— ATLAS ATC ENGINEERING, INC —

May 8, 2021

Mr. Hasan Ahmed
Project Manager
New York State Department of Environmental Conservation
Division of Environmental Remediation
47-40 21st Street
Long Island City, New York 11101

Subject: Phase Two Sulfate Injection Work Plan
Kings Plaza Shopping Center OU-3
5602 Avenue U, Brooklyn, New York 11234
NYSDEC Case No. 98-15289

Dear Mr. Ahmed:

This Phase Two Sulfate Injection Work Plan was prepared on behalf of Brooklyn Kings Plaza LLC for the former Standard Oil parcel (Operational Unit [OU]-3) located at 5602 Avenue U, Brooklyn, New York (hereafter referred to as "Site"). A Site location map is present as Figure 1. The Site is currently under a stipulation agreement with the New York State Department of Environmental Conservation (NYSDEC) for open spill case 98-15289. This plan outlines the phase two sulfate injections proposed in the OU-3 Remediation Work Plan, Kings Plaza Shopping Center, prepared by Langan Engineering, dated February 2020. The remedial plan specifically addresses impacts at, and near, monitoring well MW-52, which is located within the sidewalk along Avenue U (Figure 2).

BACKGROUND

Site Description

The Site is approximately 5.9 acres and is improved with a 1-story Lowe's Home Improvement store (Lowe's) and associated asphalt parking lot (Block 8470, Lot 114). The site is bounded by Avenue U to the northwest, Kings Plaza Shopping Center to the northeast, Mill Basin to the southeast and East 55th Street to the southwest.

Current Regulatory Status

To address historical releases at the former Standard Oil facility, NYSDEC Case No. 97-04124 was opened at the Site in July 1997. Investigations were completed at the Site between 1997 and 1999, and a second NYSDEC Case No. 98-15289 was opened in March 1999 to address the same impacts as Case No. 97-04124, but for a second responsible party. Alexander's, a wholly-owned subsidiary of Vornado, entered into a stipulation agreement with the NYSDEC in May 2002 to investigate and

remediate historic petroleum discharges to soil and shallow groundwater associated with Spill No. 97-04124, which occurred within OU-3.

Site Remediation was conducted between 2005 and 2010, which included construction of a 125,000-square-foot Lowe's with an asphalt-paved parking lot and a landscaped waterfront area adjacent to the Mill Basin. During the installation of a water line at the Site in 2009, Case No. 09-04813 was opened for petroleum product identified during installation of a water line at the Site, generating Case No. No. 97-04124. Case No. 97-04813 was closed in December 2008 following Site remediation, and Case No. 09-04813 was closed in November 2016 following receipt of a Construction Completion Report (CCR). Brooklyn Kings Plaza LLC purchased the Site from Vornado in 2012, along with the Kings Plaza shopping center.

In a conference call on November 2, 2016, the NYSDEC requested that an additional round of groundwater sampling be completed at four wells along Avenue U (MW-47R, MW-51R, MW-52, and MW-53). Based on discussions with the NYSDEC, if a decreasing trend in petroleum-related volatile organic compounds (VOCs) were observed in the wells (compared to sampling conducted in August 2013), the NYSDEC would consider closer of Case No. 98-15289. Groundwater sampling activities conducted in 2016 identified total VOCs in MW-52 at a concentration of 1.018 mg/L. Based on the identified concentration exceeding 1 mg/L, the NYSDEC requested that additional remediation be completed to close the spill. In response to that request, Langan Engineering submitted the above reference OU-3 Remediation Work Plan in February 2020. The work plan consisted of two phases. Phase One included a vacuum-enhanced fluid recovery (VEFR) event at MW-52 followed by two rounds of groundwater sampling for VOCs. If the VEFR proved ineffective, Phase Two consisted of enhance anaerobic degradation of the residual petroleum impact near MW-52 using a sulfate-based remediation product.

In December 2020, Langan Engineering submitted a Vacuum Enhance Fluid Recover Summary Letter to the NYSDEC summarizing the VEFR event and post-remedial groundwater sampling events at MW-52. A six hour VEFR event was completed at MW-52 on March 24, 2020. During that time, the well reportedly ran dry eight times. Each time this occurred vacuum activities were paused to allow the well to recharge to approximately 6 feet below ground surface (bgs). The VEFR event extracted approximately 314 gallons of oily water from the well. Subsequent to the VEFR event, Langan completed two groundwater sampling events at MW-52. Total VOCs measured in MW-52 seven days later on March 31, 2020 was 1.534 mg/L, and three months later on June 24, 2020 the concentration was 1.298 mg/L. In an email on March 9, 2021, based on the reported groundwater sampling results, the NYSDEC requested that a work plan be submitted outlining a more robust remedial approach to address the residual dissolved-phase VOCs in MW-52.

