Kent Highlands Landfill
2019-2023 Remedial Action Status Report

Prepared for

Seattle Public Utilities

September 2024

Parametrix

In Association With

HWA GeoSciences Inc.
DBE/MWBE

Kent Highlands Landfill
2019-2023 Remedial Action Status Report

Prepared for

Seattle Public Utilities
700 Fifth Avenue, Suite 4900
Seattle, WA 98124-4018

Prepared by

Parametrix
719 2nd Avenue, Suite 200
Seattle, WA 98104
T. 206.394.3700 F. 1.206.649.6353
www.parametrix.com

In Association With

HWA GeoSciences Inc.
DBE/MWBE

September 2024 | 553-1550-090

Citation

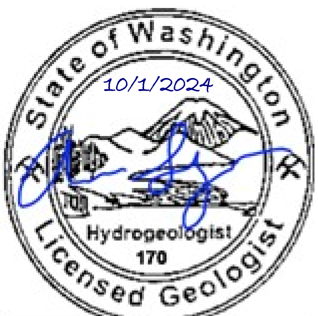
Parametrix and HWA GeoSciences Inc. 2024. Kent Highlands Landfill
2019-2023 Remedial Action Status Report.
Prepared for Seattle Public Utilities
by Parametrix and HWA GeoSciences Inc.,
Seattle, Washington.
September 2024.

Certification

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional hydrogeologist licensed to practice as such, is affixed below.

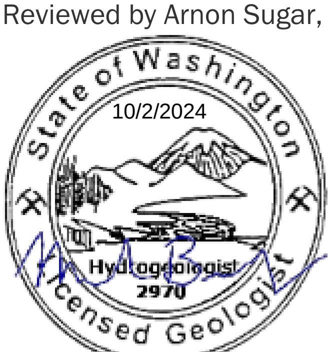
Lisa A. Gilbert

Prepared by Lisa Gilbert, LHG



Arnon Sugar

Reviewed by Arnon Sugar, LHG, HWA GeoSciences



Michael Patrick Brady

Reviewed by Mike Brady, LHG

Laura Boyce Lee

Approved by Laura Lee

Contents

Contents (continued)

Contents (continued)

Contents (continued)

FIGURES

TABLES

Contents (continued)

Contents (continued)

Acronyms and Abbreviations

AMSL	above mean sea level
BOD	biological oxygen demand
CCL	cumulative sum control limit
City	City of Seattle
COD	chemical oxygen demand
CUSUM	cumulative sum
DCE	dichloroethane
DO	dissolved oxygen
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EHSI	EHSI-International, Inc.
EPA	U.S. Environmental Protection Agency
FS	factor of safety
GCMP	Groundwater Compliance Monitoring Plan
gpm	gallons per minute
MCL	Maximum Contaminant Level (WAC 246-290-310)
MDL	method detection limit
Metro	King County Metro
mg/L	milligrams per liter
MNA	Monitored Natural Attenuation
MTCA	Model Toxics Control Act (Chapter 173-340 WAC)
NMOCs	non-methane organic compounds
ORP	oxidation-reduction potential
PLC	programmable logic control
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
RAA	Recent Alluvium Aquifer
RI	remedial investigation
RL	reporting limit
RV	regulatory value
SA	Sand Aquifer
SCADA	Supervisory Control and Data Acquisition
SCL	Shewhart control limit

Acronyms and Abbreviations (continued)

S&EE	Soils & Environmental Engineering, Inc.
SIU	Significant Industrial User
SPU	Seattle Public Utilities
SR	State Route
Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
SWQS	Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC)
TCE	trichloroethene
TL	tolerance limit
TM	Technical Memorandum
TOC	total organic carbon
UCL	upper confidence limit
µg/L	microgram per liter
VC	vinyl chloride
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1. Background

1.1 Introduction

Reporting Period: 2019 through 2023

Name of Site: Kent Highlands Landfill

Address: 23076 Military Road South, Kent, Washington 98032

Facility Site ID: 2042

Cleanup Site ID: 4428

Project Contacts: Mark Jusayan, Shannon Straws, and Min-Soon Yim

This remedial action status report presents a summary of remedial action system changes and events, and monitoring programs and results conducted at the Seattle Public Utilities (SPU) Kent Highlands Landfill (Facility Site ID #2042, Cleanup Site ID #4428) for the years 2019 through 2023, in preparation for the Fifth Periodic Review to be conducted by the Washington State Department of Ecology (Ecology). In addition, this report identifies modifications and changes planned for the next 5-year period.

1.2 Landfill Description

The Kent Highlands Landfill is located at 23076 Military Road South, Kent, Washington 98032 and is bounded to the south by State Route (SR) 516, to the west by private commercial property and vacant land, to the north by residential property and vacant land, and to the east by the Green River (see Figure 1). Midway Creek is also located east of the landfill and discharges into the Green River. The landfill is situated within a natural ravine on the eastern flank of the Des Moines upland where it adjoins the Green River valley. Landfilling operations by the Seattle Solid Waste Utility began in 1969 and were terminated in 1986, and the landfill accepted mostly municipal waste with some industrial waste and construction debris.

A brief description of the hydrogeologic setting, spring drain, surface water, leachate control, and landfill gas control systems are provided in the following sections.

1.2.1 Hydrogeologic Setting

The Kent Highlands Landfill is located on the eastern flank of the Des Moines Upland within the Puget Lowland adjacent to the alluvium of the Green River Valley. The upland sediments underlying the landfill are diverse and complexly interbedded. These sediments were deposited during what is interpreted to be the Vashon Stade of the Fraser glaciation and Salmon Springs glaciation, and also fluvial and lacustrine sediments, possibly part of the Puyallup Formation, deposited during an older interglacial period. Booth and Waldron (2004) map the surface geology below and surrounding the landfill. Alluvial sediments east of the landfill are comprised of recent and older alluvial deposits within the Green River Valley. The sediments can be divided into three major groups comprising many distinct deposits, listed below from youngest to oldest:

<u>Man-made fill and Kent Highlands Landfill refuse</u>

- Fill
- Landfill Refuse

<u>Alluvium that fills the Green River Valley</u>

- Recent Alluvium
- Older Alluvium

<u>Pleistocene glacial and interglacial deposits that underlie the Green River Valley alluvium and adjoining Des Moines Drift Plain</u>

- Vashon Recessional Outwash and Vashon Recessional lacustrine deposits
- Vashon Till and Vashon ice-contact deposits
- Outwash Sand (Vashon advance outwash, pre-Fraser age lacustrine deposits/coarse-grained Olympia beds)
- Olympia-age Interbed (fine-grained non-glacial pre-Fraser age deposits)
- Outwash Gravels (pre-Vashon; Salmon Springs Drift/pre-Olympia age glacial deposits, and Pre-Fraser age lacustrine deposits)
- Deltaic Sediments (Salmon Springs Drift/pre-Olympia age glacial deposits)
- Nonglacial Sediments (Puyallup Formation/reversely magnetized non-glacial deposits)

Groundwater occurrence and movement beneath the landfill and the adjoining sections of the Des Moines Drift Plain and Green River Valley are variable and complex. Distinct hydrostratigraphic units composed of aquifers and aquitards have been defined and are listed below in the order that they occur in the area from west to east:

- Landfill Aquifer
- Upper Aquifer
- Middle Outwash Aquifer
- Lower Outwash Aquifer
- Upper Silt Aquitard
- Sand Aquifer (SA)
- Lower Silt Aquitard
- Gravel Aquifer
- Recent Alluvium Aquitard
- Recent Alluvium Aquifer (RAA)

The two aquifers affected by the landfill include the SA and the RAA. A detailed description of these two aquifers is presented below.

Sand Aquifer. The SA exists beneath the landfill footprint and apparently extends throughout a large area of the Des Moines Upland in connection with the Vashon advance outwash. At the landfill, the aquifer solely consists of pre-Fraser age non-glacial sands, sand in the lower portion of the Deltaic Sediments and sand and gravel in the upper part of the Nonglacial Sediments. These two geologic units are hydraulically coupled beneath the landfill but have different hydraulic properties and estimated horizontal hydraulic conductivities. The SA is one continuous unit near the toe of the landfill. To the west, the saturated portion of the aquifer becomes interbedded with thick deposits of fine-grained silt and clay. The aquifer is unconfined beneath the base of the landfill but is confined by the overlying Upper Silt Aquitard at the west end of the landfill which locally separates it from the Vashon Advance Outwash.

The SA is recharged through vertical flow from the overlying Lower Outwash Aquifer and from migration of water within the Landfill Aquifer but mostly through lateral flow from the west. Groundwater from the SA discharges to the RAA, although within the landfill area, flow from the SA is also intercepted by the leachate collection system at the toe buttress

Recent Alluvium Aquifer. The RAA consists of saturated sand and silty sand. Except for local areas where silt beds confine the aquifer, the RAA is generally under water table conditions. The RAA is recharged by the following:

- Sand Aquifer (SA)
- Gravel Aquifer
- Landfill Aquifer
- Infiltration of precipitation
- Green River (under flooding conditions only)
- Part of Midway Creek
- Seeps or springs

Groundwater flow in the RAA is generally from west to east, toward the Green River. Horizontal hydraulic gradients in the aquifer increase under low water conditions (i.e., during the summer). Vertical hydraulic gradients in the aquifer are generally upward but may reverse to a downward gradient under high water (winter) conditions (CH2M HILL 1996b).

1.2.2 Spring Drain and Surface Water

The spring drain system consists of perforated pipe in gravel filled trenches installed along the north edge of the landfill prior to or during construction of the landfill to collect run-on from springs north and up-gradient of the landfill. Flow from the spring drain collection system previously flowed to the leachate pond, but it was diverted to the stormwater detention pond in November 1996 (CH2MHill 1995).

Flow from the spring drain normally is discharged to the surface water treatment pond and then to the Green River. Water quality of the combined surface water and spring drain flow is measured at the outlet structure of the surface water treatment pond. Flow rate is currently (since 2015) measured quarterly by temporarily diverting the spring drain flow through a flow measurement flume into the leachate treatment pond. Details of the spring drain are presented in the Slope Stability Review (Appendix A3, HWA 2024b).

1.2.3 Leachate Control

Leachate generated by the landfill is collected from two separate systems (south leachate system and toe buttress system) and discharged into the King County sewer. The south leachate drain consists of a series of pipes embedded in gravel-filled trenches within the landfill and was installed during filling operations to collect leachate from the landfill. The toe buttress is a trench filled with concrete rubble at the toe of the landfill to stabilize the slope, and also contains a drain.

A flow meter on the toe buttress system force main measures flows from that system. The total leachate discharged to the King County Metro system is measured by a flow meter in the leachate transmission pump station. Leachate quality samples are collected monthly from the leachate transmission pump station wet well (Ecology 2003).

1.2.4 Landfill Gas Control

The design of the Kent Highlands Landfill gas control system includes five basic elements:

1. An enclosed John Zink flare is used to incinerate the landfill gas in a controlled environmental manner.
2. Collection System – includes all the piping, valves, and mechanical equipment to create a vacuum on the landfill to draw landfill gas to the flare.
3. Interior control wells are intended to extract most of the landfill gas created as waste decomposes.
4. Perimeter control wells are intended to create a vacuum curtain around the landfill that captures any landfill gas not controlled by the interior system.
5. Landfill gas compliance probes are outside of the perimeter collection and near the facility's property boundary to confirm that the system is controlling subsurface migration of landfill gas.

1.3 Regulatory Status

A Consent Order was established between SPU and Ecology on May 27, 1987, and amended May 22, 1989, December 3, 1990, and again in 1996. The Kent Highlands Landfill was placed on the National Priorities List on August 30, 1990 for cleanup under the Comprehensive Environmental Response, Compensation and Liability Act (Superfund). Ecology is the lead agency as stipulated by an agreement with Region 10 of the U.S. Environmental Protection Agency (EPA). Cleanup was implemented under Washington Administrative Code (WAC) Chapter 173-340, the Model Toxics Control Act (MTCA).

The remedial investigation (RI, CH2M HILL 1991a) found off-site landfill gas migration and leachate impacts to groundwater that is in hydraulic connection with the Green River. The remedy to be implemented was specified in the Kent Highlands Landfill Cleanup Action Plan (Ecology 1993). The remedy included access controls, grading, a geomembrane landfill cover, a surface water conveyance system, a leachate collection system, and a landfill gas collection system. A Restrictive Covenant (Ecology 1993) was placed on the property to ensure the continued integrity of the cleanup action.

SPU oversees maintenance of landfill closure systems in accordance with the Post-Closure Operations and Maintenance Manual (CH2M HILL 1996a). Ongoing monitoring programs are in place including groundwater quality, fluid level monitoring for slope stability, surface water (spring drain discharge), leachate, landfill gas, and cap/cover integrity. Periodic Reviews are conducted by Ecology every 5 years to determine whether the cleanup remedy continues to be protective of human health and the environment.

2. Previous Five-year Review Issues and Resolutions

The Fifth Periodic Review was prepared by Ecology in 2019 (Ecology 2019) based on the 2014-2018 Remedial Action Status Report (Parametrix 2019). The Fifth Periodic Review identified changes and actions to be addressed in the 2019-2023 reporting period. The requested changes and actions from the Fifth Periodic Review that are the responsibility of SPU are identified in italics at the beginning of each of the following subsections. Actions taken by SPU to address these issues are addressed in the reports provided in Appendix A and summarized in Sections 2.1 through 2.4.

2.1 Slope Stability

Two new groundwater monitoring wells will be installed to monitor fluid levels at the toe of the landfill.

