Brookfield Avenue Landfill

Staten Island, New York
NYSDEC Site No. 2-43-006

Second Operable Unit

2024 10th-Year Monitoring Report

February 2025

New York City Department of Parks and Recreation
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NYC Parks

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Executive Summary

The Brookfield Avenue Landfill (BAL) Second Operable Unit (OU2) 2024 monitoring event for surface water and sediment in Richmond Creek was conducted in September 2024 in accordance with the requirements of the BAL OU2 Record of Decision (ROD) dated March 2007. The OU2 ROD requires monitoring in the 5th, 10th, and 20th years following the completion of the First Operable Unit (OU1) remedy in 2013. The scope of work was consistent with the OU2 Remedial Action Plan (RAP) dated December 2007, and entailed surface-water monitoring at seven (7) locations in Richmond Creek (Creek) during both high-tide and low tide as well as three-depth-interval sediment monitoring to a total depth of 30 inches at the Creek locations. Additionally, three-depth-interval sediment monitoring to a total depth of 30 inches was conducted at five (5) locations, within the tidal marsh and tributaries between the Creek and the BAL.

The results were evaluated based on applicable standards and guidance values and compared to the results of the OU2 monitoring event conducted in 2018 and the baseline monitoring round performed in October 2013, shortly after completion of the OU1 remedy. The evaluation took into consideration the tidal nature of OU2 and its proximity to other potential sources of contamination in the vicinity of the BAL, such as the Fresh Kills Landfill and the large storm sewer outfall that bisects the BAL which discharges storm water runoff from the surrounding community. The OU2 ROD identified BAL as a potential source of some contaminants found in OU-2 sediments, however, higher rates of leachate discharge from the Fresh Kills Landfill suggest that Fresh Kills Landfill was the dominant source of contaminant releases to the Fresh Kills Estuary System.

No BAL-related impacts to surface-water quality in the Creek were indicated by the 2024 results. Organic contaminant detections in surface water were limited to 1.5 ug/L of toluene in sample BK3-SW-L-6, which may be representative of background conditions; and one (1) pesticide-related compound (4,4'-DDE) in low-tide samples BK3-SW-L-4 and BK3-SW-L-5.

Overall, the 2024 surface-water monitoring results are generally consistent with the 2018 surface-water monitoring results and the 2013 baseline monitoring data, with some variations attributed to weather-related differences in certain field parameters and metal concentrations, as well as collection-related turbidity interference in a majority of the 2013 low-tide samples. The results for the three sampling events do not indicate significant BAL-related impacts to Creek surface-water quality.

The sediment in the Creek, tidal marsh, and tributaries is comprised primarily of organic silt. Site observations indicated the organic silt is dark black and gray in color and contain low levels of naturally occurring hydrogen sulfide, suggesting a potential reducing environment. This environment allows the sediment to serve as a sink for contaminants, particularly metals. Organic contaminants were detected in the sediment at sporadic and low concentrations. These contaminants appear to be associated with sources other than the BAL or pre-OU1 remedy releases, as they are found in subsurface samples and are thus biologically isolated. A detailed evaluation indicates that concentrations of semivolatile organic compounds (SVOCs), pesticide-related compounds, and polychlorinated biphenyls (PCBs) in the sediment do not currently present a significant concern for BAL OU2.

In sediment, the concentrations of detected organic contaminants appear to have increased since 2018 and temporal changes in metals concentrations varied by depth, however, overall metals concentrations in sediment appear to have generally increased since 2018. These increases can be attributed to abnormally dry conditions that occurred throughout the entire region during the sampling year, 2024, and is not indicative of BAL-related impacts.

Overall, the results of the 2024 OU2 monitoring are consistent with the findings in the OU2 ROD, and indicate that the OU2 selected remedy, consisting of the OU1 remediation and landfill post-closure monitoring in conjunction with the OU2 monitoring program, continues to be protective of public health and the environment. Future OU2 monitoring rounds are required during the 20th year following completion of the OU1 remedy.

1. Introduction

The Brookfield Avenue Landfill (BAL) Second Operable Unit (OU2) Record of Decision (ROD) dated March 2007, requires monitoring the chemical characteristics of surface water and sediment in Richmond Creek (Creek), and sediment quality in the tidal marsh and tributaries adjacent to the BAL, during the 5th, 10th, and 20th years following completion of the First Operable Unit (OU1) remedy. The OU2 monitoring program serves to supplement the BAL OU1 post-closure monitoring program. The objective of the OU2 monitoring program, as stated in the 2011 OU2 Remedial Action Plan (RAP) dated December 2007, is to understand long-term changes in surface-water and sediment quality, considering remediation efforts at this and other contaminant sites in the region, and to supplement data collected as part of the ongoing and long-term monitoring in the Fresh Kills Estuary System. As further stated in the OU2 RAP, surface water in Richmond Creek is impacted by sources of contaminants outside of OU1/OU2 areas (e.g., urban storm water runoff and the nearby Fresh Kills Landfill).

Construction of the BAL OU1 remedy was substantially complete in 2013 and a baseline OU2 monitoring round was performed in October 2013. The baseline monitoring results were reported in the April 2014 OU2 Baseline Sampling Report prepared by CDM Smith for the New York City (NYC) Department of Environmental Protection (DEP). The 5th-Year monitoring results were reported in the June 2019 OU2 5th Year Monitoring Report prepared by Lockwood, Kessler, and Bartlett, Inc. for the NYCDEP. In accordance with the OU2 RAP schedule, the 10th-Year monitoring was performed between September 10 and September 13, 2024. This report presents results from the September 2024 sampling event and includes a detailed comparison to the 2018 5th-Year monitoring results and the 2013 baseline monitoring results.

Normandeau Associates, Inc. (Normandeau) of Stowe, Pennsylvania conducted sampling collection in September 2024 under the supervision of TRC Engineers, Inc (TRC). Laboratory analysis of the samples was performed by SGS North America (SGS) of Dayton, New Jersey, a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory. Independent validation of the laboratory data for three (3) samples, BK3-SW-L-4, BK3-SD-5 (0-6”), and BK3-SD-5 (6-12”), was performed by Environmental Data Services, Inc. of Virginia Beach, Virginia, in accordance with the United States Environmental Protection Agency (USEPA) “Test Methods for the Evaluation of Solid Waste, USEPA SW-846, Third Edition, September 1986, with revisions” and the “Standard Methods for the Examination of Water and Wastewater.”

The remainder of this report is organized into the following Sections:

Section 2.0: Scope of Work – This Section provides a description of the work performed during the 2024 surface water and sediment sampling in Richmond Creek.

Section 3.0: Evaluation of 2024 BAL OU2 10th Year Results – This Section summarizes the results of the 2024 monitoring round and compares the results to applicable standards and guidance values. An assessment of the results for the quality assurance/quality control (QA/QC)-related samples are also provided.

Section 4.0: Comparison of 2024 10th– Year Results to 2018 5th Year Results and 2013 Baseline Results – This Section compares the 2024 results to the 2013 baseline results and 2018 5th-Year Monitoring Round.

Section 5.0: Conclusions and Recommendations – Provides conclusions based on the findings, as well as recommendations for the 20th-year monitoring round in 2033.

Figure 1 – 2024 OU2 Sample Locations

Figure 2 – Comparison of 2024 and OU2 RAP Sample Locations

Figure 3 – Comparison of 2024, 2018, and 2013 Sample Locations

Appendix A – Contains a copy of the field notes and water-quality measurements for surface-water samples.

Appendix B – Contains copies of the field data sheets and soil boring logs for sediment samples.

Appendix C – Contains laboratory results for surface-water and sediment samples.

Appendix D - Contains the data validator's data usability summary report (DUSR).

Sections 2.0 through 4.0 are supported by three (3) figures and 19 tables. The figures and tables are provided at the end of the report text.

2. Scope of Work

Surface-water and sediment samples were collected at seven (7) locations in the channel of the Creek, and five (5) sediment samples were collected within the tidal marsh and tributaries located between the Creek and the BAL. The sampling locations were selected using the sampling locations shown in Figures 4-1 and 4-2 of the OU2 RAP and Figure 1 of the June 2019 OU2 5th-Year Monitoring Report as guides. For future identification, and to ensure consistency between monitoring rounds, the 2018 sampling locations were marked with PVC-pipe stakes. During the 2018 and 2024 sampling events, sample location GPS coordinates were recorded. The 2024 surface-water and sediment sample locations are shown in **Figure 1**. Their locations relative to the BAL and coordinates are provided in **Table 1**.

The 2024 sample locations were selected based on the reported GPS coordinates identified in the June 2019 5th-Year Monitoring Report, with the exception of sample location BK2-SW/SD-3, which was shifted approximately 400 feet upstream to provide uniform spacing between the two adjacent Creek sampling locations, and sample location BK2-SD-10, which was shifted to the north due to refusal during sampling.

To further understand the tidal influence of Richmond Creek, surface water samples were collected at both high tide and low tide. Although base flow can influence the water quality parameters during high tide and low tide, the base flow from ground water is expected to be negligible in the creek due to the low permeability of the soils underlining the BAL in the presence of the slurry wall surrounding the landfill cells. Additionally, as outlined in the OU2 ROD, potential influences from downstream sources, such as the nearby Fresh Kills Landfill, were anticipated to be reduced at low tide. During the 2013 monitoring round, multiple high-tide sample locations were inaccessible by boat at low tide, requiring low tide samples to be collected at nearby locations still covered by water. To prevent this issue in the 2018 and 2024 monitoring rounds, sample locations were selected to ensure accessibility at low tide.

Surface Water Sampling Methodology

To minimize the potential for entrained sediment to interfere with the 2018 and 2024 surface-water samples, sample locations were selected within the Creek channel, where the water is deeper. Additionally, surface-water sampling was conducted prior to sediment sampling. A portable peristaltic pump with dedicated tubing was used to collect the samples, except for those analyzed for VOCs. The tubing was attached to a small-diameter PVC pipe, which was extended upstream from the boat used to access the sample locations. The pipe was then lowered into the middle of the water column to collect the samples. For VOC analysis, samples were collected by dipping the sample vials directly into the water to prevent potential loss of VOCs due to volatilization during pumping.

In accordance with the OU2 RAP, field measurements of required water-quality parameters, including temperature, pH, oxidation-reduction potential, conductivity, turbidity, dissolved oxygen, total dissolved solids, and salinity, were taken at each surface-water sample location at both high and low tide using a portable meter.

After sample collection, the surface-water samples were transported via courier service to SGS and analyzed for Target Compound List (TCL) VOCs, TCL semivolatile organic compounds (SVOCs), TCL pesticides, polychlorinated biphenyls (PCBs), Target Analyte List (TAL) total metals, total mercury, and hardness. To assess the influence of turbidity on the metals results, field-filtered samples were collected and analyzed for dissolved metals. A copy of the surface-water sample field notes is included in **Appendix A**. The laboratory results for the surface-water samples are included in **Appendix C**. A summary of the 2024 surface-water sample locations is included in **Table 2**.

The surface-water sample results were evaluated based on:

1. Their position (i.e., upstream, adjacent or downstream) relative to the BAL.
2. Tide stage at the time of collection.
3. Comparison to the Class SC (saline-marine surface waters) standards in New York State Department of Environmental Conservation (NYSDEC) 6NYCRR Part 703.5 or the Class SC guidance values in NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), if available (consistent with the Creek's Class SC water-quality classification stated in the OU2 ROD).
4. Comparison to the 2013 baseline results and 2018 results.

Sediment Sampling Methodology

Sediment samples were collected utilizing a piston-core sampler, vibracore samples or manual push methods, dependent on the conditions encountered in each sampling location, such as sediment consistency and the quantity of root material present. A vibracore sampler was utilized at Richmond Creek sample location BK3-SB-1 after previous piston-core sampler attempts failed to recover sediment. A direct push piston-core sampler was utilized at Richmond Creek sample locations BK3-SD-2, BK3-SD-3, BK3-SD-4, BK3-SD-5, and BK3-SD-6, as the encountered sediment was soft and relatively root-free. Manual push sampling methods were utilized at Richmond Creek sampling location BK3-SD-7 due to the presence of dense roots, and all five (5) Tidal Marsh sample locations, BK3-SD-8 through BK3-SD-12, following removal of marsh grasses.

Sediment cores were collected to the minimum required sampling depth of 30-inches or to refusal, whichever was encountered first. Sample locations BK3-SD-2, BK3-SD-3, BK3-SD-8, and BK3-SD-12 were advanced to a sampling depth of 30-inches. Refusal was encountered at the following sample locations and depths:

- Sample locations BK3-SD-1, BK3-SD-6, BK3-SD-9, and BK3-SD-11 encountered refusal at 6-inches.
- Sample location BK3-SD-10 encountered refusal at 12 inches.
- Sample locations BK3-SD-4, BK3-SD-5, and BK3-SD-7 encountered refusal between 26.04 and 29 inches.

Samples for laboratory analysis were collected at each location (as permitted) from the three depth intervals specified in the OU2 RAP: 0-6 inches, 6-12 inches and 24-30 inches. Each sediment core and discrete-depth hand-dug sample was examined for lithology and physical characteristics and screened for VOCs and hydrogen sulfide (H_2S) using portable meters. A summary of the 2024 sediment sample locations and related information is provided in **Table 3**.

After sample collection, the sediment samples were transported via courier service to SGS and analyzed for TCL SVOCs, TCL pesticides, PCBs, TAL total metals, total organic carbon (TOC) and percent solids. A copy of the field data sheets and soil boring logs are included in **Appendix B**. The laboratory results are included in **Appendix C**. A summary of the 2024 sediment sample locations is included in **Table 3**.

The sediment sample results were evaluated based on:

1. Their position relative to the BAL and depth.
2. Variations in sample composition.
3. Comparison to the Saltwater Sediment Guidance Values and Sediment Guidance Values for PAHs (Polycyclic Aromatic Hydrocarbons) in Tables 6 and 7, respectively, of the June 24, 2014 NYSDEC document "Screening and Assessment of Contaminated Sediment."
4. Comparison to the 2018 results and 2013 baseline results.

The presence of other potential sources of contamination in the vicinity of the BAL noted in the OU2 ROD include the Fresh Kills Landfill, stormwater outfalls, and industrial sources that discharge into the Arthur Kill. The presence of off-Site sources of contamination were taken into consideration during the evaluation of results.

The QA/QC-related sample results were evaluated to identify potential influences on the sample results. Specifically, trip blank results were evaluated for the presence of background sources of VOC contamination. Field blank results were reviewed to identify potential sampling equipment-related influences on laboratory results. Duplicate results were compared to assess sample variability. Matrix spike and matrix spike duplicate results were reviewed to assess and verify the precision of the laboratory analyses. The QA/QC-related samples for surface water and sediment are identified in **Tables 2 and 3**, respectively.

3. Evaluation of 2024 BAL OU2 10th-Year Results

3.1 Surface-Water Results

3.1.1 Field Parameter Results

The water-quality parameters measured in the field were: conductivity, dissolved oxygen (DO), temperature, oxidation-reduction potential (ORP), pH, salinity, total dissolved solids (TDS), and turbidity. These results are summarized in **Table 4**.

Temperature, pH, and DO, were generally higher at high tide; whereas ORP, conductivity, turbidity, TDS, and salinity were generally higher at low tide. At both high and low tides, the lowest concentrations of five (5) of the eight (8) field parameters occurred at Sampling Location BK3-SW-L-7, which is farthest upstream.

The field salinity results indicate that the Creek water is brackish, with salinity levels ranging from 0.5 to 16.7 parts per thousand (ppt). Overall, salinity levels increase from upstream to downstream during both high and low tide. This pattern, along with the lower salinities observed at low tide, is attributed to the base flow of fresh surface water from the upstream section of the Creek.

A potential correlation between the field water-quality results and the proximity to the landfill was identified as the higher low-tide turbidity observed at sampling locations BK3-SW-4 through BK3-SW-6. These elevated turbidity levels may be attributed to impacts from the BAL, such as surface stormwater runoff, as these sampling locations are situated adjacent to the East Cell.

3.1.2 Organic Parameter Results

The organic parameter analyte groups include VOCs, SVOCs, pesticides and PCBs. As shown in **Table 5**, SVOCs and PCBs were not detected in any of the samples collected.

One (1) VOC, toluene, was detected in surface-water sample location BK3-SW-L-6 at a concentration of 1.5 micrograms per liter (ug/L), which is below the NYSDEC Part 703.5 Class SC standard of 6,000 ug/L. Based on the concentration of toluene detected in the sample below the corresponding comparison criteria, this detection is not considered a concern with respect to protection of public health and the environment.

One (1) pesticide, 4,4'-DDE, was detected in surface water samples BK3-SW-L-4 and BK3-SW-L-5 at estimated concentrations of 0.0045 ug/L and 0.0051 ug/L, which is above the NYSDEC Part 703.5 Class SC standard of 0.000007 ug/L.

The results of analysis of surface-water samples for organic parameters are presented in **Table 5** and the analytical data package is presented in **Appendix C.**

3.1.3 Metals Results

Eleven metals were detected in surface-water samples for total and dissolved metals. The elevated concentrations of metals that are major seawater cations, such as calcium, magnesium, potassium and sodium, as well as the parameter hardness, are consistent with primarily brackish conditions in the Creek. The total and dissolved concentrations of these metals are similar, which is consistent with the relatively low turbidity of the 2018 surface-water samples, indicating the metals are primarily present in dissolved form.

Additionally, the results indicate that metals considered to be toxic to aquatic life, including arsenic, cadmium, chromium, lead and mercury, are either not detected in surface water, or present at low concentrations. NYSDEC Class SC standards exist for several of these toxic metals.. As indicated in **Tables 6a** and **6b**, no metals in surface-water metals exceeded the comparison criteria. As a result, the concentrations of metals in surface water do not indicate any BAL-related impacts.

The results of analysis of surface-water samples for metals are presented in **Table 6a** and **6b,** and the analytical data package is presented in **Appendix C.**

3.1.3 QA/QC Sample Results

The QA/QC-related samples for surface water included: two trip blanks, one field blank, one duplicate and one matrix spike/matrix spike duplicate (MS/MSD). The samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL total metals, dissolved metals, total mercury, and hardness. The specific findings are detailed below.

No laboratory parameters were detected in the two field blanks nor the two trip blanks collected for surface water. Based on these results, the equipment used to collect the surface-water samples did not influence the laboratory results.

A duplicate sample was collected during low tide at Sample Location BK3-SW-L-3. No organic parameters were detected in the sample or the duplicate. Metals concentrations were comparable for the metals that were detected. Based on these results, sample variability was acceptable.

Recoveries for the MS/MSD were within acceptable ranges. Based on these results, the precision of the laboratory was acceptable.

The DUSR (see Appendix D) indicated that the results for BK3-SW-L-4, BK3-SW-L-4F, BK3-SD-5 (0-6") and BK3-SD-5 (6-12") are acceptable and there are no rejections of data. The results for several parameters were qualified as estimated and the associated data summary tables have been updated accordingly.

3.2 Sediment Results

3.2.1 Field Parameter Results

Field observations indicated that all sampling locations, with the exception of BK3-SD-5, consisted of very fine-grained sediment that was comprised primarily of dark brown, black, or dark gray silt. Medium dark gray lean silty clay was observed at sampling location BK3-SD-5.

Organic matter, consisting of varying amounts of decaying vegetation and/or plant roots, was also present at all sampling locates, with the exception of BK3-SD-10, where no organic matter was observed.

Hydrogen sulfide (H_2S) was detected in two (2) sediment samples [BK3-SD-8 (24-30") and BK3-SD-12 (24-30")] at concentrations of 2.0 and 4.5 parts per million (ppm). VOCs were detected in one (1) sediment sample [BK3-SD-12 (6-12")] at a concentration of 0.9 ppm. The H_2S detections are primarily attributed to naturally occurring sulfate-reducing bacteria in the sediment.

The boring logs are presented in **Appendix B**, and the VOC and H_2S field screening results for the sediment samples are summarized in **Table 7**.

3.2.2 Organic Parameter Results

The segment of Richmond Creek and the tidal marsh adjacent to the BAL are brackish, therefore, the organic parameter results were compared to the Saltwater Sediment Guidance Values (SGVs) and Sediment Guidance Values for PAHs (PAH SGV at 2% TOC) listed in Tables 6 and 7, respectively, of the June 24, 2014 NYSDEC document "Screening and Assessment of Contaminated Sediment". As indicated, the guidance values for PAHs are based on a sediment TOC concentration of 2%, which is similar to the 1.8% average TOC concentration of the sediment samples. The available SGVs for other SVOCs, as well as for pesticides and PCBs, are divided into three classes (A, B and C) based on their potential to impact aquatic life. Specifically, results that are lower than the Class A SGVs are generally considered by the NYSDEC to have no impact on aquatic life. Results that are above the Class C SGVs are generally considered by the NYSDEC to have a high potential to impact aquatic life. Class B SGVs are the range of values between the Class A and Class C SGVs. Results that fall within the Class B SGV range may have an impact on aquatic life and require further assessment. However, the SGVs are conservative, and results that fall near the low-end of the Class B range are generally considered to be acceptable. The results for each organic parameter group are evaluated on the following pages.

SVOCs – All sediment samples were analyzed for 65 SVOCs. The total SVOC results are summarized in **Table 8**. SVOCs were detected in 27 of the 31 samples and 11 SVOCs were detected in one or more samples. No SVOCs were detected above the applicable comparison criteria. The total SVOC concentrations are relatively uniform with depth, the highest total concentration of SVOCs was observed in the 0-6 inch depth interval, with lower total concentrations as depth increases. The decrease in SVOC concentrations with depth could suggest that the upper sediment layers have higher permeability or filtration, allowing for greater movement of SVOCs, while the deeper layers likely have lower permeability, reducing the downward migration and potentially trapping contaminants in the shallower zones.

SVOCs were detected in a generally even distribution at similarly low concentrations for the same SVOCS in the upstream Creek sample locations and the tidal marsh sample locations between the Creek and the BAL, indicating a relatively recent accumulation. The downstream sample locations show a generally lower concentration of SVOCs, suggests that even if some SVOC detections are associated with the BAL, they do not show a significant presence, therefore, SVOCs do not appear to present a significant concern for BAL OU2.

The results of analysis of sediment samples for SVOCs are presented in **Tables 8, 9a,** and **9b**, and the analytical data package is presented in **Appendix C.**

Pesticides – All sediment samples were analyzed for 21 pesticide-related compounds, which were detected in 21 out of the 31 samples. Six (6) of the 21 parameters analyzed were detected at concentrations lower than the Class A SGVs. Endosulfan was detected in six (6) samples and DDT was detected in one (1) sample, both at concentrations above Class B SGVs; however no pesticide detections exceeded the Class C SGVs. Higher concentrations occurred in deeper depth samples, consistent with older, pre-remediation deposition, and are therefore biologically isolated. Accordingly, based on this evaluation, pesticides in sediment do not appear to present a significant concern for BAL OU2.

The results of analysis of sediment samples for pesticides are presented in **Table 10**, and the analytical data package is presented in **Appendix C.**

PCBs – All sediment samples were analyzed for nine PCB Aroclors. PCBs were detected at 13 of the sample locations. However, the detections were primarily at concentrations below the Class A SGV for total PCBs (<100 micrograms per kilogram (ug/kg)). PCBs were detected at the highest concentrations at sample locations BK3-SD-1, BK3-SD-2, BK3-SD-3 and BK3-SD-4, in the lower reaches of Richmond Creek. At these four (4) locations, as well as sample location BK2-SD-10 in the tidal marsh, the highest concentrations were detected in either the 0-6 inch depth samples, consistent with relatively recent accumulation, or the 24-30 inch depth samples, consistent with older, pre-remediation deposition, and therefore are biologically isolated.

