UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WISCONSIN

UNITED STATES OF AMERICA and THE STATE OF WISCONSIN,	:	
Plaintiffs,	:	
	:	Civil Action No. _____
v.	:	
NORTHERN STATES POWER COMPANY,	:	
Defendant.	:	

CONSENT DECREE BETWEEN THE UNITED STATES, WISCONSIN, NORTHERN STATES POWER COMPANY, AND THE BAD RIVER AND RED CLIFF BANDS OF THE LAKE SUPERIOR TRIBE OF CHIPPEWA INDIANS

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I. BACKGROUND

A. The United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA") and the Secretaries of the United States Department of the Interior ("DOI") and the United States Department of Commerce ("DOC"), and the State of Wisconsin (the "State"), at the request of the Governor of Wisconsin on behalf of the Wisconsin Department of Natural Resources ("WDNR"), filed a complaint in this matter pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606, 9607.

B. The United States and the State in their complaint seek, *inter alia*: (1) reimbursement of costs incurred by EPA and the U.S. Department of Justice ("DOJ") for response actions at the Ashland/Northern States Power Lakefront Site ("Site") in Ashland, Wisconsin, together with accrued interest; (2) performance of response actions by Northern States Power Company, a Wisconsin Corporation ("Settling Defendant") at the Site consistent with the National Contingency Plan, 40 C.F.R. Part 300 (as amended) ("NCP"); and (3) recovery of Natural Resource Damages.

C. In accordance with the NCP and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of negotiations with potentially responsible parties ("PRPs") regarding the implementation of the remedial design and remedial action for the Site, and the State has participated in such negotiations and elected to be a party to this Consent Decree.

D. Pursuant to Executive Order 12580 and the National Contingency Plan, 40 C.F.R. Part 300, the President has delegated authority to act as Federal Trustees for Natural Resources at and near the Site to DOI, as represented by the United States Fish and Wildlife Service, and DOC, as represented by the National Oceanic and Atmospheric Administration.

E. WDNR is a response agency and a State Trustee for Natural Resources at or near the Site.

F. The Bad River and Red Cliff Bands of the Lake Superior Tribe of Chippewa Indians (the "Tribes") are trustees for Natural Resources at or near the Site.

G. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the United States Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, WDNR, and the Tribes (collectively "Trustees") on March 28, 2011 of negotiations with PRPs regarding the release of hazardous substances that is alleged to have resulted in injury to Natural Resources under federal, State, and Tribal trusteeship and encouraged the Trustees to participate in the negotiation of this Consent Decree. The Trustees have participated in the negotiation of this Consent Decree with respect to Natural Resource Damages and support this Consent Decree.

H. The Settling Defendant does not admit any liability to Plaintiffs or the Tribes arising out of the transactions or occurrences alleged in the complaint, nor does it acknowledge that the release or threatened release of hazardous substances at or from the Site constitutes an imminent and substantial endangerment to the public health or welfare or the environment, nor any damage to Natural Resources. Settling Defendant does not admit, and reserves the right to controvert in subsequent proceedings, except as otherwise provided herein, the validity of any findings of fact, conclusions of law, or other determinations of this Consent Decree.

I. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List ("NPL"), set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 5, 2002, 67 Fed. Reg. 56757-56765.

J. In response to a release or a substantial threat of a release of a hazardous substance(s) at or from the Site, EPA and Settling Defendant commenced on November 14, 2003, a Remedial Investigation and Feasibility Study ("RI/FS") for the Site pursuant to 40 C.F.R. § 300.430 under an Administrative Order on Consent ("AOC").

K. Settling Defendant completed a Remedial Investigation ("RI") Report on February 5, 2008, and completed a Feasibility Study ("FS") Report on December 4, 2008. EPA issued a Notice of Completion for the AOC on December 13, 2010.

L. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the proposed plan for remedial action on June 1, 2009, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Director of the Superfund Division, EPA Region 5, based the selection of the response action.

M. Pursuant to Section 122(e) of CERCLA, 42 U.S.C. § 9622(e), EPA sent special notice letters to Settling Defendant, Wisconsin Central Ltd., Soo Line Railroad Co., and the City of Ashland, Wisconsin notifying them of their potential liability for the Site, and inviting them to participate in negotiations regarding cleanup of the Site. Wisconsin Central Ltd., Soo Line Railroad Co., and the City of Ashland are not parties to this Consent Decree, and have not otherwise resolved their respective liability at the Site, as of the Effective Date of this Consent Decree. The John Schroeder Lumber Company operated on the Site from approximately 1901 until sometime in the 1930s and is now defunct. Schroeder Lumber might be a potentially responsible party at the Site if still in existence.

N. The decision by EPA on the remedial action to be implemented at the Site is embodied in a final Record of Decision ("ROD"), executed on September 30, 2010, on which the State has given its concurrence. The ROD includes EPA's explanation for any significant differences between the final plan and the proposed plan as well as a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA, 42 U.S.C. § 9617(b).

O. The Site includes four inter-related areas of concern: 1) sediments in Chequamegon Bay; 2) soil and shallow groundwater in Kreher Park; 3) soil and shallow groundwater in the Upper Bluff/Filled Ravine; and 4) deep groundwater in the Copper Falls Aquifer. The remedial design and remedial action to be conducted pursuant to this Consent Decree pertains only to the selected remedy specified in the ROD for the soil and groundwater portions of the Site (items 2-4, above), and not to the sediments in Chequamegon Bay (item 1, above). The Parties agree that the remedy for the sediments in Chequamegon Bay will be addressed separately, and that this Consent Decree does not limit or otherwise affect any rights or defenses Plaintiffs or Settling Defendant may have with respect to Chequamegon Bay, except as set forth in this Consent Decree, such rights and defenses being otherwise fully retained.

P. This Consent Decree also fully and finally resolves any and all Natural Resource Damages recoverable by the United States, the State, or the Tribes from Settling Defendant for

injury to, destruction of, or loss of use or impairment of Natural Resources at the entire Site, including the portion of Chequamegon Bay within the Site, except as otherwise set forth in this Consent Decree.

Q. Based on the information presently available to EPA and the State, EPA and the State believe that the Work will be properly and promptly conducted by Settling Defendant if conducted in accordance with the requirements of this Consent Decree and its appendices.

R. Solely for the purposes of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), the remedial action set forth in the ROD and the Work to be performed by Settling Defendant shall constitute a response action taken or ordered by the President for which judicial review shall be limited to the administrative record.

S. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and implementation of this Consent Decree will expedite the cleanup of the Site and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over Settling Defendant. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendant waives all objections and defenses that it may have to jurisdiction of the Court or to venue in this District. Settling Defendant shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States, the State, the Tribes, and upon Settling Defendant and its successors and assigns. Any change in ownership or corporate status of Settling Defendant including, but not limited to, any transfer of assets or real or personal property, shall in no way alter Settling Defendant's responsibilities under this Consent Decree, except that Settling Defendant may require third parties to accept responsibility for some or all of its obligations under the Consent Decree. Unless the United States and the State agree otherwise in a Consent Decree modification filed with the Court, Settling Defendant shall remain responsible for all obligations under the Consent Decree, notwithstanding any agreement between Settling Defendant and any third party.

3. Settling Defendant shall provide a copy of this Consent Decree to each contractor hired to perform the Work required by this Consent Decree and to each person representing Settling Defendant with respect to the Work, and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Consent Decree. Settling Defendant or its contractors shall provide written notice of the Consent Decree to all subcontractors hired to perform any portion of the Work required by this Consent Decree.

Settling Defendant shall nonetheless be responsible for ensuring that its contractors and subcontractors perform the Work in accordance with the terms of this Consent Decree. With regard to the activities undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with Settling Defendant within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided in this Consent Decree, terms used in this Consent Decree that are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply solely for purposes of this Consent Decree:

a. "Ashland/Northern States Power Special Account" shall mean the special account, within the EPA Hazardous Substances Superfund, established for the Site (Site ID B5 N5) by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3).

b. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601-9675.

c. "Consent Decree" or "Decree" shall mean this Consent Decree and all appendices attached hereto (listed in Section XXX). In the event of conflict between this Consent Decree and any appendix, this Consent Decree shall control.

d. The term "day" shall mean a calendar day unless expressly stated to be a working day. The term "working day" shall mean a day other than a Saturday, Sunday, or federal holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next working day.

e. "Effective Date" shall be the date upon which this Consent Decree is entered by the Court as recorded on the Court docket, or, if the Court instead issues an order approving the Consent Decree, the date such order is recorded on the Court docket.

f. "EPA" shall mean the United States Environmental Protection Agency and its successor departments, agencies, or instrumentalities.

g. "Future Oversight Costs" shall mean that portion of Future Response Costs that EPA incurs in monitoring and supervising Settling Defendant's performance of the Work to determine whether such performance is consistent with the requirements of this Consent Decree, including costs incurred in reviewing plans, reports, and other deliverables submitted pursuant to this Consent Decree, WDNR costs billed to EPA by agreement between WDNR and EPA, and costs incurred in overseeing implementation of the Work; however, Future Oversight Costs do not include, *inter alia*: the costs incurred by the United States pursuant to Paragraph 9 (Notice to Successors-in-Title and Transfers of Real Property), Sections VII (Phase 1 Remedy Review), IX (Access and Institutional Controls), XV (Emergency Response), and Paragraph 48 (Funding for Work Takeover), or the costs incurred by the United States in enforcing the terms

of this Consent Decree, including all costs incurred in connection with Dispute Resolution pursuant to Section XXI (Dispute Resolution) and all litigation costs.

h. "Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing plans, reports, and other deliverables submitted pursuant to this Consent Decree, in overseeing implementation of the Work, in performing any aspects of the Work, or otherwise implementing, overseeing, or enforcing this Consent Decree, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Paragraph 9 (Notice to Successors-in-Title and Transfers of Real Property), Sections VII (Phase 1 Remedy Review), IX (Access and Institutional Controls) (including, but not limited to, the cost of attorney time and any monies paid to secure access and/or to secure, implement, monitor, maintain, or enforce Institutional Controls including, but not limited to, the amount of just compensation), XV (Emergency Response), Paragraph 48 (Funding for Work Takeover), Section XXXI (Community Involvement), and WDNR costs billed to EPA by agreement between WDNR and EPA.

i. "Institutional Controls" or "ICs" shall mean restrictions, limitations, or other conditions or action taken under state laws or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices to ensure that conditions at the Phase 1 Project Area, and the rest of the Site to the extent described in Paragraph 26(f), remain protective of public health, safety, and welfare and the environment, including, but not limited, to WIS. STAT. § 292.12, that may also: (a) limit land, water, and/or resource use to minimize the potential for human exposure to Waste Material at the Site; (b) limit land, water, and/or resource use to implement, ensure non-interference with, or ensure the protectiveness of the Phase 1 Remedial Action; (c) provide information intended to modify or guide human behavior at the Phase 1 Project Area, and the rest of the Site to the extent described in Paragraph 26(f); and/or (d) require easements or covenants running with the land that (i) limit land, water, or resource use and/or provide access rights and (ii) are created pursuant to common law or statutory law by an instrument that is recorded by the owner in the appropriate land records office (which has commonly been referred to as "Proprietary Controls" by EPA).

j. "Institutional Control Implementation and Assurance Plan" or "ICIAP" shall mean the plan for implementing, maintaining, monitoring, and reporting on the Institutional Controls set forth in the ROD, prepared in accordance with the statement of work ("SOW").

k. "Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

l. "National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

m. "Natural Resource" or "Natural Resources" means land, resident and anadromous fish, resident and migratory wildlife, biota, air, water, groundwater, sediments, wetlands, drinking water supplies, and other such resources, belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, the State, or the Tribes.

n. "Natural Resource Damages" means any damages recoverable by the United States or the State on behalf of the public, or by the Tribes, for injury to, destruction of, or loss or impairment of Natural Resources at the Site as a result of a release of hazardous substances, including but not limited to: (i) the costs of assessing such injury, destruction, or loss or impairment arising from or relating to such a release; (ii) the costs of restoration, rehabilitation, or replacement of injured or lost Natural Resources or of acquisition of equivalent resources; (iii) the costs of planning such restoration activities; (iv) compensation for injury, destruction, loss, impairment, diminution in value, or loss of use of Natural Resources; and (v) each of the categories of recoverable damages described in 43 C.F.R. § 11.15 and applicable state and tribal law.

o. "Operation and Maintenance" or "O&M" shall mean all activities required to maintain the effectiveness of the Phase 1 Remedial Action as required under the Operation and Maintenance Plan approved or developed by EPA pursuant to Section VI (Performance of the Work by Settling Defendant) and the SOW, and maintenance, monitoring, and enforcement of Institutional Controls as provided in the ICIAP.

p. "Paragraph" shall mean a portion of this Consent Decree identified by an Arabic numeral or an upper or lower case letter.

q. "Parties" shall mean the United States, the State, the Tribes, and Settling Defendant.

r. "Phase 1 Performance Standards" shall mean the cleanup standards for soil and groundwater in the Phase 1 Remedial Action, as set forth in the ROD, the SOW, and the design plans and specifications developed in accordance with the Phase 1 Remedial Design Work Plan and the Phase 1 Remedial Action Work Plan and approved by EPA. The Phase 1 Performance Standards for soil and groundwater shall be established to achieve: (i) the Remedial Action Objectives ("RAOs") described in Section 8.0 of the ROD; (ii) cleanup standards described in Section 12.8 of the ROD, including the table of Cleanup Standards for Soil and Groundwater on page 103 of the ROD (or their equivalent as allowed under ARARs); and (iii) any ARARs identified in Appendix C of the ROD and that are identified during the Phase 1 Remedial Design.

s. "Phase 1 Project Area" shall mean that area of the Site generally comprising Kreher Park; the Upper Bluff/Filled Ravine; and the Copper Falls Aquifer. The Phase 1 Project Area comprises the entire Site except for the portion of Chequamegon Bay within the Site boundary.

t. "Phase 1 Remedial Action" shall mean all activities Settling Defendant is required to perform under the Consent Decree to implement the ROD with respect to the Phase 1 Project Area and to implement the Phase 1 Remedial Action Work Plan to be developed under Paragraph 12 and the SOW, including implementation of Institutional Controls, until the Phase 1 Performance Standards are met, and excluding performance of the Remedial Design, O&M, and the activities required under Section XXVII (Retention of Records). The Phase 1 Remedial Action includes the entire remedy required by the ROD, except that it does not include the implementation of the ROD with respect to sediments in Chequamegon Bay.

u. "Phase 1 Remedial Action Work Plan" shall mean the document developed pursuant to Paragraph 12 (Phase 1 Remedial Action) and approved by EPA, after

consultation with WDNR, and any modifications thereto. WDNR may join EPA in approving the Phase 1 Remedial Action Work Plan.

v. "Phase 1 Remedial Design" shall mean those activities to be undertaken by Settling Defendant to develop the final plans and specifications for the Phase 1 Remedial Action pursuant to the Phase 1 Remedial Design Work Plan.

w. "Phase 1 Remedial Design Work Plan" shall mean the work plan for the design of the Phase 1 Remedial Action approved by EPA, after consultation with WDNR, and any modifications made in accordance with this Consent Decree.

x. "Plaintiffs" shall mean the United States and the State.

y. "RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901-6992 (also known as the Resource Conservation and Recovery Act).

z. "Record of Decision" or "ROD" shall mean the EPA Record of Decision relating to the Site signed on September 30, 2010 by the Director of the Superfund Division, EPA Region 5, and all attachments thereto. The ROD is attached as Appendix A.

aa. "Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

bb. "Settling Defendant" shall mean Northern States Power Company, a Wisconsin corporation.

cc. "Settling Defendant's Related Parties" shall mean: (i) all parents, subsidiaries, and affiliates of Settling Defendant (including, but not limited to, Xcel Energy, Inc., a Minnesota corporation; Xcel Energy Services, Inc., a Delaware corporation; Northern States Power Company, a Minnesota corporation; Southwestern Public Service Company, a New Mexico corporation; and Public Service Company of Colorado, a Colorado corporation), but only to the extent that the alleged liability of such person is based on the alleged liability of the Settling Defendant; and (ii) the former or current officers, directors, employees, general partners, limited partners, members, or shareholders of Settling Defendant and of any entity included in clause (i) of this Paragraph, but only to the extent that the alleged liability of such person is based on acts and/or omissions which occurred within the scope of the person's employment or capacity as an officer, director, employee, general partner, limited partner, member, or shareholder of the Settling Defendant or of any entity included in clause (i) of this Paragraph.

dd. "Site" shall mean the Ashland/Northern States Power Lakefront Site, located in the City of Ashland, Ashland County, Wisconsin, and depicted generally on the map attached as Appendix C. The Site includes both the Phase 1 Project Area and the area of Chequamegon Bay within the Site boundary (as illustrated in Appendix C).

ee. "State" shall mean the State of Wisconsin and each department, agency, and instrumentality of the State of Wisconsin, including WDNR.

ff. "Statement of Work" or "SOW" shall mean the statement of work for implementation of the Phase 1 Remedial Design, Phase 1 Remedial Action, and O&M at the Site, as set forth in Appendix B to this Consent Decree, and any modifications made in accordance with this Consent Decree.

gg. "Supervising Contractor" shall mean the principal contractor retained by Settling Defendant to supervise and direct the implementation of the Work under this Consent Decree.

hh. "Transfer" shall mean to sell, assign, convey, lease, mortgage, or grant a security interest in, or where used as a noun, a sale, assignment, conveyance, or other disposition of any interest by operation of law or otherwise.

ii. "Tribes" shall mean the Red Cliff Band of the Lake Superior Tribe of Chippewa Indians and the Bad River Band of the Lake Superior Tribe of Chippewa Indians.

jj. "Trustees" shall mean the United States Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, WDNR, and the Bad River and Red Cliff Bands of the Lake Superior Tribe of Chippewa Indians.

kk. "United States" shall mean the United States of America and each department, agency, and instrumentality of the United States, including EPA, DOI, DOC, the United States Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration.

ll. "Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C.§ 6903(27), or WIS. STAT. § 289.01(33); and (4) any "hazardous substance" under WIS. STAT. § 292.01(5).

mm. "WDNR" shall mean the Wisconsin Department of Natural Resources and its successor departments, agencies, or instrumentalities.

nn. "WDNR Database" shall mean the publically accessible database available on the internet as required by WIS. STAT. §§ 292.12, 292.31, and 292.57. The WDNR Database is accessible at http://dnr.wi.gov/org/aw/rr/brrts/index.htm

oo. "Work" shall mean all activities and obligations Settling Defendant is required to perform under this Consent Decree, except the activities required under Section XXVII (Retention of Records).

V. GENERAL PROVISIONS

5. Objectives of the Parties. The objectives of the Parties in entering into this Consent Decree are to protect public health or welfare or the environment by the design and implementation of response actions at the Phase 1 Project Area by Settling Defendant, to pay certain response costs incurred by Plaintiffs with respect to the Phase 1 Project Area, to provide compensation for Natural Resources Damages at the Site, and to resolve the claims of Plaintiffs and Tribes against Settling Defendant as provided in this Consent Decree.

6. Commitments by Settling Defendant. Settling Defendant shall finance and perform the Work in accordance with this Consent Decree, the ROD, the SOW, the Phase 1 Remedial Design Work Plan, and all work plans and other plans, standards, specifications, and schedules set forth in this Consent Decree or developed by Settling Defendant and approved by EPA (and WDNR, as applicable) pursuant to this Consent Decree. Settling Defendant shall pay the United States for Future Response Costs as provided in this Consent Decree and shall provide compensation for Natural Resource Damages as provided in this Consent Decree.

7. Compliance With Applicable Law. All activities undertaken by Settling Defendant pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal, state, and local laws, regulations, and ordinances. Settling Defendant must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD and the SOW. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be deemed to be consistent with the NCP.

8. Permits.

a. As provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and Section 300.400(e) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal, state, or local permit or approval, Settling Defendant shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. Settling Defendant may seek relief under the provisions of Section XX (Force Majeure) for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval referenced in Paragraph 8.a and required for the Work, provided that it has submitted timely and complete applications and taken all other actions necessary to obtain all such permits or approvals.

c. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal, state, or local statute, regulation, or ordinance.

9. Notice to Successors-in-Title and Transfers of Real Property.

a. For any real property owned or controlled by Settling Defendant located at the Phase 1 Project Area, Settling Defendant shall, within 15 days after the Effective Date, submit to EPA and WDNR for review and EPA approval, after consultation with WDNR, a proposed notice to be filed with the appropriate land records office that provides a description of the real property and provides notice to all successors-in-title that the real property is part of the Site, that EPA has selected a remedy for the Site, and that Settling Defendant has entered into a Consent Decree requiring implementation of the remedy for the Phase 1 Project Area. The notice also shall identify the United States District Court in which the Consent Decree was filed, the name and civil action number of this case, and the date the Consent Decree was entered by the Court. The notice shall also state that information relating to Institutional Controls impacting the property is maintained on the WDNR Database and include the internet address for the WDNR Database. Settling Defendant shall record the notice within ten working days after receiving approval of the notice from EPA and WDNR. Settling Defendant shall provide EPA

and WDNR with a certified copy of the recorded notice within ten working days after recording such notice.

b. Settling Defendant shall, at least 60 days prior to any Transfer of any real property located at the Phase 1 Project Area, give written notice: (1) to the transferee regarding the Consent Decree and any Institutional Controls regarding the real property; and (2) to EPA and WDNR regarding the proposed Transfer, including the name and address of the transferee and the date on which the transferee was notified of the Consent Decree and any Institutional Controls.

c. Settling Defendant may Transfer any real property located at the Phase 1 Project Area only if: (1) any Institutional Controls required by Paragraph 26.c have been placed in the WDNR Database, and recorded, if required, with respect to the real property; or (2) Settling Defendant has obtained an agreement from the transferee, enforceable by Settling Defendant, the United States, and the State and approved in writing by EPA, after consultation with WDNR, to (i) allow access and restrict land/water use, pursuant to Paragraphs 27.a(1) and 27.a(2), (ii) record and place in the WDNR Database any Institutional Controls on the real property, pursuant to Paragraph 27.a(3), and (iii) subordinate transferee's rights to any such Institutional Controls, pursuant to Paragraph 27.a(3). If, after a Transfer of the real property, the transferee fails to comply with the agreement provided for in this Paragraph 9.c, Settling Defendant shall take all reasonable steps to obtain the transferee's compliance with such agreement. The United States and the State may seek the transferee's compliance with the agreement and/or assist Settling Defendant in obtaining compliance with the agreement. Settling Defendant shall reimburse the United States under Section XVII (Payments for Response Costs), for all costs incurred, direct or indirect, by Plaintiffs regarding obtaining compliance with such agreement, including, but not limited to, the cost of attorney time.

d. In the event of any Transfer of real property located at the Phase 1 Project Area, unless the United States, after consultation with the State, otherwise consents in writing, Settling Defendant shall continue to comply with its obligations under the Consent Decree, including, but not limited to, its obligation to provide and/or secure access, to implement, maintain, monitor, and report on Institutional Controls, and to abide by such Institutional Controls. Settling Defendant may require third parties to accept responsibility for some or all of its obligations under the Consent Decree. Unless the United States, after consultation with the State, agrees otherwise in a consent decree modification filed with the Court, Settling Defendant shall remain responsible for all obligations under the Consent Decree, notwithstanding any agreement between Settling Defendant and any third party.

VI. PERFORMANCE OF THE WORK BY SETTLING DEFENDANT

10. Selection of Supervising Contractor.

a. All aspects of the Work to be performed by Settling Defendant pursuant to Sections VI (Performance of the Work by Settling Defendant), VII (Phase 1 Remedy Review), VIII (Quality Assurance, Sampling, and Data Analysis), IX (Access and Institutional Controls), and XV (Emergency Response) shall be under the direction and supervision of the Supervising Contractor, the selection of which shall be subject to disapproval by EPA after consultation with WDNR. Within 5 working days of the Effective Date, Settling Defendant shall notify EPA and

WDNR in writing of the name, title, and qualifications of any contractor proposed to be the Supervising Contractor. With respect to any contractor proposed to be Supervising Contractor, Settling Defendant shall demonstrate that the proposed contractor has a quality assurance system that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan ("QMP"). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001, reissued May 2006) or equivalent documentation as determined by EPA. After consultation with WDNR, EPA will issue either a notice of disapproval or an authorization to proceed regarding hiring of the proposed Supervising Contractor. If at any time thereafter, Settling Defendant proposes to change a Supervising Contractor, Settling Defendant shall give such notice to EPA and WDNR and must obtain an authorization to proceed from EPA before the new Supervising Contractor performs, directs, or supervises any Work under this Consent Decree.

b. If EPA disapproves a proposed Supervising Contractor, EPA will notify Settling Defendant in writing. Settling Defendant shall submit to EPA a list of contractors, including the qualifications of each contractor, that would be acceptable to it within 30 days after receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor(s) that it disapproves and an authorization to proceed with respect to any of the other contractors. Settling Defendant may select any contractor from that list that is not disapproved and shall notify EPA and WDNR of the name of the contractor selected within 21 days after EPA's authorization to proceed.

c. If EPA fails to provide written notice of its authorization to proceed or disapproval as provided in this Paragraph and this failure prevents Settling Defendant from meeting one or more deadlines in a plan approved by EPA pursuant to this Consent Decree, Settling Defendant may seek relief under Section XX (Force Majeure).

11. Phase 1 Remedial Design.

a. The Phase 1 Remedial Design Work Plan has been approved by EPA after consultation with WDNR. The Phase 1 Remedial Design Work Plan shall be incorporated into and enforceable under this Consent Decree. Within 30 days after EPA's issuance of an authorization to proceed under Paragraph 10, Settling Defendant shall submit to EPA and WDNR a Health and Safety Plan for field design activities that conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

b. Pursuant to the schedule set forth in the SOW, after submission of the Health and Safety Plan for all field activities to EPA and WDNR, Settling Defendant shall implement the Phase 1 Remedial Design Work Plan. Settling Defendant shall submit to EPA and WDNR all plans, reports, and other deliverables required under the approved Phase 1 Remedial Design Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables).

c. The preliminary design submission shall include, at a minimum, the elements outlined in Section III, Task 2, A. (Preliminary Design) of the SOW, including the following: (1) design criteria; (2) results of treatability studies; (3) results of additional field

sampling and pre-design work; (4) project delivery strategy; (5) preliminary plans, drawings, and sketches; (6) required specifications in outline form; and (7) preliminary construction schedule.

d. The pre-final/final design submission shall include, at a minimum, the elements outlined in Section III, Task 2, B. (Prefinal and Final Design) of the SOW, including the following: (1) final plans and specifications; (2) Operation and Maintenance Plan; (3) Construction Quality Assurance Plan (CQAP); (4) Field Sampling Plan (directed at measuring progress towards meeting Performance Standards); and (5) Contingency Plan. The CQAP, which shall detail the approach to quality assurance during construction activities at the Phase 1 Project Area, shall specify a quality assurance official, independent of the Supervising Contractor, to conduct a quality assurance program during the construction phase of the project.

12. Phase 1 Remedial Action.

a. Within 30 days after the approval of the final design submission, Settling Defendant shall submit to EPA and WDNR the Phase 1 Remedial Action Work Plan. The Phase 1 Remedial Action Work Plan shall provide for construction and implementation of the remedy set forth in the ROD with respect to the Phase 1 Project Area in accordance with this Consent Decree, the ROD, the SOW, the Phase 1 Remedial Design Work Plan, and the design plans and specifications developed in accordance with the Phase 1 Remedial Design Work Plan and approved by EPA and WDNR, if applicable. Upon its approval, the Phase 1 Remedial Action Work Plan shall be incorporated into and enforceable under this Consent Decree. At the same time as it submits the Phase 1 Remedial Action Work Plan, Settling Defendant shall submit to EPA and WDNR a Health and Safety Plan for field activities required by the Phase 1 Remedial Action Work Plan that conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

b. The Phase 1 Remedial Action Work Plan shall include the following: (1) schedule for completion of the Phase 1 Remedial Action; (2) method for selection of contractors; (3) schedule for developing and submitting other required Phase 1 Remedial Action plans; (4) groundwater monitoring plan; (5) methods for satisfying permitting requirements; (6) methodology for implementing the Operation and Maintenance Plan; (7) methodology for implementing the Contingency Plan; (8) tentative formulation of the Phase 1 Remedial Action team; (9) CQAP (by construction contractor); and (10) procedures and plans for the decontamination of equipment and the disposal of contaminated materials. The Phase 1 Remedial Action Work Plan also shall include the methodology for implementing the CQAP and a schedule for implementing all Phase 1 Remedial Action tasks identified in the final design submission and shall identify the initial formulation of Settling Defendant's Phase 1 Remedial Action project team (including, but not limited to, the Supervising Contractor).

c. Upon approval of the Phase 1 Remedial Action Work Plan by EPA and WDNR, if applicable, Settling Defendant shall implement the activities required under the Phase 1 Remedial Action Work Plan. As part of the approval of the Phase 1 Remedial Action Work Plan, WDNR may impose restrictions, limitations, or other conditions on the property and place the required Institutional Controls in the WDNR Database. If a party other than Settling Defendant ("Performing Party") performs the remedy for the sediments in Chequamegon Bay, Settling Defendant may (i) install the final cap on the Kreher Park portion of the Site required by the Phase 1 Remedial Design or (ii) elect to reimburse the Performing Party for the costs of installing the final cap on the Kreher Park portion of the Site required by the Phase 1 Remedial

Design. Should EPA be the Performing Party, and Settling Defendant elect to reimburse EPA rather than install the final Kreher Park cap, Settling Defendant shall reimburse EPA for its costs of installing the final Kreher Park cap as Future Response Costs.

d. Settling Defendant shall submit to EPA and WDNR all reports and other deliverables required under the approved Phase 1 Remedial Action Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables). Unless otherwise directed by EPA, Settling Defendant shall not commence physical Phase 1 Remedial Action activities at the Phase 1 Project Area prior to approval of the Phase 1 Remedial Action Work Plan.

13. Settling Defendant shall continue to implement the Phase 1 Remedial Action until the Phase 1 Performance Standards are achieved. Settling Defendant shall implement O&M for so long thereafter as is required by this Consent Decree.

14. Modification of SOW or Related Work Plans.

a. If EPA, after consultation with WDNR, determines that it is necessary to modify the work specified in the SOW and/or in work plans developed pursuant to the SOW to achieve and maintain the Phase 1 Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD with respect to the Phase 1 Project Area, and such modification is consistent with the scope of the remedy set forth in the ROD with respect to the Phase 1 Project Area, then EPA may issue such modification in writing and shall notify Settling Defendant of such modification. For the purposes of this Paragraph and Paragraphs 50 (Completion of the Phase 1 Remedial Action) and 51 (Completion of the Work) only, the "scope of the remedy set forth in the ROD" is the remedy described in the ROD for the Phase 1 Project Area. If Settling Defendant objects to the modification it may, within 30 days after EPA's notification, seek dispute resolution under Paragraph 80 (Record Review).

b. The SOW and/or related work plans shall be modified: (1) in accordance with the modification issued by EPA; or (2) if Settling Defendant invokes dispute resolution, in accordance with the final resolution of the dispute. The modification shall be incorporated into and enforceable under this Consent Decree, and Settling Defendant shall implement all work required by such modification. Settling Defendant shall incorporate the modification into the Phase 1 Remedial Design or Phase 1 Remedial Action Work Plan under Paragraph 11 (Phase 1 Remedial Design) or Paragraph 12 (Phase 1 Remedial Action), as appropriate.

c. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

15. Nothing in this Consent Decree, the SOW, or the Phase 1 Remedial Design or Phase 1 Remedial Action Work Plans constitutes a warranty or representation of any kind by Plaintiffs that compliance with the work requirements set forth in the SOW and the Work Plans will achieve the Phase 1 Performance Standards.

16. Off-Site Shipment of Waste Material.

a. Settling Defendant may ship Waste Material from the Site to an off-site facility only if it verifies, prior to any shipment, that the off-site facility is operating in compliance with the requirements of Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440, by obtaining a determination from EPA that the proposed receiving facility is operating in compliance with 42 U.S.C. § 9621(d)(3) and 40 C.F.R. § 300.440.

b. Settling Defendant may ship Waste Material from the Site to an out-of-state waste management facility only if, prior to any shipment, it provides written notice to the appropriate state environmental official in the receiving facility's state and to the EPA and WDNR Project Coordinators. This notice requirement shall not apply to any off-site shipments when the total quantity of all such shipments will not exceed ten cubic yards. The written notice shall include the following information, if available: (1) the name and location of the receiving facility; (2) the type and quantity of Waste Material to be shipped; (3) the schedule for the shipment; and (4) the method of transportation. Settling Defendant also shall notify the state environmental official referenced above and the EPA Project Coordinator of any major changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Settling Defendant shall provide the written notice after the award of the contract for Remedial Action construction and before the Waste Material is shipped.

c. If Settling Defendant intends to transport or manage Waste Material within the State, Settling Defendant shall comply with the applicable requirements of Chapter 289 of the Wisconsin Statutes and Chapters 500 to 538 of the Wisconsin Administrative Code.

VII. PHASE 1 REMEDY REVIEW

17. Periodic Review. Settling Defendant shall conduct any studies and investigations that EPA, after consultation with WDNR, requests in order to permit EPA to conduct reviews of whether the Phase 1 Remedial Action is protective of human health and the environment at least every five years as required by Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and any applicable regulations.

18. EPA Selection of Further Response Actions. If EPA determines, at any time, after consultation with WDNR, that the Phase 1 Remedial Action is not protective of human health and the environment, EPA may select further response actions for the Phase 1 Project Area in accordance with the requirements of CERCLA and the NCP.

19. Opportunity To Comment. Settling Defendant and, if required by Sections 113(k)(2) or 117 of CERCLA, 42 U.S.C. § 9613(k)(2) or 9617, the public, will be provided with an opportunity to comment on any further response actions proposed by EPA as a result of the review conducted pursuant to Section 121(c) of CERCLA and to submit written comments for the record during the comment period.

20. Settling Defendant's Obligation To Perform Further Response Actions. If EPA selects further response actions for the Phase 1 Project Area, EPA may require Settling Defendant to perform such further response actions, but only to the extent that the reopener conditions in Paragraph 97 or Paragraph 98 (United States' Pre- and Post-Certification Reservations) are satisfied. Settling Defendant may invoke the procedures set forth in Section XXI (Dispute Resolution) to dispute (a) EPA's determination that the reopener conditions of Paragraph 97 or Paragraph 98 are satisfied, (b) EPA's determination that the Phase 1 Remedial Action is not protective of human health and the environment, or (c) EPA's selection of the further response actions. Disputes pertaining to whether the Phase 1 Remedial Action is protective or to EPA's selection of further response actions shall be resolved pursuant to Paragraph 80 (Record Review).

21. Submission of Plans. If Settling Defendant is required to perform further response actions pursuant to Paragraph 20, it shall submit a plan for such response action to EPA for approval in accordance with the procedures of Section VI (Performance of the Work by Settling Defendant). Settling Defendant shall also submit the plan to WDNR. Settling Defendant shall implement the approved plan in accordance with this Consent Decree.

VIII. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

22. Quality Assurance.

a. Settling Defendant shall use quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance, and monitoring samples in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R5)" (EPA/240/B-01/003, March 2001, reissued May 2006), "Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/240/R-02/009, December 2002), and subsequent amendments to such guidelines upon notification by EPA to Settling Defendant of such amendment. Amended guidelines shall apply only to procedures conducted after such notification.

b. Prior to the commencement of any monitoring project under this Consent Decree, Settling Defendant shall submit to EPA for approval, after consultation with WDNR, a Quality Assurance Project Plan ("QAPP") that is consistent with the SOW, the NCP, and applicable guidance documents. If relevant to the proceeding, the Parties agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this Consent Decree. Settling Defendant shall ensure that EPA and WDNR personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Settling Defendant in implementing this Consent Decree. In addition, Settling Defendant shall ensure that such laboratories shall analyze all samples submitted by EPA and WDNR pursuant to the QAPP for quality assurance monitoring. Settling Defendant shall ensure that the laboratories it utilizes for the analysis of samples taken pursuant to this Consent Decree perform all analyses according to accepted EPA methods. Accepted EPA methods consist of those methods that are documented in the "USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4," and the "USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2," and any amendments made thereto during the course of the implementation of this Decree; however, upon approval by EPA, after opportunity for review and comment by WDNR, Settling Defendant may use other analytical methods that are as stringent as or more stringent than the CLP-approved methods. Settling Defendant shall ensure that all laboratories it uses for analysis of samples taken pursuant to this Consent Decree participate in an EPA or EPA-equivalent quality assurance/quality control ("QA/QC") program. Settling Defendant shall use only laboratories that have a documented Quality System that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001, reissued May 2006) or equivalent documentation as determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program ("NELAP") as meeting the Quality System requirements. Settling Defendant shall ensure that all field methodologies utilized in collecting

samples for subsequent analysis pursuant to this Consent Decree are conducted in accordance with the procedures set forth in the QAPP approved by EPA.

23. Upon request, Settling Defendant shall allow split or duplicate samples to be taken by EPA and WDNR or their authorized representatives. Settling Defendant shall notify EPA and WDNR not less than 28 days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA and WDNR shall have the right to take any additional samples that EPA or WDNR deem necessary. Upon request, EPA and WDNR shall allow Settling Defendant to take split or duplicate samples of any samples they take as part of Plaintiffs' oversight of Settling Defendant's implementation of the Work.

24. Settling Defendant shall submit to EPA and WDNR two copies of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Settling Defendant with respect to the Phase 1 Project Area and/or the implementation of this Consent Decree unless EPA agrees otherwise.

25. Notwithstanding any provision of this Consent Decree, the United States and the State retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, Chapter 292 of the Wisconsin Statutes, and any other applicable statutes or regulations.

IX. ACCESS AND INSTITUTIONAL CONTROLS

26. If the Phase 1 Project Area, any portion of the Phase 1 Project Area, or any other real property where access or land/water use restrictions are needed is owned or controlled by Settling Defendant:

a. Settling Defendant shall, commencing on the date of lodging of the Consent Decree, provide the United States, the State, and their representatives, contractors, and subcontractors, with access at all reasonable times to the portions of the Phase 1 Project Area or any other real property owned or controlled by Settling Defendant to conduct any activity regarding the Consent Decree including, but not limited to, the following activities:

(1) Monitoring the Work;

(2) Verifying any data or information submitted to the United States or the State;

(3) Conducting investigations regarding contamination at or near the Site;

(4) Obtaining samples;

(5) Assessing the need for, planning, or implementing additional response actions at or near the Site;

(6) Assessing implementation of quality assurance and quality control practices as defined in the approved CQAP;

(7) Implementing the Work pursuant to the conditions set forth in Paragraph 102 (Work Takeover);

(8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendant or its agents, consistent with Section XXVI (Access to Information);

(9) Assessing Settling Defendant's compliance with the Consent Decree;

(10) Determining whether the Site or other real property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted, under the Consent Decree; and

(11) Implementing, monitoring, maintaining, reporting on, and enforcing any Institutional Controls and the requirements of the ICIAP.

b. Commencing on the date of lodging of the Consent Decree, Settling Defendant shall not use the Phase 1 Project Area, or such other real property, in any manner that EPA or WDNR determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material or interfere with or adversely affect the implementation, integrity, or protectiveness of the remedy set forth in the ROD for the Site. The restrictions shall include, but not be limited to: prohibition on the use of contaminated groundwater and any excavation, drilling, or digging that could expose buried Waste Materials that remain on-site after completion of the remedy set forth in the ROD for the Site; and

c. Settling Defendant shall:

(1) Grant a right of access to conduct any activity regarding the Consent Decree including, but not limited to, those activities listed in Paragraph 26.a; and grant the right to enforce the land/water use restrictions, conditions, or limitations set forth in Paragraph 26.b, including, but not limited to, the specific restrictions listed therein and any land/water use restrictions listed in the ICIAP, as further specified in this Paragraph 26.c. Access and the right to enforce restrictions, conditions, or limitations shall be granted to one or more of the following persons, as determined by EPA: (i) the United States, on behalf of EPA, and its representatives; (ii) the State and its representatives; and/or (iii) other appropriate grantees. Access and the right to enforce restrictions, conditions, or limitations other than those granted to the United States, shall include a designation that EPA, and/or WDNR as appropriate, is a "third-party beneficiary," allowing EPA and/or WDNR to maintain the right to enforce the access and the right to enforce restrictions, conditions, or limitations without acquiring an interest in real property. If any access or rights to enforce restrictions, conditions, or limitations are granted to Settling Defendant pursuant to this Paragraph 26.c(1), then such Settling Defendant shall monitor, maintain, report on, and enforce such Institutional Controls.

(2) When submitting its final Phase 1 Remedial Design, submit to EPA and WDNR for EPA's review and approval, after consultation with WDNR, regarding such real property: (i) draft Institutional Controls that are enforceable under state or local law; (ii) the information required for the WDNR Database under WIS. STAT. §292.12(3); and (iii) a current title insurance commitment or other evidence of title acceptable to EPA, which shows title to the land affected by the Institutional Controls to be free and clear of all prior liens and encumbrances (except when EPA

waives the release or subordination of such prior liens or encumbrances or when, despite best efforts, Settling Defendant is unable to obtain release or subordination of such prior liens or encumbrances).

(3) Within 15 days of the approval and acceptance of the Phase 1 Remedial Action Work Plan from EPA and WDNR, update the title insurance commitment or other evidence of title acceptable to EPA, and, if it is determined that nothing has occurred since the effective date of the commitment, or other title evidence, to affect the title adversely, Settling Defendant shall provide EPA and WDNR with a final title insurance policy, or other final evidence of title acceptable to EPA. If the Institutional Controls are to be conveyed to the United States or the State, the Institutional Controls and title evidence (including final title evidence) shall be prepared in accordance with the U.S. Department of Justice Title Standards 2001, and approval of the sufficiency of title shall be obtained as required by 40 U.S.C. § 3111.

(4) Should EPA and WDNR determine that the Institutional Controls require modification, draft and finalize revised Institutional Controls as requested by EPA and WDNR. Upon request by EPA or WDNR, Settling Defendant shall execute and record easements or covenants running with the land that (a) limit land, water, or resource use and/or provide access rights and (b) are created pursuant to common law or statutory law by an instrument that is recorded by the owner in the appropriate land records office.

d. Within 15 days of the approval and acceptance of the Phase 1 Remedial Action Work Plan and issuance of an approval letter to Settling Defendant incorporating Institutional Controls, WDNR shall place the Institutional Controls in the WDNR Database.

e. As part of certifying the Completion of Work under Paragraph 51.b, EPA and WDNR may update or impose new restrictions, limitations, or other conditions on the property, and WDNR shall place the required Institutional Controls in the WDNR Database.

f. Commencing on the date of lodging of the Consent Decree, Settling Defendant shall comply with the following requirements of Paragraph 1 of the 1998 Spill Response Agreement ("Spill Agreement") between Settling Defendant and DNR: Activity No. a (related to lakefront warning signs) and Activity No. d (related to warning buoys in Chequamegon Bay). This Consent Decree does not otherwise affect the applicability of any provision of the Spill Agreement. The Spill Agreement is included as Appendix D to this Consent Decree and is incorporated by reference only as to Activity No. a (related to lakefront warning signs) and Activity No. d (related to warning buoys in Chequamegon Bay), as required by this Paragraph 26.f, and does not otherwise affect the provisions of this Consent Decree.

27. For those portions of the Phase 1 Project Area or any other real property where access and/or land/water use restrictions are needed that are owned or controlled by persons other than Settling Defendant:

a. Settling Defendant shall use best efforts to secure from such persons:

(1) an agreement to provide access thereto for the United States, the State, and Settling Defendant, and their representatives, contractors, and subcontractors, to conduct any activity regarding the Consent Decree including, but not limited to, the activities listed in Paragraphs 26.a and 26.f;

(2) an agreement, enforceable by Settling Defendant, the United States, and the State, to refrain from using the Site, or such other real property, in any manner that EPA determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material or interfere with or adversely affect the implementation, integrity, or protectiveness of the Phase 1 Remedial Action. The agreement shall include, but not be limited to, the land/water use restrictions listed in Paragraphs 26.b and 26.f; and

(3) the execution of Institutional Controls that can be included in the WDNR Database, that (i) grant a right of access to conduct any activity regarding the Consent Decree including, but not limited to, those activities listed in Paragraph 26.a and 26.f, and (ii) grant the right to enforce the land/water use restrictions set forth in Paragraph 26.b and 26.f, including, but not limited to, the specific restrictions listed therein and any land/water use restrictions listed in the ICIAP. The Institutional Controls shall be granted to one or more of the following persons, as determined by EPA: (i) the United States, on behalf of EPA, and its representatives, (ii) the State and its representatives, (iii) Settling Defendant and its representatives, and/or (iv) other appropriate grantees. The Institutional Controls, other than those granted to the United States, shall include a designation that EPA, and/or WDNR as appropriate, is a third party beneficiary, allowing EPA and/or WDNR to maintain the right to enforce the Institutional Controls without acquiring an interest in real property. If any Institutional Controls are granted to any Settling Defendant pursuant to this Paragraph 27.a(3), then Settling Defendant shall monitor, maintain, report on, and enforce such Institutional Controls.

b. Settling Defendant shall provide notification to such persons of the pending imposition of Institutional Controls for those properties, and placement of the relevant information in the WDNR Database.

c. When submitting its final Phase 1 Remedial Design, Settling Defendant shall submit to EPA and WDNR for EPA approval, after consultation with WDNR, regarding such property: (i) draft Institutional Controls that are enforceable under state or local law; (ii) the information required for the WDNR Database; and (iii) a current title insurance commitment, or other evidence of title acceptable to EPA, which shows title to the land affected by the Institutional Controls to be free and clear of all prior liens and encumbrances (except when EPA waives the release or subordination of such prior liens or encumbrances or when, despite best efforts, Settling Defendant is unable to obtain release or subordination of such prior liens or encumbrances).

d. Within 15 days of the approval and acceptance of the Phase 1 Remedial Action Work Plan from EPA and WDNR, Settling Defendant shall update the title insurance commitment or other evidence of title acceptable to EPA and, if it is determined that nothing has occurred since the effective date of the commitment, or other title evidence, to affect the title adversely, Settling Defendant shall record a notice with the appropriate land records office that states the real property's relationship to the Site, that EPA has selected a remedy for the Site, that a Consent Decree has been entered for the Phase 1 Remedial Action, and that Institutional Controls for the property are set forth in the WDNR Database. The notice also shall identify the United States District Court in which the Consent Decree was filed, the name and civil action number of this case, and the date the Consent Decree was entered by the Court. Within 30 days

after the notice is recorded with the land records office, Settling Defendant shall provide EPA and WDNR with a final title insurance policy, or other final evidence of title acceptable to EPA, as well as a certified copy of the original recorded deed notice showing the register's recording stamp. The Institutional Controls and title evidence (including final title evidence) shall be prepared in accordance with the U.S. Department of Justice Title Standards 2001, and approval of the sufficiency of title must be obtained as required by 40 U.S.C. § 3111.

e. Within 15 days of the approval and acceptance of the Phase 1 Remedial Action Work Plan and issuance of an approval letter to Settling Defendant incorporating Institutional Controls, WDNR shall place the Institutional Controls in the WDNR Database.

f. Should EPA and WDNR determine that the Institutional Controls require modification, Settling Defendant shall draft and finalize revised Institutional Controls as requested by EPA and WDNR. Upon request by EPA or WDNR, Settling Defendant shall execute and record easements or covenants running with the land that (a) limit land, water, or resource use and/or provide access rights and (b) are created pursuant to common law or statutory law by an instrument that is recorded by the owner in the appropriate land records office.

g. As part of certifying the Completion of Work under Paragraph 51.b, EPA and WDNR may update or impose new restrictions, limitations, or other conditions on the property, and WDNR shall place the required Institutional Controls in the WDNR Database.

28. For purposes of Paragraphs 26 and 27, "best efforts" includes the payment of reasonable sums of money to obtain access, an agreement to restrict land/water use, and/or an agreement to release or subordinate a prior lien or encumbrance, except that "best efforts" shall not include payment of money to any party that has received special notice of potential liability related to the Site. If, within 60 days after the Effective Date, Settling Defendant has not: (a) obtained agreements to provide access or restrict land/water use, as required by Paragraph 27.a(1) and 27.a(2); or (b) obtained, pursuant to Paragraph 26.c(2) or 27.c, agreements from the holders of prior liens or encumbrances to release or subordinate such liens or encumbrances, Settling Defendant shall promptly notify Plaintiffs in writing, and shall include in that notification a summary of the steps that Settling Defendant has taken to attempt to comply with Paragraphs 26 or 27. Plaintiffs may, as they deem appropriate, assist Settling Defendant in obtaining access, agreements to restrict land/water use, or the release or subordination of a prior lien or encumbrance. Settling Defendant shall reimburse the United States under Section XVII (Payments for Response Costs) for all costs incurred, direct or indirect, by Plaintiffs in obtaining such access, agreements to restrict land/water use, Institutional Controls, and/or the release/subordination of prior liens or encumbrances including, but not limited to, the cost of attorney time and the amount of monetary consideration paid or just compensation.

29. If EPA or WDNR determines that Institutional Controls in the form of state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls are needed, Settling Defendant shall cooperate with EPA's and the State's efforts to secure and ensure compliance with such governmental controls.

30. Notwithstanding any provision of the Consent Decree, the United States and the State retain all of their access authorities and rights, as well as all of their rights to require Institutional Controls, including enforcement authorities related thereto, under CERCLA, RCRA, Chapter 292 of the Wisconsin Statutes, and any other applicable statute or regulations.

X. REPORTING REQUIREMENTS

31. In addition to any other requirement of this Consent Decree, Settling Defendant shall submit to EPA and WDNR two copies each of written monthly progress reports that: (a) describe the actions that have been taken toward achieving compliance with this Consent Decree during the previous month; (b) include a summary of all results of sampling and tests and all other data received or generated by Settling Defendant or its contractors or agents in the previous month; (c) identify all plans, reports, and other deliverables required by this Consent Decree completed and submitted during the previous month; (d) describe all actions, including, but not limited to, data collection and implementation of work plans, that are scheduled for the next six weeks and provide other information relating to the progress of construction, including, but not limited to, critical path diagrams, Gantt charts, and Pert charts; (e) include information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule for implementation of the Work, and a description of efforts made to mitigate those delays or anticipated delays; (f) include any modifications to the work plans or other schedules that Settling Defendant has proposed to EPA or that have been approved by EPA; and (g) describe all activities undertaken in support of the Community Involvement Plan during the previous month and those to be undertaken in the next six weeks. Settling Defendant shall submit these progress reports to EPA and WDNR by the tenth day of every month following the lodging of this Consent Decree until EPA notifies Settling Defendant pursuant to Paragraph 51.b of Section XIV (Completion of the Work). The monthly progress reports required by this Paragraph may be submitted electronically unless EPA or WDNR requests otherwise. If requested by EPA or WDNR, Settling Defendant shall also provide briefings for EPA and WDNR to discuss the progress of the Work. Such briefings may occur telephonically if agreed by Settling Defendant and the government agency requesting the briefing.

32. Settling Defendant shall notify EPA and WDNR of any change in the schedule described in the monthly progress report for the performance of any activity, including, but not limited to, data collection and implementation of work plans, no later than seven days prior to the performance of the activity.

33. Upon the occurrence of any event during performance of the Work that Settling Defendant is required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act ("EPCRA"), 42 U.S.C. § 11004, Settling Defendant shall within 24 hours of the onset of such event orally notify the EPA and WDNR Project Coordinators (or their alternates, as necessary), or, in the event that neither the EPA Project Coordinator nor Alternate EPA Project Coordinator is available, the Emergency Response Section, Region 5, United States Environmental Protection Agency. These reporting requirements are in addition to the reporting required by CERCLA Section 103 or EPCRA Section 304.

34. Within 20 days after the onset of such an event, Settling Defendant shall furnish to EPA and WDNR a written report, signed by Settling Defendant's Project Coordinator, setting forth the events that occurred and the measures taken, and to be taken, in response thereto. Within 30 days after the conclusion of such an event, Settling Defendant shall submit a report setting forth all actions taken in response thereto.

35. Settling Defendant shall submit two copies of all plans, reports, data, and other deliverables required by the SOW, the Remedial Design Work Plan, the Remedial Action Work Plan, or any other approved plans to EPA in accordance with the schedules set forth in such plans. Settling Defendant shall simultaneously submit two copies of all such plans, reports, data, and other deliverables to WDNR. Upon request by EPA or WDNR, Settling Defendant shall submit in electronic form all or any portion of any deliverables Settling Defendant is required to submit pursuant to the provisions of this Consent Decree to the entity requesting electronic submission.

36. All deliverables submitted by Settling Defendant to EPA and WDNR that purport to document Settling Defendant's compliance with the terms of this Consent Decree shall be signed by an authorized representative of Settling Defendant.

XI. EPA APPROVAL OF PLANS, REPORTS, AND OTHER DELIVERABLES

37. Initial Submissions.

a. After review of any plan, report, or other deliverable that is required to be submitted for approval pursuant to this Consent Decree, EPA, after reasonable opportunity for review and comment by WDNR, shall: (1) approve, in whole or in part, the submission; (2) approve the submission upon specified conditions; (3) disapprove, in whole or in part, the submission; or (4) any combination of the foregoing.

b. EPA, after consultation with WDNR, also may modify the initial submission to cure deficiencies in the submission if: (1) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Work; or (2) previous submission(s) on the same issue have been disapproved due to material defects and the deficiencies in the initial submission under consideration indicate a bad faith lack of effort to submit an acceptable plan, report, or deliverable.

38. Resubmissions. Upon receipt of a notice of disapproval under Paragraph 37.a(3) or (4), or if required by a notice of approval upon specified conditions under Paragraph 37.a(2), Settling Defendant shall, within 21 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other deliverable for approval. After review of the resubmitted plan, report, or other deliverable, EPA, after consultation with WDNR, may: (a) approve, in whole or in part, the resubmission; (b) approve the resubmission upon specified conditions; (c) modify the resubmission; (d) disapprove, in whole or in part, the resubmission, requiring Settling Defendant to correct the deficiencies; or (e) any combination of the foregoing.

39. Material Defects. If an initially submitted or resubmitted plan, report, or other deliverable contains a material defect, and the plan, report, or other deliverable is disapproved or modified by EPA under Paragraph 37.b(2) or 38 due to such material defect, then the material defect shall constitute a lack of compliance for purposes of Paragraph 83. The provisions of Section XXI (Dispute Resolution) and Section XXII (Stipulated Penalties) shall govern the accrual and payment of any stipulated penalties regarding Settling Defendant's submissions under this Section.

40. Implementation. Upon approval, approval upon conditions, or modification by EPA under Paragraph 37 (Initial Submissions) or Paragraph 38 (Resubmissions) of any plan,

report, or other deliverable, or any portion thereof: (a) such plan, report, or other deliverable, or portion thereof, shall be incorporated into and enforceable under this Consent Decree; and (b) Settling Defendant shall take any action required by such plan, report, or other deliverable, or portion thereof, subject only to its right to invoke the Dispute Resolution procedures set forth in Section XXI (Dispute Resolution) with respect to the modifications or conditions made by EPA. The implementation of any non-deficient portion of a plan, report, or other deliverable submitted or resubmitted under Paragraph 37 or 38 shall not relieve Settling Defendant of any liability for stipulated penalties under Section XXII (Stipulated Penalties).

XII. PROJECT COORDINATORS

41. Within 20 days after lodging this Consent Decree, Settling Defendant, the State, and EPA will notify each other, in writing, of the name, address, and telephone number of their respective designated Project Coordinators and Alternate Project Coordinators. If a Project Coordinator or Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties listed in the prior sentence at least five working days before the change occurs, unless impracticable, but in no event later than the actual day the change is made. Settling Defendant's Project Coordinator shall be subject to disapproval by EPA, after consultation with WDNR, and shall have the technical expertise sufficient to adequately oversee all aspects of the Work. Unless approved by Plaintiffs, Settling Defendant's Project Coordinator shall not be an attorney for Settling Defendant in this matter. A Project Coordinator may assign other representatives, including other contractors, to serve as a Site representative for oversight of performance of daily operations during remedial activities.

42. Plaintiff may designate other representatives, including, but not limited to, EPA and WDNR employees and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager ("RPM") and an On-Scene Coordinator ("OSC") by the NCP, 40 C.F.R. Part 300. EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the NCP, to halt any Work required by this Consent Decree and to take any necessary response action when he or she determines that conditions at the Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

43. EPA's Project Coordinator and Settling Defendant's Project Coordinator will meet, at a minimum, on a monthly basis. Such meetings may occur telephonically by agreement of the Project Coordinators.

