under the amended remedy alternative.

*5. **Short-term Effectiveness**: This criterion addresses short-term impacts of the alternatives. The assessment with respect to this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy until the response objectives have been met.*

Leaving the original remedy in place and restarting the groundwater pump and treatment system would pose some minimal short-term risk to workers during implementation, as the system has not been in operation since 2001 and a significant amount of equipment and facility maintenance would be necessary to resume operation. The amended remedy alternative would pose no short-term risks to workers, nearby residents, or the environment.

*6. **Implementability**: The assessment with respect to this criterion evaluates the technical and administrative feasibility of implementing the alternative and the availability of the goods and services needed to implement it.*

Both options are technically and administratively feasible to implement. The amended remedy alternative would be easier to implement because the groundwater pump and treatment system, which has been shut down since 2001, would not need to be restarted.

*7. **Cost**: Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project.*

The costs of active groundwater restoration under the original remedy while groundwater extraction and treatment was ongoing exceeded $120,000 per year. The major costs associated with the amended remedy alternative are for groundwater sampling and analyses and are estimated at approximately $17,000 annually.

*8. **State/Support Agency Acceptance**: This criterion evaluates whether the support agency, based on comments submitted after its review of the Proposed Plan, concurs, opposes, or has no comment on the preferred alternative.*

WDNR (the lead agency at the site) does not consider the original remedy alternative cost-effective, and supports the selection of the amended remedy alternative. EPA (the support agency at the site) also supports the amended remedy alternative. Both Agencies are signing this ROD Amendment.

*9. **Community Acceptance**: This criterion refers to the assessment of public comments received on the Proposed Plan.*

No comments were received on the Proposed Plan that was issued on April 23, 2012. Except for discussions with the owners of the two properties with contaminated private water wells, the Agencies have received no site-related inquiries from the community.

The residents whose private water-supply wells have been routinely sampled have been notified of the results of each sampling event. In March 2011, the homeowners at the two residences where concentrations exceed the public health ES for manganese were sent health advisories, recommending that they use bottled water for human consumption. The affected homeowners have verbally agreed to allow replacement of their private water supply wells.

Principal Threat Wastes

EPA defines principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Wastes considered principal threats include the following:

- *Liquid source material* - waste contained in drums, lagoons or tanks, free product in the subsurface (i.e., NAPLs) containing contaminants of concern (generally excluding groundwater).
- *Mobile source material* - surface soil or subsurface soil containing high concentrations of chemicals of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., VOCs), surface runoff, or subsurface transport.
- *Highly-toxic source material* - buried drummed non-liquid wastes, buried tanks containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

The remedial activities carried out under requirements of the 1990 ROD eliminated any principal threats related to organic contaminants at the site. The NAPLs that were present at the site were addressed by the original remedy. What remains are residual VOCs, namely TMBs, which will eventually naturally attenuate to below state and federal standards within a reasonable amount of time. No principal threat wastes currently exist at the site.

Selected Remedy

Based on the performance of the amended remedy alternative against the nine evaluation criteria previously discussed and the data collection and analysis conducted subsequent to the groundwater extraction/treatment system shutdown, WDNR and EPA believe that the Amended Remedy as described in this ROD Amendment is the most appropriate remedy for the Onalaska Municipal Landfill Superfund site. When comparing both of the remedial options – keeping the pumping and treatment system activated versus using an MNA remedy – both are protective of human health and the environment and comply with ARARs. However, WDNR and EPA have determined that the MNA remedy provides the best balance of trade-offs in terms of the five balancing criteria. The pump and treat components of the Original Remedy are no longer cost-effective or necessary because the plume remains stable and MNA occurs naturally without the assistance of the pump-and-treat system. The MNA remedy satisfies the criteria for long-term effectiveness by continuing to degrade VOCs by MNA over time so that there are no long-term risks to human health and the environment. Therefore, WDNR and EPA are changing the original 1990 remedy for the OML site from extraction and treatment of VOC-contaminated groundwater to MNA. This ROD Amendment also designates general compliance with NR 140 as the applicable groundwater cleanup standard for human health and welfare. Finally, this ROD Amendment requires replacement of the two contaminated water-supply wells as an interim remedy for inorganics in groundwater.

Additional details regarding the Amended Remedy are provided below.

The Use of Monitored Natural Attenuation for VOCs

The results of post-shutdown groundwater monitoring support the permanent shutdown of the groundwater pump and treatment system and designation of MNA as a final remedy for VOCs in

groundwater. The Town of Onalaska will be allowed to take permanent possession of the building that housed the system, and all groundwater extraction and treatment system equipment will be decommissioned.

WDNR is currently conducting long-term groundwater monitoring for VOCs under a January 2002 State Superfund Contract (SSC) between EPA and WDNR. The SSC provides for performance of the long-term remedial action phase and operation and maintenance of the groundwater system at the site. If necessary, the SSC will be amended to update the terms and conditions of the agreement, as agreed by WDNR and EPA. Actual performance of the MNA remedy will be carefully monitored in accordance with the SSC. The groundwater monitoring program will be updated and revised to continue monitoring the plume behavior under MNA to ensure that any potential migration of contamination will be detected and to assess the fate of the remaining contaminants. If monitoring data indicate an increase in contaminant levels, WDNR and EPA will reconsider the remedy decision, as discussed below under "Contingencies."

Revised Groundwater Cleanup Standards

NR 140 Groundwater Quality ESs and MCLs will be used to monitor and determine compliance with groundwater quality at the site for all existing and new COCs. In the 1990 ROD, PALs were identified as the groundwater cleanup standards beyond the DMZ boundary; however, in terms of state requirements, general compliance with NR 140 is the applicable groundwater cleanup standard for the site. Table 1 below shows all current COCs, including those identified by the 1990 ROD as well as by post-ROD sampling at the site. Table 1 also shows the original cleanup standard for each COC as described in the 1990 ROD, as well as the current cleanup standard selected by this ROD Amendment. As noted earlier, the more stringent of the state ES or the federal MCL is the standard; this is indicated by the bold values in the last two columns of Table 1.