Detections from sample locations BK3-SD-1, BK3-SD-2, BK3-SD-3 and BK3-SD-4, exceed the Class A SGV for total PCBs, but fall near the low end of the Class B SGV range for total PCBs (100-1,000 ug/kg). None of the detections exceeded the Class C SGV (>1,000 ug/kg). Therefore, PCBs in sediment do not appear to present a significant concern for BAL OU2.

The results of analysis of sediment samples for PCBs are presented in **Table 11**, and the analytical data package is presented in **Appendix C.**

3.2.3 Metal Results

All sediment samples were analyzed for 23 metals. It should be noted that all the metals analyzed for occur naturally in the environment at varying concentrations, and that SGVs are only available for nine (9), known to be toxic to aquatic life at relatively low concentrations, specifically: arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc. Additionally, in evaluating these results, consideration was given to the fact that metals are typically detected in sediment samples because sediment serves as a natural sink for metals due to its chemistry, and that sediment metals concentrations are typically higher in urban areas where sources of metals releases to the environment are more common.

In general, sediment metals concentrations were higher in subsurface samples than in surficial samples. Concentrations were higher in the Richmond Creek sample locations compared to the Tidal Marsh and Tributary sample locations.

As shown in **Table 12a**, most of the exceedances of Class B SGV standards were arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc, and most occurred at three (3) Creek sample locations, although the exceedances for mercury were more widespread. In shallow subsurface (6-12 inch depth) samples, exceedances of the Class B SGV standards occurred for arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc, and in locations adjacent to the East Cell.

Exceedances of the Class B SGV standards in the deeper subsurface (24-30 inch depth) samples were limited to Richmond Creek sample locations with exceedances occurring for arsenic, cadmium, copper, lead, mercury, nickel, silver, zinc.

The results for the nine (9) metals for which SGVs exist are further summarized in **Table 13.** Each of these metals were detected at a range of concentrations that fall above the Class A SGV, Class B SGV, and Class C SGV standards. One (1) metal, chromium, was not detected at a range of concentrations above the Class C SGV standards. The highest concentrations of eight (8) of these metals, including most of the Class C SGV exceedances, occurred in subsurface samples that are biologically isolated.

Exceedances of the Class C SGVs in surficial (0-6 inch depth) sediment samples occurred in eight (8) of the nine (9) metals (arsenic, cadmium, copper, lead, mercury, nickel, silver, zinc), each at one or more sampling locations. Mercury exceedances were higher in magnitude and more widespread. Based on their more widespread distribution both laterally and with depth, the mercury detections appear to be primarily due to background contamination. Based on the 2024 results, due to its toxicity to aquatic life, mercury is a primary metal of concern with respect to BAL OU2 sediment quality.

Elevated concentrations of metals in sediment may be attributed to abnormally dry conditions in 2024. In September 2024, the monthly average rainfall was 0.016 inches, which is considered abnormally dry conditions, according to the National Oceanic and Atmospheric Administration (NOAA). During the 2018 sampling event, the monthly average rainfall was 0.20 inches and during the 2013 sampling event, the monthly average rainfall was 0.099 inches.

Abnormally dry conditions can cause increased oxygen penetration in wet soils which can result in the oxidation of organic matter and reduced inorganic species. Due to this oxidation, metal mobilization is increased, resulting in higher concentrations of metals sunk into the sediment and is may not be indicative of BAL-related long term sediment quality.

The results of analysis of sediment samples for metals are presented in **Tables 12a, 12b, 12c**, and **13,** and the analytical data package is presented in **Appendix C.**

3.2.4 QA/QC Sample Results

The QA/QC-related samples for sediments included: two (2) field blanks, two (2) duplicates, and two (2) MS/MSDs. The samples were analyzed for TCL SVOCs, TCL pesticides, PCBs, TAL total

metals, TOC and percent solids. Evaluation of these results did not identify any concerns with the results. The specific findings are detailed below.

The only laboratory parameter detected in the sediment field blank was phenol at a low, estimated concentration of 5.9 ug/kg. However, this low-level detection is much lower than the freshwater Class A SGV (<360,000 ug/kg) and therefore should not impact the sample results.

Comparison of the results for samples BK3-SD-3 (24-30”) and BK3-SD-12 (24-30”) with their associated duplicate sample results for detected parameters, indicates the variation inherent in duplicate analyses of semi-solid sediment and the difficulty in homogenizing samples. For example, several SVOCs were detected at low concentrations in Sample BK3-SD-3 (24-30”), but not in the duplicate. Metal, PCB and pesticide-related compound concentrations were similar in sample BK3SD-3 (24-30”) and BK3-SD-12 (24-20”).

Recoveries for the MS/MSDs were within acceptable ranges. Based on these results the precision of the laboratory was acceptable.

The laboratory results for two sediment samples [BK3-SD-5(0-6”) and BK3-SD-5(6-12”)] and two (2) surface water samples (BK3-SW-L-4 and BK3-SW-L-4F) were independently validated. The DUSR (presented in **Appendix D**) did not indicate any rejections of data. The results for certain metals were qualified as estimated. The associated summary tables have been updated accordingly.

4. Comparison of 2024 10th-Year Results to 2018 5th-Year Monitoring Report Results and 2013 Baseline Results

4.1 Comparison of Sample Locations

As shown in **Figure 3**, the 2024 sample locations were geolocated utilizing GPS coordinates from the 2018 5th-Year monitoring report, to ensure sample locations were located in approximately the same locations. In 2018, there were discrepancies in the sample locations from 2013 due to the absence of sample location GPS coordinates in the 2013 Baseline Report. The 2018 5th-Year monitoring report had taken these differences into consideration during comparison of the field and laboratory results.

4.2 Comparison of Surface-Water Results

4.2.1 Field Parameter Results

The average water temperature was higher in 2024 at high tide than 2013 and 2018. At low tide the average water temperature was higher than 2013 averages, however, was lower than 2018 averages. ORP was lower at high tide in 2024 and higher at low tide than in 2018. DO concentrations were significantly higher at both high and low tide in 2024 than in 2018.

The average pH was higher in 2024 than in 2018 and 2013. Turbidity averages in 2024 were higher than the 2018 high tide averages and the 2013 and 2018 low tide averages, but lower than 2013 low tide averages. DO averages in 2024 were higher than 2013 and 2018 in both high and low tides. TDS averages in 2024 were higher than the 2018 averages in both high and low tides. TDS was not measured in the 2013 baseline sampling.

Based on the salinity readings, conditions in the Creek were more brackish in 2024 than in 2018. Salinity at low tide was higher in 2024 than the 2013 averages but was lower than 2013 averages at high tide in 2024. Specific conductivity was higher in 2024 than the 2018 averages and lower than the 2013 averages at both high and low tides. The increasingly brackish conditions are attributed to lower average rainfall and associated freshwater runoff due to abnormally dry conditions region wide in September 2024.

The average high-tide and low-tide field parameter concentrations for 2024, 2018, and 2013 are presented in **Table 14**.

4.2.2 Organic Parameter Results

The analytical data indicates that VOCs are lower in 2024 than in the previous events, and the results for SVOCS, pesticides, and PCBs are consistent with previous sampling events in 2018 and 2013.

VOCs – Apart from the estimated concentration of toluene (1.5 ug/L) in one low-tide sample, VOCs were not detected in 2024. In 2013 and 2018 VOCs were detected in four (4) of the 14 samples. Overall, the low detections of VOCs across the 2024, 2018, and 2013 sampling events for discrete, non-repeating contaminants, indicates that VOCs are not considered a concern with respect to protection of public health or the environment.

SVOCs – SVOCs were not detected in 2024 or in 2018. In 2013, primarily estimated concentrations of SVOCs were detected in 13 of the 14 surface-water samples, which was attributed to the slightly lower laboratory method detection limits for SVOCs in 2013, and to entrained sediment containing SVOCs in the low-tide samples. Since SVOCs were not detected in the 2024 or 2018 samples they are not considered a concern.

Pesticides – In 2024, pesticides were detected in two low-tide locations (BK3-SW-11 and BK3-SW-12), at lower concentrations than the two (2) detections identified in 2018. The 2024 results were estimated and reported above the method detection limit and below the reporting limit. In 2013, pesticide-related compounds (primarily 4,4'-DDT breakdown products) were detected at greater frequency and higher concentrations in six (6) of the seven (7) low-tide samples and in one (1) high-tide sample; this difference is primarily attributed to entrained sediment containing these compounds being collected along with most of the 2013 low-tide samples. Since pesticides were detected at two (2) locations and at low levels with concentrations above Class B SGVs during both the 2018 and 2024 sampling results, pesticides are not indicated to pose a risk.

PCBs – No PCBs were detected in 2024 or in 2018. In 2013, PCBs were detected in seven (7) of the 14 samples, in primarily low-tide samples. The detections were attributed to entrained sediment containing PCBs.

The organic parameter results for the 2024, 2018, and 2013, monitoring rounds are summarized and compared in **Table 15**.

4.2.3 Metal Results

The results for the 2024 high-tide samples are similar to the 2018 and 2013 results, except for the major seawater cations (calcium, magnesium, potassium and sodium), arsenic, and selenium, which were detected primarily at higher concentrations in the 2024 and 2013 high-tide samples compared to 2018. The higher concentrations of seawater cations in 2024 and 2013 are attributed to the increasingly brackish conditions present in the Creek. The 2024 and 2013 arsenic concentrations detected appear to be consistent with seawater concentrations. The 2013 selenium concentrations appear to be higher than typically present in seawater, and generally increase in a downstream direction. Selenium was not detected in the 2024 or 2018 high-tide samples. The decrease in high-tide selenium concentrations since 2013 may be attributed to completion of the OU1 remedy.

The low-tide samples indicate that the results for most metals are generally similar in 2024 as in 2018, with the exception of the major seawater cations. The 2024 results for these seawater cations are similar to the 2013 results due to more brackish conditions than in 2018. The differences in the

metals detected in 2013 are attributed to entrained sediment containing metals, as documented previously in the 5th-year OU2 report.

The 2024, 2018, and 2013 total metals results for both high-tide and low-tide samples are compared in **Tables 16a** and **Tables16b**.

4.3 Comparison of Sediment Results

4.3.1 Field Parameter Results

The 2024, 2018, and 2013 sediment samples were examined for lithology and physical characteristics, and field-screened for VOCs and H_2S. Lithological observations indicated the 2024 and 2018 samples were primarily described as silt, whereas the 2013 samples were primarily described as clay. In 2024, 2018, and 2013, all the samples are described as dark brown, gray or black, consistent with their fine-grained lithology.

In 2024 and 2018, no odors were noted for the sediment samples. In 2013, odors described as "petroleum like" were noted at sampling locations BK2-SD-1, BK2-SD-2, BK2-SD-4 and BK2-SD-10, and a sulfide odor was noted at sampling location BK2-SD-8. The sediment samples were not analyzed for volatile aromatic hydrocarbons, therefore, the accuracy of the "petroleum like" odor description cannot be verified. SVOCs are typically associated with petroleum contamination, indicating that the odor was most likely a naturally-occurring odor similar to petroleum due to the low concentration of SVOCs in sediment samples. Similarly, the sulfide odor identified in 2013 at sampling location BK2-SD-8 was most likely associated with naturally-occurring sulfate-reducing bacteria.

In 2024, VOCs were detected in one (1) sample [BK3-SD-12 (6-12")] at a concentration of 0.9 ppm and H_2S was detected in two (2) samples [BK3-SD-12 (6-12") and BK3-SD-8 (24-30")] at concentration of 2.0 ppm and 4.5 ppm. In 2018, VOCs were detected in two (2) samples at concentrations of 0.5 ppm and 2 ppm, and H_2S was detected at concentrations ranging from 0.6 ppm to 10.5 ppm in 12 of the 2018 samples, which were attributed to naturally-occurring sulfate-reducing bacteria in the sediment because they occurred in samples containing roots and/or decaying accumulated vegetation. In 2013, above-background VOC readings were reported (but not quantified) for Sample Locations BK2-SD-3, BK2-SD-4, BK2-SD-8, and BK2-SD-9. The 2013 samples were screened for H_2S, however, no H_2S results were provided in the 2013 Baseline Report.

4.3.2 Organic Parameter Results

SVOCs – Due to the number of parameters detected at low, primarily estimated concentrations, the 2024, 2018 and 2013 SVOC results are compared based on total SVOC concentration in **Table 17**. The distribution of SVOCs in sediment is similar in 2024, 2018, and 2013; SVOCs were detected at greatest frequency and higher total concentrations at the farthest downstream Creek sample locations. Overall, sediment total SVOCs concentrations were higher in 2024 than in 2018,

however no SVOCs were detected at concentrations over the Class CS value. A summary of the results can be found in **Table 17.**

Pesticides – Concentrations of pesticide-related compounds were generally consistent between 2024 and 2018. In 2013, pesticide-related compounds were detected at a higher frequency than in 2024 and 2018, however, this was attributed partly to the laboratory method detection limits being generally lower than in 2018 and 2024.

4.3.3 Metal Results

Due to the number of sediment sampling locations (12) and samples per location (2-3 depending on refusal), totaling 31 samples, and the frequency at which metals are detected in sediment, the results from all three sampling events were first compared by sample depth and then by location to identify spatial changes in sediment metals concentrations since 2013. The comparisons of each sample depth in 2013, 2018 and 2024 are provided in Tables 19a through 19c, for the 0-6 inch, 6-12 inch and 24-30 inch depth sample results, respectively. The results for each sample depth are compared below.

As shown in **Table 19a**, comparison of the 2024, 2018, and 2013 results for the 0-6 inch depth Creek sediment samples indicates overall similar metals concentrations at two of the three farthest upstream locations (BK3-SD-7 and BK3-SD-6), higher detections at BK3-SD-2 in 2024, and slightly higher or similar metals concentrations in 2024 at downstream locations (BK3-SD-1, BK3-SD-3, and BK3-SD-4).

As shown in **Table 19b**, comparison of the results for the 6-12 inch depth sediment samples indicates overall lower metal concentrations at the first downstream Creek sampling location, BK3-SD-1, and significantly higher detections at the second downstream location, BK3-SD-2. At sampling locations BK3-SD-3, BK3-SD-4, BK3-SD-5, BK3-SD-6, and BK3-SD-7, there were generally similar or lower metals concentrations in 2024 than in 2018 and 2013. Comparison of the results for the tidal marsh sampling location indicates that overall, sediment metals concentrations in 2024 are similar or lower at sampling locations BK3-SD-8 through BK-SD-11 and higher at BK3-SD-12.

As shown in **Table 19c**, comparison of the results for the 24-30 inch depth sediment samples indicates that in 2024, there were generally higher metals concentrations at the three farthest upstream Creek sampling locations (BK3-SD-5, BK3-SD-6, and BK-SD-7), as well as generally higher metals concentrations at the four Creek sampling locations (BK3-SD-1 through BK3-SD-4) further downstream. At the tidal marsh sediment sampling locations, metals were not detected at BK3-SD-9, BK3-SD-10, and BK3-SD-11 in 2024. Tidal marsh locations BK-SD-8 and BK3-SD-12 showed results in 2024 that are generally similar to 2018 and 2013 results.

As previously discussed, generally higher increases in detected metal concentrations across all sample locations and depths can be attributed to abnormally dry conditions that occurred in the region at the time of sampling, and may not be attributed to BAL-related environmental concerns.

5. Conclusions and Recommendations

The conclusions of this report are:

1) The OU2 ROD selected remedy consisting of the OU1 remediation/monitoring with OU2 monitoring continues to be protective of public health and the environment;
2) The concentrations of certain contaminants in sediment have decreased since the 2013 baseline monitoring round and subsequent 2018 monitoring round; and
3) The key environmental issue to track during future monitoring rounds is mercury in Creek sediment since concentrations were reported significantly above the comparison criteria; however, detections may be attributed to background concentrations.

These overall conclusions are based on the following six specific conclusions and supporting information from this report and in the OU2 ROD:

1) There are currently no significant BAL-related impacts to surface-water quality in Richmond Creek. This conclusion is based on the following information from Section 3.1 of this report:
   - The field parameter results indicate that tide stage is the dominant factor controlling Creek surface-water quality. The only potential BAL-related impacts are minor and include lower ORP and higher turbidity at low tide in the section of the Creek adjacent to the East Cell;
   - VOC detections in surface water were limited to a low concentration of toluene in sample location BK3-SW-L-6;
   - One (1) pesticide-related compound (4,4'-DDE) was detected at concentrations exceeding NYSDEC Class SC standards in two (2) low-tide samples, and these detections are not necessarily associated with the BAL. 4,4'-DDE was not detected in the 2018 surface water samples at these locations. Surface-water quality in the Creek is likely influenced by discharges of stormwater runoff from the surrounding areas;
   - SVOCs and PCBs were not detected in any of the 2024 surface-water samples; and
   - The 2024 metals results are consistent with Richmond Creek being a tidal coastal surface-water body, and no BAL-related impacts are indicated by the 2024 results.
2) Organic contaminant concentrations in sediment are currently not a concern for BAL OU2. This conclusion is based on the following information from Section 3.2.2 of this report:
   - SVOCs were detected in 27 of the 31 samples, 11 SVOCs were detected in one or more samples. No SVOCs were detected above the applicable comparison criteria.
   - Pesticide-related compounds were detected in 21 of the 31 samples. Six (6) of the 21 parameters analyzed were detected at concentrations lower than the Class A SGVs. Endosulfan was detected in six (6) samples and DDT was detected in one (1) sample, both at concentrations above Class B SGVs; however no pesticide detections exceeded the Class C SGVs.
   - PCBs were detected at 13 sample locations. However, the detections were primarily at concentrations below the Class A SGV for total PCBs (<100 ug/kg)
3) As expected for an urban, aquatic sedimentary environment, 21 of the 23 metals analyzed were detected in most of the sediment samples, at a range of concentrations spanning all three classes of SGVs. However, most of the highest concentrations occur in subsurface sediment representing older, pre-remediation deposition, and are biologically isolated.

Moreover, the metals in subsurface sediment are immobilized chemically due to reducing conditions. Mercury is the only metal detected routinely at concentrations much higher than its Class C SGV in surficial sediment, but its presence may be primarily due to background contamination. General increases in metal detections in the 2024 sampling are attributed to abnormally dry conditions leading up to the sampling event.

4) Overall, the 2024 and 2018 surface-water results are similar to the 2013 baseline results; however, comparison of the low-tide metals results is not warranted. This conclusion is based on the following information from Section 4.2 of this report:
   - The results for all four organic parameter groups are basically the same, except for minor differences that are attributed to the higher turbidities of certain 2013 samples and/or differences between the 2013 and 2018 laboratory method detection limits.
   - The metals results for the high-tide samples are remarkably similar except for the major seawater cations, arsenic and selenium, which were detected at significantly higher concentrations in the 2013 and 2024 samples. The higher seawater cation and arsenic concentrations in 2013 and 2024 are attributed to the more brackish conditions in the Creek. The lower selenium concentrations in 2018 may be attributed to completion of the OU1 remedy.
   - Due to entrained sediment containing metals being collected along with most of the 2013 low-tide samples and subsequent preservation of the samples with nitric acid, metals concentrations in those samples were elevated and did not represent actual surface-water metals concentrations.
5) Overall, sediment quality has improved since completion of the OU1 remedy. This conclusion is based on the following information from Section 4.3 of this report:
   - Overall, SVOCs were detected at low levels in the downstream section of the Creek, which may be due to off-site sources such as the Fresh Kills Landfill and/or roadway runoff. Sediment total SVOC concentrations were generally lower in 2024.
   - Pesticide concentrations in sediment have generally decreased since the 2013 baseline round.
   - PCB concentrations in sediment also appear to have decreased since the 2013 baseline round. This decrease may be attributed to completion of the OU1 remedy.
   - Overall, sediment metals concentrations are similar at the three farthest upstream Creek sample locations, and lower at three of the four further downstream Creek sample locations. They are higher at Sample Location BK3-SD-2, but this is attributed to downstream migration of sediment from the outfall of the large storm sewer that drains the neighboring area south of the BAL into the Creek.
6) The BAL is a relatively minor source of potential contamination compared to other potential sources in the area, and is unlikely to impact surface-water and sediment quality in OU2. This conclusion is based on the following information from the OU2 ROD:
   - Tidal flow causes intermixing of surface water throughout the Fresh Kills Estuary System and from the Arthur Kill. Consequently, potential sources of contamination located downstream can impact water and sediment quality in the Creek.
   - The other potential sources of contamination in the area include the much larger Fresh Kills Landfill, which reportedly discharged 16 times more leachate than the BAL, numerous stormwater outfalls, including the one located between the BAL East and West Cells, and industrial sources that discharge to Arthur Kill.

- Surface-water quality in the Creek improved after installation of leachate controls at Fresh Kills Landfill in 1998.
- The contaminants currently present in the section of Creek adjacent to the BAL, such as mercury, were previously detected at higher concentrations downstream, in the section of Creek adjacent to the Fresh Kills Landfill.
- Contaminant concentration gradients indicate that the Fresh Kills Landfill was the dominant source of contamination in the Creek prior to the late 1990s.
- The BAL OU1 remedy was very robust, and included a perimeter low-permeability barrier wall as well as a landfill cap.

The following recommendations are provided for the 20th-year monitoring round:

1) Continue to sample at similar locations in similar weather conditions, if possible, at the 20th year monitoring round in order to accurately compare the results across all related sampling events.
2) Continue to track mercury concentrations in surficial sediment, as mercury was detected in Creek surficial sediment at concentrations above the comparison criteria. However, the presence of mercury in surficial sediment may be attributed to background conditions and not impacts from the BAL.

FIGURES

LEGEND:

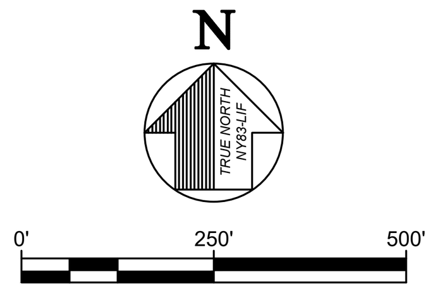
2024 SD SAMPLE LOCATION

2024 SD AND SW SAMPLE LOCATION

OU2 BOUNDARY (APPROXIMATE)

NOTES:

1. LOCATIONS AND DIMENSIONS OF PHYSICAL FEATURES AND PROPERTY BOUNDARIES ARE APPROXIMATE.
2. AERIAL BASEMAP SOURCED FROM NEARMAP DATED OCTOBER 11, 2024.
3. HORIZONTAL DATUM: 1983 NORTH AMERICAN DATUM NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE, US FOOT (NY83-LIF).
4. SD - SEDIMENT.
5. SW - SURFACE WATER.



