AMI Consulting Engineers P.A.

LETTER OF TRANSMITTAL

AMI JOB No.:	151032-4	**DATE:**	7/22/2016

TO:

Heidi Timm-Bijold
Business Resource Manager
City of Duluth
DEDA
City Hall, Room 402
411 West First Street
Duluth, MN 55802
Phone: (218) 730-5324
htimmbijold@duluthmn.gov

RE:

Excavation and Materials Management Plan
Lot D
800-1000 Railroad Street
Duluth, MN

PLEASE FIND ATTACHED:

COPIES	DECRIPTION	REVISION No.
1	Excavation and Materials Management Plan (EMMP)	1

THESE ARE TRANSMITTED ☒ Electronically ☐ Hard Copy as checked below:

☐For Approval	☐For Your Use	☐ For Signature & Return	☒ For Review and return of comments

REMARKS:

	Name	Firm
CC:		

SIGNED:

Bryan Murdock – Env. Dept. Manager

Excavation and Materials Management Plan

Lot D Property, 800-1000 Railroad Street
Duluth, Minnesota

Prepared for:

DULUTH ECONOMIC DEVELOPMENT AUTHORITY

City Hall, Room 402
411 West First Street
Duluth, MN 55802

Prepared By

AMI
Consulting Engineers P.A.

91 Main Street
Superior, WI 54880

July 2016

Table of Contents

LIST OF ACRONYMS

AAS	Asbestos Abatement Supervisor
ACM	Asbestos Containing Material
AMI	AMI Consulting Engineers, PA
ASTM	American Society of Testing and Materials
CM	Construction Manager
CQCE	Contractor Quality Control Engineer
CQCP	Contractor Quality Control Plan
CRZ	Contamination Reduction Zone
CY	Cubic Yard
DEDA	Duluth Economic Development Authority
EPA	Environmental Protection Agency
EZ	Exclusion Zone / Abatement Zone
HASP	Site-specific Health and Safety Plan
MPCA	Minnesota Pollution Control Agency
MDH	Minnesota Department of Health
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PE	Professional Engineer
PPE	Personal Protective Equipment
PPM	Parts per Million
QA/QC	Quality Assurance/Quality Control
SACM	Suspect Asbestos Containing Material
SVOCs	Semi-Volatile Organic Compounds
SS	Site Supervisor
SSHO	Site Safety and Health Officer
SZ	Support Zone
TCLP	Toxicity Characteristic Leaching Procedure
UST	Underground Storage Tank
VONCO	VONCO V Waste Management Campus

1. INTRODUCTION

The Duluth Economic Development Authority (DEDA) has contracted AMI Consulting Engineers, P.A. (AMI) to provide environmental consulting services related to remediation activities at the property named Lot D which is located at 800-1000 Railroad Street (Site). AMI has prepared this Site-specific Excavation and Materials Management Plan (EMMP) that identifies the scope of work for the excavation and materials management contractor (EMMC) and AMI will perform. This EMMC is supported technically by AMI's Revised Analysis of Brownfield Cleanup Alternatives (ABCA) dated June 1, 2016 (Appendix A) and referenced in this EMMP. The timeline for the EMMP implementation will begin immediately following August 24, 2016 when DEDA plans to finalize the contract with the selected EMMC contractor and AMI. The planned project start date will be August 25, 2016 and the field work will be completed by September 19, 2016. The selected EMMC contractor will be expected to mobilize to the site on August 25, 2016.

AMI has prepared this EMMP for remedial construction at the Site based on the following work principles:

- Safety: Perform all work with a "Safety First" attitude;
- Perform the excavation and materials management work activities per this plan, industry standards, and to the satisfaction of the Owner and AMI;
- Should asbestos containing materials (ACM) be identified during excavation, only asbestos workers and supervisors certified by the Minnesota Department of Health (MDH) will be allowed to handle, excavate or remove, load, wet, or wrap/seal ACM.
- Only 40-Hour Hazardous Waste Operations (HAZWOPER) certified staff will be allowed to handle, excavate, or remove contaminated soil.
- Work designated as performed by "AMI" includes activities under AMI's control & scope including activities performed by AMI personnel and/or AMI's subcontractors, as opposed to activities performed by DEDA.
- Schedule: Complete the required work in a timely and professional manner, and per project schedule milestones;
- Project Management/Supervision: EMMC and AMI will provide highly-experienced project teams, including an on-site Site Supervisor, who has successfully completed similar projects requiring excavation, and materials handling and management such that impacted soils and debris meet off-site disposal facility acceptance criteria.

Site Specific Approach

AMI's approach for excavation, handling, and management of materials at the Site is based on the following project milestones and objectives:

Tuesday, August 23, 2016	EMMC Contacts Utility Locators (Public and Private)
Friday, August 26, 2016	Load Currently-Existing Stockpile and Dig Test Pits (ABCA Option #3)

Monday, August 29, 2016	Begin Digging Excavation #1 - Live Load Arsenic (preferred) (ABCA Option #3)
Monday, September 5, 2016	Excavation #1 Complete. AMI collects samples and reviews current budget with DEDA.
Tuesday, September 6, 2016	Install demarcation fabric and begin backfilling Excavation #1 to an elevation specified by DEDA (TBD)
Thursday, September 8, 2016	Hammer/collapse unsafe portions of dock wall, place demarcation layer in areas needing clean fill, and place an DEDA/AMI specified volume of clean fill on demarcation fabric in low area of site. (ABCA Options #2, 4, and 3, respectively)
Monday, September 12, 2016	Review project financials with DEDA and assess what further work can be performed within the budget
Friday, September 16, 2016	Finish placing fill in the areas requiring soil separation to the extent budget permits (ABCA Option #4)
Monday, September 19, 2016	EMMC demobilizes and AMI documents final site conditions.
Friday, September 23, 2016	Invoices are received from EMMC in accordance with contract with DEDA
Friday, September 30, 2016	AMI completes reporting and closes out project
Monday, October 3, 2016	AMI submits invoice to DEDA in accordance with contract.

AMI and EMMC to provide the necessary personnel and equipment to complete the work by the following project guidelines:

- Perform and construction/excavation services in accordance with the contractual requirements as agreed to with DEDA.
- Perform all work within acceptable local, state, and federal requirements and approved variances and permits for items such as noise, dust, nuisance odors, storm water management, and asbestos abatement.
- Prepare and implement a site-specific Health & Safety Plan (HASP)
- Prior to beginning excavation, review locations and locate public and private utilities;
- Perform excavation and materials management in such a manner to ensure that contamination or sediments migrate between work areas or from the site;
- Employ best management procedures and operations that will minimize dust, erosion, and odors;
- Plan work activities to promote pollution prevention including the construction of decontamination and anti-tracking pads, stockpiling of impacted soil and debris which are covered with reinforced plastic.
- Provide and maintain water quality protection by installing and maintaining erosion controls meet industry standards;
- If so directed, utilize methods for segregating soil with differing levels of contamination and the type of work activities;
- In the event that ACM is identified during excavation, the EMMC will subcontract with an MDH-certified Asbestos Abatement Supervisor (AAS) to provide supervisory oversight of soil containing asbestos and to

provide MDH-certified Asbestos workers to prepare waste for shipment if necessary. Only AAS and workers certified by the MDH will be allowed to handle, excavate or remove ACM materials;

- Transport and dispose of impacted soil and debris at approved off-site facilities; and
- Provide weekly financial updates on job-to-date costs incurred and manage costs to stay within the not-to-exceed budget identified by DEDA.

Coordination

This EMMP represents careful consideration of the anticipated logistical issues associated with this unique site. The EMMC and AMI will comply with DEDA, EPA, City of Duluth, MPCA and MDH requirements. AMI will perform work mindful of the community and support the needs of the project.

Roles & Responsibilities

AMI – Environmental Consultant
AMI, as the environmental consultant, is responsible for identifying the excavation locations, identifying the extent of excavation, post-excavation sampling, soil/material waste characterization, soil segregation and stockpiling design, field documentation of work, and report preparation. AMI will also be responsible for sourcing backfill from sources that have been tested and found to be acceptable by the MPCA and DEDA. AMI will be responsible for obtaining acceptance approvals from the waste disposal end facilities. AMI will provide a MDH approved asbestos inspector to sample suspect asbestos containing material should it be identified during excavation activities.

Excavation & Materials Management Contractor (EMMC)
The EMMC will be responsible for soil and debris excavation, placement of demarcation materials (i.e., site controls), material segregation, stockpiling, stockpile management, and transportation and disposal of excavated materials. The EMMC will also be responsible for providing MDH-certified asbestos Site Supervisors and Workers in the event that ACM is encountered during excavation activities. The EMMC will also ensure that OSHA regulations for safe excavation will be followed throughout all excavation and backfill procedures performed during this project.

