

Item 5Ci.
BCWMC 12-17-15
Phase I Report & MPCA Voluntary
Remediation Application cover letter
available online

Phase II Investigation Work Plan

Bassett Creek Main Stem Erosion Repair Project

*Cedar Lake Road to Dupont Avenue N/2nd Avenue N, plus
Fruen Mill Site, Minneapolis, MN*

December 2015

Crystal • Golden Valley • Medicine Lake • Minneapolis
Minnetonka • New Hope • Plymouth • Robbinsdale • St. Louis Park



Phase II Investigation Work Plan Bassett Creek Main Stem Erosion Repair Project

*Cedar Lake Road to Dupont Avenue N/2nd Avenue N, plus
Fruen Mill Site, Minneapolis, MN*

December 2015

Bassett Creek Watershed Management Commission

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Prepared by
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435-4803
Phone: 952-832-2600 • Fax: 952-832-2601

Phase II Investigation Work Plan Bassett Creek Main Stem Erosion Repair Project

December 2015

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1.0 Introduction

This Phase II Environmental Investigation Work Plan (Work Plan) has been prepared on behalf of the Bassett Creek Watershed Management Commission (BCWMC) for an investigation of potential environmental impacts in the soils along the proposed Bassett Creek Main Stem Erosion Repair Project. The investigation results will be incorporated into the Bassett Creek Main Stem Erosion Repair Project Feasibility Study report (Feasibility Study) that will evaluate erosion repair and creek bank stabilization options in preparation for construction planned for 2017. The Study Area is located west of Interstate I-94 and north of Interstate I-394 in Minneapolis, Minnesota, as shown on Figure 1. The project would address needed erosion repair and stabilization work along the Main Stem of Bassett Creek from Cedar Lake Road to Irving Avenue North (Reach 1), Irving Avenue North to the tunnel inlet plus the overflow section to Second Avenue North (Reach 2) and the reach adjacent to the Fruen Mill site (Reach 3), as shown on Figure 2.

It is anticipated that the investigation and creek stabilization/repair work will be completed within existing or planned easements held by the City of Minneapolis and BCWMC, or under access agreements to be established with some property owners. The project is not expected to result in ownership or land use changes in the project area. The work will involve several parcels owned by various entities (including the City of Minneapolis) as shown on Figure 2.

The Feasibility Study will examine methods to stabilize and restore areas of erosion within this corridor. Due to the high potential for contamination along this reach, the Feasibility Study effort includes a Phase I Environmental Site Assessment (ESA) to identify potential recognized environmental conditions in the Study Area and the Phase II environmental investigation proposed in this work plan to assess potential environmental impacts in the soils that may need to be excavated or managed along the creek as part of the erosion repair and stabilization project.

1.1 Objectives

The project is being completed pursuant to the BCWMC's comprehensive water resources management plan and its statutory mandate to protect and improve the water resources in the Bassett Creek watershed. The BCWMC included this project in its Capital Improvements Program (2017CR-M) in order to improve water quality in the creek, stabilize the creek bed and banks, and improve habitat in, and adjacent to, the creek. The project is being developed in collaboration with the City of Minneapolis.

The Phase I ESA conducted for the Study Area identified documented impacts in the soil and groundwater along the Bassett Creek Study Area. Recognized environmental conditions for the Study Area are summarized in the Phase I ESA report (Barr, 2015) and the known soil contamination is summarized in Section 2.0 of this report.

In general, the intent of the project is to correct/repair existing erosion problems and stabilize the creek banks. However, groundwater investigations or response actions are not planned for the project and the

Phase II investigation is not intended to delineate the horizontal or vertical extent of soil or groundwater contamination at properties adjacent to the creek.

The objective of the proposed Phase II investigation is to further characterize the soils along Bassett Creek in the areas targeted for repair or stabilization to evaluate options for managing soils where planting, grading or excavation may be needed as part of the project. Based on the existing conditions of the creek banks, specific areas have been targeted for erosion repair and/or stabilization as shown on Figure 2.

Soils that are removed as part of the project and do not meet Minnesota Pollution Control Agency (MPCA) criteria for unregulated fill (MPCA, 2012) will likely require landfill disposal rather than being re-used as fill material at other sites. If landfill disposal is required, chemical data are needed to assess whether the soil is characteristically hazardous or nonhazardous.

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2.0 Background Information and Previous Investigations

The Bassett Creek Study Area reaches are adjacent to several properties with historical industrial use and documented environmental impacts. Most of the adjacent parcels have been previously investigated to some extent. The available data from previous investigations were reviewed and data from soil sample locations adjacent to the creek were compiled to help identify remaining data gaps for the project. The environmental history, previous investigation results and identified data gaps are summarized in this section.

2.1 Study Area Background and History

Prior to development, a wetland occupied most of the area surrounding Bassett Creek Reaches 1 and 2. During the late 1800s and early 1900s, low-lying areas in the vicinity of Bassett Creek were filled using a variety of materials including imported soil, debris, and industrial dump material, present primarily south of Bassett Creek on the Irving Avenue Dump site (Hennepin County, 2015). The alignment of Bassett Creek along all three Study Area reaches was altered over time as the city developed.

Properties adjacent to the Study Area were historically used for a variety of industrial purposes, many of which have impacted the soil and groundwater. Some of the notable historical uses are listed below:

2.1.1 Reach 1- Cedar Lake Road to Irving Avenue North

- North side of creek
 - The Pioneer Paper Site has been occupied by a junk dealer, recycling and scrap waste materials company. Soil disturbance visible on historical aerial photos from the 1940's and 1950's indicates dumping and filling may have occurred in this area.
- South side of creek
 - The Irving Avenue Dump Site is adjacent to the creek. The western-most parcel is vacant and owned by the Minneapolis Park and Recreation Board and the rest of the site is owned by the City of Minneapolis Public Works department and occupied by the city impound lot. The portion of the site adjacent to Reach 1 has generally been vacant for the past few decades but dumping and filling may have occurred in this area based on historical aerial photos.

2.1.2 Reach 2 - Irving Avenue North to the tunnel inlet/Second Avenue North

- North side of creek
 - Pioneer Paper Site – see above.
 - The Scrap Metal Processors Site was used as a bulk petroleum storage facility and for scrap metal processing.
 - The Chemical Marketing Site was used for solvent recycling and distribution, scrap metal storage.

- The Minneapolis School District Transportation Center Site is currently used by the Minneapolis School District. The site has historically been used as a coal yard, machine shop, repair shop, fueling station and auto parts storage area. Bulk asphalt storage tanks were in the southeast corner and several petroleum storage tanks were historically present at the site.
- South side of creek
 - The Irving Avenue Dump Site adjacent to Reach 2 is currently occupied by the City of Minneapolis Impound Lot. Unpermitted dumping of industrial waste, demolition debris, building remnants from a chemical fire, and other waste of unknown origin, as well as storage of contaminated soil, equipment, auto parts and used batteries previously occurred south of Reach 2. The eastern end of the site was also occupied by an oil/coal company and railroad operations. Fill containing dump debris and waste ranging from 10 to 20 feet deep is present across much of the site.
 - Prior to the 1990s, the creek ran into a tunnel at 2nd Avenue North and was later rerouted to the south as part of the Bassett Creek Flood Control Project implemented by the Army Corp of Engineers. During the project, soils with hazardous concentrations of lead were stabilized and consolidated in the south-central portion of the Irving Avenue Dump site. Lead-stabilization has also been required near this reach of the creek during excavation for the construction of Van White Memorial Boulevard. Lead-impacted soils may remain in this area.