XIII. PERFORMANCE GUARANTEE

44. In order to ensure the full and final completion of the Work, Settling Defendant shall establish and maintain a performance guarantee, initially in the amount of $40 million, for the benefit of EPA (hereinafter "Estimated Cost of the Work"). The performance guarantee, which must be satisfactory in form and substance to EPA, shall be in the form of one or more of the following mechanisms (provided that, if Settling Defendant intends to use multiple

mechanisms, such multiple mechanisms shall be limited to surety bonds guaranteeing payment, letters of credit, trust funds, and insurance policies):

a. A surety bond unconditionally guaranteeing payment and/or performance of the Work that is issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. One or more irrevocable letters of credit, payable to or at the direction of EPA, that is issued by one or more financial institution(s) (1) that has the authority to issue letters of credit and (2) whose letter-of-credit operations are regulated and examined by a federal or state agency;

c. A trust fund established for the benefit of EPA that is administered by a trustee (1) that has the authority to act as a trustee and (2) whose trust operations are regulated and examined by a federal or state agency;

d. A policy of insurance that (1) provides EPA with acceptable rights as a beneficiary thereof; and (2) is issued by an insurance carrier (i) that has the authority to issue insurance policies in the applicable jurisdiction(s) and (ii) whose insurance operations are regulated and examined by a federal or state agency;

e. A demonstration by Settling Defendant that it meets the financial test criteria of 40 C.F.R. § 264.143(f) with respect to the Estimated Cost of the Work (plus the amount(s) of any other federal or any state environmental obligations financially assured through the use of a financial test or guarantee), provided that all other requirements of 40 C.F.R. § 264.143(f) are met to EPA's satisfaction; or

f. A written guarantee to fund or perform the Work executed in favor of EPA by one or more of the following: (1) a direct or indirect parent company of a Settling Defendant, or (2) a company that has a "substantial business relationship" (as defined in 40 C.F.R. § 264.141(h)) with Settling Defendant; provided, however, that any company providing such a guarantee must demonstrate to the satisfaction of EPA that it satisfies the financial test and reporting requirements for owners and operators set forth in subparagraphs (1) through (8) of 40 C.F.R. § 264.143(f) with respect to the Estimated Cost of the Work (plus the amount(s) of any other federal or any state environmental obligations financially assured through the use of a financial test or guarantee) that it proposes to guarantee hereunder.

45. Settling Defendant has selected, and EPA has found satisfactory as an initial performance guarantee the financial test pursuant to Paragraph 44.e in the form attached hereto as Appendix E. Within ten days after the Effective Date, Settling Defendant shall execute or otherwise finalize all instruments or other documents required in order to make the selected performance guarantee(s) legally binding in a form substantially identical to the documents attached hereto as Appendix E, and such performance guarantee(s) shall thereupon be fully effective. Within 30 days after the Effective Date, Settling Defendant shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding to the EPA Regional Financial Management Officer in accordance with Section XXVIII (Notices and Submissions), with a copy to the United States, EPA, and the State as specified in Section XXVIII.

46. If, at any time after the Effective Date and before issuance of the Certification of Completion of the Work pursuant to Paragraph 51, Settling Defendant provides a performance

guarantee for completion of the Work by means of a demonstration or guarantee pursuant to Paragraph 44.e or 44.f, Settling Defendant shall also comply with the other relevant requirements of 40 C.F.R. § 264.143(f) relating to these mechanisms unless otherwise provided in this Consent Decree, including but not limited to: (a) the initial submission of required financial reports and statements from the relevant entity's chief financial officer ("CFO") and independent certified public accountant ("CPA"), in the form prescribed by EPA in its financial test sample CFO letters and CPA reports available at: http://www.epa.gov/compliance/resources/policies/cleanup/superfund/fa-test-samples.pdf; (b) the annual resubmission of such reports and statements within 90 days after the close of each such entity's fiscal year; and (c) the prompt notification of EPA after each such entity determines that it no longer satisfies the financial test requirements set forth at 40 C.F.R. § 264.143(f)(1) and in any event within 90 days after the close of any fiscal year in which such entity no longer satisfies such financial test requirements. For purposes of the performance guarantee mechanisms specified in this Section XIII, references in 40 C.F.R. Part 264, Subpart H, to "closure," "post-closure," and "plugging and abandonment" shall be deemed to include the Work; the terms "current closure cost estimate," "current post-closure cost estimate," and "current plugging and abandonment cost estimate" shall be deemed to include the Estimated Cost of the Work; the terms "owner" and "operator" shall be deemed to refer to Settling Defendant; and the terms "facility" and "hazardous waste facility" shall be deemed to include the Phase 1 Project Area.

47. In the event that EPA, after consultation with WDNR, determines at any time that a performance guarantee provided by Settling Defendant pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the estimated cost of completing the Work or for any other reason, or in the event that Settling Defendant becomes aware of information indicating that a performance guarantee provided pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the estimated cost of completing the Work or for any other reason, Settling Defendant, within 30 days after receipt of notice of EPA's determination or, as the case may be, within 30 days after becoming aware of such information, shall obtain and present to EPA for approval a proposal for a revised or alternative form of performance guarantee listed in Paragraph 44 that satisfies all requirements set forth in this Section XIII; provided, however, that if Settling Defendant cannot obtain such revised or alternative form of performance guarantee within such 30-day period, and provided further that Settling Defendant shall have commenced to obtain such revised or alternative form of performance guarantee within such 30-day period, and thereafter diligently proceeds to obtain the same, EPA shall extend such period for such time as is reasonably necessary for the Settling Defendant in the exercise of due diligence to obtain such revised or alternative form of performance guarantee, such additional period not to exceed 60 days. On day 30, Settling Defendant shall provide to EPA a status report on its efforts to obtain the revised or alternative form of guarantee. In seeking approval for a revised or alternative form of performance guarantee, Settling Defendant shall follow the procedures set forth in Paragraph 49.b(2). Settling Defendant's inability to post a performance guarantee for completion of the Work shall in no way excuse performance of any other requirements of this Consent Decree, including, without limitation, the obligation of Settling Defendant to complete the Work in strict accordance with the terms of this Consent Decree.

48. Funding for Work Takeover. The commencement of any Work Takeover pursuant to Paragraph 102 shall trigger EPA's right to receive the benefit of any performance guarantee(s) provided pursuant to Paragraphs 44.a, 44.b, 44.c, 44.d, or 44.f, and at such time EPA shall have immediate access to resources guaranteed under any such performance guarantee(s), whether in cash or in kind, as needed to continue and complete the Work assumed by EPA under the Work Takeover. Upon the commencement of any Work Takeover, if (a) for any reason EPA is unable to promptly secure the resources guaranteed under any such performance guarantee(s), whether in cash or in kind, necessary to continue and complete the Work assumed by EPA under the Work Takeover, or (b) in the event that the performance guarantee involves a demonstration of satisfaction of the financial test criteria pursuant to Paragraph 44.e or Paragraph 44.f(2), Settling Defendant (or in the case of Paragraph 44.f(2), the guarantor) shall immediately upon written demand from EPA deposit into a special account within the EPA Hazardous Substance Superfund or such other account as EPA may specify, in immediately available funds and without setoff, counterclaim, or condition of any kind, a cash amount up to but not exceeding the estimated cost of completing the remainder of the Work as of such date, as determined by EPA. In addition, if at any time EPA is notified by the issuer of a performance guarantee that such issuer intends to cancel the performance guarantee mechanism it has issued, then, unless Settling Defendant provide a substitute performance guarantee mechanism in accordance with this Section XIII no later than 30 days prior to the impending cancellation date, EPA shall be entitled (as of and after the date that is 30 days prior to the impending cancellation) to draw fully on the funds guaranteed under the then-existing performance guarantee. All EPA Work Takeover costs not reimbursed under this Paragraph shall be reimbursed under Section XVII (Payments for Response Costs).

49. Modification of Amount and/or Form of Performance Guarantee.

a. Reduction of Amount of Performance Guarantee. If Settling Defendant believes that the estimated cost of completing the Work has diminished below the amount set forth in Paragraph 44, Settling Defendant may, on any anniversary of the Effective Date, or at any other time agreed to by EPA and Settling Defendant, petition EPA in writing to request a reduction in the amount of the performance guarantee provided pursuant to this Section so that the amount of the performance guarantee is equal to the estimated cost of completing the Work. Settling Defendant shall submit a written proposal for such reduction to EPA, with a copy to WDNR, that shall specify, at a minimum, the estimated cost of completing the Work and the basis upon which such cost was calculated. In seeking approval for a reduction in the amount of the performance guarantee, Settling Defendant shall follow the procedures set forth in Paragraph 49.b(2) for requesting a revised or alternative form of performance guarantee, except as specifically provided in this Paragraph 49.a. If EPA, after consultation with WDNR, decides to accept Settling Defendant's proposal for a reduction in the amount of the performance guarantee, either to the amount set forth in Settling Defendant's written proposal or to some other amount as selected by EPA, EPA will notify Settling Defendant of such decision in writing. Upon EPA's acceptance of a reduction in the amount of the performance guarantee, the Estimated Cost of the Work shall be deemed to be the estimated cost of completing the Work set forth in EPA's written decision. After receiving EPA's written decision, Settling Defendant may reduce the amount of the performance guarantee in accordance with and to the extent permitted by such written acceptance and shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding in accordance with Paragraph 49.b(2). In the event of a dispute, Settling

Defendant may reduce the amount of the performance guarantee required hereunder only in accordance with a final administrative or judicial decision resolving such dispute pursuant to Section XXI (Dispute Resolution). No change to the form or terms of any performance guarantee provided under this Section, other than a reduction in amount, is authorized except as provided in Paragraphs 47 or 49.b.

b. Change of Form of Performance Guarantee.

(1) If, after the Effective Date, Settling Defendant desires to change the form or terms of any performance guarantee(s) provided pursuant to this Section, Settling Defendant may, on any anniversary of the Effective Date, or at any other time agreed to by EPA and Settling Defendant, petition EPA in writing, with a copy of the petition to WDNR, to request a change in the form or terms of the performance guarantee provided hereunder. The submission of such proposed revised or alternative performance guarantee shall be as provided in Paragraph 49.b(2). Any decision made by EPA on a petition submitted under this Paragraph shall be made in EPA's sole and unreviewable discretion, and such decision shall not be subject to challenge by Settling Defendant pursuant to the dispute resolution provisions of this Consent Decree or in any other forum.

(2) Settling Defendant shall submit a written proposal for a revised or alternative performance guarantee to EPA, with a copy to WDNR, that shall specify, at a minimum, the estimated cost of completing the Work, the basis upon which such cost was calculated, and the proposed revised performance guarantee, including all proposed instruments or other documents required in order to make the proposed performance guarantee legally binding. The proposed revised or alternative performance guarantee must satisfy all requirements set forth or incorporated by reference in this Section. Settling Defendant shall submit such proposed revised or alternative performance guarantee to the EPA Regional Financial Management Officer in accordance with Section XXVIII (Notices and Submissions). EPA, after consultation with WDNR, will notify Settling Defendant in writing of its decision to accept or reject a revised or alternative performance guarantee submitted pursuant to this Paragraph. Within ten days after receiving a written decision approving the proposed revised or alternative performance guarantee, Settling Defendant shall execute and/or otherwise finalize all instruments or other documents required in order to make the selected performance guarantee(s) legally binding in a form substantially identical to the documents submitted to EPA as part of the proposal, and such performance guarantee(s) shall thereupon be fully effective. Settling Defendant shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding to the EPA Regional Financial Management Officer within 30 days after receiving a written decision approving the proposed revised or alternative performance guarantee in accordance with Section XXVIII (Notices and Submissions), with a copy to the United States and EPA and WDNR as specified in Section XXVIII.

c. Release of Performance Guarantee. Settling Defendant shall not release, cancel, or discontinue any performance guarantee provided pursuant to this Section except as provided in this Paragraph. If Settling Defendant receives written notice from EPA in accordance with Paragraph 51 that the Work has been fully and finally completed in accordance

with the terms of this Consent Decree, or if EPA otherwise so notifies Settling Defendant in writing, Settling Defendant may thereafter release, cancel, or discontinue the performance guarantee(s) provided pursuant to this Section. In the event of a dispute, Settling Defendant may release, cancel, or discontinue the performance guarantee(s) required hereunder only in accordance with a final administrative or judicial decision resolving such dispute pursuant to Section XXI (Dispute Resolution).

XIV. CERTIFICATION OF COMPLETION

50. Completion of the Phase 1 Remedial Action.

a. Within 90 days after Settling Defendant concludes that the Phase 1 Remedial Action has been fully performed and the Phase 1 Performance Standards have been achieved, Settling Defendant shall schedule and conduct a pre-certification inspection to be attended by Settling Defendant, EPA, and WDNR. If, after the pre-certification inspection, Settling Defendant still believes that the Phase 1 Remedial Action has been fully performed and the Phase 1 Performance Standards have been achieved, it shall submit a written report requesting certification to EPA for approval, with a copy to WDNR, pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) within 30 days after the inspection. In the report, a registered professional engineer and Settling Defendant's Project Coordinator shall state that the Phase 1 Remedial Action has been completed in full satisfaction of the requirements of this Consent Decree. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or Settling Defendant's Project Coordinator:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after completion of the pre-certification inspection and receipt and review of the written report, EPA, after reasonable opportunity for review and comment by WDNR, determines that the Phase 1 Remedial Action or any portion thereof has not been completed in accordance with this Consent Decree or that the Phase 1 Performance Standards have not been achieved, EPA will notify Settling Defendant in writing of the activities that must be undertaken by Settling Defendant pursuant to this Consent Decree to complete the Phase 1 Remedial Action and achieve the Phase 1 Performance Standards, provided, however, that EPA may only require Settling Defendant to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy set forth in the ROD," as that term is defined in Paragraph 14.a. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require Settling Defendant to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables). Settling Defendant shall perform all activities described in the notice in

accordance with the specifications and schedules established pursuant to this Paragraph, subject to its right to invoke the dispute resolution procedures set forth in Section XXI (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent report requesting Certification of Completion of the Phase 1 Remedial Action and after a reasonable opportunity for review and comment by WDNR, that the Phase 1 Remedial Action has been performed in accordance with this Consent Decree and that Phase 1 Performance Standards have been achieved, EPA will so certify in writing to Settling Defendant. This certification shall constitute the Certification of Completion of the Phase 1 Remedial Action for purposes of this Consent Decree, including, but not limited to, Section XXIII (Covenants by Plaintiffs and Tribes). Certification of Completion of the Phase 1 Remedial Action shall not affect Settling Defendant's remaining obligations under this Consent Decree. WDNR may join EPA in certifying completion of the Phase 1 Remedial Action.

51. Completion of the Work.

a. Within 90 days after Settling Defendant concludes that all phases of the Work, other than any remaining activities required under Section VII (Phase 1 Remedy Review), have been fully performed, Settling Defendant shall schedule and conduct a pre-certification inspection to be attended by Settling Defendant, EPA, and WDNR. If, after the pre-certification inspection, Settling Defendant still believes that the Work has been fully performed, Settling Defendant shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the statement set forth in Paragraph 50.a, signed by a responsible corporate official of a Settling Defendant or Settling Defendant's Project Coordinator. If, after review of the written report, EPA, after reasonable opportunity for review and comment by WDNR, determines that any portion of the Work has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendant in writing of the activities that must be undertaken by Settling Defendant pursuant to this Consent Decree to complete the Work, provided, however, that EPA may only require Settling Defendant to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy set forth in the ROD," as that term is defined in Paragraph 14.a. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require Settling Defendant to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables). Settling Defendant shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to its right to invoke the dispute resolution procedures set forth in Section XXI (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent request for Certification of Completion of the Work by Settling Defendant and after a reasonable opportunity for review and comment by WDNR, that the Work has been performed in accordance with this Consent Decree, EPA will so notify Settling Defendant in writing. WDNR may join EPA in certifying Completion of the Work.

XV. EMERGENCY RESPONSE

52. If any action or occurrence during the performance of the Work causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Defendant shall, subject to Paragraph 53, immediately take all appropriate action to prevent, abate, or minimize such release or threat of release, and shall immediately notify the EPA and WDNR Project Coordinators (or their alternates, if necessary). If neither EPA's Project Coordinator nor EPA's Alternate Project Coordinator is available, Settling Defendant shall notify the EPA Emergency Response Unit, Region 5. Settling Defendant shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plans, the Contingency Plans, and any other applicable plans or documents developed pursuant to the SOW. In the event that Settling Defendant fails to take appropriate response action as required by this Section and EPA or, as appropriate, WDNR takes such action instead, Settling Defendant shall reimburse EPA and WDNR all costs of the response action under Section XXVII (Payments for Response Costs).

53. Subject to Section XXIII (Covenants by Plaintiffs and Tribes), nothing in the preceding Paragraph or in this Consent Decree shall be deemed to limit any authority of the United States or the State to (a) take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or (b) direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site.

XVI. TECHNICAL IMPRACTICABILITY

54. Settling Defendant may petition EPA to waive compliance with one or more of the Phase 1 Performance Standards for groundwater contaminants based on a demonstration that it is technically impracticable, from an engineering perspective, to attain those standards.

55. The determination of whether attainment of a particular Phase 1 Performance Standard is technically impracticable will be made by EPA, after consultation with WDNR, and will be based on the engineering feasibility and reliability of the remedy. If Settling Defendant objects to EPA's decision it may, within 30 days after EPA's notification, seek dispute resolution under Paragraph 80 (Record Review).

56. EPA will consider a petition for a waiver of Phase 1 Performance Standards on technical impracticability grounds only after the selected groundwater remedy has been functioning and operational for a sufficiently long time period (longer than five years) to make reliable predictions concerning its ability to achieve the Phase 1 Performance Standards. This determination will be made by EPA based on Site-specific data and conditions. If the first petition is rejected, a subsequent petition will be considered by EPA only if EPA determines that it is based on significant new Site-specific data which could not have been developed at the time the previous petition was submitted.

57. Neither the submission of a petition by Settling Defendant nor the granting of a waiver of one or more Phase 1 Performance Standards by EPA pursuant to this Section shall relieve Settling Defendant of its obligation to (i) continue to operate the groundwater remedy

until the time specified by EPA, (ii) attain Phase 1 Performance Standards for any contaminants for which EPA has not specifically granted a waiver, and (iii) complete any other obligation under this Consent Decree.

58. Such a petition shall include, at a minimum, the information and analyses required by EPA guidance and the site-specific information described in Subparagraphs (a) through (l), as follows:

a. A list of each Phase 1 Performance Standard for which a waiver is sought, and the spatial limits for which it is sought. The justification for a waiver required by items (b) - (l) below must be made for each contaminant or class of contaminants for which a waiver is sought.

b. A description of known or suspected groundwater contaminant sources at the Site, including dense non-aqueous phase liquid ("DNAPL") contaminants. The petition also shall describe source control and removal efforts that have been implemented and the effectiveness of those efforts.

c. Comprehensive groundwater monitoring data and an evaluation of the groundwater remedy implemented, along with any other remediation actions performed which enhanced or affected this remedy. The monitoring data and performance evaluation shall demonstrate, using an appropriate engineering and statistical analysis, that the groundwater remedy has been operating for a sufficiently long period of time, as stated in Paragraph 56, to permit a reliable analysis of its performance and its ability to achieve Phase 1 Performance Standards. The petition also shall demonstrate that the remedy has been designed, constructed, and operated in a manner which is consistent with the Phase 1 Remedial Design Work Plan, the Phase 1 Remedial Action Work Plan, and the conceptual models for Site contamination, and that the system has been modified or enhanced to the extent practicable to optimize its performance in an effort to attain the Phase 1 Performance Standards. Examples of modifications and enhancements which would be applicable here, in addition to the contingency requirements of the ROD, are as follows: [1] Pumping may be discontinued at individual wells where cleanup goals have been attained; [2] Alternating pumping at wells to eliminate stagnation points; [3] Pulse pumping to allow contaminants to aquifer equilibration and encourage adsorbed contaminants to partition into groundwater; and [4] Installation of additional extraction wells to facilitate or accelerate cleanup of the contaminant plume.

d. A description of the conceptual model for Phase 1 Project Area contamination, including geologic, hydrogeologic, and geochemical characterizations. A description of the distribution; characteristics; migration, potential migration, and fate; and quantities of contaminants present at the Phase 1 Project Area. These descriptions shall incorporate pertinent data obtained during the design, construction, and operation of the remedial system, as well as information obtained during previous Site characterization efforts.

e. An analysis of the performance of the groundwater remedy which describes the spatial and temporal trends in groundwater contaminant concentrations within the groundwater plume; for example, whether contaminant migration has been effectively prevented, whether there have been changes in the overall size or location of the groundwater plume, and whether the concentrations of contaminants have been slowly decreasing. The petition shall discuss the hydrogeochemical factors which influence the remedy's ability to achieve the Phase

1 Performance Standards, and demonstrate how these factors inhibit the remedial system achieving the Phase 1 Performance Standards.

f. The mass of contaminants removed from the groundwater by the remedial system, and an estimate of the mass of contaminants remaining, including the degree of uncertainty involved in this estimate.

g. A demonstration, including appropriate engineering analysis, that other conventional or innovative technologies which are potentially applicable at the Phase 1 Project Area cannot attain the Phase 1 Performance Standards in a manner that is practicable from an engineering perspective. This demonstration should include a prediction of the level of cleanup other technologies can attain.

h. A predictive analysis of the approximate time frame required to achieve the Phase 1 Performance Standards with the existing groundwater remedy, and any alternative remedial strategies, if applicable, using methods appropriate for the data and the Site-specific conditions. Such analyses also should address the uncertainty inherent in these predictions.

i. For the implemented remedy and for any alternative remedial strategies proposed as part of this petition, identification of the potential pathways by which humans and the environment are or may become exposed to the contaminated groundwater left in place. Contaminant concentration and other data needed for EPA to perform risk analyses shall be provided as part of the petition.

j. A description of the proposed alternative remedial strategy, or a comparison of two or more strategy options, proposed to be implemented by the Settling Defendant if a waiver is granted, and the level of cleanup and control of hazardous substances, pollutants, and contaminants the proposed alternative strategy or strategies will attain. Alternative remedial strategies must attain a level of cleanup and control of further releases which ensure protection of human health and the environment, and prevent further migration of contaminated groundwater. Alternative remedial strategies may include the establishment of alternative performance standards, Site-specific cleanup levels, and other alternative remediation requirements to ensure protectiveness. Proposed modifications to the existing remedy, and any additional response actions proposed to be undertaken, shall be described by the Settling Defendant in detail. EPA will make the final determination regarding the components of the alternative remedial strategy which shall be implemented at the Phase 1 Project Area by the Settling Defendant.

k. A description of any additional groundwater monitoring required to verify compliance with the alternative performance standards or remedial requirements. EPA will make the final determination regarding the scope of the groundwater monitoring requirements under the alternative remedial strategy.

l. Other information or analyses not included above, but which Settling Defendant or EPA considers appropriate to making a determination on the petition.

59. Upon receipt of all information required by Paragraph 58, EPA will review and consider the information in the petition and any other relevant information. After opportunity for review and comment by WDNR, EPA will determine (1) whether compliance with any of the Phase 1 Performance Standards shall be waived; (2) what, if any, alternative remediation requirements, including alternative performance standards and other protective measures, will be

established by EPA; (3) whether modifications to the groundwater portion of the Phase 1 Remedial Action or any additional response actions relating to groundwater contamination are required; and (4) whether revised interim milestone and completion dates are needed for attainment of Phase 1 Performance Standards or alternative performance standards under this Consent Decree. EPA's determination on the petition will be consistent with the National Contingency Plan ("NCP"), Section 121(d) of CERCLA, and any other applicable laws, regulations, and guidance in effect at the time.

60. If EPA, after a reasonable opportunity for review and comment by WDNR, grants any petition or other relief pursuant to this Section, that decision will be reflected in a post-ROD decision document, as required by the NCP. If modification of this Consent Decree or the SOW is required to implement EPA's decision, such modification will be filed and, if necessary, Court approval will be sought in accordance with Section XXXII of this Consent Decree (Modification). Upon issuance of EPA's post-ROD decision document, filing of the revised SOW and Consent Decree with the Court, and if necessary, issuance of a court order approving the modification, Settling Defendant shall implement the modifications selected by EPA to the groundwater portion of the remedial action or additional response actions relating to groundwater contamination, and achieve and maintain all Phase 1 Performance Standards, alternative performance standards, and remediation requirements established pursuant to this Section. Unless expressly modified by EPA's decision on the petition submitted hereunder, all requirements of this Consent Decree, including Settling Defendant's obligation to achieve the alternative performance standards and to conduct long-term groundwater monitoring, shall continue in force and effect.

XVII. PAYMENTS FOR RESPONSE COSTS

61. Payments by Settling Defendant for Future Response Costs. Settling Defendant shall pay to EPA all Future Response Costs not inconsistent with the NCP, excluding the first $1.5 million of Future Oversight Costs.

a. On a periodic basis, EPA will send Settling Defendant a bill requiring payment that includes an itemized cost summary and a DOJ case cost summary. Settling Defendant shall make all payments within 30 days after Settling Defendant's receipt of each bill requiring payment, except as otherwise provided in Paragraph 63, in accordance with Paragraphs 62 (Payment Instructions for Settling Defendant).

b. The total amount to be paid by Settling Defendants pursuant to Paragraph 61.a shall be deposited by EPA in the Ashland/Northern States Power Special Account (Account No. 2751026S062) to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

62. Payment Instructions for Settling Defendant.

a. All payments shall be made by Fedwire EFT to:

Federal Reserve Bank of New York
ABA = 021030004
Account = 68010727
SWIFT address = FRNYUS33
33 Liberty Street
New York NY 10045
Field Tag 4200 of the Fedwire message should read "D 68010727 Environmental Protection Agency"

b. All payments made shall reference the CDCS Number, Site/Spill ID Number B5 N5, and DOJ Case Number 90-11-2-08879/1. At the time of any payment required to be made, Settling Defendant shall send notice that payment has been made to the United States, and to EPA, in accordance with Section XXVIII (Notices and Submissions), and to the EPA Cincinnati Finance Office by email at acctsreceivable.cinwd@epa.gov, or by mail at 26 Martin Luther King Drive, Cincinnati, Ohio 45268. Such notice shall also reference the CDCS Number, Site/Spill ID Number, and DOJ Case Number.

63. Settling Defendant may contest any Future Response Costs billed under Paragraph 61 (Payments by Settling Defendant for Future Response Costs) if it determines that EPA has made a mathematical error or included a cost item that is not within the definition of Future Response Costs, or if it believes EPA incurred excess costs as a direct result of an EPA action that was inconsistent with a specific provision or provisions of the NCP. Such objection shall be made in writing within 30 days after receipt of the bill and must be sent to the United States pursuant to Section XXVIII (Notices and Submissions). Any such objection shall specifically identify the contested Future Response Costs and the basis for objection. In the event of an objection, Settling Defendant shall pay all uncontested Future Response Costs to the United States within 30 days after Settling Defendant's receipt of the bill requiring payment. Simultaneously, Settling Defendant shall establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation ("FDIC"), and remit to that escrow account funds equivalent to the amount of the contested Future Response Costs. Settling Defendant shall send to the United States, as provided in Section XXVIII (Notices and Submissions), a copy of the transmittal letter and check paying the uncontested Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. Simultaneously with establishment of the escrow account, Settling Defendant shall initiate the Dispute Resolution procedures in Section XXI (Dispute Resolution). If the United States prevails in the dispute, Settling Defendant shall pay the sums due (with accrued interest) to the United States within five days after the resolution of the dispute. If Settling Defendant prevails concerning any aspect of the contested costs, Settling Defendant shall pay that portion of the costs (plus associated accrued interest) for which it did not prevail to the United States within five days after the resolution of the dispute. Settling Defendant shall be disbursed any balance of the escrow account. All payments to the United States under this Paragraph shall be made in accordance with

Paragraphs 62 (Payment Instructions for Settling Defendant). The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XXI (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Settling Defendant's obligation to reimburse the United States for its Future Response Costs.

64. Interest. In the event that any payment for Future Response Costs required under this Section is not made by the date required, Settling Defendant shall pay Interest on the unpaid balance. The Interest on Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of Settling Defendant's payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiffs by virtue of Settling Defendant's failure to make timely payments under this Section including, but not limited to, payment of stipulated penalties pursuant to Paragraph 84.

XVIII. NATURAL RESOURCE RESTORATION PROJECTS

65. As Settling Defendant's full contribution toward Natural Resource Damages, subject to Paragraphs 100 and 101, Settling Defendant shall convey, or cause to be conveyed, on an "As Is, Where Is" basis, certain properties as described below ("Restoration Properties"):

a. Bad River Falls Project. In order to improve Natural Resources in the Bad River Falls area, Settling Defendant shall convey, or cause to be conveyed, by special warranty deed in the form contemplated below in Paragraph 67.a, to the Bad River Band of the Lake Superior Tribe of Chippewa Indians the land owned by Settling Defendant within the Bad River Reservation, totaling approximately 400 acres within the following tracts: part of the NE ¼ of the NE ¼; part of the NW ¼ of the NE ¼; part of the SE ¼ of the NE ¼; part of the NE ¼ of the SW ¼; part of the NW ¼ of the SW ¼; part of the NE ¼ of the SE ¼; and part of the NW ¼ of the SE ¼; all located in Section 36, T47N, R3W, Town of Sanborn, Ashland County, Wisconsin; and part of Govt. Lot 1 in the NE ¼ of the SE ¼; part of Govt. Lots 3 and 4 in the NW ¼ of the SE ¼; part of Govt. Lot 5 in the SW ¼ of the SE ¼; part of Govt. Lot 6 in the NE ¼ of the SW ¼; part of Govt. Lot 7 in the SE ¼ of the SW ¼; and Part of Govt. Lot 11 in the SW ¼ of the NE ¼; all located in Section 25, T47N, R3W, Town of Sanborn, Ashland County, Wisconsin. Settling Defendant (or Settling Defendant's Related Parties) shall be entitled to reserve (or to grant to itself or any of Settling Defendant's Related Parties) an easement, in the form attached as Appendix F, with respect to Settling Defendant's (or Settling Defendant's Related Parties') existing transmission and distribution lines and related equipment and facilities in the Restoration Property described in this Paragraph 65.a.

b. Iron River Project. In order to improve Natural Resources in the Iron River watershed, Settling Defendant shall convey, or cause to be conveyed, by special warranty deed, in the form contemplated below in Paragraph 67.a, lands owned by Setlling Defendant within the following tracts of property, totaling approximately 989.95 acres, to WDNR:

(1) Lake Superior Power Company Lands consisting of approximately 449.98 acres of land, being Lots 1 and 2 of Block 2; Lots 1, 2, 3, 4, 5, 6, 7 of Block 3; Lots 1, 2, 3, 4 of Block 4; Lots 1, 2, 5, 6, 7, 9, 10 of Block 5; all in Orienta Falls Park; and part of the SW¼ of the NE¼; part of the NE¼ of the NW¼; part of the NW¼ of the NW¼; the SW¼ of the NW¼; the SE¼ of the NW¼; the entire SW¼; the NW¼ of the

SE¼; the SW¼ of the SE¼; the SE¼ of the SE¼; all located in Section 10, T49N, R9W, Town of Orienta, Bayfield County, Wisconsin;

(2) Lake Superior Power Company Lands consisting of approximately 480 acres of land, being the entire NE¼; the entire NW¼; and the entire SE¼; all in Section 15, T49N, R9W, Town of Orienta, Bayfield County, Wisconsin;

(3) Lake Superior Power Company Lands consisting of approximately 40 acres of land in SE ¼ of the SE ¼, Section 9, T49N, R9W, Town of Orienta, Bayfield County, Wisconsin; and

(4) Lake Superior Power Company Lands consisting of approximately 19.97 acres of land, being Lots 1, 2, 3, 4 of Block 1 of Orienta Falls Park; and the remainder of the S ½ of the SW ¼ of the SW ¼, all located in Section 3, T49N, R9W, Town of Orienta, Bayfield County, Wisconsin.

Settling Defendant shall be allowed to complete a timber harvest on the properties listed in this Paragraph 65.b, subject to a plan ("Harvest Plan") to be drafted by Settling Defendant and approved by WDNR after consultation with the National Oceanic and Atmospheric Administration and the United States Fish and Wildlife Service. The timber harvest may be performed at various times so long as all harvest activity by Settling Defendant ceases within five years of the Effective Date. The Harvest Plan shall take into consideration WDNR's long-term management goals and objectives to improve Natural Resources in the Iron River watershed. WDNR shall collaborate with Settling Defendant, upon request, to develop the Harvest Plan. The rights under the Harvest Plan shall be recorded in a written agreement signed by the State and Settling Defendant.

c. The legal descriptions for the special warranty deeds and the easement shall be determined, and approximate acreages set forth in Paragraphs 65.a. and 65.b. shall be conformed, based on the results of the surveys and title reports contemplated in Paragraph 67.

66. In exchange for the actions to be taken by Settling Defendant pursuant to Paragraph 65, and pursuant to approval of the Natural Resources Board and the Governor, as provided for in WIS. STAT. §§ 23.15(1) and (2), the State shall convey, or cause to be conveyed, certain properties as described below ("Restoration Properties"):

a. Raspberry River Watershed Project. Pursuant to the approvals above, the State shall convey, or cause to be conveyed, under WIS. STAT. § 23.15, by quitclaim deed, the following property totaling approximately 119.62 acres to the Red Cliff Band of the Lake Superior Tribe of Chippewa Indians in order to improve Natural Resources in the Raspberry River Watershed:

(1) Government Lots 1 and 2 in Section 1, Town 51 North, Range 4 West; and

(2) Government Lot 2 in Section 36, Town 52 North, Range 4 West.

67. Within 60 days of the Effective Date of this Consent Decree:

a. Settling Defendant shall cause the following items to be transferred to the Trustees for review with respect to each of the Restoration Properties described in Paragraph 65:

(1) A draft special warranty deed (limited to the acts of Grantor) enforceable under the laws of the State of Wisconsin, free and clear of monetary liens (excluding taxes not yet due and payable) but subject to encumbrances of record (as long as those encumbrances do not preclude preservation) and matters that would be revealed by an accurate survey;

(2) A current title commitment or report prepared in accordance with customary practice in Ashland and Bayfield Counties, Wisconsin; and

(3) One or more surveys.

b. The State shall cause the following items to be transferred to the Trustees for review with respect to the Restoration Properties described in Paragraph 66:

(1) A draft quitclaim deed enforceable under the laws of the State of Wisconsin; and

(2) A current title commitment or report prepared in accordance with customary practice in Ashland and Bayfield Counties, Wisconsin.

c. Notwithstanding Paragraph 67.a, above, Trustees acknowledge that the lien of that certain Trust Indenture dated April 1, 1974, from Settling Defendant to U.S. Bank National Association, a corporation under the laws of the United States of America f/k/a Firstar Bank National Association, shall remain of record after the execution and delivery of the deeds required by Paragraph 65, but Settling Defendant shall obtain and furnish the relevant Trustees a partial release of said lien within 90 days from the date of delivery of said deeds such that there is no lien applicable to the Restoration Properties in Paragraph 65.

68. Restoration Property Title Transfer and Management.

a. With respect to the Restoration Properties each Party owns, Settling Defendant and the State shall:

(1) Within 45 days after submittal of the relevant draft deeds and other necessary instruments in Paragraphs 67.a and 67.b, cause title searches to be updated.

(2) Within 150 days after submittal of the relevant draft deeds and other necessary instruments in Paragraphs 67.a and 67.b, if it is determined that nothing has occurred since the effective date of the commitments or reports to affect the titles adversely, execute and deliver the deeds (as described in Paragraphs 67.a and 67.b) to the Restoration Properties described in Paragraphs 65 and 66 to the Trustees set forth in Paragraphs 65 and 66, at the sole expense of the transferring Party.

b. After the transfers, the Restoration Properties shall be preserved and managed by the transferee Trustees to protect and enhance the natural resource benefits associated with the Restoration Properties.

69. Dispute Resolution for Natural Resource Restoration Projects. This Paragraph applies solely to disputes under this Section and Paragraph 84.b(11)-(12).

a. Informal Dispute Resolution. Any dispute under this Paragraph shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. This dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

b. Formal Dispute Resolution. In the event that the parties cannot resolve a dispute under this Paragraph by informal negotiations, then the formal dispute procedures outlined by this Paragraph 69.b shall apply.

(1) The position advanced by Plaintiffs, after consulting with the Trustees, shall be considered binding unless, within 21 days after the conclusion of the informal negotiation period, Settling Defendant invokes the formal dispute resolution procedures of this Section by serving on the Trustees a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by Settling Defendant.

(2) Following receipt of Settling Defendant's Statement of Position, Plaintiffs, after consulting with the Trustees, will issue an administrative decision resolving the dispute which shall include or attach any factual data, analysis, opinion, or documentation supporting the decision. Plaintiffs shall compile and maintain an administrative record of the dispute containing Settling Defendant's Statement of Position and Plaintiffs' administrative decision. Plaintiffs' administrative decision shall be binding on Settling Defendant unless, within 30 days after receipt of the administrative decision, Settling Defendant files with the Court and serves on all Parties a motion for judicial review of the decision, based on the administrative record compiled and maintained by Plaintiffs pursuant to this Paragraph 69.b. Any such motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. Plaintiffs shall provide the Court a copy of the administrative record of the dispute, and may file a response to Settling Defendant's motion.

c. Effect of Invoking Dispute Resolution. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone, or affect in any way any obligation of Settling Defendant under this Consent Decree, not directly in dispute, unless Plaintiffs, after consulting with the Trustees, or the Court agree otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 90. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that Settling Defendant does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XXII (Stipulated Penalties).

XIX. INDEMNIFICATION AND INSURANCE

70. Settling Defendant's Indemnification of the United States and the State.

a. The United States and the State do not assume any liability by entering into this Consent Decree or by virtue of any designation of Settling Defendant as EPA's or WDNR's authorized representative under Section 104(e) of CERCLA, 42 U.S.C. § 9604(e), or Chapters 289, 291, and 292 of the Wisconsin Statutes. Settling Defendant shall indemnify, save and hold harmless the United States, the State, and their officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Settling Defendant, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on its behalf or under its control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Defendant as EPA's or WDNR's authorized representative under Section 104(e) of CERCLA or Chapters 289, 291 and 292 of the Wisconsin Statutes. Further, Settling Defendant agrees to pay the United States and the State all costs they incur including, but not limited to, attorneys' fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States or the State based on negligent or other wrongful acts or omissions of Settling Defendant, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on its behalf or under its control, in carrying out activities pursuant to this Consent Decree. The United States and the State shall not be held out as a party to any contract entered into by or on behalf of Settling Defendant in carrying out activities pursuant to this Consent Decree. Neither Settling Defendant nor any such contractor shall be considered an agent of the United States or the State.

b. The United States and the State shall give Settling Defendant notice of any claim for which the United States or the State plans to seek indemnification pursuant to this Paragraph 70, and shall consult with Settling Defendant prior to settling such claim.

71. Settling Defendant covenants not to sue and agrees not to assert any claims or causes of action against the United States or the State for damages or reimbursement or for set-off of any payments made or to be made to the United States, arising from or on account of any contract, agreement, or arrangement between Settling Defendant and any person for performance of Work on or relating to the Phase 1 Project Area, including, but not limited to, claims on account of construction delays. In addition, Settling Defendant shall indemnify and hold harmless the United States and the State with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between Settling Defendant and any person for performance of Work on or relating to the Phase 1 Project Area, including, but not limited to, claims on account of construction delays.

72. No later than 15 days before commencing any on-site Work, Settling Defendant shall secure, and shall maintain until the first anniversary after issuance of EPA's Certification of Completion of the Remedial Action pursuant to Paragraph 50.b of Section XIV (Completion of the Phase 1 Remedial Action), commercial general liability insurance with limits of $2 million, for any one occurrence, and automobile liability insurance with limits of $2 million, combined single limit, naming the United States and the State as additional insureds with respect to all liability arising out of the activities performed by or on behalf of Settling Defendant pursuant to this Consent Decree. In addition, for the duration of this Consent Decree, Settling Defendant shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and

regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Settling Defendant in furtherance of this Consent Decree. Prior to commencement of the Work under this Consent Decree, Settling Defendant shall provide to EPA and WDNR certificates of such insurance and a copy of each insurance policy. Settling Defendant shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling Defendant demonstrates by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendant need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor.

XX. FORCE MAJEURE

73. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of Settling Defendant, of any entity controlled by Settling Defendant, or of Settling Defendant's contractors that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendant's best efforts to fulfill the obligation. The requirement that Settling Defendant exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the Work or failure to achieve the Phase 1 Performance Standards.

74. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree for which Settling Defendant intends or may intend to assert a claim of force majeure, Settling Defendant shall notify orally EPA's Project Coordinator or, in his or her absence, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region 5, within 48 hours of when Settling Defendant first knew that the event might cause a delay. Within five days thereafter, Settling Defendant shall provide in writing to EPA and WDNR an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Settling Defendant's rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Settling Defendant, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Settling Defendant shall include with any notice all available documentation supporting its claim that the delay was attributable to a force majeure. Settling Defendant shall be deemed to know of any circumstance of which Settling Defendant, any entity controlled by Settling Defendant, or Settling Defendant's contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Settling Defendant from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 73 and whether Settling Defendant has exercised its best efforts under Paragraph 73, EPA may, in its unreviewable discretion, excuse in writing Settling Defendant's failure to submit timely notices under this Paragraph.

75. If EPA agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Consent Decree that are affected by the force majeure will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify Settling Defendant in writing of its decision. If EPA agrees that the delay is attributable to a force majeure, EPA will notify Settling Defendant in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

76. If Settling Defendant elects to invoke the dispute resolution procedures set forth in Section XXI (Dispute Resolution), it shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Settling Defendant shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendant complied with the requirements of Paragraphs 73 and 74. If Settling Defendant carries this burden, the delay at issue shall be deemed not to be a violation by Settling Defendant of the affected obligation of this Consent Decree identified to EPA and the Court.

XXI. DISPUTE RESOLUTION

77. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes regarding this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States or the State to enforce obligations of Settling Defendant that have not been disputed in accordance with this Section.

78. Any dispute regarding this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

79. Statements of Position.

a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA shall be considered binding unless, within 21 days after the conclusion of the informal negotiation period, Settling Defendant invokes the formal dispute resolution procedures of this Section by serving on the United States a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by Settling Defendant. The Statement of Position shall specify Settling Defendant's position as to whether formal dispute resolution should proceed under Paragraph 80 (Record Review) or Paragraph 81.

b. Within 21 days after receipt of Settling Defendant's Statement of Position, EPA will serve on Settling Defendant its Statement of Position, including, but not limited to, any

factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 80 (Record Review) or Paragraph 81. Within ten days after receipt of EPA's Statement of Position, Settling Defendant may submit a Reply.

c. If there is disagreement between EPA and Settling Defendant as to whether dispute resolution should proceed under Paragraph 80 (Record Review) or Paragraph 81, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA to be applicable. However, if Settling Defendant ultimately appeals to the Court to resolve the dispute, the Court shall determine which paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 80 and 81.

80. Record Review. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation, the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval by EPA under this Consent Decree, and the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendant regarding the validity of the ROD's provisions.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant to this Section. Where appropriate, EPA may allow submission of supplemental statements of position by the parties to the dispute.

b. The Director of the Superfund Division, EPA Region 5, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 80.a. This decision shall be binding upon Settling Defendant, subject only to the right to seek judicial review pursuant to Paragraphs 80.c and 80.d.

c. Any administrative decision made by EPA pursuant to Paragraph 80.b shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by Settling Defendant with the Court and served on all Parties within ten days after receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States may file a response to Settling Defendant's motion.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendant shall have the burden of demonstrating that the decision of the Superfund Division Director is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 80.a.

81. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law, shall be governed by this Paragraph.

a. Following receipt of Settling Defendant's Statement of Position submitted pursuant to Paragraph 79, the Director of the Superfund Division, EPA Region 5, will issue a

final decision resolving the dispute. The Superfund Division Director's decision shall be binding on Settling Defendant unless, within ten days after receipt of the decision, Settling Defendant files with the Court and serves on the parties a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The United States may file a response to Settling Defendant' motion.

b. Notwithstanding Paragraph R (CERCLA Section 113(j) Record Review of ROD and Work) of Section I (Background), judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

82. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone, or affect in any way any obligation of Settling Defendant under this Consent Decree, not directly in dispute, unless EPA or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 90. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that Settling Defendant does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XXII (Stipulated Penalties).

XXII. STIPULATED PENALTIES

83. Settling Defendant shall be liable for stipulated penalties in the amounts set forth in Paragraphs 84 and 85 to the United States for failure to comply with the requirements of this Consent Decree specified below, unless excused under Section XX (Force Majeure). "Compliance" by Settling Defendant shall include completion of all payments and activities required under this Consent Decree, or any plan, report, or other deliverable approved under this Consent Decree, in accordance with all applicable requirements of law, this Consent Decree, the SOW, and any plans, reports, or other deliverables approved under this Consent Decree and within the specified time schedules established by and approved under this Consent Decree.

84. Stipulated Penalty Amounts – Compliance Milestones.

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Paragraph 84.b:

Penalty Per Violation Per Day	Period of Noncompliance
$1,000	1st through 14th day
$1,500	15th through 30th day
$3,000	31st day and beyond

b. Compliance Milestones.

(1) Failure to timely submit or resubmit the Preliminary, Prefinal or Final Design;

(2) Failure to timely submit or resubmit the Phase 1 Remedial Action Work Plan;

(3) Failure to timely initiate Phase 1 Remedial Action Construction or to complete the Phase 1 Remedial Action;

(4) Failure to timely submit, resubmit, or to implement the Operation and Maintenance Plan;

(5) Failure to conduct Performance Monitoring;

(6) Failure to timely submit, resubmit, or implement the Institutional Control Implementation and Assurance Plan;

(7) Failure to establish or maintain the required performance guarantee pursuant to Section XIII of this Consent Decree;

(8) Failure to make best efforts to obtain or to provide access or to execute the required Institutional Controls and submit them to WDNR pursuant to Section IX of this Consent Decree;

(9) Failure to timely make payment of Future Response Costs pursuant to Section XVII of this Consent Decree;

(10) Failure to initiate or complete any further response actions EPA selects for the Phase 1 Project Area pursuant to Paragraph 20 of this Consent Decree;

(11) Failure to timely submit draft deeds for NRD Property pursuant to Paragraph 67 of this Consent Decree; and

(12) Failure to timely complete the transfers of NRD Property pursuant to Paragraph 68 of this Consent Decree.

85. Stipulated Penalty Amounts - Other Requirements. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate reports or other plans or deliverables, other than those specified in the preceding Paragraph, or to satisfy any other requirement of the Consent Decree:

Penalty Per Violation Per Day	Period of Noncompliance
$500	1st through 14th day
$1,000	15th through 30th day
$2,000	31st day and beyond

86. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 102 (Work Takeover), Settling Defendant shall be liable for a stipulated penalty in the amount of $1.5 million. Stipulated penalties under this Paragraph are in addition to the remedies available under Paragraphs 48 (Funding for Work Takeover) and 102 (Work Takeover).

87. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under Section XI (EPA Approval of Plans, Reports, and Other Deliverables), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Defendant of any deficiency; (b) with respect to a decision by the Director of the Superfund Division, EPA Region

5, under Paragraph 80.b or 81.a of Section XXI (Dispute Resolution), during the period, if any, beginning on the 21st day after the date that Settling Defendant's reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (c) with respect to judicial review by this Court of any dispute under Section XXI (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing in this Consent Decree shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

88. Following the United States' determination that Settling Defendant has failed to comply with a requirement of this Consent Decree, the United States may give Settling Defendant written notification of the same and describe the noncompliance. The United States may send Settling Defendant a written demand for the payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether the United States has notified Settling Defendant of a violation.

89. All penalties accruing under this Section shall be due and payable to the United States within 30 days after Settling Defendant's receipt from EPA of a demand for payment of the penalties, unless Settling Defendant invokes the Dispute Resolution procedures under Section XXI (Dispute Resolution) within the 30-day period. All payments to the United States under this Section shall indicate that the payment is for stipulated penalties, and shall be made in accordance with Paragraph 62 (Payment Instructions for Settling Defendant), except that stipulated penalties pursuant to Paragraph 84.b(11)-(12) shall be made to the Financial Litigation Unit of the U.S. Attorney's Office for the Western District of Wisconsin pursuant to instructions to be provided by the Financial Litigation Unit if necessary. Dispute resolution for Paragraph 84.b(11)-(12) shall be conducted pursuant to Paragraph 69 (Dispute Resolution for Natural Resource Restoration Projects).

90. Penalties shall continue to accrue as provided in Paragraph 87 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement of the Parties or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owed shall be paid to EPA within 15 days after the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, Settling Defendant shall pay all accrued penalties determined by the Court to be owed to EPA within 60 days after receipt of the Court's decision or order, except as provided in Paragraph 90.c;

c. If the District Court's decision is appealed by any Party, Settling Defendant shall pay all accrued penalties determined by the District Court to be owed to the United States into an interest-bearing escrow account, established at a duly chartered bank or trust company that is insured by the FDIC, within 60 days after receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days after receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to EPA or to Settling Defendant to the extent that it prevails.

91. If Settling Defendant fails to pay stipulated penalties when due, Settling Defendant shall pay Interest on the unpaid stipulated penalties as follows: (a) if Settling

Defendant has timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to Paragraph 90 until the date of payment; and (b) if Settling Defendant fails to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 89 until the date of payment. If Settling Defendant fails to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest.

92. The payment of penalties and Interest, if any, shall not alter in any way Settling Defendant's obligation to complete the performance of the Work required under this Consent Decree.

93. Nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States or the State to seek any other remedies or sanctions available by virtue of Settling Defendant's violation of this Consent Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(*l*) of CERCLA, 42 U.S.C. § 9622(*l*), and Chapters 289, 291, and 292 of the Wisconsin Statutes, provided, however, that the United States shall not seek civil penalties pursuant to Section 122(*l*) of CERCLA or Chapters 289, 291, and 292 of the Wisconsin Statutes for any violation for which a stipulated penalty is provided in this Consent Decree, except in the case of a willful violation of this Consent Decree.

94. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XXIII. COVENANTS BY PLAINTIFFS AND TRIBES

95. Covenants for Settling Defendant by the United States and the State.

a. In consideration of the actions that will be performed and the payments that will be made by Settling Defendant under this Consent Decree, and except as specifically provided in Paragraphs 97 and 98 (United States' Pre- and Post-Certification Reservations), and 101 (General Reservations of Rights), the United States covenants not to sue or to take administrative action against Settling Defendant pursuant to Sections 106 and 107(a) of CERCLA relating to the Phase 1 Project Area. These covenants are conditioned upon the satisfactory performance by Settling Defendant of its obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendant and do not extend to any other person; provided, however that these covenants not to sue (and the reservations thereto) shall also apply to Settling Defendant's Related Parties.

b. In consideration of the actions that will be performed and the payments that will be made by Settling Defendant under this Consent Decree, and except as specifically provided in Paragraph 101 (General Reservations of Rights), the State covenants not to sue or to take administrative action against Settling Defendant pursuant to Section 107(a) of CERCLA and Wisconsin statutory or common law relating to the Phase 1 Project Area. These covenants are conditioned upon the satisfactory performance by Settling Defendant of its obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendant and do not

extend to any other person; provided, however that these covenants not to sue (and the reservations thereto) shall also apply to Settling Defendant's Related Parties.

96. Covenants for Natural Resource Damages. In consideration of the actions that will be performed and the land transfers that will be made by Settling Defendant under this Consent Decree, and except as specifically provided in Paragraphs 100 and 101, the United States, the State, and the Tribes covenant not to sue or to take administrative action against Settling Defendant for Natural Resource Damages relating to the Site pursuant to Section 107(f) of CERCLA and Section 311(f) of the Clean Water Act, Wisconsin statutory or common law, or Tribal law. These covenants not to sue shall take effect upon the receipt by the Trustees of the land to be transferred as required by Section XVIII (Natural Resource Restoration Projects). These covenants are conditioned upon the satisfactory performance by Settling Defendant of its obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendant and do not extend to any other person; provided, however that these covenants not to sue (and the reservations thereto) shall also apply to Settling Defendant's Related Parties.

97. United States' Pre-Certification Reservations. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, and/or to issue an administrative order, seeking to compel Settling Defendant to perform further response actions relating to the Phase 1 Project Area and/or to pay the United States for additional costs of response if, (a) prior to Certification of Completion of the Phase 1 Remedial Action, (1) conditions at the Phase 1 Project Area, previously unknown to EPA, are discovered, or (2) information, previously unknown to EPA, is received, in whole or in part, and (b) EPA determines that these previously unknown conditions or information together with any other relevant information indicates that the Phase 1 Remedial Action is not protective of human health or the environment.

98. United States' Post-Certification Reservations. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, and/or to issue an administrative order, seeking to compel Settling Defendant to perform further response actions relating to the Phase 1 Project Area and/or to pay the United States for additional costs of response if, (a) subsequent to Certification of Completion of the Phase 1 Remedial Action, (1) conditions at the Site, previously unknown to EPA, are discovered, or (2) information, previously unknown to EPA, is received, in whole or in part, and (b) EPA determines that these previously unknown conditions or this information together with other relevant information indicate that the Phase 1 Remedial Action is not protective of human health or the environment.

99. For purposes of Paragraph 97 (United States' Pre-Certification Reservations), the information and the conditions known to EPA will include only that information and those conditions known to EPA as of the date the ROD was signed and set forth in the ROD for the Site and the administrative record supporting the ROD. For purposes of Paragraph 98 (United States' Post-Certification Reservations), the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date of Certification of Completion of the Remedial Action and set forth in the ROD, the administrative record supporting the ROD, the post-ROD administrative record, or in any information received by EPA pursuant to the requirements of this Consent Decree prior to Certification of Completion of the Phase 1 Remedial Action.

100. Trustees' Reservations Regarding Natural Resource Damages. Notwithstanding any other provision of this Consent Decree, the Trustees reserve the right to institute proceedings against Settling Defendant in this action or in a new action seeking recovery of Natural Resource Damages, based on: (1) conditions with respect to the Site, unknown to the Trustees as of the date of lodging of this Consent Decree, that result in releases of hazardous substances that contribute to injury to, destruction of, or loss of Natural Resources ("Unknown NRD Conditions"), or (2) information received by the Trustees after the date of lodging of this Consent Decree which indicates that the releases of hazardous substances at the Site have resulted in injury to, destruction of, or loss of Natural Resources of a type or future persistence that was unknown to the Trustees as of the date of lodging of this Consent Decree ("New NRD Information"). The following shall not be considered Unknown NRD Conditions or New NRD Information for the purpose of this Paragraph: (1) an increase solely in any Trustee's assessment of the magnitude of a known injury to, destruction of, or loss of Natural Resources at the Site; or (2) injury to, destruction of, or loss of Natural Resources at the Site arising from the re-exposure, resuspension, or migration of hazardous substances known to be present at the Site. For the purpose of this Paragraph, the information and conditions known to the Trustees shall include any information or conditions listed or identified in records relating to the Site that were in the possession or under the control of EPA, DOI, DOC, WDNR, or the Tribes as of the Date of Lodging of this Consent Decree.

101. General Reservations of Rights. The United States, the State, and the Tribes reserve, and this Consent Decree is without prejudice to, all rights against Settling Defendant and Settling Defendant's Related Parties with respect to all matters not expressly included within Plaintiffs' covenants. Notwithstanding any other provision of this Consent Decree, the United States and the State reserve, and the Tribes reserve as to Natural Resource Damages, all rights against Settling Defendant with respect to:

a. liability for failure by Settling Defendant to meet a requirement of this Consent Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site;

c. liability based on the ownership or operation of the Site by Settling Defendant when such ownership or operation commences after signature of this Consent Decree by Settling Defendant;

d. liability based on the operation of the Site by Settling Defendant when such operation commences after signature of this Consent Decree by Settling Defendant and does not arise solely from Settling Defendant's performance of the Work;

e. liability based on Settling Defendant's transportation, treatment, storage, or disposal, or the arrangement for the transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, other than as provided in the ROD, the Work, or otherwise ordered by EPA, after signature of this Consent Decree by Settling Defendant;

f. criminal liability;

g. liability for violations of federal or state law that occur during or after implementation of the Work;

h. liability, prior to Certification of Completion of the Phase 1 Remedial Action, for additional response actions that EPA determines are necessary to achieve and maintain Phase 1 Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD, but that cannot be required pursuant to Paragraph 14 (Modification of SOW or Related Work Plans);

i. liability for performance of response actions in areas of the Site other than the Phase 1 Project Area;

j. liability for costs that the United States will incur regarding the Site but that are not within the definition of Future Response Costs; and

k. liability for previously incurred costs of response.