2. ANTICIPATED SEQUENCE OF WORK

Pre-Excavation Activities

The EMMC will perform the following activities prior to commencing excavation/soil off-haul activities at the Site:

- Prepare a HASP for worker safety related to management of contaminated soils;
- Contact Gopher One-Call to locate public utilities and work closely with the City of Duluth engineering department to locate smaller more “private” type utilities that may exist in excavation areas;
- Erect signage and caution tape to limit access to the project from adjacent properties;

- Prepare and post on-site a spill prevention and response plan that addresses potential releases associated with heavy equipment hydraulics and fueling. A spill kit that includes petroleum absorbent pads, pillows and mini-booms is required to be at the site as long as the heavy equipment is on-site;

- Install erosion control measures, such as silt fence or bio-logs down gradient of the excavations to manage potentially migrating sediments in the event of excessive precipitation;

- Construct and manage an anti-tracking pad at the exit and as necessary, remove tracked soil from the public roadway daily; and

- Implement environmental protection measures, such as setup and implementation of dust control measures.

Anticipated Sequence of Activities Requiring Material Handling

ABCA Option #3: Perform Limited Soil Excavation and Disposal

Step 1 – Load, Transport and Dispose of Stockpile #1 which is already created. Stockpile #1 is estimated to be approximately 200 cubic yards and is currently located at the head of Slip 3. This soil has been tentatively

approved for disposal at the Vonco V Campus in west Duluth (VONCO). AMI will obtain formal waste acceptance from an end facility.

Step 2 – With direction from AMI, dig test pits to identify the extent of yellow stained soil which has been identified as containing elevated levels of arsenic.

Step 3 – If live loading cannot be accomplished (preference), the EMMC will construct temporary soil stockpiling areas for segregation of yellow stained and non-yellow stained soil. Stockpile areas should not be in low areas and be arranged for continued site ingress and egress. Stockpiles should be covered with reinforced plastic sheeting at the end of each day and prior to precipitation events.

Step 4 – Carefully excavate, segregate and load/stockpile soil and debris based on the presence of yellow staining or other field screening indicators observed by AMI and EMMC.

Step 5 – Allow excavations to remain open while post excavation and waste characterization testing is completed. Waste characterization testing may be completed prior to the project or be initiated when test pits are excavated to define extent. Secure excavations left open overnight as needed.

Step 6 – If further excavation is necessary, repeat Steps 4 and 5 until further excavation is not necessary.

Step 7 – Upon the completion of excavation activities, and before backfill is placed in any portion of the excavation, EMMC will provide and place the specified demarcation fabric throughout the excavation as directed by AMI.

Step 8 – When further contaminated soil excavation is no longer necessary, the EMMC will contour and backfill excavations with clean fill tested and sourced by AMI. Excavations will be backfilled to the elevation desired by DEDA at the time of excavation completion. The amount of backfill placed into excavations will be determined after excavation and may be more or less than the amount of excavated soil. Backfill should be wetted and compacted with a vibratory compactor in 1-foot (or less) lifts.

Step 9 – Seed and provide erosion control protection (e.g., straw blankets) throughout excavation areas.

Step 10 – Carefully load soil, transport, and dispose soil at VONCO. Should wastes not be accepted at VONCO, revised bids will be for disposal and transportation will be obtained from the EMMC. AMI to provide signed manifests to EMMC for each waste stream. If contaminated soil is stockpiled, stockpiled areas should be over excavated by a few inches to remove the entire amount of contaminated material. With the approval from the receiving landfill, PPE, poly-sheeting, or other impacted materials should be containerized and disposed with the contaminated soil.

Step 11 – The EMMC will decontaminate equipment before leaving each excavation area. Decontamination of equipment will include removal of caked dirt from tracks and buckets.

Step 12 – The EMMC will either move to the next area of contaminated soil excavation at the Site and repeat steps 3 through 10, begin implementing ABCA Option #4 or #2, or demobilize from the site within 72-hours. The EMMC is responsible for removing their equipment, trash, and unused erosion control or demarcation fabric from the site. The site should be left free of ruts and debris, similar or better than the pre-project condition.

ABCA Option #4: Create Clean Fill Separation to Contaminated Soils

Step 1 –EMMC will provide and place the specified demarcation fabric in areas specified by AMI. The size of the area receiving clean fill cover will be dependent upon the budget remaining following excavation of impacted soil activities.

Step 2 – EMMC to use erosion control BMPs downgradient of clean fill cover placement areas to prevent sediment discharge into the Duluth-Superior Harbor. Clean fill cover areas will either be covered with reinforced plastic or seeded and covered with staked straw blankets (or an acceptable alternate).

Step 3 – EMMC to place clean sandy fill tested and sourced by AMI. The depth of clean fill cover over the demarcation fabric will be contingent upon the budget remaining. Backfill should be compacted with a rolling vibratory compactor in one-foot (or less) lifts. Figure 7 of the ABCA provides an example of how clean fill may be placed on-site.

Step 4 – Upon completion of placement and compaction of clean fill cover, EMMC to begin implementing ABCA Option #2 (if not already performed) or demobilize from the site within 72 hours. EMMC is responsible for removing their equipment, trash, and unused erosion control or demarcation fabric from the site. The site should be left free of ruts and debris, similar or better than the pre-project condition.

ABCA Option #2: Stabilize Failing Dock Walls

Step 1 –EMMC to utilize heavy equipment (backhoe with jack hammer) to crumble failing portions of the 360 foot dockwall along the south side of Slip 3. It appears that only select sections of the 360-foot section of relieving platform will require stabilizing. This work will occur well above the water line and will not include discharging concrete or soil into the slip. The intent of this operation is to remove the safety hazard along the failing portions of the dock relieving platform. Work directly along the water's edge will not occur. Minor contouring and compaction with the backhoe bucket will be necessary following jackhammering to insure a stable ground surface is created. Clean fill may be used to top the crumbled sections of concrete to further remove safety hazards. Areas of fill placement should be seeded and covered with straw blankets.

Step 2 – Upon completion of dock stabilization activities, EMMC to begin implementing ABCA Option #4 (if not already performed) or demobilize from the site with 72 hours. EMMC responsible for removing their equipment, trash, and unused erosion control or demarcation fabric from the site. The site should be left free of ruts and debris, similar or better than the pre-project condition.

Backfill Materials

AMI anticipates the following methods and sequence for backfill:

- AMI to document achievement of required subgrade/contaminant clean up;
- The EMMC will place demarcation fabric along bottom and sidewalls of final excavation, prior to placing backfill;
- The EMMC will backfill the excavations with the specified backfill materials as identified in Table 1;
- The EMMC will meet the compaction requirements of the project;

- AMI will document the condition of backfilled areas;
- The EMMC will seed and stake erosion control straw blankets in backfilled areas.

Table 1: Anticipated Sources/Types of Backfill Materials Required for the Project:

MATERIAL	SOURCE	
Clean Sand Fill	Midwest Aggregate Wade Damer (218) 391-2110 9242 Highway 2 Duluth, MN 55802	KGM Contractors Scanlon Pit Only Charles Andrews Project Manager/Estimator 218-290-4940 chuck@kgmcontractors.com
Clean Stone for tacking pad	EMMC preference	
Demarcation Barrier, Mirafi 500X or similar	MMC preference, however Asdco, Duluth and Brock White, Duluth both carry product.	

Decontamination Overview

AMI and EMMC will employ decontamination procedures to ensure that contamination or pollution does not migrate from the site. The procedures will include:

- Delineating the site into multiple work zones based on the level of contamination and the type of work activities. AMI and the EMMC will pre-plan the project layout to maximize traffic flow between areas and limit tracking of contaminants;
- Construction of anti-tracking pads at the site exits;
- Decontamination of mechanical equipment prior to use for backfill operations or prior to demobilization;
- Decontamination of mechanical equipment, as needed, to prevent cross-contamination within work areas;
- Only MDH-certified asbestos workers will decontaminate objects potentially contaminated with asbestos.

3. WASTE CHARACTERIZATION AND ANALYSIS

AMI will be responsible for identifying and characterizing waste streams and working with the EMMC to design a material segregation and stockpiling plan that is implementable given the site layout and waste streams (known and encountered during excavation). AMI to draft this plan with assistance from the EMMC and provide the plan to the EMMC for reference. The EMMC will be responsible for following the plan.

AMI will perform sampling and analysis of collected soils and debris in accordance with the requirements of the intended disposal facility. Laboratory testing will be performed by a MDH certified laboratory. Sample collection frequency will be in accordance with the MPCA Soil Sample Collection and Analysis Procedures Guidance Document 4-04 and the requirements of the facility accepting the waste.

4. WASTE MANAGEMENT AND HANDLING

As part of the Lot D project, the EMMC will perform material management and handling of the anticipated waste streams as indicated in Table 2. AMI will have performed waste characterization sampling and analysis for the arsenic impacted soils located near Area #1 during work at the adjacent site. Previously, the results of waste characterization for soil located directly adjacent to Area #1 were found acceptable and approved for disposal at VONCO. The results of the prior waste characterization analysis were acceptable for classification as non-hazardous industrial waste. AMI anticipates that soil, kiln wastes, concrete debris and rubble, and metal will be present in the excavated materials. AMI will collect soil samples from the existing stockpile located in Area #1 and coordinate waste characterization analyses. AMI will submit the results of waste characterization analysis to VONCO for potential waste acceptance as non-hazardous industrial waste. AMI and the EMMC site supervisor will monitor excavation progression and segregate soils & debris into the appropriate waste streams.