SCALE: 1"= 250'
SHEET SIZE: 24" X 36"

PROJECT:
NEW YORK CITY DEPARTMENT OF PARKS AND RECREATION
BROOKFIELD AVENUE LANDFILL - 375 ARTHUR KILL ROAD
STATEN ISLAND, NEW YORK 10308

TITLE:
2024 OU2 SAMPLE LOCATIONS

DRAWN BY:	H. DELGADO	PROJ. NO.:	625454.0000.0000
CHECKED BY:	Z. CASTILLO	FIGURE 1	
APPROVED BY:	W. LINDEMUTH		
DATE:	FEBRUARY 2025		

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LEGEND:

- 2024 SD SAMPLE LOCATION
- 2024 SD AND SW SAMPLE LOCATION
- RAP SD SAMPLE LOCATION
- RAP SD AND SW SAMPLE LOCATION
- OU2 BOUNDARY (APPROXIMATE)

NOTES:

1. LOCATIONS AND DIMENSIONS OF PHYSICAL FEATURES AND PROPERTY BOUNDARIES ARE APPROXIMATE.
2. AERIAL BASEMAP SOURCED FROM NEARMAP DATED OCTOBER 11, 2024.
3. HORIZONTAL DATUM: 1983 NORTH AMERICAN DATUM NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE, US FOOT (NY83-LIF).
4. RAP - REMEDIAL ACTION PLAN.
5. SD - SEDIMENT.
6. SW - SURFACE WATER.

PROJECT: NEW YORK CITY DEPARTMENT OF PARKS AND RECREATION
BROOKFIELD AVENUE LANDFILL - 375 ARTHUR KILL ROAD
STATEN ISLAND, NEW YORK 10308

TITLE: COMPARISON OF 2024 AND OU2 RAP SAMPLE LOCATIONS

DRAWN BY:	H. DELGADO	PROJ. NO.:	625454.0000.0000
CHECKED BY:	Z. CASTILLO	FIGURE 2	
APPROVED BY:	W. LINDEMUTH		
DATE:	FEBRUARY 2025		

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LEGEND:

- 2024 & 2018 SD SAMPLE LOCATION
- 2024 & 2018 SD AND SW SAMPLE LOCATION
- 2013 SEDIMENT SAMPLE LOCATIONS
- 2013 SURFACE WATER SAMPLE LOCATIONS
- OU2 BOUNDARY (APPROXIMATE)

NOTES:

1. LOCATIONS AND DIMENSIONS OF PHYSICAL FEATURES AND PROPERTY BOUNDARIES ARE APPROXIMATE.
2. AERIAL BASEMAP SOURCED FROM NEARMAP DATED OCTOBER 11, 2024.
3. HORIZONTAL DATUM: 1983 NORTH AMERICAN DATUM NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE, US FOOT (NY83-LIF).
4. LOCATIONS OF 2013 SEDIMENT AND SURFACE WATER SAMPLE LOCATIONS ARE APPROXIMATE AND SAMPLE IDENTIFICATION WAS NOT PROVIDED.
5. SD - SEDIMENT.
6. SW - SURFACE WATER.

N

TRUE NORTH NY83-LIF

0' 250' 500'

SCALE: 1"= 250'
SHEET SIZE: 24" X 36"

PROJECT:
NEW YORK CITY DEPARTMENT OF PARKS AND RECREATION
BROOKFIELD AVENUE LANDFILL - 375 ARTHUR KILL ROAD
STATEN ISLAND, NEW YORK 10308

TITLE:
COMPARISON OF 2024, 2018, AND 2013 SAMPLE LOCATIONS

DRAWN BY:	H. DELGADO	PROJ. NO.:	625454.0000.0000
CHECKED BY:	Z. CASTILLO	**FIGURE 3**	
APPROVED BY:	W. LINDEMUTH		
DATE:	FEBRUARY 2025		

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TABLES

Table 1
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th Year Monitoring Round
Summary of Surface Water and Sediment Sample Locations

Sample Location[1,2]	Location Relative to Brookfield Avenue Landfill (BAL)	Survey Location	
Richmond Creek Sample Locations[3]		**Northing[5]**	**Easting[5]**
BK3-SW/SD-1	Downstream of BAL, Closest to Fresh Kills Landfill	631441.71	583993.88
BK3-SW/SD-2	Adjacent to BAL Drainage Tributary and West Cell	631798.90	584936.52
BK3-SW/SD-3	Adjacent to West End of East Cell	632430.88	585602.79
BK3-SW/SD-4	Adjacent to Central Portion of East Cell	632487.6	586501.99
BK3-SW/SD-5	Adjacent to Central Portion of East Cell	632398.12	587196.55
BK3-SW/SD-6	Adjacent to North End of East Cell	632818.09	588158.82
BK3-SW/SD-7	Upstream of BAL	633436.56	589743.94
Tidal Marsh / Tributary Sample Locations[4]		**Northing[5]**	**Easting[5]**
BK3-SD-8	Tidal Marsh Adjacent to West Cell	630788.61	584683.76
BK3-SD-9	Tidal Marsh Adjacent to West Cell	630959.84	585085.33
BK3-SD-10	Start of Main BAL Drainage Tributary, Near Outfall	631046.30	585454.72
BK3-SD-11	Tidal Marsh Adjacent to NW Corner of East Cell	631606.50	585733.99
BK3-SD-12	Tributary Between East Cell and Richmond Creek	631817.80	585497.69

Notes

(1) - High-tide and low-tide samples were collected at each surface water sample location. Sample IDs are in Table 2.

(2) - Three sediment samples were attempted to be collected at each sediment sample location. Sample IDs are in Table 3.

(3) - Richmond Creek sample locations include surface-water (SW) and sediment (SD) samples.

(4) - Tidal marsh and tributary sample locations are sediment samples only.

(5) - Sample location Northings and Eastings are in feet based on NAD 83 Datum.

Table 2
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Samples

Richmond Creek Surface Water Samples			
Sample Location	Tide	Sample ID	Date Sample Collected
BK3-SW-1	High	BK3-SW-H-01	9/10/2024
	Low	BK3-SW-L-01	9/10/2024
BK3-SW-2	High	BK3-SW-H-02	9/10/2024
	Low	BK3-SW-L-02	9/10/2024
BK3-SW-3	High	BK3-SW-H-03	9/10/2024
	Low	BK3-SW-L-03	9/11/2024
BK3-SW-4	High	BK3-SW-H-04	9/10/2024
	Low	BK3-SW-L-04	9/12/2024
BK3-SW-5	High	BK3-SW-H-05	9/10/2024
	Low	BK3-SW-L-05	9/11/2024
BK3-SW-6	High	BK3-SW-H-06	9/10/2024
	Low	BK3-SW-L-06	9/12/2024
BK3-SW-7	High	BK3-SW-H-07	9/10/2024
	Low	BK3-SW-L-07	9/11/2024

QA/QC-Related Samples		
Sample ID	Sample Type	Date Sample Collected
BK3-SW-TB-01	Trip Blank	9/9/2024
BK3-SW-TB-02	Trip Blank	9/11/2024
BK3-SW-FB-01	Field Blank	9/11/2024
BK3-SW-DUP	Field Duplicate	9/10/2024
BK2-SW-L-03 MS	Matrix Spike	9/11/2024
BK2-SW-L-03 MSD	Matrix Spike Duplicate	9/11/2024

Notes

BK3-SW-DUP is a duplicate of BK3-SW-H-07.

Table 3
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Samples

Richmond Creek Sediment Samples			
Sample Location	Sample ID	Sample Depth	Date Sample Collected
BK3-SD-1	BK3-SD-01 (0-6")	0-6 inch	9/13/2024
	BK3-SD-01 (6-12")	6-12 inch	
	Refusal hit before 24-30" sample depth		
BK3-SD-2	BK3-SD-02 (0-6")	0-6 inch	9/12/2024
	BK3-SD-02 (6-12")	6-12 inch	
	BK3-SD-02 (24-30")	24-30 inch	
BK3-SD-3	BK3-SD-03 (0-6")	0-6 inch	9/12/2024
	BK3-SD-03 (6-12")	6-12 inch	
	BK3-SD-03 (24-30")	24-30 inch	
BK3-SD-4	BK3-SD-04 (0-6")	0-6 inch	9/13/2024
	BK3-SD-04 (6-12")	6-12 inch	
	BK3-SD-04 (24-29")	24-29 inch	
BK3-SD-5	BK3-SD-05 (0-6")	0-6 inch	9/12/2024
	BK3-SD-05 (6-12")	6-12 inch	
	BK3-SD-05 (24-26")	24-26 inch	
BK3-SD-6	BK3-SD-06 (0-6")	0-6 inch	9/12/2024
	BK3-SD-06 (6-12")	6-12 inch	
	Refusal hit before 24-30" sample depth		
BK3-SD-7	BK3-SD-07 (0-6")	0-6 inch	9/12/2024
	BK3-SD-07 (6-12")	6-12 inch	
	BK3-SD-07 (24-27")	24-27 inch	

Tidal Marsh / Tributary Sediment Samples			
Sample Location	Sample ID	Sample Depth	Date Sample Collected
BK3-SD-8	BK3-SD-08 (0-6")	0-6 inch	9/13/2024
	BK3-SD-08 (6-12")	6-12 inch	
	BK3-SD-08 (24-30")	24-30 inch	
BK3-SD-9	BK3-SD-09 (0-6")	0-6 inch	9/13/2024
	BK3-SD-09 (6-12")	6-12 inch	
	Refusal hit before 24-30" sample depth		
BK3-SD-10	BK3-SD-10 (0-6")	0-6 inch	9/12/2024
	BK3-SD-10 (6-12")	6-12 inch	
	Refusal hit before 24-30" sample depth		
BK3-SD-11	BK3-SD-11 (0-6")	0-6 inch	9/13/2024
	BK3-SD-11 (6-12")	6-12 inch	
	Refusal hit before 24-30" sample depth		
BK3-SD-12	BK3-SD-12 (0-6")	0-6 inch	9/13/2024
	BK3-SD-12 (6-12")	6-12 inch	
	BK3-SD-12 (24-30")	24-30 inch	

QA/QC-Related Samples		
Sample ID	Sample Type	Date Sample Collected
BK3-SD-FB-01	Field Blank	9/12/2024
BK3-SD-FB-02	Field Blank	9/13/2024
BK3-SD-DUP	Field Duplicate	9/12/2024
BK3-SD-DUP-02	Field Duplicate	9/13/2024
BK3-SD-02 (24-30") - MS	Matrix Spike	9/12/2024
BK3-SD-02 (24-30") - MSD	Matrix Spike Duplicate	9/12/2024
BK3-SD-04 (24-29") - MS	Matrix Spike	9/13/2024
BK3-SD-04 (24-20") - MSD	Matrix Spike Duplicate	9/13/2024

Notes
BK3-SD-DUP is a duplicate of BK3-SD-03 (24-30").
BK3-SD-DUP-02 is a duplicate of BK3-SD-12 (24-30").

Table 4
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Field Parameters

Sample Location:		BK3-SW-1		BK3-SW-2		BK3-SW-3		BK3-SW-4	
Sample ID:		BK3-SW-H-01	BK3-SW-L-01	BK3-SW-H-02	BK3-SW-L-02	BK3-SW-H-03	BK3-SW-L-03	BK3-SW-H-04	BK3-SW-L-04
(Tide):		(High)	(Low)	(High)	(Low)	(High)	(Low)	(High)	(Low)
Date Sample Collected:		9/10/2024	9/10/2024	9/10/2024	9/10/2024	9/10/2024	9/11/2024	9/10/2024	9/12/2024
Field Parameters	Units	Results	Results	Results	Results	Results	Results	Results	Results
Temperature	°C	22.84	19.91	22.97	20.69	22.08	19.83	23.26	21.83
pH	SU	8.19	7.04	8.46	8.00	8.27	7.85	8.60	6.50
Oxidation-Reduction Potential	mV	123	232	116	153	128	189	116	238
Conductivity	mS/cm	24.3	27.0	24.0	27.3	19.8	25.9	25.5	18.5
Turbidity	NTU	32.0	64.8	32.5	53.3	46.2	70.7	39.3	73.7
Dissolved Oxygen	mg/L	36.18	7.02	13.71	9.67	11.71	10.04	12.02	8.71
Total Dissolved Solids	g/L	15.1	16.7	14.9	16.9	11.5	16.1	15.8	11.2
Salinity	ppt	14.7	16.5	14.6	16.7	11.8	15.8	15.6	10.9

Sample Location:		BK3-SW-5		BK3-SW-6		BK3-SW-7		Averages	
Sample ID:		BK3-SW-H-05	BK3-SW-L-05	BK3-SW-H-06	BK3-SW-L-06	BK3-SW-H-07	BK3-SW-L-07		
(Tide):		(High)	(Low)	(High)	(Low)	(High)	(Low)	High Tide	Low Tide
Date Sample Collected:		9/10/2024	9/11/2024	9/10/2024	9/12/2024	9/10/2024	9/11/2024		
Field Parameters	Units	Results	Results	Results	Results	Results	Results	Results	Results
Temperature	°C	23.62	21.96	24.13	25.13	24.77	15.79	23.38	20.73
pH	SU	8.61	8.13	8.80	8.19	8.10	7.46	8.43	7.59
Oxidation-Reduction Potential	mV	115	148	111	140	106	203	116	186
Conductivity	mS/cm	23.7	24.3	25.5	21.1	1.30	1.1	20.58	20.74
Turbidity	NTU	53.9	64.1	70.3	75.9	11.2	8.85	40.9	58.7
Dissolved Oxygen	mg/L	12.56	25.58	34.04	15.81	29.09	3.85	21.33	11.66
Total Dissolved Solids	g/L	14.7	15.0	15.8	13.1	0.831	0.706	12.6	12.8
Salinity	ppt	14.4	14.7	15.5	12.7	0.6	0.5	12.45	12.54

Notes
°C - Degrees Celcius
SU - Standard Units
mV - miliVolts
mS/cm - MicroSiemens per centimeter
NTU - Nephelometric Turbity Units
mg/L - Miligrams per Liter
g/L - Grams per Liter
ppt - parts per thousand

Table 5
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Sampling Analytical Results for Organic Parameters

Sample Location	Tide	Sample ID	Volatile Organic Compounds (ug/L)	Semivolatile Organic Compounds (ug/L)	Pesticides (ug/L)	Polychlorinated Biphenyls (ug/L)
BK3-SW-1	High	BK3-SW-H-01	ND	ND	ND	ND
	Low	BK3-SW-L-01	ND	ND	ND	ND
BK3-SW-2	High	BK3-SW-H-02	ND	ND	ND	ND
	Low	BK3-SW-L-02	ND	ND	ND	ND
BK3-SW-3	High	BK3-SW-H-03	ND	ND	ND	ND
	Low	BK3-SW-L-03	ND	ND	ND	ND
BK3-SW-4	High	BK3-SW-H-04	ND	ND	ND	ND
	Low	BK3-SW-L-04	ND	ND	4,4'-DDE 0.0045 J ug/L	ND
BK3-SW-5	High	BK3-SW-H-05	ND	ND	ND	ND
	Low	BK3-SW-L-05	ND	ND	4,4'-DDE 0.0051 J ug/L	ND
BK3-SW-6	High	BK3-SW-H-06	ND	ND	ND	ND
	Low	BK3-SW-L-06	Toluene 1.5 ug/L	ND	ND	ND
BK3-SW-7	High	BK3-SW-H-07	ND	ND	ND	ND
	Low	BK3-SW-L-07	ND	ND	ND	ND

Notes
ug/L - micrograms per liter
Class SC - Saline (marine) surface waters
H(FC) - Standard category for consumption of fish.
J - Estimated value
New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards for toluene are 6,000 ug/L (H(FC)).
New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards for 4,4'-DDE are 0.000007 ug/L (H(FC)).
ND - Not detected

Table 6a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Sampling Analytical Results for Total Metals and Hardness

		Sample Location:	BK3-SW-1		BK3-SW-2		B+L1:O29K3-SW-3		BK3-SW-4	
		Sample ID:	BK3-SW-H-01	BK3-SW-L-01	BK3-SW-H-02	BK3-SW-L-02	BK3-SW-H-03	BK3-SW-L-03	BK3-SW-H-04	BK3-SW-L-04
		(Tide):	(High)	(Low)	(High)	(Low)	(High)	(Low)	(High)	(Low)
		Laboratory ID:	JD95786-3	JD95786-1	JD95786-4	JD95786-2	JD95786-5	JD95938-2	JD96786-6	JD96043-14
		Date Sample Collected:	9/10/2024	9/10/2024	9/10/2024	9/10/2024	9/10/2024	9/11/2024	9/10/2024	9/12/2024
Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)	Results (ug/L)	Results (ug/L)	Results (ug/L)	Results (ug/L)	Results (ug/L)	Results (ug/L)	Results (ug/L)
Aluminum	NC	NA	254	762	364	509	431	658	401	671
Antimony	NC	NA	8.5	10.1	9.7	11.2	9.8	12.4	8.9	8.4
Arsenic	NC	NA	11.3	15 U	11.6	15.0 U	11.2	15.5	12.1	11.5
Barium	NC	NA	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Beryllium	NC	NA	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	7.7	A(C)	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	15 U	3.0 U	3.0 U
Calcium	NC	NA	227,000	191,000	195,000	191,000	178,000	226,000	218,000	144,000
Chromium	NC	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cobalt	NC	NA	250 U	50 U	50 U	250 U	50 U	250 U	50 U	50 U
Copper	NC	NA	10 U	16.1	10.3	12.1	12.6	10.9	12.4	10 U
Iron	NC	NA	438	1,210	588	785	688	1,020	626	1,070
Lead	NC	NA	60 U	60 U	15 U	150 U	15 U	15 U	60 U	150 U
Magnesium	NC	NA	689,000	640,000	635,000	624,000	598,000	672,000	658,000	434,000
Manganese	NC	NA	104	141	101	134	116	165	124	217
Mercury	NC	NA	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20
Nickel	NC	NA	50 U	10 U	10 U	50 U	10 U	50 U	10 U	10 U
Potassium	NC	NA	222,000	202,000	204,000	199,000	191,000	219,000	212,000	138,000
Selenium	NC	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver	NC	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sodium	NC	NA	5,530,000	5,180,000	5,290,000	5,110,000	5,000,000	5,300,000	5,140,000	3,330,000
Thallium	NC	NA	50 U	10 U	10 U	50 U	10 U	50 U	10 U	10 U
Vanadium	NC	NA	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Zinc	NC	NA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Total Hardness	NC	NA	3,400	3,110	3,100	3,050	2,910	3,330	3,250	2,150

Notes
ug/L - micrograms per liter
A(C) - Standard category for fish propagation.
BK3-SW-DUP is a duplicate sample of BK3-SW-H-07
Class SC - Saline (marine) surface waters
NA - Not applicable
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards
Total Hardness is calculated as total calcium carbonate
U - Non-detect

Table 6a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Sampling Analytical Results for Total Metals and Hardness

		Sample Location:	BK3-SW-5				BK3-SW-6				BK3-SW-7				QA/QC	
		Sample ID:	BK3-SW-H-05		BK3-SW-L-05		BK3-SW-H-06		BK3-SW-L-06		BK3-SW-H-07		BK3-SW-L-07		BK3-SW-DUP	
		(Tide):	(High)		(Low)		(High)		(Low)		(High)		(Low)			
		Laboratory ID:	JD95786-7		JD95938-3		JD95786-8		JD96043-15		JD95786-9		JD95938-1		JD95786-10	
		Date Sample Collected:	9/10/2024		9/11/2024		9/10/2024		9/12/2024		9/10/2024		9/11/2024		9/10/2024	
Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	438		618		666		926		200	U	200	U	200	U
Antimony	NC	NA	9.9		11.7		10		9.6		6.0	U	6.0	U	6.0	U
Arsenic	NC	NA	11.9		15	U	15	U	15	U	3.0	U	3.0	U	3.0	U
Barium	NC	NA	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Beryllium	NC	NA	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Cadmium	7.7	A(C)	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Calcium	NC	NA	208,000		188,000		216,000		174,000		32,600		30,600		35,900	
Chromium	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cobalt	NC	NA	250	U	250	U	50	U	50	U	50	U	50	U	50	U
Copper	NC	NA	11		10.7		13.5		12.4		10	U	10	U	10	U
Iron	NC	NA	682		999		1,010		1,440		378		298		442	
Lead	NC	NA	60	U	15	U	60	U	15	U	3.0	U	3.0	U	3.0	U
Magnesium	NC	NA	612,000		602,000		641,000		562,000		47,800		44,400		54,100	
Manganese	NC	NA	134		181		164		192		183		146		199	
Mercury	NC	NA	0.20	U	0.20		0.20	U	0.20		0.20	U	0.20	U	0.20	U
Nickel	NC	NA	50	U	50	U	10	U	10	U	10	U	10	U	10	U
Potassium	NC	NA	199,000		200,000		205,000		178,000		10,000	U	10,000	U	10,000	U
Selenium	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Silver	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Sodium	NC	NA	5,090,000		4,860,000		5,270,000		4,320,000		133,000		107,000		205,000	
Thallium	NC	NA	50	U	50	U	10	U	10	U	10	U	10	U	10	U
Vanadium	NC	NA	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Zinc	NC	NA	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Total Hardness	NC	NA	3,040		2,950		3,180		2,750		278		259		312	

Notes
ug/L - micrograms per liter
A(C) - Standard category for fish propagation.
BK3-SW-DUP is a duplicate sample of BK3-SW-H-07
Class SC - Saline (marine) surface waters
NA - Not applicable
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards
Total Hardness is calculated as total calcium carbonate
U - Non-detect

Table 6b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Sampling Analytical Results for Dissolved Metals

		Sample Location:	BK3-SW-1				BK3-SW-2				BK3-SW-3				BK3-SW-4			
		Sample ID:	BK3-SW-H-01		BK3-SW-L-01		BK3-SW-H-02		BK3-SW-L-02		BK3-SW-H-03		BK3-SW-L-03		BK3-SW-H-04		BK3-SW-L-04	
		(Tide):	(High)		(Low)		(High)		(Low)		(High)		(Low)		(High)		(Low)	
		Laboratory ID:	JD95786-3F		JD95786-1F		JD95786-4F		JD95786-2F		JD95786-5F		JD95938-2F		JD95786-6F		JD96043-14F	
		Date Sample Collected:	9/10/2024		9/10/2024		9/10/2024		9/10/2024		9/10/2024		9/11/2024		9/10/2024		9/12/2024	
Dissolved Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Antimony	NC	NA	9.1		9.7		8.9		10.4		9.1		11.9		10.1		8.7	
Arsenic	63	A(C)	11.1		9.5		11		15	U	12.3		15	U	12.2		9.9	
Barium	NC	NA	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Beryllium	NC	NA	5.0	U	1.0	U	1.0	U	5.0	U	5.0	U	1.0	U	5.0	U	1.0	U
Cadmium	NC	NA	3.0	U	15	U	3.0	U	3.0	U	3.0	U	15	U	3.0	U	3.0	U
Calcium	NC	NA	243,000		149,000		231,000		230,000		235,000		237,000		239,000		136,000	
Chromium	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cobalt	NC	NA	250	U	50	U	50	U	50	U	250	U	250	U	250	U	50	U
Copper	5.6 / 7.9	A(C) / A(A)	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Iron	NC	NA	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
Lead	8 / 204	A(C) / A(A)	30	U	30	U	15	U	150	U	15	U	15	U	30	U	150.0	U
Magnesium	NC	NA	742,000		592,000		704,000		688,000		711,000		714,000		727,000		469,00	
Manganese	NC	NA	94.4		100		93,7		137		121		155		120		193	
Mercury	0.0007 / 0.0026	H(FC) / W	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	8.2 / 74	A(C) / A(A)	50	U	10	U	10	U	10	U	50	U	50	U	50	U	10	U
Potassium	NC	NA	240,000		153,000		226,000		222,000		228,000		229,000		237,000		130,000	
Selenium	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Silver	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Sodium	NC	NA	5,650,000		4,830,000		5,750,000		5,480,000		5,440,000		5,690,000		5,690,000		3,650,000	
Thallium	NC	NA	50	U	10	U	10	U	10	U	50	U	50	U	50	U	10	U
Vanadium	NC	NA	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Zinc	66	A(C)	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U

Notes
g/L - micrograms per liter
A(A) - Standard category for fish survival.
A(C) - Standard category for fish propagation.
BK3-SW-DUP is a duplicate sample of BK3-SW-H-07
Class SC - Saline (marine) surface waters
H(FC) - Standard category for consumption of fish.
NA - Not applicable
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards
Standards are the NYSDEC 6NYCRR Part 703.5 Class SC surface water standards.
U - Non-detect
W -Standard cateogry for wildlife protection.