2.1.3 Reach 3 – Fruen Mill Site

- East side of creek
 - The Fruen Mill Site is east-adjacent to Reach 3. The site operated as a grain processing mill since the early 1900s. Fuel oil USTs were removed from the eastern side of the site 1992; no releases were reported.
- West side of creek
 - Bassett's Creek Park is west-adjacent to Reach 3 and is owned by the Minneapolis Park and Recreation Board. No historical uses have been identified as environmental concerns for this property.

2.2 Previous Investigations

Multiple environmental assessments and investigations have been conducted on properties adjacent to Bassett Creek. Previous reports were reviewed and the relevant information is summarized below.

2.2.1 Phase I ESA

The Phase I ESA was conducted for the Feasibility Study, and summarizes the recognized environmental conditions for the Study Area (Barr, 2015). As part of the Phase I ESA, a site visit was conducted in November 2015 which included walking the Study Area reaches of the creek. Significant findings and a photolog were included with the Phase I ESA report. The following notable observations were made:

- Evidence of debris-containing fill was observed in creek banks along Reach 1 and Reach 2. Along Reach 3, concrete was visually identified along the eastern shoreline of the Glenwood Inglewood facility.
- Iridescent sheens were observed along the creek shores and near some culverts in Reaches 1 and 2. These sheens were identified as non-organic sheens, based on the absence of cracking of the surface sheen into angular shapes when it was disturbed.
- Numerous storm water inlets were observed in Reaches 1 and 2. Additionally, several unidentified pipes, both open and capped, were observed exiting the bank along the north bank of Reaches 1 and 2.
- A machinery storage area was observed on the north bank of Reach 2, at the Minneapolis School District Transportation Center property. Multiple machines were observed with product residue on the surface of the machinery. No evidence of ground contamination was observed.

The Phase I ESA identified the following three findings as Recognized Environmental Conditions for the Study Area:

- Identified releases on the Study Area property and adjoining properties
- Undocumented dumping and filling along most of the Study Area property, most significantly on the south side of Reaches 1 and 2.
- Iridescent sheens observed in water at the creek.

2.2.2 Phase II Investigations

Multiple Phase II environmental investigations have been conducted in the Study Area, documenting soil and groundwater contamination on properties adjacent to the creek. The Phase II environmental investigation results for sites in Reaches 1 and 2 are summarized in detail and the data can be found in the Bassett Creek Areawide Groundwater Study (Hennepin County, 2015). Investigation results for the Fruen Mill Site along Reach 3 are summarized in the Phase I ESA (Barr, 2015).

2.2.3 Existing Soil Data Review

Soil boring and sample data from locations within 50 feet of the creek were compiled and a summary of documented soil contamination and previous remedial excavation extents are shown on Figure 3. Soil sample locations with analytical data are also summarized on Table 1. Sample locations that were subsequently removed as part of remediation or construction excavations are not included on Table 1. Boring logs and analytical data tables for soil sample locations in Reaches 1 and 2 can be accessed online using the Bassett Creek Areawide Groundwater Study Environmental Data Access Tool (Hennepin County, 2015).

A review of existing data indicates that soil near the creek in Reaches 1 and 2 contains debris and concentrations of metals, polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) that were above Minnesota soil criteria at the time the reports were prepared. Notable soil impacts include the following:

- Lead concentrations above limits for hazardous waste have been identified in soils immediately adjacent to the creek east of Irving Avenue North, on the Irving Avenue Dump Site and on the Minneapolis School District Transportation Center site. Lead stabilization has been conducted on several occasions to address the hazardous lead concentrations as part of construction work for the new Bassett Creek tunnel and Van White Memorial Boulevard. A restrictive covenant is in place on the NSP/Xcel Energy parcel in Reach 2 to address remaining soil impacts.
- Remedial excavation was conducted at the Chemical Marketing Site to address chlorinated solvent impacts in the soil and groundwater. VOC concentrations above industrial soil criteria remain at the base of the excavation.
- Excavations were conducted on the Scrap Metal Processors site both within the creek overflow channel (alignment for the old tunnel) for a stormwater project work, and adjacent to the channel for remediation purposes. Impacted soil remains in place along the overflow channel.
- Asbestos containing material (ACM) was positively identified on the Irving Avenue Dump site. Additional ACM may be present in dump material or debris on the site.
- Debris has been observed in nearly all the soil borings completed along the creek.

While elevated concentrations of several chemicals have been documented along many sections of the creek, little soil data are available along the areas of the creek targeted for repair or stabilization. As shown on Figure 3 and in Table 1, in nearly all the areas where excavation is anticipated, no soil data are available, or only a limited number of parameters were analyzed. The following gaps in data remain:

- Reach 1 – Few samples have been collected in the targeted project areas:
 - No soil samples have been collected in the targeted stabilization area on the southern bank of the creek on the Irving Avenue Dump site. There may be impacted fill material in this area.
 - Only one analytical soil sample has been collected on the north side of the creek at the Pioneer Paper site. No metals or PAHs data are available.
- Reach 2 – Several samples have been collected along Reach 2, but few in the targeted project areas with a limited number of parameters were analyzed:
 - Only metals data are available on the north side of the creek at the Pioneer Paper Site.
 - Soil samples collected at the Chemical Marketing Site were only analyzed for VOCs.
- Reach 3 – Few samples have been collected and limited chemical data are available:
 - Only one sample has been collected near the creek at the Fruen Mill site, and was only analyzed for polychlorinated biphenyls (PCBs). There is potential for other chemical impacts in the fill near the creek.

3.0 Investigation Methods

3.1 Soil Sampling Methods

Planned soil sampling locations are shown on Figures 4, 4a, 4b, and 4c. Due to the challenging access conditions in some areas, the investigation will involve a combination of hand auger, core drilling, and soil probing methods. It is anticipated that five shallow samples will be collected via hand augering, at approximately 1-2' below ground surface (bgs). Six soil samples are anticipated to be collected at depths up to 4' bgs using direct-push soil probing equipment. A utility locate will be performed prior to sampling and drilling.

The exact sample locations may vary from the proposed locations depending on property access, utility locations and feasibility limitations for accessing steep embankments and collecting samples when the ground is frozen. Relevant Barr Standard Operating Procedures (SOPs) are included in Appendix A.

3.2 Field Screening

Soil borings will be continuously logged and samples from the trenches inspected for visual evidence of contamination (i.e. incidental odor, discoloration, and sheen) and tested for headspace volatile organic vapor concentrations, in accordance with Barr's standard operating procedures (SOPs). A photoionization detector equipped with a 10.6 eV lamp will be used for headspace screening. Soils will be classified in general accordance with American Standard Testing Methods (ASTM) D2488 by Barr field staff. The type (wood, bricks, concrete, etc) and approximate overall percent of debris present in the soil will be documented. Photographs of the soil samples will be taken.

Sample locations will be surveyed with a GPS; ground surface elevations will be estimated using LIDAR surface elevations.

3.3 Soil Samples

Soil samples will be collected from the locations shown on Figures 4, 4a, 4b and 4c and analyzed for the parameters listed below. Soil sample depths will be based on the estimated depth of excavation required along each bank repair/stabilization area, as shown on Table 2.

Soil samples collected for laboratory analysis may be a composite of up to 4 feet of soil and will be representative of the proposed excavated interval. Soil samples collected for VOC or GRO analysis will be discrete samples and will not be composited.