Previous post-closure slope stability analyses (CM2M Hill 1991b) concluded that the east slope of the landfill is stable under static conditions for both measured and presumed-higher groundwater levels. In response to Ecology's comments in the Fourth Periodic Review, SPU completed an updated slope stability analysis (Soil & Environmental Engineers, Inc. [S&EE] 2019) which concluded that higher than normal groundwater conditions could cause slope instability, and recommended installation and testing of two dewatering wells to investigate groundwater conditions, monitor water levels on the eastern landfill slope and evaluate the feasibility of dewatering the landfill to reduce slope instability if groundwater levels increased to unacceptable levels.

2.1.1 Well Installation and Hydraulic Testing

Two wells (DW-1 and DW-2) were installed into the landfill refuse as described in the Dewatering Well Installation and Slope Stability Reevaluation (Parametrix in association with S&EE and HWA 2023; Appendix A1).

Water level transducers were installed that transmit a signal into the existing programable logic control (PLC) at the flare facility to provide continuous monitoring of water levels into SPU's existing Supervisory Control and Data Acquisition (SCADA) system.

HWA conducted hydraulic testing of the two dewatering wells in 2023 (HWA 2024a; Appendix A2). The testing indicated the wells would not be effective at dewatering the waste in the event of a high groundwater event, due to the low permeability of the waste, and resulting low achievable pumping yields and radii of influence. In addition, conditions observed during drilling of the two wells confirmed CH2M HILL's observations of multiple perched layers within the landfill, likely due to the multiple waste cells and layers of cover soil.

2.1.2 Slope Stability Reevaluation

As described in the Dewatering Well Installation and Slope Stability Reevaluation (Parametrix in association with S&EE and HWA 2023; Appendix A1), S&EE re-evaluated the assumed unit weight of landfill materials based on field observations during drilling of DW-1 and DW-2 (i.e., blow counts) and materials laboratory testing data (i.e., moisture content and density). The updated slope stability analyses showed results that were comparable to those from 2019 (S&EE 2019), showing no additional adverse impact by the increased unit weight.

The updated slope stability analysis maintained that the landfill was globally stable under static conditions using "more probable" refuse strength values, under both low and high groundwater conditions. S&EE also concluded that the local/eastern slope was stable under static conditions using "more probable" refuse strength values as long as groundwater did not reach high groundwater conditions. S&EE concluded that elevated groundwater levels in DW-1 would have "minimal effect on slope stability," but elevated groundwater levels in DW-2, (located downslope of DW-1) of 68.0, 76.5, and 82.0 feet (AMSL), would decrease the factors of safety (FS) to 1.5, 1.3 and 1.2, respectively. S&EE recommended sensors with alarms be installed in DW-2, with an "indicator" condition when groundwater reaches elevation 68.0 feet, and an alarm condition when groundwater reaches elevation 76.5 feet.

S&EE conducted a slope stability evaluation to determine alarm level settings in the dewatering wells. The results show that the rise of groundwater in DW-1 has minimal effect on the slope stability. However, the rise of groundwater in DW-2 may affect slope stability, and therefore, the system will be set to trigger an alarm in well DW-2 when groundwater reaches elevations established based on the calculated FS for slope failure. A FS above 1.5 is considered stable, while a FS of 1.0 is considered imminent failure. S&EE recommended the following alarm levels:

- Level 1 – Indicator alarm will be set when groundwater reaches an elevation of 68 ft (FS of 1.5).
- Level 2 – Warning alarm will be set when groundwater reaches an elevation of 76.5 ft (FS of 1.3). More frequent scrutiny of the monitoring data will be initiated and SPU will prepare for the possibility of dewatering.
- Level 3 – Action alarm will be set when groundwater reaches an elevation of 82 ft (FS of 1.2). Dewatering/pumping will be activated. Due to the infeasibility of dewatering, a subsequent evaluation by HWA (discussed below) provided additional contingency measures (HWA 2024b; Appendix A3).

2.1.3 Slope Stability Conclusions and Recommendations

HWA visited the landfill property and performed an independent review of previous slope stability studies (CH2M HILL 1991b; S&EE 2019; Parametrix in association with S&EE and HWA 2023) and provided the following opinions and conclusions (HWA 2024b; Appendix A3):

- The slope stability analyses performed to date by CH2M HILL and S&EE appear to have been performed in a reasonable manner using generally accepted state of the practice methods.
- The results of slope stability analyses performed by others suggest that for the "more probable" refuse strength values, the whole landfill, as well as the eastern slope is stable under static conditions with groundwater levels similar to those observed historically.
- Under seismic conditions both global and local landfill slopes were found by S&EE to have factors of safety less than one for all cases analyzed. S&EE's predicted seismic displacements ranged from 17 inches when the groundwater is low to 30 inches when it is high. Given the magnitude of these estimated displacements, these displacements will likely be manageable and readily repairable and less costly than preemptively trying to mitigate against earthquake-induced slope failure/movement.
- Due to the lack of new information regarding groundwater conditions at the landfill and the engineering properties of the refuse and underlying soil, there is no basis to re-evaluate the static stability of the landfill's slope. However, because seismic data is updated over time, HWA recommends re-evaluating the landfill's seismic slope stability every 10 years, based on updated seismic data.

- Dewatering is not a feasible mitigation strategy for high groundwater conditions due to the low permeability of the waste, and likely discontinuous nature of groundwater within the landfill.
- Based on the historical groundwater level data, it is unlikely that groundwater within the refuse will reach the levels of concerns for slope stability due to natural factors (i.e., precipitation). However, groundwater levels may be impacted by some blockage or malfunction in any of the landfill drains, which might cause groundwater to back up into the landfill. The spring drain has the highest flows, may already be blocked to some extent, and is therefore the most likely to potentially cause groundwater level changes. The unusually constant measured flow rates in the spring drain and the presence of sand coming out of the drain suggest a possible breach and/or blockage somewhere in the system, or at the control structure.
- Mitigation of potential slope instability at the landfill may be best addressed by 1) conducting an initial assessment of drain function, 2) repairing (if needed and possible) components of the landfill's drainage system that are not functioning as intended, 3) ensuring continued function of the drains, 4) monitoring drains and groundwater levels, and 5) developing contingency plans to address any reduction in flows from the drains or increases in groundwater levels.

HWA developed initial and ongoing recommendations to help maintain the stability of the landfill slopes. The recommendations relate to the leachate flow measurements and structures and the water level monitoring of the dewatering wells and are presented in Sections 6.3 and 8.3, respectively.

2.2 Vinyl Chloride in Groundwater and Landfill Property Boundary

The City has proposed re-locating the groundwater point of compliance to the point of discharge into the Green River and utilizing modeling methods to demonstrate compliance within a reasonable restoration timeframe. Ecology indicated the following would be required in order for them to consider this approach:

Ecology would need to:

- Review the eastern property line documentation provided by the City to determine whether the property line should be moved closer to the Green River. (Note, this should actually state: Review the eastern property line documentation provided by the City (Floyd|Snider 2007) to confirm that the property line is on the western edge of the Green River east of Frager Road instead of along Frager Road.)
- Determine whether the Consent Order must be amended (via a new Consent Decree), and whether the action complies with the February 23, 2000 agreement between EPA and Ecology: Superfund Management in Washington.

Ecology required the City to take several actions:

- *Demonstrate that the provisions of WAC 173-340-720(8)(e) have been met.*
- *Evaluate monitoring results in accordance with EPA's Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. For example, additional parameters would need to be added to the sampling program to meet this requirement.*
- *Take pore-water samples at the point of discharge to "spot check" the modeling results; the number and timing of such spot checks to be as approved by Ecology.*

2.2.1 WAC 173-340-720(8)(e) Provisions

Moving the point of compliance to the location where groundwater discharges into the Green River and estimating concentrations at that location via extrapolation (modeling) using data from upgradient wells KMW-17 and 17Z would require a conditional point of compliance be set for a property abutting or near surface water, and that the provisions of WAC 173-340-720(8)(e) be met. The results of the City's pore-water study demonstrated that the provisions of WAC 173-340-720(8)(e) have been met, as discussed in Section 2.2.3 below.

2.2.2 Monitored Natural Attenuation

EPA guidance states that selection of monitored natural attenuation (MNA) as a remedy requires documentation of decreasing trends in contaminant concentrations and also consideration of other data indicating that contaminant mass is being destroyed, not just being diluted or adsorbed to the aquifer matrix. Monitoring data have historically been collected for volatile organic compounds (VOCs) and for other parameters that can be used to evaluate conditions favorable to MNA, including chloride, iron, manganese, total organic carbon (TOC), and sulfate. Beginning in 2020, the following additional parameters have been tested to further evaluate MNA (Appendix B2): dissolved oxygen (DO), oxidation-reduction potential (ORP), total ferrous iron, alkalinity, methane, ethane, and ethene.

A Compliance Evaluation Update Technical Memorandum (Parametrix 2024a) evaluated the data for the additional MNA parameters using EPA guidance (EPA 1998; 1999) to further confirm that MNA is occurring consistent with the conceptual site model (Parametrix and EHSI-International, Inc. (EHSI) 2019b) and to demonstrate that attenuation of contaminants is occurring at rates sufficient to be protective of human health and the environment. The Technical Memorandum is presented in Appendix A4 and the results are summarized below.

In general, the groundwater has neutral pH, relatively low concentrations of nitrate and sulfate, and low to moderate TOC. DO measurements fluctuate between aerobic (>1 mg/L) and anaerobic (<1 mg/L), and ORP measurements also fluctuate between oxidizing and reducing conditions. Concentrations of some parameters are consistent with conditions favorable to reductive dechlorination. Nitrate and sulfate concentrations are generally below levels that would compete with the reductive pathway, although sulfate concentrations in RAA upgradient well and downgradient well KMW-017Z are greater than 20 mg/L. Iron concentrations are predominantly ferrous and are consistently greater than 1 mg/L in RAA wells. Iron (and manganese) concentrations are elevated in well KMW-019A near the toe of the landfill. All RAA wells have relatively high concentrations of methane, with methane present at concentrations greater than 5 mg/L indicating anaerobic degradation could be occurring, although methane is more likely from decomposition of landfill waste.

However, other results are inconclusive with respect to conditions for reductive dechlorination. Concentrations of DO were below or near 1 mg/L in many wells in 2019, 2022 and 2023 indicating anaerobic conditions, and aerobic conditions above 1 mg/L were observed in 2020 and 2021. Concentrations of TOC are lower than optimal, and ORP measurements primarily indicate oxidizing conditions except for 2023 measurements. Results for parameters that could represent byproducts of degradation including chloride and alkalinity (greater than two times background) are inconclusive since chloride and alkalinity concentrations are generally in the same range or higher in the upgradient wells relative to downgradient wells, except for alkalinity at well KMW-018A. No ethene or ethane were detected that would indicate byproducts of degradation. However, because the process is occurring at the end of the plume, the very end of the degradation process, and at low concentrations, some of these analytes and geochemical indicators are unlikely to be detected over the threshold of natural or landfill-induced concentrations or conditions. Overall, the measured vinyl chloride (VC) concentrations and trends suggest natural attenuation is occurring,

2.2.3 Pore-Water Sampling

In the Fourth Periodic Review (Ecology 2014), Ecology requested an evaluation of further remedial options to be completed to decrease restoration time frames. A Groundwater Compliance Evaluation was completed (Parametrix and EHSI 2019b) and MNA was selected as the most feasible and cost-effective remedy for the Site. To support selection of MNA, the BIOSCREEN and BIOCHLOR models (EPA 1996, 2000) were used to evaluate degradation of VC between monitoring wells KMW-017 and KMW-017Z and the ultimate groundwater discharge point at the Green River. A natural log linear regression technique (Newell et al. 2002) was used to determine the degradation constant of the source area near well KMW-017 discharging into the RAA. The solution of the natural degradation for the Site was determined to be:

Y = e-0.0752X also presented as X = - Ln (Y) / 0.0752, where:

Y = concentration of VC in µg/L
X = years since 2005.

The Natural Attenuation Screening protocol scoresheet in the BIOCHLOR model was completed and showed adequate evidence for anaerobic biodegradation of chlorinated organics. This evaluation is similar to the EPA MNA scoresheet (EPA 1999 Table 2.3).

The BIOSCREEN and BIOCHLOR projections (Parametrix and EHSI 2019b) indicated that VC concentrations in groundwater already met or soon could meet the regulatory value (RV) at two compliance wells (KMW-010A and KMW-019A) but would not meet the RV within a reasonable restoration time frame at the other compliance well (KMW-017). However, the modeling projections suggested that groundwater 200 feet downgradient of KMW-017 near the point of discharge into the Green River could potentially meet the RV within a reasonable restoration time frame of less than 10 years, supporting MNA as a selected remedy and avoiding more active remedial actions.

In the Fifth Periodic Review, Ecology (2019) agreed to allow SPU to address the out-of-compliance situation in the portion of the aquifer represented by KMW-017 through a combination of:

1) estimating concentrations of groundwater discharging into the Green River via extrapolation (modeling) using data from upgradient wells KMW-017 and -017Z, and

2) measuring VC concentrations directly through pore water sampling where groundwater discharges into the Green River to “spot check” the modeling results, with the number and timing of such spot checks to be as approved by Ecology.

To address Ecology’s second requirement, two piezometers (KPW-1 and KPW-2) were installed on the western bank of the Green River (Parametrix and HWA Geosciences 2022; Appendix A5). Samples from the piezometers were collected in September 2022 and September 2023 using a peristaltic pump and low flow purging techniques in the same timeframe as the annual groundwater sampling of the monitoring wells. The samples were analyzed for VC and VOCs.

Groundwater and surface water elevations were used to evaluate the gradient from KMW-17, KMW-17Z, the piezometers, and the Green River. The gradient confirmed the groundwater to surface water flow pathway to be northeasterly away from KMW-17.