Table 6b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Surface Water Sampling Analytical Results for Dissolved Metals

		Sample Location:	BK3-SW-5				BK3-SW-6				BK3-SW-7				QA/QC	
		Sample ID:	BK3-SW-H-05		BK3-SW-L-05		BK3-SW-H-06		BK3-SW-L-06		BK3-SW-H-07		BK3-SW-L-07		BK3-SW-DUP	
		(Tide):	(High)		(Low)		(High)		(Low)		(High)		(Low)			
		Laboratory ID:	JD95938-3F		JD95786-7F		JD95786-8F		JD96043-15F		JD95786-9F		JD95938-1F		JD95786-10F	
		Date Sample Collected:	9/10/2024		9/11/2024		9/10/2024		9/12/2024		9/10/2024		9/11/2024		9/10/2024	
Dissolved Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Antimony	NC	NA	10.8		9.6		9.4		9.9		6.0	U	6.0	U	6.0	U
Arsenic	63	A(C)	15	U	12.7				15	U	3.0	U	3.0	U	3.0	U
Barium	NC	NA	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Beryllium	NC	NA	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Cadmium	NC	NA	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Calcium	NC	NA	187,000		218,000		177,000		176,000		33,500		29,000		38,600	
Chromium	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cobalt	NC	NA	250	U	250	U	50	U	50	U	50	U	50	U	50	U
Copper	5.6 / 7.9	A(C) / A(A)	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Iron	NC	NA	100	U	100	U	100	U	100	U	100	U	100	U	100	U
Lead	8 / 204	A(C) / A(A)	15	U	30	U	30	U	15	U	3.0	U	3.0	U	3.0	U
Magnesium	NC	NA	594,000		658,000		575,000		570,000		49,600		42,500		63,700	
Manganese	NC	NA	185		141		140		174		176		132		171	
Mercury	0.0007 / 0.0026	H(FC) / W	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	8.2 / 74	A(C) / A(A)	50	U	50	U	10	U	10	U	10	U	10	U	10	U
Potassium	NC	NA	197,000		215,000		177,000		182,000		10,000	U	10,000	U	11,100	
Selenium	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Silver	NC	NA	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Sodium	NC	NA	4,730,000		5,190,000		4,730,000		4,530,000		131,000		105,000		305,000	
Thallium	NC	NA	50	U	50	U	10	U	10	U	10	U	10	U	10	U
Vanadium	NC	NA	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Zinc	66	A(C)	20	U	20	U	20	U	20.0	U	20	U	20	U	20	U

Notes
g/L - micrograms per liter
A(A) - Standard category for fish survival.
A(C) - Standard category for fish propagation.
BK3-SW-DUP is a duplicate sample of BK3-SW-H-07
Class SC - Saline (marine) surface waters
H(FC) - Standard category for consumption of fish.
NA - Not applicable
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards
Standards are the NYSDEC 6NYCRR Part 703.5 Class SC surface water standards.
U - Non-detect
W -Standard cateogry for wildlife protection.

Table 7
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sample Field Screening Results

Richmond Creek Sediment Samples Field Paramters				
Sample Location	Sample ID	Sample Depth	Volatile Organic Compounds (ppm)	Hydrogen Sulfide (ppm)
BK3-SD-1	BK3-SD-01 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-01 (6-12")	6-12 inch	0.0	0.0
BK3-SD-2	BK3-SD-02 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-02 (6-12")	6-12 inch	0.0	0.0
	BK3-SD-02 (24-30")	24-30 inch	0.0	0.0
BK3-SD-3	BK3-SD-03 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-03 (6-12")	6-12 inch	0.0	0.0
	BK3-SD-03 (24-30")	24-30 inch	0.0	0.0
BK3-SD-4	BK3-SD-04 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-04 (6-12")	6-12 inch	0.0	0.0
	BK3-SD-04 (24-29")	24-29 inch	0.0	0.0
BK3-SD-5	BK3-SD-05 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-05 (6-12")	6-12 inch	0.0	0.0
	BK3-SD-05 (24-26")	24-26 inch	0.0	0.0
BK3-SD-6	BK3-SD-06 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-06 (6-12")	6-12 inch	0.0	0.0
BK3-SD-7	BK3-SD-07 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-07 (6-12")	6-12 inch	0.0	0.0
	BK3-SD-07 (24-27")	24-27 inch	0.0	0.0

Tidal Marsh and Tributary Sediment Samples Field Paramters				
Sample Location	Sample ID	Sample Depth	Volatile Organic Compounds (ppm)	Hydrogen Sulfide (ppm)
BK3-SD-8	BK3-SD-08 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-08 (6-12")	6-12 inch	0.0	0.0
	BK3-SD-08 (24-30")	24-30 inch	0.0	2.0
BK3-SD-9	BK3-SD-09 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-09 (6-12")	6-12 inch	0.0	0.0
BK3-SD-10	BK3-SD-10 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-10 (6-12")	6-12 inch	0.0	0.0
BK3-SD-11	BK3-SD-11 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-11 (6-12")	6-12 inch	0.0	0.0
BK3-SD-12	BK3-SD-12 (0-6")	0-6 inch	0.0	0.0
	BK3-SD-12 (6-12")	6-12 inch	0.9	4.5
	BK3-SD-12 (24-30")	24-30 inch	0.0	0.0

Notes
ppm - parts per million

Table 8
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Total Semivolatile Organic Compounds

Richmond Creek Sediment Samples Total Semivolatile Organic Compounds				
Sample Location	Sample ID	Sample Depth	Total SVOCs Detected	Total SVOCs (ug/kg)
BK3-SD-1	BK3-SD-01 (0-6")	0-6 inch	11	2,998 J
	BK3-SD-01 (6-12")	6-12 inch	14	8,774 J
BK3-SD-2	BK3-SD-02 (0-6")	0-6 inch	10	2,125 J
	BK3-SD-02 (6-12")	6-12 inch	5	1,134 J
	BK3-SD-02 (24-30")	24-30 inch	4	593 J
BK3-SD-3	BK3-SD-03 (0-6")	0-6 inch	7	763 J
	BK3-SD-03 (6-12")	6-12 inch	11	1,903 J
	BK3-SD-03 (24-30")	24-30 inch	11	4,579 J
BK3-SD-4	BK3-SD-04 (0-6")	0-6 inch	16	5,044 J
	BK3-SD-04 (6-12")	6-12 inch	16	2,737 J
	BK3-SD-04 (24-29")	24-29 inch	6	630 J
BK3-SD-5	BK3-SD-05 (0-6")	0-6 inch	1	54.4 J
	BK3-SD-05 (6-12")	6-12 inch	2	138.5 J
	BK3-SD-05 (24-26")	24-26 inch	2	75.6 J
BK3-SD-6	BK3-SD-06 (0-6")	0-6 inch	1	89.6 J
	BK3-SD-06 (6-12")	6-12 inch	0	ND
BK3-SD-7	BK3-SD-07 (0-6")	0-6 inch	2	592 J
	BK3-SD-07 (6-12")	6-12 inch	2	124.8 J
	BK3-SD-07 (24-27")	24-27 inch	0	ND

Tidal Marsh and Tributary Sediment Samples Total Semivolatile Organic Compounds				
Sample Location	Sample ID	Sample Depth	Total SVOCs Detected	Total SVOCs (ug/kg)
BK3-SD-8	BK3-SD-08 (0-6")	0-6 inch	7	2,838 J
	BK3-SD-08 (6-12")	6-12 inch	1	489 J
	BK3-SD-08 (24-30")	24-30 inch	1	94.1 J
BK3-SD-9	BK3-SD-09 (0-6")	0-6 inch	0	ND
	BK3-SD-09 (6-12")	6-12 inch	0	ND
BK3-SD-10	BK3-SD-10 (0-6")	0-6 inch	16	8,707 J
	BK3-SD-10 (6-12")	6-12 inch	11	721.5 J
BK3-SD-11	BK3-SD-11 (0-6")	0-6 inch	1	136 J
	BK3-SD-11 (6-12")	6-12 inch	1	202 J
BK3-SD-12	BK3-SD-12 (0-6")	0-6 inch	14	3,442 J
	BK3-SD-12 (6-12")	6-12 inch	7	820.6 J
	BK3-SD-12 (24-30")	24-30 inch	1	269 J

Notes
ug/kg - micrograms per kilogram
J - Estimated value
ND - not detected
SVOC - Semivolatile organic compound

Table 9
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Semivolatile Organic Compounds from
0-6 Inch Depth Interval

		Sample Location:		Richmond Creek													
		Sample ID:		**BK3-SD-01 (0-6")**		**BK3-SD-02 (0-6")**		**BK3-SD-03 (0-6")**		**BK3-SD-04 (0-6")**		**BK3-SD-05 (0-6")**		**BK3-SD-06 (0-6")**		**BK3-SD-07 (0-6")**	
		Sample Depth		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch	
		Date Sample Collected:		9/13/2024		9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/12/2024		9/12/2024	
Semivolatile Organic Compounds (ug/kg)	Polycyclic Aromatic Hydrocarbon SGV at 2% TOC (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)	
2,4-Dinitrophenol	NC		530	U	750	U	790	U	760	U	630	U	1,400	U	850	U
Benzo(A)anthracene	16,820		172		103	J	73.2	J	241		130	U	290	U	170	U
Benzo(A)pyrene	19,340		188		127	J	80.8	J	249		130	U	290	U	170	U
Benzo(B)fluoranthene	19,580		238		136	J	89.4	J	283		130	U	290	U	170	U
Benzo(G,H,I)perylene	21,900		170		100	J	160	U	204		130	U	290	U	170	U
Benzo(K)fluoranthene	19,600		97.3	J	94.8	J	160	U	91.4	J	130	U	290	U	170	U
Bis(2-ethylhexyl) phthalate	NC		965		94.9		228	J	1,850		250	U	89.6	J	355	
Chrysene	16,860		182		109	J	73.4	J	271		130	U	290	U	170	U
Fluoranthene	14,160		361		109		97.5	J	551		130	U	290	U	170	U
Indeno(1,2,3-CD)pyrene	22,300		126		80.3	J	160	U	142	J	130	U	290	U	170	U
Phenanthrene	11,940		133		150	U	160	U	155		130	U	290	U	170	U
Pyrene	13,960		366		236		121	J	617		54.4	J	290	U	170	U

Notes
ug/kg - micrograms per kilogram
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Saltwater Sediment Guidance Values and the Sediment Guidance Values for Polycyclic Aromatic Hydrocarbons
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 9
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Semivolatile Organic Compounds from
0-6 Inch Depth Interval

	Sample Location:	Tidal Marsh and Tributary													
	Sample ID:	BK3-SD-08 (0-6")		BK3-SD-09 (0-6")		BK3-SD-10 (0-6")		BK3-SD-11 (0-6")		BK3-SD-12 (0-6")					
	Sample Depth	0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch					
	Date Sample Collected:	9/13/2024		9/13/2024		9/12/2024		9/13/2024		9/13/2024					
Semivolatile Organic Compounds (ug/kg)	Polycyclic Aromatic Hydrocarbon SGV at 2% TOC (ug/kg)	Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)					
2,4-Dinitrophenol	NC	2000	U	2,400	U	360	U	1,800	U	1,100	U				
Benzo(A)anthracene	16,820	182	J	470	U	318		360	U	201	J				
Benzo(A)pyrene	19,340	400	U	470	U	296		360	U	246					
Benzo(B)fluoranthene	19,580	400	U	470	U	365		360	U	383					
Benzo(G,H,I)perylene	21,900	400	U	470	U	194		360	U	264					
Benzo(K)fluoranthene	19,600	400	U	470	U	240		360	U	220	U				
Bis(2-ethylhexyl) phthalate	NC	242	J	950	U	4,280		136	J	682					
Chrysene	16,860	400	J	470	U	382		360	U	210	J				
Fluoranthene	14,160	233	J	470	U	769		360	U	392					
Indeno(1,2,3-CD)pyrene	22,300	400	U	470	U	188		360	U	189	J				
Phenanthrene	11,940	400	U	470	U	611		360	U	180	J				
Pyrene	13,960	231	J	470	U	734		360	U	438					

Notes
ug/kg - micrograms per kilogram
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Saltwater Sediment Guidance Values and the Sediment Guidance Values for Polycyclic Aromatic Hydrocarbons
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 9
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Semivolatile Organic Compounds from
6-12 Inch Depth Interval

	Sample Location:	Richmond Creek													
	Sample ID:	**BK3-SD-01 (6-12")**		**BK3-SD-02 (6-12")**		**BK3-SD-03 (6-12")**		**BK3-SD-04 (6-12")**		**BK3-SD-05 (6-12")**		**BK3-SD-06 (6-12")**		**BK3-SD-07 (6-12")**	
	Sample Depth	6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch	
	Date Sample Collected:	9/13/2024		9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/12/2024		9/12/2024	
Semivolatile Organic Compounds (ug/kg)	Polycyclic Aromatic Hydrocarbon SGV at 2% TOC (ug/kg)	Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)	
2,4-Dinitrophenol	NC	390	U	850	U	720	U	710	U	660	U	1,800	U	450	U
Benzo(A)anthracene	16,820	557		59.4	J	99.0	J	140	U	130	U	360	U	89	U
Benzo(A)pyrene	19,340	472		170	U	117	J	140	U	130	U	360	U	89	U
Benzo(B)fluoranthene	19,580	603		170	U	125	J	140	U	130	U	360	U	89	U
Benzo(G,H,I)perylene	21,900	291		170	U	92.5	J	140	U	130	U	360	U	89	U
Benzo(K)fluoranthene	19,600	218		170	U	101	J	140	U	130	U	360	U	89	U
Bis(2-ethylhexyl) phthalate	NC	1,490		764		647		280	U	260	U	720	U	45.5	J
Chrysene	16,860	605		55.6	J	110	J	140	U	130	U	360	U	89	J
Fluoranthene	14,160	1,590		122	J	215		140	U	61.1	J	360	U	89	U
Indeno(1,2,3-CD)pyrene	22,300	258		170	U	86.5	J	140	U	130	U	360	U	89	U
Phenanthrene	11,940	906		170	U	54.6	J	140	U	130	U	360	U	89	U
Pyrene	13,960	1,460		138	J	256		140	U	77.4	J	360	U	89	U

Notes
ug/kg - micrograms per kilogram
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Saltwater Sediment Guidance Values and the Sediment Guidance Values for Polycyclic Aromatic Hydrocarbons
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 9
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Semivolatile Organic Compounds from
6-12 Inch Depth Interval

	Sample Location:	Tidal Marsh and Tributary									
	Sample ID:	**BK3-SD-08 (6-12")**		**BK3-SD-09 (6-12")**		**BK3-SD-10 (6-12")**		**BK3-SD-11 (6-12")**		**BK3-SD-12 (6-12")**	
	Sample Depth	6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch	
	Date Sample Collected:	9/13/2024		9/13/2024		9/12/2024		9/13/2024		9/13/2024	
Semivolatile Organic Compounds (ug/kg)	Polycyclic Aromatic Hydrocarbon SGV at 2% TOC (ug/kg)	Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)	
2,4-Dinitrophenol	NC	1,600	U	330	U	200	U	1,800	U	860	U
Benzo(A)anthracene	16,820	320	U	65	U	41.1		370	U	80.1	J
Benzo(A)pyrene	19,340	320	U	65	U	44.4		370	U	170	U
Benzo(B)fluoranthene	19,580	320	U	65	U	44.9		370	U	77.5	J
Benzo(G,H,I)perylene	21,900	320	U	65	U	36.8	J	370	U	170	U
Benzo(K)fluoranthene	19,600	320	U	65	U	35.4	J	370	U	170	U
Bis(2-ethylhexyl) phthalate	NC	640	U	130	U	248		740	U	119	J
Chrysene	16,860	320	U	65	U	48.4		370	U	170	U
Fluoranthene	14,160	320	U	65	U	72.5		370	U	104	J
Indeno(1,2,3-CD)pyrene	22,300	320	U	65	U	30.7	J	370	U	170	U
Phenanthrene	11,940	320	U	65	U	32.0	J	370	U	60	J
Pyrene	13,960	320	U	65	U	87.3		370	U	106	J

Notes
ug/kg - micrograms per kilogram
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Saltwater Sediment Guidance Values and the Sediment Guidance Values for Polycyclic Aromatic Hydrocarbons
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 9c
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Semivolatile Organic Compounds from
24-30 Inch Depth Interval

	Sample Location:	Richmond Creek												Tidal Marsh and Tributary				QA/QC			
	Sample ID:	BK3-SD-02 (24-30")		BK3-SD-03 (24-30")		BK3-SD-04 (24-29")		BK3-SD-05 (24-26")		BK3-SD-07 (24-27")		BK3-SD-08 (24-30")		BK3-SD-12 (24-30")		BK3-SD-DUP		BK3-SD-DUP-02			
	Sample Depth	24-30 inch		24-30 inch		24-30 inch		24-30 inch		24-30 inch		24-30 inch		24-30 inch		24-30 inch		24-30 inch			
	Date Sample Collected:	9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/13/2024			
Semivolatile Organic Compounds (ug/kg)	Polycyclic Aromatic Hydrocarbon SGV at 2% TOC (ug/kg)	Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)		Results (ug/kg)			
2,4-Dinitrophenol	NC	390	U	79	U	660	U	560	U	260	U	850	U	710	U	650	U	890	U		
Benzo(A)anthracene	16,820	790	U	125	J	85.6	J	111	U	53	U	170	U	140	U	38	J	180	U		
Benzo(A)pyrene	19,340	790	U	125	J	77.8	J	111	U	53	U	170	U	140	U	130	U	180	U		
Benzo(B)fluoranthene	19,580	790	U	123	J	85.7	J	111	U	53	U	170	U	140	U	130	U	180	U		
Benzo(G,H,I)perylene	21,900	790	U	97.4	J	130	U	111	U	53	U	170	U	140	U	130	U	180	U		
Benzo(K)fluoranthene	19,600	790	U	83.9	J	130	U	111	U	53	U	170	U	140	U	130	U	180	U		
Bis(2-ethylhexyl) phthalate	NC	479	U	3,070		260	U	27.6	J	110	U	340	U	280	U	130	U	360	U		
Chrysene	16,860	27.4	J	146	J	67.1	J	111	U	53	U	170	U	140	U	59.7	J	180	U		
Fluoranthene	14,160	37	J	287		156		111	U	53	U	170	U	140	U	130	U	180	U		
Indeno(1,2,3-CD)pyrene	22,300	79	U	77.5	J	130	U	111	U	53	U	170	U	140	U	130	U	180	U		
Phenanthrene	11,940	79	U	80.9	J	130	U	111	U	53	U	170	U	140	U	72.5	J	180	U		
Pyrene	13,960	49.9	J	364		156		48.0	J	53	U	170	U	140	U	1,220		180	U		

Notes
ug/kg - micrograms per kilogram
BK3-SD-DUP is a duplicate sample of BK3-SD-03 (24-30")
BK3-SD-DUP-02 is a duplicate sample of BK3-SD-12 (24-30")
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Saltwater Sediment Guidance Values and the Sediment Guidance Values for Polycyclic Aromatic Hydrocarbons
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 10
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Pesticides

Richmond Creek Sample Results (ug/kg)							
Sample Location	Sample ID	Σ DDT	Σ Chlordane	Dieldrin	Endrin Aldehyde	Endosulfan-II	Σ Heptachlor
BK3-SD-1	BK3-SD-01 (0-6')	22.4	2.07	1.1	ND	**0.9**	3.8
	BK3-SD-01 (6-12')	7.27	1.74	0.47 J	ND	**0.32 J**	1.4
BK3-SD-2	BK3-SD-02 (0-6')	6.19 J	0.73	0.52 J	0.77 J	ND	1.3
	BK3-SD-02 (6-12')	5.75 J	1.2 J	0.6 J	ND	ND	1.5
	BK3-SD-02 (24-30')	7.87 J	0.28 J	0.84 J	ND	**0.60 J**	1.5
BK3-SD-3	BK3-SD-03 (0-6')	17.6 J	3.4 J	1.0 J	1.1 J	ND	2.4
	BK3-SD-03 (6-12')	15.67 J	2.08 J	1.0 J	1.2	ND	2.4
	BK3-SD-03 (24-30')	19.3 J	0.98 J	1.4	ND	**0.64 J**	3.1
BK3-SD-4	BK3-SD-04 (0-6')	**112.8**	1.93 J	2.7	ND	**1.4**	11.2
	BK3-SD-04 (6-12')	34.45 J	0.55 J	0.53 J	ND	**0.41 J**	2.63 J
	BK3-SD-04 (24-29')	0.52 J	ND	ND	ND	ND	ND
BK3-SD-5	BK3-SD-05 (0-6')	9.3 J	ND	ND	ND	ND	ND
	BK3-SD-05 (6-12')	0.72 J	ND	ND	ND	ND	ND
	BK3-SD-05 (24-26')	ND	ND	ND	ND	ND	ND
BK3-SD-6	BK3-SD-06 (0-6')	4.1 J	0.39 J	ND	ND	ND	ND
	BK3-SD-06 (6-12')	ND	ND	ND	ND	ND	ND
BK3-SD-7	BK3-SD-07 (0-6')	ND	ND	ND	ND	ND	ND
	BK3-SD-07 (6-12')	ND	ND	ND	ND	ND	ND
	BK3-SD-07 (24-27')	ND	ND	ND	ND	ND	ND

Notes:

ug/kg = Micrograms per kilogram.
Σ DDT = Sum of 4,4'-DDD , 4,4'-DDE, and 4,4'-DDT detected.
Σ Chlordane = Sum of alpha and gamma Chlordane detected.
ND = Not Detected.
J = Estimated .
SGV = Sediment Guidance Value.
Bold Font = Result exceeds Class A SGV.

