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ABBREVIATIONS / ACRONYMS

AAC	Acceptable air concentration
ANS	American Nuclear Society
ASTM	American Society of Testing and Materials
BTEX	Benzene, toluene, ethylbenzene, and xylenes
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Concentrations of concern
CQA	Construction quality assurance
EDI	EDI Engineering and Science, Inc.
ES	Enforcement Standard
FAM	Fixed air monitor
FEMA	Federal Emergency Management Agency
FS	Feasibility study
IBS	Integrys Business Support, LLC
ISS	In situ solidification/stabilization
MGP	Manufactured gas plant
MSL	Median Sea Level
NAPL	Non-aqueous phase liquid
NRT	Natural Resource Technology, Inc.
PAH	Polynuclear aromatic hydrocarbon
PAL	Preventative Action Limit
PID	Photoionization detector
PUF	Polyurethane foam
QA	Quality assurance
QC	Quality control
RAOR	Remedial Actions Options Report
RAWP	Removal action work plan
RCL	Residual Contaminant Levels
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
TVOC	Total volatile organic compounds
UCS	Unconfined compressive strength
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources
WPSC	Wisconsin Public Service Corporation

1 INTRODUCTION

1.1 Overview

This *Removal Action Work Plan (RAWP)* is for the former Two Rivers manufactured gas plant (MGP) (Site) in Two Rivers, Wisconsin (Figure 1). Wisconsin Public Service Corporation (WPSC), a subsidiary of Integrys Energy Group, owns the former MGP. Integrys Business Support, LLC (IBS) will manage the removal action on behalf of WPSC. WPSC and the United States Environmental Protection Agency (USEPA) entered into an Administrative Order on Consent and Statement of Work, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. V-W-'06-C-847, effective May 31, 2006, to perform Remedial Investigation/Feasibility Study (RI/FS) activities at six WPSC sites under the Superfund Alternative Sites Program.

Although the RI/FS activities have not been completed, site investigations have identified MGP source material at and near the ground surface that may present an exposure risk. Therefore, this work plan outlines an emergency response (i.e., time critical) removal action to mitigate the exposure risk. The removal action addressed by this RAWP is focused on addressing MGP residuals characterized as source material that pose a potential exposure risk. This RAWP and subsequent addenda outline the scope of the proposed removal action and will serve as the statement of work for a final Administrative Order on Consent between USEPA and WPSC pertaining specifically to this removal action.

The removal action is intended as an interim action to address exposed and subsurface MGP source material that will contribute to the overall remediation goals under the RI/FS Settlement Agreement.

1.2 Project Information

Regulatory Contact:	United States Environmental Protection Agency Region V Margaret Gielniewski, On-Scene Coordinator 77 West Jackson Boulevard Chicago, IL, 60604 (312) 886-6244
Project Contact:	Integrys Business Support, LLC 130 East Randolph Drive, 22nd Floor Chicago, IL 60601 Naren M. Prasad, P.E., MPH, LEED AP Senior Environmental Engineer (312) 240-4569
Site Name:	WPSC Former Two Rivers MGP Site
Site Location:	T19N, R24E, Section 1 and 2

	200 21st Street Two Rivers, Wisconsin Manitowoc County
USEPA ID #:	WIN000509953
WDNR ID #	BRRTS # 02-36-000255
Environmental Consultant:	Natural Resource Technology, Inc. (NRT) 234 W. Florida Street, Fifth Floor Milwaukee, Wisconsin 53204
NRT Project Contact:	Ms. Jennifer M. Hagen Senior Engineer (414) 837-3607

1.3 Site History

WPSC owned and operated the Two Rivers MGP from 1925 to 1946 and coal gas was produced using the carbureted water gas method. The locations of former MGP structures, based on historic Site drawings provided by WPSC, are shown on Figure 2 and include the following:

- Boiler and meter building
- Pipe shed
- Three gas holders: 10,000 cubic feet (ft^3), 80,000 ft^3, and 90,000 ft^3 capacity
- Two oil tanks
- Two propane tanks
- Three warehouses and garages

After 1946 the facility was used for propane storage and distribution prior to the availability of natural gas in the area. WPSC maintains ownership of the Site.

1.4 Site Description

The Site encompasses approximately 4-acres in Section 1 and 2, T19N, R24E (Figure 1). Specific Site features, sampling locations, and adjacent properties are shown on Figure 2. The Site is bounded by:

- 2022 School Street to the south, owned by Manitowoc County
- The School Street right-of-way and the following private properties to the east:
  - 2100 School Street
  - 2104 School Street

    - 2110 School Street
    - 1913 22nd Street
- 1926 22nd Street to the north, owned by the US Oil Company, Inc.
- The West Twin River to the west

Site features include historic concrete building foundations. A chain link fence secures the Site perimeter. A wetland exists in the center and western portion of the property. Large portions of the Site east of the wetland are covered in crushed stone and asphalt. The vegetation in the wetland consists of a fringe scrub/shrub on the eastern edge of the wetland dominated by aspen and dogwood. Emergent and wet meadow species such as green bulrush and horsetail, are located closer to the bank of the West Twin River.

The Site has elevations ranging from approximately 579 feet mean sea level (MSL) to 584 feet MSL. Surface water drainage flows overland to the West Twin River. The majority of the Site is within the 100-year flood zone as mapped by Federal Emergency Management Agency (FEMA, 2011). Existing Site contours, wetland information, and the 100-year flood zone are show on Figure 3.

1.5 Previous Upland Investigations and Reporting

Previous Site investigations and reporting have been conducted by EDI Engineering and Science, Inc. (EDI) and NRT. A summary of previous investigations and reporting is provided in Sections 1.5.1 through 1.5.5.

1.5.1 Phase I Investigation performed by EDI in 1986

Site Investigation, Former Coal Gas Manufacturing Plant, School Street, Two Rivers, Wisconsin; EDI Engineering & Science, Inc., 1986.

The EDI (EDI, 1986) investigation consisted of collecting soil, groundwater, and air samples; advancing soil borings; and installing monitoring wells. The Phase I investigation indicated the Site is covered by wetland soils, muck, and fill. Beneath the top layer of soil is up to approximately 20 feet of inter-bedded peat, marl, sand, silt, and clay; which is underlain by a thick layer of clay. Groundwater flow is west toward the West Twin River and depth to groundwater across the Site was reported at 0 to 0.3 feet bgs (below ground surface).

During the Phase I investigation, soil, air, and groundwater samples were collected and analyzed for volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), cyanides, and metals. The results are summarized below;

- Total cyanide and Benzo(a)pyrene were detected in soils at the surface and cyanide and PAHs were detected in the subsurface.
- Several parameters were detected in an up gradient monitoring wells, but none above either the Wisconsin Administrative Code (WAC) NR140 Enforcement Standard (ES) for groundwater.
- Benzene, benzo(a)pyrene, and naphthalene were detected in down gradient monitoring wells above the WAC NR 140 ES.
- Low level PAHs and VOCs were detected in down gradient monitoring wells.
- Cyanide and sulfate were detected in southern, down gradient monitoring wells.
- Low level zinc and phenol were detected in all monitoring wells.
- Nickel was detected in all down gradient monitoring wells.

1.5.2 Phase II Investigation performed by NRT in 1994

Phase II Environmental Investigation Report, Former Manufactured Gas Plant Site, Two Rivers, Wisconsin; NRT 1995.

NRT conducted a Phase II investigation in November 1994 which included test pits and soil borings and the installation and sampling of groundwater monitoring wells. The results of the investigation are summarized below:

- Soils beneath the Site include fine and silty sands, clay, and occasional, discontinuous peat layers. The surface soils are dominated by fine sands, silts and fill material comprised of glass, wood, brick, concrete, wire, and ash/cinder. A clay layer is present between 4 and 7 feet bgs and extends to 30 feet bgs in most locations. The clay is gray to red-gray, soft, wet, and plastic, and contains varying amounts of sands and silts.
- Groundwater occurs between 0.58 and 3.20 feet bgs at the Site. Groundwater flow in both the shallow and deep wells is southwest, toward the West Twin River. The calculated horizontal hydraulic gradient is low, and moderate to strong upward gradients were calculated in all well nests. The horizontal groundwater flow is estimated to be approximately 1 to 16.5 feet per year.

- The areas of benzene and PAH impacted soil are approximately 20,000 and 24,500 square feet (or 0.47 and 0.56 acres), respectively. The depth of impacts lies below the water table. Therefore, it is likely that some of the soil impacts may be due to the shallow depth of groundwater and migration of highly impacted groundwater just beneath the surface of the Site.

- Cyanide impacts were noted at well nest MW-603 and test pit TP-605 refer to Figure 2. Cyanide impacted soils lie outside the area of BTEX and PAH impacted soils.

- Evidence of MGP tar or oil wetted material was noted between 7 and 14 feet bgs at well nests MW-605 and MW-608. At well nest MW-605 the clay layer separating the upper and lower portion of the aquifer may be mitigating tar impacts in the lower portion of the aquifer.

- BTEX, PAHs, and cyanide impacts in groundwater are widespread across the Site. BTEX and PAH results suggest that impacts on the northern portion of the property may be partially due to an off-site, up gradient source.

- Results from the piezometers suggest that deeper groundwater impacts increase with distance from source areas. Well nests MW-607 and MW-608, farther down gradient from source areas, indicate groundwater impacts are present in both the shallow and deep portion of the aquifer, but concentrations decreased by an order of magnitude with depth.

- Possible MGP residuals were noted in the boring and wells on the north side of the Site (i.e. well nest MW-605). Groundwater gradients indicate that a bulk fuel terminal directly up gradient of the Site could contribute off-site sources impacting the Site.

1.5.3 Phase II Addendum Investigation performed by NRT in 1996

Phase II Addendum Investigation Results, Former Two Rivers Manufactured Gas Plant (MGP) Site, Two Rivers, Wisconsin. WDNR Transmittal; NRT, Nov. 13, 1996,

During the Phase II Addendum Investigation (NRT, 1996), NRT installed additional soil borings and monitoring wells to gather additional information on the Site. The sampling events for this Addendum occurred in March and September of 1996. A summary of the investigation is provided below:

- Soil samples around and to west of the MGP facilities, surface and subsurface, had BTEX detected above the WAC NR 720 RCL values.

- Total PAHs around and west of the Site, surface and subsurface, had PAHs ranging from 0 to 616 ppm.

- Groundwater samples around and down gradient of the Site indicated BTEX, cyanide, cadmium, and lead were detected and in some instances were above WAC NR140 ES or PAL.