2.2.4 Comparison of Data to Fate and Transport Modeling Projections

The recent 2019 through 2023 VC data were compared to the BIOSCREEN and BIOCHLOR fate and transport modeling projections (Parametrix and EHSI 2019b) that were conducted to verify prior restoration time frame estimates to demonstrate that MNA is an appropriate cleanup remedy. VC concentrations continue to decrease at KMW-017 consistent with the previous modeling projections, and VC concentrations at KMW-017Z have shown fluctuations within a limited range.

The VC concentrations and updated trend projections have been added to the modeling predictions and are presented in Figure 5 of Appendix A4. The VC concentrations measured between 2019 and 2023 at KMW-017 were very close to or below the model-predicted ranges, and well within the expected precision of this analysis given seasonal variability and model precision. VC concentrations at KMW-017Z fluctuated slightly above the model-predicted ranges. The 2022 and 2023 VC concentrations at the piezometers representing the Green River were very close to or below the model-predicted ranges, and VC was not detected in either piezometer in 2023.

The estimated compliance date at KMW-17Z appears to be around 2040 rather than the previous model predictions (2034 to 2037). The data from the piezometers and 2018 model suggest compliance is already being achieved at the Green River property boundary and point of discharge. Additionally, the 2023 source area decay constant appears to be greater than the previous analysis suggesting restoration timeframes at KMW-17 would be reached 3 years sooner than previously predicted. These results show re-calibration of the model may be necessary if KMW-17Z continues to trend above the 2018 model calibration.

The results for additional VOCs are consistent with reductive dechlorination predominantly occurring upgradient within the landfill with cis-1,2-dichloroethene (DCE) concentrations higher than the trichloroethene (TCE) concentrations, and TCE absent and cis-1,2-DCE present at KMW-017Z.

The 2019 to 2023 VC data in monitoring wells and piezometers representing the Green River confirm the model predictions that indicate that MNA is functioning as an appropriate cleanup remedy to achieve cleanup in a reasonable time frame. The model predictions and data collected at the piezometers confirm that the VC regulatory value (RV) of 0.025 microgram per liter (µg/L) is currently being met at the point of discharge to the Green River and additional remedial actions are not likely necessary.

2.3 Water Supply Well Inventory

Ecology requested the SPU conduct further evaluation related to recommendations presented in the well inventory (Parametrix and EHSI 2019a). *Three issues requiring further evaluation by the City of Seattle (City) were identified in the Fifth Periodic Review:*

- *Confirm that a new well owned by the City of Kent (15H1) is used for groundwater monitoring or has been decommissioned.*
- *Contact the owner of a new residential well (22A2) to confirm its use and advise them of the landfill proximity. This well is located approximately 1,000 feet from the southern edge of the landfill in an up-river location on the east side of the Green River.*
- *Contact The Lakes development to confirm whether or to what degree it is withdrawing surface water and/or groundwater for maintenance of its ponds.*

The status of these actions is summarized in the following sections.

2.3.1 City of Kent Well

The well inventory (Parametrix and EHSI 2019a) identified that the City of Kent recently drilled monitoring wells for the improvement of Veterans Drive. One of the wells, 15H1, was reported as a water well (dewatering) and drilled at the intersection of Veterans Drive and Frager Road, approximately 700 feet north of the landfill. This improvement project was completed in 2006 to 2007. In 2020 Parametrix and SPU staff investigated the location of the well below the Veterans Drive bridge near Frager Road. The well could not be located at that time; however, due to the overgrowth of vegetation it was clear the well was no longer used for monitoring.

2.3.2 New Well 22A2

The well inventory (Parametrix and EHSI 2019a) identified that one relatively new well, the Stearns well (22A2), was drilled by Bison Well Drilling and Septic of Spanaway, Washington in 2016 to a depth of 65 feet below ground surface within the RAA approximately 1,200 to 1,400 feet south of the landfill's southern border at 24519 Frager Road South. A residence was developed on this property in 2018 indicating the well is likely active and used for domestic purposes.

The owner of the new residential well (Stearns; 22A2) was contacted by letter in October 2021.and offered by SPU to sample the well out an abundance of caution. A copy of the letter is provided in Appendix A6. The well owner did not respond to SPU's request. Based on the upgradient location of the well, no impact from the landfill is anticipated.

2.3.3 The Lakes

The well inventory (Parametrix and EHSI 2019a) identified three groundwater production wells and active water rights for recreational use at The Lakes development located east of and across the Green River from the landfill property. The Lakes includes 19 communities made up of condominiums, townhouses, individual homes, and apartments, comprising approximately 2,000 residential units and has several man-made lakes, the closest of which is approximately 1,300 feet east of the eastern limits of the landfill. The closest well is approximately 2,800 feet east of the eastern edge of the landfill. Information gathered by HWA regarding The Lakes wells is summarized in a Technical Memorandum presented in Appendix A7. The findings and recommendations are summarized below.

The Lakes Property Manager provided the following information. The development has 26 acres of created lakes, fed by stormwater and runoff. The City of Kent permitted this system and planned to do flow monitoring but never did. Overflow in the wet season (October/November) is discharged to the river and/or wetlands via a stormwater structure. They have three wells but two of them have not been used for many years due to water quality issues with lake algal blooms. One 98-foot deep well is still pumped in August at rates of approximately 150 to 200 gallons per minute and discharged into the lakes. They do not keep any records of flows. They are in the process of getting approval to drill new well(s), perhaps deeper, in hopes of better water quality.

The associated water right appears to be a 1987 certificate (active status) amended in 1998, for 450 gallons per minute (gpm) instantaneous, 240-acre feet/year, from three wells, June through October, for recreational use. The Lakes well in use likely corresponds to well 14Q1 identified in the 2019 Well Inventory. It was originally 45 feet deep and was deepened to 98 feet in 2004 and is screened between 49 and 94 feet, likely in the RAA. The Lakes well is not used for drinking water purposes.

Based on the well location and use of the water for sustaining surface water ponds, it does not appear to be necessary to conduct further analysis or collect water quality samples at this time. If additional wells are identified in the future, The Lakes will be contacted to gather information about well use and production. In the event that new wells are installed and operated by The Lakes in closer proximity to the landfill, water quality sampling should be reevaluated.

2.3.4 Water Supply Well Inventory Update

HWA conducted a 2024 review of the same databases used in the previous well inventory (Parametrix and EHSI 2019a) including: Ecology Well Log Database and Water Resources Explorer, Washington State Department of Health (DOH) Well and Water Quality, and King County Water and Land Services to identify new water supply wells installed within 2,000 feet of the landfill after the Parametrix and EHSI (2019a) inventory update. The well inventory update (HWA 2024d) is presented in Appendix A8.

HWA did not identify any new water rights applications, permits, certificates, or water supply wells constructed within 2,000 feet of Kent Highlands Landfill, or otherwise not included in the 2019 well inventory except for the two dewatering wells installed for SPU into the landfill as part of the slope stability reevaluation in March 2022.

2.4 Landfill Gas Concentrations in Probe 35-S

Further evaluation by the City is required of the potential for a preferential transport pathway between the landfill and gas probe 35-S. Install temporary gas probes at a spacing of approximately 20 feet on center in a line perpendicular to the potential pathway between the landfill and 35-S. These probes should be installed and sampled immediately after methane has been measured in 35-S at a concentration equal to or greater than 2% by volume. Alternatively, the City can propose another approach that accomplishes the same goal.

An evaluation of landfill gas in the vicinity of KGP-35-S was completed in 2020 due to historically elevated detections of methane in that probe (see Parametrix 2019). Five temporary shallow gas probes (KGP-301, KGP-302, KGP-303, KGP-304, and KGP-305) were installed at a spacing of approximately 20 feet on center in a line perpendicular to the potential pathway between the landfill and KGP-35-S (see Appendix E1). The probes were monitored quarterly over a 2-year period for the presence of methane and no methane was detected. After the 2-year evaluation period was completed, SPU planned to conduct testing at the temporary probes only if the concentration of methane at KGP-35-S was higher than 2.0% by volume. Since no methane greater than 2.0% by volume has been measured at KGP-35-S during this 5-year period, the temporary probes will be removed.

3. Land Use Changes

3.1 Remedial Action System Changes and Events

Land use changes between 2018 and 2023 are shown on Figure 2. No changes in land use at the landfill occurred during this 5-year period. The following changes occurred at properties adjacent to the landfill:

- Development of apartment buildings located at 23000 Military Road S adjacent west of the Grandview Apartments north of the landfill.
- Demolition of some of the Poulsbo RV commercial buildings.
- Re-routing of highway ramps related to the SR 509 project. The City of Kent also installed a materials storage structure north of the landfill near the end of Riverview Blvd South.

3.2 Modifications or Changes Planned for the Next 5-Year Period

The following land use changes are planned for the next 5-year period:

- The Washington State Department of Transportation is designing an expansion project at the nearby SR 509 and Interstate 5 exchange. This expansion may increase stormwater runoff flows to Midway Creek.
- The Washington State Department of Transportation SR 509 project and the Sound Transit light rail extension through the area on the west edge of Interstate 5 are expected to stimulate new development in the area, particularly in the area west of the landfill.
- Development of portions of the landfill itself is possible, and SPU is planning to conduct a market evaluation in the near future. Careful consideration will be needed of the impact of area development on post-closure care of the landfill and vice versa.

No other modifications or changes to land use are planned during the next 5-year period.

4. Groundwater

4.1 Remedial Action System Changes and Events

4.1.1 Low-Flow Trial Event

In September 2019, to ensure that representative groundwater samples are being collected, SPU conducted a trial using low-flow groundwater monitoring procedures at the compliance wells in accordance with EPA and Ecology guidelines (EPA 2017b; Puls and Barcelona 1996; Ecology 2012). The low-flow data are summarized in Appendix B1. The results from the trial low-flow groundwater sampling event were comparable to those obtained using the routine sampling procedures. However, due to the type of dedicated pumps installed in the wells, it was determined that this approach could not be easily implemented. The wells are equipped with dedicated Bennett piston pumps operated using compressed air, and it is difficult to maintain low flows. In addition, it is not possible to measure drawdown during purging in the subset of wells where water levels are measured pneumatically. Purging and stabilization procedures were updated as discussed in Section 4.1.3 below.

4.1.2 Monitored Natural Attenuation Parameters

To provide further evaluation of the effectiveness of ongoing MNA, SPU began measuring the additional parameters DO, ORP, total ferrous iron, alkalinity, methane, ethane, and ethene during routine groundwater monitoring well sampling events beginning in 2020 (See Appendix B2). The objective was to further confirm that MNA is occurring consistent with the conceptual site model (Parametrix and EHSI 2019b) and to demonstrate that attenuation of contaminants is occurring at rates sufficient to be protective of human health and the environment. The technical memorandum is presented in Appendix A4 and the results of the compliance update are discussed in Section 2.2.2.

4.1.3 Purging and Stabilization Procedures

Beginning in 2022, purging and stabilization procedures for groundwater sampling were updated in accordance with EPA guidance (EPA 2015, 2017a). The following purging and stabilization procedures were recommended (See Appendix B3).

- Utilize a multi-parameter meter that measures pH, temperature, DO, ORP, and specific conductivity, and utilize a separate meter for turbidity.
- Purge approximately one well volume prior to connecting the discharge to the flow through cell.
- After one well volume, connect the discharge to the flow through cell and begin measuring field parameters through a minimum of three well volumes, at one-half well volume (Method A) or one well volume (Method B) intervals.
- Separately measure turbidity via grab sampling.
- If after three consecutive readings, pH is within 0.1 standard units, and specific conductivity is less than 5% variance, this is considered stable and samples can be collected if turbidity measures less than 10 NTU.

- If not stable or turbidity is greater than 10 NTU, continue measuring pH, specific conductivity, and turbidity at one-half well volume (Method A) or one well volume (Method B) intervals up to a maximum of five well volumes.
- If, after five well volumes, pH and conductivity have stabilized and the turbidity is still decreasing and approaching an acceptable level below 10 NTU, additional purging should be considered to obtain the best sample possible. No more than six well volumes should be purged, to minimize the over pumping effects.

It was recommended that for wells with a well volume greater than 5 gallons, field parameters be measured at approximately half well volume intervals, in accordance with EPA guidance. This will increase the number of measurements collected and increase the chances of achieving stabilization sooner and reducing purge times. For wells with less than 5 gallons of well volume, SPU should continue its current methodology of measuring stabilization in one well volume increments.

4.1.4 KMW-17 Pump Replacement

In July 2022, SPU personnel found that someone had cut the lock to the Frager Road north gate and had stolen the Bennett sampling pump from KMW-17. The tubing had been cut and scattered around the well. The stainless steel pump had been stolen.

In August 2022, SPU completed installation of the replacement pump into KMW-17 approximately one month prior to the September sampling event. The pump was placed with the bottom at 33.86 feet below the top of casing, or just over 1-foot of difference from the previous pump deployment depth (35 feet below the top of casing).

4.1.5 Replacement Well KMW-15R

Monitoring wells KMW-15A and KMW-15B, located southeast of the landfill near Frager Road (see Figure 3), were decommissioned and well KMW-15A was replaced with a new monitoring well KMW-15R as documented in a technical memorandum (Parametrix 2024b) presented in Appendix B4. KMW-15 was a nested well with two completions within the RAA (AGI 1990). KMW-15A, the shallow completion, was used to monitor upgradient groundwater quality in the RAA whereas KMW-15B, the deeper completion, was solely used for measuring water levels.

In August 2022, it was discovered that the well had been damaged such that the monument was leaning to the east (towards the roadway) with the concrete foundation still attached. The well monument was repaired in September 2022. However, in June 2023, during attempts to install the dedicated pump assembly into well KMW-15A, it was discovered that both wells were obstructed and contained bentonite.

In August 2023, a new monitoring well KMW-15R was installed to replace KMW-15A. SPU personnel installed a designated Bennett sample pump and used the pump to develop the well. The well was surveyed and added to the annual sampling program beginning in 2023 to monitor upgradient groundwater conditions within the RAA. The damaged KMW-15 nested well was decommissioned in September 2023 by a licensed well driller.