The soil samples will be analyzed for the following parameters, as shown on Table 2:

- Metals*
 - Soil samples from Reach 3 will be analyzed for Resource Conservation and Recovery Act (RCRA) metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

- Soil samples from Reaches 1 and 2, where dumping and filling has occurred and where previously identified metals impacts have been previously identified will be analyzed for the RCRA Metals plus the remaining six Priority Pollutant metals: antimony, beryllium, copper, nickel, thallium, and zinc.
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Diesel Range Organics
- Polychlorinated biphenyls (PCBs) will be analyzed for soil samples from the Irving Avenue Dump site, where PCBs were previously identified.
- Volatile Organic Compounds (VOCs): If soil samples exhibiting an oily sheen, strong odor and/or elevated headspace readings are encountered, selected soil may be submitted for analysis of VOCs and Gasoline Range Organics.
- Asbestos Containing Material: If potential ACM is encountered, a certified asbestos inspector will be called onsite to collect a sample for analysis.
- *Toxicity characteristic leaching procedure (TCLP) analysis will be performed on samples with total metals results or VOC results indicating potentially hazardous levels.

For soil samples analyzed for VOCs, the soil samples exhibiting the highest headspace reading will be selected for analysis.

Samples will be submitted for laboratory analysis to Legend Technical Services in St. Paul, Minnesota.

Soil sample results will be compared to MPCA Residential Soil Reference Values (SRVs) and Soil Leaching Values (SLVs) to assess whether the soil meets the requirements for Unregulated Fill (MPCA, 2012):

- free from solid waste, debris, asbestos-containing material, visual staining, and chemical odor;
- organic vapors less than 10 parts per million, as measured by a photoionization detector (PID);
- for petroleum-impacted soil, less than 100 mg/kg diesel range organics (DRO)/gasoline range organics (GRO); and
- for contaminants detected in soil, less than the MPCA's Residential Soil Reference Values (SRVs) and Tier 1 Soil Leaching Values (SLVs)*.

*Naturally-occurring concentrations of some metals, such as arsenic, selenium, or copper, sometimes exceed the SRV or SLV. Such soils are not considered impacted in the absence of a contaminant source or other field or laboratory indications of contamination.

For soils that do not meet the requirements for unregulated fill, sample results will be evaluated to determine whether the soil may be disposed of at a non-hazardous waste landfill. Metals and VOC concentrations will be assessed for whether TCLP limits for toxicity are met and total PCB concentrations

will be calculated to verify that the soil does not need to be managed under the Toxic Substances Control Act (i.e. total PCB concentrations are less than 50 mg/kg).

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4.0 Schedule and Reporting

The BCWMC is seeking MPCA technical review and approval of this work plan by January 15, 2016, so that the Phase II field investigation can be completed in January 2016. This schedule is required so that the Phase II investigation results can be incorporated into the Feasibility Study report for review by the City of Minneapolis and BCWMC in March, and finalized and submitted to the BCWMC for approval in May.

Looking ahead, the following schedule is anticipated for the project, assuming response actions are required based on the investigation results:

- Submit the Phase II Investigation Report/Response Action Plan (RAP), and/or Construction Contingency Plan (CCP) to MPCA for review and approval (Summer 2016).
- BCWMC and the City may seek environmental cleanup grants in support of the project (Fall of 2016)
- Obtain MPCA approval of the RAP/CCP (prior to November 1, 2016)
- Bidding and contractor selection (Winter 2017)
- Implement response actions as part of creek repair and stabilization work (2017)
- Submit Response Action Implementation (RAI) Report to MPCA (2017)
- Obtain MPCA technical review and approval of RAI report (2017)

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5.0 References

Barr Engineering Co., 2015. Phase I Environmental Site Assessment. Bassett Creek from Cedar Lake Road to Dupont Avenue N/2nd Avenue N, plus Fruen Mill Site, Minneapolis, Minnesota. Prepared for the Bassett Creek Watershed Management Commission. November, 2015.

Hennepin County, 2015. Bassett Creek Areawide Groundwater Study. Draft Environmental Data Access Tool. <https://hennepinedat.barr.com/>

MPCA, 2012. Best Management Practices for the Off-Site Reuse of Unregulated Fill. c-rem1-01. February 2012.

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Tables

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Table 1
Existing Soil Data Summary
Bassett Creek Main Stem Erosion Repair Project
Bassett Creek Watershed Management Commission
Minneapolis, Minnesota

SITE NAME	Sample ID (1)	Sample Type		Reference (2)	Soil Sample Depth (feet bgs)	Analytes						Comments on Analytical Data (3)	Data Gaps	Additional Information
		Boring	Excavation Sidewall			VOCs	PAHs	GRO	DRO	Metals	TCLP			
Pioneer Paper	ST-01-11	x		2001 Braun Report	2.5					x		RCRA metals below criteria	No VOC or PAH data	Debris identified in all ST-01 boring logs. Elevated headspace reading at ST-01-20.
	ST-01-20	x		2001 Braun Report	0.5	x		x	x			Elevated DRO (1,300 mg/kg)	No metals or PAH data	
Chemical Marketing	99		x	2005 Delta Report		x							No metals or PAH data	Remedial excavation performed to water table in 2005 and impacted soil remains in place below the water table. Excavation extents appear to stop approximately 15' away from edge of Bassett Creek based on 2005 map. Debris identified in soil.
	195		x	2005 Delta Report		x						PCE > criteria		
	Several Samples		x	2005 Delta Report		x						Excavation sidewall samples near creek, VOCs below criteria		
	HA-3	x	x	2005 Delta Report	1	x						petroleum VOCs detected, below criteria		
Scrap Metal Processors	MW-4	x		2003 Delta Phase II	1	x		x				1,2,4-TMB, metals > criteria, elevated DRO	PAHs had elevated reporting limits	
	SB-25	x		2003 Delta Phase II	5	x	x	x	x			VOCs, metals, cyanide > criteria, elevated DRO		
	SB-27	x		2003 Delta Phase II	2.5	x	x	x	x			VOCs, SVOCs, metals > criteria		
	SB-31	x		2003 Delta Phase II	1	x	x	x	x			benzo(b)flouranthene, Sb > criteria		
	SMP-SW-3 South		x	2008 Braun Figure	4	x	x	x	x	x		metals > criteria, elevated GRO and DRO		
Irving Ave Dump	1 to 41			1980s Investigation					x (EP Tox)	x (outdated)		Pb impacts noted in 1982 EP tox/leach test results	outdated lab methods	Lead impacts noted along creek east of Irving Avenue
	83-3-48	x		1980s Investigation			x					Only sum of cPAHs and noncPAHs shown.	Cannot compare to criteria	
	83-3-50	x		1980s Investigation			x					Only sum of cPAHs and noncPAHs shown.	Cannot compare to criteria	
	83-3-51	x		1980s Investigation			x					Only sum of cPAHs and noncPAHs shown.	Cannot compare to criteria	
	SS-2	x		2012 Braun Report	0 to 2	x	x		x		x	BaP, As, Cr > criteria		
	SS-8	x		2012 Braun Report	0 to 1.5	x	x		x		x	below criteria		
	SS-12	x		2012 Braun Report	0 to 1.5	x	x		x		x	Sb, Cr, Pb > criteria		
	SS-15	x		2012 Braun Report	0 to 1.5	x	x		x		x	below criteria		
	SS-16	x		2012 Braun Report	0 to 2	x	x		x		x	BaP, PCBs, metals > criteria		
	SS-16B	x		2012 Braun Report	0 to 4		x		x (Pb)			BaP, Pb > criteria		
SS-17	x		2012 Braun Report	2 to 4	x	x		x		x	Sb > criteria			
TP-12		x	2012 Braun Report	3 to 4 and 12	x	x		x		x	BaP, metals > criteria			
301 N Thomas Ave (Fruen Mill Reach)	SB-6	x		2011 Phase I ESA	4								Analyzed for only PCBs near the creek	Six borings were installed at the site, but only two samples analyzed for VOC and pesticides, no samples analyzed for PAHs, SVOCs, or metals. Soil samples near former UST were ND for BTEX. No shallow (0-4') soil samples were collected at the site.

