WARZYN

FFS Work Plan
13954

Focused Feasibility Study
Remedial Investigation/ Feasibility Study
N.W. Mauthe Company
Appleton, Wisconsin

Prepared for:
WI Department of Natural Resources
Madison, Wisconsin

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WORK PLAN
FOCUSED FEASIBILITY STUDY
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SECTION 1
INTRODUCTION

Project Background

This Work Plan describes the activities proposed for conducting a Focused Feasibility Study (FFS) at the N. W. Mauthe Company Site (Site). The Site is a former electroplating facility located at 725 South Outagamie Street in Appleton, Wisconsin (Figure 1). The property is presently owned by Carol Mauthe, widow of Norbert Mauthe.

In March 1982, an anonymous complaint was registered describing yellow liquid ponding adjacent to the Site. A Wisconsin Department of Natural Resources (WDNR) inspection found evidence of chromium contamination on-Site and in the basement of a residence 150 ft southeast of the Site.

The WDNR initiated remedial efforts, including:

- installation of a shallow groundwater collection system which removed approximately 1.3 million gallons of liquid;
- installation and sampling of soil borings and monitoring wells;
- excavation of contaminated soil on a limited scale; and
- regrading and sealing the surface soil to enhance runoff.

Despite these efforts, the Site is still considered contaminated, and is currently on the Superfund National Priorities List (NPL).

Basis of Focused Feasibility Study

The concept of a Focused Feasibility Study (FFS) has been proposed by the Wisconsin Department of Natural Resource (WDNR) to provide an expedited response to contamination at the Site. The purpose of conducting a FFS is to provide remedial response actions which will address specific contamination areas (i.e., soil contamination "hot spots") concurrent with conducting a full scale Remedial Investigation and Feasibility Study (RI/FS) for Site-wide, long term solutions.

The motivation for considering an FFS is based, in part, on the Site investigation and history of remedial actions at the Site. Since 1982, various Site investigations and remedial actions have been undertaken (and are documented in a Site Evaluation Report (SER), by Warzyn Engineering Inc., March 1990). The previous Site investigations have provided information relative to the Site and the contamination problem, which may be adequate to evaluate the viability of remedial actions with little or no additional investigative data. Thus, the potential exists to provide more rapid Site remedial responses than the traditional RI/FS process would otherwise allow.

The FFS Technical Memorandum (TM) issued December 14, 1989, recommended the implementation of an FFS. Comments of the FFS TM from the WDNR are addressed in this Work Plan.

Purpose and Scope of the FFS Work Plan

The purpose of this Work Plan is to address items needed to fulfill the requirements for a FFS. The Work Plan is based on Site information provided in the Site Evaluation Report (SER) and an evaluation of existing data provided in this Work Plan.

The initial review and analysis of existing information will support one of the first major project decisions: determining whether the FFS will proceed. This determination will depend on whether the existing data are adequate to support the definition of Site problems and the development and evaluation of remedial action alternatives. Criteria for determining the adequacy of information will be developed and included in the Work Plan. The Plan will also describe the work to be performed under each task and will include a schedule for the completion of each task.

At a minimum, the criteria will account for:

- Changes in the physical nature of the Site or physical features at the Site since the existing data were collected.
- Significant migration, dilution or attenuation of contaminants since the existing data were collected.
- A lack of information on the horizontal or vertical extent of soil contamination over a large enough area of the Site to preclude the development of feasible remedial alternatives.
- A lack of information on an exposure route or routes that would preclude the development of feasible remedial alternatives.

This report is organized into four sections:

- Section 1 presents the basis of the FFS and the purpose and scope of this Work Plan.
- Independent criteria are developed in Section 2 for determining information adequacy to provide a basis from which the existing Site data can be evaluated.
- Site data are evaluated in Section 3 relative to the established criteria to determine if, and to what extent, an FFS can proceed.
- Section 4 provides descriptions of Site activities necessary to fill data gaps which relate to FFS actions.
- Section 5 presents the Work Plan for the FFS.

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SECTION 2
CRITERIA FOR DETERMINING THE ADEQUACY OF INFORMATION

General

The adequacy of the information which would be used to develop recommended remedial actions must be assessed prior to proceeding with a Focused Feasibility Study (FFS). Information which is inaccurate, out of date, or misleading would lead to the recommendations of inappropriate or ineffective remedial responses. Also, information must be available to determine adequacy of remedial alternatives to satisfy applicable or relevant and appropriate requirements (ARARs). A set of independent criteria should be established for acceptance and use of the available information, and be based on the data necessary to evaluate applicable remedial technologies.

This section presents specific criteria for the evaluation of range, accuracy and level of detail for existing Site information, which must be met in order to conduct an effective FFS; i.e., one which can accurately evaluate remedial actions based on their effectiveness, implementability, and cost.

Types of Data Required

The types of data required to conduct the FFS must adequately define the physical and environmental characteristics as well as the nature of contamination. Regional and Site soils, geology, and groundwater characteristics must be defined to determine the existing or potential behavior of contaminants in the environment, and to evaluate the effectiveness of potential remediation techniques. Historical information will be required relative to contaminant exposures, previous plant operations, and remediations and disruptions. Maps and data describing the physical features (structures, utilities, ground cover, topography, etc.) will be necessary to develop practical remedial actions.

One of the most essential categories of information is the data required to define the existing contamination characteristics, including the types and distribution of contaminants, and their potential migration routes to both on-Site and off-Site receptors. Information pertaining to the risks posed by existing contamination, and regulatory requirements concerning cleanup objectives and technology implementation, must be obtained to develop effective and implementable remedial alternatives in the FFS.