Because it may be appropriate at some point in the future to calculate WACLs, and because the assumption is questionable that MW-1SR is consistently up-gradient and adequately represents background conditions, sampling will resume at monitoring well MW-7M and/or other inactive site wells in order to assess the potential for better representation of background conditions. Attachment 2 to this ROD Amendment is the current groundwater monitoring plan for MNA that details the associated wells, parameters and timeline of sampling for the OML site. The MNA monitoring plan may be revised after issuance of this ROD Amendment based upon any additional data that is gathered during a scheduled sampling event.

Table 1: Revised COCs and associated cleanup standards

Contaminant	Original Cleanup Standard in 1990 ROD (ppb)	Current NR 140 ES (ppb)	Current MCL (ppb)
Benzene	0.067	5	**5**
Toluene	68.6	**800**	1000
Xylenes (total)	124	**2000**	10,000
1,1-dichloroethane (1,1 DCA)	0.04	**850**	None
Lead	5	15	**15**
Arsenic[1]	5	10	**10**
Barium[1]	200	2000	**2000**
Ethylbenzene	272	700	**700**
1,1,1-Trichloroethane	40	200	**200**
1,1-Dichloroethene	0.024	7	**7**
Trichloroethene	0.18	5	**5**
Manganese	X	**300**	None
Naphthalene	X	**100**	None
Trimethylbenzenes (total)	X	**480**	None
Iron (public welfare)	X	**300**	None

[1] Naturally-occurring background levels at the site may be higher than these standards.
X – No standard in 1990 ROD because not considered a COC at that time.
Bold values in last two columns are the cleanup standards for the site.

Private Well Replacement for Inorganics in Groundwater

Because manganese concentrations exceed recently-promulgated Wisconsin groundwater quality standards in two private wells and concentrations approaching the ES for arsenic have also been measured, replacement of these two water-supply wells is designated as an interim remedy for inorganics in groundwater. Each of the private water-supply wells will be replaced at a depth and location to be determined under the advisement of WDNR and EPA personnel with expertise in optimizing the siting of water-supply wells in the site locality. Siting of the wells will be conducted in a fashion that minimizes concentrations of naturally-occurring inorganic compounds in the wells.

The WDNR is currently conducting long-term groundwater monitoring for inorganics under the January 2002 SSC between EPA and WDNR, which provides for performance of the long-term remedial action phase, and operation and maintenance of the groundwater system at the site. Groundwater monitoring that has been conducted following shutdown of the groundwater system confirms that reducing conditions, typically observed down-gradient of landfills, are present at the OML site. Reducing conditions in the vicinity of the landfill appear to exacerbate the solubility and persistence of inorganics in site groundwater. Long-term groundwater monitoring

for inorganics will continue, and EPA and WDNR will evaluate whether additional actions need to be taken to address inorganics in groundwater.

Contingencies

One or more of the following observations could lead to reconsideration of the Amended Remedy, if confirmed by four or more rounds of sampling:

- Concentrations in groundwater showing increasing trends for any of the original VOCs listed under the 1990 ROD or for TMB (recognizing that there will likely be seasonable spikes in concentrations), indicating that other sources may be present, or
- The contaminant plume increases significantly in areal or vertical extent and/or volume. This would be noted by ES exceedances outside the DMZ during routine sampling of monitoring wells.

If significant and unforeseeable changes in the pattern and distribution of VOCs occur during the implementation of this Amended Remedy which result in further ES exceedances outside the boundaries of the DMZ, WDNR and/or EPA may collect additional soil data in the area of naphtha solvent disposal southwest of the landfill (near well nest MW-16) to determine whether there is soil outside the delineated waste boundaries that may be acting as an ongoing source of contamination to groundwater. If a source area in soil is found, it will be evaluated for possible further remediation. Monitoring wells MW-6S, MW-6M, MW-8S, and MW-8M will be considered key sentinel wells for purposes of detecting plume expansion.

If the current monitoring well network is found to be insufficient to demonstrate containment of the aqueous metals plume through adsorption reactions within a reasonable distance from the DMZ boundary, WDNR and/or EPA may contract for installation of additional monitoring wells outside the current monitoring well network. Under the long-term groundwater monitoring currently being conducted at the site, concentrations are continually assessed for compliance with applicable or relevant and appropriate standards upon receipt of periodic groundwater monitoring reports. If and when monitoring data from MW-7M or other site monitoring wells are found to be appropriate for accurately representing background conditions, WACLs may be calculated.

Remedial Action Objectives

EPA's *Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites* and the NCP define Remedial Action Objectives as medium-specific or site-specific cleanup standards for protecting human health and the environment that are established on the basis of the nature and extent of the contamination, the resources that are currently and potentially threatened, and the potential for human and environmental exposure.

The ultimate RAO for the groundwater portion of this remedial action, and specifically for VOCs, is to restore contaminated groundwater to its anticipated beneficial uses. Based on

information obtained during the RI and a careful analysis of all remedial alternatives, WDNR and EPA believe that the Amended Remedy will achieve compliance with all cleanup levels, including MCLs and NR 140, within a reasonable period of time, while continuing beneficial use of the aquifer as a source of drinking water. As stated above, calculations of mass flux through the source area, as compared to estimates of total mass present, show that concentrations of TMBs in the source area should reach the ES within approximately 54 years. Note that this estimate pertains only to VOCs in the groundwater and does not pertain to the inorganics remaining on site. Metals in groundwater will be evaluated separately and addressed, if necessary, in a future decision document.