1.5.4 Pre-Remedial Design Site Investigation performed by NRT in 2003

Pre-Remedial Design Investigation and Remedial Action Options Report; Former Manufactured Gas Plant Site, Two Rivers, Wisconsin; NRT, December 2003 (RAOR)

NRT conducted a pre-remedial design investigation during development of a Remedial Action Options Report in 2003 (NRT, 2003), the RAOR is included as Appendix A. Soil samples collected in August 2003 from test pits in the vicinity of the former MGP structures were generally unsaturated to moist and contained large amounts of fill material (ash/cinders, wood, brick, etc.). Soil samples collected from test pits and soil borings west of the former MGP structures were generally saturated and represent the intervals exhibiting potential MGP impacts based on visual and/or olfactory observations or elevated PID measurements. Emulsified coal tar was observed in soil borings and test pits generally located within and to the west of the wetland area. Beneath a majority of the Site, a clay layer was present between 4 and 7 feet bgs and extends to the bottom of the piezometer borings (25 to 30 feet bgs).

Analytical results of soil sampling indicated the following contaminant distribution trends:

- Off-property soils to the north were not impacted by benzene and naphthalene.
- Analytical results of off-property soils to the south indicated benzene and naphthalene concentrations above the generic groundwater pathway NR720 RCLs, in effect at the time.
- Site soils are generally above the NR720 standards for benzene and naphthalene at low levels across the Site. Concentrations are significantly higher at select locations where coal tar was observed to occur within the soil matrix.

Remedial action objectives for the WPSC property from the RAOR included:

- Address contaminants of concern, as identified in NR 720 and NR 140 for soil and groundwater, respectively.
- Minimize potential threats to human health, safety and welfare and the environment to the extent practicable as defined in NR 722.09.
- Meet the evaluation criteria identified in NR 722.07, including initial screening of individual technologies and evaluation of assembled alternatives based on contaminants present, media contaminated and site characteristics.
- Be considerate of future use.
- Be cost-effective compared to other options, considering cost categories listed in NR 722.07 for each assembled alternative and as allowed in NR 722.09 (1).

Based on the investigation, the site was split up based upon contaminants of concern associated with emulsified coal tar and other MGP process residuals. The three areas of concern identified for remedial actions include:

- **Upland Area**: approximately 32,600 square feet and approximately 5,000 cubic yards, generally unsaturated fill materials extending 4 to 5 feet bgs in the vicinity of historic MGP structures.
- **Source Area**: approximately 35,800 square feet and approximately 15,000 cubic yards, generally saturated soil containing emulsified coal tar within the soil matrix in the vicinity of the wetlands, considered to be the primary source of dissolved MGP groundwater impacts. Emulsified tar is observed from ground surface to 17 feet bgs.
- **Downgradient Area:** approximately 18,600 square feet and approximately 2,600 cubic yards, (including saturated soil west of the Source Area and shallow groundwater), extends from the wetland to the West Twin River and contains emulsified coal tar in thinner layers than the Source Area within the soil matrix at depths ranging from 9 to 14 feet bgs.

The three areas listed above were used for the RAWP preliminary removal action areas as listed in Section 3.4; Areas A (Upland Area), B (Source Area), and C (Downgradient Area).

Five alternatives were assembled in the RAOR from the remaining remedial options. The alternatives included:

- Alternative 1: Excavation and On-Site Thermal Desorption of Upland and Source Areas; In-Situ Chemical Oxidation Downgradient and Natural Attenuation for Groundwater Response.
- Alternative 2: Excavation and Off-site Disposal of Upland Area; In-Situ Stabilization of Source Area; and, Funnel and Gate Permeable Reactive Barrier for Groundwater/ Downgradient Response.
- Alternative 3: Asphalt Capping for Upland Area; In-Situ Chemical Oxidation of Source Area; and, In-Situ Chemical Oxidation Downgradient and Natural Attenuation for Groundwater Response.
- Alternative 4A: Excavation and Off-site Disposal of Upland Area; In-Situ Chemical Oxidation for Source Area; and In-Situ Chemical Oxidation Downgradient and Natural Attenuation for Groundwater Response.
- Alternative 4B: Excavation and Off-site Disposal of Upland Area; In-Situ Chemical Oxidation for Downgradient, and Slurry Wall Containment with Pump and Treat and Phytoremediation for Groundwater Response.

1.5.5 Groundwater Quality Data Transmittal; Former Two Rivers Manufactured Gas Plant, Two Rivers, Wisconsin; NRT, 2005-2013

Beginning in 2005, groundwater samples and elevation measurements were collected annually to monitor conditions in Site monitoring wells. Samples were analyzed for PVOCs, PAHs, and field parameters measured during previous activities. A summary of the results is provided below;

- As in previous sampling events, the BTEX analytical results indicate a wider distribution of elevated concentrations compared to the PAHs. Benzene, the other BTEX parameters, and 1,2,4-trimethylbenzene exceeded WAC NR 140 at most of the down gradient wells and piezometers. Although benzene concentrations at some locations fluctuated above and below the groundwater quality standards, no strong correlation with the groundwater elevation was identified. The highest benzene (and other PVOC) concentrations occur in shallow groundwater near the source areas.

- 1-methylnaphthalene is the PAHs most often observed above the WAC NR140 ES. In addition, numerous other PAHs (including BaP, benzo(b)fluoranthene, chrysene, and naphthalene) have been detected above the ES, and these impacts are primarily confined to the wells located within the former MGP property boundary.

2 SUMMARY OF SITE CONDITIONS

2.1 Regional Geology and Hydrology

The regional geology of the Two Rivers area consists of Paleozoic sedimentary bedrock units overlain by unconsolidated Quaternary deposits. The regional bedrock strata is a sequence of undifferentiated Silurian dolomites underlain by Ordovician dolomite, sandstone, and shale units and Cambrian sandstones (Skinner and Borman, 1973). The unconsolidated Quaternary units in the Two Rivers area are dominated by lake deposits. The remaining Quaternary deposits found in Manitowoc County include glacial till, glacial outwash, and ground end moraine deposits.

In the Two Rivers area, the Quaternary deposits are between 50 and 100 feet thick and the Silurian dolomites are between 650 and 700 feet thick. Each of these units is a major aquifer in the vicinity of Two Rivers. The unconsolidated deposits contain the sand-and-gravel aquifer and the Silurian dolomites contain the Niagara aquifer (Skinner and Borman, 1973). In the vicinity of the Site, the Silurian dolomite is likely greater than 50 feet bgs. The WDNR high capacity well database includes five well summaries which indicate the bedrock is encountered between 86 and 108 feet bgs. Due to the depth and thickness of these units, most private wells in the area were completed in these aquifers. However, due to the proximity of the City of Two Rivers to Lake Michigan, all water for municipal use comes directly from Lake Michigan and the city has no municipal water wells.

2.2 Site Geology

Soil encountered during previous Site investigations include lacustrine and glacial deposits intermixed with fill material. Previous investigations demonstrate that the MGP Site is underlain by soils primarily composed of fine and silty sands, clay units, and discontinuous peat layers. The surface soils are dominated by fine sands, and silts. Fill material consisting of ash/cinders, fine sands, silts, glass, wood, wood chips, brick, concrete, and wire is found in the vicinity of the former MGP building locations. The fill material found likely originated on-site and the ash/cinder fill resembles a black, fine to coarse sand and silt. The ash/cinder layers are in a fill pattern.

The shallow surface soils at the Site are dominated by sands and silts. These sands and silts are an inconsistent mixture of ash/cinder fill and natural soils, including peat. Beneath a majority of the Site, a clay layer is present between 4 and 7 feet bgs and extends to the bottom of the piezometer borings (deepest borings extended 25 to 30 ft bgs). This clay has varying amounts of sands and silts, and it appears that this clay is native material. The clay is gray to red-gray, soft, wet, and plastic. The sand layers are discontinuous and facies changes occur over short distances. Also, there are sand layers

present at depth on the west end and southwest corner of the Site. None of the soil borings installed during previous Site investigations encountered bedrock. This is consistent with the regional geology of the area in which the Silurian dolomite has been encountered between 86 to 91 bgs.

2.3 Site Hydrogeology

2.3.1 Groundwater Flow

From 1994 to 2013, groundwater has occurred between approximately 0.5 feet bgs (MW-603B, June 2002) and 7.2 feet bgs (MW-603B, October 2003) at the Site. The upper and lower groundwater flows to the southwest towards the West Twin River. The 2013 Groundwater Quality Data Transmittal is in Appendix B. The transmittal includes historic groundwater monitoring data and groundwater flow information based on the September 2013 sampling event.

2.3.2 Horizontal Groundwater Gradients

The horizontal hydraulic gradient across the Site is low and ranges between 0.004 to 0.009 ft/ft based on water levels collected between June 2002 and September 2013. The average horizontal gradient of shallow wells is 0.0067 ft/ft. between October 2007 and September 2013. During these same years the groundwater elevations in the piezometers fluctuated between approximately 1.8 and 6.7 feet. The shallow wells fluctuated between approximately 1.8 and 7.1 feet.

2.3.3 Vertical Groundwater Gradients

Vertical gradients were determined for all of the well nests. Following development of the wells, well nests MW-607A/B, MW-608A/B, and MW-609A/B generally exhibited moderate to strong upward vertical gradients. The upward vertical gradients at these well nests generally range on the order of 10^{-2} to 10^{-3} ft/ft (Table 5 of RAOR). Well nest MW-605A/B generally indicated downward vertical gradients until the shallow well was replaced in 2004. This may have been a localized influence from the sand unit in this portion of the Site. The shallow well intersected the sand unit and the deeper well is screened in clay. Since the shallow well was replaced, MW-605A/B generally indicates upward vertical gradients. Well nest MW-603A/B frequently changes between upward and downward vertical gradients.

The overall upward gradients in most of the well nests indicate that the Site is a groundwater discharge area. These conditions are expected at the Site given the proximity of the West Twin River and the wetlands on the property.

2.4 Wetlands

2.4.1 Initial Wetland Delineation

A wetland boundary delineation was completed by STS Consultants, LTD. (STS) on behalf of WPSC in July 2003. Prior to the Site visit, STS reviewed WDNR Wisconsin Wetland Inventory (WWI) maps which indicated broad-leaved deciduous scrub/shrub and persistent emergent wet meadow wetland with palustrian soil conditions on the western half of the Site. STS also reviewed the U.S. Department of Agriculture (USDA) Soil Conservation Service Soil Survey (SCS) of Calumet and Manitowoc Counties, Wisconsin, (1980) which classified Site soils as Granby fine sandy loam. Granby soils are classified as hydric soils.

A wetland boundary delineation was conducted on July 22, 2003 in accordance with the US Army Corps of Engineers (COE) 1987 Wetland Delineation Methodology. STS used hydric soils, vegetation, and hydrology indicators to delineate the boundary of the wetland. The boundary was marked with pin flags that were surveyed by Carow Land Surveying Company, Inc., Appleton, Wisconsin.

2.4.2 2013 Wetland Delineation

In 2013, WPSC hired AECOM to re-delineate the Site and update the wetland boundary using the 1987 Wetland Delineation Methodology and all applicable regional supplements. The 2013 report concluded that there are approximately 2.0 acres of wetlands on the Site. A copy of AECOM's wetland report is included in Appendix C. Delineated wetland limits from 2013 are shown on Figure 3.