Data Reliability

Data and information must be available and sufficiently reliable to make recommended solutions effective and practical to implement. Data and information reliability in general is a relative, rather than an absolute, characteristic. This is notably true for data gathered from several independent sources over a period spanning several years. In evaluating whether or not the available information is sufficiently reliable for use in the FFS, general criteria, addressing the consequences of implementing a given remedial action based on that information, will be used. The consequences of using data of marginal reliability will be addressed, in particular regarding the potential effects on costs, effectiveness, and implementability of proposed remedial measures.

For several categories of information, the age of the data should be taken into account. For instance, the distribution, chemical state and interactions of various contaminants can change over time. Groundwater levels vary with seasonal and yearly fluctuations in precipitation. Data for these types of time-dependent variables must be sufficiently recent, or have a sufficiently complete chronological record such that inferences can be drawn for existing conditions.

Data and information accuracy should also be addressed. Determining the accuracy of previous data, however, is often a subjective activity and the accuracy may be difficult to assess in some instances. The accuracy of information will be essential for some types of data (i.e., contaminant sources) and less important for others (i.e., precise physical features locations). The level of accuracy should be used as a criterion for information adequacy when that information is critical in determining the effectiveness or implementability of remedial actions. The methods used to gather or analyze data, raw data used to formulate previous reports, etc., must be available to check data accuracy. In general, an assessment will be made as to whether standard and appropriate methods were used.

Site Hydrogeologic Information

Information concerning soils, geology, and groundwater characteristics will be necessary to define the contamination problem and effectively evaluate appropriate remedial technologies. Soil boring logs, monitoring well data, and local and regional geologic information should be sufficient to profile the strata and groundwater characteristics in known areas of contamination. The following criteria are established for acceptance of hydrogeologic information:

Type of Data	Criteria for Adequacy
On-Site soils stratigraphy	· Identifies Site soil types according to USCS Classification and their general distributions
	· Defines Site hydrostratigraphy.
	· Provides sufficient data to estimate void volumes, infiltration rates, and soil densities
Site geology	· Defines approximate depth and type of bedrock
	· General types and distribution of unconsolidated deposits
Groundwater characteristics	· Groundwater levels on-Site: sufficiently recent or a continuous chronological record to accurately determine current groundwater levels and the direction of groundwater flow
	· Regional groundwater information: sufficient to determine and/or fill data gaps for on-Site groundwater flow and level data
	· Aquifer characteristics: Local or Site-specific values for aquifer permeability, hydraulic conductivity, storativity, etc. (or sufficient data to accurately estimate these values)
	· Information on local pumping wells and natural groundwater discharge points

Site History

Site historical information covers a wide range of categories, including previous plant operations and contaminant spill information, observations by investigators, past exposures to contaminants, and previous remediations. While much of this type of information is helpful, two general categories are essential requirements for conducting the FFS: 1) contaminant source information, and 2) previous remediation information. The following criteria are established for determining the adequacy of historical information.

Type of Data	Criteria for Adequacy
Previous plant operations	· Sufficient information to define major types and locations of potential contaminant sources.
Previous contaminant spills or releases	· If major spills or releases are recorded in the literature, information from previous letters, inspections, investigations, etc. should identify the types, locations and quantities of contaminants involved.
Previous remediations	· Information on previously implemented remediations must be available. The information should provide the types, locations, general effectiveness, and current status of each technology. Depending on the specific technology, design or performance data may additionally be required, and will be evaluated on a case by case basis.

Physical Features

Data on physical features at and near the Site should describe the general area layout, locations of major above-ground and subsurface structures, topography, general vegetative cover, property boundaries, utility corridors, etc. This type of information is essential in defining the ability to implement various remedial alternatives, identifying the limits imposed by major on- and off-Site structures, and identifying potential sources and migration pathways of contaminants. Examples include:

- Size, location, and general structural status of on-Site buildings;
- Location, size, and containment information for aboveground and buried tanks, drums or other on-Site storage facilities;
- Any other major structures, material stockpiles, etc., which may impede excavation or other potential remediation techniques;

- The general layout and extent of vegetative cover and man-made ground cover materials (asphalt, concrete, gravel, etc);
- General up-to-date data on topography, including Site surface water drainage channels;
- Property boundaries and owners for the Site, adjacent properties, and off-Site properties with known or suspected contamination problems; and
- Approximate, up-to-date information for active utility and transportation corridors at or near the Site.

Until a remedial design is undertaken, this type of information need not be precise relative to locations and distances. Rather, it should provide comprehensive information on the general sizes, locations, and layouts of the major physical features.

Existing Contamination Problem Definition

Information concerning existing contamination characteristics must be adequate to accurately estimate the current situation. Information on the types and general distribution of contaminants must be recent and/or provide a continuous record. Identifying probable migration pathways, exposure routes, and potential immediate receptors is necessary. The following criteria are presented for determining the adequacy of information relative to defining the contamination problem:

Type of Data	Criteria for Adequacy
Types of contaminants	• Chemical analyses of soil and groundwater for the potential contaminants typically associated with industrial processes used at the Site. • Regional or local data on the natural background levels for the above constituents.
Distribution of contaminants	• A sufficient number and spatial distribution of sampling locations to define major sources and areas of contamination. • Sufficient sampling of groundwater, subsoils, surface soils, surface waters, structures, and the atmosphere.