Because the highest levels of contaminants are limited to the upper 50 to 70 feet of this aquifer, the historical and current use of the aquifer as a source of drinking water from deep wells can continue, provided that nearby private water-supply wells are optimally placed and regularly monitored. Cleanup levels for each groundwater COC are shown above in Table 1. Although the estimated time for natural processes to attain remediation objectives is longer than that required for alternatives using pump and treat, the estimated time frame is reasonable and the need for water from this aquifer for use as a source of drinking water is currently met by the Amended Remedy.

Because compliance with ICs is necessary to assure the protectiveness of the selected remedy, planning for long-term stewardship is required. Long-term stewardship will ensure effective ICs are maintained and monitored and that the selected remedy functions as intended with regard to ICs. This will include placing a long-term IC on the landfill property itself. If additional ICs are found to be needed at the site, an appropriate decision document will be executed in the future.

6. Support Agency Comments

EPA supports this fundamental change at the site and is co-signing this ROD Amendment with WDNR.

7. Statutory Determinations

The Amended Remedy satisfies the requirements of CERCLA §121 and the NCP, which are to 1) protect human health and the environment, 2) comply with ARARs, 3) be cost-effective, and 4) utilize permanent solutions and alternate treatment technologies to the maximum extent practicable. The following sections discuss how the Amended Remedy meets these statutory requirements.

In addition to the four statutory mandates listed above, CERCLA includes a preference for remedies that employ treatment technologies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element of the remedy and a bias against off-site disposal of untreated wastes. The Amended Remedy does not employ treatment as a principal element because it is not practicable to do so for the waste remaining at the site. Appropriate treatment technologies were employed as part of the remedial action already

implemented under the 1990 ROD.

Protection of Human Health and the Environment

The treatment actions already completed under the original 1990 ROD and 1991 SSC have greatly mitigated threats posed by VOC-contaminated landfill wastes since this waste was treated both by pumping and treating the contaminated groundwater and by the air injection system. The current extent of the groundwater plume is stable and evidence of the effectiveness of natural attenuation has been demonstrated by recent studies. The MNA remedy selected in this ROD Amendment will protect human health and the environment through natural attenuation processes that can effectively reduce VOC contamination in the groundwater plume.

Current human exposures to the inorganic contaminants found in current residential water-supply wells will be addressed by replacing the wells with new wells advanced into deeper, uncontaminated groundwater. The interim remedy selected in this ROD Amendment for inorganic contamination in groundwater will therefore protect human health and the environment.

Compliance with Applicable or Relevant and Appropriate Requirements

The MNA remedy will comply with federal ARARs, and state ARARs where more stringent. The ARARs are described below and are listed in Table 2.

Chemical/Medium-specific ARARS: Chemical/medium-specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. Chemical/medium-specific ARARs typically determine the extent of cleanup at a site.

Federal ARARs for Groundwater: At the Onalaska site, MCLs and MCLGs are not applicable, but are relevant and appropriate, since the sand and gravel aquifer is a Class IIA source which could potentially be used for drinking in the area of concern (the contaminant plume). MCLGs are relevant and appropriate when the standard is set at a level greater than zero (for non-carcinogens), otherwise, MCLs are relevant and appropriate. The point of compliance for federal drinking water standards is at the boundary of the landfilled wastes.

State ARARs for Groundwater: The state ESs are ARARs at the OML site where MCLs do not exist for a given COC or where the ES is more stringent than the MCL. The ES and the MCL are numerically equivalent for several COCs at the OML site, making the MCL the ARAR. Table 1 of this ROD Amendment contains the cleanup standards for the groundwater COCs at the site.

The point of standards application for compliance with the ES under NR 140 is either the property boundary or the DMZ boundary, whichever is closer to the waste boundary for the facility. As described in NR 140, the applicable DMZ for this facility extends horizontally beyond the limits of waste to a distance of 300

feet. NR 140 specifies that an ES exceedance within the DMZ is treated as a PAL exceedance, and the responses in Table 5 of NR 140 apply.

Location-specific ARARS: Location-specific ARARs are requirements that relate to the geographical position of the site. State and federal laws and regulations that apply to the protection of wetlands, construction in floodplains, and protection of endangered species in streams or rivers are examples of location-specific ARARs. The state location-specific ARARs identified in the original 1990 ROD continue to apply to the Amended Remedy selected in this ROD Amendment.

Action-specific ARARs: Action-specific ARARs define acceptable treatment and disposal procedures for hazardous substances. Action-specific ARARs regulate the specific type of action or technology under consideration, or the management of regulated materials. The state action-specific ARARs identified in the original 1990 ROD continue to apply to the Amended Remedy selected in this ROD Amendment.

Cost-Effectiveness

In EPA's judgment, the Amended Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)).

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

WDNR and EPA have determined that the MNA remedy represents the maximum extent to which permanent solutions can be utilized in a practicable manner at the site.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory five-year reviews are required. Five-year reviews were conducted in 1998, 2003, and 2008 subsequent to the initiation of the remedial action in 1994. The next five-year review is scheduled to be completed in 2013.

8. Summary of Significant Changes

The Proposed Plan for the OML site was released for public comment in April 2012. The Proposed Plan identified MNA and replacement of two private water supply wells as the preferred amended remedy alternative for the site, and also described the change in cleanup standards from PALs to ESs. No significant changes to the amended remedy alternative, as identified in the Proposed Plan, were necessary or appropriate. This ROD Amendment did add clarifying language, however, regarding groundwater cleanup standards and the interplay between federal MCLs and state ESs.