4.1.6 Revisions to Statistical Calculation Methods

Parametrix completed statistical analyses for the previous 5-year report (2014–2018) following the groundwater compliance monitoring plan (GCMP) prepared by CH2M HILL in 1996. The GCMP used approaches and analyses based on Ecology's statistical guidance for site managers (Ecology 1992), EPA's Interim Final Guidance (EPA 1989), and Gibbons (1994). EPA and Ecology have since issued updated guidance for statistical analysis of groundwater monitoring data. Ecology's current guidance (2018) recommends using EPA's Unified Guidance (EPA 2009) for guidance on statistical analysis of landfill groundwater data.

For this 5-year report (2019–2023), Parametrix revised statistical approaches and analyses to be consistent with EPA's more recent Unified Guidance (EPA 2009). These revisions were implemented using Sanitas™ (versions 10.0.16 and 10.0.19), a statistical analysis software package designed for analysis of landfill groundwater monitoring data. Sanitas was configured to calculate statistics following EPA's Unified Guidance, including default settings for handling of non-detects, distribution testing, and statistical limit calculations required by the GCMP (control charts, tolerance limits [TLs], and VC 95% upper confidence limits [UCLs]).

To evaluate how the use of Sanitas and the Unified Guidance approach would affect the statistical limits, the 2014-2018 data were rerun and compared to the limits previously based on the GCMP presented in previous reports. The results are presented in a technical memorandum presented in Appendix B5.

Table 1 in Appendix B5 compares the control chart limits calculated using Sanitas to those calculated in the 1996 groundwater monitoring report (CH2M HILL 1997). In most cases, the cumulative sum control limit (CCL) and Shewhart control limit (SCL) calculated using Sanitas are slightly lower. Additionally, Sanitas calculated upper and lower limits for pH, which was not done in the 1996 groundwater monitoring report.

Table 2 in Appendix B5 compares the TLs calculated using Sanitas to those calculated for the 2014-2018 5-Year Report following methods specified in the GCMP. In general, the TLs calculated using Sanitas are similar to those calculated for the 2014–2018 5-Year Report and are slightly lower in many cases. Additionally, Sanitas calculated upper and lower TLs for pH, which was not done in the 2014–2018 5-Year Report (which was consistent with the GCMP).

Table 3 in Appendix B5 compares the 95% UCLs for VC calculated using Sanitas to those calculated for the 2014–2018 5-Year Report following methods specified in the GCMP. In general, the parametric 95% UCLs calculated using Sanitas are slightly lower than those calculated for the 2014-2018 5-Year Report because Sanitas found the data sets to be normally distributed rather than lognormally distributed. The 95% UCL calculated for KMW-017Z is higher because Sanitas used the maximum of the detected values and RLs to set the value, while MTCAStat used a different method that resulted in a lower value.

4.2 Remedial Action Monitoring Program and Results

The remedial action monitoring program for groundwater includes sampling wells for groundwater quality and groundwater hydraulic monitoring.

4.2.1 Groundwater Quality

The groundwater monitoring program includes sampling of wells for groundwater quality and measurements of groundwater elevations as described in Section 11.1 of the Post-Closure Operations and Maintenance Manual and the Kent Highlands Landfill GCMP prepared by CH2M HILL (1996b) and approved by Ecology. Confirmational monitoring has been conducted since completion of baseline monitoring in the fourth quarter of 1996. The baseline data were compared to the RI data and the results were presented in the Kent Highlands Landfill 1996 Groundwater Monitoring Report (CH2M HILL 1997). The groundwater compliance monitoring objectives, monitoring network, data collection methods, and data analysis procedures are explained in detail in the GCMP.

Groundwater monitoring was conducted annually during the third quarter of each year in accordance with the GCMP. Groundwater samples were collected from background, indicator, and compliance monitoring wells in the SA and the RAA. Samples from each well were analyzed for field parameters, conventionals, metals, and VOCs. Groundwater sampling locations in the SA and RAA are presented in Figure 4. Analytical results for each monitoring event are summarized in Table 1.

The field data are presented in Appendix B8, data validation is presented in Appendix B9, and the laboratory reports are presented in Appendix B10. The data evaluation process during confirmational monitoring, as modified to reflect the monitoring reduction to an annual frequency, is shown in Figure 5. Statistical evaluations are discussed in the following sections and presented in Appendix B6.

4.2.1.1 Summary Statistics

Summary statistics for all well data (background, indicator, and compliance wells) were generated for the 2019 through 2023 monitoring results using Sanitas and are shown in Appendix B6-1. The statistics for each monitoring parameter include the number of samples, the number of detects, the detection frequency (i.e., the percentage of samples in which the given parameter was detected), and the number of samples in which each parameter was detected at a level above its RV.

The statistics also include the minimum and maximum values for detected parameters, the minimum and maximum values for non-detects (the quantitation limit), and the sample mean (assuming a value of one-half the quantitation limit for non-detects).

4.2.1.2 Comparison of Groundwater Data to Statistical Limits

The detailed approach for statistical analysis of post-closure groundwater monitoring data is presented in the GCMP (CH2M HILL 1996b). Because the Cleanup Action Plan (Ecology 1993) states that MTCA cleanup standards have been met at this Site, groundwater leaving the Site will continue to be in compliance unless its quality deteriorates from the groundwater quality measured during the RI. The Kent Highlands post-closure groundwater monitoring data are compared to the following three criteria:

- Baseline water quality monitoring data measured at the same well using Shewhart-cumulative sum (CUSUM) control charts
- Recent water quality data from the background well in the same aquifer using TLs
- RVs. In accordance with the GCMP, RVs are the most stringent of Maximum Contaminant Levels (MCLs, WAC 246-290-310) and MTCA Method B cleanup levels (WAC 173-340-720), unless the standard is below the RL. For this report, RVs were updated to be consistent with the most recent version of Ecology's Cleanup Levels and Risk Calculation database (CLARC, February 2024).

The GCMP states that an out-of-compliance condition for groundwater would occur for conventional and inorganic parameters if the baseline conditions (SCL), background conditions (TL), and RV were all exceeded in any of the compliance wells (RAA wells KMW-10A, KMW-17, and KMW-19A) for two consecutive events. For organic parameters, compliance is determined by comparing the upper 95 percent confidence limit of the mean of the most recent eight data points to the RV. VC is the only organic parameter for which concentrations exceeded the RV during 2019 through 2023 (see Table 1), and an evaluation of VC is discussed in Section 4.2.2.2.

For conventional and inorganic parameters, intra-well comparisons using control charts are the primary statistical tool to detect any changes in groundwater quality over time. Since the number of data points measured during the RI were not sufficient to develop control charts, the data used to develop the control limits included both RI data (1989 to 1990) and baseline monitoring data (1994 to 1996). Before constructing the control charts, the initial compliance monitoring data were compared to the RI data using boxplots, time-series plots, and summary statistics. Shewhart-CUSUM control charts were developed only for those well-parameter cases where the initial compliance monitoring data had not increased compared to the RI data (CH2M HILL 1997).

Control charts were constructed for well-parameter combinations that had not increased since the RI following the end of baseline monitoring in the fourth quarter of 1996 (CH2M HILL 1997). The control charts compare the compliance data to the SCL, and the CUSUM of the data to the CCL for parameters with data that fit a normal or lognormal distribution. Control limits for the well-parameter combinations that were not lognormally or normally distributed were estimated using a nonparametric method and no CUSUM control limits were generated.

Analysis of 2019 through 2023 Data

Using Sanitas, the control charts were updated through 2023 and are presented in Appendix B6-2. The charts for the RAA are presented before the SA charts. Control charts and comparisons to statistical limits are not presented for well KMW-17Z because the well was installed after the baseline period.

TLs are used to compare downgradient groundwater quality to background water quality. At the end of the baseline monitoring period, in the fourth quarter of 1996, TLs were generated for each monitoring parameter in each of the two background wells—KMW-13 in the SA and KMW-15A in the RAA. The limits were originally calculated using 1995 and 1996 data and were applied to the control charts for the four quarters of 1997. As specified in the GCMP, the TLs are meant to be representative of current groundwater quality; therefore, 2019 through 2023 data were compared to TLs (Table 2) calculated using the 2014 through 2018 data as presented in the 2014-2018 Remedial Action Status Report (Parametrix 2019).

A comparison of the 2019 through 2023 data to groundwater quality limits is presented in Table 2. A check in the SCL, TL, or RV column indicates that the value is greater than the limit.

If the SCL, TL, and RV are all exceeded at a compliance well (RAA wells KMW-10A, KMW-17, and KMW-19A), the GCMP states that Ecology will be notified, and a verification sample will be collected during the next monitoring event. If the exceedance is verified, the Site is out of compliance, and the agencies will determine appropriate actions on a case-by-case basis. Exceedances of limits in background or indicator wells do not constitute out-of-compliance conditions.

There were no cases during 2019 through 2023 where the SCL, TL, and RV were all exceeded in a compliance well for two consecutive events (see Table 2). However, the manganese and iron concentrations in well KMW 19A exceeded the TL and RV for at least two consecutive events, and no SCL was established for these parameters. Ecology's position as stated in the Third Periodic Review Report (Ecology 2009) is that, regardless of the SCL comparisons, manganese concentrations in downgradient wells are higher than in the background wells by a factor of two or more, and therefore Ecology considers the Site to be out of compliance for manganese. Concentrations of iron and manganese decreased following the baseline period through 2011, but since 2012 have increased and are currently above the range of those in the baseline period.

Although not an out-of-compliance condition, concentrations of manganese in indicator wells KMW-16A and KMW 16B also exceeded the RV and the TL for more than two consecutive events (see Table 2). According to the GCMP, concentrations are not compared to SCLs in these cases because the values measured during the baseline period were higher than those measured during the RI. However, since the baseline period, manganese concentrations have decreased in these wells and are currently less than the concentrations measured during the RI.

4.2.1.3 Statistical Evaluation for Vinyl Chloride

VC was the only VOC detected during 2019 through 2023 where concentrations were detected above the RV (see Table 1). VC concentrations were above the RV in two compliance wells (KMW-10A and KMW-17) during the period between 2019 and 2023.

Using Sanitas, the 95 percent UCLs for wells where VC was detected between 2019 and 2023 (KMW-10A, KMW-17, KMW-17Z, KMW-12A, and KMW-18A) were calculated using data from the most recent eight events (2016 through 2023). The resulting calculations are presented in Appendix B6-3. The UCLs for all five wells were above the RV of 0.025 µg/L, including compliance wells KMW-10A (0.045 µg/L), KMW-17 (0.66 µg/L), and KMW-17Z (0.14 µg/L). Monitoring for VC in these wells will continue during the next 5-year period.

Because monitoring occurs only once per year instead of quarterly as initially assumed in the GCMP, the resulting UCLs calculated for VC are conservative due to the overall decreasing trends in VC concentrations.

WAC Chapter 173-340-720(9)(v)(B) states that “For cleanup levels based on chronic or carcinogenic threats, the true mean concentration shall be used to evaluate compliance with groundwater cleanup levels.” It is not possible to determine the true mean concentration of a population. The UCL provides a conservative estimate of the true mean because there is only a 5 percent chance that the true mean of the population will be greater than the UCL.

4.2.1.4 Time-Series Analysis

Time-series plots were updated to include the 2019 through 2023 data and are presented in Appendix B7. These plots may be used to compare parameter values between wells. For the parameters without control limits (SCLs and CCLs), a time-series analysis is the primary tool for detecting changes in parameter values over time.

The time-series plots were prepared showing data for the RI period (1989 to 1990), the baseline period (1994 to 1996), and the compliance monitoring period (1997 to present). For parameters with a high degree of variability in the data (total coliform, nitrate, nitrate-nitrite, and total organic carbon [TOC]), a second plot was prepared on which outlying data points are not shown to improve the ability to view the majority of the data. VC concentrations measured in the RAA are also further evaluated in Figure 6, which also presents data for fall monitoring events only to reduce the variability due to seasonal effects. The following observations were noted based on the time-series plots.

In the RAA:

- In compliance well KMW-10A, specific conductivity and concentrations of chloride, iron, manganese, TOC, and chemical oxygen demand (COD) continued to be stable and lower than historical measurements. Slight increases were observed in the concentrations of ammonia.
- In compliance well KMW-19A, increasing concentrations of iron and manganese were observed. Slightly higher iron and manganese concentrations were also observed in background well KMW-15A. Ferrous iron concentrations were higher in KMW-19A than in the other wells.

- In compliance well KMW-17, annual sampling during the third quarter has reduced the seasonal variability that had been previously observed. Specific conductivity and concentrations of iron, TOC, and COD continued to decrease. Concentrations of cis-1,2-DCE, TCE, and VC continued to decrease.
- In farther downgradient indicator well KMW-17Z, concentrations of cis-1,2-DCE and VC were stable and consistently slightly lower than in well KMW-17.
- In indicator well KMW-16A, specific conductivity and concentrations of ammonia, COD, chloride, iron, manganese, and TOC continued to be stable and lower than historical measurements.

In the SA:

- In well KMW-12A, specific conductivity and concentrations of ammonia, COD, chloride, iron, manganese, sulfate, and TOC remained stable or continued to decrease. Concentrations of cis-1,2-DCE, TCE, and VC showed a decreasing trend. Concentrations of cadmium, copper, and zinc showed increases, but were lower during the past 2 years.
- In well KMW-16B, concentrations of sulfate increased slightly. A slight increasing trend was also observed in background well KMW-13.
- In background well KMW-13, slightly increasing trends in some parameters (chloride, specific conductivity, iron, and sulfate) continued to be observed. Chloride, iron, and sulfate concentrations were higher in upgradient well KMW-13 than in the downgradient wells.
- In wells KMW-08A, KMW-16B, and KMW-18A, concentrations of other parameters continued to be stable or slightly decreasing.