Excavation of impacted soil located from other areas of the site will proceed in a similar fashion with the exception of waste characterization samples will be collected from in-situ materials.

Table 2: Proposed Disposal of Wastes Generated During Site Work

WASTE STREAM	STORAGE CONTAINER	DISPOSITION
Arsenic and PAH impacted soil-material	Stockpile in designated soil storage area. Underlayment will not be required, however, covering with at least 6 mil reinforced plastic will be required.	Contingent upon approval, VONCO landfill in west Duluth, Minnesota.
Remnant Structures and debris.	Stockpile in designated soil storage area. Underlayment will not be required, however, covering with at least 6 mil reinforced plastic will be required. Stockpiled separately from the soil it was excavated with as transportation methods may be different for heavy dense items.	Contingent upon approval, VONCO landfill in west Duluth, Minnesota.

Other industrial waste streams (lead, petroleum, metals, etc.)	As additional waste streams are identified through testing, they will each be Stockpiled independently of each other in the designated soil storage area where they will be covered with at least 6 mil reinforced poly.	In determinant at this time, contingent upon budget, amount of excavation and the result of waste characterization testing.
ACM containing soil if encountered	Stockpile in designated soil storage area. Underlayment will not be required, however, covering with at least 6 mil reinforced plastic will be required.	Contingent upon approval, but anticipated to be disposed of at the VONCO landfill in west Duluth.

5. WASTE TRANSPORT AND DISPOSAL

The EMMC will load all waste streams for disposal. AMI suggests loading materials with either a 25-ton excavator or 3 - 4 cubic yard (CY) loader. Should asbestos be present in the waste stream, only asbestos workers and supervisors certified by the MDH will be allowed to handle, excavate or remove ACM, load asbestos containing waste materials, wet asbestos containing materials, or wrap asbestos loads.

The EMMC will perform the following transportation procedures:

- The EMMC will coordinate scheduling with transporters for off-site transportation of materials generated during the execution of work;
- The EMMC will coordinate the schedule for delivery and pick-up of supplied waste containers, dump trailers, and dump trucks. EMMC will coordinate movement of the containers, trucks, etc. into position required for loading of material to allow the progress of work;
- The EMMC will inspect the transportation vehicles before and after loading to ensure compliance with local, state, and federal regulations for the safe transport of wastes from the site to the receiving facility;
- If asbestos is part of a waste stream, EMMC will provide all necessary labor and materials to ensure all trucks, containers, etc. are properly lined with poly or bladder bags per ACM regulations and approved variances for this project;
- The EMMC will ensure that the transporters arriving at the site for loading do not cause undue congestion to local streets, and shall stage trucks either within the perimeter of the site or at an off-site staging area;

- AMI will provide previously prepared waste manifests for signature by DEDA;

- Trained traffic control personnel (flaggers) will be used to assist the truckers when entering and exiting the site during times of high traffic on Railroad Street; and

- The EMMC will dispose of the waste at a previously-approved disposal facility.

6. WASTE DISPOSAL RECORDS

EMMC, VONCO and AMI will produce the following Waste Disposal Records for incorporation into the post project report:

- Final Manifests (showing weight [volume for liquid wastes] of disposed material);
- Bills of Lading; and
- Other documents requiring DEDA's signature as "Generator".

APPENDIX A

REVISED ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES (ABCA)

REVISED ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES (ABCA)

Revised June 1, 2016

US EPA Region 5 Brownfields Cleanup Grant
Grant CA # BF00E01097
Lot D
Railroad Street

City of Duluth, Minnesota

Prepared for:

City of Duluth
Duluth Economic Development Authority (DEDA)

Prepared by:

AMI
Consulting Engineers P.A.

Table of Contents

Appendices
Appendix A - Figures

Figure 1 – Property Location Map
Figure 2 – Property Features Map
Figure 3 – Contamination Exceedances Above Water Table
Figure 4 – Contamination Exceedances Below Water Table
Figure 5 – Historical Structures and EM Sources
Figure 6 – Unexplained Anomalies and EM Sources
Figure 7 – Remediation (Capping/Armoring) Plan

Appendix B –2015 Property Photographs prior to barrels and debris removal

1.0 Introduction

This Analysis of Brownfield Cleanup Alternatives (ABCA) was prepared by AMI Consulting Engineers, MN. The ABCA is being prepared for the Brownfields Cleanup Grant (Grant) that was awarded to the City of Duluth, Duluth Economic Development Authority (DEDA), Minnesota by the United States Environmental Protection Agency (USEPA). This Grant was awarded to the City of Duluth for the cleanup of the Lot D Property located at 800-1000 Railroad Street, Duluth, MN. (Property, Figure 1).

The DEDA received a $200,000 EPA grant to perform remediation at Lot D. At the time of the grant award, DEDA anticipated that Lot D would be developed, at least partially into a transient marina. An Analysis of Brownfields Cleanup Alternatives (ABCA) was prepared based on the development of a transient marina. Since that time, the transient marina development was not implemented and the exact projected future use is currently unknown. For the purpose of this ABCA, it is assumed that the terrestrial portion of the parcel footprint will remain unchanged and the current dock walls will remain in their historic locations.

Property Description

The Lot D Property is an approximately 12-acre parcel that was created as a pier for the shipping industry. Lot D has remained idle for many years and is characterized as a Brownfield.

The Lot D Property is located at 800 to 1000 Railroad Street in Duluth, Minnesota (hereafter referred to as the "Property"). The Property is located on the western shore of the northern section of the Duluth Harbor Basin (Figures 1 & 2). The Property is owned by the Duluth Economic Development Authority (DEDA), and is referred to as Bayfront Lot D. Foundations, concrete pads, supportive driven piles, a small garage, and the concrete dock cap associated with the former Slip 4 remain at the Property. The Property is bound to the west by Railroad Street, to the north by Pier B and Slip 3, to the east by the Duluth Harbor Basin, and to the south by Compass Minerals (salt/mineral refining and packaging).

DEDA intends to use the $200,000 EPA Brownfield grant in 2015-2016 to accomplish remediation at the Property that will benefit a broad range of future land uses. Therefore, the purpose of this focused Analysis of ABCA is to evaluate cleanup alternatives to eliminate risks and exposure to contaminants while preparing the Property for future redevelopment.

National Historic Preservation Act, Section 106 Process

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP. Revised regulations, "Protection of Historic Properties" (36 CFR Part 800), became effective August 5, 2004. The responsible Federal agency first determines whether it has an undertaking that is a type of activity that could affect historic properties. Because this cleanup project is being undertaken with federal grant funding, USEPA initiated the process of notifying the Minnesota SHPO. U.S EPA will work with MN SHPO to determine next steps.

1.3 History and Previous Property Use(s)

Sections 2 and 3 contain text and information directly from the Barr Technical Memorandum (ABCA) dated November 16, 2011. Lot D is located at 800 to 1000 Railroad Street in Duluth, Minnesota. Lot D is located on the northern shore of the St. Louis River Harbor in a former waterfront industrial area in Downtown Duluth, as shown on Figures 1 and 2. Lot D is owned by the Duluth Economic Development Authority (DEDA), and is referred to as Bayfront Lot D. Former building slabs and some surface rubble are present at the ground surface. One small shed remains on the Slip 3 side of the Property.

The following historical information is summarized from previous reports (EMR, 2010 and Barr, 2008, 2010a). Prior to development of the Duluth Harbor in the late 1800s, the Property vicinity was largely swamp land, areas of which were filled with between 10 to 20 feet of fill. In the 1880s, Slips 3 and 4, along with the nearby Slips 1 and 2, were built within Duluth's Harbor Basin and were among the first slips created in Duluth. Slips 3 and 4 originally were constructed of timber cribbing. Over time, Slip 3 began to deteriorate and was subject to repairs. An assessment of Slip 3 (AMI 2010) revealed that as the slip deteriorated over time, portions of the slip were replaced first with Wakefield system, then with steel sheet pilings. Phase II investigation borings and surface observations indicated that the dock wall structures were filled with sand-rich fill, and in some locations with building debris is included in the fill behind dock walls. Abundant wooden piers or piles remain in the subsurface of the northwestern third of the Property. The remaining pilings, concrete slabs, likely buried railroad tracks are associated with the former warehouse building structures and some dating from the initial development of the Property as a wooden dock structure with railroad sidings on piers over the harbor. As the Property was developed the pier structures were filled-in, likely during the late 1800s, with fill soil created the filled land configuration present today.