9. Public Participation Compliance

The public participation requirements in the NCP at 40 C.F.R. § 300.435(c)(2)(ii) and CERCLA Section 117(c) were conducted. Under CERCLA Section 117(c), 42 U.S.C. § 9617(c), and the NCP, 40 C.F.R. § 300.435(c)(2)(ii), if EPA proposes to fundamentally alter the basic features of the selected remedy with respect to scope, performance, or cost, then EPA is required to publish the proposed amendment and provide an opportunity for public comment. In this case, the decision by WDNR and EPA to modify the remedy for this site fundamentally alters the basic features of the remedy previously selected, and that action necessitates the issuance of this ROD Amendment.

Accordingly, EPA and WDNR issued a Proposed Plan on April 23, 2012, soliciting comments on the proposed ROD Amendment. Before release of the plan, a Notice of Availability of the Proposed Plan was published in the La Crosse Tribune, a local paper of general circulation. The Notice of Availability also provided the opportunity for the public to request a public meeting; no such request was received. The 30-day comment period ended on May 23, 2012. No comments were received during the comment period.

▪ PART III: RESPONSIVENESS SUMMARY

No comments on the proposed change to the remedy were received during the 30-day comment period. Therefore there are no responses in this section.

TABLE 2

ARAR TABLES

TABLE 2
Federal Chemical-Specific ARARS
Onalaska Municipal Landfill

STANDARD, REQUIREMENTS, CRITERIA, OR LIMITATION	CITATION	DESCRIPTION
National Primary Drinking Water Standards	40 C.F.R. Part141	Establishes health based standards for public water systems (MCLs)
National Secondary Drinking Water Standards	40 C.F.R. Part 43	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels)
Identification and Listing of Hazardous Waste	40 C.F.R. Part 261	Defines those solid wastes which are subject to regulation as hazardous waste s under 40 C.F.R. parts 262-265 and Parts 124, 270, 271.
National Ambient Air Quality Standards	40 C.F.R. Part 50	Establishes primary (health based) and secondary (welfare based) standards for air
National Emission Standards for Hazardous Pollutants	40 C.F.R. Part 61	Establishes emission levels for certain hazardous air pollutants.

Table 2

State Chemical-Specific ARARs

Onalaska Municipal Landfill

STANDARD, REQUIREMENTS, CRITERIA, OR LIMITATION	CITATION	DESCRIPTION

Table 2
Federal Location-Specific ARARs
Onalaska Municipal Landfill

STANDARD, REQUIREMENTS, CRITERIA, OR LIMITATION	CITATION	DESCRIPTION
Protection Of Wetlands	Exec. Order No. 11,990 40 C.F.R. 6.302(a) and Appendix A	Requires Federal agencies to evaluate the potential effects of actions they may take in a flood plain to avoid the adverse impacts associated with direct and indirect development of a floodplain.
Floodplain Management	Exec. Order No. 11,908 40 C.P.R. 6.302(b) and Appendix A	Requires Federal agencies to evaluate the potential effects of actions they make take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain.

Table 2

State Location-Specific ARARs

Onalaska Municipal Landfill

STANDARD, REQUIREMENTS, CRITERIA, OR LIMITATION	CITATION	DESCRIPTION

Table 2
Federal Action-Specific ARARs
Onalaska Municipal Landfill

STANDARD, REQUIREMENTS, CRITERIA, OR LIMITATION	CITATION	DESCRIPTION
Solid Waste Disposal Act	42 U.S.C. 6901-6987	Regulates the disposal of non-hazardous material.