4.2.1.5 Calculation of Revised Tolerance Limits

Updated TLs calculated using data for the most recent eight events are presented in Appendix B6-4. Concentrations measured in SA wells will be compared to TLs calculating using 2016 through 2023 data for well KMW-13, and concentrations measured in RAA wells will be compared to TLs calculated using 2015 through 2021 data for well KMW-15A combined with the 2023 data for KMW-15R.

4.2.1.6 Groundwater Compliance Status Summary

Information presented in this status report indicates that groundwater quality has remained generally stable or improved since landfill closure. During the period between 2019 through 2023, the Site has been in compliance with the conditions stated in the GCMP, except for manganese and iron in well KMW-19A (where SCLs were not established), and VC in wells KMW-10A and KMW-17 where concentrations exceeding the RV are within the same range as the previous eight data points used to calculate the UCL. For VOCs, compliance is based on the UCL of the past eight data points meeting the RV.

The observed concentrations of iron and manganese in well KMW-19A are believed to be related to its location adjacent to wetland areas that have continued to expand during this 5-year period. Exceedances of the RVs for manganese and iron do not present a risk to human health or the environment because their RVs are not health-based. The 2014-2018 Remedial Action Status Report (Parametrix 2019) recommended that the RVs be modified for manganese and iron to the MTCA Method B groundwater criteria. For manganese, it was recommended that the (then) MTCA Method B groundwater value of 2.2 mg/L be used as the RV instead of the secondary MCL criterion of 0.05 mg/L; however, the current Method B criterion has been changed to 0.750 mg/L. For iron, it was recommended that the MTCA Method B groundwater value of 11.2 mg/L be used as the RV instead of the secondary criteria of 0.3 mg/L.

In the Fifth Periodic Review (Ecology 2019), Ecology rejected SPU's recommendation to raise the iron and manganese RV from the secondary criteria to the MTCA Method B risk-based criteria. However, Ecology stated they may not require additional remedial action because 1) it does not appear that the metals pose a risk to human health or the environment, 2) the use of groundwater downgradient of the landfill for drinking water purposes is prohibited by the Restrictive Covenant, 3) groundwater in the portion of the RAA represented by KMW-19A is likely to have high levels of naturally occurring iron and manganese due to low levels of dissolved oxygen, and an associated low ORP, and 4) attempting a remedy for this situation would be costly and potentially ineffective.

The UCL (Table B6-3) for VC continued to be above the RV in compliance wells KMW-10A and KMW-17. However, decreasing or stable trends in VC concentrations continue to be observed in the compliance wells as shown in Figure 6. KMW-10A will likely be in compliance within the next 5-year cycle reported at 0.0286 UCL for this 5-year period just slightly above the RL. Concentrations continue to be lower at well KMW-17Z than at KMW-17, indicating that continued degradation in the form of natural attenuation is occurring between these wells.

4.2.2 Groundwater Hydraulic Monitoring Results

SPU staff measure water levels annually in the third quarter at 40 monitoring wells, piezometers, gas probes, and gas extraction wells; surface water station KWSW-1; and Manholes A and B. Manholes A and B are part of the leachate collection system. The groundwater elevation data are presented in Table 3. Monitoring of the east slope piezometers to evaluate slope stability is discussed in Section 8.2.1.

Using the 2023 groundwater elevation data, contour maps of the potentiometric surfaces were generated to represent current conditions for the SA and the and RAA. The maps are presented in Figures 8 and 9 and indicate flow directions consistent with historical data. Figure 7 illustrates that the direction of groundwater flow in the SA is generally east, towards the Green River. Figure 8 shows that the direction of groundwater flow in the RAA is generally east, and that groundwater discharges into the Green River.

4.3 Modifications or Changes Planned for the Next Five-Year Period

The groundwater quality data collected during the next 5 years will be compared to the SCLs, updated RVs, and revised TLs presented in this report. Future statistical comparisons will continue to be conducted using Sanitas and the Unified Guidance approach. The GCMP (CH2M HILL 1996b) will be updated to reflect current sampling procedures, schedule, and statistical approaches.

The BIOSCREEN and BIOCHLOR models should be updated with the recent data to re-evaluate the restoration time frame at wells KMW-17 and KMW-17Z. Annual monitoring data for VC at wells KMW-017 and KMW-017Z should be compared to the updated model predictions.

Piezometers KPW-1 and KPW-2 showed groundwater at the point of discharge is currently meeting the VC RV. These temporary piezometers should be removed.

Grab samples from the adjacent Green River should be collected and along with samples collected from the groundwater monitoring wells should be analyzed for additional parameters required to prepare trilinear plots (bicarbonate alkalinity, calcium, magnesium, potassium, and sodium). The

Green River grab samples should be collected at the pedestrian bridge upstream of the landfill. The trilinear plots will provide additional information to understand the relationship between the aquifers and surface water. The results should be evaluated to determine whether the Green River sampling and additional parameters should be added permanently to the sampling program.

Following one additional dry season event in 2024, analysis of monitoring wells samples for the additional MNA parameters added beginning in 2020 (methane, ethane, and ethene; total ferrous iron, and alkalinity) should be discontinued.

- The concentrations of ferrous iron measured in the wells were consistently in the same range as and slightly higher than the dissolved iron concentrations, indicating that the iron is predominantly ferrous. Samples will continue to be tested for dissolved iron.
- Dissolved methane was detected in all the RAA wells and at much lower concentrations in the SA wells. However, methane generated from anaerobic bacterial decomposition of organic waste in the landfill likely vastly exceeds and would mask any quantity of methane generated by degradation of chlorinated hydrocarbons. Ethane and ethene are the end products of reductive dichlorination, but neither ethane nor ethene were detected in any of the wells, likely due to the low expected volumes produced and resulting expected concentrations.

As described in Section 8.3, water level monitoring in gas extraction wells (KIGW-1, KIGW-3, KIGW-23, KIGW-24, and KIGW-94B) should be discontinued, as DW-1 and DW-2 provide better groundwater level information, and these gas probes are difficult to measure due to alignment (wells are not vertical) and the high conductivity leachate interferes with electronic well probes. Well KRW-2 should be considered for water level monitoring.

5. Stormwater Capture and Quality – Spring Drain

The spring drain system is described in the Kent Highlands Landfill Spring Drain Separation Technical Memorandum (CH2M HILL 1995). This document was incorporated in the third amendment to the Consent Order as Exhibit A. Since 1996, flow from the spring drain has been diverted to the stormwater detention pond for treatment prior to discharge into the Green River. Spring drain flow has historically been measured at a relatively constant rate of approximately 99 gallons per minute, but the flow rates are believed to not be accurate as discussed in Section 6.2.2.

The treatment system is described in the Spring Drain Separation Technical Memorandum and consists of a cascade-type aerator at the pond outlet. Aeration may result in ammonia reduction due either to volatilization or nitrification—a natural process whereby ammonia is biologically converted to nitrate in the presence of nutrients and nitrifying bacteria.

5.1 Remedial Action System Changes and Events

The analytical methods for some of the metals were changed in 2019 to achieve lower reporting limits (RLs) that are below surface water quality standards (SWQS; Chapter 173-201A WAC; Ecology 2023). The revised methods were EPA Method 6020A/6020B for cadmium, lead, and selenium, and EPA 7470A low-level preparation for mercury. The laboratory also reported metals data to the method detection limits (MDLs) with J flagging of any detections below the RLs.

Beginning in 2022, silver, arsenic, antimony, and thallium were also analyzed using EPA Method 6020B to achieve lower RLs below the SWQS. Mercury results continued to be reported to MDLs and J flagged since even with the low-level preparation, the reporting limit (RL) is above the criteria of 0.000012 mg/L.

According to the Spring Drain Separation Technical Memorandum, the annual sampling for VOCs and metals will be varied by quarter each year. Beginning in 2019, the quarter for this activity is being rotated instead of consistently conducted in the third quarter.

No other changes were made to the stormwater capture or monitoring system during this period.

5.2 Remedial Action Monitoring Program and Results

Spring drain monitoring was conducted as described in the Spring Drain Separation Technical Memorandum and in Section 4 of the Post-Closure Operations and Maintenance Manual. Results of monthly inspections are now being documented on the Kent Highlands Landfill general inspection and maintenance monthly log sheet established in 2016. An example of the log sheet is provided in Appendix C.

5.2.1 Sampling Procedures

Procedures for sampling and analysis of the spring drain are outlined in the Spring Drain Separation Technical Memorandum. The objective of the spring drain discharge water quality monitoring is to verify that the discharge to the Green River complies with applicable surface water quality standards.

Samples of treated spring drain water were collected quarterly from the Pond Outfall (see Figure 9). Samples were tested in the field for DO, pH, temperature, and turbidity, and tested by a laboratory for biological oxygen demand (BOD), total suspended solids, and ammonia. The samples are tested annually for priority pollutant metals (total and dissolved) and VOCs. The sample to be tested for metals is collected as a 24-hour composite, instead of an 8-hour composite as described in the Spring Drain Separation Technical Memorandum.

5.2.2 Sampling Results and Compliance Evaluation

The compliance of the 2019-2023 spring drain data with the SWQS was determined using the process outlined in the Spring Drain Separation Technical Memorandum and includes comparison with surface water quality criteria adjusted for mixing zone dilution. The field data are presented in Appendix C1 and the laboratory reports are presented in Appendix C2.

The results of spring drain monitoring for field parameters for the period between 2019 through 2023 are presented in Table 4, including an evaluation of compliance with the Washington State Freshwater Criteria (WAC 173-201A-200) for discharge to the Green River. Water quality criteria for temperature, DO, and pH are driven by designation of this reach of the Green River for salmon and trout spawning, noncore rearing, and migration. The dilutions required to meet SWQS are below the lowest maximum allowable dilutions calculated in the Spring Drain Separation Technical Memorandum. In addition, the aeration system is expected to increase the DO prior to discharge to the Green River.

The results of spring drain monitoring for conventional parameters and metals are presented in Table 5a along with the aquatic life and human health criteria for toxic substances (WAC 173-201A-240; Ecology 2023). Spring drain results for VOCs are presented in Table 5b. All results for VOCs were below laboratory reporting limits.

Evaluation of compliance with SWQS and dilution requirements for discharge to the Green River are presented in Table 6. Table 6 includes parameters where the maximum concentration multiplied by the multiplication factor exceeds the SWQS. The minimum dilutions required to meet water quality standards at the acute or mixing zone boundary are below the lowest maximum allowable dilutions calculated in the Spring Drain Separation Technical Memorandum.

The ammonia criteria were calculated using temperatures measured in the Green River between 2019 and 2023 (King County 2023). All spring drain ammonia results were below the criteria. As shown in Figure 10, the ammonia concentrations continued to show an overall decreasing trend compared to those measured at the Pond Outfall in previous years. The continued decreasing trend in ammonia concentrations compared to pretreatment concentrations (i.e., 20 mg/L; CH2M HILL 1995) shows the treatment system is functioning to reduce ammonia concentrations. Although the Spring Drain Separation Technical Memorandum did not expect that retention time would be long enough for significant nitrification of ammonia to occur, the data collected demonstrate that reduction of ammonia is occurring compared to previously observed concentrations.

5.3 Modifications or Changes Planned for the Next 5-Year Period

No modifications or changes to the stormwater capture and quality system are planned during the next 5-year period. Modifications or changes to the spring drain system are described in Section 6.3 below.

6. Leachate Capture and Discharge

6.1 Remedial Action System Changes and Events

6.1.1 Events

The following events occurred during 2019-2023:

6.1.1.1 2020 Leachate Line Break

On May 17, 2020, the leachate line east of the Green River was cut during construction. This was an old unused pipe but still became pressurized during pumping. The issue was resolved on May 18, 2020. The leachate pipeline was inspected on May 20, 2020 after the incident and a 2- to 3-foot crack on the crown of the pipe was observed near the east end of the line. This was in the gravity flow section of the pipeline and the crack was above the flow line of the pipe. Given the location of the crack at the crown of the pipe, there was no indication of leakage. Further details and figures are provided in Appendix D1 as presented in the second quarter 2020 report to Ecology.

SPU landfill staff began evaluating non-emergency repair alternatives given the location of the crack above the normal flow line in the pipe. Landfill staff selected in-situ pipe repair as the preferred option. The repair work was contracted in early 2022 and the repair was completed on June 23, 2022. The project required a street use permit and coordination with the City of Kent for traffic control on Veterans Drive east of the Green River. Further details and figures are provided in an attachment presented in the second quarter 2022 report to Ecology (Appendix D1).

6.1.1.2 2021 Leachate Line Break

On July 6, 2021, SPU's landfill crews noticed water seepage on the road at the lower portion of the landfill in a location corresponding with the leachate force main. SPU excavated the pipe using a vactor truck and confirmed a leak. SPU shut off the pump station and notified Ecology as required by the Consent Order. Breaks were discovered in two locations, a larger break close to force main 1, and a small crack further down the line to the north. On July 8, 2021, emergency pumping of leachate to the North Pond was conducted for 5 hours due to concerns that water build up in the system could affect slope stability, and a contractor was mobilized to repair the breaks. Photographs of the repairs and a map showing the area of the primary break are presented in Appendix D2. Samples of water from the North Pond were collected on July 23, 2021 and tested for VOCs. No VOCs were detected. The analytical report for the North Pond sampling is presented in Appendix D2.

Due to the emergency nature of SPU's project, this construction project was granted an exemption (PW# 2021-043E) from the City of Seattle's Competitive Bid Requirements by SPU's Construction Management Division and the City of Seattle's Purchasing and Contracting Services Division Director, pursuant to the City's Emergency Contracting Policy and SMC 3.04 and in accordance with RCW 39.04. In addition, SPU conducted a review of this proposed action for purposes of determining compliance with SEPA and determined the work is exempted from threshold determination under provisions of SEPA as established by WAC 197-11-880 and Kent City Code 11.03.200. The SEPA threshold determination and approval for emergency contracting are presented in Appendix D2.