102. Work Takeover.

a. In the event EPA, after consultation with WDNR, determines that Settling Defendant has (1) ceased implementation of any portion of the Work, or (2) is seriously or repeatedly deficient or late in its performance of the Work, or (3) is implementing the Work in a manner that may cause an endangerment to human health or the environment, EPA may issue a written notice ("Work Takeover Notice") to Settling Defendant. Any Work Takeover Notice issued by EPA will specify the grounds upon which such notice was issued and will provide Settling Defendant a period of 30 days within which to remedy the circumstances giving rise to EPA's issuance of such notice.

b. If, after expiration of the 30-day notice period specified in Paragraph 102.a, Settling Defendant has not remedied to EPA's satisfaction the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, EPA may at any time thereafter assume the performance of all or any portion(s) of the Work as EPA deems necessary ("Work Takeover"). EPA will notify Settling Defendant in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this Paragraph 102.b. Funding of Work Takeover costs is addressed under Paragraph 48.

c. Settling Defendant may invoke the procedures set forth in Paragraph 80 (Record Review), to dispute EPA's implementation of a Work Takeover under Paragraph 102.b. However, notwithstanding Settling Defendant's invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover under Paragraph 102.b until the earlier of (1) the date that Settling Defendant remedies, to EPA's satisfaction, the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, or (2) the date that a final decision is rendered in accordance with Paragraph 80 (Record Review) requiring EPA to terminate such Work Takeover.

103. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all authority and reserves all rights to take any and all response actions authorized by law.

XXIV. COVENANTS BY SETTLING DEFENDANT

104. Covenants Not to Sue by Settling Defendant. Subject to the reservations in Paragraph 106, Settling Defendant and Settling Defendant's Related Parties covenant not to sue and agree not to assert any claims or causes of action against the United States or the State with respect to the Work, Future Response Costs, Natural Resource Damages, and this Consent Decree, including, but not limited to:

a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections 106(b)(2), 107, 111, 112 or 113, or any other provision of law;

b. any claims against the United States, including any department, agency, or instrumentality of the United States, or the State, including any department or agency of the State, under CERCLA Sections 107 or 113, RCRA Section 7002(a), 42 U.S.C. § 6972(a), or state law regarding the Work, Future Response Costs, and this Consent Decree; or

c. any claims arising out of response actions at or in connection with the Phase 1 Project Area, including any claim under the United States Constitution, the Wisconsin Constitution, the Tucker Act, 28 U.S.C. §1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, as amended, or at common law regarding the Work and this Consent Decree.

105. Except as provided Paragraph 114 (Res Judicata and Other Defenses), the covenants in this Section shall not apply if the United States or the State brings a cause of action or issues an order pursuant to any of the reservations in Section XXIII (Covenants by Plaintiffs and Tribes), other than in Paragraphs 101.a (claims for failure to meet a requirement of the Decree), 101.f (criminal liability), and 101.g (violations of federal/state law during or after implementation of the Work), but only to the extent that Settling Defendant's claims arise from the same response action, response costs, or damages that the United States, the State, or the Tribes is seeking pursuant to the applicable reservation and only with respect to the entity bringing the action.

106. Settling Defendant and Settling Defendant's Related Parties expressly reserve all rights and remedies that relate to or arise from issues or matters beyond the scope of this Consent Decree, including, specifically, but not limited to, any claims regarding Chequamegon Bay, except those claims related to Natural Resource Damages in Chequamegon Bay. Except as specifically provided in this Consent Decree, nothing herein shall limit or otherwise alter or affect Settling Defendant's or Settling Defendant's Related Parties' rights, defenses, causes of action, claims or interests, or ability to assert same, whether arising under or pursuant to state, federal, or common law whatsoever, whether against Plaintiffs or others, and all such rights, defenses, claims, causes of action, or interests are hereby fully reserved. Settling Defendant and Settling Defendant's Related Parties reserve, and this Consent Decree is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the

foregoing shall not include any claim based on EPA's selection of response actions, or the oversight or approval of Settling Defendant's plans, reports, other deliverables, or activities.

107. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

108. Claims Against De Micromis Parties. Settling Defendant agrees not to assert any claims and to waive all claims or causes of action (including but not limited to claims or causes of action under Sections 107(a) and 113 of CERCLA) that it may have for all matters relating to the Site against any person where the person's liability to Settling Defendant with respect to the Site is based solely on having arranged for disposal or treatment, or for transport for disposal or treatment, of hazardous substances at the Site, or having accepted for transport for disposal or treatment of hazardous substances at the Site, if all or part of the disposal, treatment, or transport occurred before April 1, 2001, and the total amount of material containing hazardous substances contributed by such person to the Site was less than 110 gallons of liquid materials or 200 pounds of solid materials.

109. The waiver in Paragraph 108 (Claims Against De Micromis Parties) shall not apply with respect to any defense, claim, or cause of action that a Settling Defendant may have against any person meeting the criteria in Paragraph 108 if such person asserts a claim or cause of action relating to the Site against Settling Defendant. This waiver does not apply to any potential claim Settling Defendant may assert against the City of Ashland, Wisconsin, Soo Line Railroad, or Wisconsin Central Ltd. This waiver also shall not apply to any claim or cause of action against any person meeting the criteria in Paragraph 108 if EPA determines:

a. that such person has failed to comply with any EPA requests for information or administrative subpoenas issued pursuant to Section 104(e) or 122(e) of CERCLA, 42 U.S.C. § 9604(e) or 9622(e), or Section 3007 of RCRA, 42 U.S.C. § 6927, or has impeded or is impeding, through action or inaction, the performance of a response action or Natural Resource restoration with respect to the Site, or has been convicted of a criminal violation for the conduct to which this waiver would apply and that conviction has not been vitiated on appeal or otherwise; or

b. that the materials containing hazardous substances contributed to the Site by such person have contributed significantly, or could contribute significantly, either individually or in the aggregate, to the cost of response action or Natural Resource restoration at the Site.

XXV. EFFECT OF SETTLEMENT; CONTRIBUTION

110. Nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. Each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action that each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this Consent Decree diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to

pursue any such persons to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

111. The Parties agree, and by entering this Consent Decree this Court finds, that this Consent Decree constitutes a judicially approved settlement for purposes of Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2), and that Settling Defendant and Settling Defendant's Related Parties are entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Section 113(f)(2) of CERCLA, or as may be otherwise provided by law, for "matters addressed" in this Consent Decree. The "matters addressed" in this Consent Decree are the Work, Future Response Costs, and Natural Resource Damages.

112. Settling Defendant shall, with respect to any suit or claim brought by it for matters related to this Consent Decree, notify the United States and the State in writing no later than 5 days after the initiation of such suit or claim.

113. Settling Defendant shall, with respect to any suit or claim brought against it for matters related to this Consent Decree, notify in writing the United States and the State within ten days after service of the complaint on such Settling Defendant. In addition, Settling Defendant shall notify the United States and the State within ten days after service or receipt of any Motion for Summary Judgment and within ten days after receipt of any order from a court setting a case for trial.

114. Res Judicata and Other Defenses. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendant shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States or the State in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XXIII (Covenants by Plaintiffs and Tribes).

XXVI. ACCESS TO INFORMATION

115. Settling Defendant shall provide to EPA and WDNR, upon request, copies of all records, reports, documents, and other information (including records, reports, documents, and other information in electronic form) created or generated pursuant to the requirements to perform the Work (hereinafter referred to as "Records") within its possession or control or that of its contractors or agents relating to activities at the Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information created or generated pursuant to the requirements to perform the Work. Settling Defendant shall also make available to EPA and WDNR, for purposes of investigation, information gathering, or testimony, its employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

116. Business Confidential and Privileged Documents.

a. Settling Defendant may assert business confidentiality claims covering part or all of the Records submitted to Plaintiffs under this Consent Decree to the extent

permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Records determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies Records when they are submitted to EPA and WDNR, or if EPA has notified Settling Defendant that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to Settling Defendant.

b. Settling Defendant may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendant asserts such a privilege in lieu of providing Records, it shall provide Plaintiffs with the following: (1) the title of the Record; (2) the date of the Record; (3) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (4) the name and title of each addressee and recipient; (5) a description of the contents of the Record; and (6) the privilege asserted by Settling Defendant. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to the United States and the State in redacted form to mask the privileged portion only. Settling Defendant shall retain all Records that it claims to be privileged until the United States and the State have had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendant's favor.

c. No Records created or generated pursuant to the requirements to perform the Work under this Consent Decree shall be withheld from the United States or the State on the grounds that they are privileged or confidential.

117. No claim of confidentiality or privilege shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

XXVII. RETENTION OF RECORDS

118. Until ten years after Settling Defendant's receipt of EPA's notification pursuant to Paragraph 51.b (Completion of the Work), Settling Defendant shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to its liability under CERCLA with respect to the Site, provided, however, that Settling Defendant must retain, in addition, all Records that relate to the liability of any other person under CERCLA with respect to the Site. Settling Defendant must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to the performance of the Work, provided, however, that Settling Defendant (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the Work and not contained in the aforementioned Records required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

119. At the conclusion of this record retention period, Settling Defendant shall notify the United States and the State at least 90 days prior to the destruction of any such Records, and,

upon request, Settling Defendant shall deliver any such Records to EPA or WDNR. Settling Defendant may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendant asserts such a privilege, it shall provide EPA and WDNR with the following: (a) the title of the Record; (b) the date of the Record; (c) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (d) the name and title of each addressee and recipient; (e) a description of the subject of the Record; and (f) the privilege asserted by Settling Defendant. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to the United States and the State in redacted form to mask the privileged portion only. Settling Defendant shall retain all Records that it claims to be privileged until the United States and the State have had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendant's favor. However, no Records created or generated pursuant to the requirements of this Consent Decree shall be withheld on the grounds that they are privileged or confidential.

120. Settling Defendant certifies that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since the earlier of notification of potential liability by the United States or the State or the filing of suit against it regarding the Site and that it has fully complied with any and all EPA and WDNR requests for information pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927.

XXVIII. NOTICES AND SUBMISSIONS

121. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified in this Section shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, the State, WDNR, the Tribes, and Settling Defendant, respectively. Notices required to be sent to EPA, and not to the United States, under the terms of this Consent Decree should not be sent to the U.S. Department of Justice, the U.S. Fish and Wildlife Service, or NOAA. Notices required to be sent to the United States shall be sent to EPA and the U.S. Department of Justice, but shall only be sent to the U.S. Fish and Wildlife Service and NOAA if they involve Natural Resource Damages. Notices required to be sent to Plaintiffs shall be sent to EPA, the U.S. Department of Justice, the State, and DNR, but shall only be sent to the U.S. Fish and Wildlife Service and NOAA if they involve Natural Resource Damages.

As to the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Re: DJ # 90-11-2-08879/1

As to EPA:	Richard C. Karl Director, Superfund Division United States Environmental Protection Agency Region 5 77 W. Jackson Blvd. (SR-6J) Chicago, IL 60604-3590
and	Scott Hansen EPA Project Coordinator United States Environmental Protection Agency Region 5 77 W. Jackson Blvd. (SR-6J) Chicago, IL 60604-3590
to the Regional Financial Management Officer:	Richard Hackley United States Environmental Protection Agency Region 5 77 West Jackson Boulevard Mail Code: MF-10J Chicago, IL 60604-3507
As to DOI and the United States Fish and Wildlife Service:	Assistant Solicitor Branch of Environmental Restoration, Division of Parks and Wildlife 1849 C Street, NW, MS- 5311 Washington, DC 20240
and	Field Supervisor U.S. Fish & Wildlife Service 2661 Scott Tower Drive New Franken, WI 54229
As to NOAA	Laurie Lee Office of General Counsel 501 West Ocean Blvd., Suite 4470 Long Beach, CA 90802
and	Todd Goeks Physical Scientist, Region 5 National Oceanic and Atmospheric Administration 77 West Jackson Blvd. (SR-6J) Chicago, IL 60604

As to the State:	Attorney Kristin A. Hess Bureau of Legal Services Wisconsin DNR P.O. Box 7921 101 S. Webster Street Madison, WI 53707-7921
As to WDNR:	Jamie Dunn WDNR Project Manager 810 West Maple Street Spooner, WI 54801
As to the Bad River Tribe:	Mike Wiggins Jr. Tribal Chairman 72682 Maple Street/PO Box 39 Odanah, WI 54861
and	Natural Resources Director and Environmental Specialist 72682 Maple Street/PO Box 39 Odanah, WI 54861
As to the Red Cliff Tribe:	Tribal Chairperson Red Cliff Band of Lake Superior Chippewa Indians 88385 Pike Road Bayfield, Wisconsin 54814
and	Tribal Attorney Red Cliff Legal Department 88385 Pike Road Bayfield, Wisconsin 54814
As to Settling Defendant:	Jerry C. Winslow Xcel Energy Services, Inc., on behalf of NSPW 414 Nicollet Mall, MP7 Minneapolis, MN 55401
and	Kristen Shults Carney Assistant General Counsel Xcel Energy Services, Inc., on behalf of NSPW 1800 Larimer 11th Floor Denver, CO 80202

XXIX. RETENTION OF JURISDICTION

122. This Court retains jurisdiction over both the subject matter of this Consent Decree and Settling Defendant for the duration of the performance of the terms and provisions of this Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any time for such further order, direction, and relief as may be necessary or appropriate for the construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XXI (Dispute Resolution).

XXX. APPENDICES

123. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A" is the ROD.

"Appendix B" is the SOW.

"Appendix C" is the description and/or map of the Site.

"Appendix D" is the 1998 Spill Response Agreement between Settling Defendant and DNR and is incorporated by reference only as to Activity No. a (related to lakefront warning signs) and Activity No. d (related to warning buoys in Chequamegon Bay), as required by Paragraph 26.f, and does not otherwise affect the provisions of this Consent Decree.

"Appendix E" is the form for the financial test demonstration described in Section XIII (Performance Guarantee).

"Appendix F" is the easement for the Bad River Falls Restoration Property.

XXXI. COMMUNITY INVOLVEMENT

124. If requested by EPA or WDNR, Settling Defendant shall participate in community activities pursuant to the Community Involvement Plan to be developed by EPA, after consultation with WDNR. EPA will determine the appropriate role for Settling Defendant under the Plan. Settling Defendant shall also cooperate with EPA and WDNR in providing information regarding the Work to the public. As requested by EPA or WDNR, Settling Defendant shall participate in the preparation of such information for dissemination to the public and in public meetings that may be held or sponsored by EPA or WDNR to explain activities at or relating to the Phase 1 Project Area. Costs incurred by the United States under this Section, including the costs of any technical assistance grant under Section 117(e) of CERCLA, 42 U.S.C. § 9617(e), shall be considered Future Response Costs that Settling Defendant shall pay pursuant to Section XVII (Payments for Response Costs).

XXXII. MODIFICATION

125. Except as provided in Paragraph 14 (Modification of SOW or Related Work Plans), material modifications to this Consent Decree, including the SOW, shall be in writing, signed by the United States, the State, and Settling Defendant, and shall be effective upon approval by the Court. Except as provided in Paragraph 14, non-material modifications to this Consent Decree, including the SOW, shall be in writing and shall be effective when signed by duly authorized representatives of the United States, the State, and Settling Defendant. A modification to the SOW shall be considered material if it fundamentally alters the basic features of the selected remedy within the meaning of 40 C.F.R. § 300.435(c)(2)(ii). Before providing its approval to any modification to the SOW, the United States will provide the State with a reasonable opportunity to review and comment on the proposed modification. In addition, modifications to Section XVIII (Natural Resource Restoration Projects) shall require signature from authorized representatives of the Tribes.

126. Nothing in this Consent Decree shall be deemed to alter the Court's power to enforce, supervise, or approve modifications to this Consent Decree.

XXXIII. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

127. This Consent Decree shall be lodged with the Court for a period of not less than 30 days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations that indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendant consents to the entry of this Consent Decree without further notice.

128. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XXXIV. SIGNATORIES/SERVICE

129. The undersigned representatives of Settling Defendant, Settling Defendant's Related Parties, the State, and the Tribes, as well as the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice each certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

130. Settling Defendant and Settling Defendant's Related Parties agree not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States has notified Settling Defendant in writing that it no longer supports entry of the Consent Decree.

131. Settling Defendant shall identify, on the attached signature page, the name, address, and telephone number of an agent who is authorized to accept service of process by mail on behalf of Settling Defendant with respect to all matters arising under or relating to this Consent Decree. Settling Defendant agrees to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any

applicable local rules of this Court, including, but not limited to, service of a summons. Settling Defendant need not file an answer to the complaint in this action unless or until the Court expressly declines to enter this Consent Decree.

XXXV. FINAL JUDGMENT

132. This Consent Decree and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties regarding the settlement embodied in the Consent Decree. The Parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Consent Decree.

133. Upon entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment between and among the United States, the State, and Settling Defendant. The Court enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS 2d DAY OF November, 2012.

Barbara B Crabb

United States District Judge

FOR THE UNITED STATES OF AMERICA

7/20/12
Date

Ignacia S. Moreno
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

7/30/12
Date

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Trial Attorney
Environmental Enforcement Section
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John W. Vaudreuil
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Western District of Wisconsin

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Western District of Wisconsin
P.O. Box 1585
Madison, WI 53701-1585]

7-11-12
Date

Richard C. Karl
Director Superfund Division, Region 5
U.S. Environmental Protection Agency
77 W. Jackson Blvd.
Chicago, IL 60604-3590

Date

Craig Melodia
Assistant Regional Counsel
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd.
Chicago, IL 60604-3590

FOR THE STATE OF WISCONSIN

6/29/12
Date

for Cathy Stepp
Secretary, Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, WI 53707-7921

J.B. Van Hollen
Attorney General

7/10/2012
Date

Cynthia R. Hirsch
Assistant Attorney General
State Bar # 1012870
Wisconsin Department of Justice
Post Office Box 7857
Madison, WI 53707-7857

Signature Page for Consent Decree regarding the Ashland/Northern States Power Lakefront Site

FOR NORTHERN STATES POWER COMPANY, A WISCONSIN CORPORATION

06/22/12
Date

Name (print): ~~Mark~~ E. Stoering
Title: President and Chief Executive Officer, Northern States Power Company, a Wisconsin Corporation
Address: 1414 West Hamilton Ave., PO Box 8, Eau Claire, WI 54702-0008

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name (print): CSC Lawyers Incorporating Service Company
Title: Registered Agent
Address: 8040 Excelsior Drive, Suite 400
Phone: 608-824-7000
email:

FOR SETTLING DEFENDANT'S RELATED PARTIES, SIGNING ONLY AS TO PARAGRAPHS 95, 96, 101, 104, 106, 111, 129, and 130

6/22/12
Date

Name (print): Scott Wilensky
Title: Senior Vice President and General Counsel, for Settling Defendant's Related Parties
Address: 414 Nicollet Mall, Minneapolis, MN 55401

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name (print): Corporation Service Company
Title: Registered Agent
Address: 380 Jackson Street, Suite 700, St. Paul MN 55101
Phone: 888 690-2882
email:

FOR THE BAD RIVER TRIBE

8-1-12
Date

Michael J. Wiggins Jr.
Name (print): MICHAEL S. WIGGINS Jr.
Title: TRIBAL CHAIRMAN / EXECUTIVE DIRECTOR
Address: P.O. Box 39
Odanah, WI. 54861

FOR THE RED CLIFF TRIBE

Rose Soulier

_____
Date

Rose Soulier
Tribal Chairperson
Red Cliff Bank of Lake Superior Chippewa Indians
88385 Pike Road
Bayfield, Wisconsin 54814

A

APPENDIX A

Ashland/Northern States Power Lakefront Site

Ashland, Wisconsin
Ashland County

Record of Decision

United States
Environmental Protection Agency

Region 5

September 2010

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LIST OF ACRONYMS AND ABBREVIATIONS

ADD	Average Daily Dose
AOC	Administrative Order on Consent
ALM	Adult Lead Model
AR	Administrative Record
ARAR	Applicable or relevant and appropriate requirements
BERA	Baseline Ecological Risk Assessment
bgs	Below ground surface
CDF	Confined disposal facility
CERCLA	Comprehensive Environmental Response. Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response. Compensation and Liability Information System
CFR	Code of Federal Regulations
COC	Contaminants of concern
COPC	Contaminants of potential concern
CR	Cancer risk
CSM	Conceptual Site Model
CTE	Central tendency exposure
DNAPL	Dense non-aqueous phase liquid
dwt	dry weight
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
ERA	Ecological risk assessment
ERH	Electrical Resistance Heating
ES	Enforcement standard
ESD	Explanation of Significant Differences
ESL	Ecological screening level
FS	Feasibility study
GLWQA	Great Lakes Water Quality Agreement
GW	Groundwater
HHRA	Human health risk assessment
HI	Hazard Index
HQ	Hazard quotient
IC	Institutional control
ICIAP	Institutional control implementation and assurance plan
IEUBK	Integrated Exposure Uptake Biokinetic
LNAPL	Light non-aqueous phase liquid
MCL	Maximum contaminant level
mg/kg	Milligrams per kilogram
MGP	Manufactured gas plant
MNR	Monitored natural recovery
MSL	mean sea level
MW	Monitoring well
NAPL	Non-aqueous phase liquid

NCP	National Contingency Plan
NOC	Normalized-to-organic-carbon
NPL	National Priorities List
NSPW	Northern States Power of Wisconsin
OC	Organic carbon
O&M	Operation and Maintenance
PAH	Polynuclear aromatic hydrocarbon
PAL	Preventive Action Limit
POTW	Publically Owned Treatment Works
PPE	Personal Protective Equipment
ppm	Parts per million
PRB	Permeable reactive barrier
PRG	Preliminary remediation goal
RAGS	Risk Assessment Guidance for Superfund
RAL	Remedial Action Level
RAO	Remedial action objective
RBSC	Risk based screening concentration
RBC	Risk based concentration
RCL	Residual Contaminant Level
RCRA	Resource Conservation and Recovery Act
RfC	Reference concentration
RfD	Reference Dose
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
RME	Reasonable maximum exposure
ROC	Receptors of concern
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SF	Slope Factor
SQT	Sediment quality triad
SVOC	Semivolatile organic compound
SWAC	Surface weighted average concentration
TBC	To be considered
TEC	Threshold effects concentration
tPAH	Total PAH
TRV	Toxicity Reference Value
UCL	Upper confidence limit
ug/kg	Micrograms per kilogram
ug/l	Micrograms per liter
UV	Ultraviolet light
VOC	Volatile organic compound
WAC	Wisconsin Administrative Code
WDHFS	Wisconsin Department of Health and Family Services
WDNR	Wisconsin Department of Natural Resources
WWTP	Waste water treatment plant

Ashland, Wisconsin

This Record of Decision (ROD) documents the remedy selected for the Ashland/Northern States Power (NSP) Lakefront Site in the City of Ashland, Ashland County, Wisconsin. The ROD is organized in two sections: Part I contains the *Declaration* for the ROD and Part II contains the *Decision Summary*. The *Responsiveness Summary* is included at Appendix A.

PART I: DECLARATION

This section summarizes the information presented in the ROD and includes the authorizing signature of the United States Environmental Protection Agency (EPA) Region 5 Superfund Division Director.

Site Name and Location

The Ashland/NSP Lakefront Site (CERCLIS # WISFN0507952) is located in Ashland, Ashland County, Wisconsin. The Site consists of land and sediment located along the shore of Lake Superior, in Ashland, Wisconsin. The Site contains: (i) property owned by Northern States Power Company, a Wisconsin corporation (d.b.a. Xcel Energy, a subsidiary of Xcel Energy Inc. (NSPW)); (ii) a portion of Kreher Park, a City-owned property fronting on the bay that includes the former municipal waste water treatment plant (WWTP); (iii) an inlet of Chequamegon Bay containing contaminated sediment directly offshore from the former WWTP; (iv) a railroad right-of-way owned by the Wisconsin Central Ltd., and formerly owned by the Soo Line Railroad; and (v) Our Lady of the Lake Church/School, as well as private residences. The Site is bounded by US Highway 2 (Lake Shore Drive) to the south, Ellis Avenue and its extension to the City marina to the west, Prentice Avenue and its extension to a boat launch to the east, and a line between the north termini of the marina and the boat launch to the north.

Statement of Basis and Purpose

This decision document presents the selected remedy for the Ashland/NSP Lakefront Site. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP), 40 CFR Part 300.

Information used to select the remedy is contained in the Administrative Record (AR) file for the Site. The AR file is available for review at the EPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois, the Vaughn Public Library, 502 W. Main St., Ashland, Wisconsin, the Bad River Public Library, 100 Maple St., Odanah, Wisconsin, and the Red Cliff EPA Office, 88385 Pike Road, Highway 13, Bayfield, Wisconsin.

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of the Selected Remedy

The Ashland/NSP Lakefront Site is being addressed under the framework set forth in CERCLA. The selected remedy specified in this ROD will serve as the final action for soil, groundwater, and sediment contamination at the Site. The Site consists of soils, sediments, and groundwater contaminated by polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). The most abundant constituents in each of these compounds include benzene, a VOC, and naphthalene, a PAH. Additionally, free phase hydrocarbons (free product) derived from tars are present as non-aqueous phase liquids (NAPL). The free product, or NAPL, is present in underground pockets of tar and other materials that do not readily mix with water. NAPL has also been found in subsurface sediments in the near shore area. Sediment contamination tends to be higher with depth below the sediment/water interface and is highest in the near shore area, decreasing with distance from the shoreline. Much of the contaminated sediment is covered with a layer of wood waste. The selected remedy specifies the following response actions:

- removal and treatment or off-site disposal of contaminated soil, groundwater and sediment, including all NAPL;
- engineered surface and vertical barriers to contain contaminated groundwater;
- groundwater extraction as hydraulic control and restoration and possible in-situ treatment of groundwater;
- long-term groundwater and sediment monitoring;
- institutional controls such as land use controls, to limit future site use to prevent exposure to hazardous substances that will remain at the Site after the remedy is complete.

EPA believes the response actions outlined in this ROD, if properly implemented, will protect human health and the environment.

The Site is divided into four main areas of concern: 1) sediments in Chequamegon Bay; 2) soil and shallow groundwater under Kreher Park; 3) soil and shallow groundwater under the Upper Bluff/Filled Ravine; 4) and deep groundwater in the Copper Falls Aquifer.

The selected remedy for sediments in Chequamegon Bay consists of dry excavation of all near-shore sediment and wood debris and dredging of the remaining contaminated sediment and wood debris that exceeds the Remedial Action Level (RAL) of 2,295 micrograms (ug) total PAH (tPAH)/gram (g) organic carbon (OC) [which is equivalent to 9.5 parts per million (ppm) of tPAH dry weight (dwt) at 0.415% OC]. The selected remedy requires thermally treatment of sediments or stabilization of sediments to transport off site for disposal to a NR 500 licensed landfill. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediment at a NR 500 licensed landfill will be the alternate remedy. Although EPA has serious concerns with the effectiveness of dredging the near shore area of sediments,

due to significant wood waste/wood debris and the presence of NAPL in the near shore sediments, the excavation/dredging remedy will allow for a pre-design pilot test to determine if dredging can achieve the performance standards in the near-shore area. If the pre-design pilot test indicates that dredging rather than dry excavation within the near-shore area will attain the established performance standards then EPA, in consultation with Wisconsin Department of Natural Resources (WDNR), will recommend that an alternate sediment remedy (dredging) be implemented. If after the pilot test EPA determines that the dredging remedy for near-shore sediments can achieve performance standards and be conducted in a manner protective of human health and the environment, it will publish its decision in an Explanation of Significant Differences (ESD).

The selected remedy for soil in Kreher Park and the Upper Bluff/Filled Ravine consists of limited soil removal with ex-situ thermal treatment. If thermal treatment is determined during pre-design studies to be more difficult to implement and not cost effective, then off-site disposal of soil will be the alternate disposal option. The remedy also includes in-situ treatment of soil using chemical oxidation to address any residual contamination after the soil removal. The remedy for shallow groundwater in Kreher Park and the Upper Bluff/Filled Ravine consists of groundwater containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control. Shallow groundwater extracted from the contained areas will be treated onsite and discharged to the lake or publicly owned treatment works (POTW). The remedy for shallow groundwater will achieve the dual objectives of containment and restoration.

The selected remedy for the Copper Falls Aquifer consists of a groundwater extraction system. The site currently has a limited groundwater extraction system in place. The remedy consists of enhancing the current system by installing additional extraction wells. In addition, the groundwater remedies for the Copper Falls Aquifer, Kreher Park and the Upper Bluff/Filled Ravine includes engineered surface and vertical barriers to contain contamination and prevent further migration and groundwater extraction which includes an in-situ chemical treatment component to possibly enhance the groundwater treatment. In addition, the remedy includes long-term groundwater and sediment monitoring and institutional controls, such as restrictive covenants, to restrict future site use and to restrict the use of site groundwater for potable purposes until such time as groundwater cleanup standards are achieved.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies (or resource recovery) to the maximum extent practicable. This remedy satisfies the preference for treatment as a principal element of the remedy. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory five-year review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

Data Certification Checklist

The following information is included in the Decision Summary section (Part II) of this ROD. Additional information can be found in the Administrative Record file for this Site.

- Contaminants of concern and their respective concentrations (Section 5);
- Baseline risk represented by the contaminants of concern (Section 7);
- Clean up levels established for contaminants of concern and remedial action objectives established for the Site (Section 8);
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessments and ROD (Sections 6 and 7);
- Potential land and groundwater use that will be available at the Site as a result of the selected remedy (Section 12);
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Sections 9, 10 and 12); and
- Key factors that led to selecting the remedy (Sections 10 and 12).

Support Agency Acceptance

The WDNR concurs with the remedy selected in this ROD for the Ashland/NSP Lakefront Site. The WDNR's concurrence letter is provided in Appendix B.

Authorizing Signature

Richard C Karl

Richard C. Karl, Director
Superfund Division
United States Environmental Protection Agency, Region 5

9-30-10

Date

PART II: DECISION SUMMARY

1.0 Site Name, Location, and Brief Description

The Ashland/NSP Lakefront Site is located in Ashland, Ashland County, Wisconsin (see Figure 1-1). The Site consists of property owned by NSPW, Our Lady of the Lake Church/School and private residences, a railroad corridor, a portion of Kreher Park, and sediments in an area of Chequamegon Bay adjacent to Kreher Park. The Site is located in S 33, T 48 N, R 4W in Ashland County, Wisconsin. Existing Site features and the boundary of the Site are shown on Figure 1-2. Figure 1-3 shows the location and features of the former Manufactured Gas Plant (MGP) facility.

The former MGP facility and current NSPW property is located at the south boundary of the Site at 301 Lake Shore Drive East in Ashland, Wisconsin. The facility is approximately 1,000 feet south of the shore of Chequamegon Bay of Lake Superior. The NSPW property is occupied by a small office building and parking lot fronting on Lake Shore Drive, and a larger vehicle maintenance building and parking lot area located south of St. Claire Street between Prentice Avenue and 3rd Avenue East. There is also a gravel-covered parking and storage yard area north of St. Claire Street between 3rd Avenue East and Prentice Avenue. A large microwave tower is located on the north end of the storage yard. The office building and vehicle maintenance building are separated by an alley. The area occupied by the buildings and parking lots is relatively flat, at an elevation of approximately 640 feet above mean sea level (MSL). The total area occupies approximately 2.5 acres. Surface water drainage from the NSPW property is to the north. A residence is located east of the office building and west of the blacktop parking area. Our Lady of the Lake Church and School is located immediately west of 3rd Avenue East. Private homes are located immediately east of Prentice Avenue and north of St. Claire Street. To the northwest the Site slopes abruptly to the railroad right-of-way owned by the Wisconsin Central Ltd. (Canadian National Railway (CN)) and which sits on a bluff that marks the former Lake Superior shoreline, and then to Kreher Park, with approximately 10 acres of impacted soil and groundwater, beyond which is Chequamegon Bay, with approximately 16 acres of impacted sediments. EPA is the lead agency for this Site, and the WDNR is the support agency. The Site is listed on the National Priorities List (NPL). The EPA CERCLIS Number is WISFN0507952.

2.0 Site History and Enforcement Activities

2.1 Site History

Historically, Chequamegon Bay was a vital transportation route for the shipment of various materials to and from Ashland including iron ore, lumber, pulp and coal. During the late 19th and early 20th centuries, Ashland was one of the busiest ports in the Great Lakes. In recent times the shipping volume through the bay has declined because of the decrease in the mining and lumber industries in the region, while recreational activities have increased. The City of Ashland

has a waterfront development plan that includes the impacted portions of Kreher Park and the Chequamegon Bay

The primary source of contamination at the Site was releases of coal tars from the historic MGP facility. Other historic activities at the Site, such as lumber operations, solid waste disposal and construction of the former WWTP on the lakeshore, contributed to the filling of the lakebed and may have further dispersed contamination from historic activities at the Site.

The former MGP facility is located on the Upper Bluff on NSPW's property. The former MGP building has been incorporated into NSPW's main service facility on St. Claire Street. The former MGP operated predominantly as a manufacturer of water gas and carbureted water gas for street and home lighting and other uses between 1885 and 1947. After 1947 the carbureted water gas process was retired in favor of liquid petroleum (propane). During the entire time gas was manufactured coal tars were produced as a normal co-product. An open ravine ran south/north through the MGP facility, under the current buildings, emptying out by the historic Lake Superior shoreline near what is now the railroad corridor. The ravine was filled by the early 1900s. A 12-inch clay tile pipe was buried in the Filled Ravine and runs south to north from the former MGP facility to an area north of the railroad right of way in Kreher Park. In addition, drawings for construction of the former WWTP show a 2-inch "Tar to Abandon Tar Dump" pipe running in the approximate location of the historic ravine from the MGP to Kreher Park. The WWTP drawings also mark an area in Kreher Park as the "Coal Tar Dump" located south of the former WWTP and north, or downhill, of the Filled Ravine.

Kreher Park, between Prentice and Ellis Avenues was a historic lakebed and was created over the decades as various fill materials were placed into the bay. The southern boundary of the park defined the original lake shoreline. The eastern portion of the park was filled with sawdust, wood waste and other material from sawmills. The lumbering and sawmill activities occurred during the deforestation of the northern portion of Wisconsin around the turn of the century. The John Schroeder Lumber Company owned the eastern portion of Kreher Park from 1901 until 1939 operating a sawmill until approximately 1931. In 1939, Ashland County acquired the tax deed to the Schroeder Lumber property. In 1942, Ashland County transferred the property to the City of Ashland via quit claim deed. Between the 1880s and 1951 the western portion of Kreher Park was used as an open "dump" for solid waste, primarily demolition debris. In 1986 the City of Ashland acquired a number of parcels on the western portion of the park that includes the former open dump. This area is currently used for the storage of boats.

In 1951, the City of Ashland constructed a WWTP in Kreher Park on the shoreline of Chequamegon Bay. The City added secondary treatment facilities to the WWTP in 1972 to 1973, and constructed a lift station at Prentice Avenue in 1992. The WWTP operated until 1992 and is now closed. The buildings of the former WWTP remain, but today Kreher Park is mostly grass with a gravel parking area located on the western end of the park. During the mid-1980s the marina extension of Ellis Avenue was completed to permit establishment of a marina with full service boat slips, fuel and dock facilities and a ship store. Prior to the construction of the marina the area was a rail boat dock used for offloading freight. The dock was used for this purpose beginning with the sawmill operations through the marina construction. The boat

landing jetty extension of Prentice Avenue was originally the log boom associated with the Schroeder sawmill that was located in what is now Kreher Park where the WWTP is currently located.

In 1989, during exploratory work to expand the WWTP, contaminated soil and groundwater were encountered by the City of Ashland. The City notified the WDNR, subsequently closed the WWTP, and built a new WWTP facility a few miles away to the northeast. In 1994, WDNR initiated an investigation and evaluation of the area to characterize the extent of contamination on the property.

The primary contaminants at the Site are derived from manufactured gas plant wastes in the form of coal tars, including VOCs and PAH compounds. Additionally, some free-phase hydrocarbons product (free product) derived from the coal tars is present as NAPL, and have impacted soils, groundwater, and sediments. The NAPL referenced in this document includes both light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL).

DNAPL has been encountered in the upper reaches of the Filled Ravine near the former MGP facility on the NSPW property to the former lake shore, in isolated areas of Kreher Park including the former "seep" area, in the nearshore sediments, and in the upper elevations of the Copper Falls Formation, which behaves as a confined aquifer under the former MGP in the Upper Bluff portion of the Site. DNAPLs encountered in the Filled Ravine (near the former MGP facility) and at isolated areas at Kreher Park were encountered at the base of these fill units overlying the Miller Creek Formation. The Miller Creek Formation is the confining unit for the underlying Copper Falls aquifer. LNAPLs were also observed across much of Kreher Park as oily sheen in the underlying wood waste layer encountered during a test pit investigation at the Park.

DNAPL has also been encountered in sediments in portions of the affected inlet, although the DNAPL is less defined than on-shore locations due to the dynamic conditions in the affected sediments. The most highly contaminated sediments (including areas of DNAPL) are subsurface and nearest the shoreline; however, releases of contamination to the surface water have been documented, specifically during high energy events. It is important to note that nearly all of the significant wood waste/wood debris is located within the most highly contaminated areas of the inlet nearest the shoreline.

DNAPLs in the deep aquifer correspond to high levels of VOCs in groundwater (> 50,000 µg/L), which is surrounded by a dissolved phase contaminant plume that extends north from the NAPL area in the direction of groundwater flow.

2.2 Previous Investigations

In 1994, WDNR initiated an investigation and evaluation to characterize the extent of contamination around the former WWTP, determining that contaminants had migrated from the former MGP to Kreher Park. Upon notification by WDNR of these findings, NSPW also began a series of investigations of its property. These investigations identified subsurface contamination resulting from the historic MGP operations. Contamination exists as dissolved

phase tar constituents in groundwater and as "pools" of DNAPL and LNAPL or free product as referred to in this document. Free product has been encountered at the base of the ravine and in the underlying Copper Falls Aquifer. In the Filled Ravine, free product varying from one to two feet in thickness is present from south of the service facility north of the mouth of the former ravine, commonly referred to as the "seep" area. In the upper Copper Falls Aquifer, free product has been encountered from south of the service facility north to the gravel-covered parking and storage yard area located north of St. Claire Street. It has also been measured in piezometers installed on the Our Lady of the Lake church property west of Third Avenue East.

The WDNR investigations of Kreher Park included several mobilizations to investigate subsurface conditions at the park as well as the affected sediments and concluded with the completion of a Remedial Investigation Report and Feasibility Study in 1998. A distinct free product pool varying in thickness up to five feet was identified in the area of Kreher Park just north of the seep area. A 12-inch clay tile pipe was encountered at the base of the backfilled ravine during investigations NSPW completed between September and November 2001. The clay tile pipe was traced up the Filled Ravine to the area of the former MGP as part of these investigations (see Figure 3-7). The buried clay tile pipe likely behaved as a conduit for the migration of free product as well as contaminated groundwater from the MGP to the seep area after the ravine was filled (both dissolved phase and free product were found in the pipe during the excavations). A significant portion of the clay tile was destroyed during the 2001 investigation activities.

This tile pipe may have been part of a sewer system installed in response to a 1902 City ordinance specifying that manufactured gas plant wastes were to be conveyed underground. Although there is no documentation indicating the exact date the tile pipe was installed or by whom, it presumably would have been installed shortly after the 1902 ordinance since the ravine was filled by the early 1900s, and it most likely was installed by the MGP given the tile's apparent connection to the MGP facility and the fact that it was the only manufactured gas plant in Ashland. The 1902 ordinance also indicates that prior to that time manufactured gas plant waste was conveyed via the open ravine.

After the Site was added to the NPL, EPA and NSPW entered into an administrative order on consent (AOC) dated November 14, 2003. Under the AOC, NSPW conducted a Remedial Investigation and Feasibility Study (RI/FS) to determine the nature and extent of contamination and any threat to the public health or the environment at the Site, to determine and evaluate alternatives for remedial action, and to collect data sufficient for developing and evaluating remedial alternatives. NSPW conducted the RI/FS under EPA oversight. EPA approved the final Feasibility Study on December 4, 2008. EPA's Preferred Alternative presented in the Proposed Plan came from the remedial alternatives evaluated in the Feasibility Study.

2.3 Previous Response Actions

In 2000, NSPW installed an interim action free product recovery system on its property, initially as a pilot test, to remove free product from the Copper Falls Aquifer; the system became fully operational in January 2001. The pumped water is treated at the NSPW property and discharged to the City of Ashland's sanitary sewer, and the free product/NAPL that is separated from the

water is sent off-site for treatment and disposal. More than 11,000 gallons of free product/water emulsification have been removed, and approximately 2.4 million gallons of contaminated groundwater have been treated between January 2001 and June 2010.

In addition, NSPW performed a second interim action during May 2002 to cap the seep area. Capping the seep was necessary to address the threat of direct contact with coal tars/free product seeping to the surface. Activities completed included the excavation and removal of contaminated soil in the seep area, the placement of a low permeability cap over the seep area, and the installation of a groundwater extraction well at the base of the Filled Ravine. Contaminated groundwater collected near the mouth of the Filled Ravine via a fourth extraction well is conveyed to the free product recovery system described above.

2.4 Enforcement Activities

The Site was a State (WDNR) lead for a number of years before EPA became the lead agency. The discovery of contaminants in 1989 at Kreher Park led the WDNR to initiate several investigations that culminated in the identification of the former MGP as a source of contamination and the naming of NSPW as a responsible party. The WDNR also sent the City of Ashland and Wisconsin Central Ltd., responsible party notifications for solid waste disposed on a portion of Kreher Park. WDNR and NSPW subsequently performed a series of independent investigations to assess the extent of contamination at Kreher Park and the NSPW property, respectively. In 1998, EPA was petitioned to evaluate the Site for inclusion on the NPL and cleanup under CERCLA, also known as Superfund. The Site was nominated for inclusion on the NPL in 2000, and was formally added to the NPL in 2002. In 2003, EPA sent NSPW a letter informing it that EPA believed NSPW to be a liable party under CERLCA and inviting NSPW to enter into a cooperative agreement to conduct the RI/FS. NSPW subsequently signed the AOC with EPA in 2003 to conduct the RI/FS at the Site. The RI investigation activities were completed in November 2005. The RI was approved by EPA in October 2007. The FS was approved by EPA in December 2008.

3.0 Community Participation

The Proposed Plan for the Ashland/NSP Lakefront Site was made available to the public for comment from June 17 to August 17, 2009. Copies of the Proposed Plan and the final RI and FS (as well as other supporting documents) were placed in the local Information Repository at the Vaughn Public Library, Bad River Tribal Library and Red Cliff Environmental Office. Documents are also available at the EPA Region 5 Records Center in Chicago, Illinois, and at the WDNR's Spooner Service Center. Copies of the Proposed Plan were sent to about 400 people on the Site mailing list. A note and link to the Proposed Plan on EPA's web page for the Site was emailed to about 120 people and organizations.

A public notice announcing the comment period, public meeting and availability of the Proposed Plan was published in the Ashland Daily Press and in the Evergreen County Shopper on June 15, 2009 and June 29, 2009. A news release was also sent to Ashland media on June 12, 2009. Informational meetings were held at the Bad River Conference Center on June 16, 2009, the Great Lakes Visitor Center on June 17, 2009, the Red Cliff Fire Hall on June 24, 2009 and a

neighborhood listening session was held a the Hotel Chequamegon on June 25, 2009. EPA held a public meeting on June 29, 2009, at the Northern Great Lakes Visitor Center in Ashland to present the Proposed Plan. About 80 people attended including local residents and representatives from the City of Ashland, the WDNR, NSPW and its contractors, and Senator Feingold's office. Representatives from EPA gave a short presentation, answered questions and accepted comments on the Proposed Plan. On July 8, 2009, NSPW submitted a request to extend the public comment period for an additional thirty days. Pursuant to 40 C.F.R. 300.430(3)(C), EPA extended the comment period for thirty days, until August 17, 2009. The public comment extension was published in the Ashland Daily Press on July 16, 2009, and in the Evergreen Country Shopper on July 20, 2009. Responses to comments received during the public comment period (including those submitted at the public meeting) are included in the Responsiveness Summary attached to this ROD. A transcript of the comments given at the public meeting is also available. These comments were considered prior to selection of the final cleanup plan in this ROD.

In addition to the Proposed Plan mailing and public meeting, EPA, along with WDNR, held numerous information sessions on the RI, FS, and Proposed Plan from 2007 to 2009. In addition, a workshop was held in October 2007 for parties who were interested in the Ashland/NSP Lakefront Site. A public notice was placed in the newspaper and a news release was sent to local media about a week prior to the meeting. A Community Involvement Plan for the Site, the Proposed Plan, news releases, and technical and legal documents have been posted on the Region 5 Web page at http://www.epa.gov/region5/sites/ashland.

4.0 Scope and Role of Response Action and Operable Units

The final cleanup plan selected in this ROD for the Ashland/NSP Lakefront Site has only one operable unit that addresses all contaminated media. The groundwater, soil, and sediment are impacted by high levels of VOC and PAH contamination and all media will be addressed by the selected cleanup action.

5.0 Site Characteristics

5.1 Conceptual Site Model for Ashland NSP/Lakefront Site

The former MGP produced "water gas" for street and home lighting and other uses between 1885 and 1947. Coal tars and oils were a by-product of the manufactured gas process and contain hazardous substances. The likely routes for releases of coal tars and other by-products from the former MGP to the environment were leaks and spills on the MGP property, discharge into the open ravine directly to the lake, and discharge via the 12-inch clay tile pipe after the ravine was filled. The initial discharges may have been directly into the bay and later over land as portions of the lake bed were filled forming the area known as Kreher Park. Additionally, a 2-inch pipe may have discharged to the "Coal Tar Dump" in Kreher Park. It is possible that some of the tar material was entrained in MGP plant wastewater that was discharged to a sewer (e.g., the 12-inch clay tile) directly to the lake. Other tars and free product generated as co-product in the gas manufacturing process (such as releases from gas holders or fuel tanks) discharged directly to the soil and groundwater. Some of these hazardous substances also migrated to the

base of the ravine to Kreher Park and the lake and some migrated into the Copper Falls aquifer. Wastewater and other incidental free product discharged to the sewer were conveyed via the clay pipe network to an open sewer in Kreher Park and then to the bay inlet.

From 1901 to 1931, Schroeder Lumber operated on the eastern portion of Kreher Park. Schroeder Lumber performed active sawmilling and other lumber operations for three decades. Kreher Park was created by the filling of the lakebed with solid waste mainly composed of wood waste from lumber operations on the eastern portion and demolition debris from a dump on the western portion of the park. This wood waste and demolition debris became permeated by the MGP waste.

Additionally, other industrial sources (such as rail car off-loading of feedstocks and raw materials for MGP and other industrial activities) may have contributed to high levels of PAH-rich contaminants at the Lakefront.

In 1947, continued releases of coal tars and free product from the MGP were eliminated when its water gas process was retired. However, remnants of free product (present in the ravine, the "2-inch pipe to waste tar dump," and MGP structures) and contaminated groundwater continued to migrate via the clay tile to the seep area, discharging to the surface during high flow (storms, etc.) conditions. Free product and the associated groundwater plume in the Copper Falls aquifer migrated north towards the lake. A potential stagnation or convergence zone in the Copper Falls aquifer has reduced further movement of the plume to the north and the free product removal system has reduced the mass of the plume in the aquifer.

In 1952, the City of Ashland began construction of the WWTP. During construction a clay core wall was installed at the foundation of the WWTP to prevent groundwater infiltration into basement areas, and a pipe/sewer distribution network to the new WWTP was constructed. The distribution of contaminants in sediments and soil along the shoreline may have been affected by this activity. Other construction actions that occurred after this time that may have further affected contaminant distribution include the WWTP expansion in 1973 and the periodic discharge of water that collected in the WWTP's basement sumps.

The residual contamination in the Filled Ravine continued to discharge to Kreher Park via the buried clay tile pipe and Filled Ravine. Following rainfall events coal tars and free product was observed at the surface in the seep area. The clay tile investigation in 2002 crushed and removed much of this conduit. A removal action in 2002 removed much of the surface contamination at the seep, replaced it with clean fill, and installed an interception well (EW-4) to capture residual contamination migrating through the seep into the mouth of the ravine.

The residual contamination at Kreher Park from the primary free product (DNAPL and LNAPL) source areas continues to migrate to the lake sediments.

5.2 Site Overview

The geologic conditions at the Site have been identified in previous investigations conducted by WDNR and NSPW and in the supplemental investigations completed as part of the RI in 2005.

Historic investigations included the visual classification of subsurface soil units from numerous soil borings, monitoring well boreholes and exploration test pits. Supplemental investigations completed for the RI included the installation of additional monitoring wells, the collection of surface and subsurface soil samples from borings and test pits, and a downhole geophysical survey. Geologic units investigated at the Site include the Miller Creek Formation and underlying Copper Falls Formation. Fill soil units were also encountered at the Upper Bluff and at Kreher Park. At the Upper Bluff area, fill soil was encountered in the Filled Ravine that dissects the Miller Creek Formation in the vicinity of the former MGP facility. Kreher Park consists of material used to fill the former lakebed.

The uppermost water-bearing unit at the Upper Bluff area includes the Miller Creek Formation. Groundwater is also encountered in the fill material used to backfill the former ravine that dissects the Miller Creek Formation in the vicinity of the former MGP facility. The uppermost water-bearing unit at Kreher Park consists of fill material used to fill the former lakebed; this fill material overlies the Miller Creek Formation. The fine-grained low permeability Miller Creek Formation creates an aquitard overlying the Copper Falls aquifer, behaving as a confining unit.

Previous investigations have identified groundwater contamination in the ravine fill, the Kreher Park fill and the underlying Copper Falls aquifer. Contaminants, including free product, migrated to the underlying Copper Falls aquifer in the vicinity of the former MGP facility where the Miller Creek Formation lacks plasticity and where vertical hydraulic gradients indicate downward flow in the Copper Falls aquifer. These migration pathways may have been exacerbated by construction operations during the early life of the MGP. Strong upward gradients have likely limited the vertical migration of contaminants at down gradient locations north of this area. The transition from downward to upward gradients within the Copper Falls aquifer occurs at the alley immediately south of the NSPW service center. Site investigation results indicate that contaminants in the Copper Falls aquifer have migrated laterally along the interface between the Copper Falls aquifer and overlying Miller Creek aquitard.

5.3 Sampling Strategy

Data gathered during the initial investigations by WDNR and NSPW, and additional data collected during the recently completed RI, were used to characterize the nature and extent of contamination at the Site and to evaluate impacts to human health and the environment. Field investigations consisted of the collection of samples from impacted media (i.e., surface soil, subsurface soil, soil vapor, sediment, surface water, and groundwater) from discrete areas of the Site to define physical and biological characteristics of the Site as a whole. Environmental media evaluated include the following:

- Soils at the Upper Bluff/Filled Ravine on the NSPW property near the former MGP facility;
- Soil vapor in the vicinity of the NSPW property;
- Fill soil at Kreher Park;
- Groundwater contamination (aqueous phase and non-aqueous phase) in the ravine fill, Kreher Park fill, and underlying Miller Creek and Copper Falls Formations, and
- Sediment contamination and impacts to surface water and aquatic organisms in the Chequamegon Bay inlet adjacent to Kreher Park.

Activities described in the RI Work Plan and completed during the RI field investigation include the following:

- Installation of additional monitoring wells MW-2C, MW-15A, MW-15B, and MW-21 in December 2003 to further characterize the vertical extent of groundwater contamination at the Upper Bluff/Filled Ravine;
- Installation of additional wells MW-7R, MW-7B, MW-23A, MW-23B, P-24, MW-24, MW-24A, P-25, MW-25, MW-25A, P-26, MW-26, and MW-26A at Kreher Park in May 2004. These wells were installed to evaluate the relationship between surface water and groundwater in the filled lakebed along the shoreline, and to further characterize the lateral extent of groundwater contamination in the underlying Copper Falls aquifer;
- Collection of four rounds of groundwater samples from all wells in the monitoring well network at the Site in June 2004, September 2004, December 2004, and March 2005 to characterize groundwater quality and flow conditions;
- Collection of subsurface soil samples from borings advanced in the vicinity of the former MGP in April 2005 to further characterize the lateral and vertical extent of contamination in the backfilled ravine south of St. Claire Street;
- Collection of subsurface soil samples from borings advanced at Kreher Park in the vicinity of the former "seep" area and monitoring well TW-11 in April 2005 to characterize free product observed at these locations;
- Collection of additional surface soil samples at the Upper Bluff to evaluate the direct contact exposure pathway in the vicinity of the former MGP in June 2005;
- Collection of additional surface soil samples at Kreher Park to evaluate the direct contact exposure pathway in the area in June 2005;
- Completion of an exploration test pit investigation at Kreher Park in June 2005 to characterize the uncontrolled solid waste disposal area, former coal tar "dump" area, the former "seep" area and other potential source and free-product conveyance areas at Kreher Park;
- Completion of a supplemental exploration test pit investigation in Kreher Park in November 2005 to identify the lateral extent of a clay pipe encountered between the former seep area and the former open sewer area;
- Completion of a borehole geophysical survey to verify subsurface geologic units, and a visual (downhole camera) inspection of two artesian wells open to the Copper Falls Aquifer at Kreher Park in November 2005;
- Completion of an air emission investigation at the Upper Bluff between March and July 2005 to evaluate the potential inhalation pathway for exposure to potential soil vapors at this area of the Site where nearby residents may be potentially affected;
- Performance of a wildlife habitat and wetland survey in June 2005 to characterize the terrestrial habitat of the Site;

- Completion of a Sediment Quality Triad (SQT) investigation between May and September 2005 to evaluate bulk sediment chemistry, sediment toxicity and benthic macroinvertebrate community characteristics of Site sediments. This included performance of sediment toxicity tests of benthic invertebrates and fish larvae under both natural and ultraviolet light;
- Collection of surface water samples during low and high energy events in June and November 2005 to evaluate levels of contaminants in surface water in the Chequamegon Bay inlet area adjacent to Kreher Park;
- Collection of fish tissue in April 2004, April 2005, and June 2005 to support the Baseline Ecological Risk Assessment (BERA) and Human Health Risk Assessment (HHRA);
- Completion of a sediment stability analyses that included quantitative (modeling) and an empirical evaluation of sediment stability in aquatic portions of the Site;
- Performance of sediment toxicity tests, fish larva bioassays, and ultraviolet light (UV) studies to evaluate toxicity to selected ecological receptors;
- Completion of the BERA to describe the likelihood, nature and severity of adverse effects to ecological receptors resulting from their exposure to contaminants at the Site under current conditions, and
- Completion of the HHRA to provide a risk-based interpretation of the data collected during the RI and to provide conservative estimates of potential human health risks posed by chemicals that are present at or migrating from the Site.

5.4 Source of Contamination

As discussed in Section 2.1 of this ROD, the source of the contaminants of concern (COCs) at the Site was releases from the former MGP operations from the 1880s to 1947 with potential contributions from historic lumber operations and solid waste disposal. Other activities such as the construction and expansion and operation of the former WWTP may also have redistributed contamination at the Site.

The COCs at the Site are typical by-products of manufactured gas plant processes. The groundwater, soil, and sediment at the Site are contaminated predominantly with VOCs and semivolatile organic compounds (SVOCs). With regard to the SVOCs, the predominant subgroup includes PAHs. The most commonly occurring VOC is benzene and the most commonly occurring PAH is naphthalene. Metals (e.g., lead and arsenic) have been detected at varying concentrations and are associated with natural conditions, fill, and former MGP process wastes. The VOCs and PAHs were derived from the former MGP operations located on the Upper Bluff portion of the Site.

The ongoing sources of the COCs are primarily the free-product zones of non-aqueous phase liquid (NAPL) that have been identified since investigations began at the Site in 1994, and further refined during the RI sampling performed in 2005. These free-product zones consist of

both DNAPL and LNAPL and are consistent with MGP wastes. These MGP wastes are located in the aquifers, subsurface soils and sediments.

5.5 Types of Contaminants, Affected Media and Extent of Contamination

The COCs at the Site include VOCs and a subgroup of the larger list of SVOCs referred to as PAHs. The most abundant compounds from each of these groups include benzene and naphthalene, respectively. Soils and groundwater at the Site are contaminated with these compounds, as are the sediments in the affected inlet. As stated above, the primary source of these COCs is the former MGP.

Additionally, tar/oil is present as NAPL, or free product, in the Filled Ravine, in isolated areas of Kreher Park including the former "seep" area, in the near-shore sediments of the bay in an area parallel to the shoreline and northwest of the former WWTP, and in the upper elevations of the deep Copper Falls aquifer. The free product in the deep aquifer has resulted in a dissolved phase contaminant plume that extends north from the area of the free product in the direction of groundwater flow, toward the bay. However, the thick clay aquitard (the Miller Creek Formation) provides a hydraulic barrier that separates the deep aquifer from the shallow groundwater encountered in Kreher Park fill and the bay waters in the area of the affected inlet. This separation is demonstrated by the strong artesian pressures measured at Kreher Park wells that are screened in the Copper Falls aquifer.

All data from historic investigations and the 2005 RI were compiled into one database. A large dataset of organic compounds were analyzed during the earlier investigations at the Site, with a smaller dataset available for metals and inorganics. The 2005 RI Work Plan required sampling of a smaller set of VOCs, PAHs and metals/inorganic analytes common to all media (a slightly expanded list of PAHs was analyzed for sediments for purposes of ecological evaluation). During preparation of the RI, EPA approved an amended list of compounds which included the analytes listed in the 2005 RI Work Plan and additional compounds previously analyzed that exceeded regulatory limits. These additional compounds were limited to those which were historically measured at least once in excess of 10 times an applicable regulatory standard. The amended final parameter list that was approved by EPA is included in Appendix D, Table 4-1.