Table 2

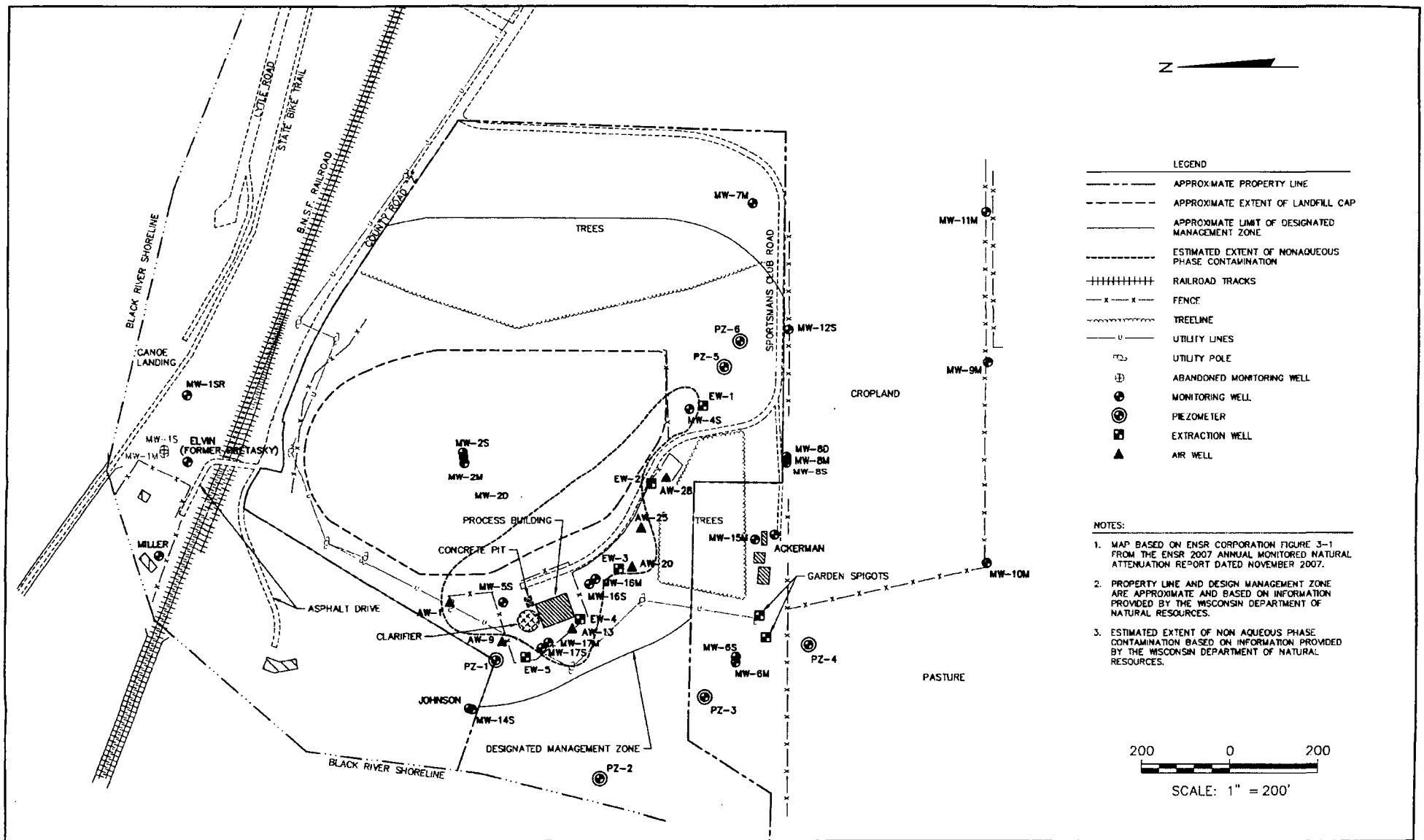
State Action-Specific ARARs

Onalaska Municipal Landfill

STANDARD, REQUIREMENTS, CRITERIA, OR LIMITATION	CITATION	DESCRIPTION

FIGURE 1

SITE MAP



PROJECT NO.	25211605.00	DRAWN BY:	SAS	ENGINEER	SCS BT SQUARED 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT		SITE	ONALASKA LANDFILL ONALASKA, WISCONSIN	SITE PLAN	FIGURE 1
DRAWN:	02/01/12	CHECKED BY:	RL								
REVISED:	02/02/12	APPROVED BY:	RL 02/02/12								