The repair process required multiple steps: 1. Cleaning, 2. Inspection, 3. Placement of pipe re-liner, 4. Curing of pipe re-liner, and 5. Final inspection.

Landfill staff pumped down the leachate treatment pond to create three days of storage in the leachate pond for incoming flow. The repairs were completed within two days and the system has operated normally since then.

6.1.2 Changes or Activities

The following changes or activities occurred during 2019-2023:

- Iron and manganese testing of leachate was discontinued in May 2019 because these parameters are not required by the Permit.
- The Leachate Gravity Line jet-cleaning and TV inspection was conducted in May 2020. The M4 and M5 segments were completed in July 2020 because water was in the line during the May inspection. The reports are provided in Appendix D3. As detailed in Section 6.1.1.1, a 2- to 3-foot crack on the crown of the pipe was observed near the east end of the line above the flow line of the pipe, and repairs were conducted in 2022. No other abnormalities or defects were noted in the piping.
- The Leachate Gravity Line jet-cleaning and TV inspection was conducted in November 2023 through May 2024. The reports are provided in Appendix D3. No abnormalities or defects were noted in the piping. This work is performed once every 3 years.
- The flow meter was replaced in July 2020 with a Stearns-type flow meter because the calibration service on the existing meter as required by the Permit was not supported.
- As noted in third quarter 2022 report to Ecology, a leachate line leak was detected at manhole C near the pond on September 8, 2022. At that time, SPU shut down the pump station until repairs could be completed. SPU drainage repair crew completed permanent repairs on September 9, 2022.
- As noted in the fourth quarter 2022 report to Ecology, Toe Buttress Pump #2 was replaced in-kind on November 30, 2022 to maintain continued operation.
- In the fourth quarter of 2023, the Leachate Flow meter was replaced and recalibrated due to a malfunction of the flow-through assembly. All other components of the Leachate system remained operating correctly. The issue was discovered on October 27, 2023 and the work was completed on December 14, 2023.

6.2 Remedial Action Monitoring Program and Results

Leachate monitoring was conducted in accordance with Industrial Waste Program Wastewater Discharge Permit No. 7115-05. Kent Highlands Landfill is regulated as a non-categorical Significant Industrial User (SIU) because it discharges an average of 25,000 gallons per day or more of process wastewater, and therefore King County's Local Limits apply.

The draft renewed Wastewater Discharge Permit No. 7115-06 was issued on December 11, 2023. Permit No. 7115-06 supersedes and cancels Permit No 7115-05 effective April 3, 2024, and has an expiration date of April 2, 2029. Inspection, maintenance, and monitoring of the leachate collection and pretreatment system were conducted as described in Sections 5 and 6 of the Post-Closure Operations and Maintenance Manual. Results of monthly inspections are now being documented on the Kent Highlands Landfill general inspection and maintenance monthly log sheet established in 2016.

6.2.1 Leachate Quality

Leachate samples were collected monthly from the leachate transmission pump station (wet well sampling station). Samples were analyzed in the laboratory for pH, total dissolved solids, and five metals (cadmium, chromium, copper, lead, nickel, and zinc), and tested in the field for pH and temperature. Lab reports are provided in Appendix D4. The individual monthly sample results are included in Table 7.

Copper and nickel were routinely detected in leachate, and chromium and zinc were detected sporadically. All concentrations were below the daily average and instantaneous maximum criteria. Total dissolved sulfides were not detected, and pH measurements were within daily minimum and maximum criteria.

No discharge violations occurred during the 2019 through 2023 operating period.

6.2.2 Leachate Flow

Historically, leachate flow data have been measured at four monitoring locations: the toe buttress pump station (see Figure 9), the leachate pond pump station, the south leachate line, and the spring drain.

Flow from the spring drain collection system previously flowed to the leachate pond, but it was diverted to the stormwater detention pond in November 1996. Since that time the spring drain flow has no longer been included in the leachate pond flow except when measuring spring drain flows. Prior to 2015 flow was temporarily diverted through the Parshall flume and into the leachate pond for around 4 hours each month so flow rate could be measured, and after 2015, flows were measured quarterly.

Leachate from the south leachate line and the toe buttress collection system flows into the pretreatment pond, from which leachate is pumped to the King County Sewer System. Flow measured at the leachate pond pump station (see Figure 9) is the total leachate flow from the leachate pretreatment pond and represents the most meaningful indicator of the amount of leachate being generated at the landfill. Beginning in June 2015, flow data are only being reported for the toe buttress and leachate pond (Ecology 2015). Data from the toe buttress and Manholes A and B are continuing to be monitored to evaluate whether leachate pump systems are operating properly.

Historical water flow rates from the landfill have been measured from these drains at four locations, as follows:

1. Toe buttress, as measured daily in a totalizer meter at the toe buttress pump station. Measured flow rates from the toe buttress drain have varied from around 0.3 to 1.2 million gallons per month from 1994 to 2023, exhibiting a strong seasonal variation, with higher flow rates in the wet season, as expected.
2. South leachate drain, as measured weekly in a totalizer meter from 1994 to 2015. Measured flow rates decreased from 1994 to 2015, from around 0.6 to 0.02 million gallons per month, with unexplained constant flow rates over long periods. These measurements were discontinued after 2015.
3. Leachate pond, as measured daily in a totalizer meter at the leachate pond pump station, which discharges into the sanitary sewer system. These measurements include flows from the toe buttress drain and south leachate drain. Measured flow rates out of the leachate pond have varied from around 1 to 3.8 million gallons per month from 1997 to 2023,

exhibiting a strong seasonal variation, with higher flow rates in the wet season, as expected. Prior to 1997, flow rate measurements were higher (around 6 to 7 million gallons per month), as flow from the spring drain collection system was also incorporated. Spring drain flow was diverted out of the leachate pond and into the stormwater detention pond after November 1996. Leachate pond flow rates also suggest the flow measurements from the south leachate drain from 1997 to 2015 may not be accurately reflected, because the pond flows are much greater than the total of toe buttress drain and south leachate drain flows.

4. Spring drain, as measured monthly in the Parshall flume prior to June 2015 and quarterly thereafter. From mid-1994 to 1996, flow rates from the spring drain were relatively stable at 4 to 4.4 million gallons per month. From 1997 to 2002, flow rates varied from around 4 to 6 million gallons per month, and from 2003 to 2023, flow rates were 3.3 to 4.8 million gallons per month. The pattern of flow readings (i.e., very consistent flows over long periods of time with no seasonal or other variations) suggests that the Parshall flume measurement procedure may not be functioning accurately, or possibly some obstruction in the drain that has been limiting flows to a steady value.

Table 8 and Figure 11 present the total leachate flow measured during each month. Total monthly flows were calculated using flow data collected on the last working day of each month; therefore, the number of days included in a month may be slightly higher or lower than the number of calendar days in the month.

The leachate flow is directly correlated with the months that typically have higher rainfall in the area.

6.3 Modifications or Changes Planned for the Next 5-Year Period

The next Leachate Gravity Line jet-cleaning and TV inspection is planned for 2026-2027.

As described in Section 2.1.4, HWA (2024) developed initial and ongoing recommendations to help maintain the stability of the landfill slopes. HWA's initial recommendations related to leachate flow measurements and structures (and spring drain system) include:

- Resume monthly measurement of flow rates from the spring drain using the control structure and Parshall flume. The monthly flow rate measurements should be documented and compared to previous measurements.
- Clean out the sand from the spring drain control structure using a vactor truck or similar piece of equipment. Several clean outs may be required to flush sand out of the pipes. The flow rate should be measured immediately before and after cleaning out the sand to see if the flow rate changes.
- Inspect the Parshall flumes and clean out if needed.
- Conduct a video inspection of the spring drain inlet pipe, beginning at the control structure and proceeding as far upstream as possible. While conducting the video inspection, the location and depth of the drain should be documented and surveyed, as well as locations of pipe damage/distress and locations of sand entering the drain. If at a certain point it is discovered that a portion of the drain has failed or collapsed, the location of the failure/collapse should be documented and surveyed.
- Perform repairs and/or selective replacement of the drain, if warranted. Depending on the types or repairs needed and their locations, repairs/replacement of the drain could involve both trenchless technology (e.g., slip lining) and conventional trench excavation.

- Perform periodic sand removal if it is determined that sand is entering the drainage system, and it is not possible to prevent the sand from entering the system. The frequency of the sand removal operation will be dependent on how quickly sand enters the drainage system.

HWA's ongoing recommendations to help maintain the stability of the landfill slopes related to leachate flow measurements and structures include:

- Continue to monitor and document flow rates from the leachate pond and toe buttress drain, report monthly (to SPU and consultants).
- Resume monitoring and documenting flow rates from the spring drain, monthly.
- Evaluate groundwater level and flow rate data on a monthly basis.
- Any problems with the drains should be addressed as soon as practicable. Better estimates of the timing required (i.e., determining the time it takes the groundwater to rise from its current level to the action level of 68 feet in DW-2) may be developed based on future data (e.g., rates of groundwater level increase), or correlation of drain flow and groundwater levels. Based on the volume of groundwater in the downslope portion of the landfill, and rate of discharge from the spring drain, the time frame for any potential critical groundwater level increases due to blockage of the spring drain would be on the order of months to years, allowing ample time to plan contingency measures if needed.

7. Landfill Gas Control

7.1 Remedial Action System Changes and Events

The following activities were conducted during 2019 through 2023:

- An evaluation of landfill gas in the vicinity of KGP-35-S was completed in 2020 due to historically elevated detections of methane in that probe (see Parametrix 2019). Five temporary shallow gas probes (KGP-301, KGP-302, KGP-303, KGP-304, and KGP-305) were installed at a spacing of approximately 20 feet on center in a line perpendicular to the potential pathway between the landfill and KGP-35-S (see Appendix E1). The probes were monitored quarterly over the 2-year period between 2020 and 2021 for the presence of methane and no methane was detected. After the 2-year evaluation period was completed, SPU planned to conduct testing at the temporary probes only if the concentration of methane at KGP-35-S was higher than 2.0% by volume. Since no methane concentrations greater than 2.0% by volume were measured at KGP-35-S between 2019 and 2023, the temporary probes will be removed.
- The existing gas monitoring probes, including new probe KGP-200, are currently providing suitable coverage to monitor the presence of methane along the northern landfill border in the vicinity of the Grandview Apartments. However, if future property development is planned between the landfill and Veterans Drive, additional probes may be necessary. In particular, an additional set of probes should be considered along the property boundary between existing probes KGP-32A and KGP-98. Although probe KGP-38B currently provides coverage in this area and is between the landfill property and the Grandview Apartments, this probe is located approximately 200 feet from the property boundary. This issue will be revisited once development plans are known for the adjoining City of Kent property.
- In accordance with recommendations made in the Gas Evaluation Report (EHSI and Parametrix 2019), SPU conducted quarterly monitoring of available operational probes along the northern landfill property perimeter in 2019 for 1 year to supplement monthly monitoring at gas extraction wells and gas monitoring probes. The operational probes along the northwest boundary originally included KDGP-95, KDGP-98, KSGP-101, and KDGP-101. The locations of these probes are shown on Figure 12. KDGP-98 was originally intended as an operational probe, but it was installed outside the line of extraction wells and therefore is currently used as a perimeter gas probe. The other three operational probes, KDGP-95, KSGP-101, and KDGP-101 are all located in-line close to the gas extraction wells. The objective of the operational probe monitoring was to confirm that negative pressures are occurring in between extraction wells, thereby providing a perimeter curtain surrounding the landfill to prevent gas migration. Monitoring was discontinued in the first quarter of 2020 after 1 year at all operational probes that had no detected methane and where consistently negative static pressures were observed.
- In the second quarter of 2020, two automatic solenoid valves were replaced at the supplemental gas feeding line.
- Static pressure was not measured in the gas extraction wells during April and May 2020 due to reductions resulting from the COVID-19 pandemic.
- A new landfill alarm monitoring system for the Kent and Midway Landfills landfill gas systems was installed at the Kent Highlands Landfill main office to address the low methane concentrations which requires supplemental gas to stabilize the system. The landfill alarm

system design was completed in the fourth quarter of 2020 and installation and testing of the landfill alarm system was completed in the third quarter of 2021. The landfill alarm system is in-use; however, data reporting function is still being refined.

- In the first quarter of 2023, the flare damper was replaced with smaller more adjustable dampers allowing a reduction in assist gas and greater control of the flare temperature.

7.2 Remedial Action Monitoring Program and Results

Inspection, maintenance, and monitoring for the landfill gas collection and transmission system and the flare were conducted as described in Chapters 7 and 8 of the Post-Closure Operations and Maintenance Manual (CH2M HILL 1996a). Monitoring of landfill gas was conducted as described in Section 11.2 of the Post-Closure Operations and Maintenance Manual and in the new Puget Sound Clean Air Agency (PSCAA) permit for landfill gas. The locations of the gas wells are shown on Figure 12. Monitoring includes monthly sampling and daily flow monitoring. Results of monthly inspections are now being documented on the Kent Highlands Landfill general inspection and maintenance monthly log sheet established in 2016.

The gas system status was described in quarterly Solid Waste Landfill Closure Reports prepared by SPU and submitted to Ecology. Each quarterly report includes a summary of combustible gas and pressure data measured in shallow and deep gas probes.

The following routine monitoring is conducted in accordance with the Post-Closure Operations and Maintenance Manual.