(1) Only soil sample locations within 50 feet of the creek are listed. Sample locations in previously excavated areas are not listed. Boring locations with no analytical data are not listed.

(2) References: All data obtained from the Hennepin County Bassett Creek Areawide Groundwater Study (<https://hennepinedat.barr.com/>), except thos listed below:

2011 Phase I ESA - Phase I Environmental Site Assessment Bassett Creek – Golden Valley Road to Irving Avenue North, Golden Valley and Minneapolis, Minnesota. Prepared by Barr Engineering Co. for the Bassett Creek Watershed Management Commission. June, 2011

(3) Criteria comparisons based on date reported

x = boring log available

Information highlighted in blue represents soil samples collected near the targeted creek restoration/stabilization areas.

Table 2
Proposed Sampling Locations and Analyses
Bassett Creek Main Stem Erosion Repair Project
Bassett Creek Watershed Management Commission
Minneapolis, Minnesota

Study Area Reach	Site Name	Sample ID	Sampling Method	Estimated Depth (feet bgs)	Analytes								Comments/Rationale
					VOCs ⁽¹⁾	PAHs	GRO	DRO	Metals ⁽²⁾	TCLP ⁽³⁾	PCBs	ACM ⁽⁴⁾	
3	Fruen Mill	SB-15-01	GP	3	x	x	(1)	x	RCRA	(3)		(4)	Only PCB data available near creek. Former UST onsite.
		SB-15-02	GP	3	(1)	x	(1)	x	RCRA	(3)		(4)	
3	Bassett's Creek Park	SB-15-03	HA	1	(1)	x	(1)	x	RCRA	(3)		(4)	No existing data in park
		SB-15-04	HA	1	(1)	x	(1)	x	RCRA	(3)		(4)	
1	Pioneer Paper	SB-15-05	GP	4	(1)	x	(1)	x	RCRA +PP	(3)		(4)	Minimal existing data near creek. Historical dumping onsite.
		SB-15-06	GP	4	(1)	x	(1)	x	RCRA +PP	(3)		(4)	
2		SB-15-07	GP	4	(1)	x	(1)	x	RCRA +PP	(3)		(4)	
2	Chemical Marketing	SB-15-08	GP	4	x	x	(1)	x	RCRA +PP	(3)		(4)	Cl VOC contamination in GW at site
1	Irving Ave Dump	SB-15-09	HA	1	(1)	x	(1)	x	RCRA +PP	(3)		(4)	Dump area, PP metals contamination documented.
2		SB-15-10	HA	1	(1)	x	(1)	x	RCRA +PP	(3)	x	(4)	PCBs identified in soils near creek at site
2	Scrap Metal Processors	SB-15-11	HA	1	(1)	x	(1)	x	RCRA +PP	(3)	x	(4)	PCBs identified in soils near creek at site. Former wetland area, potential dumping and filling

Notes:

(1) VOC and GRO sample collected only if field screening indicates potential VOC impacts, except where noted.

(2) Metals Lists:

RCRA Metals:

arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Priority Pollutant Metals:

antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

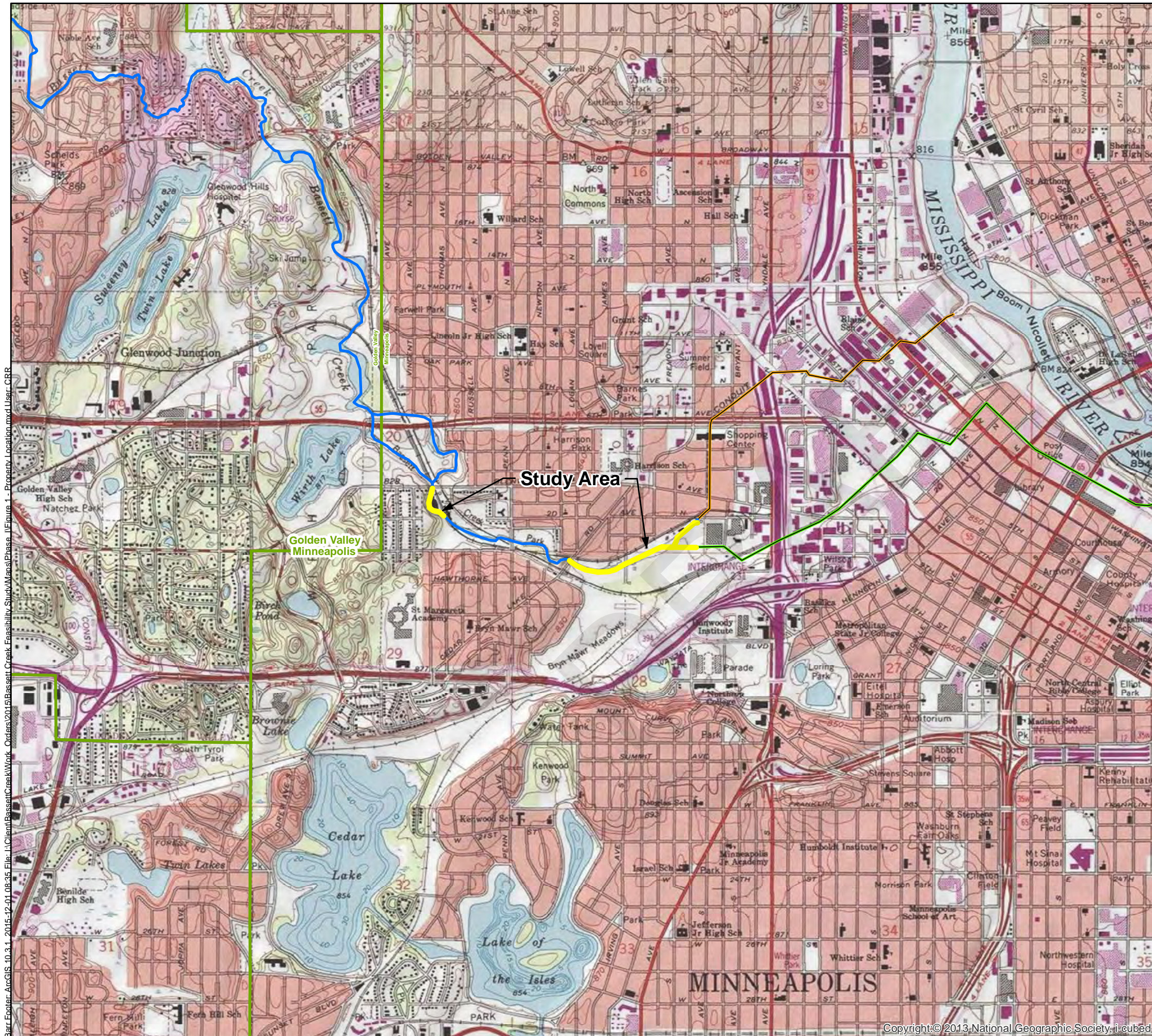
RCRA + Priority Pollutant Metals = Priority Pollutant Metals + Barium

(3) TCLP analysis will be performed for metals or VOCs for parameters with analytical results indicating potentially hazardous levels.

(4) Asbestos analysis will be performed if potential asbestos containing material encountered in debris.