E:\25211605\Drawings-Onalaska\ONALZ Site.dwg, 2/2/2012 11:12:52 AM

FIGURE 2

TRIMETHYLBENZENE TREND GRAPH

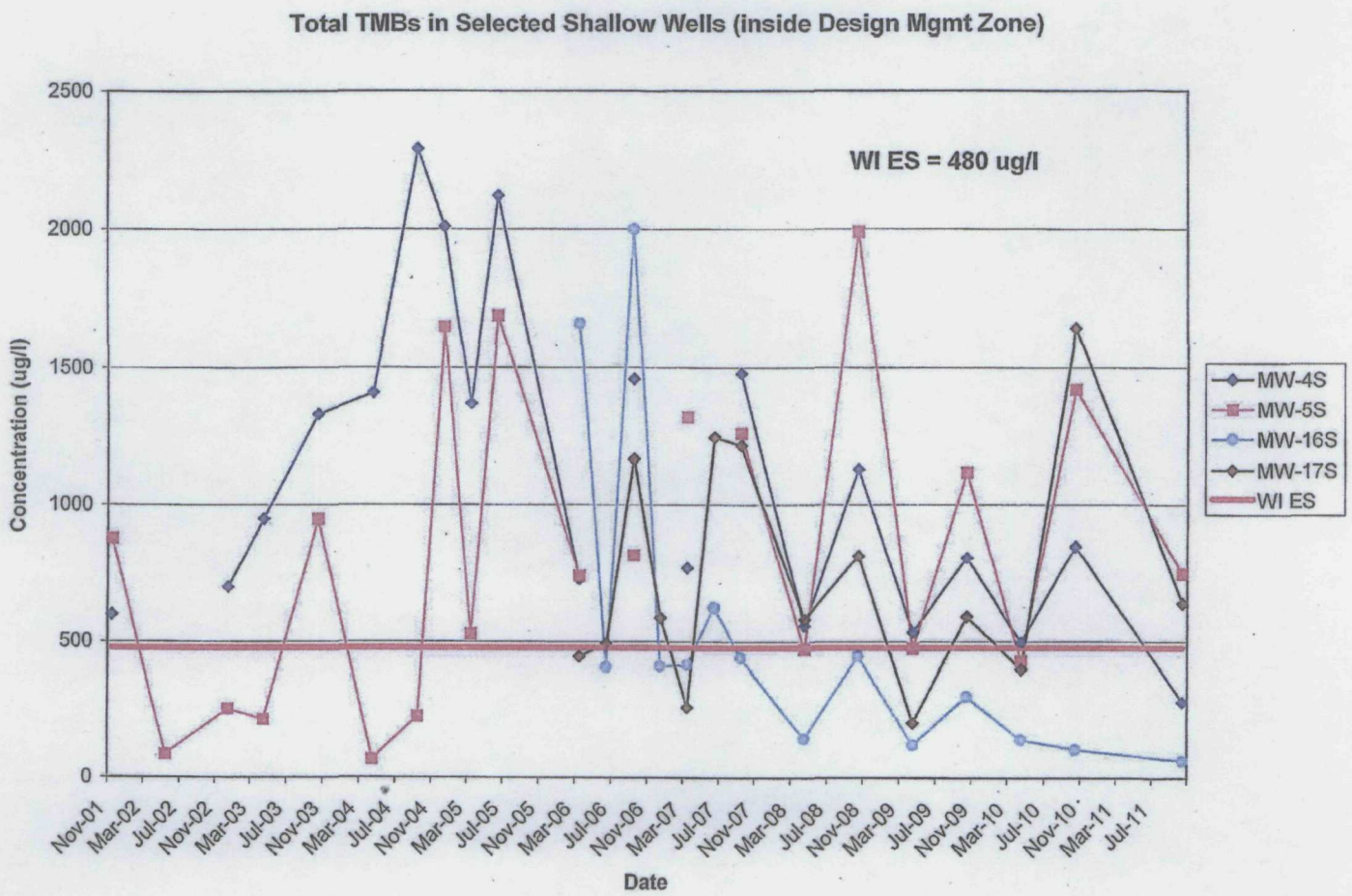
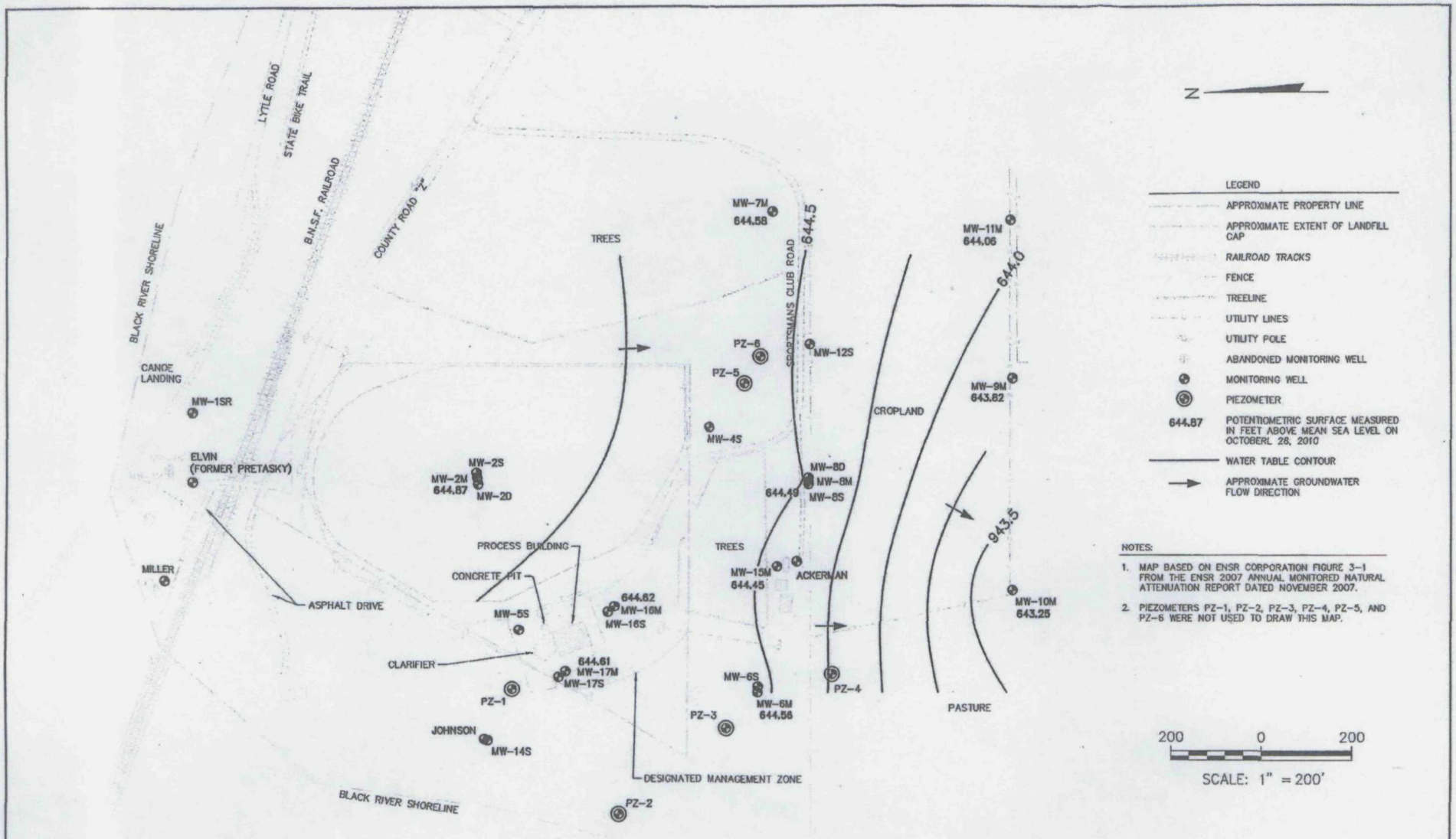

Total TMBs in Selected Shallow Wells (inside Design Mgmt Zone)
WI ES = 480 ug/l
Concentration (ug/l)
2500
2000
1500
1000
500
0
Nov-01
Mar-02
Jul-02
Nov-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Nov-06
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Jul-09
Nov-09
Mar-10
Jul-10
Nov-10
Mar-11
Jul-11
Date
MW-4S
MW-5S
MW-16S
MW-17S
WI ES

FIGURE 2

FIGURE 3

GROUNDWATER FLOW MAP



PROJECT NO.	3550	DRAWN BY:	KP
DRAWN:	12/10/10	CHECKED BY:	RL
REVISED:	12/13/10	APPROVED BY:	SS

ENGINEER: BT SQUARED
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CLIENT:

SITE: ONALASKA LANDFILL
ONALASKA, WISCONSIN

POTENTIOMETRIC SURFACE MAP

FIGURE 3

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ATTACHMENT 1

MASS FLUX METHOD MODELING

ATTACHMENT 1

Mass Flux Method

Mass Flux = $K^*i^*A^*C_o$

where: Mass Flux = mass movement from source into groundwater (M/T)
K = hydraulic conductivity (L/T)
$\Delta h \div \Delta l$ = hydraulic gradient
A = cross-sectional area of groundwater flow through source, (L^2)
C_o = concentration in groundwater at the source area, (M/L^3)

Mass flux, divided into total soluble mass in the source area, will give an estimate of source lifetime:

$$\textit{Source Lifetime} = \frac{M_s + M_{sz} + M_{gw}}{\textit{Mass flux}}$$

where: M_s = soluble mass in soil in source area
M_{sz} = soluble mass in smear zone in source area
M_{gw} = soluble mass in dissolved phase in source area

Assumptions:

1. All soluble contaminant mass in unsaturated soils leaches into saturated zone.
2. Cross sectional area of groundwater flow is equal to the depth of the contaminated saturated zone (smear zone below the water table) and groundwater contaminated source area multiplied by the width of the source area perpendicular to groundwater flow. Water table fluctuation is not taken into account.
3. Hydraulic conductivity measured in source area represents actual permeability of smear zone. Trapped residual product can reduce permeability by 20 to 70 percent.
4. Contaminant concentration in groundwater (C_o) in the source area is the highest concentration measured within the source area.
5. No retardation.