2.5 Existing Utilities and Site Constraints

2.5.1 Existing Utilities

Utility mapping has identified aboveground and underground utilities near the Site boundaries. The identified utilities are shown on Figure 4.Preliminary removal action areas are shown on Figure 5.

Identified utilities include the following:

- **Sanitary Sewers:** A sanitary sewer ranging in size from 6-inch to 8-inch exists along the gravel driveway entering the Site at School and 21st Streets. This line may be affected by construction activities. An 18-inch sanitary sewer line exists along School Street. This 18-inch line is outside of the WPSC property and will not be affected by the removal action activities.

- **Storm Sewers:** A 12-inch storm sewer exists along School Street with three catch basins located at the intersection of School and 21st Streets. The storm sewer is outside of the WPSC property and will not be affected by removal action activities. The catch basins may require erosion protection during removal action activities.

- **Water Mains:** A water main originates from the intersection of School and 21st Streets and exists along the gravel road to the location of the former building. This utility will be affected by the removal action activities and may require coordination with the utility provider to support, relocate, or remove the utility prior to or during removal action activities. This utility exists near removal action Area A.

- **Overhead Utilities**: Overhead utilities exist along the gravel drive and the southern and northern entrances inside of the Site boundaries. Additional overhead utilities exist along 21st Street. Overhead utilities that exist along the gravel drive may require coordination with the utility provider to support, relocate, or remove the utility prior to or during removal action activities. This utility exists near removal action Area A.

- **Gas Utilities**: A 6-inch gas main exists on the WPSC property from the intersection of School and 21st Street along the gravel driveway and the eastern properties over to the location of the former building. A second gas main is along the southern property boundary terminating into the buildings located on the property to the south. Additional gas mains are located on the north side of the Site. Two 6-inch gas mains originate at the former building and extend to the north and then turn east to the northern entrance of the gravel drive at School and 22nd Streets. There is an additional gas main along the northern property boundary from the West Twin River to the former building with a T-intersection to the south in the middle of the WPSC property. It is unknown if this gas main terminates at the West Twin River and at the T-intersection. All of the gas mains will require coordination with the utility provider to support, relocate, or remove the utilities prior to or during removal action activities with the exception of the utility along the southern property boundary.

2.5.2 Site Constraints

Based on previous site investigations removal action construction to mitigate source material will be limited to the WPSC property. If additional source material is discovered during the pre-removal site characterization data collection or during removal action construction, the removal action limits may be extended to encompass additional area.

2.6 Site Soil Data Compilation and Interpolation

Previous boring logs, field observations, and analytical data were compiled and summarized to evaluate potential source material and delineate removal action areas as part of the removal action planning.

Proposed removal action limits were primarily defined based on descriptions of visual NAPL identified as MGP source material as described in Section 3.2. Soil analytical data were used to correlate visual

indicators of NAPL. The visual descriptions of NAPL were used to delineate lateral and vertical extents of source material in soil boring locations. This approach is consistent with the USEPA-approved time-critical removal action at Crawford Station Parcels A, B, and O, Chicago, Illinois and North Plant MGP Site Parcels 1and 2 in Waukegan, Illinois.

2.7 Risk to Public Health, Welfare, or the Environment

Compared to factors in the National Contingency Plan Section 300.415(b)(2), conditions at the Site may present an imminent risk to public health, welfare, and the environment. Selected factors that are applicable to this determination include the following:

1. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
    - No active operations are conducted in the vicinity of exposed MGP residuals on the WPSC property. Secured fencing has been installed by WPSC to limit potential exposure.
    - A potential exposure risk exists from MGP residuals at ground surface. Subsurface contaminant migration is a potential threat to additional receptors.
2. Elevated levels of hazardous substances or pollutants or contaminants in soils at or near the surface that may migrate
    - MGP residuals meeting the classification of source material were identified at the ground surface in the Source Area (Removal Action Area B), as described in Section 1.5.4. The MGP residuals exhibit elevated concentrations of PAHs and VOCs.

Given the Site conditions, the nature of known and suspected hazardous substances, and the potential exposure pathways, actual or threatened releases of hazardous substances, pollutants, or contaminants are evident. A removal action consisting of In Situ Solidification/Stabilization (ISS) and shallow excavation of MGP source materials will mitigate the direct contact exposure pathway and reduce the potential for migration to soil, groundwater, sediment, or surface water. Other alternatives discussed in Section 1.5.5 have been reviewed as well, but due to Site geology, groundwater levels, and types of remedial options presented in Section 1.5.5, ISS is the most appropriate option for the mitigating source material, If not addressed by implementing this removal action, the Site conditions will continue to be a risk to public health, welfare, or the environment.

3 BASIS FOR REMOVAL ACTION

3.1 Removal Action Objectives and Strategy

The objectives for the removal action include the following:

1. Immobilize and/or remove identified MGP source material within the defined removal action areas and eliminate residual MGP residuals at the surface and associated direct contact concerns to the extent practicable.

2. Immobilize and remove other materials from the Site that may be impacted by MGP residuals, but are not considered source material, on a selective basis to support long-term Site management within the Multi-Site Framework and avoid future remediation below or immediately surrounding the removal areas.

3. Restore the Site by replacing removed material with clean fill and construction of a clean soil cover over the stabilized material.

The removal action was developed with the following strategy:

- Select a removal strategy that can be feasibly and economically implemented within a short timeframe.

- Use a planning and design process that addresses MGP source material defined by prior investigations and verified by pre-removal site characterization.

- Limit the removal action scope to areas of the site where immediate implementation is feasible considering issues such as property ownership, access constraints, and practical considerations.

The selected removal action strategy includes a combination of ISS, shallow soil excavation and landfill disposal, including removal of historical structures. In the event that obvious non-MGP contamination is evident during the removal action (e.g., buried drums, previously unidentified underground storage tanks, or other types of impacts that are visually distinct from the MGP source material) appropriate procedures will be employed to address the contamination in accordance with federal, state, and local requirements. As appropriate, the USEPA On-Scene Coordinator will be promptly notified. If the type of contamination encountered is not consistent with Site investigation data or the Site waste profile, supplemental sampling and waste characterization may be performed to ensure proper management, handling, and/or disposal of the material.

3.2 MGP Source Material Definition

As a time-critical removal action, the proposed source removal is proceeding without a complete RI/FS or quantitative risk assessment. To accomplish project objectives, the removal action relies on investigative

visual assessment methods supplemented with soil sampling and analysis. This is consistent with USEPA-approved approaches at other sites in Region 5 such as the time-critical removal action at Crawford Station in Chicago, Illinois and North Plant MGP Site in Waukegan, IL. The USEPA-approved removal actions at Crawford Station and North Plant MGP are being performed in general accordance with Removal Action Work Plans prepared by NRT and dated September 6, 2011 and September 21, 2012, respectively. Soils exhibiting visual NAPL conditions described below are considered source material. Areas exhibiting lesser degrees of NAPL that do not meet the source definition (e.g., sheen or MGP odors) will not be considered MGP source material.

MGP source material that will be addressed and visually identified during the removal action is defined as follows:

MGP Source Material Description

Descriptive Term	Soil boring log descriptions from prior investigation work	Definition
Tar at ground surface	Tar at surface	Areas where tar is visible at the ground surface
Oil Wetted	Tar saturated Free product	Visible brown or black oil wetting the soil sample. Oil appears as a liquid and is not held by soil grains.
Oil Coated	Tar coated, Oily, Hard tar	Visible brown or black oil coating soil particles. Typically associated with coarse-grained soil such as coarse sand, gravel, and cobbles.

3.3 Removal Action Decision Criteria

The following decision criteria will be applied to the removal action in Areas A, B, and C:

- Removal/ISS of MGP source material from 0 to 6 feet bgs to mitigate the direct contact exposure pathway and the potential impact to the river. If groundwater is encountered, soil excavation may be terminated. Soil excavation may extend below the groundwater surface and laterally outside of removal areas to remove subsurface MGP structures (e.g., foundations and piping) as shown on Figure 5.
- ISS of MGP source material to depths of up to 17 feet bgs to mitigate potential exposure to future construction workers and migration to soil, groundwater, and/or West Twin River.
- ISS of MGP source material to depths greater than 17 feet bgs to support long-term site management within the Multi-Site Framework and avoid future remediation below or immediately surrounding the removal action areas. Based on available data, the greatest planned depth of the removal action is approximately 20 ft bgs.

Following shallow soil excavation and removal of subsurface MGP structures (e.g., foundations and piping), MGP source material within the delineated removal action areas will be solidified by ISS. Completed ISS will be sampled for verification that specifications and design parameters are achieved. Construction quality assurance (CQA) details are described in Sections 5 and 7.

3.4 Estimated Removal Action Volume

The approximate lateral and vertical extents of MGP source material removal action areas and volumes associated with each are based on the RAOR and presented on Figure 5. Removal action areas include the following:

- **Area A:** Includes the eastern portion of the WPSC property where the former MGP operations were and where source material impacts are generally considered to be at or near ground surface and extend to a depth of approximately 6 bgs. Approximate removal action volume of this area is 7,100 cubic yards of excavation and disposal.
- **Area B:** Includes the central portion of the WPSC property and the delineated wetland areas. Source material impacts are generally considered to be at or near ground surface and extend to a depth of approximately 20 feet bgs. Approximate removal action volume for this area is 22,600 cubic yards of ISS.
- **Area C:** Includes the western portion of the WPSC property and delineated wetland areas along the West Twin River. Source material impacts are generally considered to be at or near ground surface and extend up to a depth of approximately 20 feet bgs. Preliminary estimates indicate the approximate removal action volume for this area is 11,600 cubic yards of ISS. Additional data collection is required to complete the delineation of this removal action area. Pre-removal data collection, as outlined in Section 4.2, will complete the delineation of source material in this area.

The total estimated volume of material to be addressed during the removal action is 41,300 cubic yards; including 34,200 cubic yards of ISS and 7,100 cubic yards of excavation and off-site disposal. The volume of material to be addressed may be increased based on the pre-removal data collection activities or if subsurface MGP structures extend beyond the preliminary removal area limits, as described in Section 5.4.1.1.

4 PRE-REMOVAL DATA COLLECTION AND *IN SITU* SOLIDIFICATION/STABILIZATION TREATABILITY STUDY

4.1 Existing Utilities

The utility information provided in Section 2.5 and on Figure 4 is from a utility survey conducted in 2003. Based on reviewing recent aerial maps (Google Maps, October 2013) of the Site, above ground utilities appear to be different now than in 2003. A utility Site survey will be conducted to confirm existing Site utilities, determine whether the existing utilities are active or abandoned, and presence/absence of previous utilities.

4.2 Pre-Removal Data Collection Objectives and Overview

Pre-removal data collection will be required to meet the following major objectives:

- Confirm the area that will be included as part of the removal action.
- Further delineate the extent of former MGP foundations and/or structures that will need to be considered for completion of the remedial action.
- Delineate and confirm the depths to the lower clay layer.
- Delineate and confirm the presence and extent of potential MGP source material previously identified on properties located north and south of the WPSC property.
- Obtain representative soil samples for an ISS treatability study from each of the areas and materials targeted for removal action.