Potential exposure routes	· Off-Site contamination levels over time. · Information on the location of known previous exposures.
Potential Receptors	· Off-Site contamination levels over time. · Locations of local water wells. · Locations, construction information, and discharge piping details for private residence basement sumps. · Locations of nearby construction or excavation activities. · Locations of nearby storm sewers. · Locations and use of downgradient (groundwater) and downstream (runoff) surface waters. · General pedestrian traffic through and adjacent to the Site.

Risk Assessment and Regulatory Requirements

Remedial response objectives must be developed in order to evaluate the types and degree of remedial actions for the FFS. The remedial response objectives should be based on some level of risk assessment for the known contaminants and on applicable regulatory requirements for immediate cleanup levels. The various remedial options which remove, immobilize, and/or reduce the toxicity of the contaminant can then be evaluated based on their effectiveness relative to the remedial objectives.

Regulatory information regarding the implementability of proposed remedial technologies is also necessary. This type of information would cover areas such as the ability to implement new technologies or on-Site treatment or disposal processes, air and water discharge standards, etc.

Specific risk assessment and regulatory information does not necessarily need to be in place for this initial information analysis; i.e., to determine if the FFS is to proceed. However, provisions to develop, provide, or waive these types of information should be in place prior to proceeding with the FFS. The development of risk assessment criteria and defining applicable regulatory requirements can be included as early tasks in the FFS. Upon determining regulatory requirements with the WDNR, an Alternatives Array Document (described in Section 5, Subtask 2.3) will be provided as part of the FFS process and will request the determination of possible applicable or relevant and appropriate requirements (ARARs) by concerned federal agencies.

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SECTION 3
INFORMATION EVALUATION

GENERAL ADEQUACY OF INFORMATION

Site Hydrogeologic Information

Current regional and Site specific information on soils generally meet the criteria established in Section 2. The prevalent Site soil types are defined by soil borings in the upper 20 feet of material. The depth to bedrock is approximately 100 ft, which is great enough that this should not be a concern. Intermittent sand seams have been reported in several borings. They do not appear to be continuous, but need to be more fully defined.

Information to define hydrogeology is grossly lacking and inadequate relative to the established criteria. Groundwater levels appear to vary significantly over time, and a sufficient chronological record does not exist to accurately determine natural level fluctuations or groundwater flow directions. Regional groundwater information is available to support general groundwater assumptions, but the existence of heterogeneous soil types makes regional data less applicable to Site-specific analysis and conclusions. No aquifer characteristics information is available to define groundwater flow rates or pumping rates or to establish appropriate pumping rates for groundwater extraction and treatment.

Site History

Historical information relative to previous plant operations and contaminant release provides adequate information to define contaminant sources. The operations which took place in the chromium building are fairly well defined for chromium materials. Historical operations information for other potential contaminants (VOCs, cyanide, zinc, etc.) are not documented. This includes operations in both the chromium and zinc buildings relative to chemicals other than chromium. Breaches within the concrete floor provide indications of probable contaminant release, but no specific information on spills is available. Floor drains and associated underground piping also represent potentially important migration pathways.

Previous remediation history is well documented for some activities and inadequate for others. The french drain and pump system which operated from 1982 until 1984 remains in place. Although design or as-built construction plans are not available to precisely locate the underground perforated piping, approximate locations have been established. If precise pipe location is required, it can be readily ascertained for the shallow system in the field during RI or FFS activities. The types and locations of U.S. Sprint and AT&T anti-seep plugs are adequately documented. Soil excavation activities in 1982 are not documented adequately to provide usable information. Plant records necessary to satisfy historical information deficiencies addressed in this discussion have not been located and their existence is unlikely. However, the FFS process can adequately proceed with current historical information.

Physical Features

A topographic survey and utility survey were performed in January 1990 and are included in the SER. The survey includes locations of structures and utilities, topography, approximate property boundaries, and building layout and construction details.

Existing Contamination Problem Definition

In general, information is inadequate to identify existing contamination characteristics at and near the Site. Inorganic and organic contaminants (i.e., chromium, cadmium, cyanide, methylene chloride, 1,1,1-TCA, TCE) have been detected since 1982, which may cause risk to human health and the environment. No sufficiently comprehensive, recent sampling has taken place to define sources within Site buildings, or to determine the distribution of contaminants in subsurface soil and groundwater. A possible exception is chromium, which has been determined as a prevalent contaminant with general source locations defined. However, the only adequate information relative to chromium distribution is for soils; it is 6 to 7 years old, and thus may not represent current conditions. More recent sampling of soil, groundwater, surface soils, and surface water provides limited additional information on the current chromium distribution.

Information concerning potential contaminant pathways and receptors is adequate for obvious means of potential exposure. Direct contact with contaminated surface soils and ponded surface water are adequately defined as potential exposure routes. High chromium levels in groundwater have been determined to be a potential risk to off-Site residences and underground construction activities. Data assembled during the preparation of the SER do not indicate the presence of private water supply wells which might be considered at risk due to Site conditions. Nearby utility corridors are adequately defined by existing information, but their potential as pathways to receptors is unknown due to a lack of on-Site groundwater flow path data.

Risk Assessment and Regulatory Requirements

Insufficient information is available to adequately assess the risks to human health and the environment. Some risk assessment was provided in recent investigative studies performed in 1989 (see SER), but these studies were limited in scope. At a minimum, a qualitative risk assessment should be included in the FFS.

ARARs have not been identified for FFS activities. Identification of ARARs will be required prior to selecting an FFS remedy.

IDENTIFICATION AND ASSESSMENT OF DATA GAPS

Description of Data Gaps

The following gaps or deficiencies in data were identified during the formulation of the SER and are discussed in this section.