K (conductivity, cm/s)	0.039 *cm/s*	33.70 *m/d*
i (gradient, dh/dl)	0.0006 *unitless*	
A* (area, $m^{2)}$	822 m^2	
C_o (concentration, ug/l)	1,600 *ug/l*	1.6 g/m^3
Mass Flux out of Source Area:	26.6 *g/d*	0.027 *Kg/d*
Total Mass in Source Area^:	520 *Kg*	
Source Lifetime:	19556.09 *d*	**54** *y*

*Depth of source area estimated at 6 m; width of source area perpendicular to gw flow estimated at 137 m
^Total mass in source area from Final Remedial Investigation Report [1989]

Mass Flux Method from WDNR Guidance on Natural Attenuation for Petroleum Releases, App. B-4

ATTACHMENT 2

CURRENT GROUNDWATER MONITORING PLAN

Groundwater Sampling Schedule – Onalaska Landfill

Sampling frequencies and wells to be sampled for VOCs, metals, and field parameters are:

April & Oct.:	MW-4S, MW-5S, MW-16S, MW-17S
April:	AW-13, AW-28, MW-1SR, MW-2S, MW-2M, MW-6S, MW-6M, MW-7M, MW-8S, MW-8M, MW-9M, MW-10M, MW-11M, MW-14S, MW-15M, MW-16M, MW-17M, PZ-1, PZ-2, PZ-3, PZ-4, PZ-5.

Samples for metals analysis shall be field filtered. Laboratory natural attenuation parameters of alkalinity and chloride shall be analyzed during April round of sampling only. Dissolved gasses, nitrate, sulfate and total organic carbon are not required. Field natural attenuation parameters (ORP, dissolved oxygen, pH, specific conductance, and temperature) shall be measured in monitoring wells from which chemical samples are scheduled to be collected using a down-hole instrument or a flow-through cell. Groundwater elevations are to be collected in April and October at all the above listed wells, plus MW-12S and PZ-6. A duplicate, trip blank, and MS/MSD sample should be collected for each event.

Four nearby private water supply wells [Ackerman, Miller, Elvin (formerly Pretasky), and Johnson] shall be sampled during April round of sampling for VOCs and metals only. Ensure accessibility of Ackerman well before conducting sampling (may need to delay to late April or early May). The contractor will be responsible for access arrangements.

Reporting shall include:

- Tables summarizing laboratory results by well
- Groundwater elevation results, including a table summarizing groundwater elevations from each monitoring event
- Groundwater table contour maps from each monitoring event based on interpolation of groundwater elevations at monitoring locations. "S" and "PZ" wells are to be used to contour the water table. Only "M" wells are to be used to contour the medium depth potentiometric surface.
- Submission of Environmental Monitoring Data Certification Reports to WDNR. Please see WDNR Waste and Materials Management program guidance on submittal of environmental data for landfills. The notification of exceedances need only list substances with exceedances – no discussion is needed, as there is already a documented release.
- Full data validation on 10% of samples collected

Onalaska Municipal Landfill Superfund Site

Water Sample Collection & Analytical Requirements

Analysis	Method	Container	Preservation & Storage	Maximum Holding Time
Volatile Organic Compounds	GC/MS SW846 8260B	Three 40 mL vials	HCL to pH < or = 2, 4°C	14 Days
Metals Arsenic Barium Iron Lead Manganese Cadmium Cobalt Mercury Vanadium	SW846 6010B	250 mL bottles	HNO_3 to pH < or = 2	180 Days
Chloride	EPA 300.0	250 mL polyethylene bottles	4°C	28 Days
Alkalinity	EPA 310.1	100 mL polyethylene bottles	4°C	14 Days

Onalaska Landfill
2011-2012 Sampling Plan Modifications

Well	2010	Proposed 2011-2012	Rationale
MW-1S	Abandoned		
MW-1M	Abandoned		
MW-1SR	Annual	Annual	Up-gradient, provides potential background data.
MW-2S	Not sampled	One round at 5-yr. interval (April 2012)	Not sampled since 2007.
MW-2M	Not sampled	One round at 5-yr. interval (April 2012)	Not sampled since 2007.
MW-3 nest	Abandoned	Abandoned	Abandoned during RA construction
MW-4S	Semi-Annual	Semi-Annual	Near south perimeter of waste. Seasonally variable trimethylbenzene (TMB) concentrations. Mn exceedances.
MW-5S	Semi-Annual	Semi-Annual	Near west perimeter of waste. Seasonally variable TMB concentrations. Metals exceedances.
MW-6S	Annual	Annual	440' southwest of waste perimeter. Mn exceedances. Sentinel for plume expansion.
MW-6M	Semi-Annual	Annual	440' southwest of waste perimeter. Metals exceedances. Sentinel for plume expansion.
MW-7M	Not sampled	Annual	350' southeast of waste. No historic detects. Sample for potential background data.
MW-8S	Annual	Annual	310' south of waste and 260' south of MW-4S. Mn exceedances. Sentinel for plume expansion.
MW-8M	Semi-Annual	Annual	310' south of waste and 260' south of MW-4S. Mn exceedances. Sentinel for plume expansion.
MW-9M	Not sampled	Annual	730' south of waste. Sampled during RI. Mn exceedances.
MW-10M	Not sampled	Annual	800' SSW of waste. Mn exceedances. Downgradient compliance point for WI NR 140.
MW-11M	Not sampled	Annual	800' SSE of waste. Sampled during RI. Mn exceedances.
MW-12S	Not sampled	Water levels only	305' south of waste. No exceedances.
MW-14S	Annual	Annual	310' west of waste. Mn exceedances. Downgradient compliance point for WI NR 140.
MW-15M	Annual	Annual	350' south of waste. Mn exceedances.
MW-16S	Semi-Annual	Semi-Annual	90' west of waste. Metals exceedances. High Mn concentrations.
MW-16M	Semi-Annual	Annual	90' west of waste. Metals exceedances.