A lime manufacturer (Kelley Lime) was operating on the north side of Slip 3 by the turn of the twentieth century. Structures were present within the area now referred to as Lot D until well into the twentieth century. By the 1940s, Duluth Terminal and Cold Storage Company (passenger terminal and refrigerated warehouses) and the Western Electric Company (former operator of Duluth's telephone system) were located on Lot D. Structures included two one-story warehouses and six-story building with a two-story wing constructed of a protected steel frame and a combination of brick and concrete. A long wooden ramp used to access the second floor of the warehouse extended eastward from its southeastern corner.

2.0 Previous Environmental Investigations and Findings

2.1 Source, Nature, and Extent of Contamination

The results of previous Phase I Environmental Site Assessments (Barr 2004a and Barr 2010a) identified the following recognized environmental conditions:

- Shallow soils composed of fill material of unknown origin that may contain debris or contamination from off-Property sources;
- Activities associated with a scrap material handling facility may have impacted soil and/or groundwater at the head of the Slip 3;
- The potential release of chemicals may be associated with electrical equipment manufacturing on the west side of the head of Slip 3;
- The potential for releases of petroleum or other hazardous material associated with the former rail lines and staging areas;
- Paint and solvent storage and handling may have occurred in a former paint warehouse facility.

According to Barr's November 2011 ABCA, City Staff reported that an underground manufactured coal gas pipeline once may have been present below Railroad Street near the head of Slip 3, indicating the potential for coal tar impacts to soil adjoining the Property along Railroad Street.

During City of Duluth street maintenance work along Railroad Street in the 1990s, the fill beneath the street right-of-way adjoining the Property was found to contain creosote type wood wastes and rubbish, and was contaminated with polycyclic aromatic hydrocarbons (PAHs). It is possible that similar fill soil is present on the western edge of the Property.

Surficial soil at the Property is composed of fill material overlying native peat and silty-sand deposits (Barr 2010b). The fill material ranges from 4 to greater than 20 feet thick and has a variable composition consisting of sand, silty sand, clayey sand, gravel, and clay. Debris material consists of concrete, brick, wood, asphalt, and metal.

AMI Consulting Engineers' experience working along the dock walls of Slip 2 and the north side of Slip 3 in 2015 have revealed that variable and contaminated soil exists directly adjacent to the dock walls where ships were unloaded. Additionally, dock wall repairs and expansions used fill of unknown origin. Arsenic contamination identified along the north wall of Slip 3 extends onto Lot D at its northwestern corner. Kiln waste generated in the early 1900s was apparently dumped in that area to raise the elevation of the pier. AMI found that yellow-colored kiln waste was an indicator of elevated arsenic contamination. AMI collected a sample along the boundary between Lot D and Pier B. Sample SW-1-16" was collected from an area of yellow stained kiln waste. The concentration yielded a result of 190 parts per million (ppm) of Arsenic. The Tier 2 SRV for Arsenic is 11 ppm. Analysis of the yellow kiln waste and non-yellow kiln waste revealed that only the yellow material contained elevated levels of arsenic. The yellow material was layered between non yellow layers. For that reason, the sample collected from location B-8/SS-5 and SB-4 may have missed the layer containing the elevated arsenic. The Barr Phase II prepared in 2004 noted the following conditions within B-8.

B8 – Moderate staining was present in this boring from 5 to 10 feet of depth, however, recovery was minimal from the 10 to 15 foot sample. Brick, metal, potential ash and other debris materials were noted in the boring from 5 to 10 feet of depth, although again, insufficient sample was recovered below this depth to determine total depth of debris materials.

This description matches the materials found on the adjacent north site where kiln waste and bricks were found. Groundwater was encountered at depths of approximately 2 to 5 feet below ground surface (bgs). Based on soil sample laboratory analytical results of DRO that exceeded 100 milligrams per kilogram (mg/kg), a petroleum release was reported to the MPCA in July 2010; Release Number 112870 was assigned to the Property.

2.2 Summary of Available Sample Analytical Results

A summary of the prior analytical soil data exceedances of background and MPCA SRVs is presented in Figures 3 and 4.

Phase II ESA – Barr 2004.

Surface and near-surface soil samples were analyzed for one or more of the following: volatile organic hydrocarbons (VOCs), semivolatile organic hydrocarbons (SVOCs), Resource Conservation Recovery Act (RCRA) metals, and Diesel Range Organics (DRO). Concentrations of VOCs, SVOCs, or DRO were not

detected at concentrations above Tier II Industrial Soil Reference Value (SRV) screening criteria. Surface and near surface soil samples had total chromium concentrations exceeding the Tier I Soil Leaching Value (SLV) screening criteria for hexavalent chromium, indicating a potential chromium impact to ground water the Property.

Supplemental Phase II Investigation – Barr 2010

A Supplemental Phase II Investigation (Barr 2010a) was conducted to further characterize soil condition to help evaluate Property soil and groundwater quality to evaluate potential environmental or human health risks and to determine potential handling, reuse, and/or disposal options.

Soil samples from 14 borings, at varying depths, were submitted for laboratory analyses of RCRA metals, VOCs, SVOCs, DRO, polychlorinated biphenyls (PCBs), and hexavalent chromium speciation.

Soil samples collected at depths less than 4 feet bgs, concentrations of all detected VOCs and SVOCs were less than SRVs and SLVs in all analyzed samples. DRO was present at one location at a one location at a concentration exceeding a general 100 mg/kg screening criteria. Concentrations of RCRA metals exceeded SRVs only at one location, for lead and arsenic. Samples collected from four locations where chromium was present did not contain hexavalent chromium.

Groundwater samples were collected from two soil borings. Filtered samples were analyzed for dissolved and total RCRA metals. SVOC and VOC analyses were conducted on unfiltered samples. Groundwater samples collected from two borings did not contain VOCs or SVOCs. Dissolved metal concentrations were less than detection limits for all RCRA metals except barium. Dissolved barium concentrations were less than Minnesota Groundwater Values and Environmental Protection Agency (PA) Maximum Contaminant Levels (MCLs). Concentrations of several total RCRA metals were greater than Minnesota Groundwater Values and/or EPA MCLs in unfiltered samples. This suggests that metals were present on the sediment in the water.

Phase II Environmental Assessment- Weston 2010

A Phase II ESA was conducted in 2010 (Weston 2011) to support the preparation of Remedial Action Plan (RAP) for Lot D. During 2010, bulk samples of suspect Asbestos Containing Materials (ACM) were collected from the northwest corner of Lot D and samples were collected of previously observed foam material for PCB analysis. Geoprobe borings were used to collect soil and groundwater samples and exploratory test pits were used to collect soil and potential ACM samples.

Suspect ACM was observed as pipe insulation in Slip 3. The sample submitted for asbestos analysis was non-detect for asbestos. Two samples of foam material were collected from under the slab and submitted for PCB analysis. All PCBs were non-detect, but the detection limit was 1,000,000 ug/kg because of interference of suspected chlorinated compounds.

Surface and subsurface soil samples were collected from 12 geoprobe borings. Soil samples were analyzed for VOCs, PAHs, PCBs and Target Analyte List (TAL) metals. Four randomly selected soil samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) Metals.

Surface soil sample VOC and PCB results were either non-detect of below SRVs. TCLP metals in surface soil samples were either non-detect or less than the RCRA hazardous waste criteria. The PAH compound in surface soil samples that exceeded Tier II Recreational SRV criteria was benzo(a)pyrene. TAL Metals in surface soil samples that exceeded Tier II Recreational SRV criteria were copper, iron, nickel and vanadium. Compounds that exceeded Tier II Short-Term Worker SRV criteria in the surface soil samples were benzo(a)pyrene and nickel.

Subsurface soil sample results for PCBs were either non-detected or below SRV criteria. TCLP Metals in subsurface soil samples were either non-detected or below RCRA hazardous waste criteria. Subsurface soil sample VOC results did not exceed Tier II Recreational SRV criteria. PAHs in subsurface soil samples that exceeded Tier II Recreational SRV criteria were benzo(a)pyrene and naphthalene. TAL Metals in subsurface soil samples that exceeded Tier II Recreational SRV criteria were antimony, copper, iron, lead, mercury and vanadium. Compounds that exceeded Tier II Short-Term Worker SRV criteria in the subsurface soil samples were benzo(a)pyrene, lead, and mercury.

Temporary monitoring wells were installed at three of the 12 Geoprobe locations. Three groundwater samples were analyzed for VOCs, PAHs, and TAL Metals. Groundwater was encountered between 5 and 6 feet bgs. VOC results were either non-detectable or below the EPA MCLs and Minnesota Department of Health (MDH) Health Risk Limits (HRLs). PAHs were either non-detect or below MCLs and HRLs with the exception of benzo(a)anthracene (greater than MCLs). TAL Metals were either non-detectable or below the MCLs and HRLs with the exception of barium (greater than MCLs and HRLs); lead (greater than MCLs); and manganese (greater than HRLs).

Five test pits were excavated to depths of 6 to 8 bgs, with the exception of one location where there was refusal at 1 foot because of a concrete slab. Five surface and four subsurface soils samples were collected and analyzed for VOCs, PAHs, PCBs, and TAL Metals. Seven suspect ACM samples were collected from one test pit and submitted for asbestos analysis- all seven were non-detect for asbestos.