HA = Hand Auger. GP = Geoprobe

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- Study Area
- Stream
- Old Tunnel
- New Tunnel

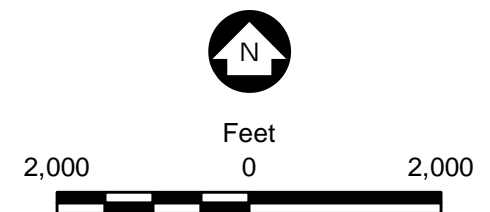
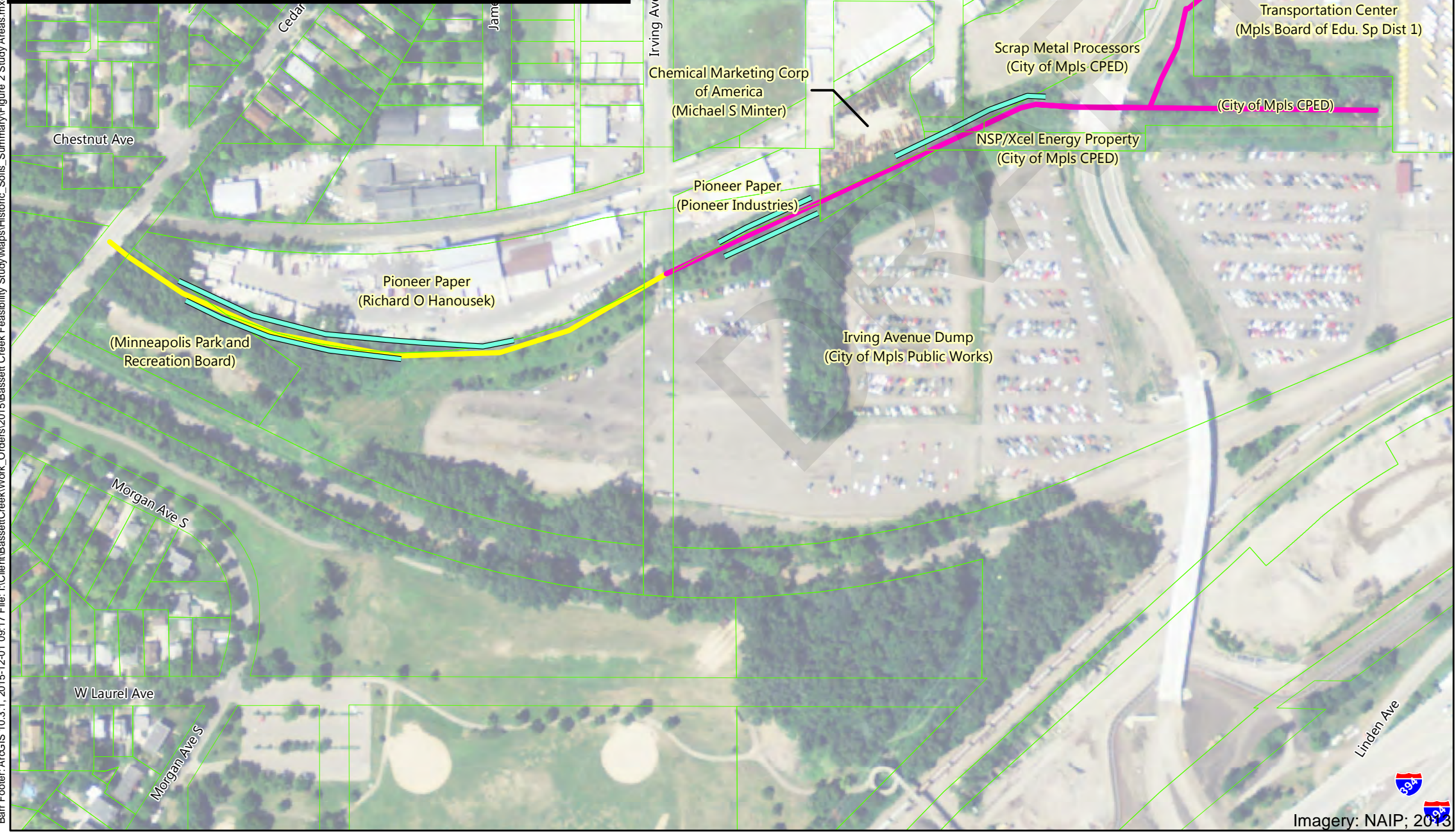


Figure 1

BASSETT CREEK STUDY AREA LOCATION
 Bassett Creek Main Stem Erosion Repair Project
 Bassett Creek Watershed
 Management Commission
 Minneapolis, Minnesota

Bar Footer: ArcGIS 10.3.1 - 2015-12-11 08:35 File: L:\Client\BassettCreek\Work_Orders\2015\BassettCreek_Feasibility_Study\Map\Phase_1\Figure_1_-_Property_Location.mxd User: CRR

Fruen Mill Inset



- Cedar Lake Rd to Irving Ave (Reach 1)
- Irving Ave to Dupont/2nd Ave (Reach 2)
- Fruen Mill (Reach 3)
- Creek Bank Repair/Stabilization Target Areas
- Parcels

SITE NAME
(PROPERTY OWNER, HENNEPIN COUNTY PROPERTY INFORMATION SEARCH)

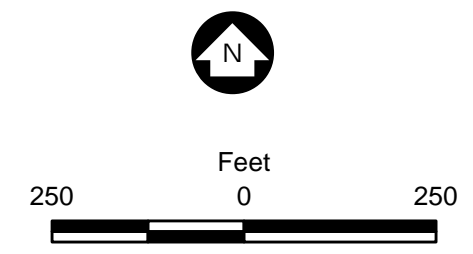
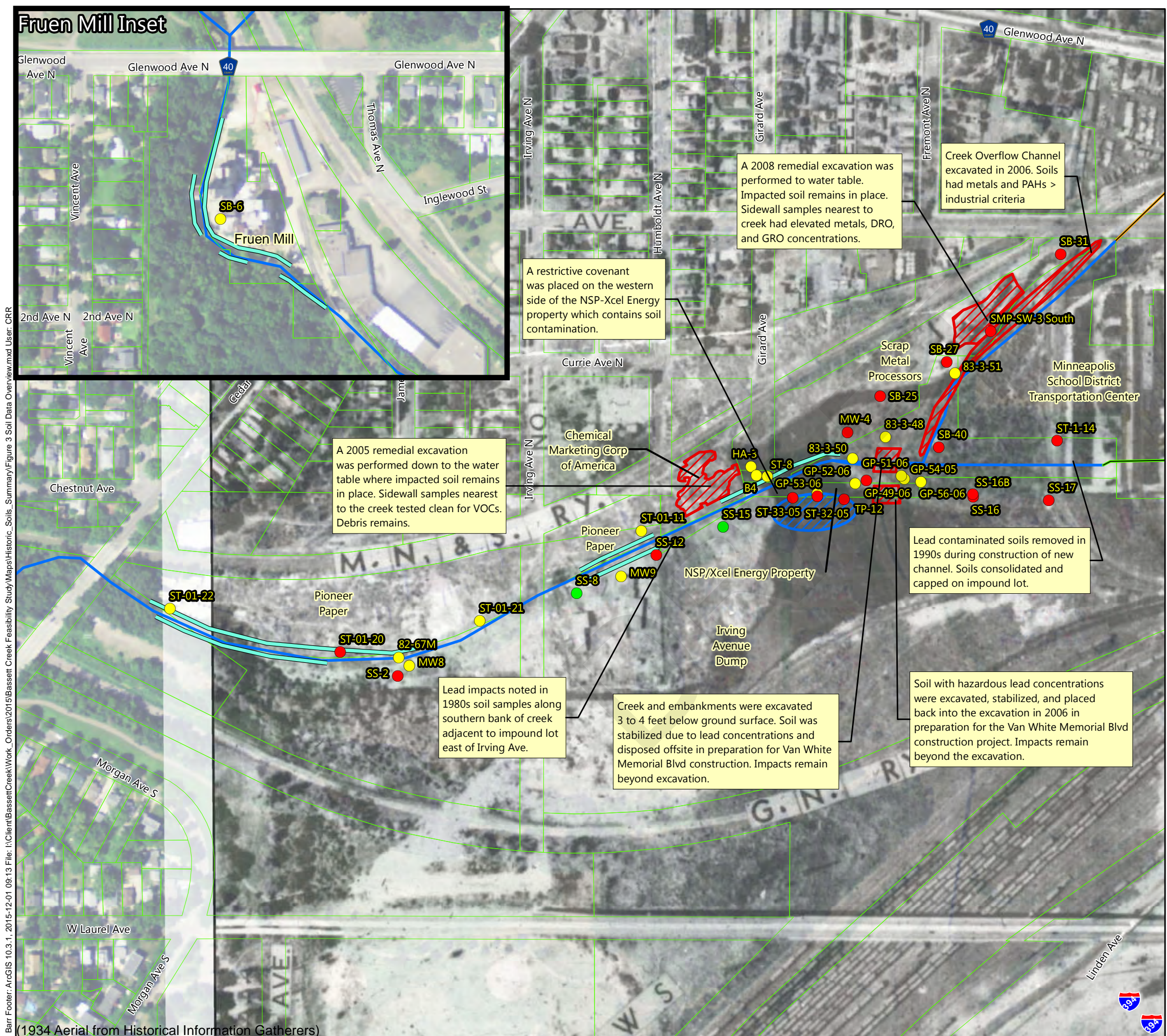