Planning, implementation and documentation of the data collection activities will be conducted in accordance with the approved Multi-Site Documents. The results of the data collection will be compiled into separate addendums.

4.2.1 Pre- Removal Data Collection

Pre-removal data collection is planned for completion during early 2014. Soil borings and test pit excavations will be completed to achieve the following specific objectives:

- Refine the proposed removal action areas delineated as described in Section 2.7 and as shown on Figure 5.
- Verify subsurface observation and analytical data from previous investigations indicating the presence of source material.
- Verify the vertical extent of MGP impacts and depths for ISS in the lower confining clay layer.
- Assess the presence of former MGP foundation structures and/or debris in the removal action areas.
- Characterize the subsurface fill for excavatability considerations including side slope stability and dewatering.
- Characterize material for off-site disposal.
- Assess odors and air quality conditions to prepare for air monitoring and fugitive emission controls during full-scale removal actions

To meet the objectives outlined above approximately 41 soil boring locations have been identified as shown on Figure 5. Additional sample locations will be added, as appropriate, to complete lateral and vertical delineation of source material and removal action areas. As indicated on the figure, boring locations have been established to complete and confirm source area delineation for each of the targeted removal action areas (Areas A, B and C) and further assess the vertical and lateral extent of potential source material previously identified on properties north and south of the WPSC property (Off-Property Assessment Areas). Additional borings are also planned in the interiors of each removal area to further define the depth to the lower clay layer. Specific data collection activities include the following:

- Soil boring locations will initially be located using handheld GPS equipment (Trimble).
- Since field operations may occur in the winter, the drilling subcontractor may be requested to provide snow removal equipment to clear boring and test pit locations as required to effectively perform the work in a safe and effective manner.
- Continuous sampling will be conducted approximately 2 feet into the lower clay layer using direct push method.
- Several test pits will be excavated to further assess the extent of MGP foundations and/or subsurface structures that will require removal. Test pits will be backfilled with excavated material.
- Additional samples will be collected during this time for the ISS treatability study as further discussed in Section 4.2.2.
- Samples will be logged, photographed and visually assessed for the presence of source material.

- Chemical analytical samples may be collected from the clay layer at two to three boring locations inside of each removal action area and submitted for laboratory analysis of BTEX (Method 8260), PAHs (Method 8270 for 18 key indicator parameters) and total cyanide (Method 9012).Where source material is identified at a given boring location, additional borings will be "stepped out" until source material is no longer identified to confirm the limits for removal action and/or extent of source material. Accordingly borings may also be "stepped in" to reduce the extent required for removal action. At removal action perimeter boring locations, borings will be initiated in anticipated "clean" areas and stepped in with additional borings as appropriate to minimize the potential for cross contamination between boring locations.

- Soil cuttings will be drummed and staged at a designated on-property location pending completion of waste profiling and acceptance at a WPSC approved landfill disposal facility.

- Direct push augers will be decontaminated between boring locations where analytical samples are planned for collection from the lower clay layer. Decontamination water will be drummed at a designated on-property location pending approval for off-site disposal with the soil cuttings.

- One composite sample of the soil cuttings will be collected and submitted for analysis of landfill acceptance parameters

- Following completion of the field activities, soil boring locations will be surveyed by WPSC to document the investigation locations.

An addendum to this RAWP will be prepared summarizing the data collection activities and conclusions. The addendum will include:

- Description of the boring assessment and the rationale for identification of source material where and what type of samples were collected

- Updated figures indicating the updated extent of source material and confirmatory limits for removal action

- Preparation of lower clay layer topographic map that will be used to establish vertical limits for the removal operations in Areas A, B and C

- Boring logs for each of the boring locations

- Tabulated summaries of laboratory analytical and geotechnical data

- Copies of all laboratory analytical data reports and other pertinent forms (e.g., chains of custody)

4.2.2 ISS Treatability Study

A bench scale/treatability study for ISS will be performed to develop a basis for design of ISS as the remedial technology. The results of the study will be submitted as an addendum to this document when it is available in 2014. Objectives for the study consist of the following:

- Develop an ISS mix design capable of stabilizing/solidifying MGP residuals, and designed to enhance protection of human health and the environment.

- Develop an economical mix design for implementation of ISS using locally available reagents.
- Assess the physical and chemical properties of the solidified/stabilized monolithic materials.
- Assess volumetric expansion associated with an ISS operation on the Property.
- Demonstrate that the solidified monolith will provide suitable geotechnical conditions for future property development.

Proposed performance goals for the study are summarized below:

Parameter	**Performance Goal**	**Methodology**
Hydraulic Conductivity	≤ 1 x 10^{-6} cm/s [1]	ASTM D5084
Unconfined Compressive Strength	≥ 50 psi	ASTM D1633
Durability (freeze and thaw)	Weight loss ≤ 15%	ASTM D4842
Durability (wetting and drying)	Weight loss ≤ 15%	ASTM D4843
Slake (Submergence Testing)	Minimal deterioration of specimen and discoloration of water, and no phase-separated tar or soil	Empirical Observations
Volumetric Expansion	< 30% if possible	Empirical Measurement
Leachability	BTEX ≤ WAC ES PAHs ≤ WAC ES Total Cyanide ≤ ES (for free cyanide)	ANS-16.1 leaching 8260B analysis for BTEX 8270 for PAHs and Total Cyanide
pH	TBD	Any acceptable methodology

1. This permeability may be revised based on composite soil permeability data obtained during the treatability study.

Implementation of ISS will create a stable and relatively impermeable monolith. Per USEPA's *Technology Performance Review: Selecting and Using Solidification/Stabilization Treatment for Site Remediation* **(**EPA/600/R-09/148 November 2009), the methodology for evaluating the physical design criteria is based on the appropriate American Society of Testing and Materials (ASTM) standards or qualitative analysis (slake testing and volumetric expansion).

To evaluate chemical design criteria, concentrations of constituents of concern (COC) are determined in leach samples. Since the application of ISS in the field will result in a monolithic material, a leach test that leaches an undisturbed monolithic column with demineralized water will be performed for the bench scale study that is based on the American Nuclear Society (ANS) Method 16.1 leaching method with some modifications to the leaching intervals. Leaching of the COCs will be evaluated at 14, 28, 42, and 56 day intervals for each mix design selected for leach testing by analyzing samples of the leachate collected from the demineralized water bath at the specified intervals.

The general process for sample collection and performance of the bench scale study is summarized below. Sample collection will include the following:

- Both composite and discrete soil samples will be collected to represent the types of soils, moisture content, and concentrations of MGP constituents that will pose the greatest concern for effective ISS that will meet the performance goals.
- Proposed sample locations are indicated on Figure 5. Each of the removal action areas (A, B and C) are targeted for sampling; however sample collection from Area A will only be completed if ISS is proposed in lieu of excavation in this area.
    - Proposed sampling in Area A will be conducted in the vicinity of the former MGP structures in Area A. This area is representative of unsaturated to moist conditions and contains large quantities of fill materials.
    - Proposed sampling in Area B will be west of the former MGP structures, in the wetland. This area represents saturated conditions. Source material observed in several soil borings from this area and soil from these borings contained measurable concentrations of benzene and naphthalene.
    - Proposed sampling in Area C will be near the river where source material was identified during previous investigations.
- Several undisturbed samples will be collected using Shelby tubes. These samples will be used for determining the soil's permeability, density, moisture content, Atterberg Limits and gradation. Data from these undisturbed samples will be used for mass and volume calculations, to scale the treatment regimen from laboratory to full-scale, and to assist in assessment of acceptable permeability reduction performance goals following ISS. Undisturbed soil samples will be collected and submitted to a local geotechnical laboratory.
- Soil samples for the ISS treatability will be collected from each of the areas using auger and/or backhoe excavating methods. The quantity and location of samples will be evaluated based on observed field conditions. If soil at a location exhibits no evidence of any MGP impacts, the location will be properly abandoned and a new location selected and sampled. Evidence corroborating the presence of source material will be based on visual assessment. Samples representative of general soil conditions may be composited with samples that are more highly impacted.

A treatability study is an iterative process. Figure 6 provides a conceptual treatability study protocol for visualization of the process. It shows in a single graphic the scope and sequence of activities to complete the study. The study assumes nine treatment regimens will be evaluated, three reagents and three doses of each regent. More or less reagents and more or less doses might be used after collecting soil samples and determining the types and amounts of contamination. Performance of the bench scale study is summarized below:

- Representative soil samples will be analyzed to determine both chemical and physical characteristics. Laboratory analyses will include BTEX, PAHs and total cyanide. Geotechnical laboratory analyses will include bulk density, moisture content, Atterberg Limits and grain size analyses.
- After determining the physical and chemical characteristics of soil samples collected for this study, similar soil types will be combined to create at least two composite soil samples for

bench-scale testing. One composite sample will be created to represent expected conditions and the other worst-case conditions. Mixes will be prepared by mixing a known dry mass of a reagent with a known dry mass of soil. Specimens will be created for all testing to be completed. Tests include strength, permeability, durability, slake, and leachability.

- NRT has utilized a 3:1 blend of ground granulated blast furnace slag and Portland cement as a reagent to stabilize soil impacted by MGP residuals. This will be the primary regimen evaluated. However, other additives such as silica fume, bentonite, and organoclay might be incorporated into a regimen to enhance the treatment's effectiveness or to reduce the dose of cementitious reagents. For example, stabilizing sandy soil that is poorly graded (uniform particle size) might benefit from bentonite as a component of a treatment regimen because bentonite will fill the pore spaces between sand particles thereby decreasing the stabilized material's permeability and also lessening the demand for cementitious materials which would otherwise have to fill this pore space.

- Prepared test specimens will be allowed to cure for 7, 14 and 28 day intervals prior to unconfined compressive strength and permeability testing. Based on these results, the mix designs will be further screened to reduce the number that will be carried forward for leachability, slake freeze/thaw and durability testing.

- To compress the schedule as much as possible, a full range of specimens that might be used for every anticipated test will be created. Many of these specimens might not be tested because as testing progresses some regimens will perform better than others and only the most effective regimens will continue to be tested through the entire study.

An addendum to this RAWP summarizing the bench scale work and conclusions will be prepared after the study has been completed. The addendum will include:

- Description of the sample collection process and the rationale for where and what type of samples were collected

- Description of all sample handling and compositing procedures and methodologies, chemical analyses, and physical analyses used to initially characterize samples

- Description of the treatment regimens selected to be evaluated and the rationale for selecting them including handling procedures (e.g., cure times and methods), selection for testing procedures, and quality assurance/quality control procedures. Description of the process, work progression, and rationale for including (or excluding) regimens from continued testing

- Tabular summaries of all test data

- Copies of all raw testing data, lab reports, and chain of custody forms

- A detailed analysis of all data including conclusions drawn from the study including recommendations for the regimen(s) that economically achieve the study objectives and ISS performance goals

- Preliminary recommendations for a pilot scale and full scale construction implementation and a discussion about scaling the process to full-scale implementation

5 REMOVAL ACTION IMPLEMENTATION

5.1 Preliminary Activities

5.1.1 Site Security and Controls

The Site is secured with an existing chain link fence that surrounds Site. WPSC currently maintains a gated and secured entrance to the Site near 200 21st Street, Two Rivers, Wisconsin. The gate will serve as the access and exit point during the removal action. The gate will be locked when no workers are present. A visual barrier may be added to the existing fence and gate surrounding the Site.