Test pit surface soil samples were less than MPCA SRV criteria for VOCs and PCBs. The PAH compound in a test pit surface soil sample that exceeded Tier II Recreational SRV criteria was benzo(a)pyrene at one sample location. The TAL Metals that exceeded Tier II Recreational SRV criteria were copper, iron, manganese, and vanadium. The TAL Metal that exceeded Tier II Short-Term Worker SRV criteria in a test pit surface sample was mercury.

Test pit subsurface soil samples were less than MPCA SRV criteria for VOCs and PCBs. The PAH compound in test pit subsurface soil samples that exceeded Tier II Recreational SRV criteria was benzo(a)pyrene. The TAL Metals in test pit subsurface soil samples that exceeded Tier II Recreational SRV criteria were iron and vanadium. The TAL Metal that exceeded Tier II Short-Term Worker SRV criteria in a test pit subsurface sample was mercury.

2015 Geophysical Survey

AMI worked with 3D Geophysics to perform a Geophysical Survey of the Property in December, 2015. The objective of Geophysical Survey is to locate and possibly identify subsurface features at the Property. The data collected through the Geophysical Survey will be utilized for remediation design and/or object avoidance during future excavation. The survey findings can also be compared to prior physical investigations observations, Property historical land uses and source documents (aerials, Sanborn maps, etc.) to confirm what subsurface features are known and anticipated to be present on the Property. Figures 5 and 6 depict the findings of the Geophysical Survey.

3.0 Exposure Pathway Analysis

3.1 Cleanup Goals

The goal of this Lot D cleanup project is to abate the risks posed by contamination associated with the former operations at the Property. The activities are intended to improve the redevelopment potential for the Property as a result of mitigating the actual and potential environmental risks associated with the Property. This Focused ABCA is intended to analyze remediation alternatives that are more focused and interim in nature to address the health and environmental risks available in advance of a formal development plan.

3.2 Potential Exposure Pathways of Concern

- During remediation or development, potential exposure risks should be addressed to protect construction workers and the public during and after development.
- Potential soil risk pathways may include direct contact, ingestion, or inhalation of soil or dust with concentrations of compounds exceeding risk-screening levels of concern.
- Although groundwater beneath the Property is not used as a drinking water source, the installation of utilities and some foundation work may require dewatering. If at all possible, dewatering should be avoided due to the rapid infiltration likely to occur. The use of divers should be considered as an option to avoid dewatering when possible. If dewatering cannot be avoided, trench water should be infiltrated on-Property or possibly tested and sent to WLSSD.
- Phase II investigations have detected residual petroleum contamination in fill soil. Therefore, as a contingency- soil vapor intrusion may be a potential risk pathway of concern. Vapor migration protections may be necessary if volatile chemicals are to remain in-place beneath or near future buildings.

4.0 Applicable Regulations and Cleanup Standards

The Property is enrolled in the MPCA VIC program. Should the project include work that occurs within the water, regulations implemented by the United States Army Corps of Engineers (USACE) and the Minnesota Department of Natural Resources (DNR) would become applicable. Consultation with the Minnesota State Historic Preservation Office (SHPO) is required. The Occupational Safety and Health Administration laws and regulations will also govern remediation field work.

4.1 Cleanup Oversight Responsibility

Under this EPA grant, the MPCA, and the DEDA will have oversight responsibility for the cleanup. AMI Consulting Engineers will be responsible for managing and overseeing the cleanup efforts.

4.2 Cleanup Standards for Major Contaminants

The MPCA Tier II Recreational, Industrial and Short-Term Worker Standard SRVs will be the cleanup goals used for the remediation considered under this ABCA. An up to date table that includes the cleanup standards for the major contaminants identified at the Property can be found at https://www.pca.state.mn.us/sites/default/files/c-r1-02.xls.

5.0 Identification of Potential and Proposed Cleanup Alternatives

The identification of clean up alternatives was based on prior investigation data, required actions, likely development designs based on the physical setting of the Property, available funding, and the reduction of developer and Property owner risk. In order for redevelopment to occur at the Property, the EPA and MPCA will need to approve a focused remedial action plan (RAP). A no action alternative is considered as part of this review for comparison purposes.

The following cleanup alternatives were evaluated, specific to this Property, based on the data collected and reviewed.

Option 1: No Action

The no action alternative would involve no further remedial activities at the Property. This alternative would not provide for mitigation of the actual and potential risks posed by the soils at the Property and would not be protective of public health, safety and the environment.

Option 2: Stabilize Failing Dock Walls

Stabilize Failing Dock Walls
As mentioned earlier in this ABCA, recent work along the Slip 2 dock walls has revealed two notable conditions; 1) these areas do not receive the level of contaminant assessment they should due to the difficulty in collecting samples near the failing dock wall due to the presence of concrete and rubble, 2) the areas adjacent to the dock walls were found to contain contaminated soils from years of ship loading and the presence of fill of unknown origin. Experience shows that soil adjacent to the dock walls at Lot D should be characterized as a high risk for contamination. Not only are the dock wall edges likely to be the most impacted, they are also directly adjacent to the water. Further, the current physical condition of the dock wall is poor and represents a public health hazard. This alternative would include the jackhammering of select portions of the southern/western edge of Slip 3. This selective demolition would only remove the safety hazard. Dock wall caps in good condition will be left in place. Broken and failing concrete would be crushed in place and compacted to close open holes and potentially unsafe conditions. The disturbed soils behind the caps would be left in place, contoured and stabilized to prevent erosion. This alternative does not include excavation or disposal of soil.
☒ Technically Feasible ☒ Financially Feasible depending upon other alternative selected ☒ Can be completed within the Grant Funding Window ☒ Required Action at this time ☐ Quantifies Developer Risk ☒ Creates a public health or environmental gain ☒ Retained for Further Consideration

Cost Estimate for Option 2	
Description	Estimated Cost
One week (40 hours) of an excavator, backhoe, jackhammer and operator.	[redacted]

Option 3: Perform Limited Soil Excavation and Disposal

Perform Limited Soil Excavation and Disposal
With consideration that any future Property design would include an increase of the ground surface elevation to above the flood plain and include supportive driven piles as foundations, the need for the excavation of impacted soils may only be limited to select areas of excessive contamination or areas where soil cuts are necessary. One such area is along the head of Slip 3 near the adjacent north site boundary. Arsenic contaminated soil and kiln waste was identified at the northwest boundary of the Property and Pier B. The extent of arsenic contamination has not been confirmed through testing, however, visual inspection for yellow stained kiln waste is an effective assessment method and could be used to guide the extent of excavation. Arsenic contamination was found to be present each time yellow stained kiln waste was tested at the adjacent site. Additionally, non-yellow stained soil contained markedly lower arsenic concentrations immediately below the yellow stained material. For

this alternative, a budget for soil excavation and disposal would be established. The excavation of impacted soils would occur in conservatively sized phases, such that analytical characterization could be performed and disposal could occur within the identified budget. Since an indicator of contamination is available, yellow stained soil would be segregated from non-yellow soil and managed separately. If budget remains after the arsenic contamination is remediated, the option of excavating elevated lead impacted from near the harbor is available.
☒ Technically Feasible ☒ Financially Feasible depending upon other alternative selected ☒ Can be completed within the Grant Funding Window ☐ Required Action at this time ☒ Quantifies Developer Risk ☐ Creates a public health or environmental gain ☒ Retained for Further Consideration

Cost Estimate for Option 3	
Description	Estimated Cost
Excavate and load, haul and dispose of approximately 995 tons (6400 square feet by 3 feet deep) arsenic contaminated soil at a cost of [redacted]/ton (includes excavation and loading, transportation, and tipping fees).	[redacted]

Option 4 – Create Clean Fill Separation to Contaminated Soils

Create Clean Fill Separation to Contaminated Soils
The presence of shallow soil contamination is a risk to human health and the environment (erosion into the Harbor). The MPCA requires that soil containing contaminant concentrations in excess of the Tier 1 Soil Reference Values (SRVs) be vertically separated from the ground surface by 1 to 4 feet, depending upon whether the ground surface is finished with a building, pavement, or green space. Option 4 proposes to place clean fill and/armoring stone over the top of areas containing elevated levels of contaminants and eroding soils. The area with the most near surface SRV exceedances is an approximately 90,000 square foot rectangular area along the eastern portion of the Property. Additionally, two areas of wind and wave erosion along the slip and harbor total approximately 15,000 square feet. Soil separation will be accomplished by placing a demarcation layer consisting of a geo-fabric and 1.0 feet of clean soil or rip-rap (along the slip and harbor). Additional soil separation will be required at the completion of redevelopment. Approximately 3,333 cy of clean fill will be required to establish a 1.0 foot separation in the 90,000 square foot area. Approximately 550 cy of rip rap will be required to armor the erosion areas along the shoreline. The rip-rap will be available for re-use on-site if a future dock wall repair does not include the use of rip-rap. This option could be performed as a standalone option or partially performed (available budget dependent) if other options were selected with higher priority but had budget remaining after completion.
☒ Technically Feasible

☒ Financially Feasible depending upon other alternative selected ☒ Can be completed within the Grant Funding Window ☐ Required Action at this time ☐ Quantifies Developer Risk ☒ Creates a public health or environmental gain ☒ Retained for Further Consideration

Cost Estimate for Option 4	
Description	Estimated Cost
3,333 cy of sand, 550 cy of rip-rap (average 1 foot diameter), 90,000 square feet of geo-fabric for demarcation, placement oversight and reporting.	[redacted]

6.0 Evaluation of Cleanup Alternatives

The goal of the Bayfront Cleanup Project is to mitigate the risks posed by the Property conditions that have been identified. Alternatives will be evaluated based on their technical and financial feasibility. More than one cleanup alternative may be selected or a combination of these in order to achieve cleanup goals for this Property.