Additional information regarding the extent of contamination at each area of the Site (Upper Bluff/Filled Ravine, Kreher Park, Sediments, and the Copper Falls Aquifer) is provided below.

Upper Bluff/Filled Ravine

DNAPL has been encountered at the base of the Filled Ravine located south of St. Claire Street beneath the NSPW service center building and adjacent asphalt courtyard area. Part of this building includes an older section incorporating the former MGP building, and gas holders for the MGP are located within the Filled Ravine (see Figure 1-3). The depth of the center of the Filled Ravine in this area ranges from 15 to 20 feet below ground surface. The former ravine dissected the Miller Creek formation, which is the uppermost unconsolidated geologic unit in the Ashland area. This low permeability silty-clay/clayey silt unit is encountered at the base and flanks of the Filled Ravine. A perched

aquifer has formed in the Filled Ravine because the fill material, which includes cinders, debris, and other locally derived detritus, is more permeable than the surrounding native soil unit. Groundwater encountered within four to six feet of the ground surface is in hydraulic connection with the regional water table that extends across the Site within the Miller Creek formation.

Soil and groundwater in the Filled Ravine are contaminated largely by contact/proximity with the DNAPL on the south side of St. Claire Street. Contamination within the Filled Ravine downgradient from this area has also been encountered. Figure 3-7 depicts the lateral extent of DNAPL at the Upper Bluff/Filled Ravine, as shown by the green lines on that figure. DNAPL was encountered in and around a 12-inch clay tile encountered at the base of the Filled Ravine on the north side of St. Claire Street during a 2001 investigation (see Figure 3-7). This clay tile was found to extend beyond the mouth of the Filled Ravine to the former seep area in Kreher Park. This discharge was eliminated in 2002 with the installation of an interception well (EW-4) at the mouth of the former ravine following the removal of contaminated soil and cap installation at the seep area, previously described in Section 2.3 of this ROD. Although DNAPL or LNAPL has not been encountered in EW-4, groundwater extracted from the Filled Ravine is conveyed to the existing tar removal system for treatment prior to discharge to the sanitary sewer.

Kreher Park

The impacted area of Kreher Park consists of a flat terrace adjacent to the Chequamegon Bay shoreline. The surface elevation of the park varies approximately 10 feet, from 601 feet above MSL, to about 610 feet above MSL at the base of the bluff overlooking the park. The bluff rises to an elevation of about 640 feet above MSL, which corresponds to the approximate elevation of the NSPW property. The lake elevation has historically fluctuated about two feet, from 601 to 603 feet above MSL. Currently the park area is predominantly grass covered. A gravel overflow parking area for the Ashland Marina occupies the west end of the park, while a miniature golf facility formerly occupied the east end of the park. The City of Ashland former WWTP and associated structures front the shoreline on the north side of the park. The impacted area of Kreher Park occupies approximately 13 acres and is bounded by Prentice Avenue and a jetty extension of Prentice Avenue to the east, the Wisconsin Central Ltd. to the south, Ellis Avenue and the marina extension of Ellis Avenue to the west, and Chequamegon Bay to the north.

At Kreher Park, DNAPL is limited to the seep area and the former coal tar dump area north of the mouth of the Filled Ravine at Kreher Park. DNAPL-contaminated soil above the wood waste layer was removed from the seep area in 2002 and replaced with clean fill. In the former coal tar dump area, DNAPL-contaminated soil was encountered beneath several feet of clean fill overlying the wood waste layer. In both areas, DNAPL remains in the underlying wood waste layer, which underlies the entire park. The lateral extent of DNAPL at Kreher Park is shown on Figure 3-8, depicted by the dark blue lines on that figure. Figure 3-8 also shows the location of the former coal tar dump area.

Although the lateral extent of the DNAPL zone is limited, contaminated soil and groundwater conditions are widespread across the entire park area. In areas of Kreher Park outside of the DNAPL zone, contaminants were encountered in the wood waste layer beneath several feet of clean surficial soil. An LNAPL sheen was observed in this wood waste layer, which was encountered at test pits locations throughout Kreher Park during test pit investigations. Areas at Kreher Park with LNAPL yielded total VOC concentrations in groundwater less than 5,000 µg/l, which is significantly lower than VOC concentrations associated with DNAPL (> 50,000 µg/l). The lateral extent of the LNAPL contamination is shown on Figure 3-8, depicted by the green lines on that figure.

Sediments

The area of impacted sediments is located in a small bay created by the Prentice Avenue jetty and marina extensions previously described. For the most part, contaminated sediments are confined within this small bay by the northern edge of the line between the Prentice Avenue jetty and the marina extension. The affected sediments consist of lake bottom sand and silts, and are mixed with wood debris likely originating from former log rafting and lumbering operations. The wood debris layer is up to seven feet thick in areas, with an average thickness of nine inches. Wood debris overlays approximately 95% of the impacted sediments. The FS report estimated that the entire area of impacted sediments encompasses approximately sixteen acres based upon a preliminary remediation goal (PRG) for sediment of 9.5 ppm tPAH /g @0.415% OC.

NAPL is also present in some sediments in the offshore zone along the Kreher Park shoreline, mainly at the sand/wood waste interface (i.e. the historic lakebed). The most NAPL is in the area between the marina and an area north of the former WWTP from 100 to 300 feet from the shore. In this area NAPL is found at depths up to four feet below the sediment/wood waste and water interface. NAPL is also encountered in sediments at depths up to 10 feet below the top of the wood waste between the former WWTP and the boat launch where the overlying wood waste layer is thickest. The lateral extent of the impacted sediments and the extent of NAPL and/or sheens are depicted on Figure 3-3. The vertical extent of the impacted sediments is shown on Figures 3-4, 3-5 and 3-6, which depict three different cross sections that are defined on the Cross Section Overview Map on each figure. Two of the cross sections run north-south, perpendicular to the shoreline (see Figures 3-4 and 3-5) and the third runs east-west, parallel to the shoreline (see Figure 3-6). In all three figures, the dashed blue line depicts the approximate vertical extent of sediments that exceed 9.5 ppm tPAH /g @0.415% OC.

Copper Falls Aquifer

A DNAPL mass is present underlying the Miller Creek Formation in the area of the NSPW service center. This material is found within the upper reaches of the Copper Falls aquifer, a sandy, coarse grained unit. DNAPL extends from depths of approximately 30 to 70 feet. The greatest thickness of DNAPL is present directly south of St. Claire Street within the main access drive of the NSPW service center, and the

DNAPL thins in all directions from this area. The lateral extent of DNAPL in the underlying Copper Falls aquifer is shown on Figure 3-7, as shown by the dark blue line on that figure. The vertical extent of the DNAPL contamination is depicted on a series of five cross-sections which are defined on Figure 3-1. Figures 3-2 and Figures 3, 4, 5 and 6 show cross sections A-A', B-B', C-C', D-D' and E-E', respectively. Cross sections A-A', B-B' and E-E' show the largest volumes of DNAPL, as those cross sections run through the NSPW service center area. (No NAPL appears on cross section D-D' which runs roughly parallel to the shoreline.)

NSPW has maintained a free product recovery system consisting of three extraction wells since the system was installed in 2000. The system is a low-flow pumping system, which uses groundwater as a carrier to remove the free product. An oil water separator is then used to separate NAPL from water. NAPL is placed in a storage tank and periodically transported off-site for treatment (incineration) and disposal, and contaminated groundwater is treated by carbon filtration prior to discharge to the sanitary sewer system. Through June 2010, 2.4 million gallons of contaminated groundwater were removed from the Copper Falls aquifer, and more than 11,000 gallons of NAPL (approximately 0.5% of the total volume removed) was separated out for off-site treatment and disposal.

Hydrogeologic conditions at the Site have restricted the migration of contaminants in the underlying Copper Falls aquifer. The fine grained low permeability of the Miller Creek Formation behaves as a confining unit (aquitard) for the Copper Falls as indicated by strong upward vertical gradients that increase with depth in nested wells screened in this unit.

The estimated volume of soil, groundwater and sediment contamination at the Site is shown in the table below.

Estimated Volumes and Areal Extent of Contaminated Media		
Media	Volume (cubic yards)	Assumptions
Soil		
Upper Bluff/Filled Ravine Area		
Upper Bluff Area	28,000	Areal extent of contamination at Upper Bluff where benzene exceeds the NR 720 Residual Contaminant Level (RCL) is approximately 1.72 acres, and thickness is 10 feet. (Includes soil contamination beneath former MGP building).
Filled Ravine Volume	20,700	Areal extent of Filled Ravine is approximately 1.28 acres, and thickness is 10 feet.
Former Gas Holder Area	9,400	Areal extent of contamination is 130 by 130 feet, and thickness is 15 feet.
Former Clay Tile Area	150	Areal extent of contamination is 75 by 10 feet, and thickness is 5 feet.
Kreher Park		
Kreher Park	224,600	Areal extent of all fill is approximately 11.6 acres and thickness is 12 feet.
Unsaturated Zone Soil Volume	83,700	Areal extent of contamination is approximately 10.38 acres, and average thickness is 5 feet.
Saturated Zone Soil Volume	117,200	Areal extent of contamination is approximately 10.38 acres, and average thickness is 7 feet (includes the wood waste layer).
Former Coal Tar Dump Area	4,800	Areal extent of contamination is 260 feet by 100 feet (approximately 0.5 acres), and layer is 5 feet thick.
Groundwater		
Upper Bluff Area	65,600	Areal extent of contamination is approximately 2.71 acres, and saturated thickness is 15 feet.
Kreher Park	133,900	Areal extent of contamination is approximately 10.38 acres, and saturated zone is 7 feet.
Copper Falls Aquifer	Upper Bluff 366,700 Kreher Park 133,500 Total 500,200	Areal extent of contamination is 6.9 acres, average thickness of 35 feet beneath Kreher Park, and 50 feet beneath Upper Bluff area.
Sediment		
Sediment exceeding 10 ppm* PAH	133,900	Approximate areal extent of contamination is 16 acres, and includes removal of wood waste and all contaminated sediment to maximum depth of 10 feet.

* For purposes of estimating sediment volume, the 9.5 ppm PRG was rounded to 10 ppm and it was assumed that the concentration was on a dry weight basis. Due to the spatial distribution of sample locations, interpolation was used to estimate the areal extent of contamination. Rounding to 10 ppm is not expected to result in a significant underestimate of the contaminated sediment volume.

Appendix G contains additional details about the extent of contamination at the Site, including the range of concentrations detected and the frequency of detections for the COCs in each affected media and each separate area of the Site. Appendix G cites instances where sample results exceeded various standards (such as specific Wisconsin standards, Region 3 or Region 9 industrial or residential PRGs, etc.). Appendix E contains those various standards for each COC in each media: soil and sediment standards are contained in Table 4-2, groundwater standards are contained in Table 4-3, surface water standards are contained in Table 4-4, and soil vapor standards are contained in Table 4-5 of Appendix E.

6.0 Current and Potential Future Land and Resource Uses

Currently the Upper Bluff/Filled Ravine portion of the Site is occupied by the NSPW facilities, residential properties, as well as a church and school. Currently, Kreher Park has a walking path along the lakefront as well as a gravel parking lot for the marina. The marina is located to the west of the inlet and is separated from the inlet by a break wall and is not part of the Site. The inlet contains the contaminated sediments that are part of the Site. The entry to the inlet is posted to prevent boats from entering and disturbing the contaminated sediments. In addition, signs posted along the shoreline of the inlet warn the public against wading or swimming. An RV park and swimming beach is located east of the inlet and is also separated by a break wall and is not part of the Site.

Future use of Kreher Park does not include a residential scenario. However, the City of Ashland has proposed a bike path along the railroad corridor that runs east/west through the Site and has a Waterfront Development Plan for the lakefront that includes Kreher Park and would expand the existing marina and make the location of the former WWTP the centerpiece of the Ashland bayfront by creating a visitor's center, and Great Lakes education center and meeting facilities.

The City of Ashland adopted a Comprehensive Plan in October 2004 which sets policy for the direction that the community would like to develop over the next 20 years. For the areas within the Ashland/NSP Lakefront Superfund Site, the City's Comprehensive Plan calls for the areas north of the bluff to be redeveloped as Planned Waterfront. For areas south of the bluff, this area is to be redeveloped as City Center with the following potential actions: relocate existing industrial uses to other areas of the City; promote water-oriented commercial uses that are respectful of existing and future residential uses; provide a sensitive mix of residential uses, including medium and high-density housing; develop an attractive, pedestrian-oriented character to this area that is strongly oriented to the waterfront; and incorporate pedestrian corridors through this area that link the waterfront and Main Street areas.

Lake Superior is a source of drinking water for many area communities including Ashland; however, the water intake is several thousand feet out into the Chequamegon Bay and is not located in the inlet containing contaminated sediments that are part of the Site. Thus, surface water as a source of drinking water is not an issue at the Site.

Currently, groundwater at the Site is not used, however, future groundwater use is an issue that will be addressed by containment, groundwater extraction and treatment, and institutional

controls to restrict future use of the groundwater until it is restored to its beneficial use. The City of Ashland has two artesian wells located in the Kreher Park area. They were taken out of use during implementation of the RI when it was determined that the wells could potentially intercept contamination. Data from the RI show that COCs from the Site were detected, however, the results were below State and/or Federal groundwater quality standards. The City is very interested in utilizing these artesian wells in the future.

In addition, the Lake Superior basin is one of the most pristine and unique ecosystems in North America. Containing the largest surface area of any freshwater lake in the world, Lake Superior has some of the most breathtaking scenery in the Great Lakes and serves as a backdrop to a wide range of recreational and outdoor activities enjoyed by people from all over the world. Sparsely populated even today, Lake Superior has not experienced the same level of development, urbanization, or pollution as the other Great Lakes. Recognizing this unique and invaluable resource, the federal, state, provincial, and U.S. tribal governments, First Nations, environmental groups, industry and the public have taken steps to protect this great legacy for generations to come. This partnership serves as a model the world over for cooperative binational resource management. The Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada commits the two countries (the Parties) to address the water quality issues of the Great Lakes in a coordinated fashion.

7.0 Summary of Site Risks

As part of the RI, NSPW prepared a Human Health Risk Assessment and a Baseline Ecological Risk Assessment for the Ashland/NSP Lakefront Site to evaluate potential risks to human health and the environment if no action is taken. The HHRA and BERA characterize current and future threats or risks to human health and the environment posed by contaminants at the Site. The risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the HHRA and BERA. The HHRA and BERA determined that the COCs for the Site are PAHs and VOCs in soils, sediment and groundwater and that cleanup to levels within EPA's risk range will be protective of human health and the environment at the Site for current and future use. The COCs developed for the Site through the HHRA and BERA are listed in Section 7.9 of this ROD.

In accordance with EPA guidance on preparing RODs, the information presented here focuses on the information that is driving the need for the response action at the Ashland/NSP Lakefront Site and does not necessarily summarize the entire HHRA and BERA. Further information is contained in the risk assessments within the RI report, included in the Administrative Record for the Site.

7.1 Summary of Human Health Risk Assessment

The risk assessment estimates what risks a site poses if no action is taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the risk assessment for the Site. The HHRA was prepared in accordance with *Risk Assessment Guidance*

for Superfund: Volume 1 Human Health Evaluation Manual, Part D (EPA 540-R-97-033, December 2001) (hereafter referred to as "*RAGS Part D*"). The results of the HHRA for the Site indicate that seven exposure pathways result in estimated risks that exceed EPA's target risk range (an incremental cancer risk [CR] of 10^{-4} to 10^{-6} and a hazard index [HI] ≤ 1) and eight exposure pathways result in estimated risks that are either equivalent to or exceed the WDNR's threshold (CR $\leq 1\times10^{-5}$ and HI ≤ 1). These exposure pathways are listed below.

Exceeds EPA Threshold (CR $\geq 1\times10^{-4}$ or HI >1)	**Exceeds WDNR Threshold (CR $\geq 1\times10^{-5}$ or HI >1)**
Residents (Soil [0-3 feet and all soil depths] - Cancer)	Residents (Soil [0-3 feet and all soil depths] - Cancer)
--	Residential Child (Soil – Noncancer)
Construction Worker (Soil [0-10 feet bgs]/Groundwater)	Construction Worker (Soil [0-10 feet bgs]/Groundwater)
Construction Worker (Trench Air)	Construction Worker (Trench Air)
Adult Swimmer (Surface Water)	Adult Swimmer (Surface Water)
Adult Wader (Surface Water/Oil Slicks)	Adult Wader (Surface Water/Oil Slicks/Sediment)
Industrial Worker (Indoor Air)	Industrial Worker (Indoor Air)
Subsistence Fisher (Biota)	Subsistence Fisher (Biota)

HI: Hazard index for noncarcinogenic effects

7.2 Identification of Contaminants of Potential Concern

A screening process was used to identify the contaminants of concern. First, contaminants of potential concern (COPCs) were identified for further evaluation in the HHRA. The process involves comparison of site data to conservative criteria which, if not exceeded, show that risks/hazards are insignificant. The COPCs selected for further evaluation are listed in Appendix H-1 and include VOCs and PAHs. Benzene is the most commonly occurring VOC. The PAHs consist of a group of SVOCs. The most commonly occurring SVOC at the Site is naphthalene. Some metals (lead, thallium and arsenic) and inorganic compounds (cyanides) have also been found.

In the HHRA, the toxicity assessment provides a framework for characterizing the relationship between the magnitude of exposure to a chemical and the nature and likelihood of adverse health effects that may result from such exposure. Chemical toxicity is typically divided into two categories: carcinogenic and noncarcinogenic. Potential health effects are evaluated separately for these two categories, because their toxicity criteria are based on different mechanistic assumptions and associated risks are expressed in different units. Thus, the COPC list was refined using toxicology, pathways, and exposure during the HHRA for the Site. No COPCs were identified in the HHRA for groundwater because groundwater is not used as a potable water supply, though construction worker exposure to groundwater is possible. At the former WWTP, trespassers who enter the buildings can potentially inhale vapors and have direct dermal

contact with contaminated groundwater and NAPLs that have infiltrated the flooded lower level of the facility. The COPCs identified for surface water include PAHs. The COPCs identified for sediment include metals and PAHs. PAHs were found to be COPCs in fish. Several volatile compounds were identified as COPCs in indoor air.

The COPCs identified in the HHRA for this Site are primarily metals, SVOCs, and limited VOCs. A summary of the COPCs by receptor and medium is presented in Appendix H-1. Tables 10 to 19 in Appendix H-1 present the detailed screening summary tables by receptor and medium.

Although many chemicals may be identified in samples collected during a site investigation, the results of a baseline HHRA typically identify a few chemicals that are the "risk drivers" at a site. To streamline the HHRA process and focus efforts on important issues, several methods have been developed by the regulatory agencies and the scientific community for the identification of chemicals and pathways that contribute significantly to the total risks posed by a site. A tiered, risk-based approach was used for the selection of COPCs to be further evaluated in the detailed HHRA for the Site. This approach is based on EPA-developed methodology and follows standard HHRA procedures.

The maximum detected concentration of a chemical was compared with chemical- and medium-specific risk-based screening concentrations (RBSCs), defined as concentrations that are not expected to result in any adverse impact based on exposure conditions which served as the basis for the calculation. A chemical was selected as a COPC if its maximum detected concentration value exceeds the RBSC.

However, because there were no data collected that are representative of the oily materials in groundwater and surface water, laboratory analytical data collected from the product stream recovered from the active free product recovery system for the Copper Falls aquifer were used to evaluate risks to the construction worker, recreational swimmer and recreational wader receptors. Because there are no readily available risk-based screening values for oily materials, all chemicals that were detected in the product stream were selected as COPCs.

For the evaluation of construction worker dermal and inhalation exposures to VOCs in a trench, the maximum detected groundwater concentration at three domains (Kreher Park, Upper Bluff, Filled Ravine) was used to estimate risk. All chemicals detected in groundwater were identified as COPCs. The groundwater data were not screened against RBSCs prior to risk characterization. This approach potentially overestimates risks to construction worker receptors as not all chemicals detected were present at concentrations greater than their RBSC.

For purposes of this project, the PRGs derived by EPA Region 9 (EPA, 2004b) were adopted as the primary source of RBSCs because they are based on conservative assumptions of exposure scenarios.

For those chemicals lacking an RBSC (i.e., PRG or risk-based concentration [RBC]) the standard practice of selecting surrogate chemicals based on similarities in structure was used to determine if a chemical should be included as a COPC.

It should also be noted that RBSCs that are protective of noncarcinogenic effects were adjusted by a factor of 0.1 (i.e., divided by a factor of 10) to account for possible additive effects of multiple chemicals. All RBSCs for the protection of carcinogenic effects were based on a target cancer risk of 1×10^{-6}.

7.3 Exposure Assessment

The exposure assessment identifies potential pathways by which people may be exposed to contaminants at the Site. This process involves consideration of constituent concentrations in site-related media (e.g., soils, groundwater, and sediment) and potentially exposed populations and their activity patterns. The exposure assessment is contained in Section 3 of the HHRA.

The assumptions used to identify the exposure scenarios evaluated in the HHRA were based on EPA guidance, Site history, current land use, and anticipated future use of the Site. If land use changes in the future (e.g., the City of Ashland rezones Kreher Park for residential development), the HHRA may need to be revisited to determine the risks associated with the new land use. The exposure pathways are summarized below.

7.3.1 Exposure to COCs in Soil

a. Residential Land Use Scenario: Child and Adult Residents

Upper Bluff - There is a residential area located upgradient of Kreher Park on the Upper Bluff northeast of the Filled Ravine. The three exposure scenarios in the HHRA for the residential receptors are:

Exposure to surface soil (0-1 foot).

The residential neighborhoods adjacent to the Site are established neighborhoods and are expected to remain so in the future. According to the Ashland Wisconsin Waterfront Development Plan, the future use of the Kreher Park portion of the Site does not include a residential scenario. In an established residential setting and without intrusive activities, receptors would most likely be exposed to surface soil.

Exposure to soil in top 3 feet (0-3 feet).

For informational purposes, COCs in soil between 0 and 3 feet below ground surface (bgs) were also considered for residential receptors based on the assumption that receptors could potentially be exposed to soil from 0-3 feet bgs when performing landscaping or gardening activities.

For the purpose of the HHRA, child and adult residents were assumed to be exposed to COCs in soil via incidental ingestion, inhalation (of soil-borne vapor and particulates) and dermal contact pathways.

Exposure to subsurface soil (1 - 10 feet).

For the purpose of the HHRA, this assumption was made because new construction would involve excavation of soil for the construction of footings or basements.

Therefore, subsurface soil would be brought to the surface resulting in a potential exposure pathway for residential receptors. This scenario represents the worst case for residential receptors, but is not likely to be the actual scenario associated with the Site. In an established residential setting and without intrusive activities, receptors would most likely not be exposed to subsurface soil.

b. Recreational Use Scenario: Child, Adolescent and Adult Visitors

Kreher Park is now zoned as City parkland. It is assumed, therefore, that the primary exposure scenario for Kreher Park is recreational, and that people will temporarily visit but not live in this area of the Site. In addition, other exposure scenarios are possible (e.g., maintenance and construction) and were developed as discussed below. Child, adolescent and adult visitors are assumed to be exposed to COCs in surface soil via incidental ingestion, inhalation (of soil-borne vapor and particulates) and dermal contact pathways.

c. Industrial/Commercial Land Use Scenario: Maintenance Workers

Although the final Work Plan indicated maintenance workers currently access the Site, additional information collected during the RI indicates that City workers and utility maintenance personnel do not access the Site. However, the City may develop the area by expanding the existing marina and creating a museum/education/conference facility on the affected area. Therefore, a potential future maintenance worker was considered a receptor to surface soil at Kreher Park. In addition, maintenance workers are a receptor to surface soil in unpaved portions of the Upper Bluff area. It is conservatively assumed that maintenance workers may be exposed to COCs in surface soil via incidental ingestion, inhalation (of soil-borne vapor and particulates) and dermal contact pathways.

d. Industrial/Commercial Land Use Scenario: General Industrial Workers

Except for the NSPW facility, no other industrial/commercial facilities exist within the Site. For this HHRA, general workers are defined as NSPW employees involved with non-intrusive, operational activities. Current and potential future general workers are not likely to be subject to significant exposure to environmental media in the normal course of their daily work. Although the potential for exposure to occur is expected to be low, general workers are assumed to be exposed to COCs in surface soil via incidental ingestion, inhalation (of soil-borne vapor and particulates) and dermal contact pathways.

e. Industrial/Commercial Land Use Scenario: Construction Workers

Upper Bluff and Kreher Park - It is conservatively assumed that construction activities could take place at every area of the Site and it is possible for construction workers to be exposed to COCs in surface and subsurface soil via incidental ingestion, inhalation (of soil-borne vapor and particulates) and dermal contact pathways. For this HHRA, subsurface soil is defined as a depth of 10 feet or less, which is a conservative estimate of the limit to which construction activities may occur based on the current and proposed future land use at the Site.

7.3.2 Exposure to COCs in Indoor Air – Residents and Industrial Workers

Upper Bluff - The residential area located upgradient from Kreher Park on the Upper Bluff area northeast of the Filled Ravine was evaluated. For the purpose of the HHRA, child and adult residents were assumed to be potentially exposed to COCs volatilizing from soil and groundwater and entering the residences located near the Filled Ravine. In addition, potential exposures to COCs in indoor air were also evaluated for industrial workers who may enter the NSPW service center/vehicle maintenance building periodically.

Kreher Park – Trespassers who enter the former WWTP can potentially inhale vapors released to contaminated groundwater and NAPLs that have infiltrated the flooded lower level of the facility. The potential health risks associated with this exposure pathway was part of the RI/FS work plan but was not quantitatively evaluated by the HHRA and is a data gap. This exposure pathway was not quantitatively evaluated because access to the interior of the plant was restricted during the RI/FS study and no samples could be collected. Additionally, earlier indoor air analyses results collected by the City of Ashland (2002) were not available for review as part of the HHRA. Despite this shortcoming, direct contact exposures to NAPL or "free-product" in groundwater may pose an unacceptable health risk.

7.3.3 Exposure to COCs in Groundwater:

a. Trespassing Land Use Scenario

The final Work Plan indicated that groundwater in the seep area was a potential exposure point for trespassers. However, this exposure point was eliminated because the seep area was capped as part of the 2002 interim action response. This exposure pathway is no longer complete and was not quantitatively evaluated in the HHRA.

Another potential point of exposure to groundwater is the former WWTP building where groundwater has infiltrated into the basement. The building is locked and the perimeter is partially fenced. A quantitative evaluation for potential trespasser exposures to the indoor air and water inside the former WWTP building was not performed due to the lack of data.

b. Industrial/Commercial Land Use Scenario: Construction Workers

Kreher Park - It was conservatively assumed that construction activities could take place at every area included in the evaluation and it is possible for construction workers to be exposed to COCs in shallow groundwater at Kreher Park via incidental ingestion, inhalation of vapors, and dermal contact pathways. For the HHRA, shallow groundwater was defined as a depth of 10 feet or less, which is a conservative estimate of the limit to which construction activities may occur based on the current and proposed future land use at the Site.

c. Residential and Industrial/Commercial Land Use Scenarios

Groundwater is present in both the water table aquifer and a confined deep aquifer. Currently the shallow groundwater is not used as a potable water source. There are two artesian wells in the Site vicinity—one located near Prentice Avenue on the eastern boundary of the Site and the other located near the marina on the western boundary. Both wells draw water from the Copper Falls aquifer, the confined deep aquifer that is separated from the shallow groundwater by the Miller Creek Formation. The City of Ashland restricted public access to these wells for public use in August 2004. To date water from these wells have met all federal and state safe drinking water standards. Water from these artesian wells is considered safe to drink as Site-related chemicals have not been detected in these wells at levels of concern.

Except for the two artesian wells, the Copper Falls aquifer is not used for drinking water and is not considered a source of human exposure. Shallow groundwater at the Site is not a drinking water source for the City of Ashland. Drinking water at the Site is provided by the City of Ashland that draws its water from intakes in Lake Superior, located approximately one mile northeast of the Site outside the known extent of surface water contamination. Therefore, there are no known receptors to shallow groundwater beneath the Site.

7.3.4 Exposure to COCs in Surface Water and Sediments

Recreational Use Scenario: Child, Adolescent and Adult Visitors to Kreher Park and Chequamegon Bay

The Site is surrounded by facilities that draw the public to the lakefront – a City marina, public swimming beach, a boat ramp and an RV park and campground. Child, adolescent and adult visitors are assumed to be exposed to COCs in surface water and sediments via incidental ingestion, inhalation of vapors, and dermal contact pathways while swimming, wading, fishing, or boating. However, only risks associated with swimming and wading activities were quantified in the HHRA. This is because they represent activities that have the greatest contact with impacted media and are considered more conservative than exposures associated with fishing and boating.

7.3.5 Exposure to COCs in Fish Tissue

Subsistence fishers were selected as the fishing receptors because there are two Chippewa Bands (the Bad River Band and the Red Cliff Band of Lake Superior Chippewa) who may use Chequamegon Bay as their source of fish. For the HHRA it was conservatively assumed that adult subsistence fishers may be exposed to COCs via ingestion of locally-caught fish. Although this scenario was selected based on the presence of the two Chippewa Bands, this exposure scenario and the selected exposure parameters are applicable to any subsistence fisher ingesting fish from Chequamegon Bay.

7.4 Toxicity Assessment

The toxicity assessment identifies the potential effects that are generally associated with exposure to a given chemical. To quantify carcinogenic effects, EPA has derived slope factors

(SFs) for those chemicals found to cause a dose-related, statistically significant increase in tumor incidence in an exposed population relative to the incidence of tumors observed in unexposed populations. SFs are typically developed based on oral toxicity studies and are reported as risk per unit dose in units of inverse milligrams per kilogram body weight per day [$(mg/kg\text{-}day)^{-1}$]. The SFs are used to quantify the potential risk of cancer associated with a given exposure (EPA, RAGS Part D).

To quantify non-carcinogenic hazards, EPA has derived reference doses (RfDs) that represent a threshold of toxicity in units of mg/kg-day. RfDs are intended to represent an exposure that the human population could be exposed to daily for an entire lifetime without appreciable risk of harmful effects (EPA, RAGS Part D).

Because most oral SFs and RfDs are based on an administered dose, the toxicity values are sometimes adjusted (expressed as an absorbed dose) when evaluating the dermal exposure scenarios. In accordance with EPA's *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual* (Part E, Supplemental Guidance for Dermal Risk Assessment) Final (540-R-99-005, July 2004) the oral SF is adjusted only when the gastrointestinal absorption of the compound is less than 50%.

There were several chemicals detected at the Site for which there are only provisional toxicity values. The EPA process for developing provisional toxicity values is inherently conservative and is not subject to the same vigorous review process as toxicity criteria that have been verified. For the HHRA, 2-methylnaphthalene is a risk driver based on its provisional toxicity value. Because the toxicity values are based on limited animal and human data, the true risks associated with these chemicals is not completely known.

There were several chemicals (1-methylnaphthalene, acenaphthylene, benzo[e]pyrene, benzo[g,h,i]perylene, phenanthrene, 1,2,3-trimethylbenzene, p-isopropyltoluene) that were detected at the Site and for which there are no toxicity values. Because of the lack of information available for these chemicals, the true risk to potential receptors at the Site is not completely known. However, because these chemicals were detected in areas where primary risk drivers are located, it is likely that any remediation based on known risk drivers will address chemicals for which there is a lack of toxicity data.

7.5 Risk Characterization

The risk characterization integrates the results of the data evaluation, toxicity assessment, and exposure assessment to evaluate potential risks/hazards associated with the Site. Consistent with EPA guidance, carcinogenic risks and non-carcinogenic hazards are evaluated separately.

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

Risk = CDI x SF

Where: risk = a unitless probability (e.g., 2 x 10-5) of an individual's developing cancer

CDI = chronic daily intake averaged over 70 years (mg/kg-day)

SF = slope factor, expressed as (mg/kg-day)-1.

These risks are probabilities that usually are expressed in scientific notation (e.g., 1 x10-6). An excess lifetime cancer risk of 1 x 10-6 indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been established to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 10-4 to 10-6.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose derived for a similar exposure period. An RfD represents a level than an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index is generated by adding the HQs for all chemicals of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI<1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI>1 indicates that site-related exposures may present a risk to human health.

Methodology for Evaluating Carcinogenic Effects

For purposes of assessing risks associated with potential carcinogens, EPA has adopted the science policy position of "no-threshold;" i.e., there is essentially no level of exposure to a carcinogen which will not result in some finite possibility of tumor formation. This approach requires the development of dose-response curves correlating risks associated with given levels of exposure. Linear dose-risk response curves are generally assumed.

Carcinogenic risks associated with a given level of exposure to potential carcinogens are typically extrapolated based on slope factors or unit risks. SFs are the upper 95% confidence limit of the slope of the dose-response curve, expressed in terms of risk per unit dose [given in $(mg/kg\text{-}day)^{-1}$]. Unit risks relate the risk of cancer development with the concentration of carcinogen in the given medium, expressed as either risk per unit concentration in air [given in $(\mu g/m^3)^{-1}$] or drinking water [given in $(\mu g/L)^{-1}$].

Current EPA Superfund guidance for calculating a dermal SF is to adjust the oral SF with an oral absorption factor specific for that chemical. It should be noted that the oral absorption factor used in the calculation refers to absorption of the chemicals in the species upon which the SF is based; i.e., generally not absorption data in humans.

The equation for extrapolation of a default dermal SF is as follows:

$$\text{Default Dermal SF}\left[(\text{mg/kg - day})^{-1}\right] = \text{Oral SF}\left[(\text{mg/kg - day})^{-1}\right] \div \text{Oral Absorption Factor (\%)}$$

Regulatory agencies have policies and guidelines to determine the significance of these calculated risk levels. EPA uses 1×10^{-6} to 1×10^{-4} as a "target range within which the Agency strives to manage risks as part of a Superfund cleanup" (EPA, 1991).

Methodology for Evaluating Non-carcinogenic Effects

EPA has adopted the science policy position that protective mechanisms (such as repair, detoxification, and compensation) must be overcome before the adverse systemic health effect is manifested. Therefore, a range of exposures exists from zero to some finite value that can be tolerated by the organism without appreciable risk of expressing adverse effects.

The approach used by EPA to gauge the potential non-carcinogenic effects is to identify the upper boundary of the tolerance range (threshold) for each chemical and to derive an estimate of the exposure below which adverse health effects are not expected to occur. Such an estimate calculated for the oral route of exposure is an oral reference dose, and for the inhalation route of exposure is an inhalation reference concentration (RfC). The oral RfD is typically expressed as mg chemical per kg body weight per day, and the inhalation RfC is usually expressed in terms of concentration in the air (i.e., mg chemical per m^3 of air). However, for purposes of baseline HHRAs, inhalation RfC values can be converted to units of dose by multiplying by the inhalation rate (20 m^3/day, an upper-bound estimate for combined indoor-outdoor activity) and dividing by the body weight (70 kg, average body weight), as detailed in the following equation:

$$\textit{Inhalation}\ \text{RfD}\,(\text{mg/kg - day}) = \text{RfC}\,(\text{mg/m}^3) \times 20\ {}^{m^3}\!/_{day} \div 70\ \text{kg}$$

Currently, two types of oral RfDs/inhalation RfCs are available, depending on the length of exposure being evaluated (chronic or subchronic). Chronic oral RfDs/inhalation RfCs are specifically developed to be protective for long-term exposure to a compound, and are generally used to evaluate the non-carcinogenic effects associated with exposure periods between seven years (approximately 10% of an average lifespan) and a lifetime. Subchronic oral RfDs/inhalation RfCs are useful for characterizing potential non-carcinogenic effects associated with shorter-term exposures. Current guidelines for Superfund program risk assessment requires that subchronic oral RfDs/inhalation RfCs be used to evaluate the potential non-carcinogenic effects of exposure periods between two weeks and seven years.

Toxicological criteria specifically derived for gauging potential human health concerns associated with the dermal route of exposure have not been developed by EPA. For purposes of this HHRA, default dermal RfD values were extrapolated from oral RfDs (EPA 1989), if:

- Health effects following exposure are not route-specific.
- Portal-of-entry effects (e.g., dermatitis associated with dermal exposure and respiratory effects associated with inhalation exposure) are not the principal effects of concern.

Exposures with the dermal route are generally calculated as absorbed doses, while oral RfDs are expressed as administered doses. Current EPA Superfund guidance is to adjust the oral RfD with an oral absorption factor (i.e., percent chemical that is absorbed) to extrapolate a default dermal RfD, which is expressed in terms of absorbed dose. It should be noted that the oral absorption factor used in the calculation refers to absorption of the chemicals in the species upon which the RfD is based (i.e., generally not absorption data in humans).

The equation for extrapolation of a default dermal RfD is as follows:

$$\textit{Default}\ \text{Dermal RfD}\ (\text{mg/kg - day}) = \text{Oral RfD}\ (\text{mg/kg - day}) \times \text{Oral Absorption Factor}\ (\%)$$

Risks were compared to both EPA target risk ranges (CR of 10^{-4} to 10^{-6} and HI $\leq$ 1) as well as the target risk thresholds for WDNR. Where the calculated carcinogenic and noncarcinogenic risks exceed either threshold it is noted in the text discussion below. Attachment D in the HHRA provides a detailed presentation of the carcinogenic and noncarcinogenic risk calculations. A summary of the risks are shown in Tables 20 – 45 in Appendix I of this ROD.

7.5.1 Risk Summary for the Residential Scenario

Risks associated with exposure to surface and subsurface soil for residents are a CR of 5×10^{-4} and an HI of 15 for samples collected within the Filled Ravine of the former MGP. These risks exceed the EPA target risk range of 10^{-4} to 10^{-6} and the WDNR threshold of 10^{-5} for cancer and an HI of 1 for noncancer endpoints, respectively. The resulting cancer risk of 5×10^{-4} is primarily attributed to benzo(a)pyrene (65%) and dibenzo(a,h)anthracene (10%). Upon review of the data gathered for benzo(a)pyrene, 10 sampling locations (located in both the Filled Ravine and the Upper Bluff) with detectable concentrations ranging from 22 to 340 mg/kg at intervals between 1 to 8 feet bgs are the main contributors to the benzo(a)pyrene cancer risk. In addition, one sample location for dibenzo(a,h)anthracene (CP110) with a reported concentration of 3.8 mg/kg (1 to 3 feet bgs) is the main contributor to the dibenzo(a,h)anthracene cancer risk. The resulting HI of 15 is primarily attributed to naphthalene (with an HI of 11).

Based on the results of the Integrated Exposure Uptake Biokinetic (IEUBK) model inputting an average lead concentration in soil of 90.5 mg/kg, the percentage of children predicted to have a blood lead concentration greater than 10 µg/dL is 0.11, which is within EPA's target criteria of no more than 5% above the concern threshold of 10 µg/dL concentration. While one soil location (GP-110 (1-3')) had a highly elevated lead concentration of 4000 mg/kg, only one other sample (GP-115 (1-3') had a concentration (480 mg/kg) that exceeded the screening level of 400 mg/kg. Thus, while there are elevated concentrations in the loading dock area of the NSPW property, the average concentration is below the screening level.

Indoor Air Pathway (Vapor Intrusion)

The inhalation pathway for potential exposure to hazardous vapors was evaluated during the RI by installing vapor probes in the unsaturated zone and collecting vapor samples in the vicinity of the former MGP. Thirteen vapor probes were installed at 10 exterior and one interior location. The results of soil gas samples collected from probes were evaluated using the most recent

revision of the Johnson and Ettinger models (U.S. EPA, 2002). Indoor air samples were also collected from the NSPW service center building to further characterize potential vapor intrusion. The soil gas data were then compared to the indoor air sample results and relevant indoor air quality criteria.

Measured concentrations in soil vapor samples collected from subsurface soil within the Filled Ravine area of the Site did not exceed the EPA's risk target shallow soil vapor screening concentrations at a target risk level of 10^{-5}, indicating that subsurface vapors are not migrating toward the residential area at St. Claire Street and Prentice Avenue.

Residential Risk Discussion

PAHs appear to be the primary risk drivers for the residential receptor within the Filled Ravine area of the former MGP. The highest concentrations of PAHs, and thus the highest risks, are associated with PAHs detected at depths of 0 to 3 feet bgs. However, residents are not currently located in this area of the Site and residential areas are not likely to be established at this part of the Site in the future.

For the HHRA, it was conservatively assumed that the residential receptors would be exposed to both surface and subsurface soil. This assumption was made because new construction would involve excavation of soil for the construction of basements or foundations. Therefore, soil with high chemical concentrations would be brought to the surface resulting in a potential exposure pathway for residential receptors. This scenario represents the worst case for residential receptors, but is not likely to be the actual scenario associated with the Site. The residential neighborhoods adjacent to the Site are established neighborhoods and are expected to remain so in the future. According to the Ashland Wisconsin Waterfront Development Plan, the future use of the Kreher Park portion of the Site does not include a residential scenario. Therefore, residential receptors would only be exposed to surface soil. If it is assumed that residential receptors adjacent to the Site tend gardens, then it is possible that the first three feet of soil will represent the most likely exposure point.

Re-evaluating the residential receptor using exposure point concentrations (EPCs) derived based on the exposure to surface soil and soil to a depth of 3 feet indicates that carcinogenic and noncarcinogenic risks fall within EPA's target risk range of 10^{-4} to 10^{-6} for cancer endpoints and below an HI of 1 for noncancer endpoints. For soils to a depth 0 to 3 feet bgs, the carcinogenic risk exceeds EPA's target risk range of 10^{-4} to 10^{-6}. The estimated cancer risk for surface soil is also above the WDNR threshold of 10^{-5}.

Receptor	Table in Appendix I	Soil	
		CR	HI
Resident (Surface Soil only)	33	1×10^{-5}	0.2
Residential (0-3 feet bgs)	34	3×10^{-4}	0.9

The resulting CR of 1×10^{-5} for exposure to surface soil only is primarily attributed to arsenic (76%). Upon review of the data, one sampling location (SS19) with a reported concentration of 8.5 mg/kg is the main contributor to arsenic cancer risk.

Seventy eight percent of the resulting CR of 3×10^{-4} (exposure to soil between 0 and 3 feet bgs) is attributed to benzo(a)pyrene. Upon review of the data, 12 sampling locations within the Filled Ravine area with reported concentrations ranging from 0.19 to 220 mg/kg (at depths greater than 1 foot bgs) are the main contributors to cancer risk.

7.5.2 Risk Summary for the Recreational Scenario

The following pathways were considered for the recreational scenarios:

- Recreational adults, adolescent, and children exposed to surface soil
- Recreational adult, adolescent, and child waders exposed to sediment and surface water
- Recreational adult and adolescent swimmers exposed to sediments and surface water

In general, risks associated with COPC exposures to surface soils for recreational users were estimated to have CRs ranging between 1×10^{-5} and 1×10^{-6}, and HIs ranging between 0.002 and 0.04. Risks associated with swimmer and wader exposures to COPCs in sediments were estimated to have CRs between 1×10^{-5} and 3×10^{-9}, and HIs between 0.002 and 0.00002. For the adult swimmer and wader exposure to oily materials in surface water, the CR was 9×10^{-2} and 5×10^{-2}, and the HI was 6 and 4, respectively. Risks associated with each medium and recreational receptor are discussed below.

Risk Summary for Recreational Users Exposed to Surface Soil

Only limited metals and carcinogenic PAHs were identified as COPCs for recreational user exposure to surface soil. Cancer and noncancer risks to recreational adults and adolescents exposed to surface soil are generally a CR between 1×10^{-6} and 1×10^{-4} and less than an HI of 1. Cancer risks to a recreational child exposed to surface soil are 1×10^{-4}, but less than a noncancer risk of an HI of 1. The primary risk driver for the recreational adult, adolescent and child is benzo(a)pyrene.

Recreational Adults

Risks associated with exposure to surface soil for recreational adults are a CR of 3×10^{-6} and an HI of 0.002 for samples collected within Kreher Park. Both the cancer and noncancer risks are within the EPA target risk range of 10^{-4} to 10^{-6} for cancer and an HI of 1 for noncancer endpoints, respectively. These calculated risks are below the carcinogenic and noncarcinogenic WDNR thresholds. Approximately 76% of the resulting CR of 3×10^{-6} is attributed to benzo(a)pyrene. Upon review of the data gathered for benzo(a)pyrene for the Site, four sampling locations (located in Kreher Park, one of which is located within the Former Coal Tar Dump, sample TP-118) with detectable concentrations ranging from 7.4 to 68 mg/kg at intervals between 0 to 1 foot bgs are the main contributors to the benzo(a)pyrene cancer risk.

Recreational Adolescents

Risks associated with exposure to surface soil for recreational adolescents are a CR of 2×10^{-6} and an HI of 0.003 for samples collected within Kreher Park. Both the cancer and noncancer risk are within the EPA target CR of 10^{-4} to 10^{-6} for cancer and an HI of 1 for noncancer endpoints,

respectively. These calculated risks are below the carcinogenic and noncarcinogenic WDNR thresholds.

Approximately 76% of the resulting cancer risk is attributable to benzo(a)pyrene. Upon review of the data gathered for benzo(a)pyrene for the Site, four sampling locations (located in Kreher Park, one of which is located within the Former Coal Tar Dump, sample TP-118) with detectable concentrations ranging from 7.4 to 68 mg/kg at intervals between 0 to 1 foot bgs are the main contributors to the benzo(a)pyrene cancer risk.

Recreational Children

Risks associated with exposure to surface soil for recreational children are a CR of 1×10^{-5} and an HI of 0.04 for samples collected within Kreher Park. Both the cancer and noncancer risks are within the EPA target CR range of 10^{-4} to 10^{-6} for cancer and an HI of 1 for noncancer endpoints, respectively. The calculated carcinogenic risk is equal to the carcinogenic WDNR threshold, but less than the noncarcinogenic WDNR threshold. Approximately 74% of the resulting cancer risk is attributed to benzo(a)pyrene. Upon review of the data gathered for benzo(a)pyrene for the Site, four sampling locations (located in Kreher Park, one of which is located within the Former Coal Tar Dump, sample TP-118) with detectable concentrations ranging from 7.4 to 68 mg/kg at intervals between 0 to 1 foot bgs are the main contributors to the benzo(a)pyrene cancer risk.

Risk Summary of Recreational Swimmers Exposed to Sediment and Surface Water

Surface water in the Chequamegon Bay has a number of issues associated with the existing data set. First, 2005 surface water data does not confirm the 1998 SEH sampling data which indicate that carcinogenic PAHs are present at concentrations greater than screening levels. Second, oil slicks have been visually observed within Chequamegon Bay. No analytical data is available which measures the levels of chemicals which might be present in oil slick surface water. Therefore, surface water exposures were evaluated using both the 1998 SEH data and analytical data collected from the product stream from the active free product recovery system for the Copper Falls Aquifer or chemical-specific solubility values detected in the DNAPL sample. This approach was used to provide a range of risks associated with the 1998 SEH sampling data and the "oil slicks."

Adult and Adolescent Swimmers Exposed to Surface Water

Wisconsin Department of Health and Family Services (WDHFS) calculated risks associated with exposures to the 1998 surface water data. Because no COPCs were identified in the 2005 RI data set, only the 1998 data were used for estimating risks. Detailed calculations using 1998 surface water data and exposure parameters consistent with the Site are presented in Attachment K of the HHRA and are summarized below for the recreational adult and adolescent swimmers.

Receptor	Calculated Risks using 1998 SEH Surface Water Data	
	CR	Noncancer Risk
Adult swimmer	6×10^{-5}	NE
Adolescent swimmer	3×10^{-5}	NE

NE – Not evaluated. Only carcinogenic PAHs were present in surface water at concentrations greater than the RBSC.

Adult and Adolescent Swimmers Exposed to Oil Slicks in Surface Water

Risks associated with exposures to oil slicks in surface water were evaluated. This pathway was evaluated because a tar slick was reported and photographed by a citizen. Although no slicks were observed by sample collectors and the subsequent data does not indicate notable surface water impacts, the 1998 SEH report calculated unacceptable levels of current and future health risks for workers, trespassers, and people engaged in recreational activities on the Site. Since this exposure pathway poses one of the greatest potential health risks at the Site, the HHRA report includes an evaluation of exposures to "oil slicks" in surface water in addition to the evaluation of the 1998 SEH data.

Risks associated with exposures to oil slicks in surface water were estimated for the recreational swimmers using concentrations of DNAPLs collected from the product stream recovered from the active free product recovery system for the Copper Falls aquifer. Risks associated with exposure to oil slicks in surface water are a CR of 9×10^{-2} and an HI of 6. The primary carcinogenic risk drivers are benzo(a)pyrene (62%) and dibenzo(a,h)anthracene (29%). The primary noncarcinogenic risk drivers are 2-methylnaphthalene (54%), naphthalene (12%) and benzene (16%).

Adult Swimmers Exposed to Sediment

Risks associated with exposure to sediment for adult swimmers are a CR of 4×10^{-5} and an HI of 0.05 for samples collected within Chequamegon Bay. Both the cancer and noncancer risk are below the EPA target risk range of 10^{-4} to 10^{-6} for cancer and an HI of 1 for noncancer endpoints, respectively. However, the cancer risk is greater than the WDNR target risk of 1×10^{-5}.

Adolescent Swimmers Exposed to Sediment

Risks associated with exposure to sediment for adolescent swimmers are a CR of 2×10^{-5} and an HI of 0.05 for samples collected within Chequamegon Bay. Both the cancer and noncancer risk are below the EPA target risk range of 10^{-4} to 10^{-6} for cancer and an HI of 1 for noncancer endpoints, respectively. However, the cancer risk is greater than the WDNR target risk of 1×10^{-5}.

Risk Summary for Recreational Waders Exposed to Sediment and Surface Water

Surface water in the Chequamegon Bay has a number of issues associated with the existing data set. First, 2005 surface water data do not confirm the 1998 SEH sampling data which indicate that carcinogenic PAHs are present at concentrations greater than screening levels. Second, oil slicks have been visually observed within Chequamegon Bay. No analytical data is available which measures the levels of chemicals which might be present in oil slick surface water. Therefore, surface water exposures were evaluated using both the 1998 SEH data and analytical data collected from the product stream from the active free product recovery system for the Copper Falls Aquifer or chemical-specific solubility values detected in the DNAPL sample. This approach was used to provide a range of risks associated with the 1998 SEH sampling data and the "oil slicks."

Adult and Adolescent Waders Exposed to Surface Water

WDNR calculated the risks associated with exposures to the 1998 surface water data. Because no COPCs were identified in the 2005 RI data set, only the 1998 data were used for estimating risks. Detailed calculations using 1998 surface water data and exposure parameters consistent with the Site are presented in Attachment K of the HHRA and are summarized below for the recreational adult and adolescent waders.

Receptor	Calculated Risks using 1998 SEH Surface Water Data	
	CR	Noncancer Risk
Adult wader	4×10^{-5}	NE
Adolescent wader	2×10^{-5}	NE

NE – Not evaluated. Only carcinogenic PAHs were present in surface water at concentrations greater than the RBSC.

Adult Waders Exposed to Oil Slicks in Surface Water

Risks associated with exposures to oil slicks in surface water were estimated for the adult waders using concentrations of DNAPLs collected from the product stream recovered from the active free product recovery system for the Copper Falls aquifer. Risks associated with exposure to oil slicks in surface water are a CR of 5×10^{-2} and an HI of 4. The primary carcinogenic risk drivers are benzo(a)pyrene (62%) and dibenzo(a,h)anthracene (29%). The primary noncarcinogenic risk drivers are 2-methylnaphthalene (54%), naphthalene (12%) and benzene (16%).

Adult Waders Exposed to Sediment

Risks associated with exposure to sediment for adult waders are a CR of 4×10^{-5} and an HI of 0.05 for samples collected within Chequamegon Bay. The cancer risk is within the EPA target risk range of 10^{-4} to 10^{-6} for cancer, and noncancer risk is less than the target HI of 1 for noncancer endpoints. However, the cancer risk is greater than the WDNR target risk of 1×10^{-5}.

Approximately 82% of the resulting cancer risk is attributable to benzo(a)pyrene. Upon review of the data gathered for benzo(a)pyrene for the Site, three sampling locations (220N-1600E, 2250N-1400E, 2400N-1200E) with detectable concentrations ranging from 10.5 to 26 mg/kg at intervals between 0 to 2 feet bgs are the main contributors to the benzo(a)pyrene cancer risk.

Adolescent Waders Exposed to Oil Slicks in Surface Water

Risks associated with exposures to oil slicks in surface water were estimated for the adolescent waders using concentrations of DNAPLs collected from the product stream recovered from the active free product recovery system for the Copper Falls aquifer. Risks associated with exposure to oil slicks in surface water are a CR of 2×10^{-2} and an HI of 4. The primary carcinogenic risk drivers are benzo(a)pyrene (62%) and dibenzo(a,h)anthracene (29%). The primary noncarcinogenic risk drivers are 2-methylnaphthalene (54%), naphthalene (12%) and benzene (16%).

Adolescent Waders Exposed to Sediment

Risks associated with exposure to sediment for adolescent waders are a CR of 2×10^{-5} and an HI of 0.05 for samples collected within Chequamegon Bay. The cancer risk is within the EPA target risk range of 10^{-4} to 10^{-6} for cancer and an HI of 1 for noncancer endpoints. However, the cancer risk is greater than the WDNR target risk of 1×10^{-5}.

Approximately 82% of the resulting cancer risk is attributable to benzo(a)pyrene. Upon review of the data gathered for benzo(a)pyrene for the site, three sampling locations (220N-1600E, 2250N-1400E, 2400N-1200E) with detectable concentrations ranging from 10.5 to 26 mg/kg at intervals between 0 to 2 feet bgs are the main contributors to the benzo(a)pyrene cancer risk.

7.5.3 Risk Summary for the Construction Worker Scenario

Soil Exposures

PAHs appear to be the primary cancer risk drivers for the construction scenario within the Kreher Park area of the Site. Of the calculated CR of 1×10^{-4}, approximately 71% is attributable to benzo(a)pyrene and 11% is attributable to dibenzo(a,h)anthracene. Upon review of the data, 27 sampling locations (located in both the Filled Ravine and Kreher Park) with detectable concentrations ranging from 205 to 3,000 mg/kg at intervals between 1 to 8 feet bgs are the main contributors to the benzo(a)pyrene cancer risk. In addition, 24 sample locations for dibenzo(a,h)anthracene (located in Kreher Park) with detectable concentrations ranging from 28 to 250 mg/kg (2 to 8 feet bgs) are the main contributors to the dibenzo(a,h)anthracene cancer risk.

The resulting HI of 38 is primarily attributed to naphthalene (with an HI of 31 and 2-methylnaphthalene (with a HI of 1). Because the HI exceeds 1, the noncancer risk for this receptor was re-calculated based on target organs affected by each chemical.

Based on the results of the Adult Lead Model (ALM), the percentage of developing fetuses predicted to have a blood lead concentration greater than 10 µg/dL is 1.5, which is within EPA's target criteria of no more than 5% of fetuses of adult female workers above the concern threshold of 10 µg/dL.

Based on the results of the ALM inputting an average lead concentration of 88.7 mg/kg, the percentage of developing fetuses predicted to have a blood lead concentration greater than 10 µg/dL is 1.5, which is within EPA's target criteria of no more than 5% of fetuses of adult female workers above the concern threshold of 10 µg/dL. While one location (GP-110 (1-3')) had a highly elevated lead concentration of 4000 mg/kg, only one other sample (GP-115 (1-3')) had a concentration (480 mg/kg) that exceeded the screening level of 400 mg/kg. Thus, while there are elevated concentrations in the loading dock area of the NSPW, the average concentration is below the screening level.

For the HHRA, it was assumed that the construction receptors would be exposed to both surface and subsurface soil. This assumption was made based on the definition of the construction scenario, which would involve the construction of residential or commercial structures at the Site. This represents the worst case scenario and is not likely to occur at the Site given both its current and future land use. Kreher Park is an established park and is expected to remain so in

the future. Any expansion to the recreational areas of the Site would likely be associated with activities such as the installation of landscaping, sidewalks, and parking lots, all of which do not involve excavation to significant depths. Therefore, construction receptors would most likely be exposed to shallow soils.

Groundwater Exposures

Cancer and noncancer risks associated with the exposure to "oily materials" in groundwater are a CR of 7×10^{-3} and an HI of 60, respectively. Benzo(a)pyrene (64 percent) and dibenzo(a,h)anthracene (27%) are the primary carcinogenic risk drivers. The primary noncarcinogenic risk drivers are 2-methylnaphthalene (54%), naphthalene (12%), and benzene (16%).

Trench Air

Cancer and noncancer risks associated with exposure to VOCs in trench air are presented below.