- The extent and continuity of sand seams in unconsolidated deposits;
- Site hydrogeologic information, including groundwater level fluctuations, the rate and direction of groundwater flow, and quantitative hydraulic properties of the aquifer;
- Details on the precise location and condition of the french drain system piping;
- Background groundwater quality;
- Location of possible sanitary sewer lines at or near the chrome building located on-Site;

- Areal and vertical distribution of contaminant concentrations in the groundwater;
- Changes in the distribution of chromium concentrations in the soil since 1983, and the distribution of other contaminants in the soil, such as cadmium, zinc, cyanide, etc.; and
- Risk assessment information and regulatory requirements.

Importance of Identified Data Gaps

The following material presents an assessment of the importance of each of the above identified data gaps, within the scope of an FFS.

The lack of adequate information on Site hydrogeology presents serious data deficiencies relative to considering any groundwater remediation. The migration direction and magnitude of contaminated groundwater flow can not currently be determined. Thus, it would be impossible to accurately evaluate the effectiveness of any proposed remedial actions designed to limit the mobility (slurry walls) or remove contaminated groundwater (collection trenches, extraction wells) at the Site. The lack of recent data on the areal and vertical extent of chromium and other contaminants would also make it difficult to develop effective groundwater remediation solutions. Implementing groundwater remediation may interfere with concurrent RI activities designed to respond to these existing data gaps.

No remedial efforts in response to potential contaminants from the zinc building (see Figure 1) can be evaluated without information regarding previous operations or extensive sampling in and around this building to determine contaminant sources. The fact that several different types of contaminants have been identified as being used during active operations in the zinc building requires a thorough characterization of this area.

Details on the existing french drain system will be necessary only if FFS remedial response actions include reactivating all or part of this system, or if other technologies are considered for the area now occupied by system piping. This does not constitute an important data deficiency, at this time.

Information relative to basement sumps in adjacent residences is important to determine the level of risk associated with chromium contaminated groundwater being contained and pumped by these units. Details concerning the sump pump size, structural condition, types of protective cover, as well as a determination of sump pump discharge locations should be ascertained for the residences adjacent to the southeast border of the Site.

Groundwater remediation will not be included in the FFS, because major data gaps exist relative to essential hydrogeologic parameters.

Data which better define the current levels and the distribution of contaminants in the soil are important to develop soil remediation alternatives which are effective in addressing the most contaminated areas. The distribution of contaminants will have a direct and significant impact on soil remediation costs developed in the FFS. Additionally, areas identified for chromium contamination may also contain other contaminants (VOCs, cadmium, zinc, cyanide, etc.). Where such multiple constituent contamination exists, soil remediation technologies designed to address chromium may not be appropriate and could potentially have adverse affects regarding other contaminants. This would more likely present problems for treatment oriented technologies as well as removal and disposal types of remediation.

Among the criteria addressed during the FFS alternatives are evaluation of long and short-term risk, and regulatory compliance. Sufficient risk assessment information and ARAR identification are necessary to adequately assess the strengths and weaknesses of each developed alternative.

<u>Additional Data and Investigation Requirements</u>

The FFS should be based on existing data and additional data which can be obtained by minimal efforts. The following discussion provides an assessment of the additional investigative requirements necessary to fill the data gaps identified previously in this section. Recommendations are provided as to whether the missing data should be obtained immediately for use in the FFS or if the gaps are better addressed during full scale RI activities.

The following confirmatory sampling and investigative activities are recommended to obtain additional data for use in the FFS.

- Inspect and inventory ten of the 18 existing monitoring wells to determine if repairs or abandonment are necessary. Also, abandon the remaining eight wells, four of which are missing and need to be located. Groundwater level readings shall be obtained at functional wells to evaluate groundwater flow directions.
- Drill approximately 20 shallow soil borings on and off the Site and analyze soil samples for suspected contaminants, including Target Compound List (TCL) volatile organic compounds and Target Analyte List (TAL) parameters, to provide more up to date information on the distribution of contaminants and to confirm suspected contamination "hot spots";
- Locate existing underground utilities (e.g., possible chrome building sanitary service) using geophysical techniques. Also, determine plumbing connections of zinc building floor drains with dye testing.
- Sample building foundation drain sumps at nearby buildings.

Data gaps requiring extensive investigative efforts should be addressed during full scale RI activities. These include:

- Determine the location, extent, and impact of sand seams and clay fracturing in Site soils;
- Determine Site hydrogeologic characteristics to define groundwater flow directions and rates;
- Assess previous operations and current contaminant levels associated with the zinc building;
- Exploratory excavation and testing of the french drain system can be included in RI activities, if deemed necessary during development of the FFS;
- Determine background water quality; and
- Implementation of a comprehensive sampling and analysis program to determine the types, levels, and distribution of contaminants in groundwater, soils, surface water, air, and private residences.

CRITERIA FOR PROCEEDING WITH FFS

The decision to proceed with the FFS, and the determination of its scope, are based in part on the following criteria:

- Existing or readily obtainable information is adequate relative to the media, contaminants and risks considered for remedial action;
- Readily implementable remedial actions are available for consideration in the FFS to address known risks associated with the Site; and
- Potential FFS remedial actions are compatible with the subsequent performance of full Site RI/FS activities and full Site remediation.