Option #1 was eliminated from further consideration since the goals would not be met.

Option #2, Stabilize Failing Dock Walls, was selected to remove the human health hazard associated with the unstable dock platform and caving soils.

Option #3, Perform Limited Soil Excavation was selected to remove the human health impacts associated with elevated levels of arsenic, lead, and PAHs. The arsenic area at the head of Slip 3 has been selected as first priority, with the elevated metals and PAH areas to follow should budget remain and their excavation become necessary.

Option #4, Create Clean Fill Separation to Contaminated Soils, was not selected, however, if budget remains following the implementation of Options #2 and #3, clean fill or rip rap could be implemented in accordance with the available budget remaining.

7.0 Proposed or Selected Alternative(s) and Cleanup Plan

Options #2 and #3 are recommended for implementation at the Property because cumulatively they are financially feasible, implementable before the grant sunset date of September 30, 2016, and they will meet the project goal of mitigating risks. These two options provide more predictable short and long-term human health and environmental gains when considering the current pre-development status of the Property.

8.0 Public Participation

A copy of this Focused ABCA will be made available for public review and comment at the public administrative record repository, during normal business hours. Any public comments received by DEDA on the draft Focused ABCA will be responded to, and incorporated into the final version of the Focused ABCA.

9.0 References

- AMI Consulting Engineers P.A., 2010. "DEDA Property Inspections, Duluth, MN" [prepared for DEDA], July 2010.
- Barr Engineering Company (Barr), 2004a. "Phase I Environmental Site Assessment: city of Duluth Waterfront Properties, 500-1000 Railroad Street, Duluth, Minnesota," prepared for the city of Duluth, Minnesota, March 2004.
- Barr, 2004b. "Phase II Environmental Site Assessment: Duluth Waterfront Property, Duluth, Minnesota," prepared for the City of Duluth, Minnesota, August 2004.
- Barr, 2008. "Historical Summary Bayfront Property Area, 500-1000 Railroad Street, Duluth, Minnesota 55805" prepared for City of Duluth [Brownfield Assessment Grant], March 2008.
- Barr, 2010a. "Phase I Environmental Assessment Update, 700-1000 Railroad Street, Duluth, Minnesota," prepared for DEDA, March 2010.
- EMR Incorporated, 2010. "Historical Context Overview of DEDA Lot D for Section 106 Evaluation, Duluth, Minnesota," prepared for Barr, December 2010.
- EPC Engineering & Testing, 2010. "Limited Geotechnical Exploration Report, Proposed Development: Bayfront Lots C and D, Railroad Street, Duluth, MN," prepared for Barr, July 2010.
- Weston Solutions, Inc., "Phase II Environmental Site Assessment Report: Duluth Bayfront Properties, Duluth, St. Louis County, Minnesota," prepared for the United States Environmental Protection Agency, Region V and the City of Duluth DEDA, May, 2011
- Barr, 2011. "Technical Memorandum: Bayfront Lot D, 800 to 1000 Railroad Street, Duluth, Minnesota," prepared for the City of Duluth DEDA, November, 2011.

10.0 Contacts

Bryan Murdock Environmental Consultant AMI Consulting Engineers P.A. bryan.murdock@amiengineers.com 218-591-8525	Ms. Rosita Clarke, PM/PO Brownfields & NPL ReUse Program SFD Tribal Coordinator Community &Land Revitalization Branch Superfund Division, U. S. EPA, Region 5 77 West Jackson Blvd, SM-7J Chicago, Illinois 60604 (312)886-7251,(708)705-2379, clarke.rosita@epa.gov
Ms. Heidi Timm-Bijold Duluth Economic Development Authority HTimmBijold@DuluthMN.gov 218-730-5324	Ms. Shanna Schmitt | Hydrogeologist Minnesota Pollution Control Agency (MPCA) VIC Program VIC & ER Section | Remediation Division 520 Lafayette Road | St. Paul, MN | 55155 Voice (651) 757-2697 shanna.schmitt@state.mn.us | www.pca.state.mn.us

APPENDIX A

Figures 1-7

N
W E
S

0 4,000 Feet
0 1,000 Meters

1:25,000
NAD 1983 UTM Zone 15N

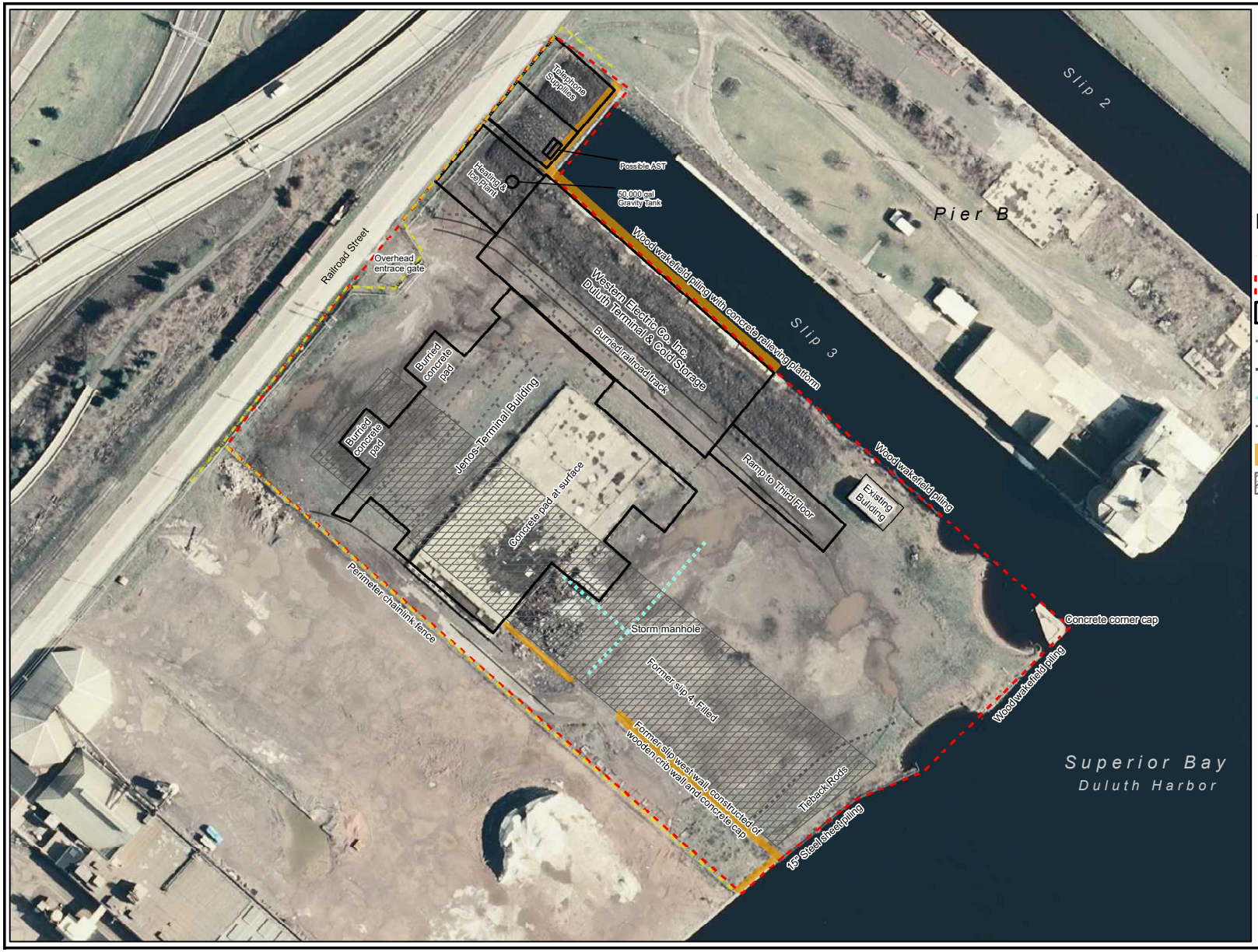
Legend

PROPERTY BOUNDARY

Figure 1: Site Location
BAYFRONT LOT D
1120 W RAILROAD ST
DULUTH, MN 55802

AMI Consulting Engineers P.A.
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	4/8/2016
AMI PROJECT #:	151032