Saltwater SGVs for Detected Compounds, ug/kg			
Compound	Class A	Class B	Class C
Σ DDT	<44	44-5,700	>5,700
Σ Chlordane	<63	63-1,400	>1,400
Dieldrin	<6	6 -2,300	>2,300
Endrin Aldehyde	<6	6.0-96	>96
Endosulfan	<0.1	0.1-3	>3
Heptaclor	<71	71-1,100	>1,100

Table 10
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Pesticides

Tidal Marsh / Tributary Sample Results, ug/kg							
Sample Location	Sample ID	Σ DDT	Σ Chlordane	Dieldrin	Endrin Aldehyde	Endosulfan-II	Σ Heptachlor
BK3-SD-8	BK3-SD-08 (0-6')	**51.7**	2.47	1.5 J	ND	**1.9 J**	1.0 J
	BK3-SD-08 (6-12')	0.83	ND	ND	ND	ND	ND
	BK3-SD-08 (24-30')	0.19 J	ND	ND	ND	ND	ND
BK3-SD-9	BK3-SD-09 (0-6')	18.4	ND	0.99 J	ND	ND	ND
	BK3-SD-09 (6-12')	0.34 J	ND	ND	ND	ND	ND
BK3-SD-10	BK3-SD-10 (0-6')	7.5 J	15.6	0.93	0.45 J	ND	1.5
	BK3-SD-10 (6-12')	7.23 J	13.8	ND	ND	ND	0.9
BK3-SD-11	BK3-SD-11 (0-6')	1.27 J	ND	ND	ND	ND	ND
	BK3-SD-11 (6-12')	2.2 J	ND	ND	ND	ND	ND
BK3-SD-12	BK3-SD-12 (0-6')	24.5 J	2.1 J	0.46 J	ND	ND	1.2 J
	BK3-SD-12 (6-12')	41.9 J	2.8 J	0.67 J	ND	**0.28 J**	1.2 J
	BK3-SD-12 (24-30')	ND	ND	ND	ND	ND	ND

Notes:
ug/kg = Micrograms per kilogram.
Σ DDT = Sum of 4,4'-DDD , 4,4'-DDE, and 4,4'-DDT detected.
Σ Chlordane = Sum of alpha and gamma Chlordane detected.
ND = Not Detected.
J = Estimated .
SGV = Sediment Guidance Value.
Bold Font = Result exceeds Class A SGV.

Saltwater SGVs for Detected Compounds, ug/kg			
Compound	Class A	Class B	Class C
Σ DDT	<44	44-5,700	>5,700
Σ Chlordane	<63	63-1,400	>1,400
Dieldrin	<6	6 -2,300	>2,300
Endrin Aldehyde	<6	6.0-96	>96
Endosulfan	<0.1	0.1-3	>3
Heptaclor	<71	71-1,100	>1,100

Table 11
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Total Polychlorinated Biphenyls

Richmond Creek Sample Results, ug/kg		
Sample Location	Sample ID	[Total PCB] (ug/kg)
BK3-SD-1	BK3-SD-01 (0-6')	**187.4 J**
	BK3-SD-01 (6-12')	90.4 J
BK3-SD-2	BK3-SD-02 (0-6')	17.8 J
	BK3-SD-02 (6-12')	25.9 J
	BK3-SD-02 (24-30')	**151.8 J**
BK3-SD-3	BK3-SD-03 (0-6')	31.3 J
	BK3-SD-03 (6-12')	70.2 J
	BK3-SD-03 (24-30')	**228.9 J**
BK3-SD-4	BK3-SD-04 (0-6')	**328.7 J**
	BK3-SD-04 (6-12')	22.3 J
	BK3-SD-04 (24-29')	ND
BK3-SD-5	BK3-SD-05 (0-6')	ND
	BK3-SD-05 (6-12')	ND
	BK3-SD-05 (24-26')	ND
BK3-SD-6	BK3-SD-06 (0-6')	ND
	BK3-SD-06 (6-12')	ND
BK3-SD-7	BK3-SD-07 (0-6')	ND
	BK3-SD-07 (6-12')	ND
	BK3-SD-07 (24-27')	ND

Tidal Marsh / Tributary Sample Results		
Sample Location	Sample ID	[Total PCB] (ug/kg)
BK3-SD-8	BK3-SD-08 (0-6')	ND
	BK3-SD-08 (6-12')	ND
	BK3-SD-08 (24-30')	ND
BK3-SD-9	BK3-SD-09 (0-6')	ND
	BK3-SD-09 (6-12')	ND
BK3-SD-10	BK3-SD-10 (0-6')	39.0 J
	BK3-SD-10 (6-12')	35.9 J
BK3-SD-11	BK3-SD-11 (0-6')	ND
	BK3-SD-11 (6-12')	ND
BK3-SD-12	BK3-SD-12 (0-6')	ND
	BK3-SD-12 (6-12')	34.5 J
	BK3-SD-12 (24-30')	ND

Saltwater SGVs for Total PCBs, ug/kg		
Class A	Class B	Class C
<100	100-1,000	1,000

Notes:

ug/kg = Micrograms per kilogram.
PCB = Polychlorinated Biphenyls.
[Total PCB] = Total PCB concentration.
ND = Not Detected.
SGV = Sediment Guidance Value.
Bold Font = Result exceeds Class A SGV.
J = Estimated Value.

Table 12
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Metals for
0-6 Inch Depth Interval

				Sample Location:		Richmond Creek													
				Sample ID:		BK3-SD-01 (0-6")		BK3-SD-02 (0-6")		BK3-SD-03 (0-6")		BK3-SD-04 (0-6")		BK3-SD-05 (0-6")		BK3-SD-06 (0-6")		BK3-SD-07 (0-6")	
				Sample Depth		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch	
				Date Sample Collected:		9/13/2024		9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/12/2024		9/12/2024	
Metals (mg/kg)	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	4,620		19,800		17,300		12,100		12,600		12,900		16,400			
Antimony	NC	NC	NC	2.30	U	6.20	U	6.70	U	4.90	U	5.00	U	11.0	U	6.90	U		
Arsenic	<8.2	8.2-70	>70	**9.20**		**41.3**		**34.2**		**52.7**		**173**		**25.5**		**11.5**			
Barium	NC	NC	NC	53.2		271		184		236		100		130		161			
Beryllium	NC	NC	NC	0.390		1.60		1.40		1.00		1.00		1.10	U	1.30			
Cadmium	<1.2	1.2-9.6	>9.6	**1.90**		**9.70**		**6.70**		**7.00**		**2.20**		**3.50**		1.70	U		
Calcium	NC	NC	NC	3,780		24,300		7,920		3,430		2,030		7,480		3,460			
Chromium	<81	81-370	>370	60.3		**178**		**158**		**131**		**86.5**		**109**		**109**			
Cobalt	NC	NC	NC	6.30		18.1		17.0	U	15.5		15.4		27.0	U	45.5			
Copper	<34	34-270	>270	**100**		**506**		413		288		272		231		21.1			
Iron	NC	NC	NC	13,600		51,800		46,800		28,700		41,100		36,200		37,300			
Lead	<47	47-220	>220	**90.8**		**342**		**265**		**238**		**273**		**159**		36.5			
Magnesium	NC	NC	NC	5,810		13,100		12,600		6,810		6,640		10,900		10,600			
Manganese	NC	NC	NC	112		498		408		233		327		341		329			
Mercury	<0.15	0.15-0.71	>0.71	**1.90**		**5.20**		**4.20**		**10.0**		**5.10**		**3.00**		0.110	U		
Nickel	<21	21-52	>52	**41.9**		**96.1**		**100**		**131**		**86.0**		**111**		**498**			
Potassium	NC	NC	NC	1,200	U	3,980		3,610		2,400	U	2,620		5,400	U	3,400	U		
Selenium	NC	NC	NC	2.30	U	6.20	U	6.70	U	4.90		7.90		11.0	U	6.90	U		
Silver	<1.0	1.0-3.7	>3.7	**1.20**		**5.80**		**3.90**		**2.60**		**1.80**		2.70	U	1.70	U		
Sodium	NC	NC	NC	3,640		17,500		17,700		5,930		9,110		18,100		3,400	U		
Thallium	NC	NC	NC	1.20	U	3.10	U	3.30	U	2.40	U	2.50	U	5.40	U	3.40	U		
Vanadium	NC	NC	NC	17.5		62.4		50.2		54.6		40.9		46.3		52.5			
Zinc	<150	150-410	>410	**183**		**784**		**630**		**542**		**383**		**349**		85.7			

Notes
mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 12A
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Metals for
0-6 Inch Depth Interval

				Sample Location:		Tidal Marsh and Tributary									
				Sample ID:		BK3-SD-08 (0-6")		BK3-SD-09 (0-6")		BK3-SD-10 (0-6")		BK3-SD-11 (0-6")		BK3-SD-12 (0-6")	
				Sample Depth		0-6 inch		0-6 inch		0-6 inch		0-6 inch		0-6 inch	
				Date Sample Collected:		9/13/2024		9/13/2024		9/12/2024		9/13/2024		9/13/2024	
Metals (mg/kg)	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC		13,200		4,390		5,510		13,600		15,000	
Antimony	NC	NC	NC		8.90	U	18.0	U	3.10	U	12.0	U	6.90	U
Arsenic	<8.2	8.2-70	>70		**93.0**		**96.40**		7.20		**87.5**		**46.7**	
Barium	NC	NC	NC		109		180	U	248		120	U	120	
Beryllium	NC	NC	NC		1.20		1.80	U	0.420		1.20	U	1.10	
Cadmium	<1.2	1.2-9.6	>9.6		2.20	U	**7.20**		0.790		3.00	U	**1.90**	
Calcium	NC	NC	NC		4,320		6,130		15,400		3,530		2,510	
Chromium	<81	81-370	>370		**113**		37.6		42.7		78.3		**158**	
Cobalt	NC	NC	NC		26.2		46.00	U	7.80	U	30.6		17.0	U
Copper	<34	34-270	>270		556		439		73.9		290		326	
Iron	NC	NC	NC		32,400		14,100		18,600		31,700		29,900	
Lead	<47	47-220	>220		**720**		**172**		**162**		**205**		**314**	
Magnesium	NC	NC	NC		9,430		8,540		10,700		7,820		7,310	
Manganese	NC	NC	NC		363		93.1		165		246		303	
Mercury	<0.15	0.15-0.71	>0.71		**3.80**		**1.00**		**0.550**		**2.30**		**9.60**	
Nickel	<21	21-52	>52		**123**		**80.6**		**30.8**		**251**		**65.5**	
Potassium	NC	NC	NC		4,500	U	9,200	U	1,600	U	5,900	U	3,400	U
Selenium	NC	NC	NC		13.9		19.0		3.10	U	21.8		6.90	U
Silver	<1.0	1.0-3.7	>3.7		**2.60**		4.60	U	0.780	U	3.00	U	**3.70**	
Sodium	NC	NC	NC		28,700		42,100		3,820		23,300		11,800	
Thallium	NC	NC	NC		4.50	U	9.20	U	1.60	U	5.90	U	3.40	U
Vanadium	NC	NC	NC		67.1		46.0	U	20.5		52.3		58.4	
Zinc	<150	150-410	>410		**410**		**519**		**171**		**743**		**340**	

Notes
mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 12
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Metals for
6-12 Inch Depth Interval

				Sample Location:		Richmond Creek											
				Sample ID:		BK3-SD-01 (6-12")		BK3-SD-02 (6-12")		BK3-SD-03 (6-12")		BK3-SD-04 (6-12")		BK3-SD-05 (6-12")		BK3-SD-06 (6-12")		BK3-SD-07 (6-12")	
				Sample Depth(inches)		6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch	
				Date Sample Collected:		9/13/2024		9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/12/2024		9/12/2024	
Metals (mg/kg)	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC		3,070		23,500		14,700		10,500		16,300		5,630		9,900	
Antimony	NC	NC	NC		1.80	U	7.00	U	6.90	U	3.60	U	4.80	U	15.0	U	3.40	U
Arsenic	<8.2	8.2-70	>70		4.90		**51.2**		**74.8**		**35.9**		**111**		15.0	U	6.20	
Barium	NC	NC	NC		33.9		327.0		137		110		153		150	U	84.8	
Beryllium	NC	NC	NC		0.260		2.00		1.10		0.870		1.40		1.50	U	0.740	
Cadmium	<1.2	1.2-9.6	>9.6		1.10		**11.8**		**1.90**		**1.70**		**2.80**		3.70	U	0.860	U
Calcium	NC	NC	NC		1,860		11,100		2,260		4,060		2,260		8,990		1,700	
Chromium	<81	81-370	>370		42.8		**205**		**170**		56.4		78.6		47.6		74.6	
Cobalt	NC	NC	NC		4.50	U	23.4		17.0		11.5		18.1		37.0	U	29.5	
Copper	<34	34-270	>270		**53.7**		**593**		**353**		**184**		**377**		25.7		15.8	
Iron	NC	NC	NC		8890		59,500		30,600		24,800		42,000		35,600		23,500	
Lead	<47	47-220	>220		**48.2**		**411**		**316**		**114**		**251**		15.0	U	24.9	
Magnesium	NC	NC	NC		2,670		15,200		6,410		6,080		7,980		7,710		11,800	
Manganese	NC	NC	NC		72.5		591		292		298		572		158		247	
Mercury	<0.15	0.15-0.71	>0.71		**0.580**		**5.20**		**10.4**		**2.40**		**1.80**		**0.210**		0.0540	U
Nickel	<21	21-52	>52		17.6		**123**		**89.5**		**83.3**		**102**		**166**		**386**	
Potassium	NC	NC	NC		910	U	4,600		3,500	U	2,130		3,160		7,400	U	1,700	U
Selenium	NC	NC	NC		1.80	U	7.00	U	12.0		6.50		8.80		15.0	U	3.40	U
Silver	<1.0	1.0-3.7	>3.7		0.59		**6.70**		**3.30**		1.00		**1.60**		3.70	U	0.860	U
Sodium	NC	NC	NC		1,790		18,700		9,510		3,130		5,620		16,100		1,700	U
Thallium	NC	NC	NC		0.910	U	3.50	U	3.50	U	1.80	U	2.40	U	7.40	U	1.70	U
Vanadium	NC	NC	NC		12.5		80.5		61.7		29.7		40.9		45.2		34.9	
Zinc	<150	150-410	>410		112		**949.0**		**389**		**285**		**532**		37.0	U	52.1	

Notes
mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 12
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Metals for
6-12 Inch Depth Interval

			Sample Location:	Tidal Marsh and Tributary									
			Sample ID:	BK3-SD-08 (6-12")		BK3-SD-09 (6-12")		BK3-SD-10 (6-12")		BK3-SD-11 (6-12")		BK3-SD-12 (6-12")	
			Sample Depth(inches)	6-12 inch		6-12 inch		6-12 inch		6-12 inch		6-12 inch	
			Date Sample Collected:	9/13/2024		9/13/2024		9/12/2024		9/13/2024		9/13/2024	
Metals (mg/kg)	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	14,700		7,920		2,090		14,900		14,700	
Antimony	NC	NC	NC	12.0	U	3.40	U	2.50	U	12.0	U	6.90	U
Arsenic	<8.2	8.2-70	>70	**19.1**		4.30		3.10		**57.5**		**74.8**	
Barium	NC	NC	NC	120	U	34.0	U	25.0	U	120	U	137	
Beryllium	NC	NC	NC	1.20	U	0.58		0.250	U	1.20	U	1.10	
Cadmium	<1.2	1.2-9.6	>9.6	3.00	U	0.85	U	0.630	U	3.00	U	**1.90**	
Calcium	NC	NC	NC	3,000	U	977		9,040		4,090		2,260	
Chromium	<81	81-370	>370	34.9		15.0		13.9		41.7		**170**	
Cobalt	NC	NC	NC	30.0	U	8.50	U	6.30	U	30.0	U	17.0	
Copper	<34	34-270	>270	**51.8**		10.1		19.8		**87.8**		**353**	
Iron	NC	NC	NC	30,000		10,700		9,970		20,900		30,600	
Lead	<47	47-220	>220	**52.9**		9.50		38.3		**81.0**		**316**	
Magnesium	NC	NC	NC	8,410		2,670		6,150		8,470		6,410	
Manganese	NC	NC	NC	435		84.8		110		181		292	
Mercury	<0.15	0.15-0.71	>0.71	**0.220**		0.043	U	0.04	U	**0.190**		**10.4**	
Nickel	<21	21-52	>52	**49.3**		15.8		**24.6**		**204**		**89.5**	
Potassium	NC	NC	NC	6,000	U	1,700	U	1,300	U	6,100	U	3,500	U
Selenium	NC	NC	NC	12.0	U	3.40	U	2.50	U	14.1		12.0	
Silver	<1.0	1.0-3.7	>3.7	3.00	U	0.850	U	0.630	U	3.00	U	**3.30**	
Sodium	NC	NC	NC	22,500		3,530		1,790		22,200		9,510	
Thallium	NC	NC	NC	6.00	U	1.70	U	1.30	U	6.10	U	3.50	U
Vanadium	NC	NC	NC	47.7		20.4		11.8		42.5		61.7	
Zinc	<150	150-410	>410	111		26.9		93.8		**349**		**389**	

Notes
mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 12c
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Metals for
24-30 Inch Depth Interval

				Sample Location:		Richmond Creek										
				Sample ID:		BK3-SD-02 (24-30")		BK3-SD-03 (24-30")		BK3-SD-DUP		BK3-SD-04 (24-29")		BK3-SD-05 (24-26")		BK3-SD-07 (24-27")	
				Sample Depth		24-30 inch		24-30 inch		24-30 inch		24-29 inch		24-26 inch		24-27 inch	
				Date Sample Collected:		9/12/2024		9/12/2024		9/12/2024		9/13/2024		9/12/2024		9/12/2024	
Metals (mg/kg)	Class A Saltwater SGVs	Class B Saltwater SGVs	Class C Saltwater SGVs	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	15,300		27,100		28,000		11,100		14,900		5,770			
Antimony	NC	NC	NC	4.90	U	6.50	U	5.40	U	4.00	U	4.30	U	3.40	U		
Arsenic	<8.2	8.2-70	>70	**32.4**		**75.9**		**57.6**		**43.2**		**52.8**		4.70			
Barium	NC	NC	NC	236		490		450		98.4		60.7		94.8			
Beryllium	NC	NC	NC	1.30		2.40		2.00		0.870		1.00		0.470			
Cadmium	<1.2	1.2-9.6	>9.6	**9.80**		**18.7**		**17.0**		**1.30**		1.10	U	0.850	U		
Calcium	NC	NC	NC	7,310		7,580		8,280		1,660		3,240		3,480			
Chromium	<81	81-370	>370	**163**		**306**		**266**		76.2		61.3		38.3			
Cobalt	NC	NC	NC	13.7		29.6		25.0		12.3		12.5		10.5			
Copper	<34	34-270	>270	**439**		**851**		**744**		**167**		**127**		8.30			
Iron	NC	NC	NC	34,900		63,500		53,200		25,100		32,100		14,400			
Lead	<47	47-220	>220	**284**		**601**		**542**		**120**		**132**		11.9			
Magnesium	NC	NC	NC	9,230		14,000		12,500		5,520		6,550		4,670			
Manganese	NC	NC	NC	339		450		407		170		293		179			
Mercury	<0.15	0.15-0.71	>0.71	**5.70**		**9.30**		**6.00**		**1.20**		**1.70**		0.0450	U		
Nickel	<21	21-52	>52	**82.8**		**232**		**193**		**101**		**90.8**		**104**			
Potassium	NC	NC	NC	2,780		4,660		3,960		2,000	U	2,460		1,700	U		
Selenium	NC	NC	NC	4.90	U	7.70		7.00		5.80		4.30	U	3.40	U		
Silver	<1.0	1.0-3.7	>3.7	**5.30**		**7.60**		**7.20**		0.990	U	1.10	U	0.850	U		
Sodium	NC	NC	NC	8,720		8,550		7,560		3,380		3,180		1,700	U		
Thallium	NC	NC	NC	2.40	U	3.20	U	2.70	U	2.00	U	2.10	U	1.70	U		
Vanadium	NC	NC	NC	51.5		104		83.6		28.9		34.0		19.5			
Zinc	<150	150-410	>410	**619**		**1,110**		**961**		**252**		**251**		46.1			

Notes
mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
BK3-SD-DUP is a duplicate sample of BK3-SD-03 (24-30")
BK3-SD-DUP-02 is a duplicate sample of BK3-SD-12 (24-30")
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 12c
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Sediment Sampling Analytical Results for Metals for
24-30 Inch Depth Interval

				Sample Location:		Tidal Marsh and Tributary			
				Sample ID:		BK3-SD-08 (24-30")		BK3-SD-12 (24-30")	
				Sample Depth		24-30 inch		24-30 inch	
				Date Sample Collected:		9/13/2024		9/13/2024	
Metals (mg/kg)	Class A Saltwater SGVs	Class B Saltwater SGVs	Class C Saltwater SGVs	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	14,800		14,600		15,400	
Antimony	NC	NC	NC	5.60	U	5.70	U	6.10	U
Arsenic	<8.2	8.2-70	>70	**16.4**		**8.40**		7.60	
Barium	NC	NC	NC	56.0	U	57.0	U	61.0	U
Beryllium	NC	NC	NC	0.920		0.880		0.880	
Cadmium	<1.2	1.2-9.6	>9.6	1.40	U	1.40	U	1.50	U
Calcium	NC	NC	NC	1,860		1,730		1,770	
Chromium	<81	81-370	>370	32.8		31.6		33.3	
Cobalt	NC	NC	NC	14.0	U	14.0	U	15.0	U
Copper	<34	34-270	>270	17.0		10.9		10.8	
Iron	NC	NC	NC	35,900		29,400		29,200	
Lead	<47	47-220	>220	15.2		12.8		12.1	
Magnesium	NC	NC	NC	7,080		6,150		6,530	
Manganese	NC	NC	NC	388		335		366	
Mercury	<0.15	0.15-0.71	>0.71	0.0870	U	0.0870	U	0.0860	U
Nickel	<21	21-52	>52	**33.5**		**30.9**		**33.1**	
Potassium	NC	NC	NC	3,330		3,230		3,310	
Selenium	NC	NC	NC	5.60	U	5.70	U	6.10	U
Silver	<1.0	1.0-3.7	>3.7	1.40	U	1.40	U	1.50	U
Sodium	NC	NC	NC	9,910		4,880		4,680	
Thallium	NC	NC	NC	2.80	U	2.80	U	3.00	U
Vanadium	NC	NC	NC	38.4		37.9		38.6	
Zinc	<150	150-410	>410	71.4		66.0		65.2	

				Sample Location:		Tidal Marsh and Tributary
				Sample ID:		BK3-SD-DUP-02
				Sample Depth		24-30 inch
				Date Sample Collected:		9/13/2024
Metals (mg/kg)	Class A Saltwater SGVs	Class B Saltwater SGVs	Class C Saltwater SGVs	Results (mg/kg)		
Aluminum	NC	NC	NC	15,400		
Antimony	NC	NC	NC	6.10	U	
Arsenic	<8.2	8.2-70	>70	7.60		
Barium	NC	NC	NC	61.0	U	
Beryllium	NC	NC	NC	0.880		
Cadmium	<1.2	1.2-9.6	>9.6	1.50	U	
Calcium	NC	NC	NC	1,770		
Chromium	<81	81-370	>370	33.3		
Cobalt	NC	NC	NC	15.0	U	
Copper	<34	34-270	>270	10.8		
Iron	NC	NC	NC	29,200		
Lead	<47	47-220	>220	12.1		
Magnesium	NC	NC	NC	6,530		
Manganese	NC	NC	NC	366		
Mercury	<0.15	0.15-0.71	>0.71	0.0860	U	
Nickel	<21	21-52	>52	**33.1**		
Potassium	NC	NC	NC	3,310		
Selenium	NC	NC	NC	6.10	U	
Silver	<1.0	1.0-3.7	>3.7	1.50	U	
Sodium	NC	NC	NC	4,680		
Thallium	NC	NC	NC	3.00	U	
Vanadium	NC	NC	NC	38.6		
Zinc	<150	150-410	>410	65.2		

Notes
mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
BK3-SD-DUP is a duplicate sample of BK3-SD-03 (24-30")
BK3-SD-DUP-02 is a duplicate sample of BK3-SD-12 (24-30")
J - Estimated value
NC - No criterion
Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
TOC - Total Organic Carbon
U - Non-detect

Table 13
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Comparison of Sediment Sampling Analytical Data for Metals to Saltwater Sediment Guidance Values

SGV Metals	Saltwater SGVs, ug/kg			Range of Detections, ug/kg			Detections per SGV Class			Class C Exceedances by Depth		
	Class A	Class B	Class C	Min.	Max.	Avg.	Class A	Class B	Class C	0-6 In.	6-12 In.	24-30 In.
Arsenic	<8.2	8.2-70	>70	3	173	43	7	15	9	4	4	1
Cadmium	<1.2	1.2-9.6	>9.6	1	19	4	15	12	4	1	1	2
Chromium	<81	81-370	>370	14	306	98	18	13	0	0	0	0
Copper	<34	34-270	>270	8	851	243	18	6	7	1	4	2
Lead	<47	47-220	>220	10	720	194	8	11	12	6	4	2
Mercury	<0.15	0.15-0.71	>0.71	0	10	3	7	5	19	10	5	4
Nickel	<21	21-52	>52	16	498	117	2	6	23	10	8	5
Silver	<1.0	1.0-3.7	>3.7	1	8	3	18	8	5	2	1	2
Zinc	<150	150-410	>410	27	1,110	361	12	11	8	6	2	2

Notes:

Results are compared to the Class A, B, and C New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " values.

ug/kg - micrograms per kilogram

SGV - Sediment Guidance Value

Table 14
NYC Department of Parks and Recreation
Brookfield Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Comparison of 2013, 2018, and 2024 Surface Water Field Parameter Results

Field Parameters	Units	2013 Averages		2018 Averages		2024 Averages	
		High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature	°C	16.08	18.51	21.70	21.32	23.38	20.73
pH	SU	6.30	6.94	7.32	7.26	8.43	7.59
ORP	mV	256	183	177	126	116	186
Conductivity	mS/cm	30.2	48.9	15.1	9.20	20.58	20.74
Turbidity	NTU	15.0	200	12.5	74.7	40.9	58.7
DO	mg/L	9.35	7.65	7.39	6.23	21.33	11.66
TDS	g/L	NM	NM	9.4	5.7	12.6	12.8
Salinity	ppt	17.92	10.15	8.92	5.21	12.45	12.54

Notes:

ORP = Oxidation-Reduction Potential.
DO = Dissolved Oxygen.
TDS = Total Dissolved Solids.
°C = Degrees Celsius.
SU = Standard Units.
mV = MilliVolts.
mS/cm = microSiemens per centimeter.
NTU = Nephelometric Turbidity Units.
mg/L = Milligrams per Liter.
g/L = Grams per Liter.
ppt = Parts per thousand.
NM = Not Measured.