FFS SCOPE AND LIMITATIONS

Based on the evaluation of existing data, the identification of readily obtainable information to fill data gaps, and the criteria presented above, the FFS should proceed within a limited scope. The limitations of the FFS scope include addressing only those areas which meet the established criteria. General remedial actions which can be effectively evaluated in the FFS include the following:

- Site access restrictions to prevent direct contact with contaminated soils and surface water;
- Surface water and or shallow groundwater drainage control to limit Site runon and runoff of rainwater and prevent contaminated surface water ponding;
- Actions to address known and suspected contaminant pathways and receptors, including Site surface soil dust control, and utility corridor isolation;
- Actions to remediate the drain systems, such as changing the discharge location to the sanitary sewer or cutting off the flow of contaminants into the systems.
- Contaminant source control at and near Site buildings to remove known sources and/or reduce further migration of contaminants to subsurface soils and groundwater; and
- Remediation of contaminated soil on Site.

Remediation of groundwater cannot be effectively evaluated as part of the FFS. A lack of sufficient data on aquifer characteristics and contaminant distribution in the groundwater precludes the evaluation of groundwater remedial options. Similarly, soil remediation for potential contaminants other than chromium can not be addressed in the FFS, due to a lack of existing data to define the types and distribution of contaminants. However, additional chemical characterization of the soil is described in the next Section. This data may indicate the need for remediation of soil contaminated with compounds other than chromium.

Additional recommendations include obtaining the previously identified information to fill data gaps, developing a risk assessment consistent with the FFS scope, and including a review of applicable regulatory requirements as part of the FFS.

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SECTION 4
CONFIRMATORY SAMPLING AND INVESTIGATIVE ACTIVITIES

This section provides descriptions of Site activities necessary to fill data gaps identified in the previous section which relate to FFS activities. These activities include inspection and abandonment of existing monitoring wells, confirming areal and vertical extent of soil contamination, confirming contamination "hot spots", locating existing underground utilities not located during the SER and sampling building foundation drain sumps. A Quality Assurance Project Plan (QAPP), including a Sampling Plan and Data Management Plan has been submitted with the RI/FS Work Plan. The RI/FS Work Plan also includes a conceptual design for a decontamination facility. Also, a Health and Safety Plan has been submitted which addresses FFS investigative activities.

Inventory and Abandonment of Existing Monitoring Wells

Eighteen existing monitoring wells were inspected during preparation of the SER. Ten of the wells were considered potentially viable for data collection, four of the wells were found to be severely damaged, and four wells were not located and may be covered with gravel or asphalt pavement.

The four damaged wells will be abandoned in accordance with NR 141 Wisconsin Administrative Code (WAC) requirements. An attempt will be made to locate the four missing wells. The search for these wells will be based on existing well location data, and will include a surface inspection of the area and the use of a metal detector. If found, the wells will be abandoned in accordance with NR 141 WAC requirements.

A review of well construction details of existing monitoring wells revealed that these wells were installed using construction methods not meeting NR 141 WAC standards. The most significant shortcomings of the construction methods include the use of cement grout installed directly above the filter pack, and the use of glued PVC connections. The grouting technique suggests that there is a potential for grout contamination of these wells, and the use of glue for PVC connections can potentially introduce organic compounds into water samples, leading to inaccurate interpretations of chemical analyses of the groundwater.

The 10 potentially viable wells will be examined to determine whether repairs or abandonment are needed. The types of repairs which may be required will likely include repairs to the protective steel casings and/or surface seal. The integrity of the surface seals will be tested by checking for free play or movement of the PVC casing. Wells in which the PVC casing shows free movement may be abandoned or repaired, based on the judgement of the field geologist (in consultation/approval by WDNR PM).

The pH of the water in the existing monitoring wells will be measured as part of the inspection procedure. Procedures for measuring pH are outlined in the Sampling Plan (Appendix A of the QAPP). Purged water will be handled according to the Investigation Waste Management Plan (IWMP) included in Appendix A of the RI/FS Work Plan. If the measured pH is above 9.0, the well will be assumed to be affected by the cement grout and will be abandoned. Well abandonment will be performed in accordance with NR 141 requirements. Groundwater level measurements will be obtained from the remaining viable wells and a determination of the water table elevation will be made.

The existing well inspection is assumed to be conducted at personal protection level D.

Contamination Confirmation

Twenty-one soil borings will be drilled to confirm extent of contamination and contamination "hot spots". Locations of these borings are shown on Figure 1. Borings SB1 through SB8 are located adjacent to previous soil borings to confirm validity of existing data. Borings SB9 through SB21 are located to confirm the extent of soil contamination. Soil borings at locations SB3, SB12, and SB20 will be angle drilled to the north, at an angle of 60 degrees from horizontal, so that soils below the building slabs can be sampled. Soil borings will be drilled using 4 1/4-in. inside diameter (I.D.) hollow stem augers, to a maximum depth of 20 ft. Soil samples for field classification and chemical analysis will be collected using a split spoon sampler at 2 1/2-ft intervals from ground surface to a depth of 10 ft, and at 5-ft intervals to the terminus of the borehole. The 20-ft maximum depth is intended to delineate the vertical extent of the contaminated soil, based on the WDNR's 1982 soil boring data. Soil samples will be analyzed for U.S. EPA Contract Laboratory Program (CLP) TCL (VOCs) and TAL parameters. Soil samples for grain size analysis will be collected from each identified soil unit within each soil boring, including the clays and any sand seams with a thickness of approximately 1 ft or greater. Approximately four grain size samples are anticipated per boring.

Drill cuttings and excess soil from sampling will be contained and handled according to the (IWMP), included in Appendix A of the RI/FS Work Plan.

Soil sampling equipment will be decontaminated between samples using methods described in the Sampling Plan (Appendix A of the QAPP). Drilling equipment will be steam cleaned between borings.