Site Geology and Hydrogeology

The Site is relatively level with elevations ranging from 8 to 10 feet above Mean Sea Level (MSL). Base on available USGS maps this area of Brooklyn generally consist of a thin layer of fill overlying unconsolidated glacial deposits. Bedrock in the area of the Site is between 600 to 700 feet bgs.

Based on a review of prior subsurface investigations at the Site, historic fill consisting of a fine to coarse sand, silt and varying amounts of brick, gravel, wood, coal, and concrete is present to a depth of approximately 7 feet bgs. Underlying the fill is a fine to coarse sand that is approximately 2 to 10 feet thick. A continuous organic clay unit underlies the silty sand at a depth of approximately 8 to 18 feet bgs.

Depth to groundwater at MW-52 was measured at 5.58 feet bgs in December 2016 and the general groundwater flow direction in the area of MW-52 was reported to be to the northwest.

BASIS FOR DEVELOPED OF THE SULFATE INJECTION WORK PLAN

Given the fact that the petroleum impact appears to be limited to the general area of MW-52, no bench scale testing is proposed. Atlas ATC Engineering Inc. (AAE) proposed to use the following assumptions to determine the required chemical loading and injection volume for a treatment area of 25 feet by 25 feet by 7.5 feet centered at the location of MW-52.

- Treatment Volume: 4,687 $ft.^3$
- BTEX Concentration: 51 µg/L
- Oxygenation Reduction Potential (ORP): -98.3 mV
- Dissolved Oxygen: 0.6 mg/L
- pH: 7.30
- Depth to Water: 5.7 ft.
- Groundwater Flow: Northwest
- Vertical Treatment Interval: 5.5 ft. to 13 ft. (based on stratigraphy for MW-4)
- Soil Density: 110 $lbs./ft.^3$ or 49.9 $kg/ft.^3$
- Porosity: 25%
- Target Injection Volume: 20% pore volume
- Contaminant Mass: 250 mg/kg

  (modeled using soil data from B-3A, B12A and B-19A at OU-2 and to account for dissolved phase)

Based on the target treatment volume of 4,687 cubic feet (25 ft. x 25 ft. x 7.5 ft.) and assuming a soil density of 49.9 kg/cubic foot, this equal a soil mass of 233,858 kg. Assuming a total contaminant concentration of 250 mg/kg, this results in a contaminant mass of 58.5 kg or 129 lbs. of total Polycyclic Aromatic hydrocarbons (PAH) and Volatile Organic Compounds (VOCs). Given that 12.3 lbs. of

magnesium sulfate is required per pound of contaminant, the total required mass of magnesium sulfate is 1,585 pounds.

Given a nutrient requirement of 32 lbs. of ammonium chloride and 3.8 lbs. of disodium phosphate per 100 lbs. of hydrocarbons, the total nutrient demand is: 41.3 lbs. of ammonium chloride and 4.9 lbs. of disodium phosphate.

Given a soil treatment volume of 4,687 cubic feet with a porosity of 25%, and a target injection volume of 20% of the porosity, results in a total injection volume of 1,753 gallons.

PROPOSED WORK PLAN

Based on the Phase 2 Sulfate Injection Plan outline in above referenced Langan Engineering OU-3 Remediation Work Plan, dated February 2020, and the assumptions discussed above, AAE developed the following proposed sulfate injection work plan.

Task 1 – Preliminary Activities

Health and Safety Plan
Prior to initiating the intrusive Site activities, AAE will create a property specific health and safety plan (HASP) using available information concerning possible hazardous materials and routes of exposure and anticipated property activities and safety concerns for use by AAE personnel. The HASP will be updated as necessary upon conducting actual property reconnaissance. A copy of the HASP and a designated site safety officer will be present during all phases of the fieldwork.

Underground Injection Control Permit Application
Subsequent to NYSDEC approval of the Phase Two Sulfate Injection Work Plan, AAE will prepare an Underground Injection Control (UIC) permit application for submittal to the United States Environmental Protection Agency (USEPA), which will provide information on the reagents, injection dosage, volume, injection locations, injection depth interval, injection duration and performance monitoring.