Domain	Trench Air	
	CR	**HI**
Kreher Park	8.34×10^{-3}	17152
Upper Bluff	2.14×10^{-5}	228
Filled Ravine	3.29×10^{-2}	646601

The primary Trench Air cancer risk drivers at Kreher Park are benzene (77%) and benzo(a)pyrene (23%) and the primary non-cancer risk drivers are naphthalene (87%) and benzene (11%). The primary Trench Air cancer risk driver at the Upper Bluff is benzene (100%) and the primary non-cancer risk drivers are naphthalene (92%) and benzene (3%). The primary Trench Air cancer risk drivers at the Filled Ravine are benzene (47%) and benzo(a)pyrene (53%) and the primary non-cancer risk driver is naphthalene (99%).

7.5.4 Risk Summary for the General Industrial Worker

For the industrial worker, samples collected within a 0-2 foot depth interval were included in the 0-1 ft dataset, as the average sample depth was 1 foot (i.e., , GP-137, GP-131, GP-120). A conservative evaluation of the risks was performed using the average concentration of benzo(a)pyrene at these locations as the EPC since the concentrations of these samples were greater than maximum detected concentration within the industrial worker dataset. Risks from ingestion and dermal contact exposure were calculated.

Cancer and noncancer risks associated with the exposure to surface soil for the general industrial worker receptor are a CR of 1×10^{-6} and an HI of 0.007. Cancer and noncancer risks associated with exposure to indoor air are a CR of 8×10^{-5} and an HI of 3, respectively. The primary cancer risk drivers are trichloroethylene (44%) and benzene (3%). The resulting HI of 3 is primarily attributed to 1,2,4-trimethylbenzene with an HI of 2.

7.5.5 Risk Summary for the Maintenance Worker

Cancer and noncancer risks associated with the exposure to surface soil for the maintenance worker receptor are a CR of 1×10^{-6} and an HI of 0.001. Risks for this receptor are within the target risk levels.

Based on the results of the ALM, the percentage of developing fetuses predicted to have a blood lead concentration greater than 10 µg/dL is 1.6, which is within EPA's target criteria of no more than 5% of fetuses of adult female workers above the concern threshold of 10 µg/dL.

7.5.6 Risk Summary for the Subsistence Fisherman

Risks associated with the ingestion of locally-caught fish from Chequamegon Bay is a CR of 1×10^{-4}, which is just within the EPA target cancer risk range of 10^{-4} to 10^{-6} for cancer endpoints, but greater than the WDNR threshold of 10^{-5}. Although the primary risk drivers for this scenario are the carcinogenic PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[e]pyrene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene), individual cancer risks for each detected carcinogenic PAH are between 1×10^{-5} and 1×10^{-6}.

7.6 Risk Assessment Conclusions

The results of the HHRA for the Site indicate that seven exposure pathways result in estimated risks that exceed EPA's target risk range (CR of 10^{-4} to 10^{-6} and an HI $\leq$ 1) and eight exposure pathways result in estimated risks that are either equivalent to or exceed the WDNR's threshold (CR $\leq1\times10^{-5}$ and HI $\leq$ 1).

Cancer risks to a subsistence fisher (finfish) are equivalent to the upper-end of the EPA target risk range, but greater than the WDNR threshold of a CR of 1×10^{-5}. Noncarcinogenic risk is within acceptable limits for both EPA and WDNR.

Risks to recreational children (surface soil) are equivalent to the WDNR risk threshold. However, risks to adolescent and adult receptors exposed to surface soil are below the EPA acceptable risk range and below the WDNR risk threshold.

Risks to waders and swimmers (sediments), industrial workers (surface soil), and maintenance workers (surface soil) are all within EPA's target risk range of 10^{-4} to 10^{-6} for lifetime cancer risk and a target HI of less than or equal to 1 for non-cancer risk, but are greater than the WDNR threshold of 1×10^{-5} for lifetime cancer risk.

These include estimates for the reasonable maximum exposure (RME) scenarios for potential cancer risks and non-cancer risks. The conclusions are based on assumed exposures to soil in the Filled Ravine area (for residential receptors) and the Filled Ravine, Upper Bluff and Kreher Park area (for construction worker receptors), and to indoor air samples collected at the NSPW Service Center. Carcinogenic risks based on central tendency evaluation (CTE) scenarios indicate that only the residential receptor exposure to soil (all soil depths to 10 feet bgs) is estimated to be at a CR of 1×10^{-4}, which is at the upper-end of the EPA target risk range and greater than the WDNR threshold. Noncarcinogenic risks for the residential receptor (for soil depths 0-1 foot and 0-3 feet bgs) and risks associated with the construction scenario are within

acceptable levels. However, residential receptor exposure to subsurface soil is not expected given the current and potential future land use of the Site. Residential risks associated with exposures to surface soil (0 to 1 foot bgs) are within the target risk ranges.

Although the results of the HHRA indicate risks for the construction workers under the RME conditions exceed EPA's target risk levels, the assumptions used to estimate risks to this population were conservative and assumed the worst case. Given both the current and future land use of the Site it is unlikely that construction workers would be exposed to soil in the Filled Ravine and Upper Bluff. The most likely scenario for the future construction worker is exposure to soil within 0 to 4 feet below ground surface at Kreher Park (a typical depth for the installation of underground utility corridors), as most activities associated with the implementation of the future land use would be associated with regrading, landscaping, and road or parking lot construction.

At the request of the WDHFS, risks were also estimated for construction workers exposed to "oily materials" in groundwater via dermal contact and swimmers and waders who may be exposed to oil slicks in surface water via ingestion and dermal contact. Because no media-specific concentrations are available for either scenario, risks were estimated using analytical data collected from the product stream from the active NAPL recovery system for the Copper Falls aquifer or chemical-specific solubility values detected in the DNAPL sample. Risks to construction workers exposed to "oily material" in groundwater and adult swimmers and waders exposed to "oil slicks" in surface water is greater than both the EPA upper risk range (CR 1×10^{-4} and HI of 1) and WDNR threshold (CR 1×10^{-5} and HI of 1).

The response actions selected in this ROD are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

7.7 Summary of Ecological Evaluation

A Baseline Ecological Risk Assessment was conducted to describe the likelihood, nature and severity of adverse effects to ecological receptors resulting from their exposure to contaminants at the Ashland/NSP Lakefront Site under current conditions. The BERA was prepared following EPA Guidance including, *Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final.* (EPA 1997).

The BERA supplemented two other ecological risk assessments that were conducted for this Site. In 1998, SEH completed an Ecological Risk Assessment (ERA) of the contaminated sediments adjacent to Kreher Park (SEH 1998). A supplemental ecological risk assessment (ERA) was performed in 2001 (SEH 2002) during which additional sediment toxicity testing was conducted to provide information for determining cleanup goals for the sediments.

7.7.1 Scope of Baseline Problem Formulation

Problem formulation was the systematic planning process that identified the factors to be addressed in the BERA and consisted of several activities, including:

- Refinement of the preliminary list of COPCs at the Site (i.e., those that were identified during the screening level ecological risk assessment);
- Development of management goals and objectives that provide an explicit statement of the desired condition of the valued entity being protected;
- Identification of assessment endpoints;
- Review and refinement of the information relating to the fate and transport of COPCs, potential exposure pathways, and the information on receptors potentially at risk;
- Development of a conceptual model with risk questions that the risk assessment will address; and
- Identification of lines of evidence and measurement endpoints to address the risk hypotheses.

Aquatic Toxicity, Fate and Transport of PAHs

Individual ecological toxicity benchmark values do not exist for many individual PAH compounds. However, PAHs in general appear to have a similar mode of action in many organisms. In general, PAHs are toxic to membrane function, and cause a "narcosis" type of toxicity. Therefore the toxicity is treated as additive and a total PAH exposure and toxicity estimate is used to characterize the ecological risk for many ecological endpoints. The mechanism of toxicity for the high molecular weight PAHs also can operate within the cell, resulting in damage to DNA and proteins. This damage may result in carcinogenesis, teratogenesis, or disturbance of hormone regulation.

As a generality PAHs tend not to biomagnify (i.e., increase in concentration through the food chain or strongly bioconcentrate). This is because many organisms (including mammals and fish) can effectively metabolize these compounds. Additionally, many of these compounds are apparently not actively or effectively taken into organisms. Certainly bioconcentration factors (BCFs) of much greater than 1 are documented, but the maintenance of the resulting tissue concentrations relies upon continued exposure. For these reasons field bioaccumulation studies (e.g. fish tissue measurements) are not typically conducted as it is anticipated that little bioaccumulated PAHs will be found and that the fish tissue will not be a substantive component of a dietary exposure route to an ecological consumer of fish. When PAHs are found in tissues such as fish this finding indicates a complete exposure pathway and a strong indication of active release of these contaminants.

One- and two- ring aromatics do not persist in the environment; three-, four- and five-ring aromatics can persist in the natural environment. The higher molecular weight PAHs are not volatile, not soluble, and degrade much more slowly. As a generality, at a PAH concentration of 10% (10,000 ug/g) biological degradation is inhibited; this concentration is consistent with the presence of NAPL.

7.7.2 Results of Previous Ecological Risk Assessments

In 1998, SEH completed an ecological risk assessment of the contaminated sediments adjacent to Kreher Park (SEH 1998). The 1998 ERA concluded that sediment at the Site is contaminated to a degree that is harmful to benthic organisms living in sediment.

Several lines of evidence were used in the 1998 investigation including:

1) a literature search conducted to select relevant sediment effects benchmarks for evaluation of Site data and to identify ecological effects documented at other sites with similar contaminants and exposures;
2) sediment and surface water samples collected, analyzed, and compared to sediment and surface water effects benchmarks for the contaminants identified;
3) collection of fish for analysis of tissue chemical concentrations;
4) a limited survey conducted of the benthic community at contaminated and reference locations; and
5) a series of laboratory bioassays conducted to characterize the effects of short-term exposure to contaminated and reference sediment samples.

A supplemental ERA was performed in 2001 (SEH 2002) during which additional sediment toxicity testing was conducted to provide information for determining cleanup goals for the sediments.

The following sections summarize the various lines of evidence used and the conclusions of the two preliminary ecological risk assessments.

Sediment and Surface Water Chemical Data Evaluation

Sediment chemical data from the Site were compared to several sets of effects levels for both dry weight units (µg/g) and normalized-to-organic-carbon (NOC) units (µg/gOC). SVOCs and VOCs sediment benchmarks were exceeded for several chemicals at several locations in the shallow bioactive zone sediments (0-15 cm) and deeper sediments. Based on this comparison, the ERA concluded there was a high probability of adverse effects to aquatic life from the contaminated sediments.

The presence of quantifiable PAHs in surface water samples appears to be related to high energy events. One unfiltered water column sample collected on May 14, 1998, when wave heights were estimated to be between 60 and 90 cm, had benzo(a)anthracene and benzo(a)pyrene levels that exceeded secondary chronic and acute water quality criteria values, respectively. Other water samples, collected when wave heights were significantly lower, did not contain quantifiable levels of PAHs. These results are consistent with the documentation of the occurrence of slicks within Chequamegon Bay during high energy events.

Fish Tissue Study

As part of the SEH 1998 ERA, a study was conducted to evaluate levels of PAHs in fish caught at the Site and to evaluate the condition of the fish at the Site. Results from this

study indicated that there was no evidence of external deformities in the fish. Of 27 fish collected on May 18, 1998, October 14, 1998, and May 28, 1999, fewer than 50% had measurable levels of any PAHs (Correspondence from Henry Nehls-Lowe to Jamie Dunn, et al., January 12, 2000). The PAHs detected were low molecular weight PAHs including naphthalene, acenaphthene, anthracene, fluorene, and phenanthrene. Total PAH concentrations ranged as high as 483 µg/kg in the whole fish samples.

Both walleye and smelt were collected to generate fish consumption exposure data for the risk assessments. Both of these species are highly mobile species, which would be anticipated to have limited residence time within the area of the Site and thereby limited Site exposure. Fish collected at the Site had measurable PAH concentrations within the fish. The study findings are strong evidence of Site-related exposure to PAHs. As noted, PAHs do not bioconcentrate because they are not actively accumulated and are metabolized by fish. The presence of these compounds within a fish indicates recent exposure to the contaminants. The results therefore indicate an active release of PAHs into Lake Superior. The fact that both of the species in this study are expected to reside at the Site for only a limited time reinforces a conclusion of active contaminant release.

Benthic Community Evaluation

A limited benthic community survey was conducted in 1998 (SEH 1998). The results of the benthic community studies were confounded with sediment substrate differences (presence of wood material and sediment grain size) which could not be isolated from the PAH contamination distribution.

Bioassays

Bioassays were conducted in 1998 on several sediment samples collected from the same two contaminated wood and sand stations and two reference wood and sand stations (SEH 1998). These were the same two stations where the benthic community samples were collected. Bulk sediment toxicity tests were conducted on the following benthic species: *Hyalella azteca*, *Chironomous dilutus* (formerly *C. tentans*), and *Lumbriculus variegatus*. Sediment elutriate preparations from these sites were also used in tests on *Pimephales promelas* and *Daphnia magna*. The results of these tests generally showed that growth and survival of test organisms decreased as the HA-28 NOC toxic units increased. In addition at least one sampling location studied demonstrated acute mortality with effectively complete 100% mortality within the test.

In an effort to develop sediment PRGs, supplemental bioassay toxicity studies were conducted in 2001 using *H. azteca*, *C. dilutus*, and *P. promelas* exposed to bulk sediments collected from four contaminated stations and two reference stations (SEH 2002). Parallel tests were conducted utilizing a dilution methodology in which various proportions of sediments from impacted sites were mixed with sediments from reference sites to obtain a range of exposure concentrations. In some instances control and reference station survival was less than test acceptance criteria.

Test results were evaluated for effects on survival and growth, and graphically compared to PAH toxic units. Statistically significant differences in survival and/or growth between

each sample were documented. The SEH report concluded that toxic effects appeared to correlate well to the magnitude of toxic units. SEH concluded that results from both the bulk sediment dilution tests and the sediment elutriate dilution tests supported the exposure concentration/effects characterization.

SEH also reported that comparison of phototoxic PAH concentrations at the Site to reference levels in the literature indicated the potential for phototoxic effects at the Site. Phototoxicity studies using UV light were performed in 1998 and 2001 in conjunction with standard toxicity test organisms exposed to bulk sediment or sediment elutriate samples collected from the Site. While there was no documentation of how well the UV regime during the bioassay compared to what ecological receptors would be exposed to at the Site. SEH concluded that under the conditions in which the bioassay was conducted there was evidence of enhanced phototoxicity effects for benthic organisms, zooplankton, and fish larvae.

Risk Characterization

The conclusions of the BERA and the data generated within the RI investigation support a conclusion that ecological risk exists. The lines of evidence used to support this conclusion include: 1) PAH concentrations in sediments exceeding several sediment effects benchmarks; 2) evidence from field studies that benthic community impairment may exist in the contaminated areas; 3) results of standard and photo-enhanced bioassay tests that indicated acutely toxic sediments do exist within the Site, and that the likelihood of ecological effects increase with exposure to increased contaminant concentrations in sediments and surface waters over the sediments; 4) the exceedance of secondary acute and chronic water quality criteria in one surface water sample collected during heavy wave action, based on field sampling and elutriate studies; 5) sediment concentrations of PAHs similar to those at other sites where bioaccumulation and mutagenic effects have been observed in fish; and 6) evidence of low molecular weight PAHs in some fish tissues collected from the Site, which indicates active release of contaminants into Lake Superior waters.

The risk characterization also concluded that levels of PAHs in subsurface sediments are higher than in the bioactive zone and that future disturbance and exposure of the deeper contaminated sediments to the sediment-water interface and water column by either natural (e.g., storms, ice scouring) or uncontrolled anthropogenic (e.g., boat prop wash, shoreline maintenance) forces could potentially release contaminants from subsurface sediments and transport them from the Site.

The 2001 ERA (SEH 2002) also proposed PRGs for the contaminated substrates present (wood chips and sand) that were based on the results of these lines of evidence.

Contaminants of Potential Concern

SEH (1998) screened data on contaminants found in sediment samples collected in 1996 against several sediment quality benchmarks, including those developed by the Ontario Ministry of the Environment (Persaud 1993) and Long and Morgan (1991). Concentrations of most PAHs, as well as total PAHs, and some VOC's exceeded

screening values. Metals found in this sampling campaign did not exceed guideline values at any location (SEH 2003); cyanide exceeded a sediment quality guideline in one location.

Further sampling in 2001 detected phenolic compounds in a few samples although these were not specifically screened against sediment quality benchmarks.

SEH (2003) reported additional screening was conducted for contaminants associated with surface sediments collected during 2003. In addition to exceeding sediment quality benchmarks for PAHs and some VOCs (primarily benzene, toluene, ethylbenzene, and xylenes [BTEX]), it was concluded that copper, lead, mercury, zinc and cyanide also exceeded some sediment quality benchmarks. SEH (2003) concluded that COPCs for the RI studies should include VOCs, SVOCs and copper, lead, mercury, zinc, and cyanide.

No screening of contaminants in other media was conducted in these previous risk assessments.

As part of the BERA, all media were re-screened to select COPCs.

7.7.3 Summary of Studies Conducted for the Remedial Investigation

As part of the RI, a number of investigations were conducted and the results were used, along with historical information, to support the BERA. All of the historical and current data were used as discussed below to screen for COPCs. Investigations conducted during the RI included:

1) Surface soil samples collected in the vicinity of Kreher Park;
2) Sediment samples collected as part of the supplemental sediment sampling and sediment quality triad investigations;
3) Sediment toxicity testing;
4) Benthic macroinvertebrate community studies;
5) Collection of fish tissue;
6) Surface water collection; and
7) Characterization of wetlands and terrestrial habitats.

The details of these investigations are in the reports appended to the BERA or in other reports submitted separately to EPA.

Screening of Contaminants of Potential Concern

As the first task in the Baseline Problem Formulation, data for all media, including all historical data, were screened to select COPCs. Screening was conducted using the following benchmarks using the maximum concentration measured:

- **Sediment:** Contaminants in sediment were screened using Wisconsin's sediment quality guidelines (WDNR 2003). If benchmarks for Site contaminants were not

available from WDNR the following were used, in order of precedence: EPA Region V Ecological Screening Levels (ESLs) (EPA 2003a); TLM=Target Lipid Model (DiToro and McGrath 2000); T50 =Logistic model point estimate of T50 concentrations (concentration at which 50% of samples are predicted to be toxic) (Field et al. 2002); NOAA Screening Quick Reference Table (SQuiRT- http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html); and other available sources.

- **Surface Water:** Region V ESLs (EPA 2003a) were used as the primary source of screening criteria. If ESLs were not available, then the following criteria were used, in order of precedence: ORNL Tier II values; EPA Region IV Water Quality Standards and structure-activity relationships using chronic values for fish (ECOSAR).
- **Soil:** EPA Ecological Soil Screening Levels (ECO-SSLs) (USEPA 2003b; 2005a) were the primary screening criteria for evaluating soils. If ECO-SSLs were not available, then the following criteria were used, in order of precedence: Region V ESLs (EPA 2003a); and other available sources.

Because EPA advises that some chemicals that also function as nutrients (e.g., calcium, magnesium, sodium and potassium) typically pose no ecological risk when present at relatively low concentrations that allow them to function in this manner, these chemicals were not screened.

If any PAH exceeded its individual screening criterion, PAHs as a group were retained as COPCs because the mode of action is similar for all PAHs and their toxicity is additive.

The chemicals that were retained for further analysis in the BERA are included in Appendix H-2, which provides a list of the COPCs by medium.

Exposure Assessment

As part of the *Problem Formulation*, an overall risk management goal was developed as the basis for evaluating risk at the Site:

> *Maintenance (or provision) of soil, sediment and water quality as well as food source, and habitat conditions capable of supporting a "functioning ecosystem" for the aquatic and terrestrial plant and animal populations (including individuals of protected species) inhabiting or utilizing the Ashland/NSP Lakefront Superfund Site area.*

Exposure assessment endpoints were developed based upon this risk management goal.

A conceptual site model (CSM) was developed that describes the following:

- The source of contamination;
- Release and transport mechanisms;
- Contact point and exposure media;
- Routes of entry; and

- Key receptors.

The potential exposure pathways are illustrated in the CSM, which is depicted in Figures 3-1 and 3-2 in Appendix J. Assessment endpoints, risk questions and measurement endpoints were selected as the basis for the BERA. These are summarized in Table ES-2 in Appendix K.

Based upon these risk questions and endpoints a number of Receptors of Concern (ROCs) were selected, as shown in the table below.

Receptors of Concern

ROC Category	ROC	Habitat
Aquatic Habitat		
Benthic macroinvertebrate community	Generic	Littoral portions of Chequamegon Bay
Fish Community	Generic	Littoral portions of Chequamegon Bay
Omnivorous birds	Black Duck	Littoral portions of Chequamegon Bay
Insectivorous birds	Tree swallow	Upland and riparian
Piscivorous birds	Double-crested cormorant Osprey (State endangered)	Littoral portions of Chequamegon Bay
Insectivorous mammals	Big brown bat	Upland and riparian
Piscivorous mammals	Mink	Upland and riparian
Terrestrial Habitat		
Omnivorous birds	Red-winged blackbird	Upland and riparian
Omnivorous mammals	White-footed mouse	Upland and riparian

Ecological Effects Analysis

The effects analysis consisted of an evaluation of available toxicity or other effects information that could be used to relate the exposure estimates to a level of adverse effects. Stressor-response (i.e., effects) data that were used to evaluate ecological risks in this BERA were of three types: (1) literature-derived toxicity data, (2) site-specific ambient media toxicity tests (e.g. sediment toxicity tests), and (3) site-specific biological community surveys.

The focus of the majority of the effort for the BERA was on aquatic portions of the Site. For the evaluation of Site sediment, all three lines of evidence were integrated into a Sediment Quality Triad approach (Triad) (Long and Chapman 1985; Chapman et al. 1987). The Triad evaluates sediment quality by integrating spatially and temporally matched sediment chemistry, biological, and toxicological information. Benthic invertebrate community analysis and sediment toxicity testing provided site-specific information regarding potential ecological effects of exposure of ecological receptors to COPCs in the Site sediment. These additional lines of evidence supplement traditional

bulk sediment chemistry data to provide a more relevant, site-specific assessment of risks.

The evaluation of bulk sediment chemistry data involved comparison of Site sediment chemistry data to effects levels published by WDNR (2003), derived from relevant studies reported in published literature, or from studies performed for this BERA. Site-specific sediment toxicity tests were conducted with aquatic receptors that are representative surrogates for those living on the Site and the results of this testing provided information on potential toxic effects that were observed in Site-relevant organisms exposed to Site sediment. Site-specific surveys of the benthic macroinvertebrate community also were conducted for the Site. In addition to these three lines of evidence that focus primarily on the benthic environment at the Site, surface water quality data and fish tissue data were collected from Site waters.

For upland portions of the Site, only two lines of evidence were used in the BERA. One was the comparison of bulk soil chemistry to soil quality benchmarks used as generic criteria, e.g., the soil ECO-SSLs (EPA 2005a), or derived from relevant studies reported in published literature. The second was the comparison of doses accumulated through the food chain that terrestrial and aquatic prey-dependent wildlife (i.e., birds and mammals) may feed upon. These doses were compared to toxicity reference values (TRVs) derived from the primary scientific literature.

The result of the ecological effects analysis was a range of TRVs that were compared with the dose estimates (birds and mammals) or toxicological benchmarks that were compared with estimated EPCs (benthic invertebrates and fish) to estimate potential risks in the risk characterization.

Ecological Exposure Analysis

In the exposure analysis, the relationship between receptors at the Site and potential stressors (chemical, biological, or physical entities that may result in adverse effects to one or more receptors or groups of receptors) were evaluated. Exposure point concentrations used to estimate exposure were calculated as the mean and 95% upper confidence limit of the mean concentration (UCL_{95}) of the exposure medium. EPCs calculated for surface water, sediment, soil, or tissue residues were based directly upon the levels of contaminants in these media.

Exposure estimates for birds and mammals were calculated using food chain models. Simplified food chain models were developed to calculate average daily doses (ADDs) of COCs that selected receptor groups experience through exposure to surface water, sediment, and surface soil at the Site. The ADD represents the dose of a chemical that a receptor may ingest if it foraged within designated exposure units. ADDs for wildlife receptors are calculated using (1) EPCs for prey and media developed for each, (2) COC-specific bioaccumulation factors or bioaccumulation models for dietary items, and (3) receptor-specific exposure parameters and food chain model assumptions, (e.g., diet composition, foraging area, amount of incidental soil or sediment ingested, etc.).

Ecological Risk Characterization

Risk characterization was the final phase of the BERA. In the risk characterization, the information from the effects and exposure analyses was used to determine a probability of adverse effects to ROCs and discuss the strengths, weaknesses, and assumptions in the BERA. Risk estimates (or Hazard Quotients) were developed for each assessment endpoint based upon comparison of site-specific media concentrations and/or estimated ingested contaminant dose estimates (the latter for wildlife) to effects levels (generic criteria, benchmarks and TRVs) for the various ROCs. Finally risk was characterized for each assessment endpoint by integrating the risk estimate with the results of other lines of evidence, if available. A detailed summary of the risk characterization is in Section 6 of the BERA which is part of the AR.

7.8 Ecological Risk Assessment Conclusions

The results of the risk characterization indicated that there are unacceptable risks to the benthic macroinvertebrate community from exposure to contaminated sediment at the Site. Two lines of evidence, bulk sediment chemistry and sediment toxicity testing, indicate an unacceptable risk to the benthic community. Effects observed from field surveys of the existing benthic community indicated effects that were less dramatic than those demonstrated in the laboratory toxicity studies, but interpretation of the field survey data is made very difficult by a high degree of variability and lack of comparability between reference and site stations.

However, the fact that hydrocarbons are sporadically released from the Site sediment during some high energy meteorological events or when disturbed by other activities indicates the potential for impact to the benthic community that may not have been fully measured by the benthic community studies conducted to support the RI. Since the impact from releases was not fully measured during the RI and there is no evidence that shows impairment of populations and communities of these receptors inhabiting the waters of Chequamegon Bay, the full impact from these releases remains a source of uncertainty. However, the presence of this continuing source of site-related contaminants in sediments presents an unacceptable risk that could impair the healthy functioning of the aquatic community in the Chequamegon Bay area of the Site.

In addition, if normal lake front activities (i.e, wading, boating etc.) were not presently prohibited, the disturbance of sediments and contaminant release of subsurface COCs would increase. This could lead to greater impacts than were measured during these RI/FS studies.

Table 7-1 in Appendix L summarizes the results of the BERA.

The response actions selected in this ROD are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

7.9 Selection of Final COCs

Based on the results of the HHRA and the BERA, final COCs were determined for the Site. The list of final COCs determined by the HHRA and BERA are listed in the table below.

List of Final COCs Identified by the HHRA and BERA

Surface Water	Groundwater	Sediment	Soil	Fish	Indoor Air
Benzo(a)anthracene	1-Methylnaphthalene	Antimony	1-Methylnaphthalene	1-Methylnaphthalene	1,2,4-Trimethylbenzene
Benzo(a)pyrene	2-Methylnaphthalene	Iron	2-Methylnaphthalene	Benzo(a)anthracene	1,4-Dichlorobenzene
Benzo(b)fluoranthene	Acenaphthene	Manganese	Acenaphthene	Benzo(a)pyrene	Benzene
Benzo(k)fluoranthene	Benzo(a)anthracene	Vanadium	Benzo(a)anthracene	Benzo(e)pyrene	Carbon tetrachloride
Chrysene	Benzo(a)pyrene	1-Methylnaphthalene	Benzo(a)pyrene	Benzo(b)fluoranthene	Trichloroethylene
Dibenzo(a,h)anthracene	Benzo(b)fluoranthene	2-Methylnaphthalene	Benzo(b)fluoranthene	Dibenzo(a,h)anthracene	
Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	Benzo(a)anthracene	Benzo(k)fluoranthene	Dibenzofuran	
	Chrysene	Benzo(a)pyrene	Chrysene		
	Dibenzo(a,h)anthracene	Benzo(b)fluoranthene	Dibenzo(a,h)anthracene		
	Dibenzofuran	Benzo(k)fluoranthene	Dibenzofuran		
	Fluoranthene	Indeno(1,2,3-cd)pyrene	Fluoranthene		
	Fluorene	Naphthalene	Fluorene		
	Indeno(1,2,3-cd)pyrene	Total PAHs	Indeno(1,2,3-cd)pyrene		
	Naphthalene	Dibenzofuran	Naphthalene		
	Phenanthrene	m-Cresol	Phenanthrene		
	Pyrene	o-Cresol	Pyrene		
	1,2,4-Trichlorobenzene	p-Cresol	1,2,4-Trichlorobenzene		
	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene		
	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene		
	Benzene	Benzene	Benzene		
	Ethylbenzene	Ethylbenzene	Ethylbenzene		
	Toluene	Toluene	Toluene		
	Total Xylenes	Total Xylenes	n-Butylbenzene		
		Arsenic	sec-Butylbenzene		
		Barium	Total Xylenes		
		Cadmium	Arsenic		

Surface Water	Groundwater	Sediment	Soil	Fish	Indoor Air
		Copper	Lead		
		Lead	Thallium		
		Mercury	Total PAHs		
		Nickel	Antimony		
		Selenium	Barium		
		Silver	Cadmium		
		Thallium	Chromium		
		Zinc	Copper		
		Cyanide	Manganese		
			Mercury		
			Selenium		
			Silver		
			Zinc		
			Cyanide		

8.0 Remedial Action Objectives

Remedial Action Objectives (RAOs) are remedial goals for protecting human health and the environment. These objectives are used in the development of specific remedial alternatives (i.e., alternatives are developed in consideration of site objectives), and later as a criterion in the evaluation of the various remedial alternatives (i.e., evaluation of the extent to which each alternative would achieve the RAOs). The specific RAOs developed for the Ashland/NSP Lakefront Site are:

RAOs for Soil

- Protect human health by reducing or eliminating exposure (ingestion/direct contact/inhalation) to soil having COCs representing an excess cancer risk greater than 10^{-6} as a point of departure (with cumulative excess cancer risks not exceeding 10^{-5}) and a hazard index (HI) greater than 1 for reasonably anticipated future land use scenarios.
- Ensure future beneficial commercial/industrial use of the Site and recreational use of Kreher Park.
- Protect populations of ecological receptors or individuals of protected species by eliminating exposure (direct contact with or incidental ingestion of soils or prey) to soil with levels of COCs that would pose an unacceptable risk.
- Conduct NAPL removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land, sediments or water (groundwater and surface water).

- Protect the environment by minimizing/eliminating the migration of contaminants in the soil to groundwater, sediments or to surrounding surface water bodies.

RAOs for Groundwater

- Protect human health by eliminating exposure (direct contact, ingestion, inhalation) to groundwater with COCs in excess of regulatory or risk-based standards.
- Restore groundwater to its beneficial use by reducing contaminant levels in groundwater to meet maximum contaminant levels (MCLs) and State of Wisconsin Drinking Water Standards.
- Protect the environment by controlling the off-site migration of contaminants in groundwater to surrounding surface water bodies which would result in exceedance of applicable or relevant and appropriate requirements (ARARs) for COCs in surrounding surface waters.
- Conduct NAPL removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land, sediments or water.
- Protect the environment by minimizing/eliminating the migration of contaminants in the groundwater to soil, sediments or to surrounding surface water bodies.

No COPCs were initially identified in the HHRA for groundwater because groundwater is not used as a potable water supply. However, currently there is no restriction on groundwater use in the area of known contamination. Exposure to contaminated groundwater and accompanying NAPLs can potentially occur via the following exposure scenarios:

- Construction worker exposure to shallow groundwater infiltrating trenches at Kreher Park; and
- Trespasser exposure to groundwater infiltrating the lower level of the former WWTP.

NAPL encountered in the Kreher Park fill, ravine fill, NSPW property and Copper Falls aquifer are a source for the dissolved phase plumes identified in groundwater in each unit at the Site. RAOs for NAPL within these units are based on Chapter NR 708.13, Wisconsin Administrative Code (WAC), which states the following:

Responsible parties shall conduct free product removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, lands or waters of the state. When required, free product removal shall be conducted, to the maximum extent practicable, in compliance with all of the following requirements:

1) *Free product removal shall be conducted in a manner that minimizes the spread of contamination into previously uncontaminated zones using recovery and disposal techniques appropriate to the hydrologic conditions at the site or facility, and properly reuses or treats discharges of recovery*

byproducts in compliance with applicable state and federal laws.

2) *Free product removal systems shall be designed to abate free product migration.*
3) *Any flammable products shall be handled in a safe and competent manner to prevent fires or explosions.*

RAOs for Sediment

In general, the RAO is to reduce or remove contaminated sediments at the Site in order to prevent human ingestion or direct contact with sediments having COCs which pose an unacceptable risk to human health. Similarly, for ecological receptors, the general goal is to prevent direct contact with or ingestion of contaminated sediments at levels of COCs that would pose an unacceptable risk to populations of ecological receptors or individuals of protected species.

Remedial action objectives for sediment include:

- Protect human health by eliminating exposure (direct contact, ingestion, inhalation, fish ingestion) to sediment with COCs in excess of regulatory or risk-based standards;
- Conduct NAPL (source) removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land or water; and
- Protect populations of ecological receptors or individuals of protected species by eliminating exposure (direct contact with sediment or ingestion of sediment or prey) to sediment with COCs that would pose an unacceptable risk.

With the exception of iron, the cumulative risks estimated for the human health recreational receptor exposures to sediments were below EPA's target risk levels, but the cancer risk is greater than the WDNR target of $1x10^{-5}$.

For ecological receptors, EPA established a PRG of 2295 µg tPAH/g OC, which is equivalent to 9.5 ppm tPAH dwt at 0.415% OC. This value was based on a best professional evaluation of sediment chemistry, bioassay, and benthic community study data collected at the Site. In addition, when it developed the sediment PRG, EPA stated that, "This PRG does not include the added effects of UV and is based on a water depth of 6 feet or more. If the final depth of sediments will be less than 6 feet, the PRG for any active remedial intervention will be adjusted downward as based upon UV extinction coefficients measured in Site waters." More detailed information about the derivation of the sediment cleanup goal(s) can be found in Appendix M-1.

Based on the results of the Site-specific HHRA, PRGs were also derived for soil and surface water for exposure scenarios that exceeded a cumulative cancer risk of 10^{-5} or a cumulative noncancer risk of a hazard index (HI) of 1. PRGs were also developed for groundwater. The PRG tables for soil, surface water and groundwater are summarized in Appendix M-2.

Thus, the focus of the RAOs is to minimize exposure to site soils, sediments and groundwater potentially posing a risk to human health and the environment.

Potential ARARs and other to-be-considered material (TBCs) that were developed during the FS for various soil, groundwater and sediment alternatives are summarized in Appendix C.

9.0 Description of Alternatives

Following development of the RAOs, a screening and evaluation of potential remedial alternatives was conducted as part of the FS in accordance with CERCLA and the NCP and is included in the FS Report.

The technologies were assembled into remedial alternatives that meet RAOs and satisfy ARARs. The specific details of the remedial components discussed for each alternative are intended to serve as representative examples. As mentioned in Part I of this ROD, the Site was divided into four areas of concern as described in the RI report:

1. Upper Bluff/Filled Ravine
2. Copper Falls Aquifer
3. Kreher Park
4. Bay Sediments

First, a number of potential remedial alternatives were developed as part of the FS to address soil, groundwater and sediment at the Site considering available and applicable remedial technologies. The alternatives were developed in consultation with WDNR. As described in more detail below, appropriate alternatives were then considered for each area of the Site depending on the affected media in those areas.

The Upper Bluff/Filled Ravine and Kreher Park include remedial alternatives for both soil and groundwater. Remedial alternatives for the Copper Falls aquifer are limited to groundwater, and remedial alternatives for the bay are limited to sediments. Appendix N-1 lists all the potential remedial alternatives that were considered in the FS for each area of concern based on the affected media in each area. A detailed description of each potential remedial alternative for each affected media is provided in Appendix N-2. Six major remedial alternatives were developed for soil (S-1 though S-6), with three of them (S-3, S-4 and S-5) having "A" and "B" variations. Nine major remedial alternatives were developed for groundwater (GW-1 through GW-9), with two of them (GW-2 and GW-9) having "A" and "B" variations. Six major remedial alternatives were developed for sediment (SED-1 through SED-6), with four of them (SED-3, SED-4, SED-5 and SED-6) having either "A" and "B" or "A", "B", "C" and "D" variations.

To organize all of these remedial alternatives for soil, groundwater and sediment into workable combinations that would address the entire Site, the FS formed ten integrated cleanup "scenarios." The cleanup alternatives were evaluated in the FS in the detailed analysis of alternatives using the nine evaluation criteria described in the NCP at 40 CFR Part 300.430(e)(9)(iii).

9.1 Description of Remedy Components

Each of the ten integrated cleanup scenarios is briefly described below. Appendix N-3 contains a table of the ten integrated remedial scenarios from the FS that shows which media-specific alternatives were considered for each scenario to address the four areas of concern at the Site (Bay, Kreher Park, Upper Bluff/Filled Ravine, and Copper Falls Aquifer). More detailed information about each of the integrated remedial alternatives, including cost estimates for each alternative, can be found in Section 9.2 of the FS report, which is included in the Administrative Record for the Site.

Scenario 1 – No Action

As previously discussed, the NCP at 40 CFR §300.430(e)(6) provides that the no action alternative should be considered at every site. Implementation of no further action consists of leaving contaminated soil, groundwater and sediment in place; no engineering, maintenance, or monitoring would be required. This combined no action remedial scenario is included here only as a baseline to which other remedial scenarios can be compared. In addition, this alternative contains no restrictions on future use of the Site.

Scenario 2

- **Sediments:** Alternative SED-3 – Mechanically dredge top four feet of sediments and install subaqueous cap. After dredging is completed, place six inches of clean sediment on dredged areas. Transport contaminated sediment off site for landfill disposal. Dispose of or burn wood debris separately, and discharge treated wastewater from sediment de-watering to lake.
- **Kreher Park:** Alternative S-2 - Containment using surface barriers to prevent infiltration and direct contact with subsurface contamination. Surface barriers at former coal tar dump and seep area, at the solid waste disposal area, and the well TW-11 area.
- **Upper Bluff/Filled Ravine:** Alternative S-2 - Containment using surface barriers to prevent infiltration and direct contact with subsurface contamination. Asphalt pavement over Filled Ravine area.
- **Copper Falls Aquifer:** Alternative GW-9A - Operate existing NAPL recovery system.
- **Conduct O&M and Long-Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site with groundwater. Check monitoring wells for presence of NAPL. Collect sediment and surface water samples to ensure contaminants are not migrating through subaqueous cap. Complete annual inspections to ensure integrity of surface barriers and subaqueous cap and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional Controls:** Implement land use controls as part of a remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface and for the subaqueous cap.

Scenario 3

- **Sediments:** Alternative SED-4 - Remove wood debris from sediments and mechanically dredge impacted sediments. After dredging is completed, place six inches of clean sediment on dredged areas. Precautions will be taken to ensure that the

contaminated sediments do not impact the underlying soil in the sediment staging area. De-water, stabilize and thermally treat sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport decontaminated sediment off site for landfill disposal or beneficial re-use. Dispose or burn wood debris separately.

- **Kreher Park**: Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), and enhanced groundwater extraction (Alternative GW-9B). Shallow groundwater extracted from within the contained area would be treated on-site prior to discharge to the lake.
- **Upper Bluff/Filled Ravine:** Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), and groundwater extraction using the existing system (GW-9A). Site restoration would include surface barriers to restrict groundwater recharge. Shallow groundwater would be extracted from existing well EW-4 located at the mouth of the Filled Ravine to limit discharge to the contained area at Kreher Park.
- **Copper Falls Aquifer**: In-situ treatment of groundwater and NAPL via ozone sparge (Alternative GW-3) or surfactant injection and dual phase recovery (GW-4), with continued operation of existing groundwater extraction system (GW-9A), or in-situ chemical oxidation (GW-6), electrical resistance heating (ERH)(GW-7), steam injection (GW-8), or enhanced groundwater extraction (GW-9B).
- **Conduct O&M and Long-Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site with groundwater. Check monitoring wells for presence of NAPL. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional Controls:** Implement land use controls where contaminants remain in subsurface following remedial response at Upper Bluff and Kreher Park and for shallow groundwater and Copper Falls aquifer.

Scenario 4

- **Sediments**: Alternative SED-4 - Remove wood debris from sediments and mechanically or hydraulically dredge impacted sediments. After dredging is completed, place six inches of clean fill on dredged areas for stabilization. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area. Dewater and stabilize sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport stabilized sediments off site to NR 500 licensed landfill or thermal treatment. Dispose of or burn wood debris separately.
- **Kreher Park:** –Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), and engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A) or a permeable reactive barrier (PRB) wall (Alternative GW-5). Alternative GW-2A includes partial caps at Kreher Park to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or would be treated as it passes through the PRB wall.

- **Upper Bluff/Filled Ravine:** Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), and engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A) or a PRB wall (Alternative GW-5) at Kreher Park. Shallow groundwater would discharge to Kreher Park for groundwater extraction or treatment via the PRB wall.
- **Copper Falls Aquifer:** In-situ treatment via ozone sparge (Alternatives GW-3), or surfactant injection and dual phase recovery (GW-4), and continued operation of the existing groundwater extraction system (GW-9A), or in-situ chemical oxidation (GW-6), in-situ thermal treatment via ERH (GW-7) or steam injection (GW-8), or enhanced groundwater extraction (GW-9B).
- **Conduct O&M and Long Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Check monitoring wells for presence of NAPL. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface and for shallow groundwater in contained areas.

Scenario 5

- **Sediments:** Alternative SED-2 - Construct NR 504. WAC conforming confined disposal facility (CDF) over approximately seven acres of lake bed and all of Kreher Park. Dredge remaining impacted sediments and dispose in CDF. After dredging is completed, place six inches of clean fill on dredged areas outside of CDF. Dewater sediment, treat wastewater and discharge to lake. Dispose of or burn wood debris separately. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area.
- **Kreher Park:** Alternative GW-2B – Engineered surface and vertical barriers would be used in conjunction with the on-site CDF. Implement hydraulic control around periphery of CDF, which will include groundwater extraction from the contained area for on-site treatment prior to discharge to the lake.
- **Upper Bluff/Filled Ravine:** Alternative S-4 - Conduct limited (Alternative S-4A) or unlimited excavation (Alternative S-4B) of contaminated soil in saturated and unsaturated zone at Upper Bluff, dispose of these soils in CDF. Continued groundwater extraction from EW-4 located at the mouth of the Filled Ravine (GW-9A).
- **Copper Falls Aquifer:** In-situ treatment via ozone sparge (Alternatives GW-3), or surfactant injection and dual phase recovery (GW-4), and continued operation of the existing groundwater extraction system (GW-9A), or in-situ chemical oxidation (GW-6), in-situ thermal treatment via ERH (GW-7) or steam injection (GW-8), or enhanced groundwater extraction (GW-9B).
- **Conduct O&M and Long Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site with groundwater. Check monitoring wells for presence of NAPL. Collect sediment and surface water samples to ensure contaminants

are not migrating through CDF. Complete annual inspections to ensure integrity of surface barriers and CDF and repair damage as needed. Conduct MNR monitoring of sediments.

- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface.

Scenario 6

- **Sediments:** Alternative SED-5 - Construct offshore sheetpile or rock breakwater enclosure and dewater impacted areas; remove wood debris and excavate impacted sediments; dewater and stabilize sediments at Kreher Park area and treat wastewater and discharge to lake. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area. Transport stabilized sediments to NR 500 licensed landfill. Dispose or burn wood debris separately.
- **Kreher Park:** Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), and engineered surface and vertical barriers with hydraulic control (Alternative GW-2A or 2B) or a PRB wall (Alternative GW-5). Alternative GW-2A includes partial caps at Kreher Park, and Alternative GW-2B includes capping the entire park. Shallow groundwater extracted for hydraulic control for Alternatives GW-2A and 2B would be treated onsite and discharged to the lake, or for Alternative GW-5 it would be treated as it passes through the PRB wall.
- **Upper Bluff/Filled Ravine:** –Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or soil washing (S-6), and groundwater remediation via engineered surface and vertical barriers with hydraulic control (Alternative GW-2A) or a PRB wall (Alternative GW-5) at Kreher Park. Shallow groundwater would discharge to Kreher Park for groundwater extraction or pass through the PRB wall at Kreher Park.
- **Copper Falls Aquifer:** In-situ treatment via ozone sparge (Alternative GW-3), or surfactant injection and dual phase recovery (GW-4), and continued operation of the existing groundwater extraction system (G-9A), or in-situ chemical oxidation (GW-6), in-situ thermal treatment via ERH (GW-7) or steam injection (GW-8).
- **Conduct O&M and Long Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site with groundwater. Check monitoring wells for NAPL. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface.

Scenario 7

- **Sediments:** Alternative SED-5 - Construct offshore sheetpile or rock breakwater enclosure and dewater impacted areas; remove debris and excavate impacted sediments; dewater and stabilize sediments at Kreher Park area and treat wastewater and discharge to lake. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area. Transport stabilized sediments to NR 500 licensed landfill. Dispose or burn wood debris separately.

- **Kreher Park:** Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), or in-situ treatment of source area via chemical oxidation (GW-6), ERH (GW-7), or steam injection (GW-8), and groundwater remediation via ozone sparge (GW-3), or enhanced groundwater extraction (GW-9B).
- **Upper Bluff/Filled Ravine:** Limited soil/source removal and off-site disposal (Alternative S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), or in-situ treatment of source area via chemical oxidation (GW-6), ERH (GW-7), or steam injection (GW-8), and groundwater remediation via ozone sparge (GW-3), or continued groundwater extraction from EW-4 located at the mouth of the Filled Ravine (GW-9A).
- **Copper Falls Aquifer:** Alternative GW-9B - Enhanced groundwater extraction, to remove NAPL and contaminated groundwater, which would include additional extraction wells and an upgraded on-site treatment system.
- **Conduct O&M and Long Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site with groundwater. Check monitoring wells for NAPL. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface.

Scenario 8

- **Sediments:** Alternative SED-4 - Prior to dredging, construct a breakwater at the northern boundary of the contaminated sediment area. It is assumed this breakwater will be later utilized by the City in the expansion of the marina as proposed in the City's Lakefront Development Plan. Remove wood debris and dredge contaminated sediments. After dredging is completed, place six inches of clean fill on dredged areas for stabilization. Dewater and stabilize sediments at Kreher Park area and treat wastewater and discharge to lake. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area. Transport stabilized sediments to NR 500 licensed landfill. Dispose or burn wood debris separately.
- **Kreher Park:** Limited soil/source removal and off-site disposal (Alternatives S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), or in-situ treatment of source area via chemical oxidation (GW-6), ERH (GW-7), or steam injection (GW-8), and groundwater remediation via engineered surface and vertical barriers with hydraulic control (Alternative GW-2B) or a PRB wall (Alternative GW-5). Alternative GW-2B includes capping the entire park. Shallow groundwater extracted for hydraulic control for Alternatives GW-2B would be treated onsite and discharged to the lake, or for Alternative GW-5 it would be treated as it passes through the PRB wall.
- **Upper Bluff/Filled Ravine:** Limited soil/source removal and off-site disposal (Alternatives S-3A), or beneficial reuse as backfill following ex-situ thermal treatment (S-5A), offsite incineration (S-5B), or ex-situ soil washing (S-6), or in-situ treatment of source area via chemical oxidation (GW-6), ERH (GW-7), or steam injection (GW-8), and groundwater remediation via engineered surface and vertical barriers with hydraulic

control (Alternative GW-2A) or a PRB wall (Alternative GW-5) at Kreher Park.

- **Copper Falls Aquifer:** In-situ treatment via ozone sparge (Alternatives GW-3), or surfactant injection and dual phase recovery (GW-4), and continued operation of the existing groundwater extraction system (GW-9A), or in-situ chemical oxidation (GW-6), in-situ thermal treatment via ERH (GW-7), steam injection (GW-8), or enhanced groundwater extraction (GW-9B).
- **Conduct O&M and Long Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site with groundwater. Check monitoring wells for NAPL. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface.

Scenario 9

- **Sediments:** Alternative SED-5 - Construct offshore sheetpile or rock breakwater enclosure and dewater impacted areas; remove debris and excavate impacted sediments: dewater and stabilize sediments at Kreher Park area and treat wastewater and discharge to lake. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area. Transport stabilized sediments to NR 500 licensed landfill. Dispose or burn wood debris separately.
- **Kreher Park:** Alternative S-3B - Remove all fill material including wood waste and underlying impacted media at Kreher Park. Treat/stabilize soil and transport decontaminated soils off site for disposal. Dispose the wood waste at an offsite facility.
- **Upper Bluff/Filled Ravine:** Alternative S-3B - Removal entire fill and impacted soil including gas holders from the ravine and Upper Bluff, dispose of these soils to NR500 landfill.
- **Copper Falls Aquifer:** Alternative GW-9B - Enhanced groundwater extraction and treatment of NAPL and groundwater from Copper Falls Aquifer; discharge treated groundwater to sanitary sewer (alternative may also include in-situ treatment of NAPL prior to extraction).
- **Conduct O&M and Long Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off-site with groundwater. Check monitoring wells for NAPL. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface. Conduct MNR monitoring of sediments.

Scenario 10

- **Sediments:** Alternative SED-6 – Using excavation equipment, remove in the dry all near shore sediment and wood debris. In addition, remove wood debris from offshore sediments and mechanically or hydraulically dredge remaining offshore sediments. After dredging/excavation is completed, place six inches of clean fill on dredged areas for lakebed stabilization. Dewater and stabilize sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport stabilized sediments off site to NR 500 licensed landfill or thermal treatment. Dispose of or burn wood debris

separately.

- **Kreher Park:** Limited soil/source removal with ex-situ thermal treatment (Alternative S-5A) and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps at Kreher Park to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. In-situ chemical oxidation (GW-6) can be used to possibly enhance groundwater treatment.
- **Upper Bluff/Filled Ravine:** Limited soil removal with ex-situ thermal treatment (Alternative S-5A) and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Copper Falls Aquifer:** Enhance existing groundwater extraction system (GW-9B). In-situ chemical oxidation (GW-6) or in-situ treatment via ozone sparge (GW-3) can be used to possibly enhance groundwater treatment.
- **Conduct O&M and Long-Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface and for shallow groundwater in contained areas.

9.2 Common Elements and Distinguishing Features of Each Alternative

A common element of most of the cleanup scenarios is institutional controls to limit the future use of portions of the Site to prevent contact with contamination that remains at the Site or to ensure that the contaminated water is not used for drinking water purposes after construction of the remedy until groundwater cleanup goals are attained. In addition, most alternatives include long-term monitoring and maintenance of the surface barriers and caps to make sure remaining buried pollution is not moving off-site. None of the cleanup alternatives EPA considered rely exclusively on institutional controls to achieve protectiveness. Monitoring and institutional controls to ensure the effectiveness of the cleanup are elements of all the cleanup alternatives except the "no action" alternative.

Another common element of most of the cleanup scenarios is containment, removal and in-situ treatment of contaminated soil, sediments and groundwater. This will result in the generation of solid waste (soil and sediment) and wastewater (from sediment de-watering, excavation de-watering, and long-term groundwater extraction). The solid waste will have to be treated or disposed off-site, and the wastewater will have to be treated before being discharged under most of the cleanup scenarios. Each of the remedies will include a vertical barrier (e.g., sheet pile) at

Kreher Park. This barrier will help prevent further migration of source materials to the sediments and surface water of Chequamegon Bay and Lake Superior. In addition, most of the sediment remedies will require six inches of cover for lakebed stabilization.

The estimated time for completion of remedial actions for Scenarios 2 through 10 will be 3 to 4 years, although groundwater treatment will be an ongoing activity for a longer period of time. The estimated total cost for Scenario 1 is $0. The estimated total costs for Scenarios 2 through 10 range from $40 million up to $123 million.

10.0 Summary of Comparative Analysis of Alternatives

This section explains EPA's rationale for selecting the preferred alternative. To support the selection of a remedial action EPA must document in a record of decision all facts, analyses of facts, and site-specific policy determinations considered in selecting the remedy, including an explanation of how the nine evaluation criteria were used to select the remedy. (40 CFR 300.430(f)(5)(i)) EPA must consider nine criteria when evaluating remedial alternatives to ensure that important considerations are factored into remedy selection decisions. (40 CFR 300.430(f)(5)(i)) These criteria, described in detail in the NCP at 40 CFR 300.430(e)(9)(iii), are derived from the statutory requirements of Section 121 of CERCLA, 42 USC § 9621, the NCP, as well as other technical and policy considerations that have proven to be important when selecting remedial alternatives. When selecting a remedy for a site, EPA conducts a detailed analysis of the remedial alternatives consisting of an assessment of the individual alternatives against each of the nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria. This section summarizes the comparative analysis of alternatives presented in the detailed analysis section of the RI/FS Report.

The nine evaluation criteria are described in more detail below.

Threshold Criteria

Threshold criteria are standards that all alternatives must meet in order to be eligible for selection as a remedy for the Site. (NCP §300.430(f)(1)(i)(A)) There is little flexibility in meeting the threshold criteria. If ARARs cannot be met, a waiver may be obtained where one or more site exceptions occur as defined in the NCP.

Overall Protection of Human Health and the Environment. Protectiveness is the main requirement that remedial actions must meet under CERCLA. It is an assessment of whether each alternative achieves and maintains adequate protection of human health and the environment. A remedy is protective if it eliminates, reduces, or controls all current and potential risks posed by the site through each exposure pathway. Treatment, engineering controls, and/or institutional controls can be implemented to control exposure and thereby ensure reliable protection of human health and the environment over time. In addition, implementation of a remedy cannot result in unacceptable short-term risks or cross-media impacts on human health and the environment.

Compliance with ARARs. Section 121(d) of CERCLA and the NCP at 40 CFR 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites must attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations (referred to as "ARARs") identified at the time of ROD signature unless such ARARs are waived under CERCLA section 121(d)(4) and the NCP at 40 CFR 300.430(f)(1)(ii)(C). Compliance with ARARs is a statutory requirement of remedy selection. This criterion is used to determine whether the selected alternative would meet the ARARs identified in Appendix C to this ROD. A discussion of the compliance of each alternative with chemical-, location-, and action-specific ARARs is included.

Primary Balancing Criteria

Five balancing criteria are used to compare alternatives. (40 CFR 300.430(f)(1)(i)(B)) These represent the standards upon which the detailed evaluation and comparative analysis of alternatives are based. A high rating for one criterion may compensate for a low rating on another of the balancing criteria

Long-Term Effectiveness and Permanence. Long-term effectiveness and permanence reflects CERCLA's emphasis on implementing remedies that will protect human health and the environment in the long term. Under this criterion, results of a remedial alternative are evaluated in terms of the risk remaining at the Site after the remedial action is complete. The primary focus of the evaluation is the extent and effectiveness of the actions or controls that may be required to manage the risk posed by treatment residuals or untreated wastes.

Factors to be considered and addressed are magnitude of residual risk, adequacy of controls, and reliability of controls. Magnitude of residual risk is the assessment of the risk remaining from untreated waste or treatment residuals after remediation. Adequacy and reliability of controls is the evaluation of the controls that can be used to manage treatment residuals or untreated wastes that remain onsite.

Reduction of Toxicity, Mobility, or Volume through Treatment. This criterion addresses the statutory preference for remedies that employ treatment to significantly reduce the toxicity, mobility, or volume of the hazardous substances. That preference is satisfied when treatment is used to reduce the principal threats at a site by destroying toxic chemicals or reducing the total mass or total volume of affected media. This criterion is specific to evaluating only how the treatment reduces toxicity, mobility, and volume. Specifically, the analysis will examine the magnitude, significance and irreversibility of reductions.

Short-Term Effectiveness. This criterion examines the short-term impacts associated with implementing the alternative. Implementation may affect workers, the neighboring community, or the surrounding environment. Short-term effectiveness also includes potential threats to human health and environment associated with excavation, treatment and transportation of hazardous substances;

potential cross-media impacts of the remedy; and the time required to achieve protection of human health and the environment.

Implementability. Implementability considerations include technical and administrative feasibility of the alternatives, as well as the availability of goods and services (including treatment, storage or disposal capacity) associated with the alternative. Implementability considerations often affect the timing of remedial actions (for example, limitations on the season in which the remedy can be implemented, the number and complexity of material handling steps, and the need to secure technical services). Onsite activities must comply with the substantive parts of applicable permitting regulations.

Cost. The detailed cost analysis of alternatives includes capital costs (both direct and indirect) and annual operation and maintenance costs incurred over a period of 50 years in accordance with EPA guidance *Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. The focus during the detailed analysis is on the net present value of these costs.

The cost estimates are prepared to have accuracy in the range of –30 to +50 percent. The exact accuracy of each cost estimate depends upon the assumptions made and the availability of costing information. Net present value will be calculated assuming the current discount rate established by the Office of Management and Budget.

Modifying Criteria

Modifying criteria are evaluated by addressing comments received after the state and the public have reviewed and commented on the Proposed Plan. (40 CFR 300.430(f)(1)(i)(C))

State Acceptance. This criterion evaluates the degree to which the state supports the various remedial alternatives, primarily the selected remedy. This criterion also may evaluate any technical and administrative concerns the state has expressed.

