ENVIRONMENT
& HEALTH

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VAPOR MITIGATION SYSTEM DOCUMENTATION AND PRESSURE FIELD EXTENSION TESTING WORK PLAN NORTHWESTERN BARREL (MARINA CLIFFS) - ADJACENT PROPERTY 3333 5TH AVENUE, SOUTH MILWAUKEE, WISCONSIN FID NO. 241428990, BRRTS NO. 02-41-559478

June 1, 2020

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Ref. 1690016812

Dear Mr. Neumann:

On behalf of the Marina Cliffs Performing Parties (the "Performing Parties"), Ramboll US Corporation (Ramboll) has prepared this Vapor Mitigation System Documentation and Pressure Field Extension Testing Work Plan (the "Work Plan") for the Marina Cliffs/Northwestern Barrel Site Condominium Property located at 3333 5th Avenue in South Milwaukee, Wisconsin (the "Property" or "site"). This Work Plan was prepared in accordance with NR 716 Wisconsin Administrative Code (WAC) to supplement prior Vapor Intrusion Work Plans. The objectives of this Work Plan are to prepare a construction documentation report for the recently installed vapor mitigation systems (VMS) and evaluate the effectiveness of the VMS by completing pressure field extension (PFE) testing. The following sections of this Work Plan include a site location and description, project background, scope of services, and schedule for the project. We are submitting this Work Plan for your information. We are not requesting a formal review of this Work Plan at this time.

SITE LOCATION AND DESCRIPTION

The Property is owned by the Marina Cliffs Condominium Corporation and is located at 3333 5th Avenue in South Milwaukee, Wisconsin, northeast of the intersection of Marina Road and Fifth Avenue (Figure 1). The Property is municipally zoned for residential occupancy. A site plan of the Property is depicted on Figure 2.

Four residential condominium buildings (Buildings 1, 2, 3, and 4) are developed on the Property. Each building contains ten residential units (Units "A" through "I") and is constructed with two livable floors over a basement (three levels total). The area around the buildings is further developed with depressed concrete carports, asphalt surfaced parking lots, concrete sidewalks, and landscaped patio areas.

The basements are all constructed of poured concrete slabs and cinder block walls in low permeability silty clay till (calculated mean bulk hydraulic conductivity of

approximately 1.2 x 10^{-5} centimeters per second (cm/s) and measured mean triaxial (vertical) permeability of approximately 9.1 x 10^{-8} cm/s) that is the principle stratigraphic unit at and in the vicinity of the Property. The groundwater elevation in the vicinity of the four condominium buildings within the silty clay till is approximately 10 feet below ground surface. The low permeability silty clay vadose zone limits the potential for significant vapor migration from the subsurface to the surface and the interface with the basements. The basements in certain units have been finished, while others remain unfinished. The footprint of each basement unit is approximately 15 feet wide by 30 feet long (by 8 feet high), for a total area of approximately 450 square feet per unit. Each building is comprised of ten units and has a total basement area of approximately 4,500 square feet.

To mitigate the potential for vapor migration from subsurface soil to indoor air (IA) in condominium basements, drain tile depressurization systems (VMS) were installed in each of the four buildings on the Property in October 2004. An initial VMS was installed in Units 1J, 2A, 3J, and 4A, which consisted of an extraction fan (blower) connected to a sealed sump crock. In December 2019, an additional VMS was installed in Units 1A, 2J, 3A, and 4J. The current VMS in each building depressurizes the subsurface via a vacuum on the installed drain tile. The drain tile surrounds each of the buildings. The Wisconsin Department of Natural Resources (WDNR) expressed concern that the depressurization system provides full coverage for all units within each of the four buildings.

PROJECT BACKGROUND

The Northwestern Barrel Company operated a barrel reconditioning operation on an 18-acre parcel of property extending to Lake Michigan. Under United States Environmental Protection Agency (USEPA) and WDNR oversight, the Property was subjected to extensive investigation and remediation activities for over 20 years. The USEPA divided the Property into two separate sites for purposes of investigation and remediation activities: 1) Marina Cliffs/Northwestern Barrel Site (13 acres in size; activities were completed between 1995 and 2009), and 2) properties immediately adjacent to Marina Cliffs/Northwestern Barrel (5 acres in size; activities commenced in 2002). The Condominium Property is included in the Properties Immediately Adjacent to the Marina Cliffs/Northwestern Barrel Site.

The Property was subject to Time-Critical and Non-Time-Critical remedial actions completed from 2002 through 2010 pursuant to the requirements of Administrative Order by Consent (AOC) Docket No. V-W-02-C-703, (2002 AOC), Administrative Order by Consent Docket No. V-W-04-C-787 (2004 AOC), and Administrative Order by Consent Docket No. V-W-11-C-985 (2011 AOC) issued by the USEPA.