A geologist will observe and record the soil boring activities. The geologist will visually classify and describe the materials encountered during drilling, and will keep a log showing:

- Boring identification;
- Date or dates of drilling;
- Depth and thickness of "each" stratum;
- Identification of the material composition of each stratum, according to the Unified Soil Classification System (USCS);
- Standard Penetration Test (SPT) blow counts;
- Depth interval from which each sample was taken;
- Total depth of boring; and
- Type and amount of backfill.

Soil borings will be backfilled upon completion of the borehole. If standing water is observed in a boring, the water will be pumped or bailed prior to backfilling of the boring. Removed waste will be contained and handled according to the IWMP. Bentonite chips will be poured into the hollow stem as the augers are removed. Within 3 ft of the ground surface, bentonite pellets will be used. Angle drilled borings will be backfilled with bentonite slurry, using a Tremie pipe. Where soil borings are drilled in grassy locations, the grass will be removed prior to drilling, and will be replaced after the boring has been backfilled. For each boring, one copy of Soil Boring Log form 4400-122 will be sent to WDNR within 60 days of completion of the boring.

Personal protection level D or C is assumed for drilling operations.

Utility Location

Most of the underground utilities in the area have been identified by the respective utility companies and included on Figures 2 and 3 of the SER. However, the possibility exists that abandoned or undisclosed utilities may be located on the Site. It is important to determine the location of buried utilities, because the trenches in which they are installed may serve as preferential migration pathways for contaminants.

Three geophysical methods were initially considered for locating buried utilities. These methods included Ground Penetrating Radar (GPR), electromagnetic, and magnetic methods.

GPR was rejected, because the presence of clay rich soils limits the penetration of the signal. The high frequency signals needed to resolve relatively shallow features are especially susceptible to rapid attenuation by the electrically conductive clay soils.

Magnetic methods were rejected, because of susceptibility to "electrical interference", such as the magnetic fields associated with the adjacent electrical substation and overhead utilities.

Electromagnetic methods are probably the most useful tool in conducting surveys of this nature. An electromagnetic induction method will be employed, using a Geonics EM-31D non-contacting terrain conductivity meter. The EM-31D can be specifically set up to respond to buried metal. The instrument operates by inducing current loops into the earth through a transmitting pole, and measuring the magnetic field induced by the resultant current at the receiving pole. The EM-31D measures elevated terrain conductivity where metal is buried beneath the ground surface.

Data will be collected in a systematic manner by establishing an orthogonal grid with 5-ft node spacing over the Site. Apparent soil conductivity values will be measured at the nodes of the grid. The apparent conductivity will be monitored continuously between the nodal points, providing a more thorough evaluation of subsurface conditions than individual readings at discrete points. Anomalous apparent soil conductivities will be recorded, staked and shown on a Site map.

The survey will require one day of field work, which will be completed prior to intrusive activities. Personal protection level D is assumed to be adequate for the geophysical survey.

Dye testing will be performed to determine the plumbing connections between two floor drains, identified in the Zinc building and Municipal utilities. A television survey will be performed of the existing storm and sanitary sewers in Melvin Street to determine their condition and locate "blind" laterals. These utilities may eventually, during the FFS, be rerouted to eliminate them as contaminant pathways.

The sanitary sewer main in Melvin Street was last televised in 1982 and the sanitary sewer main in Outagamie Street was last televised in 1981. The records of this work are available from the City of Appleton Department of Public Works. An updated televised survey may be obtained, if the present surveys are determined to be inadequate during the FFS.

Building Foundation Drain Sumps

Building foundation drain sumps have been identified as a potential receptor of contaminants. Buildings with potentially contaminated foundation drains include Miller Electric, Netticoat Junction, Hency, Ginter (if a floor drain is present) and Ludwig. Grab samples shall be collected from the drain sumps at these five residences. Samples shall be analyzed for VOC and TAL parameters. Other investigative work associated with the drain sumps includes a check of the City sewer system inspection records, including any Sewer System Evaluation Survey work, dye testing and any necessary inspections. The results of this sampling will help in determining the extent of contamination.

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SECTION 5
WORK PLAN SCOPE

Purpose

The purpose of the FFS Work Plan is to develop and evaluate alternative remedial actions that will protect human health and the environment, and present the relevant information needed to allow for the selection of a Site remedy which will protect human health and the environment. Work performed as part of the FFS should be compatible with future remedial options.

The FFS will conform to Section 121 of CERCLA; the National Contingency Plan (NCP), as amended; and FS Guidance, as amended. It is comprised of the following tasks:

Task 1: Development of Remedial Alternatives
Task 2: Screening of Alternatives
Task 3: Remedial Alternatives Evaluation
Task 4: Focused Feasibility Study Report
Task 5: Community Relations Support

The intent and purpose of each of these tasks is outlined in the following sections.

TASK 1 - DEVELOPMENT OF REMEDIAL ALTERNATIVES

The purpose of this task is to develop a range of remedial alternatives for the Site. This task constitutes the first stage of the FFS and is comprised of interrelated subtasks. The subtasks described below may be viewed as steps that involve making successively more specific definition of potential remedial activities.

Subtask 1.1 - Establishment of Remedial Action Objectives

Site-specific objectives for the remedial action will be established, considering the description of the current situation, the NCP (40 CFR 300), the U.S. EPA's interim guidance, and the requirements of other U.S. EPA, Federal, and Wisconsin ARARs.

These objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment. They will specify: the contaminant(s) of concern; exposure route(s) and receptor(s); and an acceptable contaminant level or range of levels for each exposure route.