Table 15
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Summary of Comparison of 2013, 2018, and 2024 Surface Water Organic Parameter Results

Sample Location	Tide	Sample ID	[Total VOC]			[Total SVOC]			[Total Pesticide]			[Total PCB]		
			2013	2018	2024	2013	2018	2024	2013	2018	2024	2013	2018	2024
BK2-SW-1	High	BK2-SW-01	ND	ND	ND	0.251 J	ND	ND	ND	ND	ND	ND	ND	ND
	Low	BK2-SW-08	0.26 J	2.89 J	ND	1.604 J	ND	ND	0.0155 J	0.00628	ND	0.017	ND	ND
BK2-SW-2	High	BK2-SW-02	ND	5.01	ND	0.212 J	ND	ND	ND	ND	ND	0.0039 J	ND	ND
	Low	BK2-SW-09	0.27 J	ND	ND	0.553 J	ND	ND	0.0643 J	0.00620	ND	0.13	ND	ND
BK2-SW-3*	High	BK2-SW-03	ND	ND	ND	0.055 J	ND	ND	ND	ND	ND	ND	ND	ND
	Low	BK2-SW-10	ND	3.75 J	ND	0.220 J	ND	ND	0.0129 J	ND	ND	0.048	ND	ND
BK2-SW-4	High	BK2-SW-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Low	BK2-SW-11	0.52 J	ND	ND	0.690 J	ND	ND	0.041	ND	0.0045 J	0.13	ND	ND
BK2-SW-5	High	BK2-SW-05	ND	3.13 J	ND	0.054 J	ND	ND	ND	ND	ND	ND	ND	ND
	Low	BK2-SW-12	0.42 J	ND	ND	1.210 J	ND	ND	0.0141 J	ND	0.0051 J	0.052	ND	ND
BK2-SW-6	High	BK2-SW-06	ND	ND	ND	0.054 J	ND	ND	0.0013 J	ND	ND	0.053 J	ND	ND
	Low	BK2-SW-13	ND	2.56	1.5	0.396 J	ND	ND	0.0094 J	ND	ND	ND	ND	ND
BK2-SW-7	High	BK2-SW-07	ND	ND	ND	0.047 J	ND	ND	ND	ND	ND	ND	ND	ND
	Low	BK2-SW-14	ND	ND	ND	0.094 J	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Results are in units of micrograms per Liter (ug/L).
[Total VOC] = Total volatile organic compound concentration.
[Total SVOC] = Total semivolatile organic compound concentration.
[Total Pesticide] = Total pesticide-related compound concentration.
[Total PCB] = Total polychlorinated biphenyl concentration.
ND = Not Detected.
J = Estimated.
* = 2018 sample location approximately 400 feet upstream from 2013 location.

Table 16a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 High-Tide Surface-Water Sample Analytical Data for Metals

		Sample Location:	BK2-SW-01						BK2-SW-02						BK2-SW-03*						BK2-SW-04					
		Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
		Sample ID:	BK2-SW-01		BK2-SW-01		BK3-SW-01		BK2-SW-02		BK2-SW-02		BK3-SW-02		BK2-SW-03		BK2-SW-03		BK3-SW-03		BK2-SW-04		BK2-SW-04		BK3-SW-04	
Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	240	J	200	U	254		210	J	200	U	509		230	J	200	U	658		230	J	200	U	671	
Antimony	NC	NA	20	UJ	5	U	8.5		20	UJ	5	U	11.2		20	UJ	5	U	12.4		20	UJ	5	U	8.4	
Arsenic	NC	NA	19		4.3		11.3		32		3.95		15.0	U	21		6.91		15.5		20		6.59		11.5	
Barium	NC	NA	42	J	42.5		200	U	43	J	46.3		200	U	40	J	39.2		200	U	45	J	41.9		200	U
Beryllium	NC	NA	10	U	1	U	5	U	10	U	1	U	5	U	10	U	1	U	1	U	10	U	1	U	1	U
Cadmium	7.7	A(C)	10	U	4	U	3	U	10	U	4	U	3	U	10	U	4	U	15	U	10	U	4	U	3	U
Calcium	NC	NA	270,000		148,000		227,000		270,000		139,000		191,000		260,000		159,000		226,000		270,000		148,000		144,000	
Chromium	NC	NA	20	U	10	U	10	U	20	U	10	U	10	U	20	U	10	U	10	U	20	U	10	U	10	U
Cobalt	NC	NA	0.96	J	20	U	250	U	0.92	J	20	U	250	U	0.98	J	20	U	250	U	0.98	J	20	U	50	U
Copper	NC	NA	12	J	8	U	10	U	11	J	8	U	12.1		11	J	8	U	10.9		10	J	8	U	10	U
Iron	NC	NA	1,000	UJ	300	U	438		1,000	UJ	300	U	785		1,000	UJ	300	U	1,020		1,000	UJ	300	U	1,070	
Lead	NC	NA	10	UJ	5	U	60	U	10	UJ	5	U	150	U	10	UJ	5	U	15	U	10	UJ	5	U	150.0	U
Magnesium	NC	NA	820,000	J	440,000		689,000		820,000	J	411,000		624,000		790,000	J	493,000		672,000		820,000	J	454,000		434,000	
Manganese	NC	NA	91		92.3		104		90		97.1		134		87		81.9		165		110		92.2		217	
Mercury	NC	NA	0.08	J	0.5	U	0.2	U	0.082	J	0.5	U	0.2	U	0.067	J	0.5	U	0.2	U	0.073	J	0.5	U	0.2	
Nickel	NC	NA	4.4	J	10	U	50	U	4.5	J	10	U	50	U	4.8	J	10	U	50	U	5	J	10	U	10	U
Potassium	NC	NA	250,000		149,000		222,000		250,000		138,000		199,000		240,000		160,000		219,000		250,000	J	144,000		138,000	
Selenium	NC	NA	69		10	U	10	U	110		10	U	10	U	73		10	U	10	U	73		10	U	10	U
Silver	NC	NA	10	U	4	U	10	U	10	U	4	U	10	U	10	U	4	U	10	U	10	U	4	U	10	U
Sodium	NC	NA	6,500,000	J	4,040,000		5,530,000		6,600,000	J	3,800,000		5,110,000		6,600,000	J	2,830,000		5,300,000		6,600,000	J	4,350,000		3,330,000	
Thallium	NC	NA	10	U	2	U	50	U	10	U	2	U	50	U	10	U	2	U	50	U	10	UJ	2	U	10	U
Vanadium	NC	NA	10	UJ	20	U	50	U	10	UJ	20	U	50	U	10	UJ	20	U	50	U	10	UJ	20	U	50	U
Zinc	NC	NA	50	UJ	25	U	20	U	50	UJ	25	U	20	U	50	UJ	25	U	20	U	50	UJ	25	U	20	U

Notes

L - micrograms per liter

A(C) - Standard category for fish propagation.

Class SC - Saline (marine) surface waters

J - Estimated value.

NA - Not applicable

NC - No criterion

Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

Table 16a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 High-Tide Surface-Water Sample Analytical Data for Metals

		Sample Location:	BK2-SW-05						BK2-SW-06						BK2-SW-07					
		Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024	
		Sample ID:	BK2-SW-05		BK2-SW-05		BK3-SW-05		BK2-SW-06		BK2-SW-06		BK3-SW-06		BK2-SW-07		BK2-SW-07		BK3-SW-07	
Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	290	J	470		618		420		262		926		320	J	200	U	200	U
Antimony	NC	NA	20	UJ	5	U	11.7		20	UJ	5	U	9.6		0.35	J	5	U	6	U
Arsenic	NC	NA	20		6.15		15	U	20		6.35		15	U	13	J	3	U	3	U
Barium	NC	NA	48	J	48.2		200.0	U	56	J	54.6		200	U	120	J	92,6		200	U
Beryllium	NC	NA	10	U	1	U	1	U	10	U	1	U	1	U	0.057	J	1	U	1	U
Cadmium	7.7	A(C)	10	U	4	U	3	U	10	U	4	U	3	U	1	UJ	4	U	3	U
Calcium	NC	NA	250,000		82,200		188,000		260,000		121,000		174,000		92,000	J	27,200		30,600	
Chromium	NC	NA	20	U	10	U	10	U	20		10	U	10	U	8.3	J	10	U	10	U
Cobalt	NC	NA	1.1	J	20	U	250	U	1.2	J	20	U	50	U	1.1	J	20	U	50	U
Copper	NC	NA	12	J	15.9		10.7		15	J	8	U	12.4		7.6	J	8	U	10	U
Iron	NC	NA	1,000	UJ	1,040		999		1,000	UJ	421		1440		990	J	1,270		298	
Lead	NC	NA	10.0	UJ	12		15	U	10	UJ	5	U	15	U	5.9	J	5	U	3	U
Magnesium	NC	NA	770,000	J	218,000		602,000		800,000	J	342,000		562,000		230,000	J	28,900		44,400	
Manganese	NC	NA	120		157		181		150		136		192		650	J	277		146	
Mercury	NC	NA	0.091	J	0.5	U	0.2		0.14	J	0.5	U	0.2		0.06	J	0.5	U	0.2	U
Nickel	NC	NA	5	J	10	U	50	U	6.6	J	10	U	10	U	12	J	16.2		10	U
Potassium	NC	NA	230,000		70,200		200,000		240,000		114,000		178,000		61,000	J	3,250		10,000	U
Selenium	NC	NA	70		10	U	10	U	66		10	U	10	U	41	J	10	U	10	U
Silver	NC	NA	10	U	4	U	10	U	10	U	4	U	10	U	1	UJ	4	U	10	U
Sodium	NC	NA	6,300,000	J	2,200,000		4,860,000		6,400,000	J	3,150,000		4,320,000		1,500,000	J	80,100		107,000	
Thallium	NC	NA	10	UJ	2	U	50	U	10	UJ	2	U	10	U	1	UJ	2	U	10	U
Vanadium	NC	NA	10	UJ	20	U	50	U	10	UJ	20	U	50	U	9.9	J	20	U	50	U
Zinc	NC	NA	50	UJ	31.4		20	U	50	UJ	25	U	20.0	U	23	J	25	U	20	U

Notes

L - micrograms per liter

A(C) - Standard category for fish propagation.

Class SC - Saline (marine) surface waters

J - Estimated value.

NA - Not applicable

NC - No criterion

Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

Table 16b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Low-Tide Surface-Water Sample Analytical Data for Metals

		Sample Location:	BK2-SW-01						BK2-SW-02						BK2-SW-03*						BK2-SW-04					
		Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
		Sample ID:	BK2-SW-01		BK2-SW-01		BK3-SW-01		BK2-SW-02		BK2-SW-02		BK3-SW-02		BK2-SW-03		BK2-SW-03		BK3-SW-03		BK2-SW-04		BK2-SW-04		BK3-SW-04	
Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	20,000		200	U	762		7,000	J	200	U	509		1,300	J	200	U	658		35,000	J	470		671	
Antimony	NC	NA	20	UJ	5	U	10.1		20	UJ	5	U	11.2		2	UJ	5	U	12.4		3.2	J	5	U	8.4	
Arsenic	NC	NA	50		7.6		15	U	29	J	8.0		15.0	U	41	J	7.68		15.5		77	J	6.15		11.5	
Barium	NC	NA	290		53.5		200	U	180	J	56.4		200	U	88	J	55.1		200	U	590	J	48.2		200	U
Beryllium	NC	NA	2.1	J	1	U	1	U	10	U	1	U	5	U	0.46	J	1	U	1	U	3.3	J	1	U	1	U
Cadmium	7.7	A(C)	**8.6**	J	4	U	3	U	1.9	J	4	U	3	U	0.57	J	4	U	15	U	16	J	4	U	3	U
Calcium	NC	NA	240,000		116,000		191,000		220,000	J	91,500		191,000		240,000	J	116,000		226,000		230,000	J	82,200		144,000	
Chromium	NC	NA	180		10	U	10	U	64	J	10	U	10	U	13	J	10	U	10	U	290	J	10	U	10	U
Cobalt	NC	NA	19		20	U	50	U	7	J	20	U	250	U	1.9	J	20	U	250	U	29	J	20	U	50	U
Copper	NC	NA	490	J	8	U	16.1		190	J	8	U	12.1		30	J	8	U	10.9		750	J	15.9		10	U
Iron	NC	NA	60,000	J	344		1210		19,000	J	419		785		3,100	J	384		1,020		110,000	J	1,040		1,070	
Lead	NC	NA	410		6.18		60	U	120	J	6.1		150	U	20	J	8.23		15	U	710	J	12.0		150.0	U
Magnesium	NC	NA	670,000	J	332,000		640,000		630,000	J	243,000		624,000		710,000	J	331,000		672,000		610,000	J	218,000		434,000	
Manganese	NC	NA	620		149		141		660	J	197		134		290	J	153		165		1,400	J	157		217	
Mercury	NC	NA	9.6		0.5	U	0.2	U	2.4		0.5	U	0.2	U	0.29		0.5	U	0.2	U	13		0.5	U	0.2	
Nickel	NC	NA	97		10	U	10	U	36	J	10	U	50	U	14	J	10	U	50	U	180	J	10	U	10	U
Potassium	NC	NA	200,000		107,000		202,000		190,000	J	76,100		199,000		210,000	J	107,000		219,000		180,000	J	70,200		138,000	
Selenium	NC	NA	60		10	U	10	U	59		10	U	10	U	150	J	10	U	10	U	88	J	10	U	10	U
Silver	NC	NA	10	UJ	4	U	10	U	10	UJ	4	U	10	U	1	UJ	4	U	10	U	9.8	J	4	U	10	U
Sodium	NC	NA	5,500,000	J	2,740,000		5,180,000		4,800,000	J	2,120,000		5,110,000		5,600,000	J	2,660,000		5,300,000		4,500,000	J	2,200,000		3,330,000	
Thallium	NC	NA	10	UJ	2	U	10	U	10	UJ	2	U	50	U	1	UJ	2	U	50	U	1	UJ	2	U	10	U
Vanadium	NC	NA	67		20	U	50	U	22	J	20	U	50	U	8.9	J	20	U	50	U	94	J	20	U	50	U
Zinc	NC	NA	890	J	25	U	20	U	260	J	25	U	20	U	74	J	25	U	20	U	1,100	J	31.4		20	U

Notes

L - micrograms per liter

A(C) - Standard category for fish propagation.

Class SC - Saline (marine) surface waters

J - Estimated value.

NA - Not applicable

NC - No criterion

Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

Table 16b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Low-Tide Surface-Water Sample Analytical Data for Metals

		Sample Location:	BK2-SW-05						BK2-SW-06						BK2-SW-07					
		Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024	
		Sample ID:	BK2-SW-05		BK2-SW-05		BK3-SW-05		BK2-SW-06		BK2-SW-06		BK3-SW-06		BK2-SW-07		BK2-SW-07		BK3-SW-07	
Metals (ug/L)	Class SC Surface Water Standard (ug/L)	Class SC Surface Water Category	Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)		Results (ug/L)	
Aluminum	NC	NA	2,000	J	589		618		1,600	J	495		926		190	J	425		200	U
Antimony	NC	NA	2	UJ	5	U	11.7		2	UJ	5	U	9.6		0.39	J	6.42		6	U
Arsenic	NC	NA	35	J	6.88		15	U	33	J	5.64		15	U	9.8	J	3	U	3	U
Barium	NC	NA	130	J	50.0		200.0	U	130	J	49.4		200	U	100	J	60.4		200	U
Beryllium	NC	NA	1	UJ	1	U	1	U	1	UJ	1	U	1	U	0.98	J	1	U	1	U
Cadmium	7.7	A(C)	0.77	J	4	U	3	U	0.67	J	4	U	3	U	1	UJ	4	U	3	U
Calcium	NC	NA	210,000	J	87,700		188,000		200,000	J	74,400		174,000		80,000	J	16,200		30,600	
Chromium	NC	NA	18	J	10	U	10	U	14	J	10	U	10	U	9.5	J	10	U	10	U
Cobalt	NC	NA	2.5	J	20	U	250	U	2.2	J	20	U	50	U	0.91	J	20	U	50	U
Copper	NC	NA	43	J	16.2		10.7		38	J	14.9		12.4		5.8	J	9.36		10	U
Iron	NC	NA	5,200	J	933		999		4,300	J	943		1,440		670	J	1,230		298	
Lead	NC	NA	29.0	J	13.4		15	U	25	J	14.3		15	U	3.1	J	5.87		3	U
Magnesium	NC	NA	600,000	J	238,000		602,000		570,000	J	191,000		562,000		200,000	J	16,800		44,400	
Manganese	NC	NA	590	J	151		181		570	J	167		192		290	J	193		146	
Mercury	NC	NA	1.0		0.5	U	0.2		0.52		0.5	U	0.2		0.045	J	0.5	U	0.2	U
Nickel	NC	NA	20	J	13.5		50	U	20	J	10	U	10	U	11	J	16.4		10	U
Potassium	NC	NA	180,000	J	77,000		200,000		170,000	J	61,600		178,000		55,000	J	2,730		10,000	U
Selenium	NC	NA	120	J	10	U	10	U	120	J	10	U	10	U	37	J	10	U	10	U
Silver	NC	NA	1	UJ	4	U	10	U	1	UJ	4	U	10	U	1	UJ	4	U	10	U
Sodium	NC	NA	4,500,000	J	3,060,000		4,860,000		4,300,000	J	1,630,000		4,320,000		1,400,000	J	48,400		107,000	
Thallium	NC	NA	1	UJ	2	U	50	U	1	UJ	2	U	10	U	1	UJ	2	U	10	U
Vanadium	NC	NA	11	J	20	U	50	U	7.6	J	20	U	50	U	8.7	J	20	U	50	U
Zinc	NC	NA	84	J	37.2		20	U	68	J	29.0		20.0	U	21	J	25	U	20	U

Notes

L - micrograms per liter

A(C) - Standard category for fish propagation.

Class SC - Saline (marine) surface waters

J - Estimated value.

NA - Not applicable

NC - No criterion

Shaded and **bold** results exceed the corresponding New York State Department of Environmental Conservation 6NYCRR Part 703.5 Class SC standards

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

Table 17
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sample Analytical Results for Total Semivolatile Organic Compounds

Richmond Creek Sample Total SVOC Results, ug/kg				
Sample Location	Sample ID	2013	2018	2024
BK2-SD-1	BK2-SD-1A	9,367 J	4,122.5 J	2,998 J
	BK2-SD-1B	15,438 J	2,426.3 J	8,774 J
	BK2-SD-1C	10,187 J	217 J	NA
BK2-SD-2	BK2-SD-2A	4,689 J	2,746 J	2,125 J
	BK2-SD-2B	3,695.4 J	1,639.1 J	1,134 J
	BK2-SD-2C	4,041 J	423.6 J	593 J
BK2-SD-3*	BK2-SD-3A	8,285 J	678 J	763 J
	BK2-SD-3B	10,195 J	236 J	1,903 J
	BK2-SD-3C	4,509 J	ND	4,579 J
BK2-SD-4	BK2-SD-4A	37,646 J	2,355 J	5,044 J
	BK2-SD-4B	8,069 J	2,199 J	2,737 J
	BK2-SD-4C	15,023 J	2,587.6 J	630 J
BK2-SD-5	BK2-SD-5A	9,626 J	104 J	54.4 J
	BK2-SD-5B	1,161.5 J	157 J	138.5 J
	BK2-SD-5C	106 J	ND	75.6 J
BK2-SD-6	BK2-SD-6A	15,144 J	132 J	89.6 J
	BK2-SD-6B	220 J	ND	ND
	BK2-SD-6C	130 J	ND	NA
BK2-SD-7	BK2-SD-7A	ND	ND	592 J
	BK2-SD-7B	23 J	ND	124.8 J
	BK2-SD-7C	450	ND	ND

Tidal Marsh and Tributary Sample Total SVOC Results, ug/kg				
Sample Location	Sample ID	2013	2018	2024
BK2-SD-8	BK2-SD-8A	6,989 J	ND	2,838 J
	BK2-SD-8B	240 J	ND	489 J
	BK2-SD-8C	1,922 J	ND	94.1 J
BK2-SD-9	BK2-SD-9A	1,610 J	127 J	ND
	BK2-SD-9B	222 J	ND	ND
	BK2-SD-9C	79.5 J	ND	NA
BK2-SD-10**	BK2-SD-10A	7,159 J	214.2 J	8,707 J
	BK2-SD-10B	4,560 J	113 J	721.5 J
	BK2-SD-10C	7,608 J	1,155.2 J	NA
BK2-SD-11	BK2-SD-11A	593.7 J	ND	136 J
	BK2-SD-11B	3,320.6 J	ND	202 J
	BK2-SD-11C	670 J	ND	NA
BK2-SD-12	BK2-SD-12A	480 J	ND	3,442 J
	BK2-SD-12B	58 J	ND	820.6 J
	BK2-SD-12C	586.2 J	ND	269 J

Notes:

SVOC = Semivolatile Organic Compound.
ug/L = micrograms per kilogram.
ND = Not Detected.
J = Estimated Value.
* = 2024 and 2018 location approximately 400 feet upstream of 2013 location.
** = 2013 location shifted north due to refusal.