Task 2 Chemical Injections

Prior to any intrusive site activity, a geophysical survey of the treatment area will be conducted to clear the injection locations for underground utilities. In addition, each injection location will be either hand auger and/or air knifed at least 5 feet below ground surface (bgs) to clear for utilities.

Six direct-push injection locations are anticipated to be required. Three injections will be completed approximately 6 feet to the northwest, northeast and southeast of monitoring well MW-52. Another set of three injections are anticipated at approximately 12 feet from MW-52. At each location, reagents will be injected from approximately 5.5 feet to 13 feet bgs at a rate of approximately 39 gallons per foot. The

injected magnesium sulfate concentration will be 0.91 pounds per gallon, with added nutrients at a concentration of 0.028 pounds of ammonium nitrate and sodium phosphate per gallon.

The work area will be cordoned off using traffic barrels and caution tape, or approved equal, to restrict pedestrian access to the work zone. In addition, AAE will provide oversight and air monitoring in accordance with the Community Air Monitoring Plan (CAMP) developed for the Site during the sulfate injections. Two CAMP stations are proposed, one upwind of the work zone and one downwind of the work zone.

Reagent mixing will be performed at a temporary staging area on-site. Potable water for mixing will be brought to the Site by the injection contractor.

Upon completion, each injection location will be properly abandoned and the sidewalk surface restored to match existing conditions.

Task 3 – Performance Monitoring

Approximately 3 months following injections, MW-52 will be samples using the low-flow method developed by the United States Environmental Protection Agency (USEPA) Low-Flow Groundwater Sampling Procedures (EPA/540/S-95/504, April 1996). Well purging will be performed using a bladder pump fitted with dedicated, disposable tubing at the well. During purging, the turbidity, pH, temperature, conductivity, redox potential, and dissolved oxygen of the groundwater will be monitored using a Horiba U-22 Water Quality Checker with a flow-through cell. Purging will be considered complete after at least three well volumes had been purged and parameter readings have stabilized for three successive readings within a reasonable time frame, and turbidity is less than 50 Nephelometric Turbidity Units (NTUs). The purged water will be contained in 55-gallon drums and temporarily stored at the nearby OU-2 Site pending characterization and proper disposal.

Subsequent to purging, the well will be sampled directly from the pump discharge using USEPA low-flow sampling techniques. For quality assurance and quality control, one field blank, a duplicate sample and one trip blank per cooler will be collected and analyzed during this sampling event.

The samples will collected into the appropriate container and place in a cooler at 4^{o}C for shipment to a New York New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory for analyses. The sample will be analyzed for VOCs in accordance with EPA Method 8260B.

Task 4 – Reporting

Following completion of the performance monitoring, ATC will prepare a Remedial Action Report (RAR) summarizing the injection dosage, injection interval, locations, flow and pressure during injections, and CAMP data. In addition, results of the post-injection groundwater sampling will be provided.

SCHEDULE

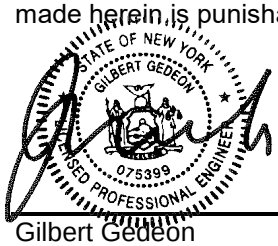
The following table summarizes the proposed schedule to complete the Phase Two Sulfate Injection Program at OU-3.

TASK NO.	DESCRIPTION	COMPLETION DATE
1	Approval of the work plan and submittal of UIC Injection Application	June 2021
2	Sulfate Injections	July 2021
3	Performance Monitoring	October 2021
4	RAR Preparation and Submittal	November 2021

CERTIFICATION

I, Gilbert Gedeon, certify that I am currently a registered professional engineer licensed by the State of New York as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan (RAWP) was prepared in accordance with all applicable statutes and regulations and is in substantial conformance with the Department of Environmental Remediation (DER) Technical Guidance for Site Investigations and Remediation (DER-10).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.



5/8/21

Gilbert Gedeon — Date

NYS Professional Engineer

CLOSURE

If you have any questions or need any additional information, please do not hesitate to contact the undersigned.