Acceptable exposure levels for human health will be determined on the basis of risk factors and contaminant-specific ARARS. Contaminant levels in each media will be compared with these acceptable levels, which will be determined on the basis of an evaluation of the following factors:

- For carcinogens, whether the chemical-specific ARARS provide protection within the risk range of 10^{-4} to 10^{-6} and whether achievement of each chemical-specific ARAR will sufficiently reduce the total risk from exposure to multiple chemicals.
- For non-carcinogens, whether the chemical-specific ARAR is sufficiently protective, if multiple chemicals are present at the Site.
- Whether environmental effects (in addition to human health effects) are adequately addressed by the ARARS.

If an ARAR is determined to be protective, it will be used to establish the acceptable exposure level. If not (presents a risk greater than 10^{-4}), or if an ARAR does not exist for the specific chemical or pathway of concern, or if multiple contaminants may be posing a cumulative risk, acceptable exposure levels will be identified through the risk assessment process.

Detailed guidance for conductivity baseline risk assessment at Superfund Sites is described in U.S. EPA documents entitled: Risk Assessment Guidance for Superfund, Volume 1 - Human Health Evaluation Manual and Volume 2 - Environmental Evaluation Manual (1989).

Clearly, the determination of acceptable exposure levels will depend on the investigation results. Where possible, preliminary response objectives will be established based on existing Site information and a qualitative assessment of potential risks. Response objectives may be revised as information from the RI becomes available.

Subtask 1.2 - Development of General Response Actions

The purpose of this subtask is to identify general response actions that will meet the identified remedial action objectives. Response actions may include source control measures, migration control measures, or both, depending on the media and/or exposure pathways that may need to be addressed.

Subtask 1.3 - Initial Area and Quantity Determination

The purpose of this subtask is to identify areas of concern and quantities of material to be addressed by the general response actions for each medium of concern. This initial determination will be made based on existing information.

Subtask 1.4 - Identification and Screening of Remedial Technologies/Process Options

The purpose of this subtask is to consider a range of potentially applicable technologies and, based on Site and waste characteristics, identify a limited number of specific process options that may be used to address Site problems. Conceptually, the screening process may be viewed as consisting of the following:

- Identification of the general technology types associated with the general response actions.
- Identification of process options associated with each technology type.
- Screening technology types and process options based on an evaluation with respect to technical implementability.

Technologies and process options that cannot be effectively implemented will be eliminated from further consideration. This screening will be based on existing Site information and on technology capabilities/limitations.

Subtask 1.5 - Evaluation of Process Options

The purpose of this subtask is to select process options that represent each technology type considered to be viable. Process options will be evaluated using effectiveness, implementability, and cost criteria. Limiting the number of specific process options is intended to make more manageable the development and screening of alternatives by limiting the potential number of alternatives developed.

Subtask 1.6 - Assembly of Alternatives

Alternatives will be assembled by combining general response actions and the process options chosen to represent the various technology types for each media or operable unit. Alternatives will be formulated to provide remedies consistent with the scope discussed in Section 3. A No Action alternative will also be developed.

TASK 2 - SCREENING OF ALTERNATIVES

The purpose of this task is to narrow the list of potential alternatives that will be evaluated in detail. This screening step may be required if the number and complexity of alternatives would make their detailed evaluation excessively complicated or unpractical. If necessary, screening of alternatives will be accomplished by:

- Further refinement, as appropriate;
- Evaluation on a general basis to determine their effectiveness, implementability, and cost; and
- Decisions based on this evaluation, as to which alternatives should be retained for further analysis.

Subtask 2.1 - Alternatives Definition

In this subtask, alternatives will be further defined to form a basis for evaluating and comparing them prior to their screening. Sufficient quantitative information to allow differentiation among alternatives with respect to effectiveness, implementability, and cost is required. Parameters that may require additional refinement include the extent or volume of contaminated material and the size of major technology and process options. The following information will be developed, as appropriate, for the various technology processes used in an alternative:

- Size and configuration of on-Site extraction and treatment systems or containment structures;
- Time frame in which treatment, containment, or removal goals can be achieved;
- Process flow rates and/or rates of treatment;
- Spatial requirements for constructing treatment or containment technologies or for staging construction materials or excavated soil or waste;

- Distances to disposal or treatment facilities;
- Required permits and imposed limitations.

Subtask 2.2 - Initial Screening

In this subtask, defined alternatives will be evaluated against short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost. These are described as follows:

- Effectiveness: Alternatives will be evaluated to determine whether they adequately protect human health and the environment; attain Federal and Wisconsin ARARs or other applicable criteria, advisories, or guidance; significantly and permanently reduce the toxicity, mobility, or volume of the hazardous constituents; are technically reliable; and are effective in other respects. The consideration of reliability will include the potential for failure and the need to replace the remedy.
- Implementability: Alternatives will be evaluated as to the technical feasibility and availability of the technologies that each alternative would employ; the technical and institutional ability to monitor, maintain, and replace technologies over time; and the administrative feasibility of implementing the alternative.
- Cost: The cost of construction and long-term costs to operate and maintain the alternative will be evaluated. This evaluation will be based on conceptual costing information and not a detailed cost analysis. At this stage of the FS, cost will be used as a factor when comparing alternatives that provide similar results, but will not be a consideration at the screening stage when comparing treatment and non-treatment alternatives.

Subtask 2.3 - Alternatives Array Document

Upon determining regulatory requirements with the WDNR, an Alternatives Array Document will be provided to request the determination of possible ARARs by concerned Federal agencies. A description of the alternatives carried through screening will be presented. This document will also include a brief Site history and background, a contaminant characterization summary that includes contaminants of concern, migration pathways, receptors, and other pertinent Site information. This Alternatives Array Document will be submitted to the U.S. EPA and the WDNR, along with the request for notification of the standards and requirements. If needed, a meeting will be scheduled between the U.S. EPA, WDNR, and Warzyn to discuss the Alternatives Array Document and ARARs.