- Flares are continuously monitored to ensure that the mechanical systems are operating properly. Landfill staff routinely inspect the facility 5 days a week and respond to off-hour system alarms such as flame failure or temperatures out of permitted range on the enclosed flare.
- The collection system is inspected monthly.
- The interior and perimeter control wells are monitored monthly.
- Landfill gas compliance probes are monitored either monthly or quarterly depending on the compliance status of the probe.

Methane data measured in the gas probes (see locations on Figure 13) during the period between 2019 and 2023 are summarized in Table 9. As noted in the table, 20 to 61 sampling events occurred at each probe and no methane above 5 percent by volume (%) was detected in any of the probes.

KGP-35-S has historically shown detections of methane. Further investigation of methane in the area of KGP-35-S was conducted as discussed in Section 7.1. Methane concentrations at KGP-35-S have remained below 2% since 2019, and the maximum concentration of methane detected in KGP-35-S during this period was 1.9%.

At KGP-8-S, which previously had substantial detections of methane, only two detections of methane were observed in 60 events with a maximum concentration of 0.5 % observed during this period. The methane at KGP-8-S is not believed to be related to the landfill and may be associated with the presence of organic soils.

The only other detections of methane during this period were observed in gas probes KGP-1-D (3.7%) in January 2020 and KGP-200-D (1.6%) in November 2020. Low detections below 1% were also observed in KGP-7A-S and KGP-7A-D during May 2019, and KGP-1D and KGP-20-I in November 2021.

Static pressures measured in gas extraction wells between 2019 and 2023 are summarized in Table 10 and a plot of pressures is presented in Appendix E2. The majority of pressures were negative, indicating operation of the extraction system is creating a consistent vacuum at the perimeter of the landfill, preventing gas migration. Static pressure in the gas wells was measured at -24.10 inches of water column or less in 2021. Static pressures in some of the extraction wells continued to be less negative beginning in August 2015 due to modifications made to the blower and subsequent rebalancing of the well field.

7.3 Modifications or Changes Planned for the Next 5-Year Period

The existing gas monitoring probes, including new probe KGP-200, are currently providing suitable coverage to monitor the presence of methane along the northern landfill property border in the vicinity of the Grandview Apartments. However, if future property development is planned between the landfill property and Veterans Drive, additional probes may be necessary. In particular, an additional set of probes should be considered along the property boundary between existing probes KGP-32A and KGP-98. Although probe KGP-38B currently provides coverage in this area and is between the landfill property and the Grandview Apartments, this probe is located approximately 200 feet from the property boundary. This issue will be revisited once development plans are known for the adjoining City of Kent property.

Since methane levels have remained below 2% by volume at KGP-35-S for more than 2 years, it is recommended that temporary probes KGP-301, KGP-302, KGP-303, KGP-304, and KGP-305 be removed.

The PSCAA permit for landfill gas will be renewed as long as the flare continues to control emissions at less than 20 parts per million (ppm) of non-methane organic compounds (NMOCs) at 3 percent oxygen.

An evaluation of the flare system will be completed to select a new alternative for replacement of the flare. This will include developing 15-year projections based on existing operations and evaluating existing blower curves, existing flare sizes, and current PSCAA permits. SPU will engage with PSCAA and Ecology to pursue approval for implementation of the recommended landfill gas management system modifications or replacement.

8. Cap/Cover Integrity and Slope Stability

8.1 Remedial Action System Changes and Events

8.1.1 Slope Stability

Additional slope stability studies were conducted during this period, as described in Section 2.1. The studies included installing two dewatering wells, collecting and testing soil samples, conducting hydraulic testing of the wells, updating the previous slope stability evaluation (S&EE 2019), and conducting an independent review of slope stability. Recommendations based on these studies are provided in Section 8.3.

8.1.2 Monthly Log Sheet

A Kent Highlands Landfill general inspection and maintenance monthly log sheet was established in 2016 to document the activities required in the Post-Closure Operations and Maintenance Manual. The log was submitted to Ecology for review and is now in use (see Appendix E3).

8.2 Remedial Action Monitoring Program and Results

Monitoring, maintenance and repair, and troubleshooting were conducted as described in Chapter 3 of the Post-Closure Operations and Maintenance Manual.

8.2.1 East Slope Water Levels

The stability of the eastern slope of the landfill with respect to potential water buildup in the refuse was evaluated during the Kent Highlands Landfill final closure (CH2M HILL 1991b). The stability analysis included a high-water condition reflecting the highest level of groundwater observed during field measurements. A FS of 1.7 or greater was calculated for the high-water condition, indicating stable slope conditions under long term loading.

The Second Periodic Review Response (Floyd|Snider 2007) stated that SPU will annually monitor water levels in refuse on the east slope. If water levels in the refuse remain sufficiently low so as not to contribute to instability of the eastern slope, and as long as surface grades do not exceed original grades, the landfill should be stable for both the static and seismic loading conditions evaluated for final closure.

A trend plot showing water level measurements collected between 2005 and 2023 at landfill gas extraction wells screened in the refuse (KIGW-1, KIGW-3, KIGW-23, and KIGW-24) and Manholes A and B is presented in Figure 14. The water levels remain well below the calculated high-water conditions used to establish an acceptable slope stability FS in the 1991 geotechnical study. Although most of the water level elevations measured during this period were similar to or slightly lower than previous water levels, the water levels in KIGW-3 and KIGW-1 were historically high in 2019 and 2020, respectively.

Based on the Fifth Periodic Review in 2019 (Ecology 2019), subsequent scope stability analyses were performed, as described in Sections 2.1 and 6.3, which added water level monitoring at the two new wells DW-1 and DW-2. Water levels measured in the dewatering wells are shown on Figure 15. No contingency triggers in well DW-2 were exceeded.

8.3 Modifications or Changes Planned for the Next 5-Year Period

As described in the Slope Stability Report (S&EE 2019) there is a possibility that groundwater levels could be higher than that assumed in the 1991 slope stability evaluation, and this condition would incur the risk of slope instability. To mitigate such risk, SPU installed two dewatering wells in the refuse that are being used to monitor fluid levels at the toe of the landfill.

As described in Section 2.1.4, HWA (2024) developed initial and ongoing recommendations to help maintain the stability of the landfill slopes. HWA's recommendations for modifications and changes related to the leachate control system that might affect slope stability are provided in Section 6.3. In addition to recommendations for the leachate control system, HWA's ongoing recommendations to help maintain the stability of the landfill slopes include:

- Continue the recently implemented groundwater level monitoring in DW-1 and DW-2 with alarm conditions as recommended by S&EE. Measurement frequency should be continued at daily intervals with monthly reporting/analysis (to SPU and consultants), unless an indicator or alarm condition in DW-2 is reached (groundwater at elevation 68.0 feet, or 76.5 feet, respectively).
- Continue water level measurement of Manholes A and B, to evaluate whether leachate pump systems are operating properly.
- Water level monitoring in gas extraction wells (KIGW-1, KIGW-3, KIGW-23, KIGW-24, and KIGW-94B) should be discontinued, as DW-1 and DW-2 provide better groundwater level information, and these gas probes are difficult to measure due to alignment (wells are not vertical) and the high conductivity leachate interferes with electronic well probes. Well KRW-2 should be considered for water level monitoring.KRW-2 is a piezometer located upslope of DW-1 and DW-2 that is also screened within refuse and will provide additional information on water levels to supplement the measurements in DW-1 and DW-2).
- Discontinue monitoring relating to rain/freezing events as these events are not expected to impact slope stability to the same degree as a rising groundwater level and because groundwater level impacts associated with rain/freezing events will eventually be reflected in the groundwater level measurements.
- Evaluate groundwater levels (DW-1 and DW-2) and flow rate data on a monthly basis.

Contingency triggers will include:

- If groundwater levels in DW-1 or DW-2 show an increasing trend above seasonally expected levels, commence monitoring and evaluating groundwater levels and flow rates on a weekly basis, subject to modification based on observations.
- If groundwater levels in DW-2 rise to an "indicator" elevation of 68 feet, OR flow rate of any drain decreases by 30 percent or more below the average seasonal value over 2 or more months:
    - → Report condition to Ecology.
    - → Conduct landfill cap and facility inspections.
    - → Develop contingency plans, depending on circumstances. Likely actions may include additional video inspections, removal of sand, repairs as needed, etc.

9. Other Features (Fencing, Alarms, Landscaping)

9.1 Remedial Action System Changes and Events

A new landfill alarm monitoring system for the Kent and Midway Landfills gas flare systems was installed at the Kent Highlands Landfill main office to address the low methane concentrations which requires supplemental gas to stabilize the system. The landfill alarm system design was completed in the fourth quarter of 2020 and installation and testing of the landfill alarm system was completed in the third quarter of 2021.

No other substantial events or changes to landfill property features occurred during this period.

9.2 Remedial Action Monitoring Program and Results

Inspection and maintenance of other landfill property features such as fencing, alarms, and landscaping were conducted as described in Chapter 10 of the Post-Closure Operations and Maintenance Manual. Results of monthly inspections are now being documented on the Kent Highlands Landfill general inspection and maintenance monthly log sheet established in 2016.

As discussed above, there were two incidents where monitoring wells were vandalized, one of which included breaching of the landfill perimeter fence. Due to the repeated incidents, all monitoring wells within the landfill perimeter are locked with an SPU masterlock. The Frager Road north gate was replaced/repaired.

9.3 Modifications or Changes Planned for the Next 5-Year Period

As described in Section 8.3, HWA's ongoing recommendations to help maintain the stability of the landfill slopes include continuing the recently implemented groundwater level monitoring in DW-1 and DW-2 with alarm conditions as recommended by S&EE. Measurement frequency should be continued at daily intervals with monthly reporting/analysis (to SPU and consultants), unless an indicator or alarm condition in DW-2 is reached (groundwater at elevation 68.0 feet, or 76.5 feet, respectively).

SPU Security plans on installing a chain-link fence along Veterans Dr and Military Rd S to enclose the wooded portion of SPU's property north of the entrance road on the northwest corner of the landfill. This is in response to recent issues with trespassing.

No other modifications or changes to emergency management procedures are planned during the next 5-year period.

10. Accidents or Upsets

10.1 Remedial Action System Changes and Events

As described in Section 6.1, leachate line breaks occurred during 2020 and 2021.

As described in Section 9.2, there were two incidents where monitoring wells were vandalized, one of which included breaching of the landfill perimeter fence. Due to the repeated incidents, all monitoring wells within the landfill perimeter are locked with an SPU masterlock. The Frager Road north gate was replaced/repaired.

During March 2020, SPU implemented a COOP staffing plan to address the Governor’s stay-home directive due to the COVID-19 pandemic. The plan consisted of reducing staffing levels to one or two staff members and scaling back to the basic critical functions to prolong the available service in case of staff shortage. All staff reported back to regularly scheduled work on May 10, 2020.

No other accidents or upsets occurred during this 5-year period.

10.2 Remedial Action Monitoring Program and Results

Emergency response procedures are described in Section 13 of the Post-Closure Operations and Maintenance Manual.

10.3 Modifications or Changes Planned for the Next 5-Year Period

No modifications or changes to emergency management procedures are planned during the next 5-year period.

11. Summary of Recommendations

SPU will continue ongoing monitoring as described in the Post-Closure Operations and Maintenance Plan and in accordance with the GCMP for groundwater, Spring Drain Separation Technical Memorandum for surface water, Wastewater Discharge Permit for leachate, and PSCAA permit for landfill gas. The next comprehensive status report will be prepared summarizing data collected during the period between 2024 and 2028 to support the Sixth Five-Year Periodic Review in 2029.

11.1 Groundwater

The GCMP (CH2M HILL 1996b) should be updated to reflect current sampling procedures, schedule, and statistical approaches. Future statistical comparisons should continue to be conducted using Sanitas and the Unified Guidance approach.

In 2019, to ensure that representative groundwater samples are being collected, SPU conducted a trial using low-flow groundwater monitoring procedures at the compliance wells in accordance with EPA and Ecology guidelines (EPA 2017; Puls and Barcelona 1996; Ecology 2012). However, due to the limited screened intervals in many of the monitoring wells and the type of dedicated pumps installed in the wells, it was determined that this approach could not be easily implemented. Since the results from the trial low-flow groundwater sampling event were comparable, SPU should continue to use the typical sampling procedures, including the purging and stabilization procedures summarized in Section 4.1.3.

The 2019 to 2023 VC data in monitoring wells and piezometers representing the Green River confirmed the degradation model predictions that indicate that MNA is functioning as an appropriate cleanup remedy to achieve cleanup in a reasonable time frame. The BIOSCREEN and BIOCHLOR models should be updated with the recent data to re-evaluate the restoration time frame at wells KMW-17 and KMW-17Z. Annual monitoring data for VC at wells KMW-017 and KMW-017Z should be compared to the updated model predictions.

Piezometers KPW-1 and KPW-2 showed groundwater at the point of discharge is currently meeting the VC RV. Therefore, the piezometers should be removed.

Grab samples from the adjacent Green River should be collected and along with samples collected from the groundwater monitoring wells should be analyzed for additional parameters required to prepare trilinear plots (bicarbonate alkalinity, calcium, magnesium, potassium, and sodium). The Green River grab samples should be collected at the pedestrian bridge upstream of the landfill. The trilinear plots will provide additional information to understand the relationship between the aquifers and surface water. The results should be evaluated to determine whether the Green River sampling and additional parameters should be added permanently to the sampling program.

Following one additional dry season event in 2024, analysis of monitoring wells samples for the some of the additional MNA parameters added beginning in 2020 (methane, ethane, and ethene; and total ferrous iron) should be discontinued.

The project team recommends checking Ecology's well database every 5-years to determine whether any new wells have been installed within 1,000 feet of the landfill. These findings will be reported in each 5-year status report, or sooner if any high-capacity wells have been put into use.