Sincerely,

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Senior Project Manager
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Christopher Tomasello, NYPG
Division Manager
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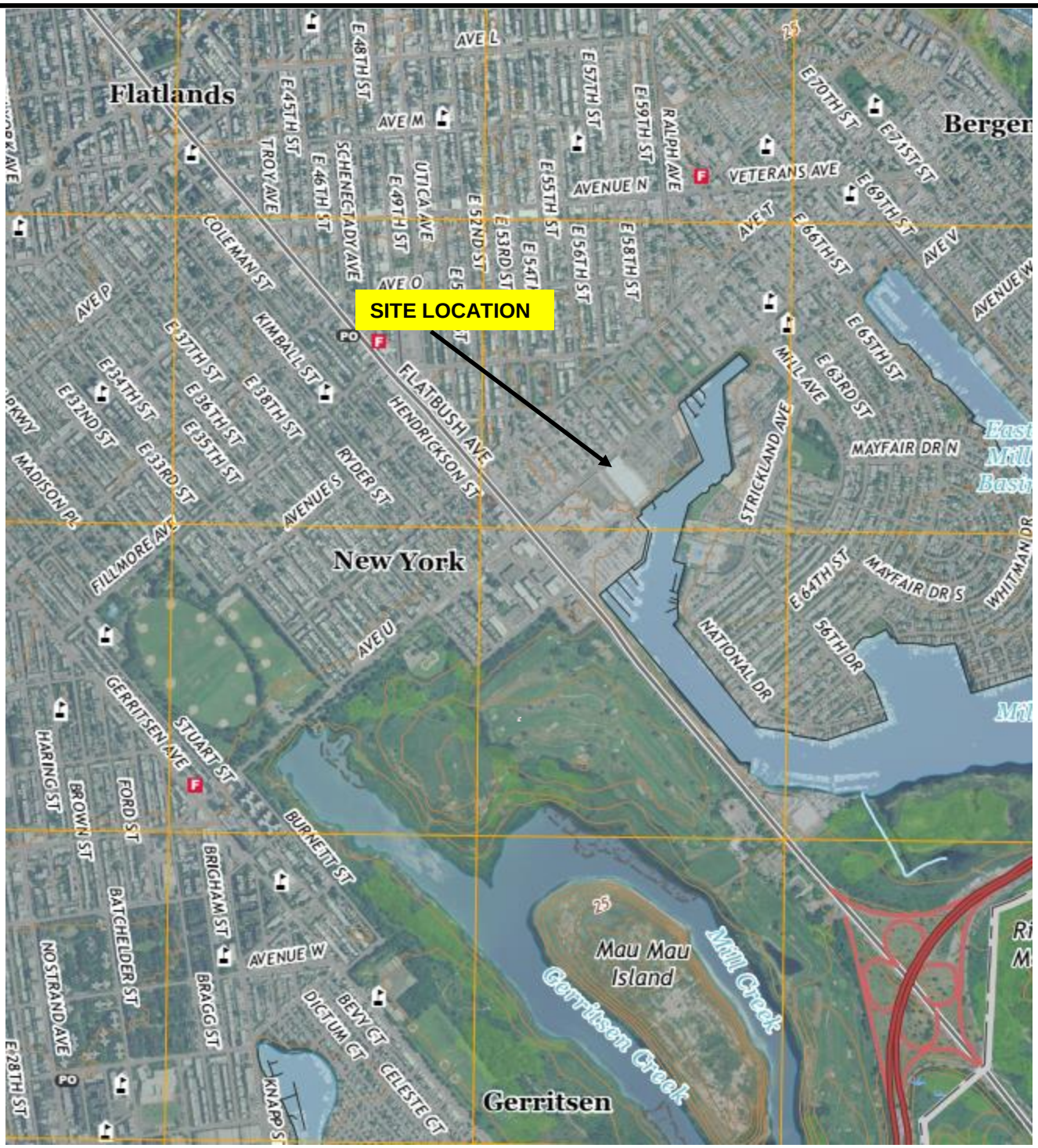

