Bay West
Customer-Focused Environmental & Industrial Solutions

Bay West LLC
5 Empire Drive, St. Paul, MN 55103
651-291-0456 * FAX 651-291-0099
www.baywest.com • info@baywest.com

Technical Memorandum

To: Shanna Schmitt and Amy Hadiaris, Minnesota Pollution Control Agency

From: Rick Van Allen, Bay West

Date: September 16, 2015

Subject: Proposed Groundwater Monitoring Plan
Building 102 Chlorinated VOC Plume
Twin Cities Army Ammunition Plant Redevelopment
MPCA Site ID: VP22892/PB4687

Dear Shanna and Amy-

Bay West has prepared this Technical Memorandum to propose establishing permanent groundwater monitoring points between the chlorinated volatile organic compound (VOC) plume originating from former Building 102 on the Twin Cities Army Ammunition Plant (TCAAP) and a proposed remeander of Rice Creek immediately west of the inferred extent of the Building 102 VOC groundwater plume. This Technical Memorandum includes a background section summarizing the groundwater sampling history and investigation work completed to date at Building 102; a proposed remeander section describing Ramsey County's plans to re-align Rice Creek; and a well installation and monitoring section which describes the proposal to install monitoring wells to establish baseline groundwater concentrations prior to the remeander and provide for continued groundwater monitoring post-remeander.

BACKGROUND

Ramsey County proposes to remeander Rice Creek southeast of its current intersection with County Road H. Exhibit 1 attached illustrates the proposed remeander. Construction of the remeander will accomplish the following:

- Allow for construction of a new roadway interchange at County Road H which will serve as the "gateway" to the new Rice Creek Commons redevelopment;
- Restore Rice Creek in this area to a more natural state improving the floodplain and hydrology of the creek and wildlife habitat; and
- Greatly improve the creek access and aesthetics and the biking/hiking corridor.

A groundwater contaminant plume in the upper Unit 1 aquifer is present east and southeast of Rice Creek (see Exhibit 1). This contaminant plume is the result of a release of chlorinated solvents from former TCAAP production Building 102. In response to this release, the Army conducted groundwater investigation activities to delineate the contaminant plume and install a network of monitoring wells. Based on the investigation results, the Army, EPA and MPCA concluded the Contaminants of Concern (COCs) in the plume include trichloroethene, cis-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride. Because the Unit 1 groundwater in this area of TCAAP discharges to Rice Creek the Recommended Remediation Goals (RRGs) established by the MPCA, EPA, and Army for the Building 102 plume are the lower of the MPCA's surface water quality standards or the Minnesota Department of Health – Health Risk Limit (MDH-HRL). Table 1 below presents the RRGs for the Building 102 chlorinated solvent plume.

Table 1
Building 102 Recommended Remediation Goals

Chemical	Groundwater Standard (MDH-HRL) (µg/L)	Surface Water Standard (µg/L)	RRG for Building 102 Groundwater Plume (µg/L)
Trichloroethene	5	25	5
cis-1,2-Dichloroethene	70	Not Established	70
1,1-Dichloroethene	6	Not Established	6
Vinyl Chloride	0.2	0.18	0.18

Ultimately, the Army, EPA, and MPCA selected monitored natural attenuation (MNA) and Land Use Controls (LUCs) as the groundwater remedy at Building 102. Operable Unit 2 (OU2) Record of Decision (ROD) Amendment #4 formally documented selection of the remedy.

In July 2013 the Army conducted a groundwater sampling event using direct push sampling methods to more fully delineate the Building 102 contaminant plume and confirm that the selected remedy was effective. The results of this sampling were summarized in a document titled "Supplemental Investigation Report for Building 102 Groundwater, New Brighton/Arden Hills Superfund Site" dated March 2014 (Wenck 2014). The Army collected multiple depth groundwater samples from a series of nine direct push sampling locations perpendicular to the Building 102 groundwater plume. Exhibit 2, taken from the Wenck report and attached herein, illustrates the sampling locations and the inferred extent of the Building 102 plume. Results of the additional groundwater sampling suggested that natural attenuation of VOCs was occurring at an acceptable rate and no VOCs were detected at concentrations above their respective RRGs in the line of direct push samples (Wenck 2014). Notably during the sampling event, the slope of the Unit 2 clay till confining unit was well defined and shown to drop sharply from

southwest to northeast. Exhibit 3, taken from the Wenck report and attached, is a cross-section illustrating the surface of the Unit 2 till and the multiple groundwater sampling intervals at each push probe location.