Community Acceptance. This criterion evaluates the issues and concerns the public may have regarding the various remedial alternatives presented in the Proposed Plan.

The full text of the detailed analysis of the ten remedial alternatives against the nine evaluation criteria (including both the individual analysis and the comparative analysis) is contained in the FS Report for the Ashland/NSP Lakefront Site, which is part of the Administrative Record for the Site. Because the two Modifying Criteria could not be fully evaluated until the public comment period was over, they were not evaluated in the FS. The State's acceptance of the selected remedy is documented in the letter at Appendix B). The community's acceptance of the selected remedy is documented in the public comments received and the Responsiveness Summary at Appendix A, that contains a more detailed discussion of public comments received.

This section of the ROD presents a comparative analysis of the remedial alternatives presented for the Site. The purpose of the comparative analysis is to identify the relative advantages and/or disadvantages of each remedial action alternative.

10.1 Overall Protection of Human Health and the Environment

Soil Alternatives: ***Alternative S-1*** (no action) offers no additional protection for human health and the environment because no additional actions would be taken to address soil contamination at the Site. ***Alternative S-3B*** (unlimited removal and off-site disposal) offers the highest level of protection of human health and the environment in the long term because all fill and contaminated soil would be removed. ***Alternative S-3A*** (limited soil/source removal and off-site disposal), ***Alternative S-5A*** (limited removal and on-site thermal treatment), and ***Alternative S-5B*** (limited removal and off-site incineration) would also offer a high level of protection because these remedial responses would result in the removal of a significant mass of contaminated soil that exceeds regulatory or risk-based standards. ***Alternative S-6*** (limited removal and treatment by soil washing) would offer a moderate to high level of overall protection if this technology can be implemented to effectively reduce contaminant concentrations. ***Alternative S-2*** (containment using engineered surface barriers) would eliminate the direct contact exposure route, but would provide a low level of overall protection because soil (and groundwater) contamination would remain. ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) would provide a moderate level of protection because highly contaminated material from the Upper Bluff area and the former coal tar dump area would be consolidated into a disposal cell at Kreher Park.

Although unlimited removal for ***Alternative S-3B*** (unlimited removal and off-site disposal) would provide a high level of human health and environmental protection, limited soil/source removal for Alternatives S-3A, S-5A, S-5B, and S-6 would also provide a high level of protection because these remedial responses would result in the removal of a significant mass of contaminated soil in excess of regulatory or risk-based standards. Although Alternatives S-2 and S-4 would result in the containment of contaminated materials, which would be inaccessible to humans or biota, thereby reducing risk, the overall level of protection is lower because there is no reduction of contaminant mass.

Groundwater Alternatives: ***Alternative GW-1*** (no action) offers no additional protection for human health and the environment because no additional actions would be taken to address groundwater contamination at the Site. ***Alternatives GW-2A and GW-2B*** (containment using surface and vertical barriers) and ***Alternative GW-5*** (in-situ treatment using PRB walls) offer an overall moderate level of protection because contaminants will be left on site. Under these alternatives shallow ground water contamination would be contained and inaccessible to humans or biota, thereby reducing risk, but the alternatives offer no protection for the underlying Copper Falls aquifer. ***Alternatives GW-9A and GW-9B*** (removal using groundwater extraction wells) can be used for shallow and deep groundwater, but offer a moderate level of protection of human health and the environment in the long term because operation will require an extended period to achieve RAOs. ***Alternatives GW-4*** (surfactant injection and removal), ***GW-6*** (chemical oxidation), ***GW-7*** (ERH) ***and GW-8*** (steam injection), which all use in-situ treatment methods, offer adequate levels of protection because each alternative would result in the removal of

significant contaminant mass, NAPL in particular, from the subsurface. ***Alternative GW-3*** (ozone sparge) is not effective in addressing NAPL.

Sediment Alternatives: ***Alternative SED-1*** (no action) offers the least protection of human health and the environment, as no additional actions would be taken to address contaminated sediments in the bay. ***Alternative SED-2*** (CDF) assures protection of human health and the environment by eliminating access to impacted sediment. Under this alternative, there is no destruction of COCs, but these materials would be permanently contained and inaccessible to humans or biota, thereby reducing risk. ***Alternative SED-3*** (subaqueous capping of a portion of the sediment and removal of the remainder) is also protective of human health and the environment, because it would isolate a portion of the contaminated sediments from exposure to humans or biota and would remove the remaining contaminated sediments. If that portion is thermally treated it reduces its volume and permanently eliminates its toxicity by treatment. If the sediment were to be sent off-site for disposal without treatment, then this alternative reduces in-situ volume and eliminates exposure to humans and biota by transfer of these materials to an environment where access is controlled. There is no reduction in toxicity if the sediment that is removed is disposed in a landfill, although because a landfill is designed to prevent migration of or exposure to the contaminated sediments there would be no further releases to the environment or exposure to humans or ecological receptors. ***Alternative SED-4*** (dredging) could also be protective of human health and the environment, because it results in decontamination of sediment above the RAL and removes it from the aquatic environment. Due to the large amount of wood waste and free product in the near shore sediments, however, dredging this area would likely result in releases of COCs into the water column recontaminating on-site sediments and potentially impacting off-site areas. These conditions make it very difficult to implement a wet dredge remedy that would achieve the cleanup goal and performance standards established in this ROD to protect human health and the environment. ***Alternatives SED-5 and SED-6*** (dry excavation or combination of dredging and dry excavation) are protective of human health and the environment, because it results in decontamination of sediment above the RAL and removes it from the aquatic environment. ***Alternative SED-6***, dry excavation of the near shore area, is also a more protective alternative than ***SED-4*** (wet dredge) to remove near shore contamination because of the presence of large amounts of wood waste and free product in the near shore area that could be released during dredging operations into the water column and environment exposing humans or ecological receptors to COCs. ***Alternatives SED-5 and SED-6***, therefore, are more protective of human health and the environment than ***Alternative SED-4*** (wet dredge) or any other alternative that employs wet dredging of sediments in the near shore areas.

10.2 Compliance with ARARs

Soil Alternatives: ***Alternative S-1*** (no action) would not achieve compliance with ARARs and TBCs. ***Alternatives S-2, S-4A,*** and ***S-4B*** (surface barriers, and limited and unlimited removal and on-site disposal) must be implemented with a groundwater remedial response to achieve compliance. If properly implemented, the remaining remedial responses could achieve compliance with ARARs and TBCs for soil. Implementation would require that engineering and construction actions be developed and completed in compliance with Federal and State ARARs in Appendix C to this ROD.

Groundwater Alternatives: ***Alternative GW-1*** (no action) would not achieve compliance with ARARs and TBCs. Compliance with ARARs and TBCs would be met for the remaining remedial alternatives for groundwater. Implementation would require that engineering and construction actions be developed and completed in compliance with Federal and State ARARs in Appendix C to this ROD.

Sediment Alternatives: ***Alternative SED-1*** (no action) would not comply with ARARs and TBCs. ***Alternatives SED-2 and SED-3*** (CDF and subaqueous capping of a portion of the sediment and removal of the remainder) would require placement of a structure or deposit on the bed of navigable waters. The placement of a structure or deposit must not be detrimental to the public interest, must not materially reduce the flood flow capacity of a stream, and must not materially obstruct navigation. A confined disposal facility on the bed of Lake Superior does not meet these requirements for approval and, according to WDNR, cannot be permitted by the Department under Section 30.12, WI Statutes. A bulkhead line may be established under Section 30.11, WI Statute, however that bulkhead line must be in the public interest and shall conform as nearly as practicable to the existing shoreline. The proposed confined disposal facility in ***Alternative SED-2*** (CDF) would not follow the shoreline and would not meet the public interest standards and therefore cannot be established using this statutory authority. ***Alternatives SED-4 SED-5, and SED-6*** (dredging, dry excavation or combination of dredging and dry excavation) would be similar with respect to meeting ARARs and TBCs, as engineering and construction actions would be developed and completed in compliance with federal and state regulations.

All the ARARs are presented in Appendix C to this ROD.

10.3 Long-Term Effectiveness and Permanence

Soil Alternatives: ***Alternative S-1*** (no action) would not provide any long-term benefit; no additional actions would be taken to address soil contamination at the Site. ***Alternative S-3B*** (unlimited removal and off-site disposal) would provide the highest effectiveness and permanence over the long term because all contaminated material and fill soil would be removed. ***Alternative S-3A*** (limited removal and off-site disposal), ***Alternative S-5A*** (limited removal and ex-situ thermal treatment), and ***Alternative S-5B*** (limited removal and incineration) would also be highly effective and permanent over the long term because these responses will result in the removal of a significant mass of contamination in excess of regulatory or risk-based standards. ***Alternative S-6*** (limited removal and treatment by soil washing) would provide a moderate level of effectiveness and permanence over the long term; effectiveness would depend upon the reduction in contaminant concentrations that can be achieved with this technology. The long-term effectiveness of ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) is considered low to moderate because contaminants would remain on site in a disposal cell constructed at Kreher Park. The long-term effectiveness of ***Alternative S-2*** (containment using engineered surface barriers) is considered low because constituents would remain at the site beneath the surface barriers. However, for ***Alternatives S-2***, ***S-4A***, and ***S-4B***, contaminated material would be contained and inaccessible to humans or biota, thereby reducing risk. If properly implemented, a range of long-term effectiveness and permanence for all alternatives (except ***Alternative S-1)*** can be achieved for all active remedial responses for soil.

Alternative S-2 (surface barriers) must be implemented in conjunction with a remedial response for groundwater.

Groundwater Alternatives: ***Alternative GW-1*** (no action) would not provide any long-term benefit; no additional actions would be taken to address groundwater contamination at the site. ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment using PRB walls) offer low levels of effectiveness and permanence over the long term. Although risk would be reduced by containment of contaminated material, contaminants would be left on site. Additionally, both are limited to shallow groundwater; neither is a feasible alternative for the underlying Copper Falls aquifer. ***Alternative GW-9*** (removal using groundwater extraction wells) would provide a moderate level of effectiveness and permanence over the long term; operation would be required for an extended period to achieve RAOs. The remaining alternatives have high levels of effectiveness and permanence over the long term because each technology would result in the removal of a significant contaminant mass, NAPL in particular, from the subsurface.

Sediment Alternatives: ***Alternative SED-1*** (no action) would not provide any long-term benefit, as no remedial action would be taken and any potential risk associated with impacted sediment would remain. Although there would be no reduction in volume or toxicity of the contaminated sediment, ***Alternative SED-2*** (CDF) still provides a moderate level of permanence and effectiveness over the long term. Since no sediment is treated, the toxicity of the material remains the same. however accessibility and exposure to humans and biota is eliminated through containment. ***Alternative SED-3*** (subaqueous capping of a portion of the sediment and removal of the remainder) provides a high level of long-term effectiveness and permanence for that sediment which is removed and treated. For the contaminated sediment that is capped there is no destruction of COCs, but these materials are permanently contained and inaccessible to humans or biota, thereby reducing risk. If the sediment that is removed is not treated but disposed in an NR500 licensed landfill exposure to humans and biota is eliminated through access restrictions. ***Alternatives SED-4, SED-5 and SED-6*** (dredging, dry excavation or combination of dredging and dry excavation) would provide the highest effectiveness and permanence over the long term due to the permanent removal of the largest volume of sediment. However, due to sediment residuals after removal, it might take longer to reach long-term effectiveness and permanence using dredging under ***Alternatives SED-4 and SED-6***. If treated, thermal treatment of the sediment would eliminate toxicity, reduce volume and is permanent. If the sediment that is removed is not treated but disposed in a licensed landfill, exposure to humans and biota is eliminated through access restrictions.

10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Soil Alternatives: ***Alternative S-1*** (no action), ***S-2*** (containment using engineered surface barriers), ***S-3A*** (limited removal and off-site disposal), ***S-3B*** (unlimited removal and off-site disposal), ***S-4A*** (limited removal and on-site disposal), ***and S-4B*** (unlimited removal and on-site disposal) do not include treatment as a component of the remedy. Therefore, these alternatives would not result in a reduction in the toxicity, mobility, or volume of contamination at the Site. ***Alternative S-5A*** (limited removal and ex-situ thermal treatment), and ***Alternative S-5B*** (limited removal and incineration) would reduce toxicity, mobility and volume of approximately 14,000

cubic yards of contaminated soil which would be removed and either incinerated or thermally treated. ***Alternative S-6*** (limited removal and treatment by soil washing) would result in a moderate degree of reduction of toxicity, mobility, and volume of contaminated soil, but would depend upon the reduction in contaminant concentrations that can be achieved with this technology.

Groundwater Alternatives: ***Alternative GW-1*** (no action) and ***Alternatives GW-2A and GW-2B*** (containment using surface and vertical barriers) do not include treatment as a component of the remedy. Therefore, these alternatives would not result in a reduction in the toxicity, mobility, or volume of contamination at the Site. However, ***Alternatives GW-2A*** and ***GW-2B*** would reduce contaminant mobility for shallow groundwater, but not for the Copper Falls. ***Alternatives GW-9A and GW-9B*** (removal using groundwater extraction wells) would result in a reduction in the toxicity, mobility, and volume of contaminant mass through NAPL recovery and treatment, but operation would be required for an extended period to achieve RAOs. Implementation of the remaining in-situ treatment alternatives ***Alternatives GW-3*** (In-situ treatment using ozone sparge), ***GW-4*** (In-situ treatment using surfactant injection and removal using dual phase recovery), ***GW-5*** (In-situ treatment using permeable reactive barrier walls), ***GW-6*** (In-situ treatment using chemical oxidation), ***GW-7*** (In-situ treatment using electrical resistance heating), ***and GW-8*** (In-situ treatment using steam injection) would reduce the toxicity, mobility, and volume of contaminated groundwater. However, the amount of volume reduction would vary for each of the in-situ treatment alternatives.

Sediment Alternatives: ***Alternatives SED-1*** (no action) and ***SED-2*** (CDF) do not include treatment as a component of the remedy. Therefore, these alternatives would not result in a reduction in the toxicity, mobility, or volume of contamination at the Site. ***Alternative SED-3*** (subaqueous capping of a portion of the sediment and removal of the remainder) would reduce toxicity, mobility and volume of approximately 78,000 cubic yards of sediment which would be permanently removed from the environment and thermally treated. The sediment remaining under the cap would have reduced mobility and since it would be inaccessible to humans or biota, it would eliminate exposure and risk. The inherent toxicity of that sediment remaining under the cap would not be reduced. ***Alternatives SED-4, SED-5, and SED-6*** (dredging, dry excavation or combination of dredging and dry excavation) would have the greatest degree of reduction of toxicity, mobility, and volume of contaminated material. Approximately 134,000 cubic yards will be removed and thermally treated. However, due to sediment residuals after removal via dredging of near shore sediments and free product co-located with wood waste, ***Alternative SED-4*** would not reduce toxicity, mobility or volume of contaminated sediments as well as ***Alternatives SED-5 and SED-6***.

10.5 Short-Term Effectiveness

Soil Alternatives: Implementation of ***Alternative S-1*** (no action) would not achieve RAOs or improve environmental impacts in the short term. Because there is no remediation, there would be no exposure to the community and workers during implementation. The remaining alternatives would improve environmental impacts in the short term, but require varying degree of effort to protect the community and workers during remediation. Implementation of ***Alternative S-3B*** (unlimited removal and off-site disposal) would result in the most significant

on and off-site disturbance and require the highest levels of effort for this protection. ***Alternatives S-4A*** and ***S-4B*** (limited removal and on-site disposal) would result in no off-site disturbance; site disturbance would be limited to the site, and would require a moderate level of effort for protection. ***Alternative S-2*** (containment using engineered surface barriers) would result in minimal on-site disturbance, and no off-site disturbance. Because the remaining alternatives include limited removal of highly contaminated soil, they would require high levels of effort for worker and community protection. Engineered controls and monitoring would be implemented as needed for all alternatives to maximize short-term effectiveness for soil. ***Alternative S-2*** (surface barriers) must be implemented in conjunction with a remedial response for groundwater.

Groundwater Alternatives: Implementation of ***Alternative GW-1*** (no action) would not achieve RAOs or improve environmental impacts in the short-term, but it would not pose any implementation risks to the community and workers during remediation. The short-term effectiveness for the remaining alternatives is considered high. Each alternative can achieve RAOs and would reduce environmental impacts in the short term by removing contaminant mass or preventing the off-site migration of contaminants. The containment, in-situ, and removal technologies evaluated would require minimal effort to protect the community and workers during remediation.

Sediment Alternatives: ***Alternative SED-1*** (no action) would have the least short-term impact on human health and the environment, as impacted sediment would not be disturbed, and contaminants would not potentially be released into surface water and air. Of the five active remedial options. ***Alternative SED-2*** (CDF) would have the least short-term impact, as sediment would not be brought to shore for dewatering or treatment, but would be disposed in a CDF, a portion of which is subaqueous. Adequate controls would be in place to ensure worker and community safety during remedial activities. All other alternatives would have the potential of some short-term risk from release of volatile emissions during debris removal and onshore dewatering and/or treatment and transportation. In addition, ***Alternatives SED-3, SED-4 and SED-6*** could have some short-term risk from the COCs being re-suspended in the water column during dredging of sediments and impacts to the community during dewatering of sediments on-shore. The dry excavation of sediments in ***Alternatives SED-5 and SED-6*** are the best methods to quickly remove COCs and achieve protection, but there are increased concerns with worker safety in a dry excavation scenario, but dry excavation is a commonly used technology and there are effective and reliable mitigative measures that will be developed during the design phase for the remedial action. ***Alternative SED-5*** presents greater difficulty in implementing mitigative measures because it would require a dry excavation of the entire bay, not just the near shore areas under ***Alternative SED-6***.

10.6 Implementability

Soil Alternatives: ***Alternative S-1*** (no action) would require the least amount of effort, as no remedy would be implemented. ***Alternative S-3B*** (unlimited removal and off-site disposal) would result in significant site disturbance, and would be the most difficult to implement. ***Alternative S-6*** (limited removal and treatment by soil washing) may require a bench scale treatability study and pilot test to evaluate its implementability. ***Alternatives S-4A and S-4B***

(limited removal and on-site disposal) would require a variance from the State of Wisconsin for siting the landfill at Kreher Park. Obtaining a variance from the State of Wisconsin may be difficult, which could cause a significant delay in implementing the remedial response action. The remaining limited removal alternatives are highly implementable.

Groundwater Alternatives: ***Alternative GW-1*** (no action) would require the least amount of effort, as no remedy would be implemented. ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment) have a very high degree of implementability. The remaining alternatives have a high degree of implementability. However, buried structures in the Upper Bluff area and the wood waste layer at Kreher Park may limit the effectiveness of in-situ treatment for shallow and deep groundwater in these areas. Removal of the buried structures concurrent with remedial alternatives evaluated for soil may ease implementation of the in-situ treatment and removal alternatives for the Copper Falls. If removal and disposal (on- or off-site) or on-site treatment is selected as a remedial response for soil, or if containment is selected for shallow groundwater, in-situ treatment and/or removal would not be necessary for soil and shallow groundwater contamination because the contamination is being addressed. However, one or more of the in-situ and/or removal technologies evaluated would be required for the Copper Falls aquifer.

Sediment Alternatives: Implementation of ***Alternative SED-1*** (no action) would be easy, as no action would be performed. ***Alternative SED-2*** (CDF) would be more difficult to implement than ***Alternative SED-1***. The technology and equipment that would be used for this alternative is readily available, and has proven to be reliable at other similar sites. However, because WDNR has indicated that the Governor and Legislature must approve ***Alternatives SED-2 and SED-3*** (CDF and subaqueous capping of a portion of the sediment and removal of the remainder), obtaining authorization to proceed is uncertain. The impact on schedule for implementation of the remedy would also be significant. ***Alternatives SED-2, SED-3, and SED-4*** (dredging), require confirmation sampling and possible redredging if performance standards are not met as the dredging proceeds. The need for confirmation sampling and possible redredging makes implementation more difficult. ***Alternatives SED-3 and SED-4***, which mechanically or hydraulically dredge about four feet of wood debris and sediment before capping, or mechanically or hydraulically dredge all sediments greater than 9.5 ppm, would be difficult to implement, as additional equipment, technology, and permitting would be required to perform the dewatering, thermal treatment, and disposal of sediment as well as for implementation of engineering controls for volatilization. The amount of wood waste and presence of free product also present difficult implementation challenges in order to control the release of contaminants and recontamination of sediments. Furthermore, the capping component included as part of Alternative SED-3 would add additional complexity to the implementation of this alternative. ***Alternative SED-5 and SED-6*** (dry excavation or combination of dredging and dry excavation) would be difficult to implement because of the need to install safe and watertight enclosures, pump the surface water out, keep water out (from seepage and precipitation), and engineering controls for volatilization. ***Alternative SED-5*** is more difficult to implement in this regard since it involves the entire bay whereas ***Alternative SED-6*** would only require these controls in the near shore area. A dry excavation of the whole bay or inner bay, however, is an efficient and effective way to remove the significant amount of wood waste and free product since work is not taking place in the "wet" (i.e., in water) making it possible to see what is being removed without

the need to control for the release of free product to the water column resulting in the recontamination of sediment and volatilization of surface sheens and releases to the outer bay.

10.7 Cost

Soil Alternatives: There are no costs associated with ***Alternative S-1*** (no action) because no remedial activities would be conducted. For the Upper Bluff area, the ***Alternatives S-3B*** (unlimited removal and off-site disposal) and ***S-5B*** (limited removal and incineration) yield the highest costs. ***Alternative S-6*** (limited removal and treatment by soil washing) yields the next highest cost, followed by ***Alternative S-5A*** (unlimited removal and on-site thermal treatment), ***Alternative S-3A*** (limited removal and off-site disposal), and ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) yielded lowest costs for the Upper Bluff area. ***Alternative S-2*** (containment using engineered surface barriers) would be the lowest cost remedial response for soil in the Upper Bluff area, but would likely need to be completed in conjunction with a groundwater remedial response to be effective. ***Alternative S-3B*** (unlimited removal and off-site disposal) also yields a high cost for Kreher Park. ***Alternative S-4B*** (unlimited removal and on-site disposal at Kreher Park) yields the next highest cost followed by ***Alternative S-6*** (limited removal and treatment by soil washing), ***Alternative S-5A*** (limited removal and on-site thermal treatment), ***Alternative S-2*** (containment using engineered surface barriers), ***Alternative S-5B*** (limited removal and off-site incineration), and ***Alternative S-4A*** (limited removal and on-site disposal). ***Alternative S-3A*** (limited removal and off-site disposal) yields the lowest cost.

Groundwater Alternatives: There are no costs associated with ***Alternative GW-1*** (no action) because no remedial activities would be conducted. For shallow groundwater, ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment) have high installation costs. Annual O&M costs for ***GW-2*** are high due to long-term groundwater recovery and disposal costs, but low for ***GW-5***, which relies on in-situ treatment. Cost for implementation of the in-situ treatment ***Alternatives GW-6*** (chemical oxidation), ***GW-7*** (ERH), and ***GW-8*** (steam injection) are also high with low annual O&M costs. ***Alternative GW-3*** (ozone sparging) has low implementation and annual O&M costs. Implementation costs for ***Alternative GW-9*** are the lowest, but it has high annual O&M costs for continued operation, which may be required for an extended period of time.

For the Copper Falls aquifer, in-situ treatment ***Alternatives GW-6*** (chemical oxidation), ***GW-7*** (ERH), and ***GW-8*** (steam injection) have high implementation costs. ***GW-6*** has high O&M costs, and ***GW-7*** and ***GW-8*** have low O&M annual costs. In-situ treatment ***Alternatives GW-3*** (ozone sparging), and ***GW-4*** (surfactant injection) have low implementation costs, but high annual O&M costs. As with shallow groundwater, implementation costs for ***Alternative GW-9*** are the lowest, but it has high annual O&M cost for continued operation, which may be required for an extended period of time.

Sediment Alternatives: ***Alternative SED-1*** (no action) would be the lowest cost alternative. The cost for ***Alternative SED-2*** (CDF) would be greater than costs for Alternative SED-1 and SED-3 if construction of the CDF is required to meet ch. NR 504, WAC specifications and armouring to the top of the sheet pile is required on the lake side. The cost to implement

Alternative SED-3 (subaqueous capping of a portion of the sediment and removal of the remainder) would range between approximately $34 to 46 million depending upon whether the sediment is thermally treated or not. The cost to implement ***Alternative SED-4*** (dredging) would range between approximately $45 to 64 million depending upon whether the sediment is mechanically or hydraulically dredged and whether it is thermally treated. Costs for implementation of ***Alternative SED-5*** (dry excavation) are the highest among the alternatives and range between approximately $74 to 88 million depending upon whether the sediment is thermally treated. Costs for ***Alternative SED-6*** (combination of dredging and dry excavation) would range between $63 and 77 million depending upon how the sediment is dredged and whether it is thermally treated. Alternative capping designs, for instance a three-foot cap (two feet of sand and one foot of rock for erosion control) with a carbon mat (three-feet of sand and one-foot of rock) would be several million dollars less than the four-foot cap upon which the cost estimates for ***Alternative SED-3*** is based.

The tables in Appendix O of this ROD (and in Appendix F of the FS) summarize the estimated costs associated with each of the remedial alternatives presented above.

10.8 State Acceptance

The State Agency, WDNR, was the lead agency at the Site prior to EPA taking the lead, and has continued to be involved in all steps of the RI/FS for the Site. The WDNR concurs with the selection of Scenario 10. A letter of concurrence from the State can be found in Appendix B.

10.9 Community Acceptance

During the public comment period on the Proposed Plan, the community expressed a few concerns with the proposed remedy for the Ashland/NSP Lakefront Site, but overall expressed strong support for EPA's preferred alternative. In general, the community raised concerns with the cost of the cleanup, but also expressed a preference for a remedy that is permanent and removes as much of the contamination as possible to prevent exposure and protect public health and the environment. NSPW and its consultants expressed concerns with implementing a dry excavation sediment alternative based on engineering and cost considerations. This ROD includes a responsiveness summary that summarizes the public comments and EPA's response to those comments. The responsiveness summary is included as Appendix A.

11.0 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threat wastes posed by a site wherever practicable. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Benzene was detected in the sediments approximately 1,000 times higher than the WDNR threshold effects concentration (TEC) and total PAHs were detected in the sediments approximately 6,000 times higher than the WDNR TEC. Oil slicks continue to form on the surface of the Chequamegon Bay during high-wind events due to the NAPL in sediments. The PAH and VOC free product and NAPLs found in the soils, groundwater and sediment at the

Ashland/NSP Lakefront Site are highly toxic. The NAPL and free product materials act as a reservoir for migration of contamination to groundwater, surface water, soil and sediment, and represent a potential source for direct exposure. Therefore, the NAPL and free product materials represent the principal threat waste at the Site.

The selected remedy described in Section 12 of this ROD incorporates treatment of the principal threat wastes found in soils, groundwater and sediments to the maximum extent practicable. For example, the NAPL removed from the soil, sediment and groundwater will be sent off-site for treatment. The NAPL currently being extracted from the groundwater from the interim groundwater extraction system is sent to an off-site facility for treatment.

12.0 Selected Remedy

This section describes the selected remedy and provides EPA's reasoning behind its selection. Alternatives can change or be modified if new information is made available to EPA through further investigation or research. An appropriate range of alternatives was developed, based upon initial screening of technologies, potential for contaminants to impact the environment, and site-specific RAOs and goals. Appendix Q includes Figures showing what the various components of the selected remedy and alternate sediment remedy (SED-4) are expected to look like during implementation of the remedy.

12.1 Identification of the Selected Remedy and Summary of the Rationale for its Selection

Based on the analysis of the nine criteria as summarized in Section 10 of this ROD, the selected remedy for the Ashland/NSP Lakefront Site is Scenario 10 as described in Section 9.1 of this ROD. This alternative represents the best balance of overall protectiveness, compliance with ARARs, long-term effectiveness and permanence, cost, and other criteria. It is also the scenario favored by the WDNR and the community. Figures in Appendix Q show the expected implementation of the various components of the selected remedy. The selected remedy described in this section may change as a result of the remedial design and construction processes. Any changes to the remedy selected in this ROD will be properly documented using a technical memorandum in the Administrative Record, an ESD, or a ROD amendment, as appropriate.

12.2 Description of the Selected Remedy

The selected remedy is Scenario 10, which as described in Section 9.1 includes the following components:

- **Sediments:** Alternative SED-6 – Using excavation equipment, remove in the dry all nearshore sediment and wood debris. In addition, remove wood debris from offshore sediments and mechanically or hydraulically dredge remaining offshore sediments. After dredging/excavation is completed, place six inches of clean fill on dredged areas for lakebed stabilization. Dewater and stabilize sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport stabilized sediments off site

to NR 500 licensed landfill or thermal treatment. Dispose of or burn wood debris separately.

- **Kreher Park:** Limited soil/source removal with ex-situ thermal treatment (Alternative S-5A) and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps at Kreher Park to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. The remedy will serve to restore the shallow groundwater to its beneficial use by reducing contaminant levels in groundwater. In-situ chemical oxidation (GW-6) can be used to possibly enhance groundwater treatment.
- **Upper Bluff/Filled Ravine:** Limited soil removal with ex-situ thermal treatment (Alternative S-5A) and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. The remedy will serve to restore the shallow groundwater to its beneficial use by reducing contaminant levels in groundwater. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Copper Falls Aquifer:** Enhance existing groundwater extraction system (GW-9B). In-situ chemical oxidation (GW-6) or in-situ treatment via ozone sparge (GW-3) can be used to possibly enhance groundwater treatment. Enhancing the existing groundwater extraction and treatment system (and possibly using in-situ treatment) will hydraulically control the groundwater contamination and NAPL in the aquifer. The remedy will also serve to make progress toward restoring groundwater to beneficial use.
- **Conduct O&M and Long-Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface and for shallow groundwater in contained areas.

Each of these components of the selected remedy is described in greater detail below.

Sediments: Alternative SED-6 – (Dry Excavation near shore/Dredging offshore) - Using excavation equipment, remove in the dry all near shore sediment and wood debris that exceeds the RAL of 2,295 ug tPAH/g OC (9.5 ppm tPAH dwt at 0.415% OC). In addition, remove wood debris from sediments outside the dry excavation area and mechanically or hydraulically dredge all targeted sediments that exceed the RAL. After dredging is completed, place six inches of clean fill/sand on dredged areas for stabilization. Dewater and stabilize sediments at Kreher Park area and treat wastewater to meet state and federal discharge limits; discharge treated wastewater to the lake or POTW. Thermally treat sediments or stabilize sediments to transport off site for disposal to a NR 500 licensed landfill. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediment at a NR 500 licensed landfill will be the

alternate remedy. Thermal treatment will be determined during the pre-design phase. Dispose of or burn wood debris separately. If a pre-design pilot test for wet dredging of the near shore area is conducted and indicates that dredging rather than dry excavation within the near shore area will attain the established performance standards and can be conducted in a manner protective of human health and the environment, then EPA, in consultation with WDNR, will recommend that an alternate sediment remedy (dredging) be implemented for both near shore and outer shore sediments and EPA will publish its decision in an ESD.

This alternative consists of the following components, the specifications of which may vary and will be finalized during the Remedial Design:

1) Determine sediment with concentrations of PAH greater than 9.5 ppm tPAH/g dwt at 0.415% OC.
2) Delineation of near shore areas that contain NAPL-impacted sediments and substantial wood debris will be done during pre-design testing and may be refined during Remedial Action. This will become the boundary of the near shore dry excavation area and the offshore dredging area. For purposes of this conceptual plan the boundary is assumed to be approximately 200 feet from the shoreline. Sheet piling would be constructed along the boundary between the near shore dry excavation area and the offshore dredging area.
3) In order to control wave action on the near shore area containment wall (sheet pile), a wave attenuation flotation device or breakwater wall will be installed at the outer boundary of the area to be remediated (north of 2900N).
4) Lake water within the sheet pile containment would be removed with two 500 gpm, stand-alone pumps. Lake water pumped from within the containment will be managed/treated by an adsorbent liquid phase activated carbon system sized to adequately remove contaminants of concern. The untreated lake water will be tested to provide contaminant mass loading data and the carbon will be changed out and regenerated based upon the contaminant load and testing for contaminants. The treated effluent will be discharged directly to Lake Superior following laboratory testing that shows compliance with WDNR water quality criteria and meet the substantive requirements for NPDES permit.
5) Variable rate discharge pumps will be used to assist with dewatering sediments. Wastewater obtained from sediment dewatering will be managed/treated with filtration of the solids followed by contaminant adsorption with liquid phase activated carbon filters. The wastewater will flow through bag or sand filters and will then flow into a liquid phase activated carbon system sized to remove contaminants of concern from the water. The wastewater will be tested to estimate the contaminant mass loading on the carbon, and the carbon will be changed out and regenerated on an as needed basis based on testing for contaminants. In addition, the effluent will be tested to show compliance with WDNR water quality criteria, and discharged to the lake. Alternatively, if surface water criteria are not initially met, the water will be contained and re-treated, and the system will be adjusted to treat the water fully.
6) Wood debris and sediment will be prepared for loading and disposal by one of the following methods: Stabilizing wet, fine grained (silt and clay) sediments with reagents such as Type C fly ash and/or Portland cement and excavation of wood debris and

granular (sand and gravel) sediments on an impermeable asphalt pad to allow drainage of fluids by gravity flow.

7) Sediment excavation/stabilization/dewatering will be performed with heavy equipment such as a crane with drag-line and/or tracked excavator and/or wheeled conveyor and displacement with a bull dozer. It is anticipated that all of the sediment volume will be thermally treated or disposed off site.
8) Imported clean sand will be used as backfill in the area where removal of sediment and wood debris is performed in the dry. Heavy equipment will be used to place the sand. Techniques for placement of the sand may include: pushing the sand into the excavation created by removal of the sediment and wood debris and/or placing sand from long-stick excavators positioned adjacent to the sheet piling or the shoreline. Temporary sand berms may be constructed to support equipment used for excavation. Material from these berms may later be used for backfill.
9) Sediment outside the near shore containment will be removed using barge-based hydraulic or mechanical dredging. Dredge material will be conveyed to shore-based dewatering facility.
10) Excavated and dredged sediment will be dewatered on site using a settling pond and mechanical separation followed by on-site treatment of sediment and liquid and/or off-site disposal of untreated sediment;
11) If sediment is treated using thermal desorption or incineration it would be sent for off-site disposal at a solid waste or other landfill after treatment;
12) If sediment is not treated on site but only stabilized, it would be sent to a NR 500 permitted landfill for off-site disposal;
13) Wastewater will be treated using flocculation, clarification, sand filtering, and carbon filtering and discharged to the Ashland WWTP. Alternatively it could be discharged directly to Lake Superior if it meets DNR surface water criteria and the substantive requirements of an NPDES permit;
14) Groundwater removed from a trench system that parallels the sheet pile wall on the land side will be treated with filtration, oil/water separation followed by treatment with liquid phase activated carbon. As with the other water that will enter the activated carbon system, water will be treated to comply with WDNR water quality criteria and discharged into the lake.
15) Sediment areas outside of the dredge area where concentrations of PAH are greater than 5.6 µg tPAH/g dwt at 0.415% OC will be monitored.

Equipment that may be used for implementation of this alternative includes:

- Construction of wave attenuation floatation device on lakeside of containment wall
    - Barge equipped with crane, pile driving hammer and steel sheet piles with interlock seal
    - Barge equipped with crane and carriage lift for placement of stone and barges loaded with blasted rock/cut limestone, or barges equipped with crane for placement of wave attenuation device and dead-man
    - Hydrocarbon collection booms
- Construction of landside containment wall
    - Crane, pile driving hammer and sheet piles with interlock seal

- Hydrocarbon collection booms
- Dewatering equipment – for removing water from bay, groundwater collection trench and sediment
  - Trailer mounted 500 gpm pumps
  - Variable rate (10-100 gpm) sump pumps
  - Sump pump for collection of drained sediment fluids from asphalt drainage pad
  - Mechanical dewatering equipment
- Water treatment equipment
  - Piping to lake or WWTP for treatment of water and collected fluids
  - Water treatment system
    - Oil/water separator
    - Bag filtration
    - Activated carbon adsorption
    - Sand Filtration
- Sediment excavation equipment
  - Modular barges to provide access throughout containment areas, if necessary
  - Geotechnical mats (e.g., Durabase) may be needed on crest of sand berms to provide support to heavy equipment
  - Bulldozers
  - Excavators
  - Crane equipped with drag–line to move sediment into position for handling and stabilization
  - Wheel mounted conveyors
- Sediment dredging equipment
  - Hydraulic
  - Mechanical
- Sediment stabilization/drainage equipment
  - Backhoes
  - Compressors
  - Tanker trucks containing reagent
  - Asphalt drainage pad and sump
- Disposal equipment
  - Transport to disposal location
    - Truck
- Monitoring equipment – to evaluate effectiveness of remedy
  - Groundwater monitoring wells
  - Piezometers for water level measurements
  - Sediment sampling equipment
  - Surface water sampling equipment

Concept

Under this alternative, sediments greater than 9.5 ppm tPAH/g dwt at 0.415% OC would be removed regardless of depth. In some areas, sediments as deep as ten feet would be removed. Sediment removal under this alternative would be conducted with excavators, mechanical dredges and hydraulic dredges. In some near shore areas, caissons could be constructed to

enable dewatering near shore areas, which would allow use of shore-based excavators to remove sediment. The efficacy of this latter approach could be determined during a pilot scale project.

Engineering controls would need to be implemented to minimize volatilization of VOCs during dredging. This can best be evaluated during a pilot scale project. During dredging operations, turbidity curtains and floating hydrocarbon booms or sheet piling, if necessary based on the results of a potential pilot study that would be conducted during pre-design phase, would be deployed to minimize dispersal of suspended sediments or floating free phase. Site restoration would include placing at a minimum six inches of clean fill/sand on all areas that have been dredged.

Removal is technically feasible for the Site, although several issues would have to be addressed in the design of a dredging alternative, including control of the release of free-phase product and dispersal and volatilization of VOCs during dredging activities, as well as management of dredging residuals and handling of a substantial amount of wood debris. Some aspects of the Site are more disposed to the use of mechanical dredges or excavators (e.g., debris removal), while other aspects favor hydraulic dredges, (e.g., capture of free phase and minimization of volatilization).

Implementation of Remedy

Mobilization/Demobilization

This includes mobilization and demobilization of all the equipment and facilities needed to implement this alternative.

Construction of Temporary Wave Attenuation Device

Wave dampening will be required to minimize dynamic forces on the containment wall that will enclose the near shore area. A partially assembled wave attenuator will be shipped to the Site on flat bed trailers. The device will be unloaded and placed onto a work barge for assembly along the proposed alignment. Installation along the alignment will occur by placing concrete dead-men along the alignment. The exposed rebar extending from the dead-men would be connected to metal shackles that are connected to a metal cable which connects to the metal rods on the wave attenuator. Adjustment of the cables length would be performed to maximize wave attenuation.

During winter the wave attenuator could remain in-place or be pulled below the surface of the water to a depth that would be below the bottom of the ice that customarily forms in the bay. After ice out in the spring, the attenuator could be returned to its initial position by adjusting the cable attached to the dead-men. At the completion of the project the attenuator could be anchored to the bottom or cleaned and sold.

A breakwater wall could also be utilized to minimize the wave action on the near shore area containment wall. In addition, if a breakwater wall is constructed, it could also be utilized as a

semi-permanent confinement system during the dredging of offshore sediments (as described in the "*Dredging of Offshore Sediments*" section below).

Containment Wall Installation

Landside containment wall construction will be performed by driving steel sheet piling that utilizes an interlock sealant to minimize seepage. The lake and landside sheet piling will be driven into the underlying Miller Creek formation approximately 20 feet and 5 feet, respectively. Prior to driving the sheet piling, an exploratory trench will be excavated along the land wall alignment to a depth of approximately 10 feet below ground surface to remove obstacles or debris that would prevent the sheeting from being installed.

The lakeside containment wall will be constructed from a barge by driving PZ-35 steel sheeting. Preliminary structural analysis of the PZ-35 wall system without the use of a breakwater wall indicates excessive deflections (around 12 to 14 inches of deflection at the top of the wall) when lateral forces from the lake waves are applied to the sheeting. Use of a wave attenuator or breakwater wall decreases the wall deflection to a more desired defection of approximately 6 inches or less. Decreasing wall deflection will also help reduce the volume of seepage through the wall located in the bay. The final design of the lakeside containment wall will be determined at the Remedial Design stage after geotechnical data is collected along the alignment.

Following completion of the containment wall system, the water within the containment will be removed using trailer mounted 500 gpm pumps. The discharged water from initial pumping within the containment wall will be transported via pipeline to the WWTP and processed with minimal treatment. Variable rate discharge pumps will be deployed to reduce the water content of the sediments within the containment. This water will also be piped to the WWTP and treated before discharge. Details of treatment will be developed during Remedial Design.

Excavation/stabilization/disposal of near shore sediments

The excavation of the wood debris in the near shore area will be performed with tracked mounted excavators and a crane equipped with a dragline and bucket. The excavated wood debris and some of the sediments that underlie the debris will be placed on the impermeable asphalt drying pad to allowing additional drainage of trapped fluids. The drained wood debris will be loaded into trucks for transport to the disposal facility or off-site facility for burning. Fluids collected at the drainage pad will be transferred to the WWTP and treated before being discharged.

The silty/clayey sediments underlying the wood deposits will be stabilized with reagents prior to being loaded onto trucks for disposal. The reagent(s) will be of a type that will help to absorb the majority of the remaining fluids within the silty/clayey sediments. Concrete Jersey barriers will be used to separate the stabilization activity from other activities. Stabilization of the sediments will be performed by using a compressor to transfer the reagent provided in tanker trucks to the stabilization area. Mixing of the reagent with the sediments will be performed

using an excavator bucket and/or bulldozers. The stabilized sediments will be loaded by excavator into trucks for transport to the disposal facility.

The underlying sandy granular sediments will be removed and placed on an asphalt drainage pad to allow additional drainage of fluids. The sandy material will be moved to the drainage pad using wheel mounted conveyors and/or tracked excavators and bull dozers. Drained sandy sediments will be loaded onto trucks for transport in closed watertight containers to a disposal facility. Fluids collected at the drainage pad will be transferred to the WWTP and treated before being discharged.

As with other sediment alternatives, controls for minimization of volatile releases are available for onshore operations; however, volatilization control for near shore dry excavation would have to be investigated further during the pre-design phase .

Dredging of Offshore Sediments

Sediments outside of near shore excavation area will be dredged using conventional dredging technology. Dredging operations further from shore will require a semi-permanent confinement system in the bay (e.g., sheet pile wall, breakwater wall) at the outer edge (north) of the Site work area to minimize dispersal of suspended sediments or floating free phase. The details of the system and exact requirements will be fully delineated during the pre-design phase and Remedial Design for the sediment remedy. Sediments in this area are less contaminated and have less debris than the near shore excavation area, therefore, it is anticipated that there will be less potential for dispersal of contaminated sediment. However, during dredging operations, turbidity curtains and floating hydrocarbon booms would be deployed to minimize dispersal of resuspended sediments or free-phase product.

During Remedial Design dredging performance objectives will be developed for allowable rates of sediment resuspension during dredging based upon water quality standards that are protective of ecological receptors. These will be used for operational control of dredging. Typically, performance objectives for resuspension are two or three-tiered and specify how dredging operations need to be modified if the action levels are exceeded.

Sections 12.3 and 12.4 of this ROD discuss dredging performance standards and the remedial approach for sediments, respectively, including specifying under what conditions re-dredging would be necessary.

Dredge material will be conveyed hydraulically or by barge to dewatering areas onshore.

After dredging is completed, six inches of clean fill/sand would be placed on areas that are dredged for purposes of providing lakebed stabilization. A side benefit is that it will also provide a better habitat for recruitment of benthic macroinvertebrates and for spawning of fish. The issue of dredged residuals management is discussed in Section 12.4.

Volatilization and Odor Control

There is a potential for volatilization during dry excavation of near shore sediments since areas would be exposed to the air. Although a dry excavation scenario was not explicitly modeled in the Air Emissions Treatability Study, volatiles could disperse beyond the immediate vicinity of excavation and onshore treatment operations, depending upon ambient weather conditions. With the proximity of a relatively large population in Ashland, this presents the possibility of unacceptable exposure unless volatiles can be controlled.

Engineering controls would need to be implemented to minimize volatilization of VOCs during dredging. The need for and design of engineering controls for volatilization would need to be evaluated during a pilot scale project.

Controls for minimization of volatile releases are available for dry excavation and onshore operations; however, volatilization control for operations on the water would likely have to be investigated further during a pilot scale project during pre-design, since tenting over working dredges on the water is difficult and would add complexity to maintaining efficient dredge production rates. Beyond controls that can be employed by the dredge operator to minimize exposure of sediment to air there is little precedent for implementing engineering controls for volatilization at the dredge platform. Dredging areas with a high potential for release of volatiles during cooler periods of the year or when winds are predominantly offshore also may help minimize transport of volatiles to residential areas. However, it is likely that dredging will be shut down in the colder months of the year and wind directions in the Ashland area are variable and sometimes unpredictable.

Sediment Dewatering

Dewatering of the sediment will be performed using variable rate discharge pumps that are placed in sumps pits located within the containment area and adjacent to the outermost containment wall. Additional drainage of wood debris and sandy granular sediments will be provided by placing these materials on the asphalt drainage pad built at the Kreher Park area. Sediment dewatering and seepage through the containment wall are estimated at 7,000 gal/day.

Wastewater Treatment

Water treatment includes bag/sand filtration, oil/water separation, adsorption with activated carbon filter and related testing for O&M and discharge. Most of the systems are closed and should have minimal impact on air emissions. Discharge will be to the City of Ashland WWTP or to Lake Superior if it meets WDNR water quality criteria. Estimated total treatment quantity for the dredge in the dry option is 60,000,000 gallons. The total treatment volume is based on a project duration of 2 years.

Sediment Treatment

Sediment treatment includes either stabilization for disposal in a NR 500 permitted landfill or alternatively, thermal treatment before land filling in a solid waste landfill. Both processes have

the potential to create some emissions in handling the dewatered sediment feed to the stabilization or thermal treatment systems. However, there is likely much lower emissions associated with sediment treatment than with the dewatering operations unless there is an upset in the operations. HTTD is again assumed to be the most cost effective thermal method and is the basis for cost estimates for thermal treatment at this time. However additional design testing would be needed to evaluate this choice.

Sediment Disposal

The disposal process will include the loading of sediment following drying and treatment/stabilization at the Site, and transportation to a commercial/industrial landfill or NR 500 permitted landfill. Several scenarios were evaluated for this option, assuming a sediment quantity of 133,000 cy based upon the sediment PRG. For purposes of cost estimation it is assumed one cubic yard of sediment will weigh 1.5 tons.

Other Disposal Alternatives

NSPW also may initiate siting of landfill per chapter NR 500 requirements in the Ashland area for solid materials removed from the Lakefront Site. This disposal option is dependent on the material volume. An analysis of siting a landfill per chapter NR 500 requirements in the Ashland area is presented in Appendix H of the FS.

Ancillary Solid Wastes

Waste such as PPE, construction debris and other types of solid wastes generated during the conduct of remedial activities can be disposed of at a local municipal landfill. The quantity generated will depend on the remedial alternative. PPE will be evaluated and handled in accordance with EPA guidance document to handle investigation derived waste (EPA 2007).

Wood Waste

Under this alternative there is the potential for generating a substantial quantity of wood waste. The wood waste ranges in size from sawdust and chips to timber. Potentially, the larger debris could be burned as fuel at the NSP Bayfront Power Plant located in Ashland. Some additional maintenance at the plant would be required to accommodate the wood debris but this is considered a viable option at this time and will evaluated further during remedial design.

Kreher Park and Upper Bluff/Filled Ravine: For soils, Alternative S-5A – Limited soil/ source removal with ex-situ thermal treatment. Excavated soil would likely be treated on site by a mobile unit. Debris must be separated by size from material suitable for thermal treatment and transported off site for disposal. Consequently, wood waste at Kreher Park and fly-ash and cinders in the Filled Ravine at the Upper Bluff area must be separated from NAPL-contaminated material encountered in these areas. Thermal treatment by LTTD or HTTD will be completed for suitable NAPL-contaminated fill material, and contaminated material not suitable for thermal treatment will be transported off-site for disposal. Fill material including fly ash and cinders that is not contaminated with VOC and PAH compounds will be returned to the excavation.

Thermal treatment will be performed on suitable fill material from areas with the highest levels of contamination. This includes the former gas holder area at the Upper Bluff, the NAPL in the Filled Ravine and contaminated soil encountered above the wood waste layer at Kreher Park; the underlying wood waste layer would not be suitable for thermal treatment. Key elements of the conceptual design for ex-situ thermal treatment of material removed from these areas follows:

1. A mobile unit and ancillary equipment will be set up at Kreher Park because inadequate space is available at the Upper Bluff area.
2. Demolition of the center section of the NSPW service center for excavation south of St. Claire Street will be required to access contaminated soil beneath this building at the Upper Bluff area.
3. Removal of existing asphalt pavement in the alley and courtyard area will also be required.
4. All shallow water table wells screened in the fill soil unit will be abandoned prior to excavation. Piezometers screened in the underlying Copper Falls aquifer will be protected during excavation and backfilling activities and remain in place for future use.
5. Removal will include the excavation of soil containing NAPL, and the removal of buried structures (i.e. former gas holders) at the Upper Bluff area south of St. Claire Street. This area includes the excavation of unsaturated and saturated zone soils to a depth between 12 and 15 feet for an area approximately 130 feet by 130 feet, yielding between 7,600 and 9,400 cubic yards. Also included for removal will be soil containing NAPL in the Filled Ravine on the north side of St. Claire Street. This will include the excavation of saturated zone soil from the bottom five feet of the Filled Ravine where the clay tile and NAPL were encountered. At the surface, this excavation area will be approximately 30 by 75 feet wide. An estimated 75 to 150 cubic yards of NAPL-contaminated soil will be removed from the base of the Filled Ravine.
6. Removal will also include the excavation of unsaturated and saturated zone soils at the former coal tar dump area. This includes approximately 5 feet of contaminated soil in an area approximately 260 feet by 100 feet, yielding approximately 4,800 cubic yards.
7. Deep excavations or excavations completed near facility buildings may require shoring to support sidewalls.
8. Groundwater seeping into the excavation will be collected, temporarily placed in holding tanks, and treated by the on-site treatment system prior to discharge to the sanitary or storm sewer. Discharge to the sanitary sewer system will require approval from the wastewater treatment plant, and discharge to a storm sewer will require a WPDES permit.
9. Saturated and unsaturated zone material will be thermally treated to reduce contaminant mass and toxicity and returned to the excavation as backfill. Material unsuitable for thermal treatment will be transported off site for landfill disposal. Fill material not contaminated with VOC and PAH compounds will be returned to the excavation as backfill.
10. Site restoration at the Upper Bluff area will include the installation of new asphalt pavement as a surface barrier over the excavated area on both sides of St. Claire Street, and new asphalt pavement at the gravel covered courtyard area on the north side of the street. The existing street (inspected for water tightness and sealed or replaced as

needed) and new asphalt pavement on the NSPW property will prevent exposure to fill material beneath St. Claire Street and the NSPW storage yard.

11. Site restoration at Kreher Park will include backfilling excavated areas with clean fill material and installation of a new RCRA Subtitle D (ch. NR 500) cap over the excavated area.

Long-term operation and maintenance of backfilled areas will include groundwater monitoring, cap maintenance including the periodic inspection and repair of all asphalt and soil caps.

For groundwater, Alternative GW-2A - Containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control. Containment for groundwater contamination consists of engineered surface barriers, vertical barrier walls installed in the aquifer, and extraction wells (hydraulic barrier wells). Surface barriers eliminate the direct contact exposure pathway. They also can reduce contaminant leaching from the unsaturated zone, by restricting infiltrating water from contacting contaminated soil at areas where contaminated soil is present. Vertical barrier walls and barrier wells prevent the off-site migration of contaminants with groundwater. Institutional controls will be implemented as part of this remedial response to prevent exposure to groundwater contamination remaining within the contained area until such time as groundwater cleanup standards are achieved. Long-term operation and maintenance will include groundwater monitoring to confirm contaminants are not migrating from the contained area. This will include fluid level monitoring and groundwater extraction to ensure the hydraulic head within the confined area remains at or below lake level.

Engineered surface barriers, vertical barrier walls, and barrier wells are described below.

Engineered Surface Barriers

Engineered surface barriers are considered passive containment alternatives because the contaminated zone is not disturbed, and only minimal maintenance is required following implementation. Surface barriers include the following:

- Asphalt cap;
- Low permeability soil cap (i.e. 2 feet of clay with hydraulic conductivity of less than 10^{-7} cm/sec);
- Multi-layer cap with a minimum two-foot thick clay barrier, drainage layer, soil and vegetated top soil cover; and
- Multi-layer cap with geomembrane (a minimum two-foot thick clay barrier, geomembrane, drainage layer, soil and vegetated top soil cover.

At the Upper Bluff area, asphalt caps over the Filled Ravine as surface barriers will be compatible with existing and future site use. At Kreher Park, a low permeability soil cap could be placed over the entire 11.6 acre parcel, but installation of a clay cap over the entire park will require the removal of the existing marina parking lot, Marina Drive, and the former WWTP. New asphalt roads, parking lots, and/or slab on grade buildings could be then constructed on top of a larger cap, or installed at select areas in place of a cap for the entire park. These smaller surface barriers will be designed to be compatible with existing and future site use, and include

asphalt pavement for the marina parking lot and a low permeability cap for the former coal tar dump. Asphalt pavement over the gravel covered marina parking lot will reduce infiltration at this area. A surface barrier over the former coal tar dump area will reduce contaminant leaching from the unsaturated zone if contaminated soil remains in place. If the WWTP is removed, a clay cap or asphalt pavement could be installed at this area.

Multi-layer caps will be compatible with on-site areas of unexcavated soil, especially at Kreher Park. Single layer asphalt and low permeability caps will meet 40 CFR Subtitle D requirements, and multi-layer caps will meet 40 CFR Subtitle C requirements.

Groundwater Extraction/Barrier Wells

Barrier wells are considered active hydraulic containment alternatives. Long-term operation (groundwater extraction), maintenance, and monitoring will be required. Down gradient barrier wells will be used for groundwater at the Upper Bluff and for the saturated fill unit at Kreher Park. These wells will prevent contaminants from migrating off site with groundwater.

Vertical Barrier Walls

Vertical barrier walls consist of a slurry wall or sheet piling installed around the perimeter of the contaminated groundwater zone. A slurry wall is a low permeability barrier constructed by placing a low permeability material (slurry) in a trench around the perimeter of the contaminated groundwater mass. Sheet piling will consist of inter-locking sheets of steel pilings that form a continuous wall installed around the perimeter of the contaminated groundwater mass.

For shallow groundwater, both types of vertical barriers could be anchored into the underlying low permeability Miller Creek Formation to create a barrier that will prevent contaminants in the shallow fill units from migrating off site with groundwater. However, because groundwater in the Filled Ravine discharges to Kreher Park, vertical barriers will be used to funnel groundwater from the Filled Ravine to Kreher Park, which will be enclosed by vertical barrier walls. Engineered surface barriers will be used with vertical barriers to minimize groundwater recharge to contained areas from infiltration. Key elements for the conceptual design of a sheet pile vertical barrier wall around the perimeter of Kreher Park follows:

1. Site preparation will include clearing and grubbing of small trees and bushes along the bluff and near the former seep area as needed.
2. Although the former wastewater treatment plant will be located within the contained area, demolition of this dormant facility may be required.
3. A vertical barrier wall will be placed around the perimeter of Kreher Park. This vertical barrier will consist of a sheet pile wall anchored into the underlying Miller Creek Formation.
4. The sheet pile wall along the shoreline will be installed at an approximate depth of 25 feet below existing grade to allow the off-shore removal of sediment to a depth of ten feet adjacent to the sheet pile wall. The sheet pile wall on the south, east, and west sides of Kreher Park will be installed at an approximate depth of 16 feet below existing grade.

5. Surface barriers will be installed over the Filled Ravine to minimize groundwater recharge from infiltration, and the sheet pile wall on the south side of Kreher Park will terminate on the east and west flanks of the Filled Ravine to create a "funnel" for shallow groundwater discharge into Kreher Park.
6. A groundwater diversion trench will be installed between the remainder of the south wall and the Upper Bluff area to divert groundwater that currently seeps from the Upper Bluff area into the Kreher Park fill unit.
7. At Kreher Park, site restoration will include installation of new asphalt pavement over the marina parking lot to minimize infiltration in this area. Additionally, a low permeability soil cap will be placed over the former coal tar dump area, and if applicable, a soil cap over the disposal cell.
8. Regrading and a storm water basin will be constructed within the confined area to manage storm water and restrict infiltration. The storm water basin will be lined to minimize seepage.
9. Long-term operation and maintenance of the facility will include the removal of contaminated groundwater, and annual inspection of surface barriers. A minimum of 15 groundwater extraction wells will be installed to remove groundwater and reduce the hydraulic head within the confined area. Contaminated groundwater will be conveyed to a treatment system constructed on-site prior to discharge to a sanitary or storm sewer. Discharge to the sanitary sewer system will require approval from the City wastewater treatment plant, and discharge to a storm sewer will require a WPDES permit.
10. The treatment system will include an oil water separator, transfer pumps, and air stripper. This remediation equipment will be housed in a small on-site treatment building.