As of 2015, numerous remedial activities had been performed at the Property to reduce source mass including limited soil excavation and *in-situ* chemical oxidation (ISCO) remediation in areas on site where elevated chlorinated volatile organic compounds (cVOCs) were present in soil. Prior to conducting the full-scale ISCO pilot test in November/December 2004, precautionary depressurization systems were installed in October 2004 in four basement sump crocks; one in each of the four buildings on the Property. These sump crocks were connected to a buried shallow drain tile system surrounding the perimeter of each building. The units where the original drain tile depressurization systems were installed included 1J, 2A, 3J, and 4A (Figure 2). Five additional basement sump crocks were sealed with a cover at this same time and were located in Units 1A, 2J, 3A, 3D, and 4J. Refurbishment of all nine sump crock seal covers, crock cleanouts and replacement of the nine crock sump pumps was completed in May 2013. Operation of the initial mitigations systems has been performed by GHD Environmental, Inc. on behalf of the Performing Parties since installation in 2004.

A Case Closure Report for the Property was submitted to the WDNR by the Performing Parties in October 2012. As of September 2013, all work under the 2002, 2004, and 2011 AOCs had been completed with the exception of the Post-Closure Site Control Agreement. In May 2015, the WDNR advised the Performing Parties that the WDNR's vapor intrusion (VI) rules and policies have evolved and the newly assigned WDNR Project Manager, Jason Lowry, requested that additional VI issues be addressed but also clarified that a decision on Case Closure will ultimately be up to WDNR's Southeast Region Closure Committee.

In September 2016, a VI Evaluation Work Plan (VI Work Plan) was prepared by GHD on behalf of the Performing Parties and submitted to the WDNR to address the additional air monitoring activities requested by the WDNR; assess the need for continued operation of the four existing VMS; and assess if any additional vapor mitigation devices were required. The WDNR reviewed and provided conditional approval with comments on the VI Work Plan in October 2016. In accordance with the WDNR-approved VI Work Plan, the following activities were performed: in November 2017, 10 sub-slab monitoring points in 10 units were installed; in November 2017, 10 sub-slab and 9 IA samples were collected while the VMS was operating; in December 2017, 10 sub-slab and 10 IA samples were collected following 2-week shutdowns of VMS units in all buildings; and in April 2018, 12 sub-slab and 12 indoor samples were collected following a 30-day shutdown of VMS units in Buildings 2, 3, and 4.

Based on the results of this additional testing, GHD prepared a Soil Vapor Evaluation Report on behalf of the Performing Parties on March 5, 2018. Subsequent sampling performed during the 2017 to 2018 winter heating season confirmed the presence of sub-slab soil gas concentrations warranting continued mitigation at three of the four buildings. Pilot testing for VMS design in August 2018 confirmed the effectiveness of the existing VMS units for portions of each of the four building and identified the need for supplemental VMS installations to ensure complete coverage. As detailed in the July 16, 2019 Design Report prepared by GHD, a VMS was installed in Units 1A, 2J, 3A, and 4J in December 2019 along with a number of upgrades to the VMS installed in 2004.

In response to the Design Report submittal on July 16, 2019, and a subsequent technical meeting on August 20, 2019, the WDNR generated a comment letter dated September 13, 2019. Specific WDNR comments requested an expanded scope of work to verify the performance of the upgraded VMS and IA sampling to verify the VI pathway is incomplete. VI assessments at the Property have been encumbered by difficulty in obtaining access to individual units at each building. The WDNR recommended a preliminary commissioning sampling plan based on existing access, with a supplemental demonstration as additional access is granted.

TECHNICAL STRATEGY

In consideration of the work completed to date and the work being requested by the WDNR, Ramboll has prepared a technical strategy that first focuses on evaluating the effectiveness of the VMS by completing pressure field extension (PFE) testing and documenting VMS performance in conjunction with preparation of a Construction Documentation Report for the VMS in all four buildings, then addresses the IA sampling requested by the WDNR. The purpose of this strategy is to quickly assess and document the effectiveness of the VMS in each building since installation of the expanded and upgraded VMS in December 2019 to ensure complete VI mitigation coverage below all units. If the results of the PFE testing support the conclusion that the current VMS as designed and installed is providing complete coverage below all units in each of the four buildings, then IA testing will be conducted in accordance with a targeted IA Testing Program Work Plan which will be developed after completion of the performance testing scope presented herein. The IA testing

program will be designed by Ramboll and presented in a NR 716 WAC Work Plan for review and approval. The IA testing program will be based on the additional data collected during the PFE testing and will include collection of IA samples considering full column testing in select units and seasonal variability testing. If it is determined that the current expanded VMS is not providing complete coverage during the initial PFE testing, then Ramboll will work with a VI mitigation contractor to further modify/upgrade the vapor mitigation systems. This strategy ensures the VMS is effective in creating an acceptable building-wide vacuum below each building before IA is sampled.