PROPOSED CREEK REMEANDER

Ramsey County proposes to remeander Rice Creek to allow for construction of the gateway entrance to the development, improve the hydrology of the creek, and improve the aesthetics of the creek. The proposed remeander is illustrated on Exhibit 1. The remeander will shift the Rice Creek channel approximately 400 feet to the east and closer to the existing Building 102 VOC plume. The VOC plume is currently traveling north and monitoring data suggests that contaminants are attenuating to below the RRGs prior to discharging to Rice Creek. Because monitored natural attenuation is the selected remedy for the Building 102 VOC plume, adequate residence time in the aquifer to allow natural processes to degrade the contaminants is critical to the success of the remedy. The remeander proposed by Ramsey County may alter local hydrogeology resulting in a more westerly groundwater flow direction toward the newly aligned Rice Creek. The residence time for VOCs in the aquifer may be reduced resulting in potential discharges to Rice Creek at concentrations exceeding the RRGs.

PROPOSED MONITORING WELL INSTALLATION AND SAMPLING

Well Locations

To monitor the potential effects of the Rice Creek remeander project, Bay West proposes to install two nested pairs of monitoring wells (four wells) between the remeander and the Building 102 plume. The purpose of the monitoring wells is twofold:

- The wells will be installed and sampled prior to the remeander work to document baseline groundwater quality and the vertical gradient.
- The wells will be sampled post-remeander to monitor groundwater quality and the vertical gradient.

The proposed well locations are depicted on Exhibit 1. These locations were selected based on the following criteria:

- Located between the creek remeander and the existing Building 102 plume to document baseline and post-remeander groundwater quality;
- Located in areas that will remain at roughly the same elevation pre- and post-development; and
- Located in areas where the wells will not be disturbed or require removal post-development.

Well Construction

Bay West proposes to install two nested pairs of monitoring wells. Each pair will consist of one well screened to intersect the Unit 1 water table, and a second well screened on top of the Unit 2 clay till. Generally the wells will be constructed as follows:

- Water Table Wells – 2-inch ID schedule 40 PVC, 0.010 slot screen set at approximately 5-15 feet below grade, above-grade steel protective top.
- Piezometer Wells – 2-inch ID schedule 40 PVC, 0.010 slot screen set at approximately 25-35 feet below grade, above-grade steel protective top.

The wells will be installed using the hollow stem auger drilling method. Split spoon soil samples will be collected every 2½ feet to provide lithological information and aid in determining the depth to saturated conditions.

Bay West is estimating the total depth of the proposed piezometer wells based on the Unit 2 till surface depicted on Exhibit 3. The actual depth of these wells will be determined in the field based on split spoon sampling. Bay West intends to install these wells with the base of the screens set approximately 0.5 - 1.0 foot into the Unit 2 till.

Following installation the wells will be developed by alternately surging and purging each well until the groundwater appears clear and free of sediment.

Well Sampling

Bay West proposes to sample the wells prior to the creek remeander to establish baseline groundwater quality, and post-remeander to continue monitoring for the effects of the project. Bay West will contact the Army's consultant and attempt to coordinate our well sampling schedule with their building 102 groundwater sampling as frequently as possible. Table 2 presents the proposed groundwater monitoring schedule:

Table 2
Well Sampling Schedule

Sampling Event	Number of Events	Frequency
Pre-remeander	4	Quarterly with the first event immediately following installation of the wells.
Post-remeander	4	Semi-annually, first event approximately 3 months after the creek is allowed to flow through the meander.

All groundwater samples will be collected by the low-flow sampling method using a bladder pump and submitted to Pace Analytical Services, Inc. for analysis of VOCs by EPA Method 8260. Bay West will collect well stabilization data prior to sample collection; the parameters will include dissolved oxygen, turbidity, temperature, and pH.

Reporting

Bay West will prepare a groundwater monitoring report following each sampling event for submission to the MPCA. The reports will include cumulative sample results, figures depicting the site layout and well locations, copies of field sampling data sheets, and copies of laboratory analytical reports.

Exhibit 1

SECTION A-A

SECTION A-A

SECTION B-B

SECTION B-B

SITE K TREATMENT TRENCH

SITE K PLUME

RICE CREEK

RICE CREEK
10-YR WSL = 874.8

W-5
NWL=882.75
HWL=883.00
BOTTOM=881.00

P-13
NWL=883.00
HWL=885.61
BOTTOM=879.00

P-13
NWL=883.00
HWL=885.61
BOTTOM=879.00

1
886.05
N=210823.594
E=551378.602
WELL

2
886.50
N=210818.819
E=551377.120
WELL

3
887.97
N=210602.297
E=551300.716
WELL

4
888.00
N=210600.712
E=551305.450
WELL

WELL01U128
WELL01U048
WELL01U607
WELL01U603
WELL01U612
WELL01U617
WELL01U621
WELL01U618
WELL01U583

Kimley»Horn
2550 UNIVERSITY AVENUE WEST, SUITE 238N
SAINT PAUL, MINNESOTA 55114
Ph: 651-645-4197 www.kimley-horn.com