In-Situ Chemical Oxidation

In addition to the remedial components described above, in-situ chemical oxidation (GW-6) can be used to possibly enhance groundwater treatment. This will be determined during the pre-design phase. Chemical oxidation introduces strong oxidizing chemicals such as permanganate and peroxide into the subsurface to degrade VOCs and PAH compounds to CO_2 and H_2O end products. Permanganate or peroxide could be injected as liquid reagents through boreholes, wells, or mixed with a backhoe in shallow trenches. Chemical oxidation has an added benefit of enhancing biodegradation by increasing oxygen concentrations in the subsurface. Chemical oxidation could be performed on saturated and unsaturated zone soils by injecting chemicals into the subsurface via borings or wells.

In-situ chemical oxidation could be used for unsaturated and saturated zone contamination at the Upper Bluff. However, existing conditions at the Upper Bluff area (the NSPW facility building and buried gas holders) and at Kreher Park (wood waste layer) may limit implementability. Mixing reagent in shallow trenches would be the most effective treatment method at Kreher Park because contamination is present at shallow depths at the former coal tar dump area, and would be easily accessible. Because in-situ chemical oxidation reactions can result in the generation of off-gases, primarily CO_2, passive venting or an active SVE system may be required to capture off-gases. The presence of NAPL may require multiple applications to lower contaminant concentrations to acceptable levels. Key elements for the conceptual design for in-situ chemical oxidation for shallow soil and groundwater at the Site follow:

1. Demolition of the center section of the NSPW service center south of St. Claire Street would be required to access contaminated soil beneath the building at the Upper Bluff area.
2. Between 200 and 300 injection borings would be advanced in the Filled Ravine using a direct push drill rig.
3. It is assumed that approximately 1,500 gallons of reagent would be injected into each boring.
4. Injections would be completed in a controlled manner and monitored to ensure that reaction off-gases do not create unsafe conditions (i.e. explosive conditions). A minimum of 10 passive vent wells would be installed in the Filled Ravine to allow off-gases to escape, which would minimize the subsurface migration of gases. Each vent well would be installed to an approximate depth of 20 feet with well screens 10 feet in length. Because the water table would intersect the well screen, these wells may also be used to recover fluids that rise to the surface in response to chemical reactions taking place in the subsurface. Recovered fluids would be placed in a holding tank and discharged to the on-site treatment system.
5. Site restoration at the Upper Bluff area would include replacement of existing asphalt pavement and new pavement over the footprint of the demolished building south of St. Claire Street. New pavement on the north of St. Claire Street would also be installed to prevent infiltration into this section of the Filled Ravine.
6. At Kreher Park, site preparation would include clearing and grubbing small trees and bushes along the bluff and near the former seep area as needed.
7. Chemical oxidation at Kreher Park would be completed above and in the wood waste layer where DNAPL is encountered and at the former coal tar dump area by mixing reagent in a shallow excavation.
8. Additionally, between 100 and 150 injection borings would be advanced at the former seep area and near TW-11 where DNAPL has been encountered. A direct push drill rig would be used to advance these borings, and approximately 1,500 gallons of reagent would be injected into each boring. Existing wells MW-7 and TW-11 would be used as passive vent wells in these areas.
9. Site restoration would include installation of new asphalt pavement over the marina parking lot and a low permeability soil cap over the former coal tar dump area to minimize potential exposure to subsurface contamination and minimize infiltration.
10. Regrading and a storm water basin would be constructed within the confined area to manage storm-water and restrict infiltration.
11. Multiple applications may be needed to reduce contaminant levels to the extent practicable. Two applications were assumed for cost-estimating purposes. The first application would be completed in a regular grid pattern over the treatment area, but additional applications would be completed within the treatment area as needed.

Although chemical oxidation applications can be completed within a short period of time, the groundwater extraction system may be operated for several years. Long-term groundwater monitoring to evaluate natural attenuation and institutional controls would be included with this remedial response.

Copper Falls Aquifer: Alternative GW-9B – NAPL Removal using Enhanced Groundwater Extraction System. Groundwater extraction uses water as a carrier to remove both NAPL and dissolved phase contamination. The existing interim groundwater extraction system currently extracts groundwater from one well installed at the mouth of the Filled Ravine, and groundwater and DNAPL from three low-flow wells installed in the underlying Copper Falls aquifer. Enhanced removal at the Upper Bluff area will include installation of additional low-flow extraction wells in the Copper Falls aquifer to increase DNAPL removal rates, and continued operation of existing wells EW-1, EW-2, and EW-3. This will also include continued operation of EW-4. Key elements for enhanced groundwater and NAPL extraction in the Upper Bluff area follow.

1. A minimum of 12 extraction wells will be installed in the Copper Falls aquifer.
2. Installation of lateral piping between each extraction well and the existing treatment building.
3. Replacement of existing asphalt pavement south of St. Claire Street and new pavement north of St. Claire Street will be installed to reduce infiltration into the ravine fill.
4. Recovered fluids will be treated on site prior to discharge to the sanitary or storm sewer. NAPL that is separated from the recovered fluids will be sent off-site for treatment and disposal. Discharge to the sanitary sewer system will require approval from the City wastewater treatment plant, and discharge to a storm sewer will require a WPDES permit. This will require upgrades to the existing treatment system (i.e. new oil water separator, and air stripper for increased volume).

The groundwater extraction system at the Upper Bluff area may be operated for an extended period of time. Long-term groundwater monitoring will be required to evaluate natural attenuation and institutional controls will also be implemented as part of this option. Based on the historical operation of the existing system, a combined groundwater extraction rate of two to three gallons per minute (gpm) was used to evaluate long-term operation and maintenance costs. Additional wells will result in an increase of the combined flow rate to 10 to 15 gpm, which will require an upgrade to the existing treatment system.

In addition, implementation of in-situ chemical oxidation (GW-6) for the underlying Copper Falls would be more extensive: it may require groundwater extraction rather than soil vapor extraction. EPA's SITE program completed a demonstration pilot test to fully evaluate the implementability of this alternative at the Site. This will be determined during the pre-design phase. Chemical oxidation may also increase the mobility of NAPL recovered by extraction wells resulting in the removal of significant contaminant mass in a short time frame. Preliminary results from the SITE program pilot test indicate that injection into areas with NAPL contaminants resulted in an initial vigorous reaction followed by an increase in the mobility and recovery of NAPL. Key elements for the conceptual design for in-situ chemical oxidation for the Copper Falls aquifer follow:

1. Between 250 and 500 injection borings would be advanced in the Copper Falls aquifer using a direct push drill rig.
2. It is assumed that approximately 1,500 gallons of reagent would be injected into each boring.

3. Existing extraction wells EW-1, EW-2, and EW-3 would continue to operate during and after reagent injection.
4. A minimum of 7 additional extraction wells would be installed in the Copper Falls aquifer in borings advanced with hollow stem auger using a rotary drill rig.
5. Recovered fluids would be treated on site prior to discharge to the sanitary or storm sewer. This would require upgrades to the existing treatment system. Discharge to the sanitary sewer system would require approval from the City wastewater treatment plant, and discharge to a storm sewer would require a WPDES permit.
6. Multiple applications may be needed to reduce contaminant levels to the extent practicable. Two applications were assumed for cost-estimating purposes. The first application would be completed in a regular grid pattern over the treatment area, but additional applications would be completed within the treatment area as needed.

Although chemical oxidation applications can be completed within a short period of time, the groundwater extraction system may be operated for several years. Long-term groundwater monitoring to evaluate natural attenuation and institutional controls would be included with this remedial response.

Ozone Sparging

Ozone sparging is an in-situ chemical oxidation technology that can be used to oxidize and degrade contaminants in groundwater. Because ozone is a gas, it can be injected into the saturated zone as a gas via sparging. Sparging consists of injecting air or oxygen rich ozone into an aquifer as a gas through small diameter sparge wells. Commercially, ozone is generated by a high voltage discharge through air or oxygen in an ozone generator. Generally, yields are on the order of 1 to 3-percent ozone by volume in air and 2 to 6-percent ozone by volume in oxygen. In water, ozone decomposes to form free radicals. These free radicals are strong oxidizers and react with contaminants in water to form carbon dioxide and water. As an additional benefit, ozone treatment increases the dissolved oxygen level in the water when any un-reacted free radicals combine to form water and oxygen; the dissolved oxygen content in groundwater promotes biodegradation of contaminants.

Ozone sparging is typically used for dissolved phase contamination, but is typically not used in areas where NAPL is present. If used for NAPL contamination, groundwater extraction will likely be needed because ozone/air injection may displace NAPL and/or cause a chemical reaction increasing the mobility of NAPL. This mobilized material is then recovered via extraction wells. It will be determined during pre-design whether ozone sparging will be used for the Copper Falls aquifer. Key elements for the conceptual design of an ozone sparging system follow:

1. All sparge wells would be installed in soil borings advanced with a hollow stem auger by a rotary drill rig.
2. Sparge wells would be installed on approximate 50-foot diameter centers, and one control panel will inject ozone into a cluster of 12 sparge wells.
3. Six control panels would be needed for groundwater in the underlying Copper Falls aquifer.

4. All air lines between the sparge wells and control panels would be buried in shallow trenches.
5. For the Copper Falls aquifer, the groundwater extraction system would be operated concurrent with the ozone sparge system to recover NAPL.

The ozone sparge system may need to be operated for several years. Long-term groundwater monitoring would be required to evaluate the effectiveness of the sparging and subsequent natural attenuation, and institutional controls would be included with this remedial response.

Conduct O&M and Long-Term Monitoring: Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure the integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments. The long-term monitoring will evaluate achievement of the specified action levels and will ascertain whether the remedial actions objectives were achieved. The sampling endpoints, monitoring frequency and criteria will be part of the approved O&M plan.

Institutional Controls: Implement land use controls as provided under chapter 292 of the Wisconsin Statutes, as part of the remedial action to prohibit use of contaminated groundwater and restrict use of land at the Filled Ravine, Upper Bluff and Kreher Park to prevent exposure to contaminants that remain in groundwater and soil after implementation of the remedial action. Institutional controls to prohibit use of groundwater will be required until groundwater cleanup goals are achieved.

Institutional Controls (ICs) are necessary to prevent interference with the remedy and to reduce human or ecological receptors' exposure to contaminants. ICs are defined as non-engineered instruments, such as administrative and legal controls, that help minimize potential for exposure to contamination and protect the integrity of the remedy. ICs are also required to assure long-term protectiveness for those areas that do not allow for unlimited use and unrestricted exposure. ICs are also required to maintain the integrity of the remedy. At this Site, ICs are required to protect the cap (engineered remedy), and reduce potential exposure for all areas where residual contamination will remain. Also, interim ICs may be necessary to prevent exposure to contaminants which may be released during construction activities such as dredging, capping and placing of covers. Long-term protectiveness requires compliance with effective ICs. Hence, effective ICs must be implemented, monitored and maintained.

Institutional controls will be identified as part of the remedial design process in an Institutional Control Implementation and Assurance Plan (ICIAP) for review and approval by EPA and WDNR. The required ICs may include property use controls (such as easements and restrictive covenants), governmental controls (including zoning ordinances and local permits), and informational devices (including signage and fish consumption advisories). The ICIAP shall identify parties responsible (i.e., federal, State or local authorities or private entities) for implementation, enforcement, and monitoring and long-term assurance of each institutional control including costs, both short-term and long-term, and methods to fund the costs and responsibilities for each step.

The ICIAP shall include maps, which shall describe coordinates of the restricted areas on paper and provide shape files in an acceptable GIS format (i.e., NAD 83) depicting all areas that do not allow unlimited use/unrestricted exposure, where dredging is not allowed, and areas where ICs have been implemented along with a schedule for updating them. The maps and information about the ICs shall be made available to the public in at least several ways, such as a website that is easily accessible to the public and posted in the public library. In addition the ICIAP shall identify reporting requirements associated with each institutional control which shall include at a minimum an annual certification to EPA regarding the status and effectiveness of the ICs. The ICIAP shall also provide additional information to the public to assure protectiveness of the remedy (such as fish consumption advisories).

12.3 Performance Standards for Selected Sediment Remedy

The following table shows the relationship between the RAL and the overall cleanup goal for the selected sediment remedy, which is based on a surface weighted average concentration (SWAC).

Relationship Between Remedial Action Level and Cleanup Goal

	Concentration	Concentration Based on Organic Carbon Content of 0.415%*	Requirement
Remedial Action Level (RAL)	2,295 ug tPAH/g OC	9.5 ppm	Excavate/dredge (depending on area) all sediments exceeding the RAL, as determined by the characterization data collected during the RI and/or additional pre-design sampling.
Cleanup Goal (SWAC)	2,295 ug tPAH/g OC surface weighted average concentration across entire remedial footprint No sample to exceed 5,324 ug tPAH/g OC (also known as the "not-to-exceed threshold")	9.5 ppm surface weighted average concentration across entire remedial footprint No sample to exceed 22 ppm (also known as the "not-to-exceed threshold")	SWAC to be measured following excavation/dredging actions, but prior to placement of lakebed stabilization layer. SWAC to be reconfirmed following placement of lakebed stabilization layer.

* Based on the data collected during the RI, 0.415% OC was determined to be the best representation of the OC content of the existing sandy-type sediments at the site. The sediments that will be present at the site following completion of the excavation/dredging actions is anticipated to be similar to those upon which the 0.415% OC determination was based, but will need to be evaluated. If the OC content of the top layer of sediments is lower than 0.415%, then a cleanup goal of 9.5 ppm for those sediments would not be protective. If necessary, the 9.5 ppm cleanup goal will be adjusted based on the OC content of the sediments so that the 2,295 ug/g OC cleanup goal is achieved.

The sediment remedy implemented at the Site shall meet the following performance standards, or other equivalent performance standards approved by EPA:

- All NAPL source material shall be removed.
- All targeted sediments with PAH concentrations exceeding the RAL, as determined by the characterization data collected during the RI and additional pre-design sampling data, shall be excavated/dredged (depending on the area).
- Upon completion of excavation/dredging activities and prior to placement of a lakebed stabilization layer, the SWAC cleanup goal (including the not-to-exceed threshold) shall be achieved, averaged across the entire remedial footprint.
- For dredging actions, surface water quality standards, as identified as ARARs, shall not be exceeded outside the containment area(s) or turbidity curtains and floating hydrocarbon booms, including releases of NAPL sheens and/or turbidity. (A pre-design pilot test is needed to determine whether turbidity curtains and floating hydrocarbon booms are sufficient to control releases during dredging in the further offshore areas, or whether sheet piling is needed to contain the area(s) being dredged. Sheet piling must be used for any dredging, including pilot test dredging, within the heavily-contaminated near shore area.)
- For dredging actions, surface water quality standards, as identified as ARARs, shall be achieved within and throughout the containment area(s) prior to any water within the containment area(s) being released to the larger water body.
- Air quality standards, as identified as ARARs, shall not be exceeded outside the exclusion zone (work/handling) or during the transport of contaminated media.
- All local, state and federal permitting requirements, if necessary, shall be followed.
- Sediment, wood debris, NAPL, carriage and contact water, and waste generated by the project shall be managed to prevent the release of contaminants and potential contamination off-site to land and waters.
- Following the achievement of the sediment cleanup goal, the lakebed throughout the remedial footprint shall be stabilized with a suitable granular material (sand/gravel) approved by EPA and WDNR.
- Any waste that is to be discharged to a publicly-owned treatment system shall meet all requirements set forth in that facility's permit including pretreatment standards.
- Appropriate measures to control airborne particulate matter shall be taken during all excavation/dredging and materials handling activities.
- Local, state, and federal noise pollution requirements shall be met.
- All investigation derived waste shall be handled in accordance with EPA guidance and EPA's offsite rule.

As described above, the overall goal of the sediment cleanup is to achieve the SWAC cleanup goal following excavation/dredging, prior to the placement of the lakebed stabilization layer. (The SWAC is then to be reconfirmed following placement of the lakebed stabilization layer.) However, in the event that the SWAC cleanup goal cannot be met prior to placement of the lakebed stabilization layer, despite the utilization of best efforts and best available excavation and dredging technologies and techniques (as determined by EPA and WDNR), the Agencies may decide to allow use of the lakebed stabilization layer as a sediment residual cover to assist in meeting the SWAC.

12.4 Remedial Approach for Sediments

The remedy adopts sediment removal (discussed below) as the remedial approach for sediments exceeding the RAL.

- **Sediment removal requirements.** All sediment with total PAH concentrations exceeding the RAL, as determined by the characterization data collected during the RI and additional pre-design sampling, will be targeted for removal in Chequamegon Bay. More specifically, in each sediment removal area, sediment shall be removed to a target elevation that: (1) encompasses all contaminated sediment exceeding the RAL, including an overdredge allowance, as appropriate; and (2) removes additional sediment to ensure that side slopes are stable for the remaining sediment.

- **Sediment removal methods and precautions.** The more heavily contaminated near shore sediments, which contain NAPLs and have the greatest amount of wood debris, shall be removed in the dry using conventional excavation equipment. Excavation in the dry will require the construction of impermeable barriers such as steel sheet piling to enclose the area(s) to be excavated, and dewatering within those area(s). The less contaminated sediment further from shore will be removed using mechanical or hydraulic dredging equipment or other appropriate sediment removal technologies. Dredging operations further from shore will require a semi-permanent confinement system in the bay (e.g., sheet pile wall, breakwater wall) at the outer edge (north) of the Site work area to minimize dispersal of suspended sediments or floating free product. The details of the system and exact requirements will be fully delineated during the pre-design phase and Remedial Design for the sediment remedy. In addition, during dredging operations turbidity curtains and floating hydrocarbon booms will be deployed to minimize dispersal of resuspended sediments or free product. Using only silt curtains and hydrocarbon booms during dredging operations further from shore will not likely provide adequate protection to keep contamination from being released from the Site and entering Chequamegon Bay and Lake Superior outside the Site boundaries, and therefore, a sound containment system (i.e., sheet pile, breakwater) will be necessary to protect the waters of Chequamegon Bay and Lake Superior. If sheet piling is utilized, the sheet pile will not be removed until water concentrations within the enclosure have returned to ambient or protective levels. Kreher Park will be used as a staging area for sediment removal activities.

- **Sediment dewatering, water treatment and disposal.** Thermal desorption of sediment may be needed to pre-treat contaminated media prior to off-site disposal. The on-site treatment of contaminated sediment will reduce the volume of material transported off-site for disposal if used as backfill for excavated areas.

  Superfund cleanups are required to meet substantive discharge requirements of the Clean Water Act, but National Pollutant Discharge Elimination System (NPDES) permits are not required for on-site work. Thus, water generated by dredging and dewatering operations will be treated prior to discharge back to the Lake and will meet all state and federal water quality standards. Such treatment may include (but is not limited to) bag filter and granulated activated carbon (GAC) treatment. Treated water will be sampled and analyzed to verify compliance with the appropriate discharge requirements.

  The existing treatment system at the Upper Bluff can be utilized to treat wastewater generated during dewatering activities. The rate of water removed from the dewatering will likely exceed the influent treatment rate, but storage tanks can be used for temporary water storage. However, this system will not be adequate to treat wastewater generated from sediment dewatering. Dredged sediment will require dewatering and stabilization prior to treatment and/or off-site disposal. This will require temporary on-site wastewater treatment. Equipment used for treatment of wastewater resulting from sediment dewatering can also be used to treat groundwater recovered during excavation dewatering activities, and later can be used for the long-term treatment of groundwater at Kreher Park.

- **Post-removal confirmatory surveys and sampling.** After removal of sediments from a particular area, surveys and sampling in the area will be done to determine whether the sediment removal requirements specified above are met. The post-removal surveys and sampling will initially be conducted when the party implementing the remedy believes it has removed the sediments to the specified targeted elevation. If the surveys and/or sampling shows that the sediment removal requirements (including the sediment cleanup goal) are not met in an area, then additional sediment in the area shall be removed until compliance with the sediment removal requirements is achieved. If, despite the utilization of best efforts and best available excavation and dredging technologies and techniques (as determined by EPA and WDNR), the sediment cleanup goal cannot be met, then post-removal dredge residuals management measures may be needed, and the Agencies may decide to allow use of the lakebed stabilization layer as a sediment residual cover to assist in meeting the SWAC cleanup goal.

  Sampling of Dredged Areas

  Definitions: For purposes of this ROD, "generated residuals" means sediment that, as a result of dredging operations, is resuspended and re-deposited on the surface of the newly-dredged area (e.g., within the top six inches of the sediment). The term "undisturbed residuals" (also known as "undredged inventory") means sediment that is more than six inches below the sediment surface in a newly dredged area.

Sampling: The post dredge core samples will extend at least twelve inches into the sub-aqueous material. The samples to be analyzed will be a top 6-inch layer representing the generated residuals layer and extending the full 6 inches (i.e., the 0 to 6 inch depth from the top of the post-dredge sediments), and a second 6-inch layer representing the top of the undisturbed residual (undredged inventory) layer (i.e., the 6 to 12 inch depth from the top of the post-dredge sediments). Both samples will be composited and analyzed separately.

- **Post-removal residuals management for dredged areas**

If post-dredging confirmatory sampling detects generated residuals with tPAH concentrations that will not allow the SWAC cleanup goal over the entire remedial footprint to be met, or if any sample of generated residuals exceeds the not-to-exceed threshold; or if confirmatory sampling results of the undisturbed residuals exceed the RAL; or if evidence of residual free product in the form of sheen or globules are present in the samples, then the following actions will be taken:

  - Generated residuals with a tPAH concentration greater than the not-to-exceed threshold at any sampling location must be removed (typically by hydraulic re-dredging) until the not-to-exceed threshold is met, and/or additional generated residuals must be removed until the SWAC cleanup goal over the entire remedial footprint can be met.

  - Undisturbed residuals with a tPAH concentration exceeding the RAL at any sampling location must be removed (typically by re-dredging) in accordance with the sediment removal requirements specified above.

  - Generated or undisturbed residuals showing evidence of free product shall be removed until all NAPL material is removed and sampling shows no evidence of free product.

- **Other Features of the Sediment Remedy**

  - **Site Preparation.** Staging areas will be required for facilities associated with sediment dewatering, sediment handling, and water treatment. Specific staging areas will be identified during the remedial design process. Site preparation at the staging areas will include collecting soil samples, securing onshore property equipment staging, and constructing necessary onshore facilities for sediment management and transportation. Docking facilities for dredging equipment and ancillary equipment may need to be constructed and multiple staging areas may be necessary. Preparation for remedial actions shall also include obtaining needed access agreements and landfill disposal agreements, if necessary.

  - **Demobilization and Site Restoration.** Demobilization, site restoration, and decontamination of all equipment will require removing all equipment from the staging and work areas and restoring the Site to a condition acceptable to EPA,

WDNR and the property owner. The sheet piling placed in the Chequamegon Bay will be removed only after contaminant concentrations within the enclosure have returned to ambient conditions or below protective levels.

- **Long-term monitoring of surface water, sediment, lakebed stabilization layer, fish and benthic community.** Although the SWAC cleanup goal is to be achieved immediately upon successful implementation of the remedy, long-term monitoring of surface water and sediment is required to ensure that the containment components of the land-based remedy are functioning properly and not releasing additional contamination into the bay. Long-term monitoring and maintenance of the lakebed stabilization layer is also required to ensure its integrity over time. In addition, fish sampling and benthic community surveys are required to assess the effect of the sediment cleanup on those communities. A detailed Long-Term Monitoring and Maintenance Plan, specifying the types and frequency of monitoring and maintenance, will be developed during the remedial design process.

12.5 Description of Alternate Sediment Remedy

As mentioned above in Section 12.2, if a pre-design pilot test for wet dredging of the near shore area is conducted and indicates that dredging rather than dry excavation within the near shore area will attain the established performance standards and can be conducted in a manner protective of human health and the environment, then EPA, in consultation with WDNR, will recommend that an alternate sediment remedy (Alternative SED-4, dredging) be selected. A more detailed description of Alternative SED-4 is included in Appendix N-2. The remaining components of the remedy for Kreher Park, Upper Bluff/Filled Ravine, and the Copper Falls aquifer would be the same as described in Section 12.2 of this ROD.

Alternative SED-4 would remove wood debris from sediments and mechanically or hydraulically dredge sediments that exceed the RAL. After dredging is completed, six inches of clean fill/sand will be placed on dredged areas for lakebed stabilization. Precautions will be taken to ensure that the contaminated sediments do not impact the underlying soil in the sediment staging area. Dewater and stabilize sediments at Kreher Park area and treat wastewater to meet state and federal discharge limits; discharge treated wastewater to the lake. Transport stabilized sediments off-site to NR 500 licensed landfill or thermal treatment. Dispose or burn wood debris separately. Alternative SED-4, if selected as the sediment remedy in an ESD, would use the same performance standards and remedial approach as described in Sections 12.3 and 12.4 of this ROD.

A description of the pre-design pilot test for wet dredging of the near shore areas, if such a pilot test is to be conducted, as well as the performance standards that would be used to judge the success of such a pilot test, are contained in Section 12.6 below.

12.6 Pre-design Pilot Test for Dredging of Near Shore Sediments

Before EPA would consider selecting the alternate sediment remedy discussed above, a pre-design pilot test would need to be conducted to determine whether wet dredging for the near-shore sediments will meet performance standards and can be conducted in a manner protective of human health and the environment. The draft pilot test locations are depicted on Figure 1A in Appendix Q. If a pilot test is to be conducted, the final/actual pilot test locations must be approved by EPA and WDNR.

- **Performance standards for pilot test**

  The following table shows the relationship between the RAL and the pilot test average concentration cleanup level.

Relationship Between Remedial Action Level and Cleanup Level for Pilot Test

	Concentration	Concentration Based on Organic Carbon Content of 0.415%*	Requirement
Remedial Action Level (RAL)	2,295 ug tPAH/g OC	9.5 ppm	Dredge all sediments in pilot test area exceeding the RAL, as determined by the characterization data collected during the RI and/or additional pre-design sampling.
Pilot Test Cleanup Level	2,295 ug tPAH/g OC surface weighted average concentration over dredged pilot test area No sample to exceed 5,324 ug tPAH/g OC (also known as the "not-to-exceed threshold")	9.5 ppm surface weighted average concentration over dredged pilot test area No sample to exceed 22 ppm (also known as the "not-to-exceed threshold")	Concentration to be measured following dredging activities in pilot test area

* Based on the data collected during the RI, 0.415% OC was determined to be the best representation of the OC content of the existing sandy-type sediments at the site. The sediments that wil be present at the site following completion of the excavation/dredging actions is anticipated to be similar to those upon which the 0.415% OC determination was based, but will need to be evaluated. If the OC content of the top layer of sediments is lower than 0.415%, then a cleanup level of 9.5 ppm for those sediments would not be protective. If necessary, the 9.5 ppm cleanup level will be adjusted based on the OC content of the sediments so that the 2,295 ug/g OC cleanup level is achieved.

The following performance standards, or other equivalent standards approved by EPA, would need to be met in order for the pre-design pilot test to be judged a success.

- All NAPL source material shall be removed.
- All targeted sediments with PAH concentrations exceeding the RAL, as determined by the characterization data collected during the RI and/or additional pre-design sampling, shall be dredged.
- Upon completion of dredging activities, post-dredging confirmatory sampling results must show that the cleanup level (including the "not-to-exceed threshold") identified in the table above has been achieved.
- Surface water quality standards, as identified as ARARs, shall not be exceeded outside the containment area(s) including releases of NAPL sheens and/or turbidity.
- Surface water quality standards, as identified as ARARs, shall be achieved within and throughout the containment area(s) prior to any water within the containment area(s) being released to the larger water body.
- Air quality standards, as identified as ARARs, shall not be exceeded outside the exclusion zone (work/handling) or during the transport of contaminated media.
- All local, state and federal permitting requirements, if necessary, shall be followed.
- Sediment, wood debris, NAPL, carriage and contact water, and waste generated by the project shall be managed to prevent the release of contaminants and potential contamination off-site to land and waters.
- Any waste that is to be discharged to a publicly-owned treatment system shall meet all requirements set forth in that facility's permit including pretreatment standards.
- Appropriate measures to control airborne particulate matter shall be taken during all dredging and materials handling activities.
- Local, state, and federal noise pollution requirements shall be met.
- All investigation derived waste shall be handled in accordance with EPA guidance and EPA's offsite rule.

- **Remedial Approach for Pilot Test**

Sediment removal requirements. All sediment in the pilot test area with total PAH concentrations exceeding the RAL, as determined by the characterization data collected during the RI and/or additional pre-design sampling, will be targeted for removal. More specifically, in each pilot test area, sediment shall be removed to a target elevation that: (1) encompasses all contaminated sediment exceeding the RAL, including an overdredge allowance, as appropriate; and (2) removes additional sediment to ensure that side slopes are stable for the remaining sediment. The pilot test area will be a portion of the containment area sufficient in size to demonstrate the effectiveness of the pilot approach.

The lakebed areas within the containment area but outside of the test area will require some dredging in insure stable side slopes at the conclusion of the pilot and the removal of the containment walls. Side slope dredging will also need to insure the removal of all NAPL to prevent the recontamination of the pilot test area. The size of the containment area and test area will be approved by EPA and WDNR.

Sediment Removal Methods and Precautions. Dredging will be conducted within impermeable barriers such as steel sheet piling to contain releases. Fabric curtains or booms alone will not be sufficient within the heavily-contaminated near shore area because they permit water and sediments to travel below them and soluble contaminants to travel through them. Sheet piling will not be removed until water concentrations within the enclosure have returned to ambient or protective levels.

Sediment Dewatering, Treatment and Disposal. Same as described in Section 12.4.

Post-Removal Confirmation Surveys and Sampling for Pilot Test. After removal of sediments from the pilot test areas, surveys and sampling in the areas will be done to determine whether the sediment removal requirements specified above are met. The post-removal surveys and sampling will initially be conducted when the party conducting the pilot test believes it has removed the sediments to the specified targeted elevation. If the surveys and/or sampling shows that the sediment removal requirements (including the pilot test cleanup level) were not met in the pilot test area, then additional sediment in the area shall be removed until compliance with the sediment removal requirements is achieved.

Sampling of Dredged Areas

Definitions: For purposes of this ROD, "generated residuals" means sediment that, as a result of dredging operations, is resuspended and re-deposited on the surface of the newly-dredged area (e.g., within the top six inches of the sediment). The term "undisturbed residuals" (also known as "undredged inventory") means sediment that is more than six inches below the sediment surface in a newly dredged area.

Sampling: The post dredge core samples will extend at least twelve inches into the sub-aqueous material. The samples to be analyzed will be a top 6-inch layer representing the generated residuals layer and extending the full 6 inches (i.e., the 0 to 6 inch depth from the top of the post-dredge sediments), and a second 6-inch layer representing the top of the undisturbed residual (undredged inventory) layer (i.e., the 6 to 12 inch depth from the top of the post-dredge sediments). Both samples will be composited and analyzed separately.

Post-removal residuals management for pilot test

If post-dredging confirmatory sampling detects generated residuals with tPAH concentrations exceeding the pilot test cleanup level (see table above, including the not-to-exceed threshold), or if confirmatory sampling results of the undisturbed residuals exceed the RAL; or if evidence of residual free product in the form of sheen or globules are present in the samples, then the following actions will be taken:

- Generated residuals with a tPAH concentration greater than the not-to-exceed threshold at any sampling location must be removed (typically by hydraulic re-dredging) until the not-to-exceed threshold is met, and/or additional generated residuals must be removed until the pilot test cleanup level for the dredged area is met.

- Undisturbed residuals with a tPAH concentration exceeding the RAL at any sampling location must be removed (typically by re-dredging) in accordance with the sediment removal requirements specified above.

- Generated or undisturbed residuals showing evidence of free product shall be removed until all NAPL material is removed and sampling shows no evidence of free product.

12.7 Summary of the Estimated Remedy Costs and Time Required for Implementation

The estimated cost of the selected remedy for the Ashland/NSP Lakefront Site is $83 to $97 million. The remedial design is expected to take 9 to 12 months to complete, and the remedial action is expected to take at least three years to complete. Appendix P contains the cost breakdown for Scenario 10.

The information in Appendix P and the cost estimate summary table is based on the best available information regarding the scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedy. Changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment, as appropriate. The cost estimate is expected to be within +50 to -30 percent of the actual project cost.

12.8 Expected Outcomes of the Selected Remedy

The selected remedy for the Ashland/NSP Lakefront Site, Scenario 10, will achieve the RAOs for the Site as described in Section 8 of this ROD. The selected remedy will be protective of human health and the environment and will comply with ARARs. The following are the expected outcomes that will be achieved by implementing Scenario 10:

- The former MGP facility property will be available for beneficial commercial/industrial use, and Kreher Park will be available for recreational use.

- Soil and sediment at the Site will have PAH and VOC concentrations below specified cleanup levels, which will reduce the potential human health and ecological risks to acceptable levels. Cleanup standards for various COCs in soil are listed in the table at the end of this section. The cleanup goal for sediments is specified in the table in Section 12.3 of this ROD.

- Elevated concentrations of metals in groundwater (e.g., arsenic) will be removed since nearly all of the elevated metals that were detected in the upper aquifer are located within the areas that will be excavated under the "limited soil removal" component of the remedy. The groundwater cleanup standards for metals are listed in the table at the end of this section.

- For shallow groundwater at Kreher Park and the Upper Bluff/Filled Ravine, the remedy will achieve the dual objectives of containment and restoration. The remedy, which includes engineered surface and vertical barriers and a groundwater extraction and treatment system (and possibly in-situ treatment), will meet the containment objective by controlling the source of contamination and preventing additional contamination from migrating to Chequamegon Bay. The remedy will also serve to restore the groundwater to its beneficial use by reducing contaminant levels in groundwater to meet MCLs and State of Wisconsin Drinking Water Standards over time. The cleanup standards for various COCs in groundwater are listed in the table at the end of this section.

- For the Copper Falls Aquifer, the remedy will serve the dual objectives of containment and restoration. Enhancing the existing groundwater extraction and treatment system (and possibly using in-situ treatment) will hydraulically control the groundwater contamination and NAPL in the aquifer. The remedy will also serve to make progress toward restoring groundwater to beneficial use. However, given the large quantity of NAPL in the Copper Falls Aquifer, it may end up being technically impracticable to restore the aquifer. If that is the case and EPA decides to waive the requirement to meet the specified groundwater cleanup standards within a certain zone due to technical impracticability, then EPA will properly document that decision in accordance with Agency guidance. The cleanup standards for various COCs in groundwater are listed in the table at the end of this section.

- There are anticipated beneficial socio-economic and community impacts that will result from the remediation. The City of Ashland is currently interested in revitalization of the area. The City has a proposed Waterfront Development Plan for the lakefront and Kreher Park area that includes a possible new marina and an updated park. Any planned projects will not move forward until the areas are remediated.

Cleanup Standards for Soil and Groundwater					
Analyte	Soil (units as shown)	Groundwater (ug/L)	Analyte	Soil (units as shown)	Groundwater (ug/L)
1,2,4-Trichlorobenzene	62,160 ug/kg		Dibenzofuran	145,263 ug/kg	
1,2,4-Trimethylbenzene	51,608 ug/kg	480 (total)	Ethylbenzene	395,000 ug/kg	700
1,3,5-Trimethylbenzene	21,253 ug/kg		Fluoranthene	600,000 ug/kg	400
1-Methylnaphthalene	1,100,000 ug/kg		Fluorene	600,000 ug/kg	400
2-Methylnaphthalene	600,000 ug/kg		Indeno(1,2,3-cd)pyrene	88 ug/kg	
Acenaphthene	900,000 ug/kg		Iron	23,463 mg/kg	300
Acenaphthylene	18,000 ug/kg		Lead	50 mg/kg	15
Anthracene	5,000,000 ug/kg	3000	Manganese	1,762 mg/kg	50
Antimony	31.3 mg/kg	6	Mercury		2
Arsenic	0.039 mg/kg	10	Methylene Chloride		5
Barium		2000	Naphthalene	20,000 ug/kg	100
Benzene	643 ug/kg	5	n-Butyl benzene	240,000 ug/kg	
Benzo(a)anthracene	88 ug/kg		Nickel	1,564 mg/kg	100
Benzo(a)pyrene	8.8 ug/kg	0.2	Pentachlorophenol	2,979 ug/kg	1
Benzo(b)fluoranthene	88 ug/kg	0.2	Phenanthrene	18,000 ug/kg	
Benzo(g,h,i)perylene	1,800 ug/kg		Phenol	18,330,929 ug/kg	6000
Benzo(k)fluoranthene	800 ug/kg		Pyrene	500,000 ug/kg	250
Beryllium	154 mg/kg	4	Pyridine		10
Cadmium	8 mg/kg	5	Selenium		50
Chloroform		6	Silver	391 mg/kg	50
Chloromethane		3	Styrene		100
Chromium		100	Thallium		2
Chrysene	8,800 ug/kg	0.2	Toluene	520,000 ug/kg	1000
Cobalt		40	Vanadium	78.2 mg/kg	30
Copper	3,129 mg/kg	1300	Xylenes(total)	27,063 ug/kg	10000
Cyanide		200	Zinc	23,463 mg/kg	5000
Dibenzo(a,h)anthracene	8.8 ug/kg				

13.0 Statutory Determinations

Under CERCLA Section 121 and the NCP, remedies are required to be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a waiver is justified) and be cost effective. The following subsections discuss how the selected remedy for the Ashland/NSP Lakefront Site meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The current and potential future risks at the Ashland/NSP Lakefront Site are due to the presence of elevated concentrations of PAHs and VOCs in soils, groundwater and sediment. Implementation of the selected remedy will be protective of human health and the environment, as described in the NCP, through the removal and possible treatment of contaminated soils and sediment, and through groundwater cleanup actions that will serve to contain areas of contaminated groundwater and restore groundwater to its beneficial use. Implementation of the selected remedy will reduce exposure levels to protective ARARs and EPA and WDNR acceptable ranges for carcinogenic and non-carcinogenic risk. Implementation of the selected remedy will also protect benthic organisms and other ecological receptors. The site-specific RAOs were developed to protect current and future receptors that are potentially at risk from contaminants at the Site. The selected remedy will meet the RAOs. The Site will be available for reuse at the completion of the remedial action as described in Section 12.8 above, and institutional controls will be required to ensure that the remedy remains protective.

13.2 Compliance with Applicable or Relevant and Appropriate Requirements

CERCLA, as amended by SARA, specifies that Superfund remedial actions must comply with the substantive requirements of federal and state environmental laws. Such requirements may be ARARs. In addition to ARARs, federal and state advisories and guidance documents exist that, although not binding regulations, contain information "to be considered" (TBC). ARARs and TBCs are important in developing remedial objectives that comply with regulatory requirements or guidance (as appropriate). The identification of site-specific ARARs is based on specific constituents at a site, the various response actions proposed, and the general site characteristics. As such, ARARs are classified into three general categories:

Chemical-specific ARARs – specific to the type(s) of constituents, pollutants, or hazardous substances at a site; include state and federal requirements that regulate contaminant levels in various media;

Action-specific ARARs – specific to the cleanup activities being considered; usually technology- or activity-based; regulatory requirements that define acceptable excavation, treatment, and disposal procedures; and

Location-specific ARARs – *specific to actions at the geographic location; requirements for* contaminant concentrations or remedial activities resulting from a site's physical location (e.g., wetlands or floodplains).

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. Appendix C provides all ARARs identified for the Site which will be met under this ROD. In addition to ARARs, non-enforceable guidelines, criteria, and standards may be useful in designing the selected remedy. As described above, these guidelines, criteria, and standards are known as TBCs. The selected remedy will comply with the ARARs for the Site.

13.3 Cost Effectiveness

EPA has determined that the selected remedy for the Ashland/NSP Lakefront Site is cost effective and represents value for the money to be spent. A cost effective remedy in the Superfund program is one whose costs are proportional to its overall effectiveness. The overall effectiveness of the potential remedial alternatives for the Site was evaluated in the FS by considering the following three criteria: 1) long-term effectiveness and permanence; 2) reduction in toxicity, mobility and volume through treatment; and 3) short-term effectiveness. The overall effectiveness was then compared to cost to determine whether an alternative is cost effective. Of the remedial alternatives evaluated for the Site, Scenario 10 provided the highest degree of cost effectiveness. It is important to note that more than one cleanup alternative can be cost-effective, and the Superfund program does not mandate the selection of the most cost-effective cleanup alternative. Rather, the cost-effectiveness is concerned with the reasonableness of the relationship between the effectiveness afforded by each alternative and its costs compared to other available options.

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

The selected remedy represents the maximum extent to which permanent solutions and treatment are practicable at the Ashland/NSP Lakefront Site. Treatment technologies will be utilized in certain components of the selected remedy and might be utilized in others. The selected remedy utilizes technologies with proven long-term permanence and effectiveness. The selected remedy also permanently removes the contamination from portions of the Site and safely contains the remaining contamination, allowing for reuse of the property. In addition, the selected remedy is favored by the State and local community.

13.5 Preference for Treatment as a Principal Element

This remedy satisfies the preference for treatment as a principal element of the remedy for the following reasons: (1) the treatment of contaminated PAH and VOC soils and sediment has been demonstrated for long term permanence and effectiveness, (2) the chosen remedy is a permanent remedy that is widely accepted by the community, (3) source materials consisting of principal threat wastes will be addressed within the scope of this action, and (4) NAPL that is removed from the groundwater will be sent off-site for treatment and disposal.

13.6 Five-Year Review Requirements

The NCP requires that the remedial action be reviewed no less often than every five years if the remedial action results in hazardous substances, pollutants, or contaminants remaining at the Site

above levels that allow for unlimited use and unrestricted exposure. Because this remedy will result in hazardous substances, pollutants, or contaminants in groundwater and soil remaining on-site above levels that allow for unlimited use and unrestricted exposure, including Wisconsin Preventive Action Limits (PALs), a five-year review will be required for this remedial action.

14.0 Documentation of Significant Changes from Preferred Alternative of Proposed Plan

The Proposed Plan for Ashland/NSP Lakefront Site was released for public comment on June 12, 2009, and the public comment period ran from June 17 through August 17, 2009. The Proposed Plan identified Scenario 10 as the preferred alternative for the Site. During the public comment period, comments were submitted by NSPW that stated the sediment remedy SED-6 (dry excavation near shore and dredging offshore) might be more difficult to implement and costs would be significantly higher than those estimated in the FS. Based on a comparison of the SED-6 alternative to the other alternatives using the nine criteria, it was determined that, without confirmation of the ability of dredging in near shore areas to attain performance standards, SED-6 (dry excavation near shore and dredging offshore) represents a good balance of all the options. The nine criteria analysis indicated that SED-4 (dredging) was comparable to SED-6, with the possibility of lower implementation costs, but this is subject to a successful pilot test showing that dredging can be effective for the heavily-contaminated near shore areas. Therefore, the selected remedy includes the option to conduct a pre-design pilot test to demonstrate that dredging the near shore areas can meet the performance standards and be protective of human health and the environment. If a pre-design pilot test indicates that dredging rather than excavation within the near shore area will attain the established performance standards and can be conducted in a manner protective of human health and the environment, then EPA, in consultation with WDNR, will recommend that an alternate sediment remedy (SED-4, dredging) be implemented and EPA will publish its decision in an ESD.

In addition, the Proposed Plan stated that, "the purpose of this groundwater cleanup alternative is hydraulic containment within the waste management area and restoration of the aquifer outside the waste management area" In this ROD, EPA is not designating any areas of the Site as waste management areas, and the RAOs for groundwater include meeting MCLs and State of Wisconsin drinking water standards. The selected groundwater remedy will serve the dual objectives of containment and restoration. For shallow groundwater at Kreher Park and the Upper Bluff/Filled Ravine, the engineered surface and vertical barriers and a groundwater extraction and treatment system (and possibly in-situ treatment) remedy will meet the containment objective by controlling the source of contamination and preventing additional contamination from migrating to Chequamegon Bay. The remedy will also serve to restore the groundwater to its beneficial use by reducing contaminant levels in groundwater to meet MCLs and State of Wisconsin drinking water standards over time. For the Copper Falls Aquifer, enhancing the existing groundwater extraction and treatment system (and possibly using in-situ treatment) will hydraulically control the groundwater contamination and NAPL in the aquifer, and will also serve to make progress toward restoring groundwater to beneficial use. However, given the large quantity of NAPL in the Copper Falls Aquifer, it may end up being technically impracticable to restore the aquifer. If that is the case and EPA decides to waive the requirement to meet the specified groundwater cleanup standards within a certain zone due to technical impracticability, EPA will properly document that decision in accordance with Agency guidance.

LIST OF REFERENCES CITED*

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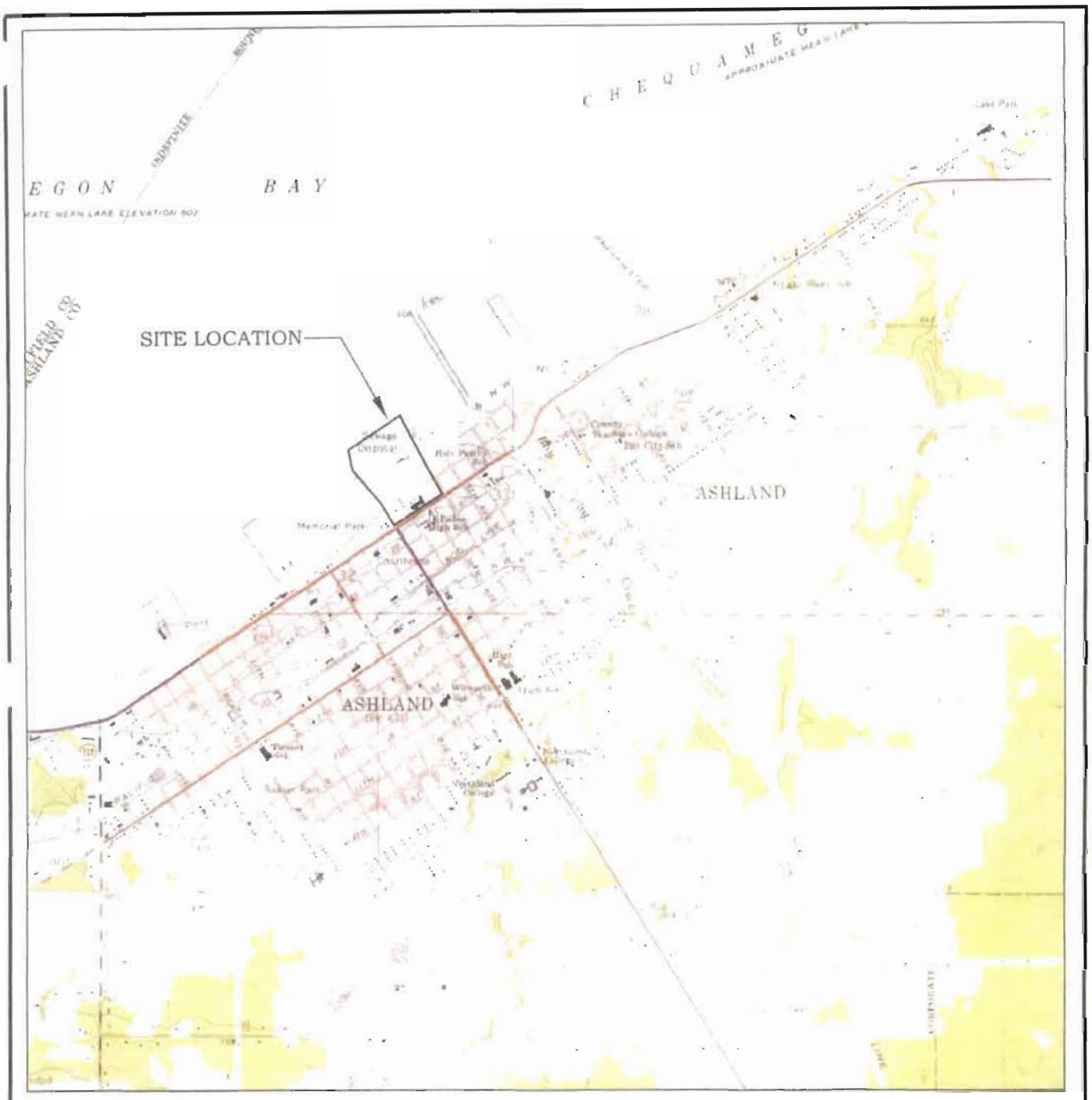
* The U.S. EPA guidance documents considered in the selection of the remedy as described in this ROD are hereby incorporated by reference into the Administrative Record for the Ashland/Northern States Power Lakefront Site.

FIGURES



BASE MAP SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, ASHLAND, WISCONSIN, DATED 1964, PHOTOREVISED 1975.