N
W E
S

0 200 Feet
0 60 Meters

1:1,400
NAD 1983 UTM Zone 15N

Legend

- CHAINLINK FENCE
- PROPERTY BOUNDARY
- BUILDINGS
- CONCRETE FOUNDATION
- TIEBACK WALL
- STORM SEWER
- RAILROAD TRACK
- DOCKWALL
- FORMER SLIP 4, FILLED

Figure 2: Property Features
BAYFRONT LOT D
1120 W RAILROAD ST
DULUTH, MN 55802

AMI
Consulting Engineers P.A.
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	4/11/2016
AMI PROJECT #:	151032

N
W E
S

0 200 Feet
0 60 Meters

Coordinate System:
NAD 1983 UTM Zone 15N

Soil Samples
- No Exceedance
- Tier 1 Residential Exceedance
- Tier 2 Recreational Exceedance
- Tier 2 Industrial Exceedance

Data Source
- 2011 Weston Sampling Points
- 2010 Barr Sampling Points
- 2004 Barr Sampling Points
- Property Boundary
- Former Slip 4, Filled

Soil Reference Values

Chemical Name	Tier 1 Residential mg/kg	Tier 2 Recreational mg/kg	Tier 2 Industrial mg/kg
Antimony	12	16	100
Arsenic	9	11	20
Chromium (VI)	87	120	650
Copper	100	100	9000
Lead	300	300	700
Manganese	3600	5000	8100
Mercury	0.5	1.2	1.5
Nickel	560	800	2500
B(a)P Equi.	2	2	3
Naphthalene	10	24	28

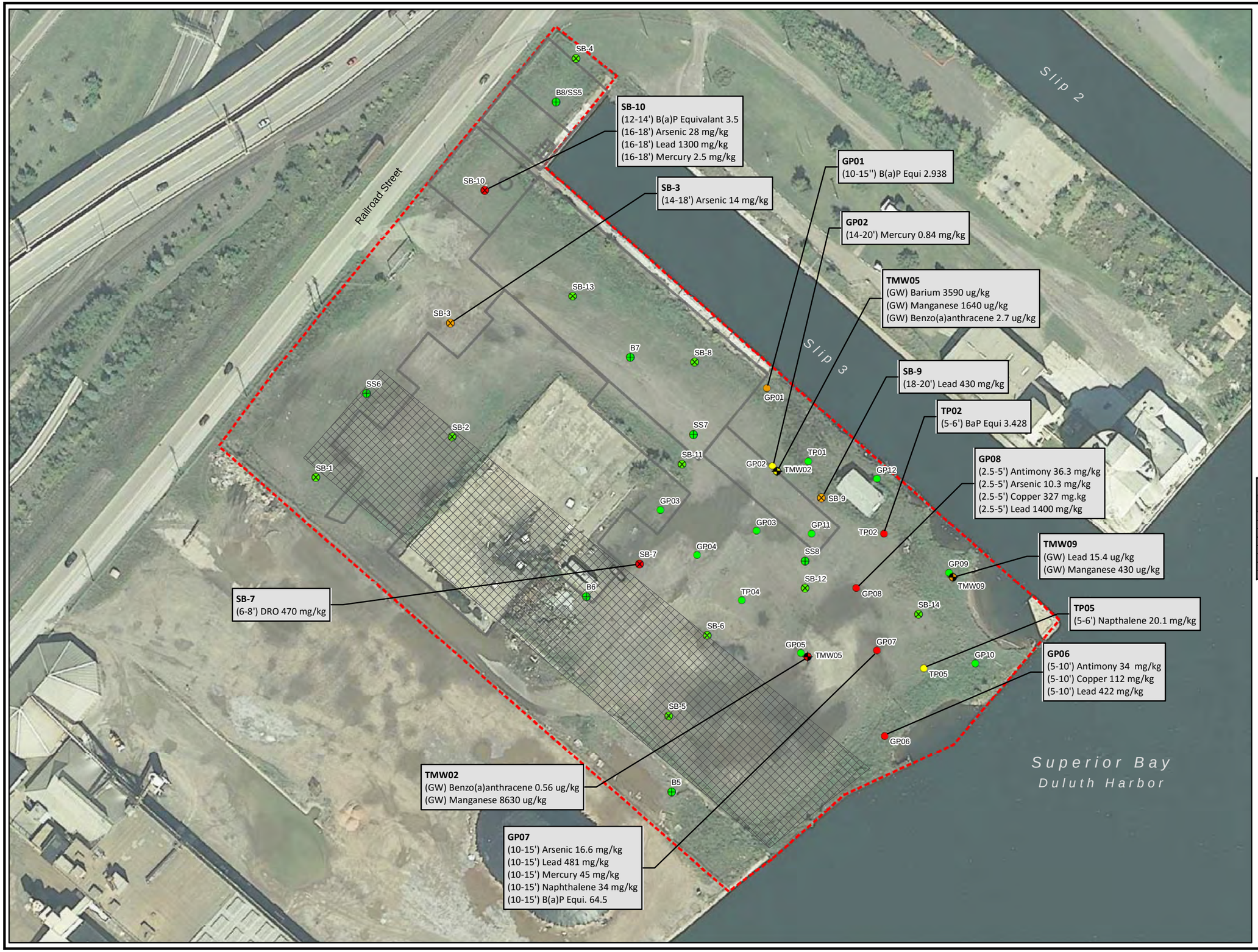
*Iron and Vanadium not listed due to highbackground levels
**Duplicate sample displayed if higher than initial sample.

Figure 3: Property Contamination Above Water Table (<4' BGS)

BAYFRONT LOT D
1120 W RAILROAD ST
DULUTH, MN 55802

AMI
Consulting Engineers P.A.
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	4/21/2016
AMI PROJECT #:	151032



N
W E
S

0 200 Feet
0 60 Meters

Coordinate System:
NAD 1983 UTM Zone 15N

Soil Samples

- No Exceedance
- Tier 1 Residential Exceedance
- Tier 2 Recreational Exceedance
- Tier 2 Industrial Exceedance

Data Source

- 2011 Weston Sampling Points
- 2010 Barr Sampling Points
- 2004 Barr Sampling Points

Monitoring Well Samples

- No Groundwater Exceedance
- Exceeds EPA MCL
- Exceeds MDH HRL
- Exceeds EPA MCL and MDH HRL

PROPERTY BOUNDARY

FORMER SLIP 4, FILLED

Soil Reference Values

Chemical Name	Tier 1 Residential mg/kg	Tier 2 Recreational mg/kg	Tier 2 Industrial mg/kg
Antimony	12	16	100
Arsenic	9	11	20
Chromium (VI)	87	120	650
Copper	100	100	9000
Lead	300	300	700
Mercury	0.5	1.2	1.5
B(a)P Equi.	2	2	3
Naphthalene	10	24	28

Groundwater Standards

Chemical Name	US EPA MCL ug/kg	MDH HRL ug/kg
Barium	2000	2000
Lead	15	NL
Manganese	NL	300
Benzo(a)anthracene	0.2	NL

HRL- Health Risk Limits

MCL- Maximum Contaminant Level

*Iron and Vanadium not listed due to highbackground levels.