All visitors will be required to sign a visitor's log when entering and exiting the Site. Access to removal action areas will be limited to authorized personnel approved by IBS and will be required to participate in a site-specific health and safety briefing by the site supervisor or health and safety officer prior to entry.

5.1.2 Surveying

At a minimum, the following items will be surveyed at the Site:

- Stake out of the proposed removal action areas
- ISS column locations and top and bottom elevations
- Lateral extents of shallow soil excavations
- Locations and elevation of former MGP pipes and/or foundations left in-place at the removal extents, if applicable
- Location and elevation of ISS swell material
- Final lateral and vertical surface contours of areas disturbed during construction
- Final Site improvements and surface elevations
- Property boundaries
- Current and remaining wetlands (if applicable)
- Existing and new utilities

5.2 Site Preparation

Site preparation will include protection, removal, or relocation of utilities if needed, installation of erosion controls, clearing and grubbing of vegetation, abandonment of monitoring wells located in removal action areas, construction of a temporary on-site truck access road, and establishment of truck routes. Trees

that do not interfere with removal actions will be protected from construction activities to the extent practical. Concrete barricades or steel traffic bearing plates will be placed around or on monitoring wells that will remain.

5.2.1 Protection of Utilities and Construction Utilities

As discussed in Section 2.5.1, active underground utilities have been identified that will interfere with proposed removal action Areas A, B, and C. Overhead utilities exist along the eastern portion along the removal action Area A. Underground and overhead utilities in removal action areas may require coordination with the utility provider to support, relocate, or remove the utility prior to or during removal action activities.

If utility modifications are necessary, IBS will coordinate with the utility provider. Additionally, coordination with utility providers will occur to facilitate installation of utility services as necessary for construction operations. Construction operations will require, at a minimum, electrical and/or communication services for office trailers, air monitoring equipment, and the ISS batch plant. In addition, the contractor's site superintendent will be specifically tasked with ensuring all utility conflicts are cleared as construction progress.

5.2.2 Runoff and Erosion Control

Runoff and erosion control measures will be implemented in accordance with WAC NR 216 and City of Two Rivers requirements. Prior to beginning Site work, the following minimum erosion control activities will be performed:

- A tracking pad of open graded stone will be placed at truck entrances/exits to minimize off-site tracking of material from truck tires
- Silt fence will be placed around removal action areas or around the Site perimeter, as appropriate
- Material management and decontamination areas will be bermed on all sides to prevent sediment run-off
- Filter fabric will be placed above existing storm sewer catch basins, if any exist near the Site, to prevent sediment from entering state waterways
- Street sweeping will be used, as necessary, to promptly remove potentially tracked materials on public right-of-ways
- If necessary, additional measures will be taken to prevent run-on of surface water, particularly to prevent surface water contact with the removal action areas

Installation methods and maintenance procedures for silt fence and inlet protection will follow best management practices. Trucks, grading equipment, and other construction vehicles will use constructed

tracking pads to minimize tracking of soil off site. Erosion control measures will be maintained throughout construction activities until permanent erosion control measures are in place.

The contractor will be responsible for implementing an adequate erosion control plan and complying with all applicable requirements including conducting site inspections. At a minimum, inspections will satisfy the following requirements:

- Document the conditions and/or repair of silt fences and/or catch basin filter fabric
- Document sediment accumulation amounts adjacent to fences and/or on catch basin filter fabric
- Evaluate eroded or potentially unstable soils

Inspections will be made weekly and within 24-hours after rainfall events of 0.5 inches or greater, or as directed by the oversight engineer. Maintenance activities may include removal of sediment from fences and/or catch basin filter fabric, and repair as needed. Weekly inspection logs will be maintained at the Site.

5.2.3 Clearing and Grubbing

Clearing of trees and brush was completed by WPSC in the fall of 2013. Grubbing will be performed as part of excavation during the removal action following placement of temporary erosion control measures. It will include the removal of stumps and root balls from within the removal action and operational areas. Roots and root balls removed during the removal action will be transported off site for disposal.

5.2.4 Route of Ingress and Egress for Construction

Construction ingress and egress points will be through the existing gates on the WPSC property.

A temporary truck access road may be constructed that may consist of placement of an 8-oz non-woven geotextile (if needed) and a 6 to 12-inch layer of stone or base course material.

During construction activities, trucks will enter and exit the property at gated entrances, where appropriate signage will be posted to identify the construction entrance and exit. All truck beds will be covered and securely fastened before leaving the property.

5.2.5 Monitoring Well Abandonment

Existing monitoring wells within proposed removal action areas will be abandoned prior to construction. The following wells shown on Figure 5 are targeted for abandonment:

- MW603A and MW603B

- MW604
- MW605A and MW605B
- MW606

The following wells are near removal action areas and may require abandonment if removal action limits are expanded or the wells could be damaged by the removal action:

- MW607A and MW607B
- MW608A and MW608B
- MW609A and MW609B

Monitoring wells will be abandoned in accordance with the *Multi-Site Field Sampling Plan Revision 4*, dated September 8, 2008, consistent with WAC NR 141.

5.3 Fugitive Emission Control

Site activities could generate fugitive emissions including vapor, dust, odor, and noise. A standard level of care will be taken to minimize fugitive emissions. Fugitive emission control measures may include the use of sheet plastic and/or water or foam-based vapor suppression agents. Plastic sheeting may be used to provide a physical barrier to fugitive vapor and dust emissions specifically on inactive stockpiles or open excavations. Soil wetting using potable water with or without additives may be sufficient to control fugitive dust emissions from stockpiles, excavated areas, and access roads. A vapor suppression agent (e.g. Rusmar™ Foam or similar) will be applied to open excavations, completed ISS areas, and stockpiles of MGP impacted materials when necessary to mitigate odors. Fugitive emission controls will be applied in accordance with the fugitive emissions management plan.

5.4 Removal Action Operations

Removal action operations will consist of the following elements:

- Pre-excavation and Excavation
- Management and Disposal of Excavated Materials
- In situ Solidification/Stabilization
- On-site Materials Management
- Excavation Dewatering
- Equipment Decontamination

5.4.1 Pre-Excavation and Excavation

Pre-excavation and excavation within the removal action areas will be conducted to remove and demolish subsurface structures/foundations and debris and excavate removal action Area A. Depending on the ISS treatability study results, removal action Areas B and C may require shallow excavation of soil for construction of an ISS work platform and to accommodate ISS swell generated from ISS treatment. Pre-excavation and excavation activities, if necessary will be performed in each removal action area prior to ISS construction.

Oversized debris and materials excavated, removed, and generated during demolition of subsurface MGP structures will be managed within removal action areas or material management areas and taken off site for landfill disposal in conjunction with disposal of excavated shallow soils.

5.4.1.1 Shallow Soil Excavation

Shallow soils will be removed within removal action Area A as shown on Figure 5. Shallow excavation may stop at the groundwater table if shallower than 2 feet. An exception will be made in areas where subsurface MGP structures and foundations require demolition and removal. In these cases, soil excavation and structure removal will extend as deep as necessary to remove the debris. Excavated soils will either be used to fill voids following structure and debris removal within removal action areas and managed with ISS or will be transported off site for landfill disposal. Additionally, subsurface structures that extend beyond the removal action limits may be removed depending on contractor and equipment capabilities and structural considerations for surrounding roads and infrastructure, if applicable. As presented in Section 3.4, approximately 7,100 cubic yards of soil and debris are proposed for excavation and disposal.

During shallow soil excavation, soils will be inspected for MGP residuals and additional MGP related structures/foundations at the delineated limits. If MGP residuals or subsurface structures are present beyond the proposed removal action area, the shallow excavation may be expanded, as access allows, to remove remaining MGP-related materials.

The excavation process will occur in a staged progression to minimize the duration of open excavations and allow for adequate access to removal action areas for completing ISS construction. Soil excavation will be performed with conventional hydraulic excavators. To the extent practical, excavators will load soil directly from the excavation into trucks for transport and landfill disposal. Temporary stockpiling of these soils is discouraged but may be necessary. Phasing and work sequencing will be further developed during the final design phase.

5.4.1.2 Pre-Excavation for ISS

Pre-excavation will be conducted within removal action areas to depths greater than required for shallow soil removal to verify removal of all subsurface structures, obstructions, and oversized debris. All subsurface structures and obstructions are expected to be removed within the removal action areas. Additionally, subsurface structures that extend beyond the removal action limits may be removed depending on contractor and equipment capabilities and structural considerations for surrounding roads and infrastructure, if applicable.

If encountered, remnant MGP piping will be evaluated for MGP residuals. If MGP residuals are present in the piping, they will be removed to the extent practicable and treated or disposed following characterization. At the removal action limit, pipes will be abandoned in place and capped.

Following debris removal, excavations may be backfilled with the excavated MGP impacted soils within the removal action areas in preparation for ISS construction.

5.4.2 Management and Disposal of Excavated Materials

During the pre-excavation and excavation activities, materials will be visually inspected for MGP residuals and segregated into the following categories:

- Non-MGP impacted construction debris
- MGP impacted construction debris
- MGP impacted soil/source material

Segregation and management of excavated materials will include the following activities:

- Non-impacted construction debris will be temporarily stockpiled on site in a designated clean stockpile area prior to loading and transport to a recycling facility or disposal facility as construction debris.
- MGP impacted construction debris will be loaded and transported in covered trucks to the landfill for disposal. MGP impacted construction debris that is not directly loaded for immediate disposal will be temporarily stockpiled within the removal action area limits or within the appropriate material management area. MGP impacted construction debris that is too large for transport will be mechanically demolished prior to transport. Fugitive emission controls will be employed for stockpiles that remain after work hours.
- Remnant MGP piping will be cut or broken into manageable sections for loading and transport in covered trucks to the landfill for disposal. MGP residuals will be removed from the piping to the extent practicable and characterized prior to treatment or disposal. The piping may be temporarily stored either within the removal action area or in the appropriate material management area.
- MGP impacted soil/source material may be placed within the removal action areas for ISS treatment or transported in covered trucks for landfill disposal. Soil that is not directly loaded for immediate disposal or placed for ISS treatment will be temporarily stockpiled within the removal action area limits. Fugitive emission controls will be employed to stockpiles as necessary.