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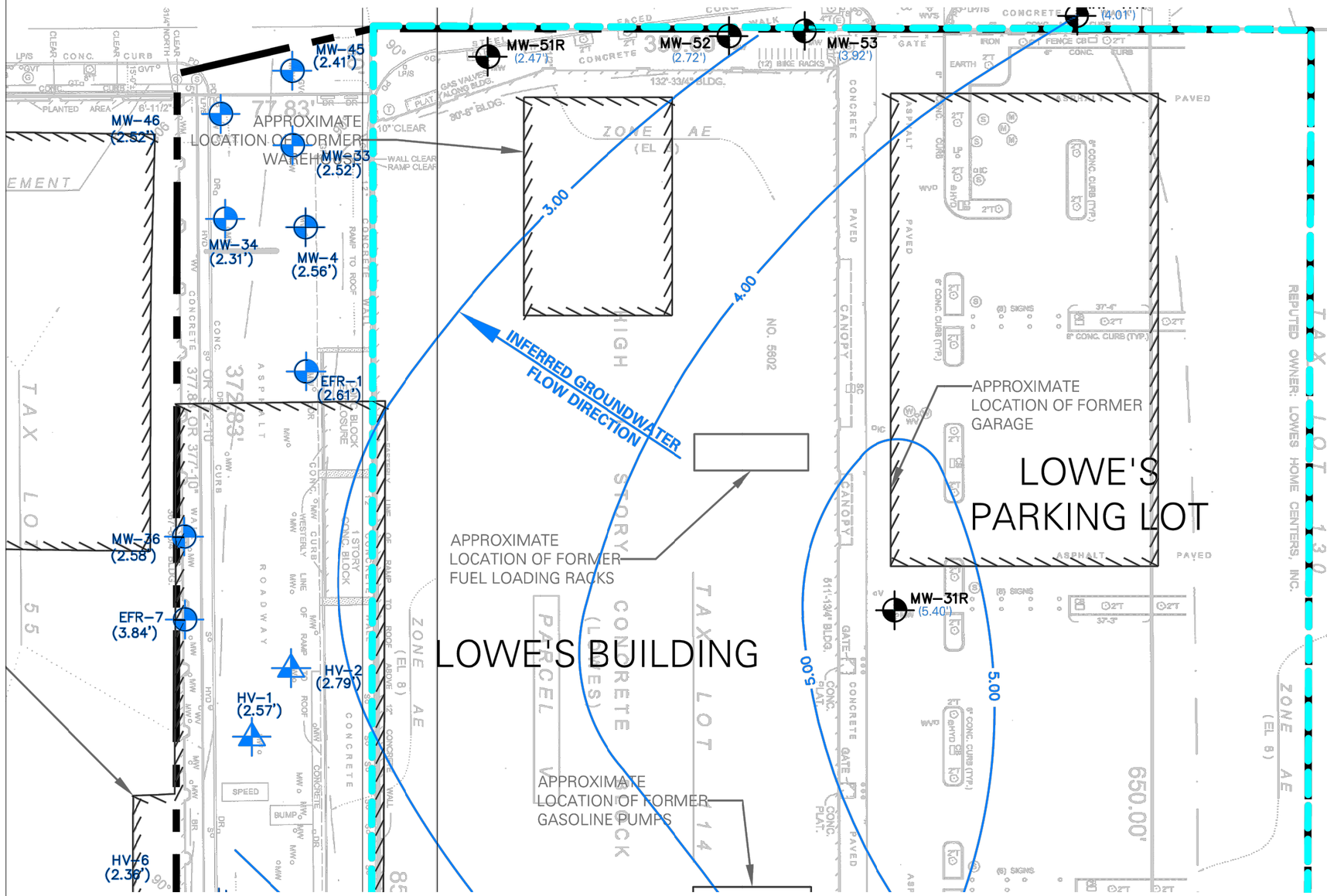
FIGURE 1 – SITE LOCATION MAP

SITE: Kings Plaza Shopping Center OU-3
5602 Avenue U
Brooklyn, New York 11234

Source – USGS 7.5 Minute Topographical Map, Coney Island, NY, 2019



NOTE:

SITE PLAN FROM GROUNDWATER MONITORING REPORT FOR FORMER STANDARD OIL PARCEL (OU-3), PREPARED BY LANGAN ENGINEERING, DATED FEBRUARY 2017

NO.	DESCRIPTION	DATE	APP.

DRAWN BY: E. MILKIS
REVISED BY: J. MYERS
DESIGNED BY: J. MYERS
CHECKED BY: J. MYERS

CLIENT: BROOKLYN KINGS PLAZA LLC
5120 AVENUE U,
BROOKLYN, NY 11234

LOCATION: *FORMER STANDARD OIL PARCEL (OU-3)*
5602 AVENUE U,
BROOKLYN, NEW YORK 11234

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DRAWING TITLE:
KINGS PLAZA FORMER STANDARD OIL PARCEL (OU-3) PROJECT AREA

SCALE: NOT TO SCALE
ATC PROJECT No. Z214 JMMC01

DRAWING NO. FIGURE 2
SHT. 1 OF 1
DATE: 05.05.2021
REVISION No.

FILE: M:\ACADD-WORKS\ENVIRONMENTAL INVESTIGATION\2021\Z214JMMC01-Kings Plaza Stand. Oil Parcel