**Duplicate sample displayed if higher than initial sample.

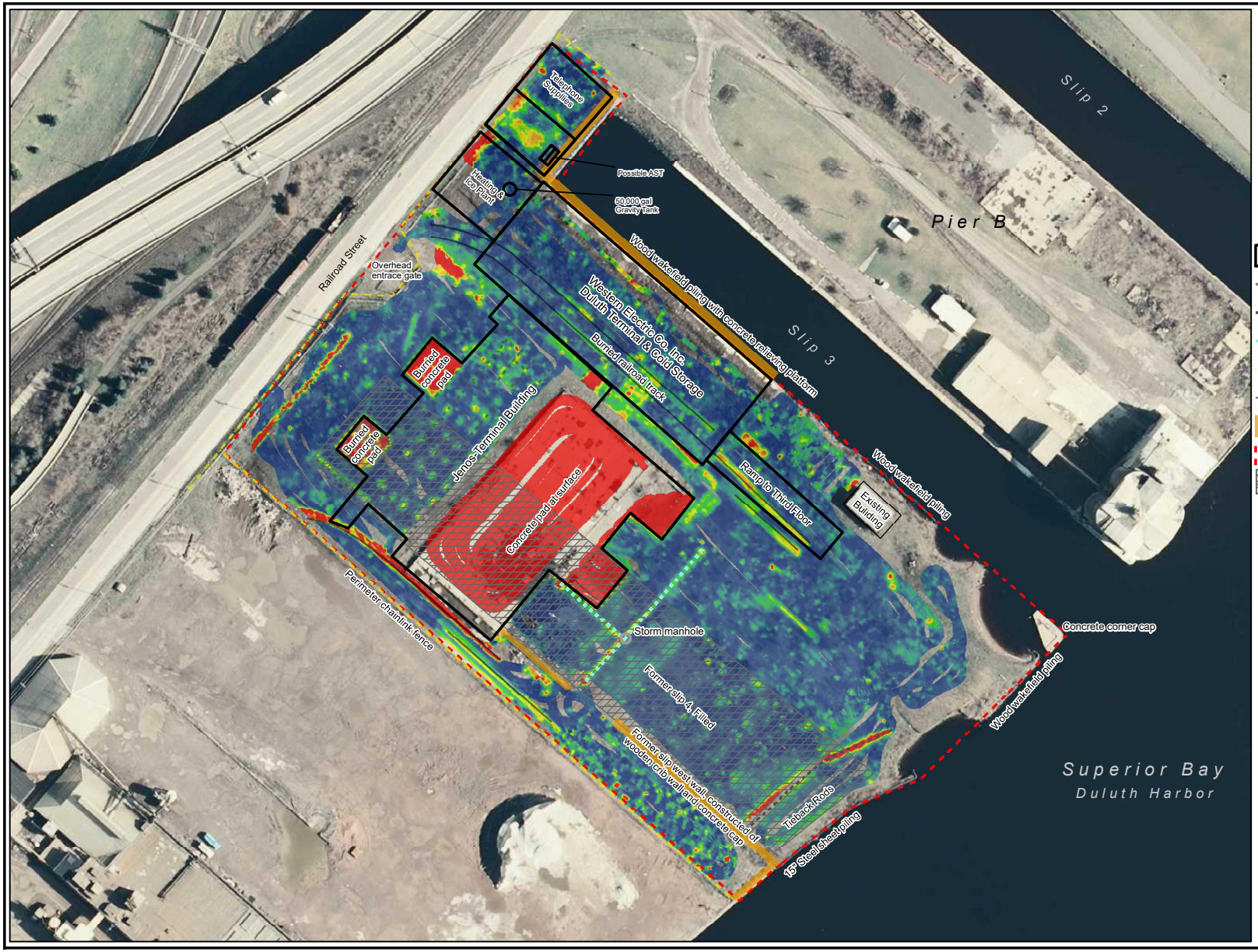
Figure 4: Property Contamination Below Water Table (>4' BGS)

BAYFRONT LOT D

1120 W RAILROAD ST
DULUTH, MN 55802

AMI Consulting Engineers P.A
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	4/20/2016
AMI PROJECT #:	151032



N
W E
S

0 200 Feet
0 60 Meters

NAD 1983 UTM Zone 15N

- BUILDINGS
- CONCRETE FOUNDATION
- TIEBACK WALL
- STORM SEWER
- CHAINLINK FENCE
- RAILROAD TRACK
- DOCKWALL
- PROPERTY BOUNDARY
- FORMER SLIP 4

Figure 5: Historical Structures and EM Sources
BAYFRONT LOT D
1120 W RAILROAD ST
DULUTH, MN 55802

AMI
Consulting Engineers P.A.
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	4/11/2016
AMI PROJECT #:	151032

568100 568200 568300 568400

5180800 5180700 5180600

N W E S

0 25 50 100 150 200 Feet

0 5 10 20 30 40 Meters

Scale 1:1250
Coordinate System:
NAD 1983 UTM Zone 15N

EM late channel conductivity

high

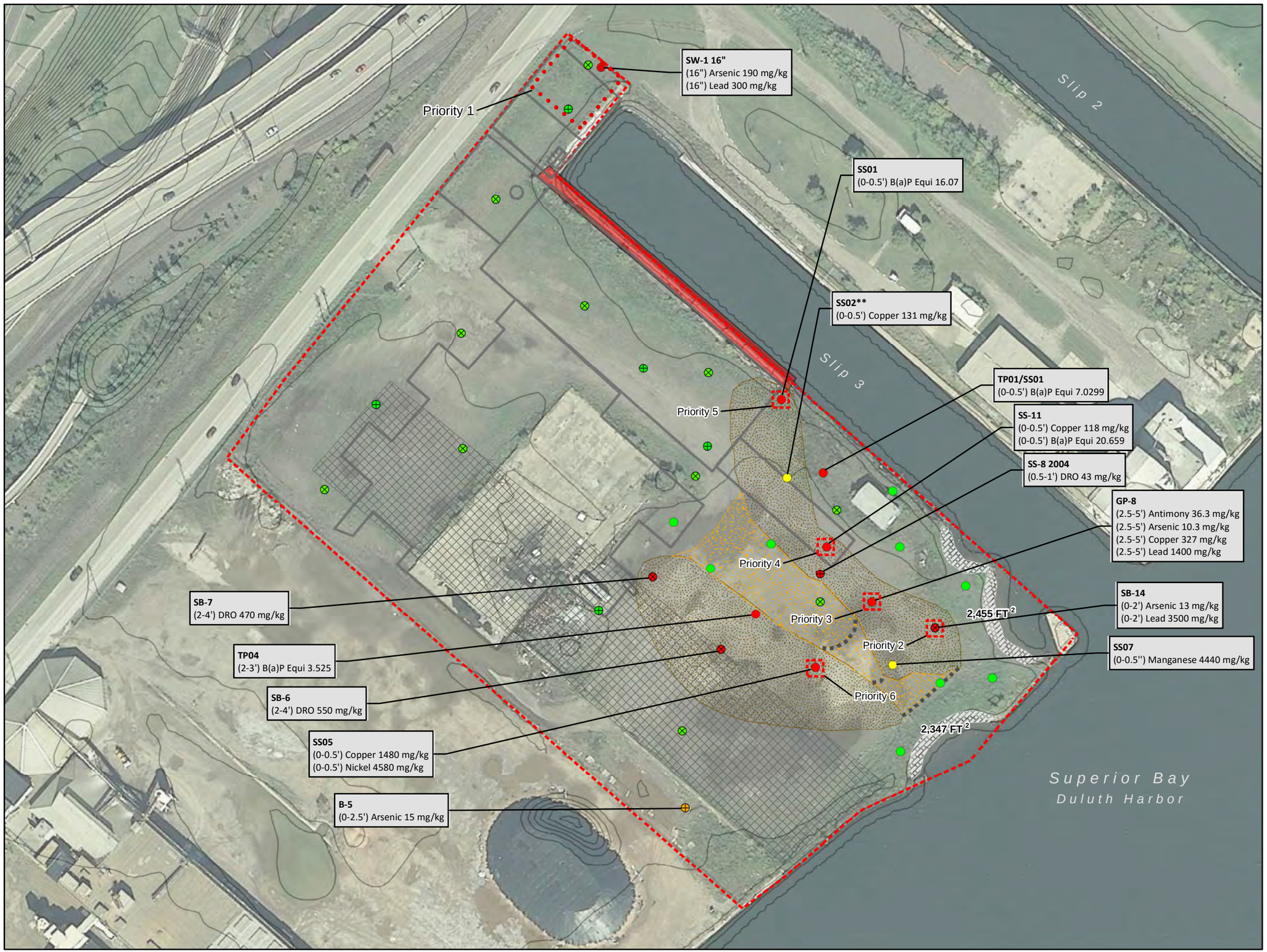
low

EM anomaly not explained by current historical or excavation data

Figure 6-Unexplained Anomalies
Lot D Geophysical Survey
Late Channel EM

AMI Consulting Engineers P.A.
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	1/7/2016
AMI PROJECT #:	151145



N
W E
S

0 200 Feet
0 60 Meters

Coordinate System:
NAD 1983 UTM Zone 15N

Soil Samples
- No Exceedance
- Tier 1 Residential Exceedance
- Tier 2 Recreational Exceedance
- Tier 2 Industrial Exceedance

Data Source
- 2015 AMI Sampling Points
- 2011 Weston Sampling Points
- 2010 Barr Sampling Points
- 2004 Barr Sampling Points
- Property Boundary
- Slip 4, Filled

Alternative 2
- Remove Public Health Hazard Dockwall Demolition

Alternative 3
- Contaminated Soil Excavation

Alternative 4
- Sand Fill - 8 in
- Sand Fill -1 ft
- Rip-rap- 2.5 ft
- Stormwater Controls

Soil Reference Values			
Chemical Name	Tier 1 Residential mg/kg	Tier 2 Recreational mg/kg	Tier 2 Industrial mg/kg
Antimony	12	16	100
Arsenic	9	11	20
Chromium (VI)	87	120	650
Copper	100	100	9000
Lead	300	300	700
Manganese	3600	5000	8100
Nickel	560	800	2500
Mercury	0.5	1.2	1.5
B(a)P Equi.	2	2	3

*Iron and Vanadium not listed due to highbackground levels
**Duplicate sample displayed if higher than initial sample.

Figure 7: Proposed Remediation (Alternatives 2,3, and 4)

BAYFRONT LOT D
1120 W RAILROAD ST
DULUTH, MN 55802

AMI Consulting Engineers P.A.
91 MAIN ST
SUPERIOR, WI 54880

DRAWN BY:	JMP
CHECKED BY:	BM
DATE:	6/1/2016
AMI PROJECT #:	151032

APPENDIX B

2015 Photographs of Property before barrels and debris were removed