Table 18
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sample Analytical Results for Total Pesticides

Richmond Creek Total Pesticide Results, ug/kg				
Sample Location	Sample ID	2013	2018	2024
BK2-SD-1	BK2-SD-1A	97.3 J	26.9	30.3
	BK2-SD-1B	162 J	112	11.2 J
	BK2-SD-1C	136 J	ND	NA
BK2-SD-2	BK2-SD-2A	68.0 J	56.9	9.50 J
	BK2-SD-2B	203 J	68.6	9.10 J
	BK2-SD-2C	128 J	8.35	11.1 J
BK2-SD-3*	BK2-SD-3A	143 J	29.7	25.5 J
	BK2-SD-3B	172 J	33.3	22.4 J
	BK2-SD-3C	4.6 J	ND	25.4 J
BK2-SD-4	BK2-SD-4A	243 J	14.6	130 J
	BK2-SD-4B	125 J	119	38.6 J
	BK2-SD-4C	198 J	50.3	0.52 J
BK2-SD-5	BK2-SD-5A	3.52 J	8.49	9.30 J
	BK2-SD-5B	0.57 J	7.10	0.72 J
	BK2-SD-5C	ND	12.1	ND
BK2-SD-6	BK2-SD-6A	304 J	3.07	4.50 J
	BK2-SD-6B	44.0 J	11.1	ND
	BK2-SD-6C	1.02 J	ND	NA
BK2-SD-7	BK2-SD-7A	0.26 J	ND	ND
	BK2-SD-7B	0.96 J	ND	ND
	BK2-SD-7C	0.30 J	ND	ND

Tidal Marsh and Tributary Total Pesticide Results, ug/kg				
Sample Location	Sample ID	2013	2018	2024
BK2-SD-8	BK2-SD-8A	221 J	26.4	58.6 J
	BK2-SD-8B	29.6 J	393	0.83 J
	BK2-SD-8C	5.85 J	2.94	0.19 J
BK2-SD-9	BK2-SD-9A	121 J	43.3	19.4 J
	BK2-SD-9B	51.2 J	17.0	0.34 J
	BK2-SD-9C	0.28 J	ND	NA
BK2-SD-10**	BK2-SD-10A	114 J	12.2	26.0 J
	BK2-SD-10B	58.9 J	12.5	21.9 J
	BK2-SD-10C	287 J	9.56	NA
BK2-SD-11	BK2-SD-11A	125 J	10.7	1.27 J
	BK2-SD-11B	50.3 J	64.0	2.20 J
	BK2-SD-11C	4.99 J	6.45	NA
BK2-SD-12	BK2-SD-12A	2.47 J	13.9	28.3 J
	BK2-SD-12B	0.40 J	9.23	46.9 J
	BK2-SD-12C	34.6 J	ND	ND

Notes:

ug/kg = Micrograms per kilogram.
ND = Not Detected.
NA = Not Applicable
J = Estimated.
* = 2018 location approximately 400 feet upstream of 2013 location.
** = 2013 location shifted north due to refusal.

Table 19a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
0-6 Inch Depth Interval

			Sample Location:	Richmond Creek																				
			Sample ID:	BK-SD-1					BK-SD-2						BK-SD-3*						BK-SD-4			
			Sample Depth	0-6 inch					0-6 inch						0-6 inch						0-6 inch			
			Year Collected	2013		2018		2024	2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	11,000	J	2,240		4,620	2,700		9,460		19,800		13,000	J	11,400		17,300		15,000	J	11,500		12,100	
Antimony	NC	NC	NC	0.84	J	2.77	U	2.30	U	0.43	J	5.79	U	6.20	U	1	J	5.5	U	6.70	U	1.7	J	6.33	U	4.90	U
Arsenic	<8.2	8.2-70	>70	**18**	J	5.31		**9.20**		4.2	J	**21.6**		**41.3**		**30**	J	**33.7**		**34.20**		**25**	J	**23**		**52.7**	
Barium	NC	NC	NC	160	J	19		53.2		24		110		271		210	J	96.9		184		170	J	140		236	
Beryllium	NC	NC	NC	0.90	J	0.346	U	0.390		0.19		0.745		1.60		0.91	J	1		1.40		1	J	0.879		1.00	
Cadmium	<1.2	1.2-9.6	>9.6	**4.0**	J	0.644		**1.90**		0.85		**3.12**		**9.70**		**6.5**	J	**5.71**		**6.70**		**5.7**	J	**3.84**		**7.00**	
Calcium	NC	NC	NC	17,000	J	6,610		3,780		4,700	J	6,630		24,300		5,400	J	5,840		7,920		5,900	J	4,980		3,430	
Chromium	<81	81-370	>370	**84**	J	19.6		60.3		20		**94.2**		**178**		**140**	J	**118**		**158**		**130**	J	**112**		**131**	
Cobalt	NC	NC	NC	23	J	3.46	U	6.30		3		8.3		18.1		13	J	10.1		17.00	U	13	J	9.55		15.5	
Copper	<34	34-270	>270	**220**	J	**39.5**		**100**		**50**		**238**		**506**		**360**	J	**308**		**413**		**360**	J	**287**		**288**	
Iron	NC	NC	NC	2,800	J	6,660.00		13,600		8,600	J	35,800		51,800		33,000	J	37,300		46,800		36,000	J	43,100		28,700	
Lead	<47	47-220	>220	**400**	J	**73.1**		**90.8**		**50**		**146**		**342**		**260**	J	**196**		**265**		**240**	J	**168**		**238**	
Magnesium	NC	NC	NC	14,000	J	4,940		5,810		3,900		8,550		13,100		9,900	J	7,780		12,600		9,800	J	8,070		6,810	
Manganese	NC	NC	NC	440	J	65.6		112		70		236		498		370	J	287		408		370	J	253		233	
Mercury	<0.15	0.15-0.71	>0.71	**2**		**0.568**		**1.90**		**0.69**		**3.95**		**5.20**		**6.4**		**4.62**		**4.20**		**4.1**		**5.13**		**10.0**	
Nickel	<21	21-52	>52	**60**	J	13.5		**41.9**		14		**48**		**96.1**		**90**	J	**65.4**		**100**		**72**	J	**57.9**		**131**	
Potassium	NC	NC	NC	1,600	J	444		1,200	U	560		1,870		3,980		2,700	J	2,290		3,610		3,100	J	2,200		2,400	U
Selenium	NC	NC	NC	2.1	J	2.77	U	2.30	U	0.53	J	5.79	U	6.20	U	3.4	J	5.5	U	6.70	U	3.4	J	6.33	U	4.90	
Silver	<1.0	1.0-3.7	>3.7	**1.9**	J	0.346	U	**1.20**		0.45		**2.03**		**5.80**		**4.6**	J	**2.53**		**3.90**		**4.1**	J	**2.46**		**2.60**	
Sodium	NC	NC	NC	2,300	J	1,650		3,640		2,500		7,690		17,500		11,000	J	9,000		17,700		15,000	J	6,010		5,930	
Thallium	NC	NC	NC	0.20	J	2.08	U	1.20	U	0.07	UJ	4.34	U	3.10	U	0.3	J	4.13	U	3.30	U	0.4	J	4.75	U	2.40	U
Vanadium	NC	NC	NC	41	J	9.92		17.5		11		36.2		62.4		45	J	38.9		50.2		41	J	33.6		54.6	
Zinc	<150	150-410	>410	**380**	J	91.3		**183**		96	J	**387**		**784**		**430**	J	**473**		**630**		**460**	J	**418**		**542**	

Notes

mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
U - Not Detected
* 2018 sample location approximately 400 feet upstream from 2013 location.
** 2013 sample location shifted north due to refusal.

Table 19a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
0-6 Inch Depth Interval

				Sample Location:	Richmond Creek														Tidal Marsh and Tributary					
				Sample ID:	BK-SD-5				BK-SD-6				BK-SD-7				BK-SD-8					
				Sample Depth	0-6 inch				0-6 inch				0-6 inch				0-6 inch					
				Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC		18,000	J	1,140		12,600		12,000	J	14,600		12,900		13,000	J	10,400		16,400		6,300	J	8,400		13,200	
Antimony	NC	NC	NC		1.5	J	5.13	U	5.00	U	2.8	J	5.76	U	11.0	U	0.27	UJ	6.31	U	6.90	U	8.8	J	6.72	U	8.90	U
Arsenic	<8.2	8.2-70	>70		**66**	J	**27.9**		**173**		**42**	J	**51.3**		**25.5**		5.4	J	**9.52**		**11.5**		**62**	J	**27.3**		**93**	
Barium	NC	NC	NC		73	J	80.8		100		83	J	94.4		130		62	J	71.7		161		45	J	38.1		109	
Beryllium	NC	NC	NC		1.1	J	1.02		1.00		1.1	J	1.35		1.10	U	0.78	J	0.896		1.30		0.54	J	0.84	U	1.20	
Cadmium	<1.2	1.2-9.6	>9.6		0.67	J	**6.16**		**2.20**		**2.2**	J	**5.83**		**3.50**		0.22	J	**1.28**		**1.70**	U	0.78	J	0.971		**2.20**	U
Calcium	NC	NC	NC		3,000	J	4,320		2,030		3,600	J	3,180		7,480		1,800	J	6,790		3,460	U	4,500	J	2,740		4,320	U
Chromium	<81	81-370	>370		75	J	**115**		**86.5**		**110**	J	**156**		**109**		**96**	J	79.2		**109**		49	J	67.1		**113**	
Cobalt	NC	NC	NC		16	J	10.8		15.4		20	J	21.2		27.0	U	27	J	22.3		45.5		5.5	J	8.4	U	26.2	
Copper	<34	34-270	>270		**180**	J	**298**		**272**		**330**	J	**354**		**231**		20	J	**46.3**		21.1		**320**	J	**155**		**556**	
Iron	NC	NC	NC		35,000	J	38,700		41,100		32,000	J	48,900		36,200		27,000	J	29,000		37,300		11,000	J	15,100		32,400	
Lead	<47	47-220	>220		**210**	J	**196**		**273**		**300**	J	**301**		**159**		15	J	**132**		36.5		**310**	J	**154**		**720**	
Magnesium	NC	NC	NC		8,000	J	7,290		6,640		8,500	J	8,110		10,900		13,000	J	11,200		10,600		7,600	J	5,680		9,430	
Manganese	NC	NC	NC		680	J	289		327		560	J	302		341		280	J	287		329		96	J	147		363	
Mercury	<0.15	0.15-0.71	>0.71		**2.1**		**3.76**		**5.10**		**3.2**	J	**5.75**		**3**		0.022	J	0.202	U	0.11	U	**2**	J	**1.93**		**3.80**	
Nickel	<21	21-52	>52		**73**	J	**69**		**86**		**130**	J	**140**		**111**		**470**	J	**290**	U	**498**		**41**	J	**36.2**		**123**	
Potassium	NC	NC	NC		3,300	J	2,160		2,620		2,900	J	2,750		5,400	U	1,600	J	1,460		3,400	U	2,500	J	1,960		4,500	U
Selenium	NC	NC	NC		2.7	J	5.13	U	7.90		8.5	J	5.76	U	11.0	U	0.87	J	6.31	U	6.90	U	9.5	J	6.72	U	13.9	
Silver	<1.0	1.0-3.7	>3.7		**1.1**	J	**2.44**		**1.80**		**2.5**	J	**3.23**		**2.70**	U	0.082	J	0.788	U	1.70	U	**1.7**	J	**1.33**		**2.60**	
Sodium	NC	NC	NC		11,000	J	6,550		9,110		17,000	J	1,000		18,100	U	1,900	J	2,070		3,400	U	36,000	J	8,570		28,700	
Thallium	NC	NC	NC		0.31	J	3.85	U	2.50	U	0.33	UJ	4.32	U	5.40	U	0.17	J	4.73	U	3.40	U	0.33	UJ	5.04	U	4.50	U
Vanadium	NC	NC	NC		39	J	40.5		40.9		52	J	62.5		46.3		39	J	44.3		52.5		53	J	45.6		67.1	
Zinc	<150	150-410	>410		**220**	J	**439**		**383**		**390**	J	**477**		**349**		47	J	**147**		**85.7**		120	J	**208**		**410**	

Notes

mg/kg - miligrams per kilogram

Bold results exceed Class A SGV and is within Class B SGV range.

J - Estimated value

NC - No criterion

Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.

SGV - Sediment Guidance Value

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

** 2013 sample location shifted north due to refusal.

Table 19a
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
0-6 Inch Depth Interval

			Sample Location:	Tidal Marsh and Tributary																				
			Sample ID:	BK-SD-9						BK-SD-10**						BK-SD-11						BK-SD-12		
			Sample Depth	0-6 inch						0-6 inch						0-6 inch						0-6 inch		
			Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	11,000	J	8,780		4,390		8,900	J	2,780		5,510		8,000	J	13,400		13,600		16,000	J	14,200		15,000	
Antimony	NC	NC	NC	2.4	J	7.03	U	18	U	0.86	J	2.84	U	3.10	U	0.32	J	10.8	U	12	U	0.24	UJ	6.75	U	6.90	U
Arsenic	<8.2	8.2-70	>70	**36**	J	**30.4**		**96.40**		**15**	J	5.51		7.20		**14**	J	**16.4**		**87.5**		**15**	J	**35.7**		**46.7**	
Barium	NC	NC	NC	71	J	48.5		180	U	100	J	22.7		248		41	J	76.5		120	U	29	J	98.3		120	
Beryllium	NC	NC	NC	0.95	J	0.878	U	1.80	U	0.58	J	0.355	U	0.420		0.69	J	1.35	U	1.20	U	1.1	J	1.22		1.10	
Cadmium	<1.2	1.2-9.6	>9.6	**2.8**	J	0.878	U	**7.20**		**2.6**	J	1.18		0.790		0.52	J	**1.35**	U	**3.00**	U	0.11	J	**5.05**		**1.90**	
Calcium	NC	NC	NC	4,000	J	3,070		6,130		7,300	J	5,000		15,400		1,500	J	4,530		3,530		1,900	J	3,770		2,510	
Chromium	<81	81-370	>370	**100**	J	62.4		37.6		74	J	21.4		42.7		30	J	**113**		78.3		35	J	**142**		**158**	
Cobalt	NC	NC	NC	14	J	8.78	U	46.00	U	8.3	J	3.55	U	7.80	U	7.8	J	13.5	U	30.6		11	J	12		17	U
Copper	<34	34-270	>270	**350**	J	**132**		**439**		**200**	J	**54.2**		**73.9**		**51**	J	**235**		**290**		**16**	J	**360**		**326**	
Iron	NC	NC	NC	33,000	J	14,600		14,100		23,000	J	8,930		18,600		20,000	J	19,000		31,700		34,000	J	37,000		29,900	
Lead	<47	47-220	>220	**270**	J	**155**		**172**		**140**	J	41.7		**162**		35	J	**178**		**205**		16	J	**262**		**314**	
Magnesium	NC	NC	NC	7,700	J	5,730		8,540		7,900	J	3,800		10,700		4,500	J	8,220		7,820		7,500	J	8,030		7,310	
Manganese	NC	NC	NC	490	J	127		93.1		270	J	73.7		165		190	J	210		246		410	J	358		303	
Mercury	<0.15	0.15-0.71	>0.71	**3.7**	J	**1.92**		**1**		**2.3**		**0.305**		**0.550**		**2**	J	**3.7**		**2.30**		0.11	J	**6.28**		**9.60**	
Nickel	<21	21-52	>52	**70**	J	**36.6**		**80.6**		**38**	J	13.2		**30.8**		**43**	J	**49**		**251**		**32**	J	**59.7**		**65.5**	
Potassium	NC	NC	NC	2,800	J	1,920		9,200	U	1,800	J	497		1,600	U	1,700	J	3,020		5,900	U	3,400	J	2,840		3,400	U
Selenium	NC	NC	NC	8.4	J	7.03	U	19		1.9	J	2.84	U	3.10	U	1.8	J	10.8	U	21.8		1.3	J	6.75		6.90	U
Silver	<1.0	1.0-3.7	>3.7	**2.8**	J	0.907		**4.60**	U	**1.9**	J	0.549		0.780	U	0.31	J	**2.89**		**3**	U	0.12	UJ	**3.28**		**3.70**	
Sodium	NC	NC	NC	20,000	J	8,930		42,100	U	7,300	J	947		3,820		3,800	J	16,100		23,300		7,400	J	11,800		11,800	
Thallium	NC	NC	NC	0.21	J	5.27	U	9.20	U	0.2	J	2.13	U	1.60	U	0.11	J	4.05	U	5.90	U	0.14	J	5.06	U	3.40	U
Vanadium	NC	NC	NC	49	J	52.2		46	U	31	J	12.1		20.5		22	J	64		52.3		37	J	52.9		58.4	
Zinc	<150	150-410	>410	**390**	J	**174**		**519**		**270**	J	115		**171**		75	J	**256**		**743**		69	J	**434**		**340**	

Notes

mg/kg - miligrams per kilogram

Bold results exceed Class A SGV and is within Class B SGV range.

J - Estimated value

NC - No criterion

Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.

SGV - Sediment Guidance Value

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

** 2013 sample location shifted north due to refusal.

Table 19b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
6-12 Inch Depth Interval

				Sample Location:																				
				Sample ID:																				
				Sample Depth																				
				Year Collected																				
Metals	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	15,000	J	3,810		3,070		3,000		8,670		23,500		16,000	J	15,200		14,700		14,000.00	J	10,300		10,500	
Antimony	NC	NC	NC	1.1	J	3.69	U	1.80	U	0.33	J	5.55	U	7.00	U	1.5	J	5.41	U	6.90	U	1.0	J	5.02	U	3.60	U
Arsenic	8.2	8.2-70	>70	**23**	J	**27.9**		4.90		5.3	J	**20.4**		**51.2**		**41**	J	**88.7**		**74.8**		**25**	J	**21.4**		**35.9**	
Barium	NC	NC	NC	260	J	50.8		33.9		37		118		327.0		290	J	89.7		137		160	J	124		110	
Beryllium	NC	NC	NC	0.98	J	0.46	U	0.260		0.23		0.770		2.00		1.1	J	1.48		1.10		0.90	J	0.793		0.870	
Cadmium	1.2	1.2-9.6	>9.6	**8.50**	J	1.04		1.10		1.1		**3.00**		**11.8**		**9.4**	J	**5.24**		**1.90**		**5.2**	J	**3.59**		**1.70**	
Calcium	NC	NC	NC	16,000	J	915		1,860		4,100	J	6,950		11,100		5,400	J	5,180		2,260		5,000	J	4,920		4,060	
Chromium	81	81-370	>370	**130**	J	29.8		42.8		22		**90.0**		**205**		**160**	J	**101**		**170**		**110**	J	**99.9**		56.4	
Cobalt	NC	NC	NC	13	J	4.62	U	4.50	U	3.6		8.19		23.4		15	J	14.3		17.0		13.0	J	9.04		11.5	
Copper	34	34-270	>270	**380**	J	**91.9**		**53.7**		**60**		**237**		**593**		**530**	J	**378**		**353**		**320**	J	**252**		**184**	
Iron	NC	NC	NC	33,000	J	9,230		8890		10,000	J	40,000		59,500		36,000	J	48,000		30,600		34,000	J	38,300		24,800	
Lead	47	47-220	>220	**420**	J	**113**		**48.2**		**66**		**139**		**411**		**350**	J	**220**		**316**		**230**	J	**155**		**114**	
Magnesium	NC	NC	NC	13,000	J	2,000		2,670		3,600		7,420		15,200		10,000	J	9,230		6,410		8,400	J	7,660		6,080	
Manganese	NC	NC	NC	410	J	69.4		72.5		95		217		591		350	J	415		292		380	J	237		298	
Mercury	0.15	0.15-0.71	>0.71	**4.5**		**4.01**		**0.580**		**0.60**		**3.59**		**5.20**		**6.1**		**7.77**		**10.4**		**3.7**		**4.89**		**2.40**	
Nickel	21	21-52	>52	**59**	J	20.1		17.6		16		48.4		**123**		**100**	J	83.8		**89.5**		71	J	55.3		**83.3**	
Potassium	NC	NC	NC	2,200	J	744		910	U	630		1,890		4,600		2,700	J	3,450		3,500	U	**2,700**	J	**2,040**		2,130	
Selenium	NC	NC	NC	3.1	J	3.69	U	1.80	U	0.54	J	5.55	U	7.00	U	4.6	J	6.19		12.0		3.1	J	5.02	U	6.50	
Silver	1	1.0-3.7	>3.7	**4.50**	J	0.519		0.59		0.66		**1.97**		**6.70**		**4.4**	J	0.676	U	**3.30**		**4.00**	J	**2.27**		**1.00**	
Sodium	NC	NC	NC	2,700	J	2,770		1,790		2,000		7,810		18,700		11,000	J	6,600		9,510		11,000	J	6,530		3,130	
Thallium	NC	NC	NC	0.33	J	2.77	U	0.910	U	0.076		4.16	U	3.50	U	0.36	J	4.06	U	3.50	U	0.34	J	3.76	U	1.80	U
Vanadium	NC	NC	NC	43	J	13.2		12.5		13		34.2		80.5		63	J	49.3		61.7		40	J	31.1		29.7	
Zinc	150	150-410	>410	**500**	J	**167**		112		110	J	**372**		**949.0**		**530**	J	**499**		**389**		**420**	J	**380**		**285**	

Notes

mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
U - Not Detected
* 2018 sample location approximately 400 feet upstream from 2013 location.
** 2013 sample location shifted north due to refusal.