5.4.3 On-Site Materials Management

To facilitate proper on-site segregation and staging of materials during the removal action, the following staging areas will be set up:

- Material Management Area: MGP source material and MGP impacted debris that requires stockpiling prior to transport for disposal may be stockpiled within this area. The area will be constructed with a low permeability working surface (e.g., asphalt pavement or polyethylene lined pad), a sump, and berms.
- Decontamination Area: This area will be used to decontaminate construction equipment. The area will be constructed with a low permeability working surface, a sump, and berms. Liquids generated during decontamination activities will be managed similarly to the excavation dewatering treatment discussed in Section 5.4.4.

- Clean Staging Area: Clean, imported fill materials will be stockpiled in this area. The Clean Stockpile Area will consist of silt fence or berms around the perimeter to minimize potential storm water run-off.
- Water Treatment Pad: If required, a mobile pre-treatment system will be staged here. Water collected from excavation dewatering will be treated prior to discharge and is assumed to discharge to the sanitary sewer system, as described in Section 5.4.4.

5.4.4 Excavation Dewatering

If required, excavations and removal action areas will be dewatered to facilitate removal activities. Dewatering will be performed via a trench along the bottom of the excavation or via down-hole sumps equipped with pumps of adequate capacity. Water will be pumped to frac tanks for solids settling. The water may either be directly discharged to a City of Two Rivers sanitary sewer on site, pumped through a mobile pre-treatment system and then discharged to the sewer (as approved by the City of Two Rivers), or reused in the production of ISS grout at the batch plant. If a pre-treatment system is required, it may consist of bag filters and granular activated carbon units.

Residuals resulting from the groundwater pretreatment system may include:

- Granular Activated Carbon
- Bag or cartridge filters
- Solids from frac tanks

Bag or cartridge filters and solids will be transported for landfill disposal. Granular activated carbon may either be regenerated at a dedicated facility or transported for landfill disposal.

5.4.5 *In Situ* Solidification/Stabilization Construction

Following completion of shallow excavation and pre-excavation, ISS will be performed to solidify/stabilize MGP source material within the removal action areas to the anticipated depths indicated in Section 3.4. ISS construction will be completed as described below.

5.4.5.1 ISS Layout and Design

The layout of the ISS construction activities including the designed limits, depths, and alignment of the ISS treatment is provided in Section 3.4 and on Figure 5. And may be modified pending the results of the pre-removal action data collection activities disclosed in Section 4.2.

A layout of the ISS column locations will be provided by the ISS contractor prior to construction for review and approval by USEPA. Typical ISS column diameters range from 8 to 12 feet. Various diameter columns may be used depending on the subsurface soil conditions, site constraints or layout, or project

schedule. Columns will be spaced based on a “neat line” overlap (i.e., 0 feet of overlap where three columns intersect). This pattern of overlap represents the industry standard design of ISS remediation projects.

Each ISS column will include continuous application from the ISS platform surface to the depths designated in Section 3.4. Each ISS column will have a unique lateral location (northing, easting) and top and bottom treatment elevations. Each column is survey located prior to construction.

ISS columns completed in removal action will be constructed to a depth of at least 6 inches below the top elevation of the confining clay layer. Top of clay elevation contours will be provided to the selected remediation contractor for precise design of each ISS column. The final bottom ISS column elevation may be adjusted in the field based on the actual depth to the clay surface if determined different based on field conditions.

Based on the removal action areas and depths the planned ISS construction, the preliminary quantity of MGP impacted soil/source material that will be stabilized/solidified is approximately 34,200 cubic yards, as indicated in Section 3.4.

5.4.5.2 ISS Operations

Final ISS equipment requirements will be evaluated and confirmed following selection of the ISS contractor. Typically, the following equipment will be required to complete ISS construction:

- Earth Moving Equipment: Conventional earth moving equipment including bulldozers and hydraulic excavators will be used during ISS construction to manage materials including soil and ISS swell. Ancillary equipment needed for daily operations and construction will include front-end loaders, fork lifts, man lifts, vibratory compaction equipment, and quad-axle or semi dump trucks.

- ISS Batch Plant: ISS grout will be prepared using an on-site batch plant. Grout plants operate by mixing known quantities of reagents and water to form an ISS grout of predetermined proportions in accordance with the mix designs specified from the ISS treatability study. Grout is then pumped from the mixing plant to the point of use. Typically, the grout plant will consist of, at a minimum: a storage silo, mixing tank, storage tank, and grout pump (e.g., moyno pump, a type of progressive cavity pump). A secondary bulk dry reagent storage vessel, sometimes called a “pig” is typically added to the system as additional on-site storage for reagent, which prevents delivery trucks from having to supply reagents directly to the overhead silo. The storage vessel can hold approximately six truckloads of reagents as opposed to the storage silo that can hold approximately one truckload. This setup will aid in scheduling reagent deliveries and minimize operational downtime.

- Vertical Rotary Mixing System (ISS rig): Vertical rotary mixing systems utilize a Kelly-bar drive system either attached to a track-type crawler crane or a hydraulic type unit (e.g., Delmag) that includes the following key components:

    - Power Unit: Supplies power that turns the Kelly bar. Systems can be diesel, electric, hydraulic, or a combination of these. The power unit can be a drill table attached to a crawler type crane or a hydraulic unit (e.g., Delmag).

- Kelly: The rod that mixing tools are attached to and grout is conveyed through to the mixing tool. The Kelly can be modified depending on the required treatment depth.

- Tool: Augers that are advanced through the subsurface while mixing the soil and grout. Tools sizes can be modified depending on required mixing area. For this project, mixing tools are anticipated to be 8 to 10 feet in diameter.

Typical ISS construction uses vertical rotary mixing systems to stabilize soil in place by mixing a cementitious grout and impacted soil. Grout is pumped to the top of the hollow Kelly. Grout flows through a secondary pipe inside the Kelly and exits through ports on a multi-blade mixing tool attached to the bottom end. The tool loosens the soil while a grout is pumped into the loosened soil as the tool advances from the ground surface to a target depth. Since a mixing tool loosens but does not remove soil, a drilling fluid is needed to lubricate the tool as it turns and advances through the subsurface. For this application the lubricant is typically the ISS grout itself.

Once the appropriate ISS mix design is prepared at the ISS batch plant, the ISS rig is lined up over an ISS column location and ISS treatment of the targeted soils can commence. A typical sequence of activities for installation of each ISS column is as follows:

1. The ISS rig positions the auger over the column and the location is confirmed via total station survey. This ensures each ISS column is placed in the correct location and ensures the integrity of the column overlap with adjacent columns.

2. The appropriate mix design is prepared in the batch plant and the ISS grout is transferred to the ISS rig.

3. The ISS rig begins advancing the auger into the targeted soils. As the auger is advanced, the flow of the mix design slurry is started and is injected into the soils through orifices in the mixing paddles on the auger. The mixing paddles blend the mix design slurry with the soil as the auger continues to advance until the target depth is reached. In general, the majority of the mix design slurry is mixed with the soils as the auger penetrates downward.

4. Once the auger reaches the column target depth, the remainder of the mix design slurry is injected as the auger is withdrawn from the ISS column so that the blending process is repeated.

5. The auger may make repeated up and down passes as necessary to adequately blend each ISS column. Often, a minimum of three passes are performed at each column location.

6. Upon completion of the ISS column, the ISS rig is moved to the next column location.

ISS performance will be monitored with an ISS CQA Plan as described in Section 7.5 and will be primarily based on the established design goals for unconfined compressive strength (UCS) and hydraulic conductivity as presented in Section 4.2.

5.4.5.3 ISS Swell Management

Full-scale ISS construction will result in expansion of the treated soil. The expansion, often referred to as “swell,” is a result of blending reagent mixtures with the soil. Depending on the soil type, the swell can

range from 10% (sandy materials) to 40% (clayey materials) of the original treatment volume. Final testing during the ISS treatability study and the ISS pilot test will provide an estimate of ISS swell expected for this application. An ISS swell management plan will be developed during final design and is anticipated to be based on the following parameters:

- To minimize off-site disposal of contaminated materials, ISS swell material will be managed on site and within the removal action area limits to the extent practical.
- ISS swell will be managed in place following ISS column completion when appropriate. If necessary ISS swell could be transported for management in other removal action areas and graded to the elevation contours developed during final design.
- Elevation contours developed during final design will promote positive drainage of surface water and infiltration of surface water at the edges of removal action areas.

5.4.6 Equipment Decontamination

Decontamination of equipment and management of generated decontamination wastes will be performed in accordance with the site-specific Health & Safety Plan. All equipment will be decontaminated within the designated decontamination area. Final equipment decontamination, prior to demobilization, will consist of dry mechanical removal (i.e., scraping or brushing) of any loose material followed by pressure washing.

Road trucks will not be allowed within the removal action limits to prevent off-site tracking of excavated materials. A tracking pad will be located at the truck entrances and exits as an additional measure to prevent off-site tracking of excavated materials.

Excavation and ISS equipment visibly containing MGP-impacted materials will be decontaminated prior to being moved from one location to another, as necessary to control cross-contamination between removal areas and areas not being removed.

Additional equipment decontamination procedures are described in the *Multi-Site Field Sampling and Analysis Plan* (Integrys 2007).

5.5 Site Restoration

The Site will be restored to pre-removal action conditions and grades to the extent practicable. Surface grades will be sloped to promote drainage similar to current site topography. Final ground surface in select areas will either be vegetated or consist of coarse aggregate. For vegetated areas, topsoil, with appropriate seeding and mulch, will be placed on top of the clean backfill. For gravel areas, such as access roads, a layer of gravel will be placed on top of the clean backfill.

It is anticipated clean soil cover will be constructed over the removal action areas following ISS construction and ISS swell management. The soil cover will consist of clean imported fill and topsoil and

will be constructed with the intent to meet the requirements of a direct contact barrier per WDNR guidance. The purpose of the earthen cover systems are to function as WAC NR 720 soil performance standard by protecting human health by preventing direct contact with underlying impacted soils. Imported clean fill will be used as backfill. Backfill material will be imported from a clean borrow source and may include stone, coarse aggregate, or fine-grained material depending on local availability and future site use.

Wetland mitigation at an alternate agreed upon location, will be in substantive conformance with wetland mitigation requirements of WDNR, USACE and USEPA. Final elevations for completion of removal action operations will consider the current 100 year flood plain and maintain flood storage capacity as acceptable to local ordinances based on technical assistance from WDNR and FEMA.

All erosion controls used during construction activities will be removed at the completion of the removal action. Post-construction erosion controls will be installed along the down gradient edge of the disturbed areas and as needed until vegetation is established.

6 STATE AND LOCAL REQUIREMENTS

6.1 Storm Water Discharge

A construction site Notice of Intent (NOI) for storm water discharges associated with land disturbing construction activities under WAC NR 216 will be submitted to the WDNR since the disturbed portion of the site is more than one acre. A Notice of Termination will be prepared and submitted to WDNR once site conditions are fully stabilized following the completion of construction activities.