Figure 2
STUDY AREAS
Bassett Creek Main Stem Erosion Repair Project
Bassett Creek Watershed Management Commission
Minneapolis, Minnesota

Barr Footer: ArcGIS 10.3.1, 2015-12-01 09:17 File: I:\Client\BassettCreek\Work_Orders\2015\BassettCreek Feasibility Study\Maps\Historic_Soils_Summary\Figure 2 Study Areas.mxd User: CRR

Imagery: NAIP; 2013



— Bassett Creek
— Old Tunnel
— New Tunnel
— Creek Bank Repair/Stabilization Target Areas
 Parcels
⊕ Remedial Excavation Extents
⊕ Asbestos Containing Material Identified
Soil Sample Locations
● Analytical Data Above State Criteria¹
● Analytical Data Below State Criteria¹
● Limited or No Analytical Data Found

- Notes:
1. Minnesota soil criteria as of reported date.
 2. Table 1 shows analytes tested at each sample location
 3. Sample locations below Van White Memorial Blvd. and within remedial excavation extents are not shown
 4. Debris encountered in majority of soil borings shown.
 5. Soil sample locations within approximately 50 feet of creek are shown.
 6. Asbestos containing material may be present throughout dump material. Area shown is where samples were tested.

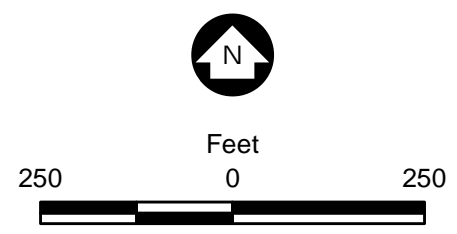
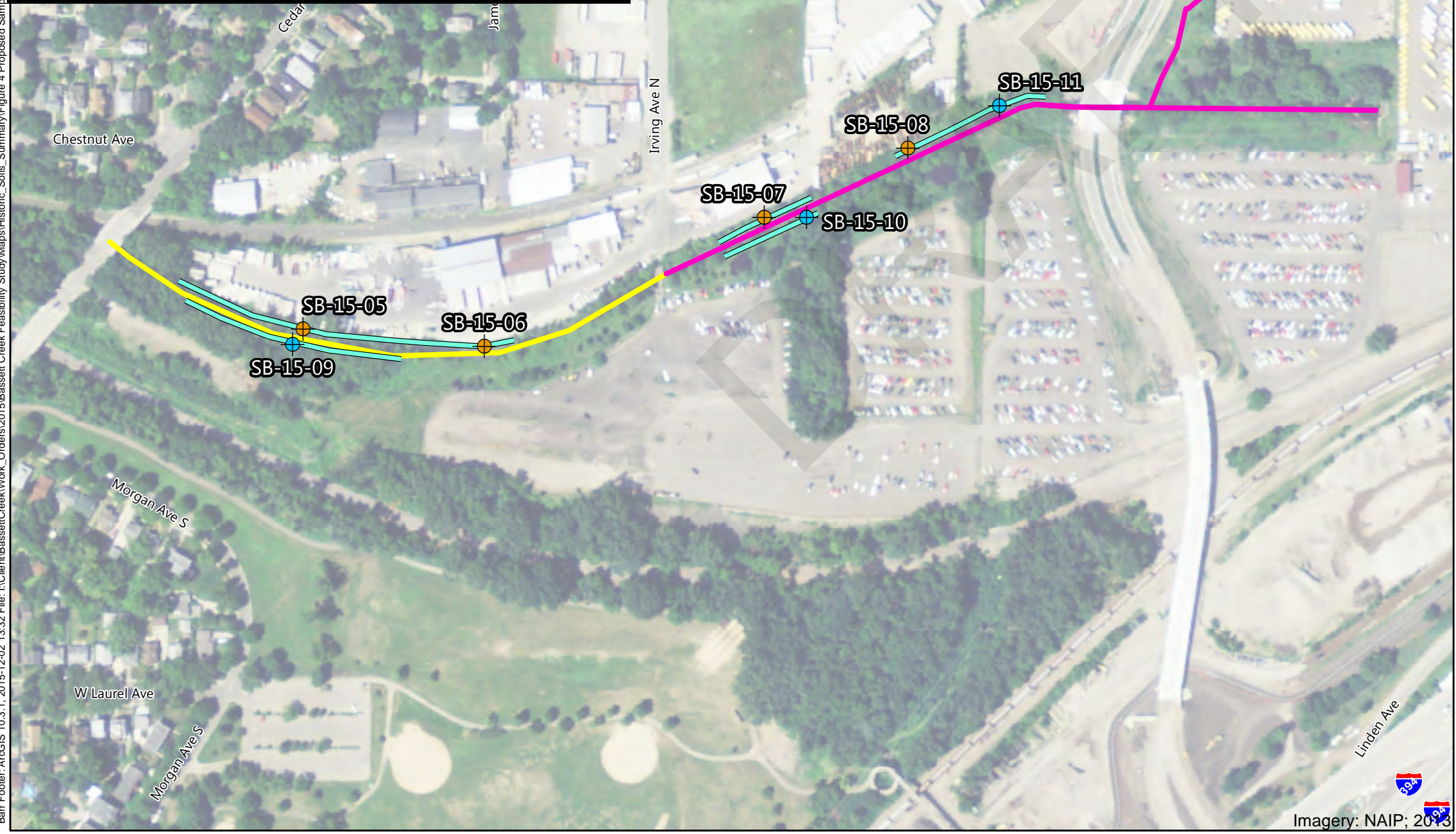


Figure 3

SOIL DATA OVERVIEW
 Bassett Creek Main Stem Erosion Repair Project
 Bassett Creek Watershed Management Commission
 Minneapolis, Minnesota

Barr Footer: ArcGIS 10.3.1, 2015-12-01 09:13 File: I:\Client\BassettCreek\Work_Orders\2015\BassettCreek_Feasibility Study\Map\Historic_Soils_Summary\Figure 3 Soil Data Overview.mxd User: CRR
 (1934 Aerial from Historical Information Gatherers)