RAMSEY COUNTY

ARDEN HILLS

TCAAP Site Redevelopment Infrastructure

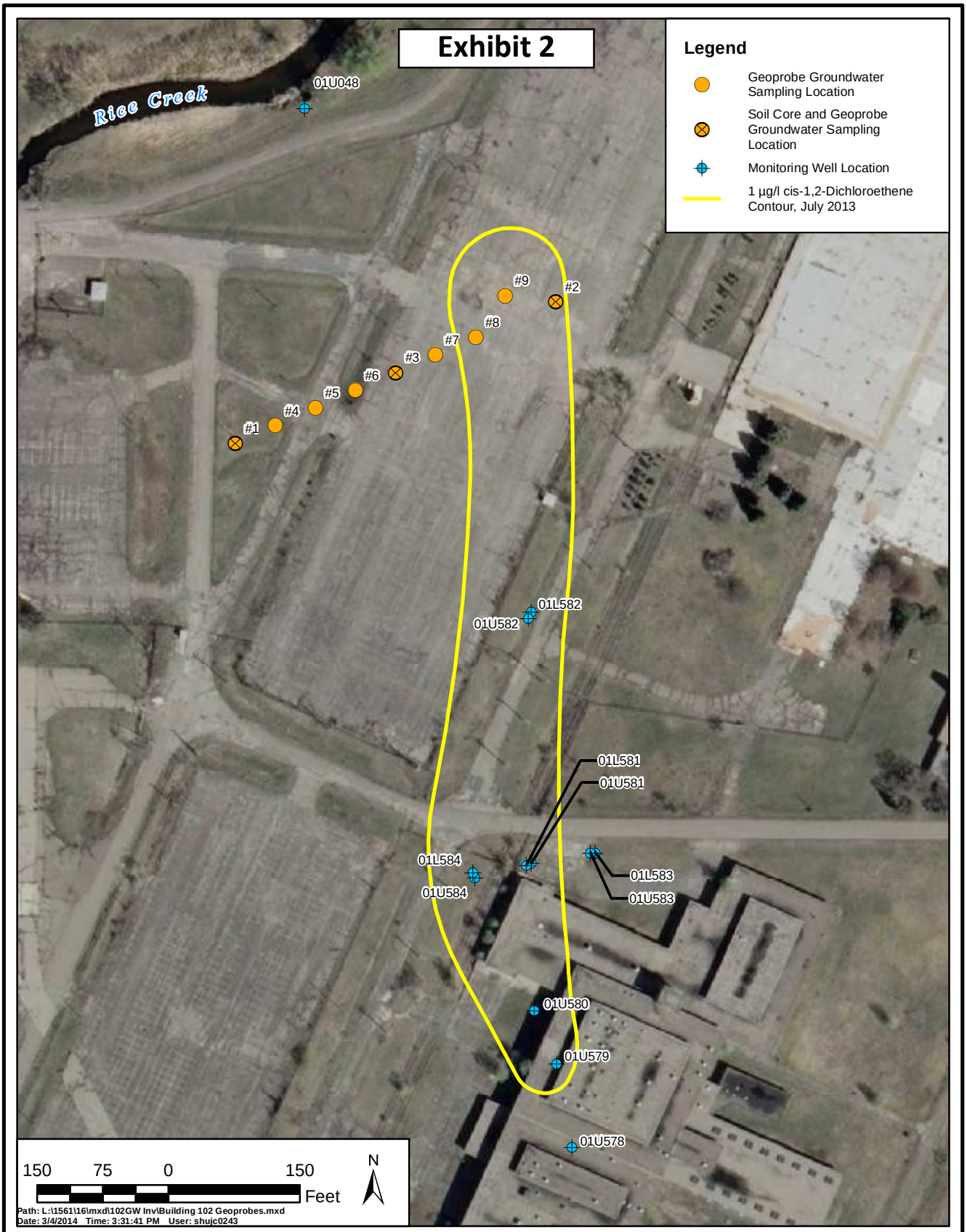
TCAAP SITE K / BUILDING 102
PROPOSED CONDITIONS

NORTH

0 30 60
SCALE IN FEET

EXHIBIT 2

K:\TPC_Civil\County\RAMSEY\TCAAP_Spine Rd BP2\CAD\Plan Sheets\Exhibits\MPCA\TCAAP_EXHIBIT MPCA_PROP.dwg September 16, 2015 1:39 PM