TASK 3 - REMEDIAL ALTERNATIVES EVALUATION

Section 121 (b)(1)(A-G) of CERCLA outlines general rules for cleanup actions, and establishes the SARA statutory preference for permanent remedies, and for treatment and/or resource recovery technologies that reduce toxicity, mobility or volume of hazardous substances, pollutants, and contaminants. Further, it directs that the long-term effectiveness of alternatives be specifically addressed. At a minimum, the following areas should be considered in assessing alternatives:

A. Long-term uncertainties associated with land disposal;

B. Goals, objectives, and requirements of the Solid Waste Disposal Act;

C. Persistence, toxicity, mobility, and propensity to bioaccumulate of hazardous substances and their constituents;

D. Short and long-term potential for adverse health effects from human exposure;

E. Long-term maintenance costs;

F. Potential for future remedial action costs, if the alternative were to fail;

G. Potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment; and

H. Compatibility of FFS work with full Site remedial options.

The U.S. EPA has developed nine evaluation criteria.

1. Overall Protection of Human Health and the Environment;
2. Compliance with ARARs;
3. Long-Term Effectiveness and Permanence;
4. Reduction of Toxiciity, Mobility, and Volume Through Treatment;
5. Short-Term Effectiveness;
6. Implementability;
7. Cost;
8. State Acceptance; and
9. Community Acceptance.

Consideration of the criteria is intended to satisfy the statutory requirements; i.e., points A through H above, and to enable the decision maker to compare alternatives and select a remedy which will:

1. Be protective of human health and the environment;

2. Attain applicable or relevant and appropriate requirements (ARARs), or provide grounds for invoking a waiver;

3. Be cost effective;

4. Use permanent solutions and alternative treatment technologies to the maximum extent practicable; and

5. Satisfy the preference for treatment that reduces toxicity, mobility or volume as a principle element (or provide an explanation for why it does not).

The Evaluation of Alternatives task is basically a three-stage process consisting of the following:

- Detailed definition of alternatives;
- Detailed analysis of alternatives; and
- Comparison of alternatives.

<u>Subtask 3.1 - Detailed Definition of Alternatives</u>

Each alternative will be defined in sufficient detail to facilitate subsequent evaluation and comparison. Typically, this activity may involve modification of alternatives based on ARARs, refinement of quantity estimates, technology changes, or Site areas to be addressed. Prior to detailed definition, the final conceptual alternatives will be agreed upon by the WDNR and the U.S. EPA.

<u>Subtask 3.2 - Detailed Analysis of Alternatives</u>

Alternatives will be evaluated with respect to ten criteria. The first nine criteria are described in 40 CFR 300.430; the tenth criteria addresses consistency with other possible future activities and remedial measures and is included, because of the unique purpose of the FFS. In general, the criteria encompass technical, cost, institutional considerations, compliance with statutory and regulatory requirements, and state and community acceptance.

Each criterion to be addressed in the FFS is briefly discussed below.

- Overall Protection of Human Health and the Environment The assessment against this criterion describes how the alternative as a whole achieves protection and will continue to protect human health and the environment.

- Compliance with ARARs The assessment against this criterion describes how the alternative complies with ARARs, or, the justification for a waiver should it be required.

- Long-Term Effectiveness and Permanence The assessment of alternatives against this criterion evaluates the long-term effectiveness of alternatives in protecting human health and the environment after response objectives have been met.

- Reduction of Toxicity, Mobility, and Volume Through Treatment The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies.

- Short-Term Effectiveness The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation period until response objectives have been met.

- Implementability This assessment evaluates the technical and administrative feasibility of alternatives and the availability of required resources.

- Cost This assessment evaluates the capital, O&M, and present net worth costs of each alternative.

- State Acceptance This assessment reflects the State's (or supporting agency's) apparent preferences or concerns about alternatives.

- Community Acceptance This assessment reflects the community's apparent preferences or concerns about alternatives.

- FFS Compatibility The assessment against this criterion describes how FFS work will be compatible with other Site remedial options.

Subtask 3.3 - Comparison of Alternatives

After each alternative has been analyzed against each of the criteria, a comparative analysis will be conducted. The purpose of this analysis is to compare the relative performance of alternatives with respect to each evaluation criterion. The comparison will consider the strengths and weaknesses of the alternatives relative to one another with respect to each criterion, and how reasonable variations of key uncertainties could change the expectations of their relative performance. If innovative technologies are being considered, their potential advantages in cost or performance and the degree of uncertainty in their expected performance (as compared with more demonstrated technologies) will also be discussed.

TASK 4 - FOCUSED FEASIBILITY STUDY REPORT

Focused Feasibility Study activities and results will be described and documented in a report covering the activities and conclusions of Tasks 1 through 3. The report will be prepared and submitted in draft form to the WDNR and U.S. EPA for review and comment.

A meeting will be scheduled to discuss the WDNR and U.S. EPA comments, if any, prior to preparation of the draft final report. The final FFS report will be placed by the WDNR in public repositories for public review and comment. Following the public comment period, the WDNR or the U.S. EPA may determine that the FFS requires revision.

TASK 5 - COMMUNITY RELATIONS PROGRAM

A program for community relations support will continue throughout the FFS, to the selection of a Site remedy. The program will be consistent with Superfund community relations policy, as stated in the "Guidance for Implementing the Superfund Program" and Community Relations in Superfund - A Handbook.

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