- Cedar Lake Rd to Irving Ave (Reach 1)
- Irving Ave to Dupont/2nd Ave (Reach 2)
- Fruen Mill (Reach 3)
- Creek Bank Repair/Stabilization Target Areas
- Proposed Geoprobe Sample Location
- Proposed Hand Auger Sample Location

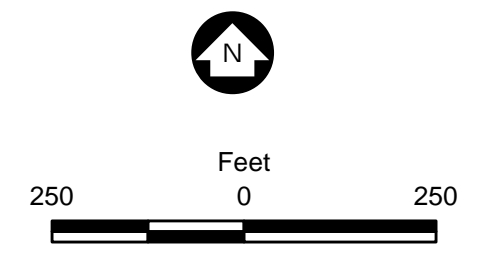
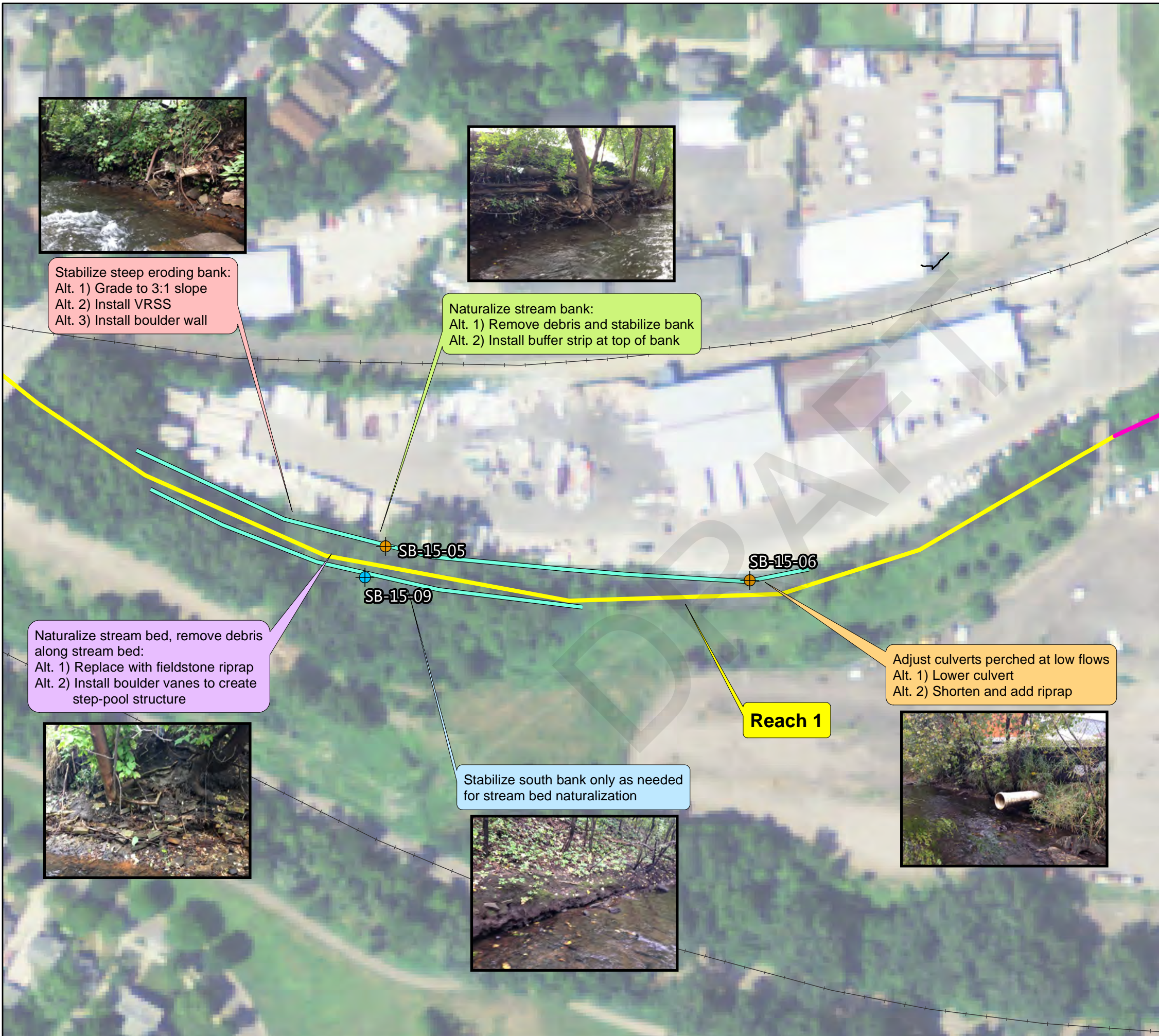


Figure 4
 PROPOSED SAMPLE LOCATION SUMMARY
 Bassett Creek Main Stem Erosion Repair Project
 Bassett Creek Watershed
 Management Commission
 Minneapolis, Minnesota

Barr Footer: ArcGIS 10.3.1, 2015-12-02 13:32 File: I:\Client\BassettCreek\Work_Orders\2015\BassettCreek_Feasibility_Study\Maps\Historic_Soils_Summary\Figure 4 Proposed Sample Locations.mxd User: CRR

Imagery: NAIP; 2013

Barr Footer: ArcGIS 10.3.1, 2015-12-01 09:56 File: I:\Client\BassettCreek\Work_Orders\2015\Bassett Creek Feasibility Study\Maps\Historic_Soils_Summary\Figure 4a Proposed Sample Locations Reach 1.mxd User: CRR



Legend

- Proposed Geoprobe Sample Location
- Proposed Hand Auger Sample Location
- Creek Bank Repair/Stabilization Target Areas

Study Reaches

- Reach 1
- Reach 2
- Reach 3

Note:
 VRSS = Vegetated Reinforced Slope Stabilization

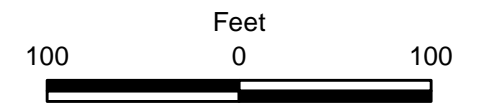
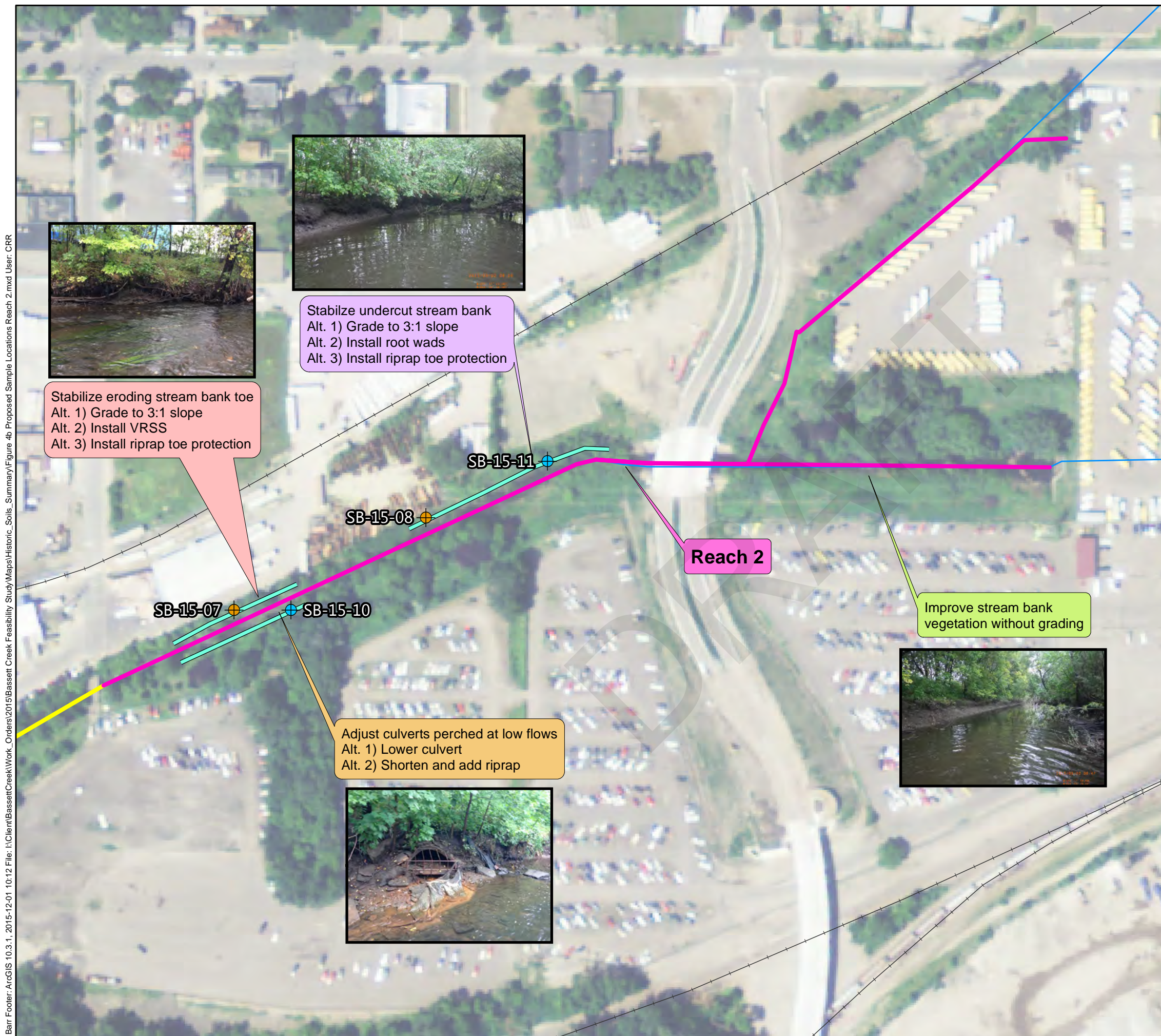