6.2 Wetlands

As described in Section 2.4 and shown on Figure 3, a wetland delineation was completed on the WPSC property identifying approximately 2.0 acres of wetland in the western and central portions of the Site. Based on correspondence with USEPA, a document drafted by the U.S. Army Corps of Engineers and the Wisconsin Department of Natural Resources titled *Guidelines for Wetland Compensatory Mitigation in Wisconsin,* will serve as the guidance document for mitigation at this site. This document indicates that the standard starting ratio for wetland mitigation is 1.7 to 1.0 per acre of wetland impacted. Through correspondence with WDNR and USACE, USEPA agrees that there will be no permits required with WDNR and USACE for wetland disturbance. WPSC and USEPA also agree the wetland mitigation will occur at an off-Site location. Future wetland mitigation will meet the requirements of the *Guidelines for Wetland Compensatory Mitigation in Wisconsin* document, or as approved by the USEPA. Future addendums to this RAWP will document a final wetland restoration agreement between WPSC and USEPA.

6.3 Additional Coordination and Permitting

Coordination with governmental agencies and utility providers will be required for the following project elements; treated contact water discharge to the City of Two Rivers sanitary sewer system, gas utilities with WPSC, Two Rivers Water and Light for water and power utilities.

WPSC will coordinate with the City of Two Rivers for approvals and permits on the following activities:

- Transportation and routing of equipment and materials through City Streets
- Construction hours and noise ordinances
- Temporary electrical permit
- Temporary water use permit

- Permit to discharge possible MGP impacted groundwater or surface water as part of the remedial activities. If required, the MGP impacted groundwater and/or surface water may be pre-treated to meet the City's discharge requirements.

Additional permit equivalences for construction will be prepared as needed during construction activities by the affected contractors.

6.4 Off-Site Disposal

Excavated MGP-impacted debris and soil is planned to be profiled and disposed at an approved Subtitle D landfill.

Due to the site location, the close proximity of the residents, and desire to limit public exposure to VOC emissions, a waiver may be requested to WAC NR 419.07(4) (d), which limits the maximum tonnage of VOC impacted soil a landfill may accept per day. The waiver, if needed and approved, will reduce the timeframe for completion of the project and minimize disruption to the community.

6.5 Beneficial Use of Ground Granulated Blast Furnace Slag

In accordance with the requirements of WAC NR 538.10(2), a request for approval to beneficially reuse ground granulated blast furnace slag as one of the ISS reagents will be submitted to WDNR. Submission of this request is anticipated in Spring 2014.

7 CONSTRUCTION QUALITY ASSURANCE MEASURES

This section describes the following construction quality assurance measures that will be employed during the removal action.

- Air Monitoring
- Fugitive Emissions Management
- Health and safety
- Sampling and analysis

7.1 Air Monitoring Plan

Removal action activities have the potential to generate emissions, including odor, fugitive respirable particulate matter less than 10 µm in diameter (PM_{10}), and vapor phase COCs. Potential emission sources include the following:

- Soil Excavation: Potential emissions consist of VOC vapors and fugitive dust during soil excavation and loading into trucks.
- In Situ Solidification/Stabilization: Potential emissions consist of non-MGP related fugitive dust (i.e., dry reagent) and MGP-related vapor/odor emissions as the soil is disturbed by mixing.
- Excavated Material Management: Potential emissions consist of fugitive dust and/or vapor/odor emissions from stockpiles and during material handling.

Consistent with other IBS managed removal actions (i.e., Crawford and North Plant), pre-construction air monitoring will be performed to document background levels of particulates and vapor phase COCs at the Site. Air monitoring will be conducted at the Site perimeter during removal action activities to ensure engineering measures are being protective of public health and the environment and to determine when response actions are warranted. Specific air monitoring elements are likely to include the following:

- Establishing a dedicated continuously operated weather station at the Site to monitor meteorological conditions.
- Collecting pre-construction background air samples to establish baseline ambient air concentrations.
- Continuously monitoring TVOCs and PM_{10} with fixed air monitoring (FAM) stations at the Site perimeter.

- Supplemental periodic handheld operational air monitoring for TVOCs, benzene, and PM_{10} during active work periods using portable and handheld equipment for comparison with established Action Levels.

- Collecting 24-hour time-weighted SUMMA canister samples along the Site perimeter during active construction. SUMMA canisters will be used to collect 24-hour time-weighted average samples for VOC analysis. Results will be compared to the site-specific risk-based acceptable air concentrations (AAC) which will be developed and provided in an addendum to this document at a later date.

- Collecting 24-hour time-weighted polyurethane foam (PUF) samples along the Site perimeter during active construction. PUF samples will be used to collect 24-hour time-weighted average samples for PAH analysis. Results will be compared to the site-specific risk-based AACs which will be developed and provided in an addendum to this document at a later date.

Air monitoring activities will be conducted by NRT. The air monitoring contractor will support planning, implementation, and documentation of a comprehensive perimeter air monitoring program during removal action activities. The air monitoring contractor will work with the removal action contractor and the engineer through all phases of the removal action to ensure appropriate control and mitigation of vapor phase, fugitive dust, and odor emissions.

7.1.1 Real-Time Perimeter Air Monitoring

Real-time air monitoring for TVOCs and PM_{10} will be conducted along the Site perimeter continuously at FAM stations. The intent of the real-time monitoring program is to provide an early detection of short-term emissions and potential off-site migration of removal action related TVOCs and PM_{10}. Real-time FAM stations will operate 24-hours per day, 7-days per week, during periods of removal action activity. The real-time perimeter air monitoring system consists of FAM stations that are supported by a central computer and an alarm notification system.

The FAM stations are typically programmed to measure 15-minute average TVOC and PM_{10} concentrations. Each station will include a gas chromatograph programed to differentiate individual BTEX compounds if the 15-minute TVOC average exceeds the Action Levels described in Section 7.1.5. The FAM stations will transmit data in real-time to a central computer via wireless radio telemetry. The central computer will be programed to compare the TVOC and PM_{10} 15-minute averages to the Action Level. If an Action Level is exceeded, an alarm will display on the central computer and predetermined individual(s) will be notified.

7.1.2 Time Weighted Average (24-Hour) Perimeter Air Monitoring

The proposed air sampling strategy is divided into three categories: background monitoring, full-scale startup, and full-scale operations. Each category has distinct sampling frequencies and quantity requirements. Frequencies and quantities may be revised during construction. Sampling requirements include the following:

- Background: Prior to startup of full-scale operations, background air sampling and monitoring will be conducted to establish baseline concentrations for comparison with AACs. In addition to continuous real-time monitoring with the FAMs, 24-hour SUMMA and PUF sampling will be performed at upwind and downwind locations along Site perimeter. The SUMMA samples will be analyzed for VOCs including naphthalene (USEPA Method TO-15). The PUF samples will be analyzed for PAHs (USEPA Method TO-13A).

- Full Scale Startup: During approximately the first two months of full-scale operation, 24-hour SUMMA samples will be collected at upwind and downwind locations along the Site perimeter three times per week. 24-hour PUF samples will be collected at upwind and downwind locations along the Site perimeter a minimum of once per week. Priority (3-day) laboratory turnaround will be requested for rapid assessment of the analytical results. The duration of the Full Scale Startup period may be extended based on site-specific conditions that could include weather and work activities.

- Full Scale: During the remaining duration of full-scale operations, 24-hour SUMMA samples will be collected twice per week at upwind and downwind locations along the Site perimeter. PAH data will be collected with 24-hour PUF samples at upwind and downwind locations along the Site perimeter once per week or may be monitored indirectly by measuring the PM_{10} concentration (i.e., using real-time monitor), rather than using PUF samplers.

- With the exception of full scale startup, samples will be analyzed within the 14-day holding time unless real-time monitoring results indicate that the sample analysis should be expedited to evaluate potential on-site exceedances of AACs.

- Upwind and downwind samples will be located along the Site perimeter based on removal action activities, accessibility, receptors, and weather conditions.

- Field duplicates for the SUMMA canisters and PUF samples will be collected at a frequency of one per 20 samples. Duplicates will be obtained by collecting two concurrent samples from a single location and having both analyzed by the laboratory.

7.1.3 Real-Time Handheld and Observational Monitoring

Periodic real-time air monitoring using portable and handheld devices will be conducted along the Site perimeter prior to and during the removal action operations. The frequency and locations for monitoring will be based on site-specific conditions encountered during the removal operations and potential sensitivity of off-site receptors. Key requirements include of the following:

- TVOCs will be monitored at least once daily along the Site perimeter during active work periods using a handheld photoionization detector (PID) at upwind and downwind locations

- Benzene will be monitored at upwind and downwind locations using a handheld PID with a vapor-specific separation tube that analyzes specifically for benzene only when sustained concentrations of TVOCs are observed at or above the Action Level

- PM_{10} will be monitored at least once daily during active work periods using portable DustTrak™ aerosol monitoring equipment, or similar

- Odor will be periodically assessed along the Site perimeter during active work periods

- Fugitive dust will be continuously monitored by visual assessment during construction operations.

7.1.4 Assessment of Meteorological Conditions

An on-site meteorological station will be used to measure wind speed, wind direction, relative humidity, ambient air temperature, and barometric pressure. Data will be relayed to a dedicated computer that will receive continuous meteorological data and compute a 5-minute running average of the wind speed and direction. The 5-minute running average wind direction will be used to identify upwind and downwind sample locations and to monitor off-site receptors. The information will be stored electronically and included in daily reports. Average daily temperatures and barometric pressures will be used to calculate 24-hour time-weighted average air sample volumes for the SUMMA canisters and PUF samples. Meteorological data may also be obtained from the National Data Buoy Center (Two Rivers Station C58W3) in the event of a malfunction of the on-site station.

7.1.5 Action Levels

Action Levels will be used as a screening tool to manage construction activities to minimize the potential for off-site emissions. Action levels are selected at appropriate levels to avoid exceeding an action level from ambient air concentrations (e.g., exhaust from nearby parked cars) versus concerns that could be resulting from removal action operations. Exceedance of an Action Level at the Site perimeter will require a response action for vapor phase, particulate, and/or odor mitigation based on the conditions presented in Section 7.2.1. The effectiveness of the Action Levels to maintain off-site vapor phase emissions below the AACs will be assessed during the full-scale startup and may be adjusted, as appropriate. Proposed Action Levels for periodic real-time perimeter monitoring are summarized in the table below:

Action Levels

Parameter	Action Level
TVOCs	1.0 ppm greater than background (15-minute average concentration)
Benzene	0.5 ppm
PM_{10}	1.0 mg/m^3 greater than background (15-minute average concentration)

These action levels are based on the Wisconsin Bureau of Environmental and Occupational Health, Department of Health Services' *Health based Guidance for Air-Management, Public Participation, and Risk Communication During the Excavation of Former Manufactured Gas Plants.*

7.2 Fugitive Emissions Management Plan

Action Levels for fugitive air emissions will be used in a tiered approach to determine necessary response actions to different exposure conditions. In addition to the Action Levels provided in Section 7.1.5, a qualitative assessment will be performed for odor at the Site perimeter. An odor Action Level will be defined as conditions perceived to present a public nuisance or if a public complaint is received. Dust will also be assessed qualitatively based on observed off-site migration.