BUILDING 102 GROUNDWATER INVESTIGATION

Geoprobe Locations

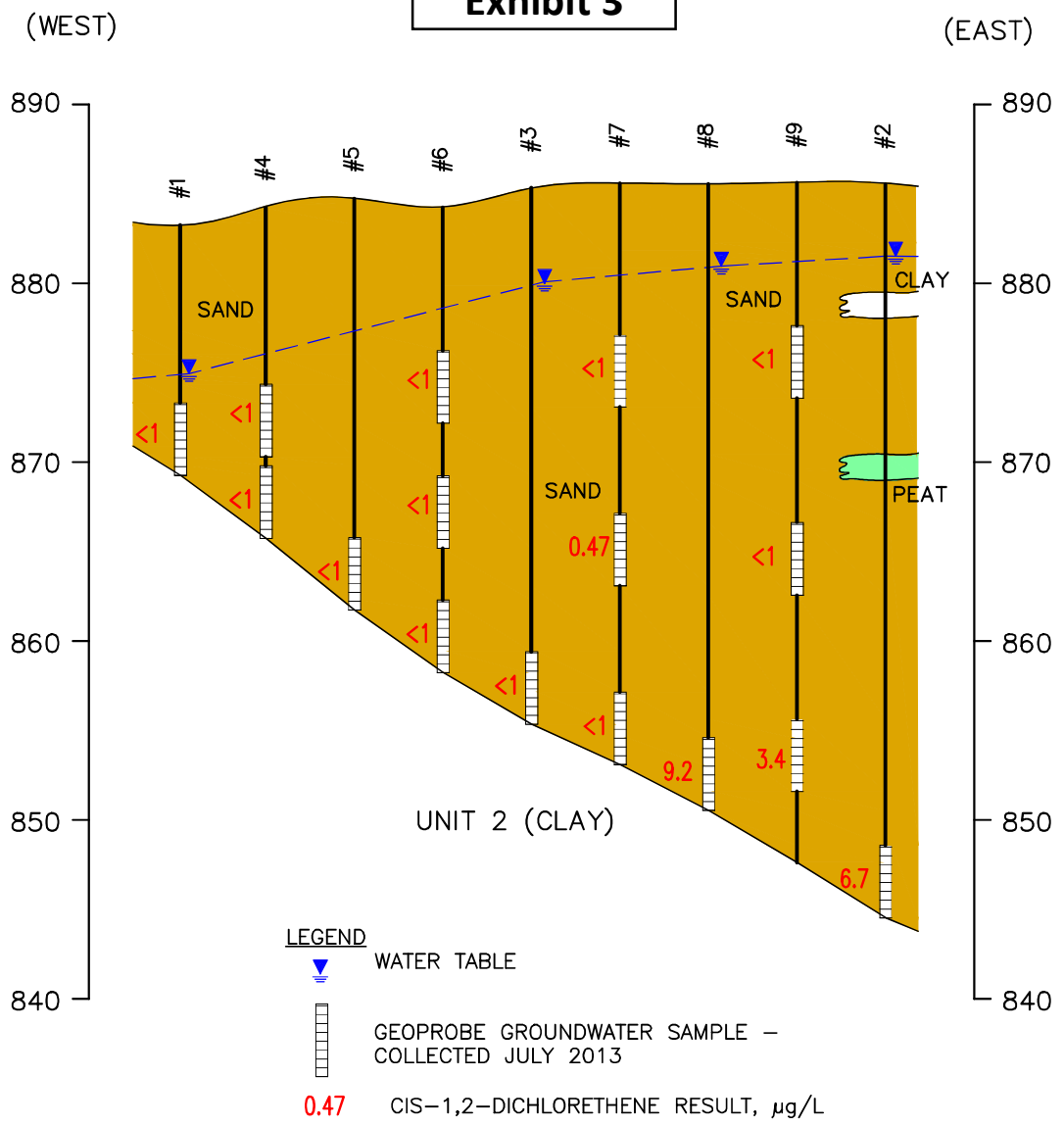
Engineers - Scientists
Business Professionals
www.wenck.com

Wenck
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

MAR 2014

Figure 2-1

Exhibit 3



M:\1561\2013\Bldg 102 x sec.dwg

BUILDING 102 GROUNDWATER INVESTIGATION

Cis–1,2–Dichloroethene Cross–Section, July 2013 Geoprobes

Wenck

Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Ctr. Maple Plain, MN 55359
P.O. Box 249 (763) 479–4200

MAR 2014

FIGURE 2–2