Figure 4a

PROPOSED SAMPLE LOCATIONS REACH 1
 Bassett Creek Main Stem Erosion Repair Project
 Bassett Creek Watershed
 Management Commission
 Minneapolis, Minnesota



Legend

- Proposed Geoprobe Sample Location
- Proposed Hand Auger Sample Location
- Creek Bank Repair/Stabilization Target Areas

Study Reaches

- Reach 1
- Reach 2
- Reach 3

Note:
VRSS = Vegetated Reinforced Slope Stabilization

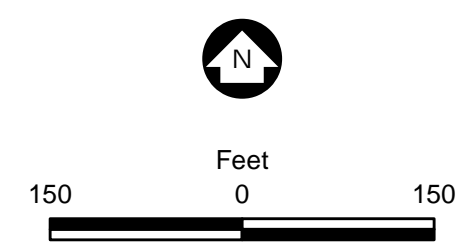
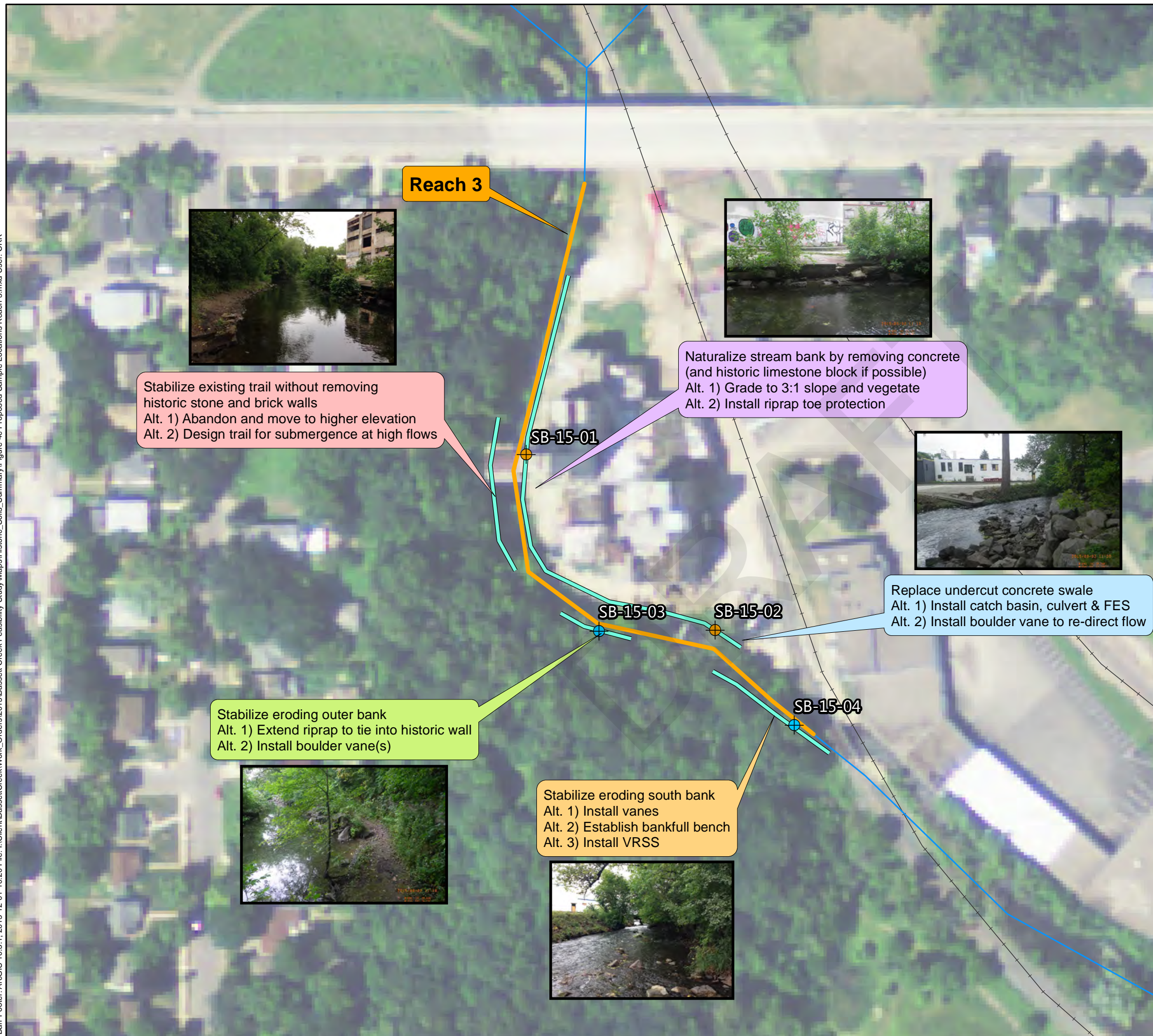


Figure 4b

PROPOSED SAMPLE LOCATIONS REACH 2
Bassett Creek Main Stem Erosion Repair Project
Bassett Creek Watershed
Management Commission
Minneapolis, Minnesota



Legend

- Proposed Geoprobe Sample Location
- Proposed Hand Auger Sample Location

Creek Bank Repair/Stabilization Target Areas

Study Reaches

- Reach 1
- Reach 2
- Reach 3

Note:
VRSS = Vegetated Reinforced Slope Stabilization

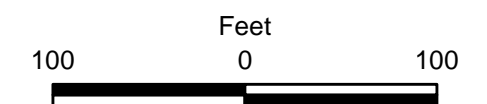


Figure 4c

PROPOSED SAMPLE LOCATIONS REACH 3
 Bassett Creek Main Stem Erosion Repair Project
 Bassett Creek Watershed
 Management Commission
 Minneapolis, Minnesota