SCOPE OF SERVICES

Based on the technical strategy discussed above, Ramboll will complete the following tasks:

Task 1: Completion of PFE Testing

Ramboll will work with the Performing Parties to arrange access and perform PFE testing in the 15 units where vapor pins are currently installed[1] in the four buildings (as depicted in Figure 2) and the 8 units where access was granted[2]. Ramboll selected these 23 units for testing because there are current access agreements in place for the 23 units. The pressure influence testing will be utilized to check that the PFE of the VMS has influence across all units in each building.

Ramboll will confirm that the VMS are operating properly and test and measure the extent of the drain-tile depressurization in each of the 23 units using a digital manometer to confirm there is sufficient coverage under all the affected units. Performance verification will be based upon demonstration of an established pressure field. The induced pressure gradient will be measured to 0.001 inch of water column within the designated units of each building following a period of at least 30-days of operation (for equilibration of the VMS). According to GHD, the upgraded systems were started January 7, 2020.

Task 2: VMS Construction Documentation

In addition to PFE verification within each structure, performance verification will include a compilation of operation parameters (i.e., induced pressure, barometric pressure, humidity and exterior ambient temperature), that will be continuously collected by the remote monitoring system. The goal is to verify that the VMS maintain the design benchmark of greater than 0.004-inch of water column, or sufficient, induced sub-slab pressure differential with reference to the IA environment throughout the buildings, thus mitigating occupant exposure to the contaminants of concern.

In conjunction with the PFE and performance testing, Ramboll will also review the accessible units for preferential pathways where soil vapors may migrate along preferential flow pathways in the subsurface (e.g., utility corridors that transect a cVOC area, sewer lines, cracks in basement floors, utility laterals that penetrate basement walls). In addition, Ramboll will utilize a digital manometer to measure the interior pressure differential in each unit in comparison to ambient outside pressure. The interior pressure differential will be measured in each unit accessed during each site visit (i.e., during PFE verification and during subsequent IA sampling).

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[1] 1I, 1J, 2A, 2C, 2F, 2I, 3D, 3E, 3F, 3G, 3J, 4A, 4B, 4G, and 4J.

[2] 1A, 1B, 1C, 2B, 3A, 3C, 3I and 4F.

Task 3: Report on Efficiency of Existing VMS and Preparation of IA Sampling Program Work Plan

Following completion of the PFE testing, Ramboll will provide an opinion regarding the adequacy of the existing systems to provide full coverage for all units in the four buildings. If the PFE testing confirms coverage, Ramboll will prepare a VMS Construction Documentation report detailing the VMS installation and performance, verification testing and summary of the results of the testing conducted in accordance with WAC NR 724.

If Ramboll determines that additional PFE test data is necessary in select units where access is not currently available to document coverage, Ramboll will work with the Performing Parties to obtain access to the additional units for additional PFE testing prior to preparing the VMS Construction Documentation report. VMS modifications/upgrade recommendations may include but are not limited to addition of vapor depressurization points in the interior of the building's footprint, changing out the VMS fans with larger capacity units to increase the vacuum draw and/or sealing any identified cracks or utility entry points that may short circuit the sub-slab depressurization field.

After evaluating the efficacy of the VMS, or subsequent to any required VMS modifications, Ramboll will develop an IA Sampling Program Work Plan. The Work Plan will conform to the IA sampling requested by the WDNR letter dated September 13, 2019 (i.e., documenting that the VMS are effective in mitigating potential cVOC vapors in units located throughout the entire building layout and include full column testing in at least a couple of units in each building). The IA sampling will also include sampling in the winter months to evaluate potential heating system stack effects in potential "worst-case"[3] conditions.

CLOSING

We hope the information contained herein meets your needs. If you have any questions or need further information, please contact either of the undersigned.