Table 19b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
6-12 Inch Depth Interval

			Sample Location:	Richmond Creek															Tidal Marsh and Tributary					
			Sample ID:	BK-SD-5						BK-SD-6						BK-SD-7						BK-SD-8					
			Sample Depth	6-12 inch						6-12 inch						6-12 inch						6-12 inch					
			Year Collected	2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	18,000	J	14,300		16,300		9,500	J	12,700		5,630		15,000	J	10,500		9,900		6,100	J	6,260		14,700	
Antimony	NC	NC	NC	0.50	J	5.36	U	4.80	U	8.70	J	9.09		15.0	U	0.29	UJ	5.56	U	3.40	U	3.7	J	8.31	U	12.0	U
Arsenic	8.2	8.2-70	>70	**32**	J	**34.8**		**111**		**40**	J	**161**		**15.0**	U	6.80	J	**8.32**		6.20		**33**	J	**74.9**		**19.1**	
Barium	NC	NC	NC	48	J	97.4		153		45	J	70.20		150	U	60	J	49.5		84.8		27	J	49.5		120	U
Beryllium	NC	NC	NC	1.1	J	1.44		1.40		0.52	J	1.33		1.50	U	0.95	J	0.919		0.740		0.50	J	1.04	U	1.20	U
Cadmium	1.2	1.2-9.6	>9.6	0.55	J	**11.0**		**2.80**		**3.0**	J	**4.59**		3.70	U	0.25	J	1.09		0.860	U	0.37	J	1.04	U	3.00	U
Calcium	NC	NC	NC	2,000	J	5,450		2,260		3,800	J	3,020		8,990		2,400	J	2,560		1,700		5,500	J	3,040		3,000	U
Chromium	81	81-370	>370	63	J	**154**		78.6		47	J	**126**		47.6		**89**	J	65.2		74.6		27.00	J	**94.1**		34.9	
Cobalt	NC	NC	NC	13	J	14.5		18.1		14	J	39.4		37.0	U	27	J	21.3		29.5		3.70	J	26.90		30.0	U
Copper	34	34-270	>270	**85**	J	**408**		**377**		**110**	J	**311**		25.7		16	J	16.3		15.8		**110**	J	**343**		**51.8**	
Iron	NC	NC	NC	31,000	J	40,000		42,000		14,000	J	53,000		35,600		34,000	J	32,400		23,500		8,300	J	19,200		30,000	
Lead	47	47-220	>220	**130**	J	**283**		**251**		**82**	J	**413**		15.0	U	14	J	30.5		24.9		**97**	J	**299**		**52.9**	
Magnesium	NC	NC	NC	7,600	J	8,500		7,980		5,900	J	7,150		7,710		9,300	J	6,110		11,800		8,100	J	5,000		8,410	
Manganese	NC	NC	NC	450	J	304		572		180	J	367		158		440	J	360		247		68	J	211		435	
Mercury	0.15	0.15-0.71	>0.71	**1.40**		**6.25**		**1.80**		**0.81**	J	**4.83**		**0.210**		0.02	J	**0.172**	U	0.0540	U	**1.0**	J	**3.49**		**0.220**	
Nickel	21	21-52	>52	78	J	103		**102**		150	J	223		**166**		320	J	222	U	**386**		28	J	104		**49.3**	
Potassium	NC	NC	NC	2,800	J	2,680		3,160		2,400	J	2,490		7,400	U	2,100	J	1,580		1,700	U	2,600	J	1,670		6,000	U
Selenium	NC	NC	NC	1.30	J	5.35	U	8.80		12	J	7.64		15.0	U	0.91	J	5.56	U	3.40	U	5.3	J	10.8		12.0	U
Silver	1	1.0-3.7	>3.7	0.37	J	**3.98**		**1.60**		0.57	J	**1.35**		**3.70**	U	0.08	J	0.695	U	0.860	U	0.65	J	**1.86**		3.00	U
Sodium	NC	NC	NC	6,200	J	7,870		5,620		20,000	J	11,600		16,100		730	UJ	2,120		1,700	U	37,000	J	13,600		22,500	
Thallium	NC	NC	NC	0.25	J	4.02	U	2.40	U	0.33	J	5.04	U	7.40	U	0.16	J	4.17	U	1.70	U	0.37	UJ	6.23	U	6.00	U
Vanadium	NC	NC	NC	41	J	55.6		40.9		47	J	74.0		45.2		50	J	39.7		34.9		33	J	62.5		47.7	
Zinc	150	150-410	>410	**180**	J	**591**		**532**		**500**	J	**810**		37.0	U	54	J	65.2		52.1		63	J	**325**		111	

Notes

mg/kg - miligrams per kilogram

Bold results exceed Class A SGV and is within Class B SGV range.

J - Estimated value

NC - No criterion

Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.

SGV - Sediment Guidance Value

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

** 2013 sample location shifted north due to refusal.

Table 19b
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
6-12 Inch Depth Interval

Sample Location:				Tidal Marsh and Tributary																					
Sample ID:				BK-SD-9						BK-SD-10**						BK-SD-11						BK-SD-12			
Sample Depth				6-12 inch						6-12 inch						6-12 inch						6-12 inch			
Year Collected				2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals	Class A Saltwater SGVs (mg/kg)	Class B Saltwater SGVs (mg/kg)	Class C Saltwater SGVs (mg/kg)	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	5,600	J	2,100		7,920		3,500		3,850		2,090		6,900	J	15,000		14,900		18,000	J	14,100		14,700	
Antimony	NC	NC	NC	9.4	J	9.54	U	3.40	U	0.37	J	2.84	U	2.50	U	0.57	J	11.0	U	12.0	U	0.27	UJ	5.55	U	6.90	U
Arsenic	8.2	8.2-70	>70	**57**	J	**80.1**		4.30		4.6	J	7.68		3.10		**15**	J	**100**		**57.5**		**14**	J	**39.7**		**74.8**	
Barium	NC	NC	NC	45	J	47.7	U	34.0	U	35		35.70		25.0	U	43	J	77.2		120	U	33	J	84.9		137	
Beryllium	NC	NC	NC	0.51	J	1.19	U	0.58		0.26		0.355	U	0.250	U	0.62	J	1.82		1.20	U	1.4	J	1.16		1.10	
Cadmium	1.2	1.2-9.6	>9.6	**5.4**	J	1.19	U	0.85	U	1.1		**1.74**		0.630	U	0.55	J	**2.31**		**3.00**	U	0.19	J	**5.86**		**1.90**	
Calcium	NC	NC	NC	4,800	J	4,700		977		8,700	J	3,920		9,040		1,600	J	4,770		4,090		2,100	J	5,450		2,260	
Chromium	81	81-370	>370	55	J	14.9		15.0		28		31.5		13.9		38	J	**205**		41.7		37	J	**136**		**170**	
Cobalt	NC	NC	NC	10	J	11.9	U	8.50	U	3.9		3.82		6.30	U	7.8	J	26.6		30.0	U	15	J	12.6		17.0	
Copper	34	34-270	>270	**260**	J	**234**		10.1		**100**		**79.60**		19.8		**71**	J	**381**		**87.8**		18	J	**342**		**353**	
Iron	NC	NC	NC	19,000	J	13,500		10,700		11,000	J	13,800		9,970		18,000	J	50,800		20,900		50,000	J	40,600		30,600	
Lead	47	47-220	>220	**170**	J	**69.7**		9.50		**53**		**65.7**		38.3		**60**	J	**426**		**81.0**		20	J	**252**		**316**	
Magnesium	NC	NC	NC	6,800	J	4,840		2,670		6,400		3,480		6,150		4,000	J	8,470		8,470		8,200	J	7,920		6,410	
Manganese	NC	NC	NC	260	J	55.7		84.8		130		120		110		240	J	293		181		560	J	371		292	
Mercury	0.15	0.15-0.71	>0.71	**2.0**	J	**0.346**		0.043	U	**1.5**		**0.772**		0.04	U	**0.81**	J	**4.90**		**0.190**		0.036	J	**5.29**		**10.4**	
Nickel	21	21-52	>52	91	J	52.9		15.8		17		17.3		**24.6**		52	J	135		**204**		44	J	64.4		**89.5**	
Potassium	NC	NC	NC	2,000	J	1,190		1,700	U	770		680		1,300	U	1,400	J	3,260		6,100	U	3,700	J	2,910		3,500	U
Selenium	NC	NC	NC	20	J	15.4		3.40	U	0.60	J	2.84	U	2.50	U	2.0	J	11.0	U	14.1		1.4	J	5.55	U	12.0	
Silver	1	1.0-3.7	>3.7	**1.7**	J	**1.52**		0.850	U	0.73		0.752		0.630	U	0.49	J	**2.84**		**3.00**	U	0.14	UJ	**3.35**		**3.30**	
Sodium	NC	NC	NC	26,000	J	19,900		3,530		2,700		990		1,790		3,600	J	16,900		22,200		8,600	J	10,300		9,510	
Thallium	NC	NC	NC	0.30	UJ	7.16	U	1.70	U	0.084		2.13	U	1.30	U	0.10	J	4.12	U	6.10	U	0.18	J	4.16	U	3.50	U
Vanadium	NC	NC	NC	37	J	36.0		20.4		12		15.8		11.8		22	J	110		42.5		43	J	51.4		61.7	
Zinc	150	150-410	>410	**480**	J	**191**		26.9		130	J	**164**		93.8		79	J	**702**		**349**		78	J	**452**		**389**	

Notes

mg/kg - miligrams per kilogram
Bold results exceed Class A SGV and is within Class B SGV range.
J - Estimated value
NC - No criterion
Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.
SGV - Sediment Guidance Value
U - Not Detected
* 2018 sample location approximately 400 feet upstream from 2013 location.
** 2013 sample location shifted north due to refusal.

Table 19c
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
24-30 Inch Depth Interval

Sample Location:				Richmond Creek																					
Sample ID:				BK-SD-1						BK-SD-2						BK-SD-3*						BK-SD-4					
Sample Depth				24-30 inch				ND		24-30 inch						24-30 inch						24-30 inch				24-29 inch	
Year Collected				2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals (ug/L)	Class A Saltwater SGVs	Class B Saltwater SGVs	Class C Saltwater SGVs	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	7,900	J	7,870		ND		12,000	J	10,100		15,300		15,000	J	14,700		27,100		14,000	J	6,660		11,100	
Antimony	NC	NC	NC	0.65	J	3.38	U	ND		1.4	J	3.97	U	4.90	U	2.3	J	4.74	U	6.50	U	1.1	J	3.51	U	4	U
Arsenic	8.2	8.2-70	>70	12	J	5.80		ND		31	J	50.8		**32.4**		55	J	13.6		**75.9**		25	J	46.5		**43.2**	
Barium	NC	NC	NC	99	J	58.2		ND		280	J	124		236		230	J	31.2		490		230	J	72.2		98.4	
Beryllium	NC	NC	NC	0.59	J	0.772		ND		0.82	J	0.793		1.30		1.1	J	1.08		2.40		0.95	J	0.566		0.870	
Cadmium	1.2	1.2-9.6	>9.6	3.3	J	0.423	U	ND		7.8	J	1.10		**9.80**		2	J	1.13		**18.7**		8.3	J	2.27		**1.30**	
Calcium	NC	NC	NC	6,800	J	10,600		ND		4,800	J	2,580		7,310		2,800	J	2,230		7,580		5,900	J	2,420		1,660	
Chromium	81	81-370	>370	65	J	23.6		ND		130	J	68.6		**163**		88	J	39.4		**306**		140	J	61.4		76.2	
Cobalt	NC	NC	NC	8.1	J	9.53		ND		11	J	8.11		13.7		13	J	10.4		29.6		13	J	7.48		12.3	
Copper	34	34-270	>270	180	J	24.0		ND		400	J	248		**439**		450	J	18.8		**851**		410	J	160		**167**	
Iron	NC	NC	NC	21,000	J	26,000		ND		27,000	J	34,900		34,900		32,000	J	33,000		63,500		32,000	J	22,500		25,100	
Lead	47	47-220	>220	160	J	13.2		ND		250	J	163		**284**		300	J	27.8		**601**		280	J	120		**120**	
Magnesium	NC	NC	NC	6,400	J	8,130		ND		6,100	J	5,490		9,230		8,100	J	6,870		14,000		8,900	J	4,600		5,520	
Manganese	NC	NC	NC	280	J	421		ND		270	J	174		339		280	J	230		450		350	J	139		170	
Mercury	0.15	0.15-0.71	>0.71	2.1		0.0885	U	ND		7.1		3.35		**5.70**		1.7		0.123	U	**9.30**		5.7		2.69		**1.20**	
Nickel	21	21-52	>52	42	J	38.9		ND		62	J	72.7		**82.8**		120	J	38.8		**232**		90	J	66.8		**101**	
Potassium	NC	NC	NC	1,400	J	2,030		ND		1,800	J	1,740		2,780		2,600	J	3,070		4,660		2,500	J	1,170		2,000	U
Selenium	NC	NC	NC	1.6	J	3.38	U	ND		3.7	J	12.5		4.90	U	14	J	4.74	U	7.70		3.4	J	3.97		5.80	
Silver	1	1.0-3.7	>3.7	2.20	J	0.423	U	ND		4	J	0.868		**5.30**		5.3	J	0.592	U	**7.60**		5.2	J	0.830		0.990	U
Sodium	NC	NC	NC	4,400	J	2,560		ND		1,500	J	4,050		8,720		8,800	J	5,760		8,550		10,000	J	2,960		3,380	
Thallium	NC	NC	NC	0.19	J	0.540	U	ND		0.29	J	2.98	U	2.40	U	0.40	J	3.55	U	3.20	U	0.33	J	2.64	U	2	U
Vanadium	NC	NC	NC	29	J	26.6		ND		45	J	26.7		51.5		41	J	44.9		104		44	J	24.1		28.9	
Zinc	150	150-410	>410	270	J	62.7		ND		420	J	313		**619**		380	J	68.1		**1,110**		480	J	291		**252**	

Notes

mg/kg - miligrams per kilogram

Bold results exceed Class A SGV and is within Class B SGV range.

J - Estimated value

NC - No criterion

Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.

SGV - Sediment Guidance Value

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

** 2013 sample location shifted north due to refusal.

Table 19c
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
24-30 Inch Depth Interval

Sample Location:				Richmond Creek														Tidal Marsh and Tributary					
Sample ID:				BK-SD-5						BK-SD-6						BK-SD-7						BK-SD-8					
Sample Depth				24-30 inch				24-26 inch		24-30 inch			ND			24-30 inch				24-27 inch		24-30 inch					
Year Collected				2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals (ug/L)	Class A Saltwater SGVs	Class B Saltwater SGVs	Class C Saltwater SGVs	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	18,000	J	16,000		14,900		14,000	J	18,700		ND		12,000	J	11,200		5,770		3,800	J	8,510		14,800	
Antimony	NC	NC	NC	0.22	UJ	6.08	U	4.30	U	0.41	UJ	5.23		ND		0.23	UJ	5.33	U	3.40	U	0.83	J	11.9	U	5.60	U
Arsenic	8.2	8.2-70	>70	7.1	J	55.4		**52.8**		7.6	J	77.6		ND		5.6	J	7.96		4.70		6.8	J	7.94		**16.4**	
Barium	NC	NC	NC	41	J	338.0		60.7		27	J	51.3		ND		45	J	52.2		94.8		15	J	59.5	U	56	U
Beryllium	NC	NC	NC	1.1	J	1.46		1		1	J	1.39		ND		0.73	J	0.924		0.470		0.32	J	1.49	U	0.920	
Cadmium	1.2	1.2-9.6	>9.6	0.28	J	13.5		1.10	U	0.092	J	2.07		ND		0.23	J	0.984		0.850	U	0.19	J	1.49	U	1.40	U
Calcium	NC	NC	NC	2,300	J	6,460		3,240		2,800	J	2,710		ND		1,900	J	2,040		3,480		9,700	J	3,920		1,860	
Chromium	81	81-370	>370	49	J	200		61.3		33	J	80.2		ND		54	J	71.8		38.3		44	J	17.5		32.8	
Cobalt	NC	NC	NC	13	J	16		12.5		8.2	J	27.6		ND		13	J	23.3		10.5		2.60	J	14.9	U	14	U
Copper	34	34-270	>270	22	J	564		**127**		15	J	151		ND		14	J	14.9		8.30		14	J	11.2		17	
Iron	NC	NC	NC	31,000	J	48,100		32,100		23,000	J	41,800		ND		21,000	J	34,100		14,400		8,100	J	17,300		35,900	
Lead	47	47-220	>220	32	J	396		**132**		13	J	169		ND		13	J	23.2		11.9		7.9	J	10.7		15.2	
Magnesium	NC	NC	NC	8,400	J	9,730		6,550		6,200	J	8,600		ND		5,900	J	6,150		4,670		9,600	J	7,150		7,080	
Manganese	NC	NC	NC	330	J	368		293		160	J	712		ND		370	J	345		179		55	J	206		388	
Mercury	0.15	0.15-0.71	>0.71	0.079		8.65		**1.70**		0.034	J	2.55		ND		0.032	J	0.173	U	0.0450	U	0.1	U	0.345	U	0.0870	U
Nickel	21	21-52	>52	93	J	126		**90.8**		50	J	158		ND		97	J	250		**104**		35	J	27.7		**33.5**	
Potassium	NC	NC	NC	3,000	J	3,010		2,460		2,900	J	3,070		ND		1,800	J	1,660		1,700	U	1,700	J	2,710		3,330	
Selenium	NC	NC	NC	1.0	J	6.08	U	4.30	U	1.9	J	5.18		ND		0.77	J	5.33	U	3.40	U	3.6	J	11.9	U	5.60	U
Silver	1	1.0-3.7	>3.7	0.10	J	4.72		1.10	U	0.20	UJ	0.647		ND		0.12	J	0.666	U	0.850	U	0.35	UJ	1.49	U	1.40	U
Sodium	NC	NC	NC	5,800	J	9,630		3,180		11,000	J	7,070		ND		580	UJ	1,940		1,700	U	35,000	J	24,700		9,910	
Thallium	NC	NC	NC	0.20	J	4.56	U	2.10	U	0.20	UJ	3.88		ND		0.13	J	4	U	1.70	U	0.35	UJ	8.92	U	2.80	U
Vanadium	NC	NC	NC	43	J	67.7		34.0		38	J	51.8		ND		31	J	41.1		19.5		14	J	34.8		38.4	
Zinc	150	150-410	>410	64	J	763		**251**		52	J	325		ND		52	J	62.4		46.1		15	J	96.8		71.4	

Notes

mg/kg - miligrams per kilogram

Bold results exceed Class A SGV and is within Class B SGV range.

J - Estimated value

NC - No criterion

Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.

SGV - Sediment Guidance Value

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

** 2013 sample location shifted north due to refusal.

Table 19c
NYC Department of Parks and Recreation
Brookfield Avenue Landfill OU2
Staten Island, New York
2024 10th-Year Monitoring Round
Comparison of 2013, 2018, and 2024 Sediment Sampling Analytical Results for Metals for
24-30 Inch Depth Interval

Sample Location:				Tidal Marsh and Tributary																			
Sample ID:				BK-SD-9						BK-SD-10**						BK-SD-11						BK-SD-12					
Sample Depth				24-30 inch				ND		24-27 inch				ND		24-30 inch				ND		24-30 inch					
Year Collected				2013		2018		2024		2013		2018		2024		2013		2018		2024		2013		2018		2024	
Metals (ug/L)	Class A Saltwater SGVs	Class B Saltwater SGVs	Class C Saltwater SGVs	Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)		Results (mg/kg)	
Aluminum	NC	NC	NC	7,000	J	9,800		ND		17,000	J	2,490		ND		9,600	J	8,650		ND		11,000	J	16,200		14,600	
Antimony	NC	NC	NC	0.1	UJ	6.41	U	ND		2.2	J	2.71	U	ND		10	J	12.9	U	ND		2.5	J	5.19	U	5.70	U
Arsenic	8.2	8.2-70	>70	2.1	J	3.48		ND		57	J	4.19		ND		81	J	3.23	U	ND		110	J	12.9		**8.40**	
Barium	NC	NC	NC	22	J	32.1	U	ND		830	J	29.8		ND		48	J	64.7	U	ND		85	J	31.2		57	U
Beryllium	NC	NC	NC	0.50	J	0.801	U	ND		1.2	J	0.339	U	ND		0.61	J	1.62	U	ND		0.92	J	1.14		0.880	
Cadmium	1.2	1.2-9.6	>9.6	0.034	J	0.801	U	ND		17	J	1.08		ND		3.1	J	1.62	U	ND		1.4	J	1.65		1.40	U
Calcium	NC	NC	NC	330	J	2,490		ND		5,700	J	4,250		ND		5,900	J	4,140		ND		2,000	J	2,630		1,730	
Chromium	81	81-370	>370	13	J	18.1		ND		260	J	16.9		ND		45	J	20.4		ND		78	J	36.4		31.6	
Cobalt	NC	NC	NC	5.5	J	8.01	U	ND		14	J	3.39	U	ND		12	J	16.2	U	ND		16	J	9.55		14	U
Copper	34	34-270	>270	10	J	11.9		ND		660	J	132		ND		270	J	9.70	U	ND		240	J	1.90		10.9	
Iron	NC	NC	NC	13,000	J	8,850		ND		36,000	J	9,420		ND		14,000	J	8,830		ND		31,000	J	43,700		29,400	
Lead	47	47-220	>220	6.7	J	8.74		ND		380	J	82.7		ND		98	J	6.18		ND		220	J	30.5		12.8	
Magnesium	NC	NC	NC	2,300	J	5,030		ND		8,500	J	2,940		ND		8,200	J	7,710		ND		5,800	J	7,370		6,150	
Manganese	NC	NC	NC	83	J	97		ND		300	J	87.4		ND		190	J	148		ND		370	J	383		335	
Mercury	0.15	0.15-0.71	>0.71	0.013	J	0.151	U	ND		12		0.187		ND		0.33	J	0.334	U	ND		3.8		0.118	U	0.0870	U
Nickel	21	21-52	>52	18	J	15.3		ND		81	J	14		ND		200	J	29.4		ND		83	J	29.7		**30.9**	
Potassium	NC	NC	NC	570	J	1,250		ND		3,000	J	399		ND		2,500	J	2,970		ND		2,300	J	3,410		3,230	
Selenium	NC	NC	NC	0.39	J	6.41	U	ND		8.1	J	2.71	U	ND		46	J	12.9	U	ND		10	J	5.19	U	5.70	U
Silver	1	1.0-3.7	>3.7	0.1	UJ	0.801	U	ND		6.2	J	0.405		ND		1.5	J	1.62	U	ND		1.4	J	0.649	U	1.40	U
Sodium	NC	NC	NC	1,700	J	9,270		ND		11,000	J	670		ND		29,000	J	29,500		ND		10,000	J	4,220		4,880	
Thallium	NC	NC	NC	0.070	J	4.81	U	ND		0.50	J	2.03	U	ND		0.30	UJ	4.85	U	ND		0.19	J	3.89	U	2.80	U
Vanadium	NC	NC	NC	15	J	19.4		ND		75	J	12.7		ND		28	J	28		ND		38	J	41.3		37.9	
Zinc	150	150-410	>410	23	J	49.1		ND		780	J	120		ND		470	J	32		ND		280	J	89.3		66	

Notes

mg/kg - miligrams per kilogram

Bold results exceed Class A SGV and is within Class B SGV range.

J - Estimated value

NC - No criterion

Shaded and bold results exceed the corresponding New York State Department of Environmental Conservation June 24, 2014 "Screening and Assessment of Contaminated Sediment " Class B SGV range and is within Class C.

SGV - Sediment Guidance Value

U - Not Detected

* 2018 sample location approximately 400 feet upstream from 2013 location.

** 2013 sample location shifted north due to refusal.

APPENDIX A

FIELD NOTES AND WATER QUALITY MEASUREMENTS FOR SURFACE-WATER SAMPLES

APPENDIX B

FIELD DATA SHEETS AND SOIL BORING LOGS

APPENDIX C

LABORATORY ANALYTICAL DATA

APPENDIX D

DATA USABILITY SUMMARY REPORT