QUADRANGLE LOCATION

NORTH

0 1320 2640 5280

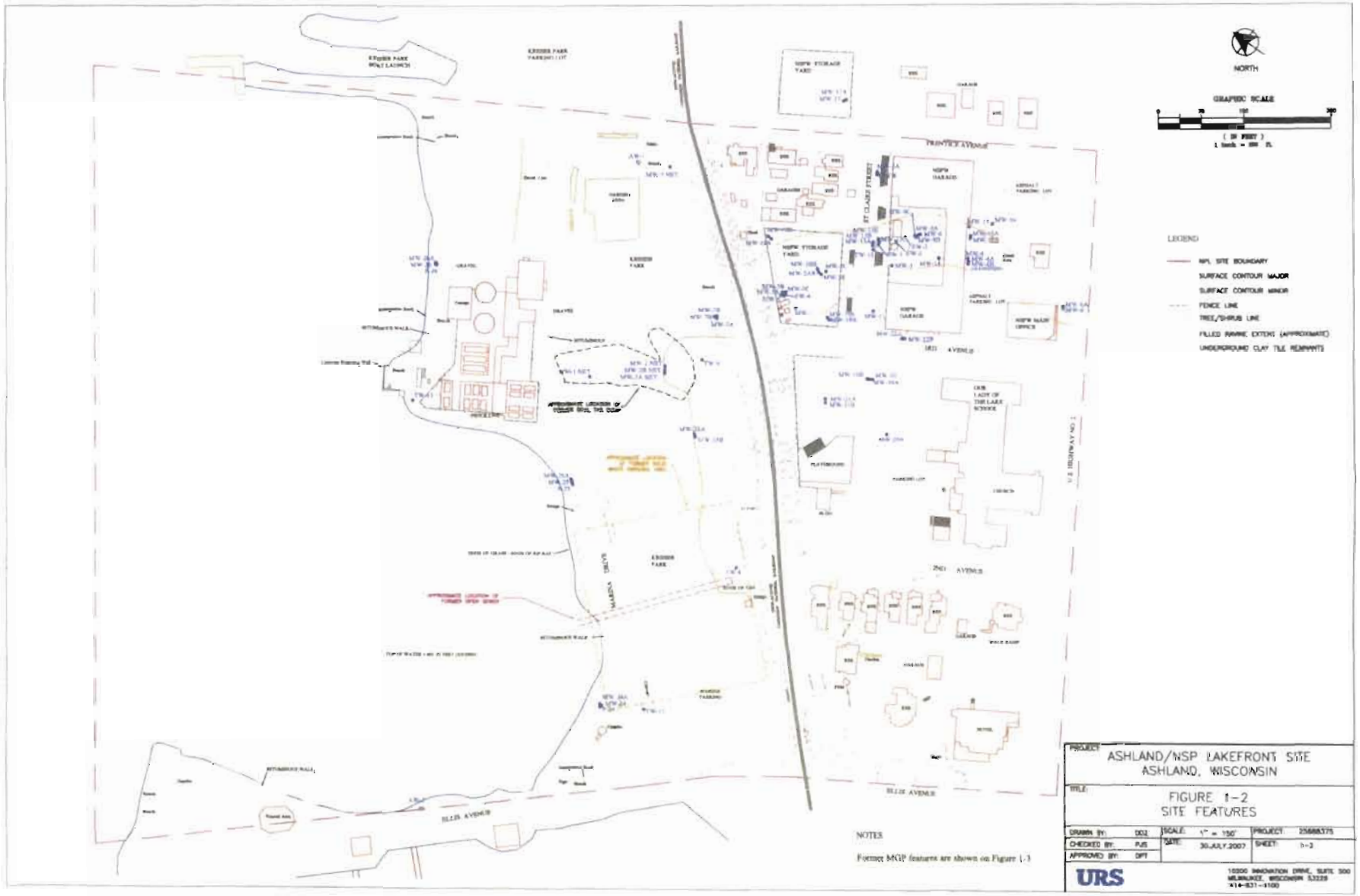
SCALE IN FEET

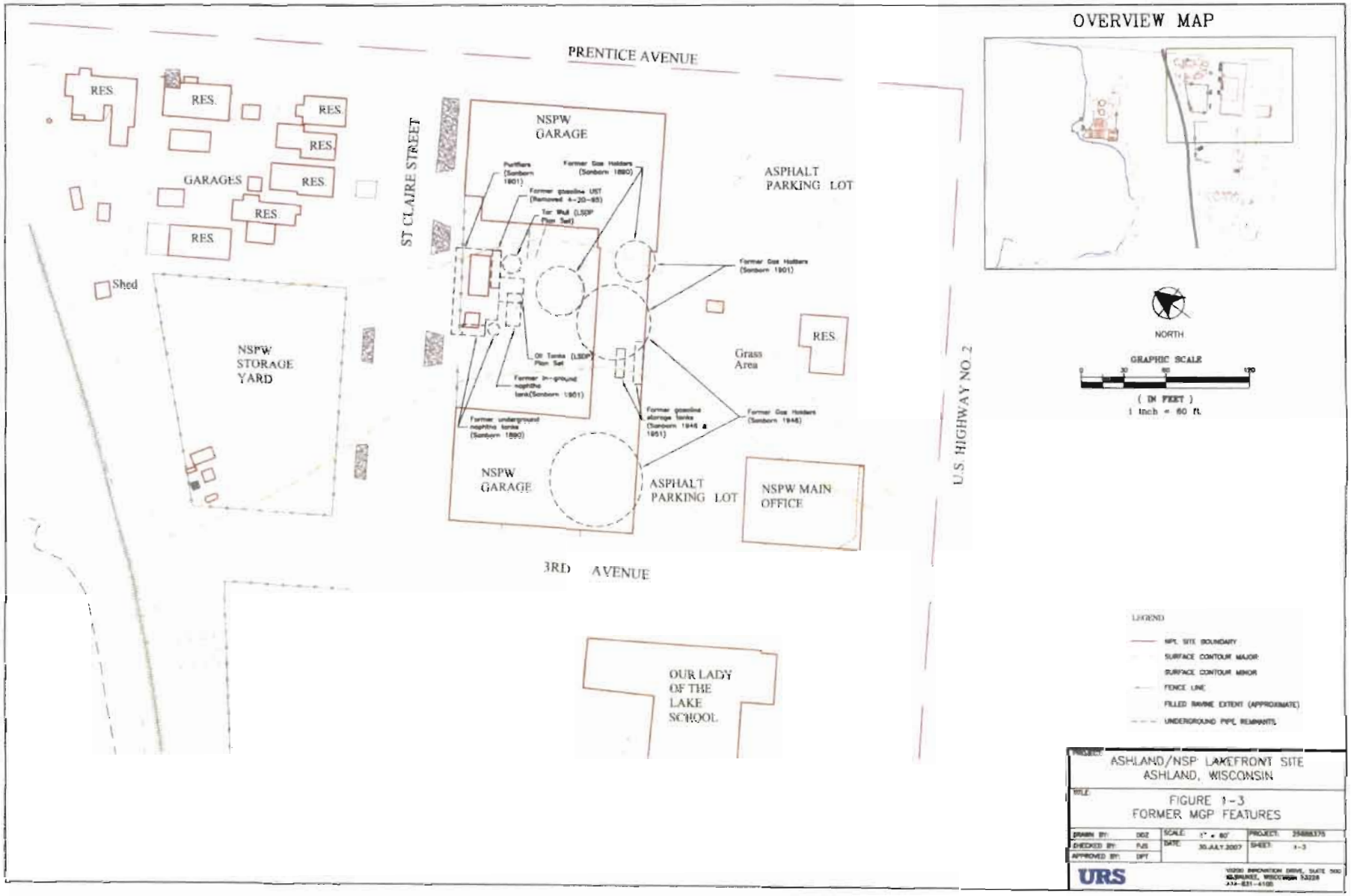
PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

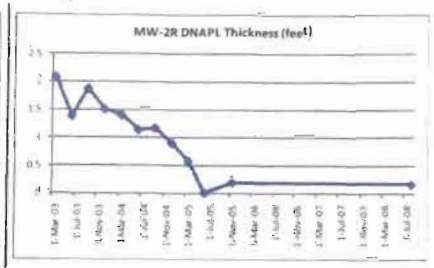
TITLE: FIGURE 1-1
SITE LOCATION

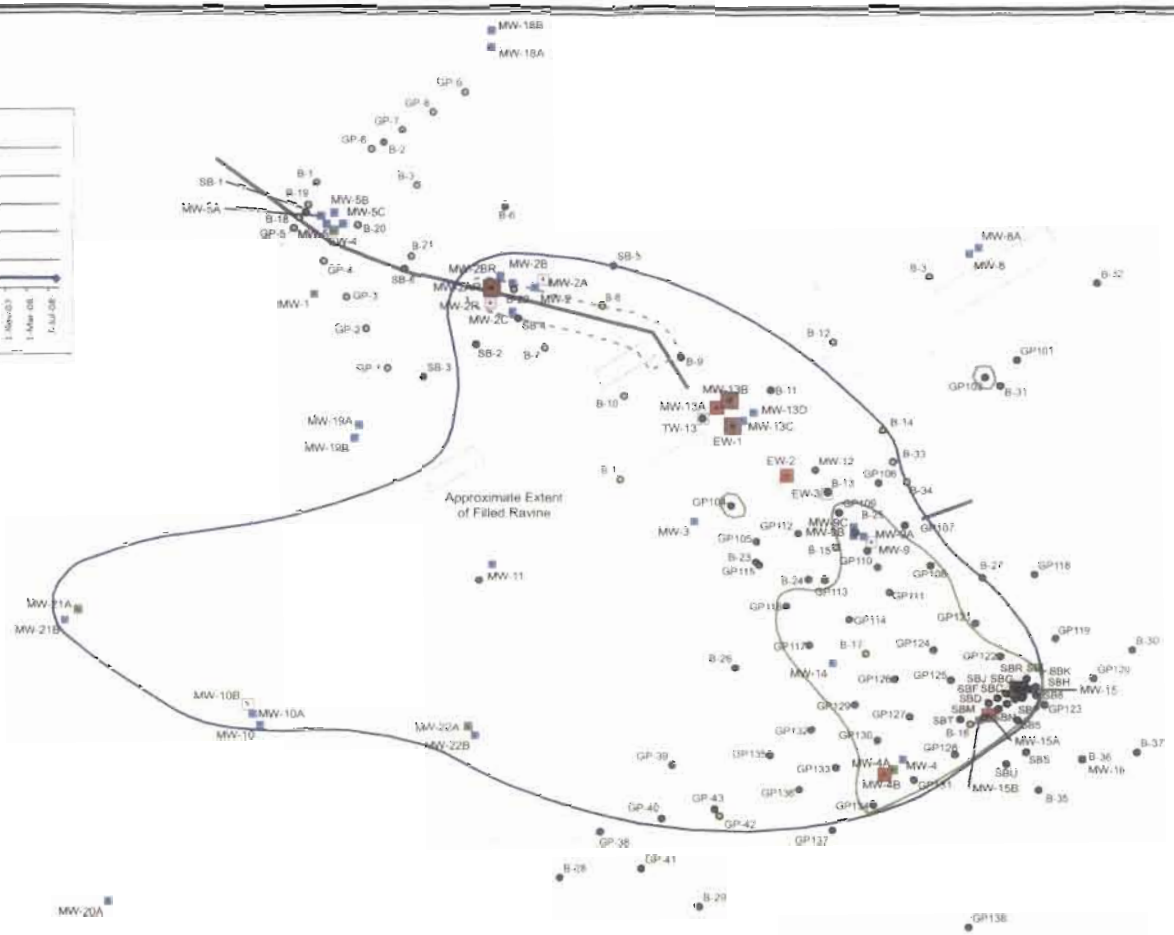
DRAWN BY: DDZ	SCALE: 1" = 2640'	PROJ. NO. 25688375
CHECKED BY: PJS	DATE: 30.JULY.2007	SHEET: 1-1
APPROVED BY: DPT		

URS
10200 INNOVATION DRIVE, SUITE 500
MILWAUKEE, WISCONSIN 53226
414-831-4100


NORTH
GRAPHIC SCALE
LEGEND
NPL SITE BOUNDARY
SURFACE CONTOUR MAJOR
SURFACE CONTOUR MINOR
FENCE LINE
TREE/SHRUB LINE
FILLED RAVINE EXTENT (APPROXIMATE)
UNDERGROUND CLAY TILE REMAINDS
PRENTICE AVENUE
ST CLAIRE STREET
3RD AVENUE
2ND AVENUE
ELLIS AVENUE
U.S. HIGHWAY NO. 2
MARINA DRIVE
NOTES
Former MGP features are shown on Figure 1-3
PROJECT
ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN
TITLE:
FIGURE 1-2
SITE FEATURES
DRAWN BY: DDZ
CHECKED BY: PJS
APPROVED BY: DPT
SCALE: 1" = 150'
DATE: 30 JULY 2007
PROJECT: 25688375
SHEET: 1-2
URS
10306 INNOVATION DRIVE, SUITE 300
MILWAUKEE, WISCONSIN 53226
414-831-4100


PRENTICE AVENUE
RES.
RES.
RES.
RES.
GARAGES
RES.
RES.
RES.
Shed
NSPW
STORAGE
YARD
ST CLAIRE STREET
NSPW
GARAGE
Purifiers
(Sanborn
1901)
Former Gas Holders
(Sanborn 1890)
Former gasoline UST
(Removed 4-20-95)
Tar Wall (LSDP
Plan Set)
Former Gas Holders
(Sanborn 1901)
Oil Tanks (LSDP
Plan Set)
Former in-ground
naphtha
tank(Sanborn 1901)
Former underground
naphtha tanks
(Sanborn 1890)
Former gasoline
storage tanks
(Sanborn 1946 &
1951)
Former Gas Holders
(Sanborn 1946)
ASPHALT
PARKING LOT
Grass
Area
RES.
NSPW
GARAGE
ASPHALT
PARKING LOT
NSPW MAIN
OFFICE
U.S. HIGHWAY NO. 2
3RD AVENUE
OUR LADY
OF THE
LAKE
SCHOOL
OVERVIEW MAP
NORTH
GRAPHIC SCALE
0
30
60
120
(IN FEET)
1 inch = 60 ft.
LEGEND
NPL SITE BOUNDARY
SURFACE CONTOUR MAJOR
SURFACE CONTOUR MINOR
FENCE LINE
FILLED RAVINE EXTENT (APPROXIMATE)
UNDERGROUND PIPE, REMNANTS
PROJECT:
ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN
TITLE:
FIGURE 1-3
FORMER MGP FEATURES
DRAWN BY: DDZ
CHECKED BY: FJS
APPROVED BY: DPT
SCALE: 1" = 60'
DATE: 30-JULY-2007
PROJECT: 35466375
SHEET: 1-3
URS





Legend

Free Product thickness (feet)
Maximum by well

- 0
- 0.1 - 1
- 1.1 - 5
- 5.1 - 10
- 10.1 - 26.3
- Historical Soil Borings
- Soil Sample Locations

Free Product Extent
Label

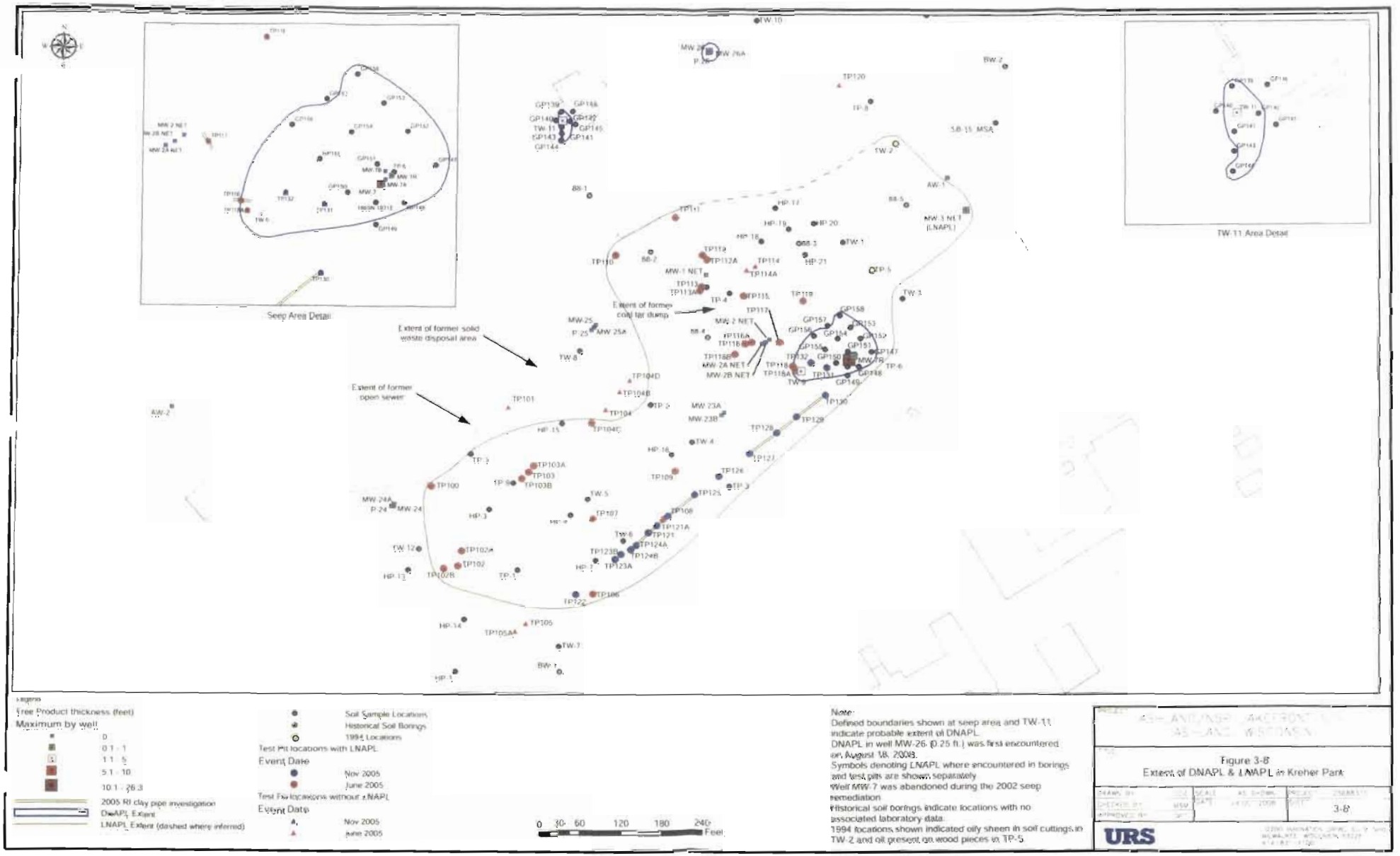
- 2001 Clay Tile Investigation
- April 2005 geoprobes
- Copper Falls wells
- Free Product Extent Inferred - Filled Ravine

0 25 50 75 100 Feet

Note:
Free product extent between TW-13 and MW-2R is based on recent data, which indicates the free product plume in this area is significantly declining (dashed line where inferred). See graph of MW-2R historical free product measurements at upper left.
Free product is assumed to approximate trace of clay tile which was removed in 2001.
Wells MW-2, MW-2A, and MW-2B were abandoned during the 2001 clay tile investigation.
Historical soil borings indicate locations with no associated laboratory data.

Figure 3-7
Extent of DNAPL in
Upper Bluff, Filled Ravine, and Copper Falls

URS


Seep Area Detail
TW-11 Area Detail
Extent of former solid waste disposal area
Extent of former coal tar dump
Extent of former open sewer
Legend
Free Product thickness (feet)
Maximum by well
0
0.1 - 1
1.1 - 5
5.1 - 10
10.1 - 26.3
2005 RI clay pipe investigation
DNAPL Extent
LNAPL Extent (dashed where inferred)
Soil Sample Location
Historical Soil Borings
1994 Locations
Test Pit locations with LNAPL
Event Date
Nov 2005
June 2005
Test Pit locations without LNAPL
Event Date
Nov 2005
June 2005
0 30 60 120 180 240
Feet
Note:
Defined boundaries shown at seep area and TW-11 indicate probable extent of DNAPL.
DNAPL in well MW-26 (0.25 ft.) was first encountered on August 18, 2008.
Symbols denoting LNAPL where encountered in borings and test pits are shown separately.
Well MW-7 was abandoned during the 2002 seep remediation.
Historical soil borings indicate locations with no associated laboratory data.
1994 locations shown indicated oily sheen in soil cuttings in TW-2 and oil present on wood pieces in TP-5.
Figure 3-8
Extent of DNAPL & LNAPL in Kreher Park
3-8
URS

Legend

- Extent of NAPL and/or sheen
- Extent of contamination

All Sed Results - Total PAH ppm

Total PAH ppm

- 0
- 1 - 5
- 6 - 9.4
- 9.5 - 100
- 101 - 200
- 201 - 1000
- >1000

0 62.5 125 250 375 500 Feet

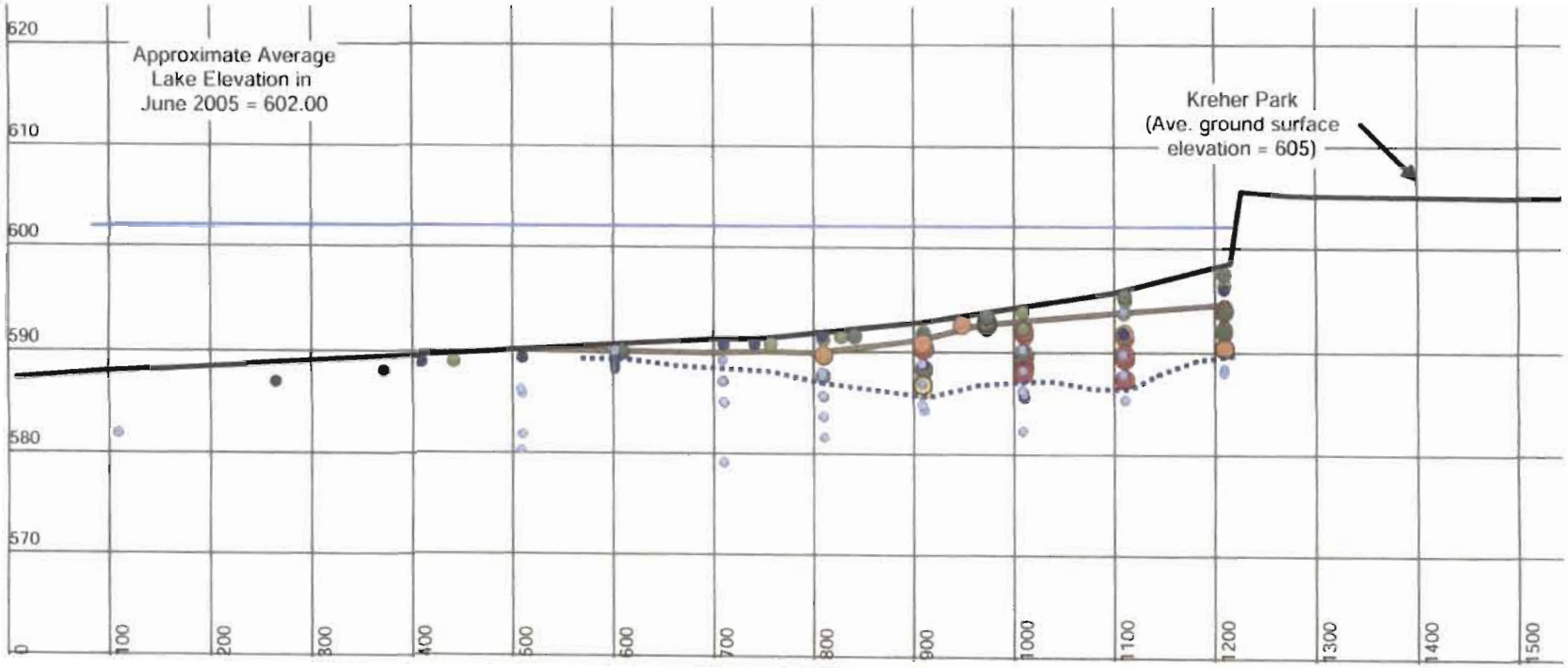
PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE: Figure 3-3
Area of Impacted Sediment

DRAWN BY	DDZ	SCALE	AS SHOWN	PROJECT	25688375
CHECKED BY	MSM	DATE	24 OCT 2008	SHEET	3-3
APPROVED BY	DPT				

URS

6737 W. WASHINGTON ST., SUITE 2265
MILWAUKEE, WISCONSIN 53214
414-831-4100



Legend

XS Total PAH ppm - NS1

total PAH - mg/kg

- ND
- 1 - 5
- 6 - 9.4
- 9.5 - 100
- 101 - 200
- 201 - 1000
- >1000

Surface Type

Type

- Top of Surface
- Water Surface
- Top of wood surface
- XY Grid (feet)

0 25 50 100 150 200 Feet

Cross Section Overview Map

Note: sample results shown depict locations within 200 feet of either side of given transect line.

Blue dashed line depicts approximate vertical extent of 9.5 ppm total PAHs

PROJECT

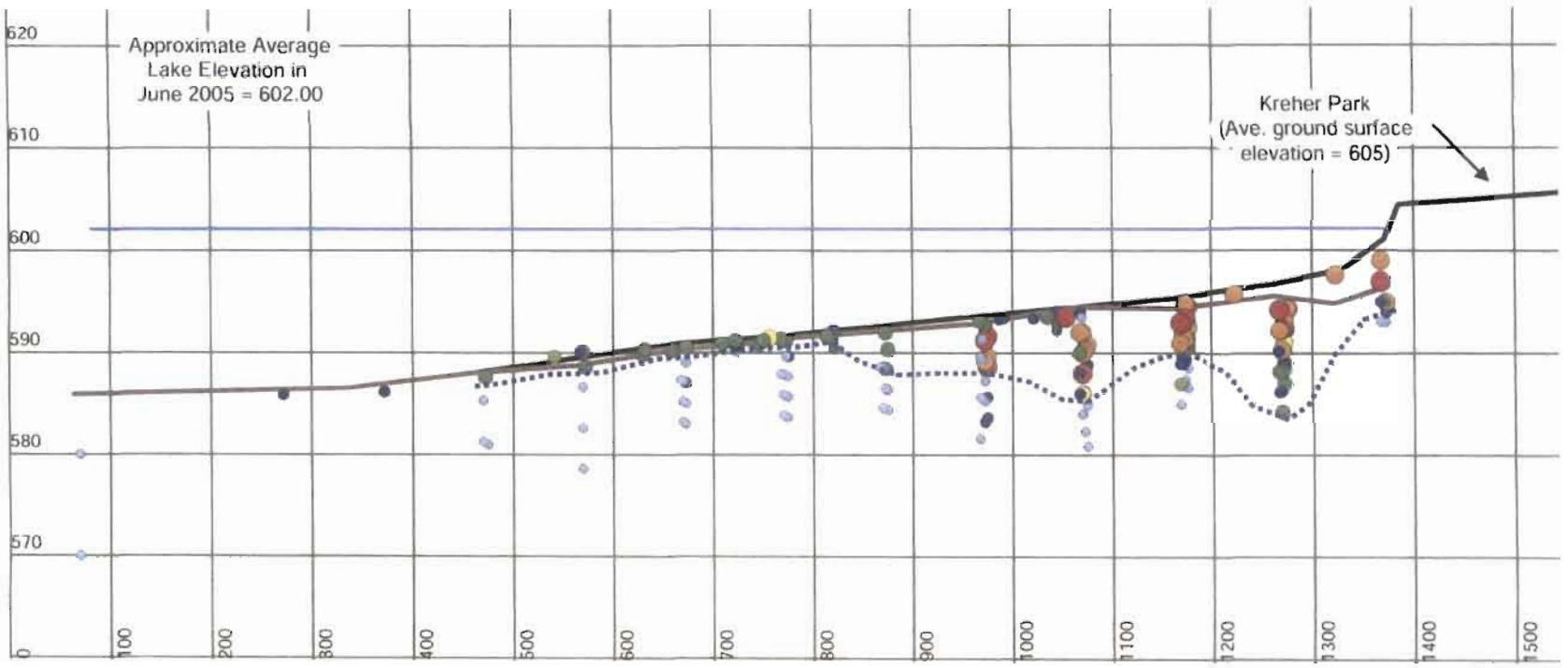
ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE

Figure 3-4
Sediment Sample Results - Total PAHs - all depths
North-South 1 cross section

DRAWN BY	DDZ	SCALE	AS SHOWN	PROJECT	25688375
CHECKED BY	WSB	DATE	24 OCT 2008	SHEET	3-4
APPROVED BY	DPT				

URS
6737 W. WASHINGTON ST., SUITE 2265
MILWAUKEE, WISCONSIN 53214
414-831-4100



Legend

XS Total PAH ppm - NS2

total PAH - mg/kg

- ND
- 1 - 5
- 6 - 9.4
- 9.5 - 100
- 101 - 200
- 201 - 1000
- >1000

Surface Type

Type

- Top of Surface
- Water Surface
- Top of wood surface
- XY Grid (feet)

0 25 50 100 150 200 Feet

Cross Section Overview Map

Note: sample results shown depict locations within 200 feet of either side of given transect line.

Blue dashed line depicts approximate vertical extent of 9.5 ppm total PAHs.

PROJECT

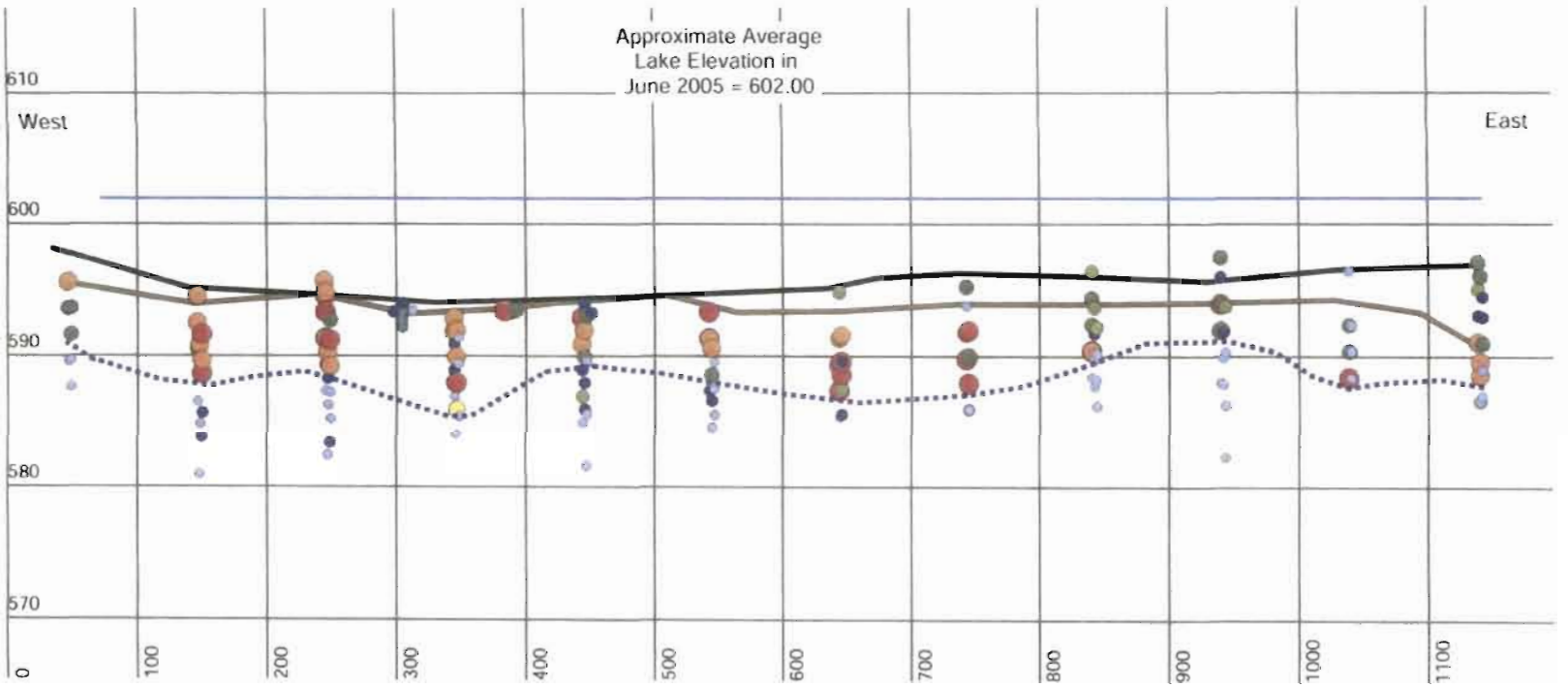
ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE

Figure 3-5
Sediment Sample Results - Total PAHs - all depths
North-South 2 cross section

DRAWN BY	DDZ	SCALE	AS SHOWN	PROJECT	25688375
CHECKED BY	WSB	DATE	24 OCT 2008	SHEET	3-5
APPROVED BY	DPT				

URS
6737 W. WASHINGTON ST., SUITE 7265
MILWAUKEE, WISCONSIN 53214
414-831-4100



Legend

XS Total PAH ppm - WE1

total PAH - mg/kg

- 0
- 1 - 5
- 6 - 9.4
- 9.5 - 100
- 101 - 200
- 201 - 1000
- 1001 - 12870000

Surface Type

Type

- Top of Surface
- Water Surface
- Top of wood surface
- XY Grid (feet)

0 25 50 100 150 200 Feet

Cross Section Overview Map

Note:
Cross section includes samples collected within 150 feet of projected cross section line; samples shown above the surface water/sediment surface interface were collected within this 300 foot width.

Blue dashed line depicts approximate vertical extent of 9.5 ppm total PAHs

PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE: Figure 3-6
Sediment Sample Results - Total PAHs - all depths
West-East 1 cross section

DRAWN BY:	DDZ	SCALE:	AS SHOWN	PROJECT:	25688375
CHECKED BY:	WSB	DATE:	24 OCT 2008	SHEET:	3-6
APPROVED BY:	DPT				

URS

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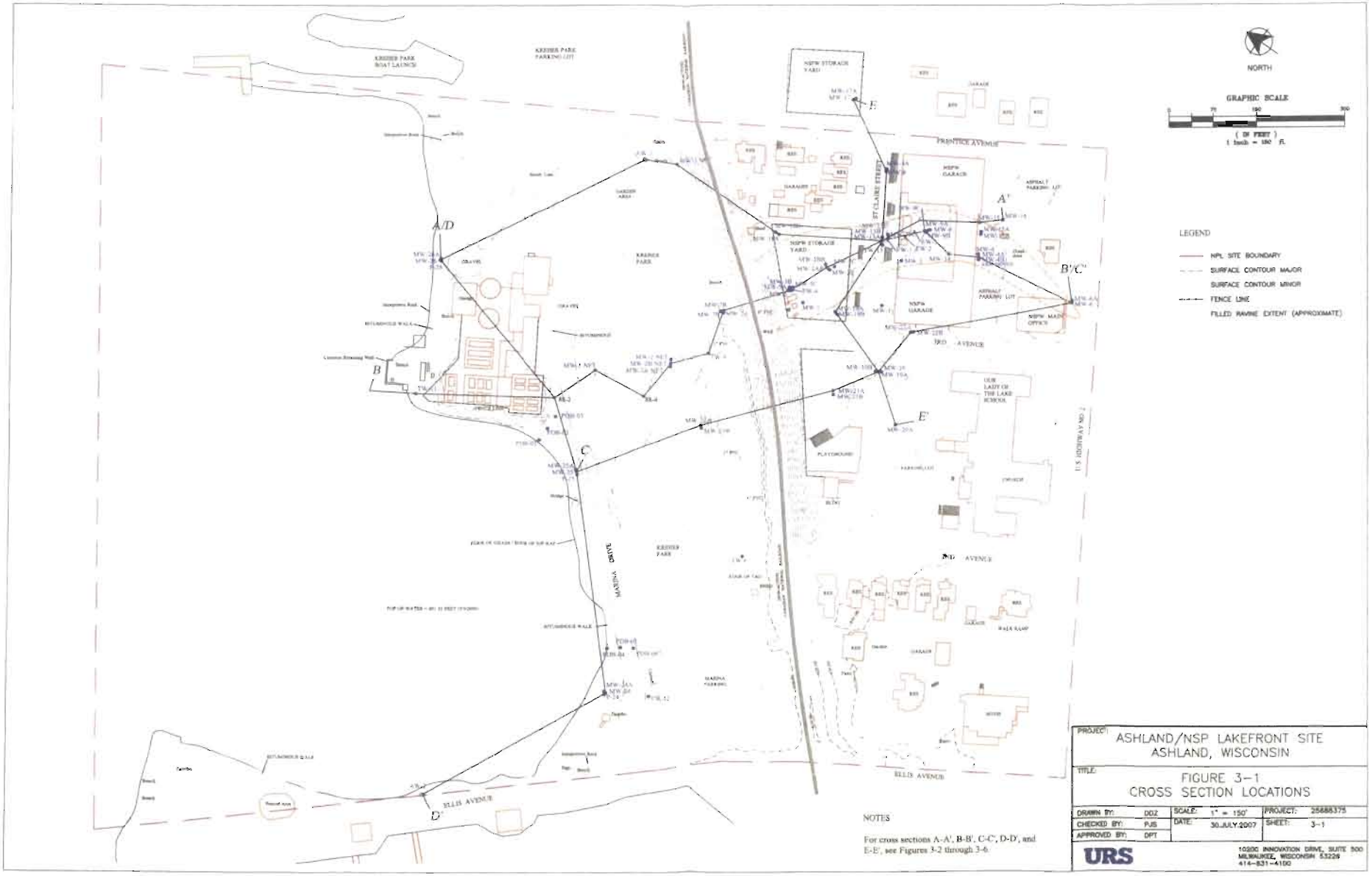
MILWAUKEE, WISCONSIN 53214
414-831-4100



NOTES

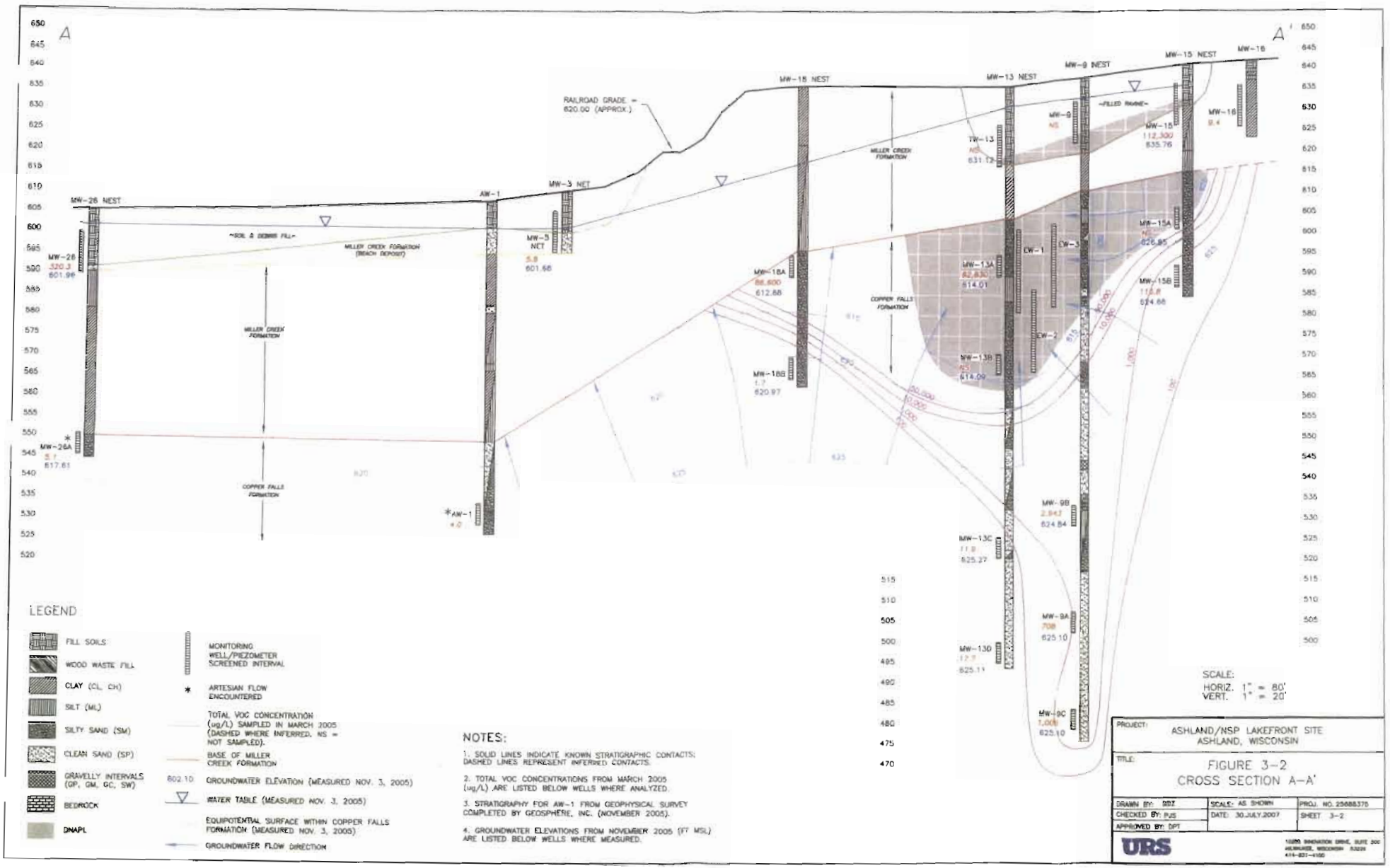
For cross sections A-A', B-B', C-C', D-D', and E-E', see Figures 3-2 through 3-6.

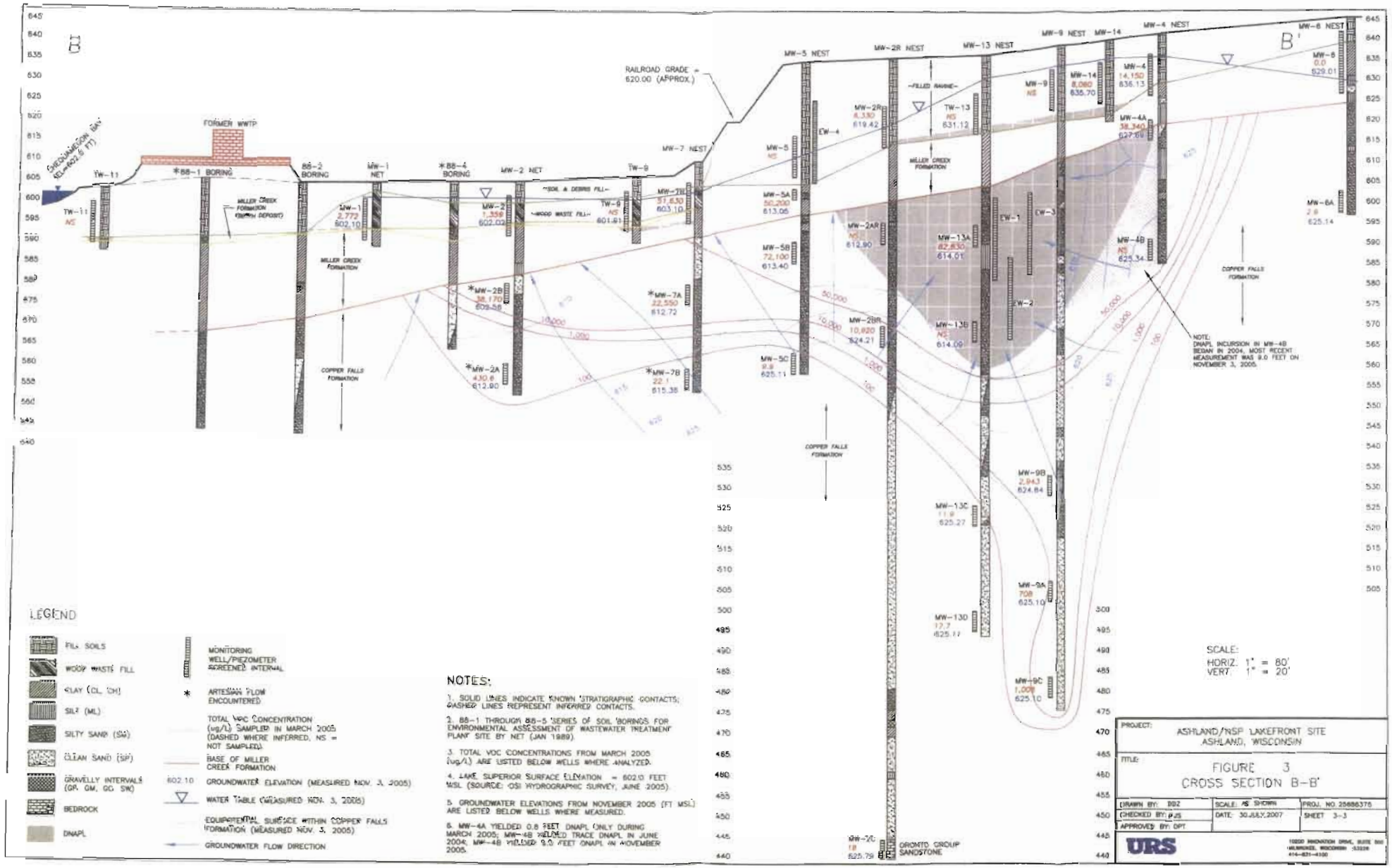
PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

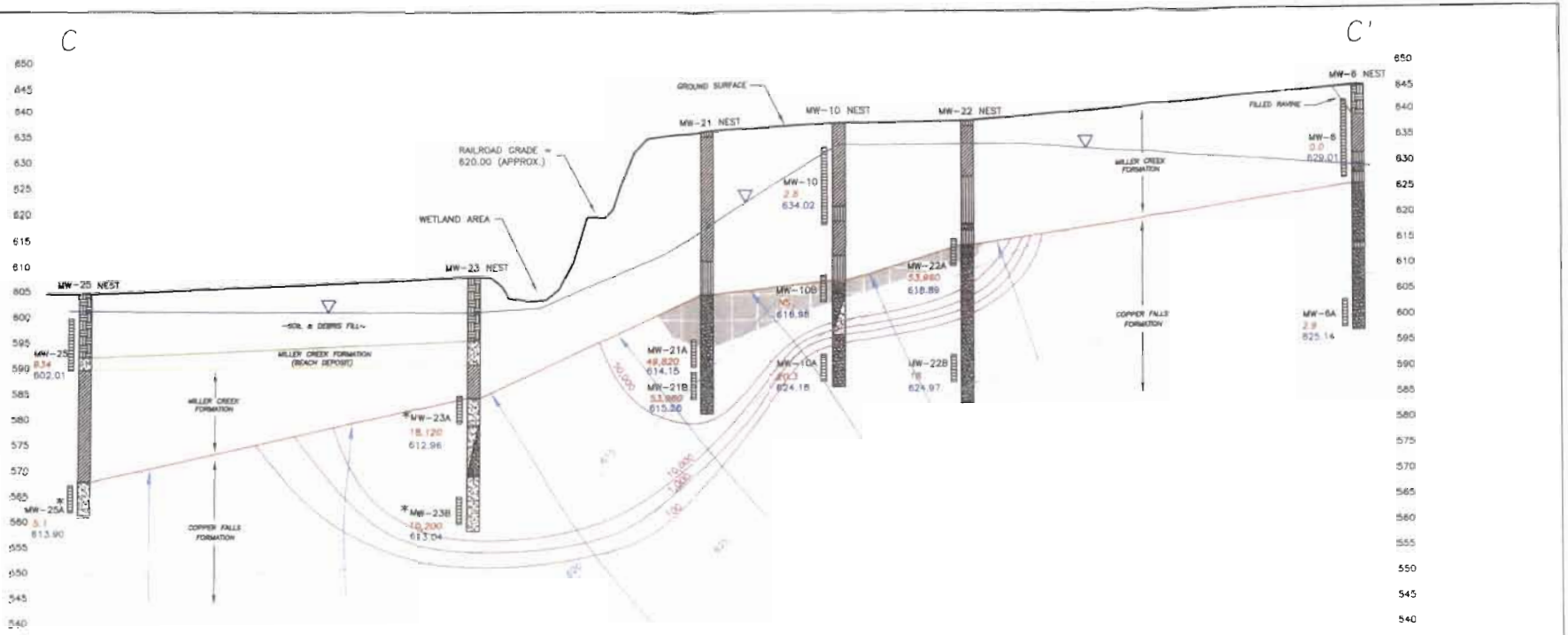
TITLE: FIGURE 3-1
CROSS SECTION LOCATIONS

DRAWN BY:	DDZ	SCALE:	1" = 150'	PROJECT:	25688375
CHECKED BY:	PJS	DATE:	30 JULY 2007	SHEET:	3-1
APPROVED BY:	DPT				

URS
10200 INNOVATION DRIVE, SUITE 500
MILWAUKEE, WISCONSIN 53226
414-831-4100


A
A'
MW-26 NEST
MW-3 NET
AW-1
MW-18 NEST
MW-13 NEST
MW-9 NEST
MW-15 NEST
MW-16
RAILROAD GRADE = 620.00 (APPROX.)
~SOIL & DEBRIS FILL~
~FILLED MARINE~
MILLER CREEK FORMATION (BEACH DEPOSIT)
MILLER CREEK FORMATION
COPPER FALLS FORMATION
MW-26 320.3 601.96
MW-26A 9.7 617.61
MW-5 NET 5.8 601.66
MW-18A 86,600 612.88
MW-18B 1.7 620.97
TW-13 NS 631.12
MW-13A 82,830 614.01
MW-13B NS 614.09
MW-13C 11.9 625.27
MW-13D 12.9 625.11
MW-9 NS
MW-9B 2,943 624.84
MW-9A 708 625.10
MW-9C 1,005 625.10
MW-15 112,300 635.76
MW-15A NS 626.85
MW-15B 115.8 624.66
MW-16 9.4
EW-1
EW-2
EW-3
AW-1 4.0
LEGEND
FILL SOILS
WOOD WASTE FILL
CLAY (CL, CH)
SILT (ML)
SILTY SAND (SM)
CLEAN SAND (SP)
GRAVELLY INTERVALS (GP, GM, GC, SW)
BEDROCK
DNAPL
MONITORING WELL/PIEZOMETER SCREENED INTERVAL
ARTESIAN FLOW ENCOUNTERED
TOTAL VOC CONCENTRATION (ug/L) SAMPLED IN MARCH 2005 (DASHED WHERE INFERRED, NS = NOT SAMPLED).
BASE OF MILLER CREEK FORMATION
602.10 GROUNDWATER ELEVATION (MEASURED NOV. 3, 2005)
WATER TABLE (MEASURED NOV. 3, 2005)
EQUIPOTENTIAL SURFACE WITHIN COPPER FALLS FORMATION (MEASURED NOV. 3, 2005)
GROUNDWATER FLOW DIRECTION
NOTES:
1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. TOTAL VOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
3. STRATIGRAPHY FOR AW-1 FROM GEOPHYSICAL SURVEY COMPLETED BY GEOSPHERE, INC. (NOVEMBER 2005).
4. GROUNDWATER ELEVATIONS FROM NOVEMBER 2005 (FT MSL) ARE LISTED BELOW WELLS WHERE MEASURED.
SCALE:
HORIZ. 1" = 80'
VERT. 1" = 20'
PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN
TITLE: FIGURE 3-2
CROSS SECTION A-A'
DRAWN BY: DDZ
CHECKED BY: RJS
APPROVED BY: DPT
SCALE: AS SHOWN
DATE: 30 JULY 2007
PROJ. NO. 25688375
SHEET 3-2
URS


B
B'
FORMER WWTP
RAILROAD GRADE = 620.00 (APPROX.)
SHEDIMENTATION BAY
TW-11
*88-1 BORING
88-2 BORING
MW-1 NET
*88-4 BORING
MW-2 NET
TW-9
MW-7 NEST
MW-5 NEST
MW-2R NEST
MW-13 NEST
MW-9 NEST
MW-14
MW-4 NEST
MW-6 NEST
MILLER CREEK FORMATION
COPPER FALLS FORMATION
~SOIL & DEBRIS FILL~
~WOOD WASTE FILL~
~FILLED RAVINE~
EW-1
EW-2
EW-3
EW-4
NOTE: DNAPL INCURSION IN MW-4B BEGAN IN 2004, MOST RECENT MEASUREMENT WAS 9.0 FEET ON NOVEMBER 3, 2005.
ORDMTO GROUP SANDSTONE
LEGEND
FILL SOILS
WOOD WASTE FILL
CLAY (CL, CH)
SILT (ML)
SILTY SAND (SM)
CLEAN SAND (SP)
GRAVELLY INTERVALS (GP, GM, GC, SW)
BEDROCK
DNAPL
MONITORING WELL/PIEZOMETER SCREENED INTERVAL
ARTESIAN FLOW ENCOUNTERED
TOTAL VOC CONCENTRATION (ug/L) SAMPLED IN MARCH 2005 (DASHED WHERE INFERRED, NS = NOT SAMPLED).
BASE OF MILLER CREEK FORMATION
602.10 GROUNDWATER ELEVATION (MEASURED NOV. 3, 2005)
WATER TABLE (MEASURED NOV. 3, 2005)
EQUIPOTENTIAL SURFACE WITHIN COPPER FALLS FORMATION (MEASURED NOV. 3, 2005)
GROUNDWATER FLOW DIRECTION
NOTES:
1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. 88-1 THROUGH 88-5 'SERIES OF SOIL BORINGS FOR ENVIRONMENTAL ASSESSMENT OF WASTEWATER TREATMENT PLANT SITE BY NET (JAN 1989).
3. TOTAL VOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
4. LAKE SUPERIOR SURFACE ELEVATION = 602.0 FEET MSL (SOURCE: OSI HYDROGRAPHIC SURVEY, JUNE 2005).
5. GROUNDWATER ELEVATIONS FROM NOVEMBER 2005 (FT MSL) ARE LISTED BELOW WELLS WHERE MEASURED.
6. MW-4A YIELDED 0.8 FEET DNAPL ONLY DURING MARCH 2005; MW-4B YIELDED TRACE DNAPL IN JUNE 2004; MW-4B YIELDED 9.0 FEET DNAPL IN NOVEMBER 2005.
SCALE:
HORIZ. 1" = 80'
VERT. 1" = 20'
PROJECT: ASHLAND/NSP LAKEFRONT SITE ASHLAND, WISCONSIN
TITLE: FIGURE 3 CROSS SECTION B-B'
DRAWN BY: DDZ
CHECKED BY: PJS
APPROVED BY: DPT
SCALE: AS SHOWN
DATE: 30 JULY 2007
PROJ. NO. 25886376
SHEET 3 OF 3
URS



LEGEND

- FILL SOILS
- WOOD WASTE FILL
- CLAY (CL, CH)
- SILT (ML)
- SILTY SAND (SM)
- CLEAN SAND (SP)
- GRAVELLY INTERVALS (GP, GM, GC, SW)
- BEDROCK
- DNAPL

MONITORING WELL/PIEZOMETER SCREENED INTERVAL

* ARTESIAN FLOW ENCOUNTERED

TOTAL VOC CONCENTRATION (ug/L) SAMPLED IN MARCH 2005 (DASHED WHERE INFERRED, NS = NOT SAMPLED).

BASE OF MILLER CREEK FORMATION

602.10 GROUNDWATER ELEVATION (MEASURED NOV. 3, 2005)

WATER TABLE (MEASURED NOV. 3, 2005)

EQUIPOTENTIAL SURFACE WITHIN COPPER FALLS FORMATION (MEASURED NOV. 3, 2005)

GROUNDWATER FLOW DIRECTION

NOTES:

1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. TOTAL VOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
3. GROUNDWATER ELEVATIONS FROM NOVEMBER 2005 (FT MSL) ARE LISTED BELOW WELLS WHERE MEASURED.

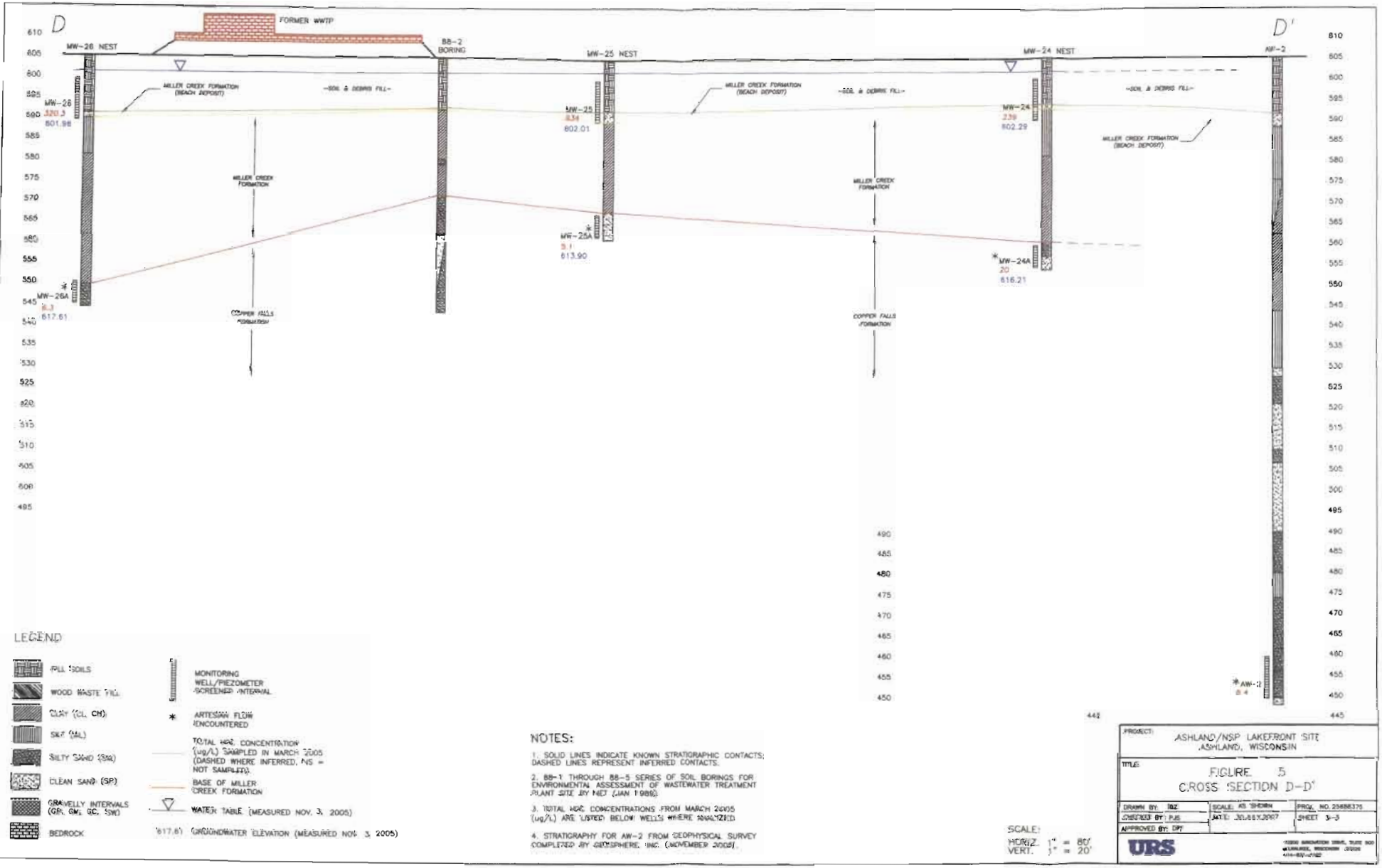
SCALE:
HORIZ. 1" = 80'
VERT. 1" = 20'

PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE: FIGURE 4
CROSS SECTION C-C'

DRAWN BY: BBZ	SCALE: AS SHOWN	PROJ. NO. 25688375
CHECKED BY: PJS	DATE: 30 JULY 2007	SHEET 3-4
APPROVED BY: DPT		

URS



NOTES:

1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. 88-1 THROUGH 88-5 SERIES OF SOIL BORINGS FOR ENVIRONMENTAL ASSESSMENT OF WASTEWATER TREATMENT PLANT SITE BY NET (JAN 1988).
3. TOTAL HOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
4. STRATIGRAPHY FOR AW-2 FROM GEOPHYSICAL SURVEY COMPLETED BY GEOSPHERE, INC. (NOVEMBER 2005).

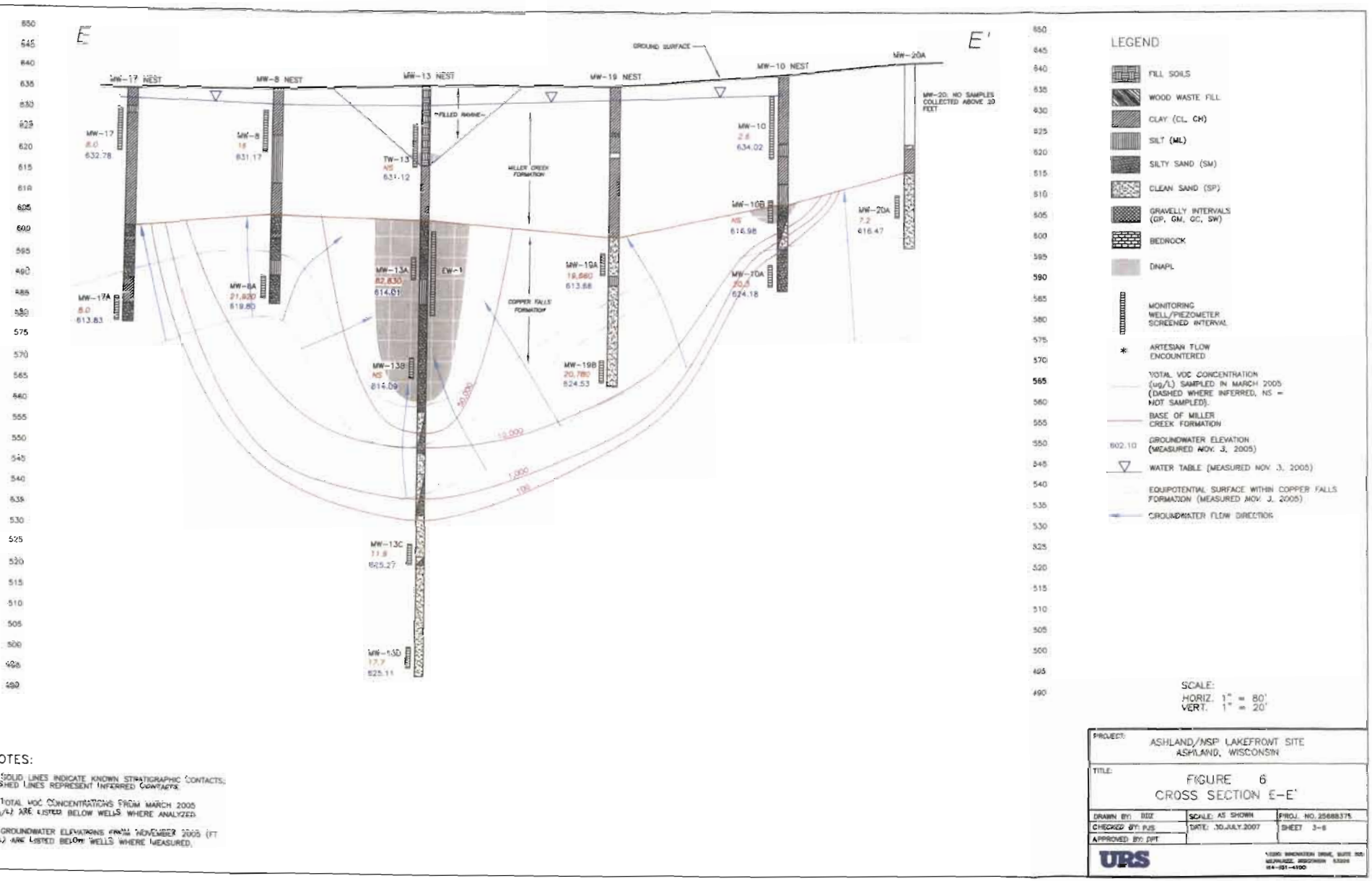
SCALE:
HORIZ. 1" = 80'
VERT. 1" = 20'

PROJECT: ASHLAND/NSP LAKEFRONT SITE ASHLAND, WISCONSIN

TITLE: FIGURE 5 CROSS SECTION D-D'

DRAWN BY: BIZ	SCALE: AS SHOWN	PROJ. NO. 25686375
CHECKED BY: PJS	DATE: 12/15/2005	SHEET 3-3
APPROVED BY: DPT		

URS



SCALE:
HORIZ. 1" = 80'
VERT. 1" = 20'

NOTES:

1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. TOTAL VOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
3. GROUNDWATER ELEVATIONS FROM NOVEMBER 2005 (FT MSL) ARE LISTED BELOW WELLS WHERE MEASURED.

PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE: FIGURE 6
CROSS SECTION E-E'

DRAWN BY: BDZ	SCALE: AS SHOWN	PROJ. NO. 25688375
CHECKED BY: PJS	DATE: 30 JULY 2007	SHEET 3-6
APPROVED BY: DPT		

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