MW-17S	Semi-Annual	Semi-Annual	200' west of waste. Seasonally variable TMB concentrations. Metals exceedances.
MW-17M	Annual	Annual	200' west of waste. Mn exceedances.
PZ-1	Annual	Annual	175' west of waste. 130' down-gradient of MW-5S. Mn exceedances.
PZ-2	Annual	Annual	400' WSW of waste. 300' down-gradient of MW-17 nest. Mn exceedances.
PZ-3	Annual	Annual	440' SW of waste. 350' down-gradient of MW-16 nest. Mn exceedances.
PZ-4	Not sampled	Annual	540' SW of waste. 260' down-gradient of MW15M. Not sampled since 2005. Mn exceedances.
PZ-5	Not sampled	One round at 5-yr. interval (April 2012).	130' south of SE corner of waste. Not sampled since 2007. Mn exceedances.
PZ-6	Not sampled	Water levels only	175' SE of SE corner of waste. Retain for possible future sampling.
AW-1	Not sampled	Not to be sampled	Former air injection well –only 1' into water table.
AW-9	Not sampled	Not to be sampled	Former air injection well – only 1' into water table. Data from MW-5S and PZ-1 provide better assessment of groundwater quality in this area.
AW-13	Not sampled	Annual	Former air injection well – only 1' into water table. Not sampled since 2007. High and variable Mn concentrations.
AW-20	Not sampled	Not to be sampled	Former air injection well – only 1' into water table. MW-16 nest provides better data for this area.
AW-25	Not sampled	Not to be sampled	Former air injection well – only 1' into water table.
AW-28	Annual	Annual	Former air injection well – only 1' into water table. No other data point in area. Mn exceedances.
EW-2, EW-3, EW-4, & EW-5	Not sampled	Not to be sampled	30' screen remediation wells. Retain for possible future sampling.
Ackerman, Johnson, Miller, & Pretasky private supply wells	Annual	Annual	Purpose of sampling to assure protectiveness. Mn exceedances at Miller and Elvin (formerly Pretasky) wells. Ackerman well 300' deep. Johnson well is side-gradient of unknown construction. There is at least one sentinel well between the site and the Johnson well.

ATTACHMENT 3

ADMINISTRATIVE RECORD INDEX

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
ONALASKA MUNICIPAL LANDFILL SITE
ONALASKA, LACROSSE COUNTY, WISCONSIN

UPDATE #5
AUGUST 20, 2012

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	01/19/09	Smith, S. & R. Langdon, SCS BT Squared	Willkom, M., WDNR	Letter re: October 2008 Groundwater Monitoring Report for the Onalaska Landfill Superfund Site	
2	07/14/09	Smith, S. & R. Langdon, SCS BT Squared	Willkom, M., WDNR	Letter re: April 2009 Groundwater Monitoring Report for the Onalaska Landfill Superfund Site	
3	12/31/09	Smith, S. & R. Langdon, SCS BT Squared	Willkom, M., WDNR	Letter re: October 2009 Groundwater Monitoring Report for the Onalaska Landfill Superfund Site	
4	06/09/10	Bradshaw, D., Braun Intertec Corporation	Paudler, D., Town of Onalaska	Letter re: June 2010 Onalaska Landfill Gas Monitoring	
5	07/01/10	Smith, S. & R. Langdon, SCS BT Squared	Willkom, M., WDNR	Letter re: April 2011 Groundwater Monitoring Report for the Onalaska Landfill Superfund Site	
6	10/04/10	Bradshaw, D., Braun Intertec Corporation	Paudler, D., Town of Onalaska	Letter re: September 2010 Onalaska Landfill Gas Monitoring	
7	12/14/10	Bradshaw, D., Braun Intertec Corporation	Paudler, D., Town of Onalaska	Letter re: December 2010 Onalaska Landfill Gas Monitoring	
8	01/07/11	Smith, S. & R. Langdon, SCS BT Squared	Willkom, M., WDNR	Letter re: October 2010 Groundwater Monitoring Report for the Onalaska Landfill Superfund Site	
9	04/04/11	Bradshaw, D., Braun Intertec Corporation	Paudler, D., Town of Onalaska	Letter re: March-April 2011 Onalaska Landfill Gas Monitoring	
10	12/21/11	Smith, S. & R. Langdon, SCS BT Squared	Willkom, M., WDNR	Letter re: October 2011 Groundwater Monitoring Report for the Onalaska Landfill Superfund Site	
11	04/00/12	U.S. EPA	Public	Fact Sheet: Proposed Plan for the Onalaska Municipal Landfill Site	

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
12	06/26/12	Willkom, M., WDNR	Collier, D., U.S. EPA	Letter re: Notification of Five-Year Review Start for the Onalaska Municipal Landfill Site	