Yours sincerely,

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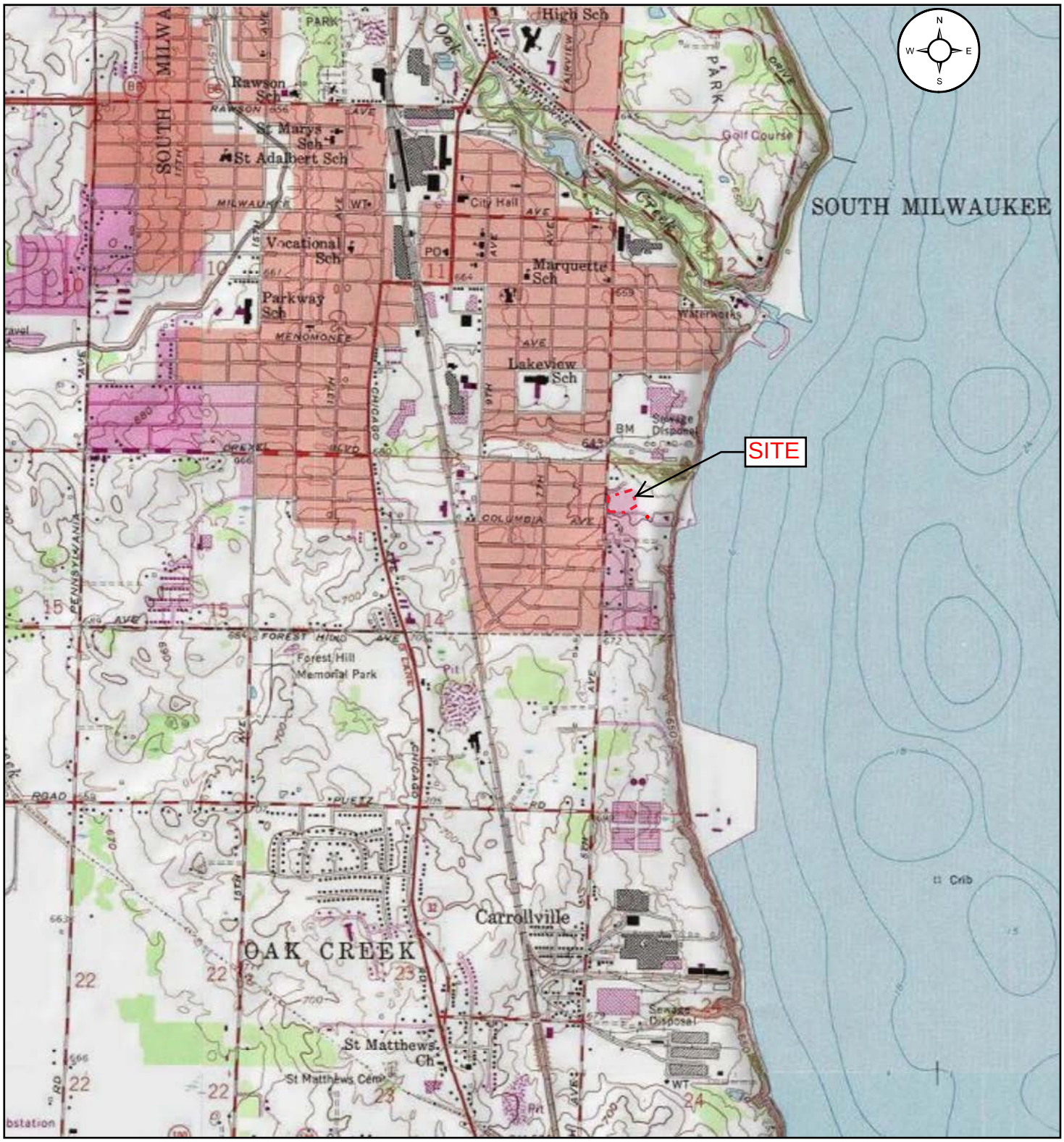
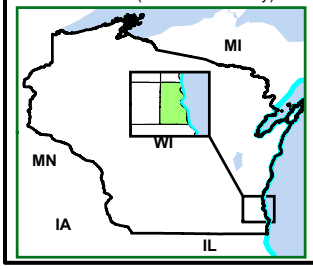
[3] Sub-slab and indoor air vapor samples during the winter months (snow cover and/or frozen ground conditions), samples collected in the fall, winter and spring seasons are more likely to reveal the presence of vapors while samples collected in the summer are the least likely to reveal the presence of vapor (WDNR RR-986, *Sub-Slab Vapor Sampling Procedures*, July 2014).