7.2.1 Emission Conditions

Three Emission Conditions have been developed based on the type and duration of an Action Level exceedance. The three conditions are depicted on Figure 7 and have the following definitions:

- **Emission Condition 1**: Air conditions for either TVOCs or particulates exceed the Action Level at the Site perimeter. Emission Condition 1 may also be triggered by odor at the Site perimeter that could pose a public nuisance and/or sustained off-site migration of visible dust. This condition initiates a yellow flag.
- **Emission Condition 2**: BTEX concentrations exceed the Action Level or particulates continue to exceed the Action Level longer than 15 minutes. Emission Condition 2 will also be triggered if mitigation measures for an Emission Condition 1 are ineffective in reducing odors or visible off-site dust migration. This condition initiates a red flag.
- **Emission Condition 3**: Concentrations of BTEX or particulates continue to exceed an Action Level for an additional 15 minutes after Emission Condition 2 is initiated. Emission Condition 3 will also be triggered if mitigation measures for an Emission Condition 2 are ineffective in reducing odors or visible off-site dust migration or if a public complaint is received. This condition continues the red flag.

Site Condition information will be conveyed to the air monitoring contractor via visual confirmation on the base computer monitor paired with an automated cell phone notification to the air monitoring contractor's

field technician. Following the receipt of the information, verbal notification will be made directly to the engineer by the air monitoring contractor's field technician.

In addition to monitoring Action Levels, monitoring of AACs at the perimeter will be conducted using 24-hour time-weighted sampling methods for target compounds. The objective for monitoring AACs is to confirm that any off-site fugitive emissions are below levels that would pose an exposure concern. If exceedances of the AACs are identified, modifications to the fugitive emissions response strategy may be required that could include more aggressive application of fugitive emission controls/measures and/or reducing Action Level concentrations for Site Condition response.

7.2.2 Notification, Communication and Response Procedures

Clear lines of communication and understanding of roles and responsibilities is critical to effectively responding to and implementing appropriate mitigation measures. Notification, communication, and response procedures will be in accordance with the following general procedure:

- **Identification and Verification of an Emission Condition Alarm:** The air monitoring contractor identifies and verifies the condition from an on-site activity.
- **Notification and Communication:** The air monitoring contractor notifies the engineer and contractor for a collaborative determination of the appropriate mitigation measures.
- **Response Implementation:** The contractor implements the mitigation measures.
- **Assessment and Confirmation:** The engineer and air monitoring contractor determine if the mitigation measures implemented were effective in reducing perimeter emissions.

Communication of an Emission Condition Alarm will be initiated by the air monitoring contractor to the engineer who will then coordinate and communicate with the remediation contractor to implement the appropriate mitigation measures. During initial notification to the engineer, the air monitoring contractor will verify that the alarm is not due to off-site emission sources. Following verification, the notification will be confirmed with the engineer and the air monitoring contractor, engineer, and remediation contractor will discuss the Site Condition and appropriate mitigation measures. Following implementation, the engineer will assess the effectiveness of the mitigation measures by communication with the air monitoring contractor who will continue to monitor changes to Action Level parameter concentrations. Changes in concentrations will be reported directly to the engineer by the air monitoring contractor. If mitigation measures are not effective, the engineer, air monitoring contractor, and the remediation contractor will meet to discuss and implement appropriate additional and/or modified mitigation measures.

Following implementation of the appropriate mitigation measures the engineer will assess the effectiveness of the mitigation measures by communicating with the air monitoring contactor and the remediation contractor. Following demonstration that the perimeter concentrations have been effectively

reduced below, the engineer will confirm with the remediation contractor a return to an operational condition.

7.2.3 Mitigation Measures

Mitigation measures for fugitive emissions are divided into the following categories:

- Physical Controls: Physical controls are the primary mitigation measures and incorporate a variety of activities (e.g., good housekeeping practices, maintaining exclusion zones, and covering stockpiles). If Emission Condition 2 or 3 mitigation measures are required, modifications to the physical controls may include more aggressive activities such as daily covering of stockpiles or continuous use of water for dust suppression.

- Work Sequencing: Sequencing the work will limit emissions from freshly exposed soil and the amount of material that may require stockpiling pending further management. Other sequencing aspects include planning the operations to avoid double-handling of impacted materials and scheduling loading and off-site hauling to minimize the duration that staged materials will need to be maintained. If Emission Condition 2 or 3 mitigation measures are required, work sequencing may be modified.

- Site Layout: Requirements for site layout include planning by the contractor to locate proposed stockpile and material management areas away from potentially sensitive receptors to the extent practicable. These requirements will also include reassessment of site layout as necessary throughout construction.

- Engineering Controls: Required during Emission Condition 2. Engineering controls will consist primarily of the use of Rusmar™ Long Duration Foam (AC-645) or an equal product approved by the Field Engineer. Application produces thick viscous foam for immediate suppression of fugitive emissions. Foam application is not required under Emission Condition 1 but may be used for control of localized emissions in the removal action areas. The use of Rusmar AC-900 series may only be required under Emission Condition 3. This foam provides an extended duration and higher level of suppression effectiveness than the Rusmar AC-645.

7.3 Health and Safety Plan

IBS, contractors, and NRT personnel will be qualified and knowledgeable with respect to health and safety requirements relating to the removal action. A site-specific Health & Safety Plan will be developed for IBS and oversight personnel working at the Site during all field activities in general accordance with the USEPA-approved *Multi-Site Health and Safety Plan Revision 2* (Prepared for Integrys, 2007). This plan will be a separate document and will be available upon request for review. Project team members will read and be familiar with the plan prior to beginning field work.

Contractors retained to conduct the removal action will be required to have a written Health & Safety Plan prior to the start of field activities and will maintain a copy at the Site at all times during work activities. The Contractors' Health & Safety Plan will comply with all applicable OSHA regulations including 29 CFR 1910: Occupational Safety and Health Standards and 29 CFR 1926: Health and Safety Regulations for Construction. The plan will, at a minimum, address the following elements:

- Key Personnel
- Air Monitoring
- Health and Safety Risks
- Site Control
- Training Documentation
- Decontamination
- Protective Equipment
- Emergency Response
- Medical Surveillance

Contractor's employees and subcontractors performing work on this project involving excavation, movement, or treatment of solid waste or contaminated media will be required to have appropriate training as specified in the OSHA standards, including HAZWOPER Standard 29 CFR 1910.120. All work is to be performed in Level D personal protective equipment, but the contractor will have capability to upgrade to Level C.

7.4 Sampling and Analysis Plan

If soil and wastewater samples need to be collected, the following criteria will be followed:

- Analysis of environmental media samples will be performed by an analytical laboratory included in the USEPA-approved RI/FS Multi-Site QAPP – Revision 2 (Submitted to the USEPA in 2007). The approved laboratories anticipated for use are STAT Analysis, Pace Analytical, and Test America.
- All samples for laboratory analysis will be collected in laboratory-supplied containers.
- Each cooler of samples will contain a temperature blank and trip blank for BTEX (if aqueous samples are submitted for BTEX) to demonstrate proper sample preservation and handling.
- All QA/QC required by the analytical method will be completed. Lab QA/QC summary and chain of custody documentation will be submitted with analytical results.

Soil and water sampling procedures and analytical methods will be in accordance with the USEPA-approved RI/FS Multi-Site QAPP – Revision 2 (Submitted to the USEPA in 2007).

7.4.1 Pre-Disposal Sampling

If required by the landfill, pre-disposal samples of excavated soils will be collected prior to disposal to verify that MGP source material soils are not above the Subtitle D landfill requirements. If soils are above landfill requirements and require amendment, the soils will either be managed onsite with ISS or samples

will be collected following amendment to document that landfill requirements are met. These samples will be submitted to a laboratory per landfill requirements.

7.4.2 Wastewater

If wastewater is generated, wastewater samples will be collected in accordance with the City of Two Rivers requirements prior to discharge to the sanitary sewer. Samples will be analyzed for the parameters specified by the City of Two Rivers to confirm concentrations are below the discharge limits required by the permit.

7.5 ISS Construction Quality Assurance Plan

During ISS construction, a CQA plan will be implemented to ensure the ISS columns are constructed to meet the design performance goals. A preliminary CQA Plan is provided in Table 1. This plan will be revised, if necessary, following ISS treatability study completion and provided as a report addendum submitted in summer 2014. Since the treatability study will correlate leaching performance to the physical parameters of the mix design (UCS and hydraulic conductivity), the CQA program will evaluate the physical parameters and no leach testing or durability tests will be performed during the removal action.

The CQA plan implemented during full-scale ISS construction will likely include collection of one CQA sample for every 1,000 cubic yards treated or once each day of ISS treatment, and collection of one CQA sample for every 200 linear feet along the treatment area perimeter to ensure compliance with the design parameters. Any ISS columns that do not meet the mix design parameters will be documented and retreated if necessary.

8 SCHEDULE

8.1 Schedule for Construction

Construction activities are tentatively scheduled to begin in summer 2014 subject to review and approval of this RAWP by the USEPA, issuance of a final Administrative Order on Consent, and governmental approvals. Property access and contractor availability are not expected to be constraints with respect to the project schedule; however, weather conditions may influence the production rate of the work.

The table below summarizes the estimate construction schedule based on the planned scope of work.

Preliminary Construction Schedule

Activity	Duration (Weeks)
Target Project Start Date	Summer 2014
Mobilization / Site Preparation	3
ISS and Shallow Excavation	12
ISS Swell Management	1
Site Restoration/Close Out	2
Contingency	2
Total Estimated Project Duration	20 (0.38 Years)
Target Completion	Fall 2014

Assumptions: A prudent estimate for typical ISS/excavation construction assumes approximately 700 cubic yards/day; which was utilized for this schedule. An estimate of 41,300 cubic yards of remediation is assumed.

8.2 Future Addendums

Future information will be submitted to the USEPA in regards to;

- Summary of the pre-removal action data collection activities
- Update figures of source material and confirmatory limits for removal action (Section 4.2.1)
- Results from the treatability study including recommended mix design(s), geotechnical and chemical results, and additional recommendations based upon the results (Section 4.2.2)
- Lower clay layer topographic map to establish vertical limits for the removal operations in Areas A, B and C

- Boring logs for each of the boring locations
- Tabulated summaries of laboratory analytical data
- Copies of all laboratory analytical data reports and other pertinent forms (e.g., chains of custody)
- Construction Quality Assurance Plan
- Site-specific risk-based acceptable air concentration memo
- Site staging for removal action activities
- ISS column layout
- Site restoration design (including wetland restoration)
- Final Wetland Mitigation Plan

8.3 Completion Report

A Removal Action Completion Report will be submitted to USEPA within 90 days following restoration of the Site.

9 REFERENCES

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