FIGURES



Site Location (Milwaukee County)



SITE LOCATION MAP
Marina Cliffs
3333 5th Avenue
South Milwaukee, WI 53172

Ramboll Project: 16900116812

Date: 04/13/2020

0 mi 1/2 mi 1 mi

Source: NGS USA Topographic Maps
Copyright: © 2009 National Geographic Society

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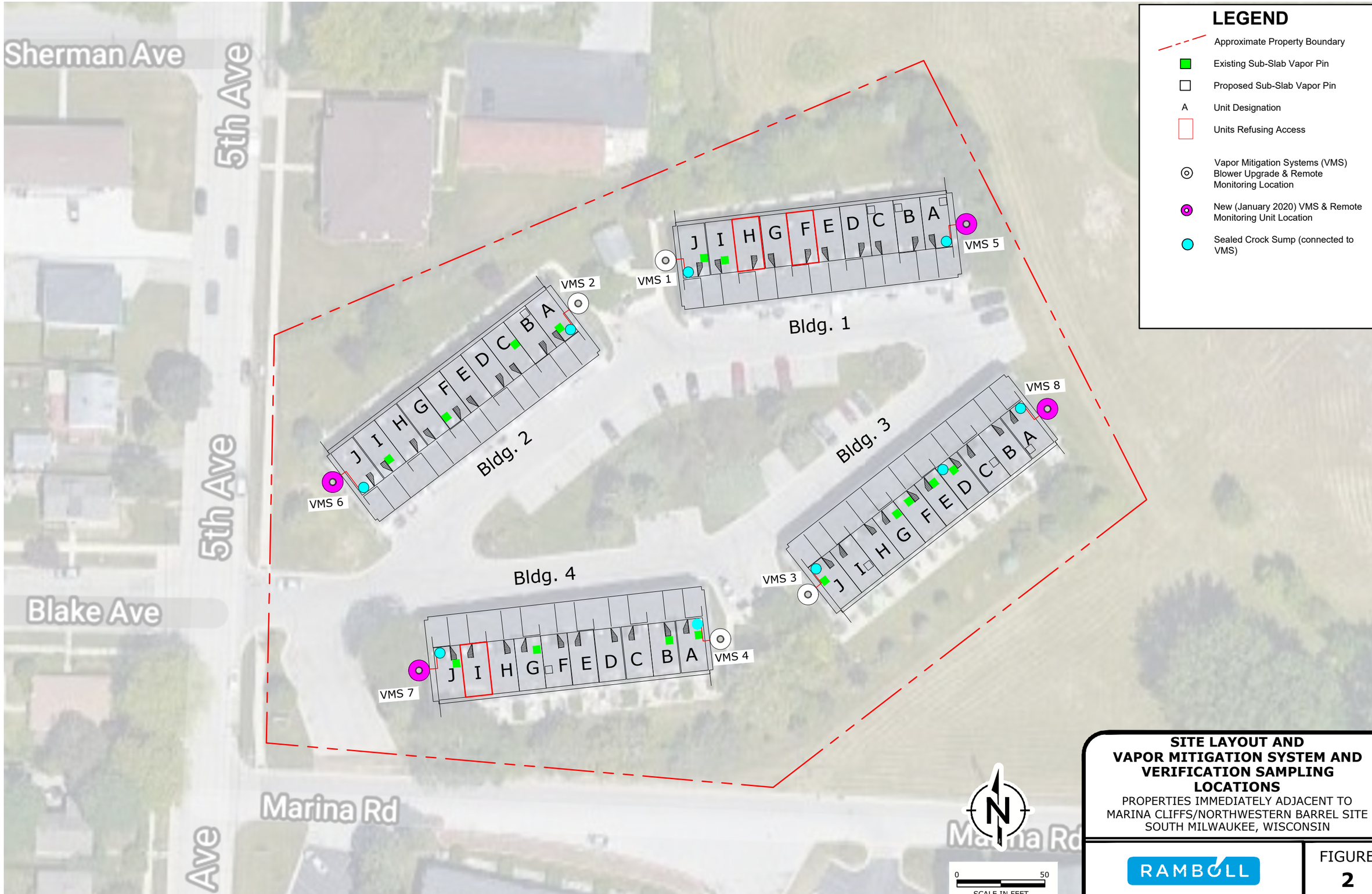
FIGURE 1

NW1/4, NW1/4, Section 13, Township 5 North, Range229 East



SOURCE: GHD *DRAFT VAPOR MITIGATION VERIFICATION WORK PLAN,* FIGURE 5, 10/07/2019.

SITE LAYOUT AND VAPOR MITIGATION SYSTEM AND VERIFICATION SAMPLING LOCATIONS

PROPERTIES IMMEDIATELY ADJACENT TO MARINA CLIFFS/NORTHWESTERN BARREL SITE
SOUTH MILWAUKEE, WISCONSIN

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FIGURE **2**

DRAFTED BY: rpm | DATE: 03/10/2020

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