11.2 Slope Stability

As described in Section 2.1, there is a possibility that groundwater levels could be higher than that assumed in the stability evaluation, and this condition would incur the risk of slope instability. To mitigate such risk, initial and ongoing recommendations have been made for the leachate flow measurements and structures system (Section 6.3) and for monitoring water levels in the two dewatering wells (Section 8.3). Continuous monitoring of the dewatering wells and an alarm system is in place, and contingency triggers have been developed.

HWA's initial recommendations include:

- Resume monthly measurement of flow rates from the spring drain using the control structure and Parshall flume. The monthly flow rate measurements should be documented and compared to previous measurements.
- Clean out the sand from the spring drain control structure using a vactor truck or similar piece of equipment. Several clean outs may be required to flush sand out of the pipes. The flow rate should be measured immediately before and after cleaning out the sand to see if the flow rate changes.
- Inspect the Parshall flumes and clean out if needed.
- Conduct a video inspection of the spring drain inlet pipe, beginning at the control structure and proceeding as far upstream as possible. While conducting the video inspection, the location and depth of the drain should be documented and surveyed, as well as locations of pipe damage/distress and locations of sand entering the drain. If at a certain point it is discovered that a portion of the drain has failed or collapsed, the location of the failure/collapse should be documented and surveyed.
- Perform repairs and/or selective replacement of the drain, if warranted. Depending on the types or repairs needed and their locations, repairs/replacement of the drain could involve both trenchless technology (e.g., slip lining) and conventional trench excavation.
- Perform periodic sand removal if it is determined that sand is entering the drainage system, and it is not possible to prevent the sand from entering the system. The frequency of the sand removal operation will be dependent on how quickly sand enters the drainage system.

HWA's ongoing recommendations to help maintain the stability of the landfill slopes include:

- Continue to monitor and document flow rates from the leachate pond and toe buttress drain, report monthly (to SPU and consultants).
- Resume monitoring and documenting flow rates from the spring drain, monthly.
- Evaluate groundwater level and flow rate data on a monthly basis.
- Any problems with the drains should be addressed as soon as practicable. Better estimates of the timing required (i.e., determining the time it takes the groundwater to rise from its current level to the action level of 68 feet in DW-2) may be developed based on future data (e.g., rates of groundwater level increase), or correlation of drain flow and groundwater levels. Based on the volume of groundwater in the downslope portion of the landfill, and rate of discharge from the spring drain, the time frame for any potential critical groundwater level increases due to blockage of the spring drain would be on the order of months to years, allowing ample time to plan contingency measures if needed.
- Continue the recently implemented groundwater level monitoring in DW-1 and DW-2 with alarm conditions as recommended by S&EE. Measurement frequency should be continued at daily intervals with monthly reporting/analysis (to SPU and consultants), unless an indicator

or alarm condition in DW-2 is reached (groundwater at elevation 68.0 feet, or 76.5 feet, respectively).

- Continue water level measurement of Manholes A and B, to evaluate whether leachate pump systems are operating properly.
- Water level monitoring in gas extraction wells (KIGW-1, KIGW-3, KIGW-23, KIGW-24, and KIGW-94B) should be discontinued, as DW-1 and DW-2 provide better groundwater level information, and these gas probes are difficult to measure due to alignment (wells are not vertical) and the high conductivity leachate interferes with electronic well probes. Well KRW-2 should be considered for water level monitoring. KRW-2 is a piezometer located upslope of DW-1 and DW-2 that is also screened within refuse and will provide additional information on water levels to supplement the measurements in DW-1 and DW-2).
- Discontinue monitoring relating to rain/freezing events as these events are not expected to impact slope stability to the same degree as a rising groundwater level and because groundwater level impacts associated with rain/freezing events will eventually be reflected in the groundwater level measurements.
- Evaluate groundwater level (DW-1 and DW-2) and flow rate data on a monthly basis.

11.3 Landfill Gas

Since methane levels in KGP-35-S have remained below 2.0% by volume for more than 2 years, the five temporary shallow gas probes (KGP-301, KGP-302, KGP-303, KGP-304, and KGP-305) should be removed.

Continue to track development changes surrounding the landfill. The City of Kent has made additional improvements along the northern fence line boundary. Contact the City of Kent regarding future plans or land use changes.

12. References

Booth, D.B., and Waldron, H.H., 2004, Geologic Map of the Des Moines 7.5-minute Quadrangle, King County, Washington, USGS Scientific Investigations Map 2855, Scale 1:24,000

CH2M HILL. 1991a. Kent Highlands Landfill Closure and RI/FS, Remedial Investigation Report. Prepared for the City of Seattle. June 1991.

CH2M HILL. 1991b. Final Draft Kent Highlands Landfill East Slope Stability Investigation and Analysis. Prepared for the City of Seattle. October 14, 1991.

CH2M HILL. 1995. Kent Highlands Landfill Spring Drain Separation Technical Memorandum. Prepared for Cathy Orsi, Seattle Solid Waste Utility. September 13, 1995.

CH2M HILL. 1996a. Kent Highlands Landfill Post-Closure Operations and Maintenance Manual. Prepared for the City of Seattle. December 1996.

CH2M HILL. 1996b. Kent Highlands Landfill Groundwater Compliance Monitoring Plan (GCMP). Prepared for the City of Seattle. February 1996.

CH2M HILL. 1997. Kent Highlands Landfill 1996 Groundwater Monitoring Report. Prepared for the City of Seattle. June 1998.

Ecology (Washington State Department of Ecology). 1992. Statistical Guidance for Ecology Site Managers. Publication No. 92-54. August 1992.

Ecology (Washington State Department of Ecology). 1993. Kent Highlands Landfill Cleanup Action Plan. April 1993.

Ecology 2003. Second Periodic Review for Kent Highlands Landfill Site, Kent, Washington. Prepared by the Northwest Regional Office, Bellevue, Washington. September 23, 2003.

Ecology. 2009. Periodic Review, Kent Highlands Landfill, Facility Site ID #2042. Prepared by the Northwest Regional Office, Toxics Cleanup Program. June 2009.

Ecology. 2012. Guidance for Groundwater Monitoring at Landfills and Other Facilities Regulated Under Chapters 173-304, 173-306, 173-350, and 173-351 WAC. Publication No. 12-07-072. December 2012. Revised December 2018.

Ecology. 2014. Fourth Periodic Review 2009–2013, Kent Highlands Landfill, Facility Site ID #2042. Prepared by the Northwest Regional Office, Toxics Cleanup Program. September 2014.

Ecology. 2015. Kent Highlands Meeting Notes – Periodic Review, 5-year Monitoring Report. Email from Mark Adams to Jeff Neuner, Min-Soon Yim, and Eugene Freeman. June 18, 2015.

Ecology. 2018. Water Quality Program Permit Writer's Manual. Publication No. 92-109. June 1989. Revised July 2018.

Ecology. 2019. Fifth Periodic Review 2014–2018, Kent Highlands Landfill, Facility Site ID #2042. Prepared by the Northwest Regional Office, Toxics Cleanup Program. September 2019.

Ecology. 2023. Water Quality Standards for Surface Waters of the State of Washington, Chapter 173-201A WAC. December 2023 update.

EHSI (EHSI-International, Inc.) and Parametrix. 2019. Northwest Landfill Boundary Property Redevelopment Gas Evaluation Report, Kent Highlands Landfill. Unpublished Report. Prepared by EHSI in association with Parametrix. February 2019.

EPA (U.S. Environmental Protection Agency). 1989. Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Interim Final Guidance. April 1989.

EPA 1991. Technical Support Document for Water Quality-based Toxics Control. Office of Water. EPA/505/2-90-001. March 1991.

EPA (U.S. Environmental Protection Agency). 1996. BIOSCREEN Natural Attenuation Decision Support System User's Manual, Version 1.3. Publication No. EPA/600/R-96/087. August 1996.EPA. 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. Publication No. EPA/600/R-98/128. September 1, 1998.

EPA. 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, Office of Solid Waste and Emergency Response (OSWER), Directive 9200.4-17P, Final Draft. Washington, D.C. April 21, 1999. Available at: www.epa.gov/swerust1/oswermna/mna_epas.htm.

EPA. 2000. BIOCHLOR Natural Attenuation Decision Support System User's Manual, Version 1.0. Publication No. EPA/600/R-00/008. January 2000.

EPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. EPA 530/R-09-007. March 2009.

EPA. 2016. Aquatic Life Ambient Water Quality Criteria, Cadmium – 2016. Publication No. EPA 820-R-16-002. March 2016.

EPA/600/R-00/008. January 2000. EPA. 2015. Standard Operating Procedure for the Standard/Well Volume Method for Collecting a Groundwater-Water Sample from Monitoring Wells for Site Characterization. https://www.epa.gov/sites/default/files/2015-06/documents/finalgwsamp_sop.pdf

EPA. 2017a. Groundwater Sampling, Science and Ecosystem Support Division Operating Procedure. SESDPROC-301-R4. April 27, 2017.

EPA. 2017b. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. EQASOP-GW4 Region 1 Low-Stress (Low-Flow) SOP Revision Number: 4. July 30, 1996. Revised September 19, 2017.

Floyd|Snider. 2007. Kent Highlands Landfill. Second Periodic Review Response. Prepared for Seattle Public Utilities. October 2007.

Gibbons, R.D. 1994. Statistical Methods for Groundwater Monitoring. John Wiley and Sons, Inc., New York, NY.

HWA (HWA Geosciences, Inc.) 2024a. Kent Highlands Landfill – Dewatering Well Hydraulic Testing, 23076 Military Road South Kent, Washington. Letter report prepared for Seattle Public Utilities as a subconsultant to Parametrix. January 26, 2024.

HWA. 2024b. Kent Highlands Landfill – Slope Stability Review, 23076 Military Road South Kent, Washington. Technical memorandum prepared for Seattle Public Utilities as a subconsultant to Parametrix. July 2024.

HWA. 2024c. Kent Highlands Landfill – The Lakes at Kent Water Use, 23076 Military Road South Kent, Washington. Technical memorandum prepared for Seattle Public Utilities as a subconsultant to Parametrix. July 2024.

HWA. 2024d. Kent Highlands Landfill – Water Supply Well Inventory Update, 23076 Military Road South Kent, Washington. Technical memorandum prepared for Seattle Public Utilities as a subconsultant to Parametrix. July 2024.

King County. 2024. King County Watersheds and Rivers – Streams Data. Available at: http://green2.kingcounty.gov/streamsdata/DataDownload.aspx.

Newell, C.J., Rifai, H.S., Wilson, J.T., Connor, J.A., Aziz, J.A., and Suarez, M.P. 2002. Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies. EPA/540/S-02/500 November 2002. Available online at https://nepis.epa.gov/Exe/ZyPDF.cgi/10004674.PDF?Dockey=10004674.PDF

Parametrix. 2014. Kent Highlands Landfill Five-Year Groundwater Monitoring Summary (2009–2013). Prepared for City of Seattle – Seattle Public Utilities. October 2014.

Parametrix. 2017. Kent Highlands Landfill Notice of Construction Application for Permit Modification. Prepared for Seattle Public Utilities. June 5, 2017.

Parametrix. 2019. Kent Highlands Landfill Remedial Action Status Report (2014-2018). Prepared for City of Seattle – Seattle Public Utilities. May 2019.

Parametrix. 2020. Monitored Natural Attenuation Parameters, Kent Highlands Landfill. Technical Memorandum prepared for Seattle Public Utilities. August 12, 2020.

Parametrix. 2022. Preliminary Evaluation of Monitored Natural Attenuation Procedures and Results, Kent Highlands Landfill. Technical Memorandum prepared for Seattle Public Utilities. September 15, 2022.

Parametrix 2024a. Kent Highlands Landfill Groundwater Compliance Update. Technical Memorandum prepared for Seattle Public Utilities. August 2024.

Parametrix 2024b. Kent Highlands Landfill KMW-15A Replacement. Technical Memorandum prepared for Seattle Public Utilities. July 2024.

Parametrix in association with EHSI. 2019a. Kent Highlands Landfill Well Inventory. Prepared for Seattle Public Utilities. February 27, 2019.

Parametrix in association with EHSI. 2019b. Kent Highlands Landfill Groundwater Compliance Evaluation. Prepared for Seattle Public Utilities. May 2019.

Parametrix in association with HWA. 2022. Kent Highlands Landfill Vinyl Chloride Groundwater to Surface Water Pathway Pont of Compliance Study Report. Prepared for Seattle Public Utilities. December 2022.

Parametrix in association with HWA. 2024. The Lakes at Kent Water Use. Prepared for Seattle Public Utilities. July 2024.

Parametrix in association with Soil and Environmental Engineers and HWA Geosciences, Inc. 2023. Dewatering Well Installation and Slope Stability Reevaluation, Kent Highlands Landfill. Prepared for Seattle Public Utilities. May 2023.

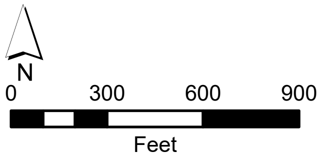
Puls, R. W. and M. J. Barcelona. 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. Publication No. EPA/540/S-95/504.

S&EE (Soil & Environmental Engineers, Inc.). 2019. Report of Geotechnical Study Slope Stability Evaluation Update, Kent Highlands Landfill. Prepared for Seattle Public Utilities. September 4, 2019.

Figures

Image Sources: Google Earth Aerial Imagery 2023; ArcGIS Pro

Parametrix



City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 1
Landfill Property Map Kent Highlands Landfill Kent, Washington

2018

2023

Prepared by Parametrix: U:\PSO\Projects\Confid\Clients\1550-CityofSeattle\553-1550-003 KentHighMidwyLFPost\99Svcs\GIS\ArcPro Map\Annual_Report_2021\Annual_Report_2023.aprx, 4/30/2024

Service Layer Credits: Google Earth Aerial Imagery 2018 and 2023; ArcGIS Pro

Parametrix

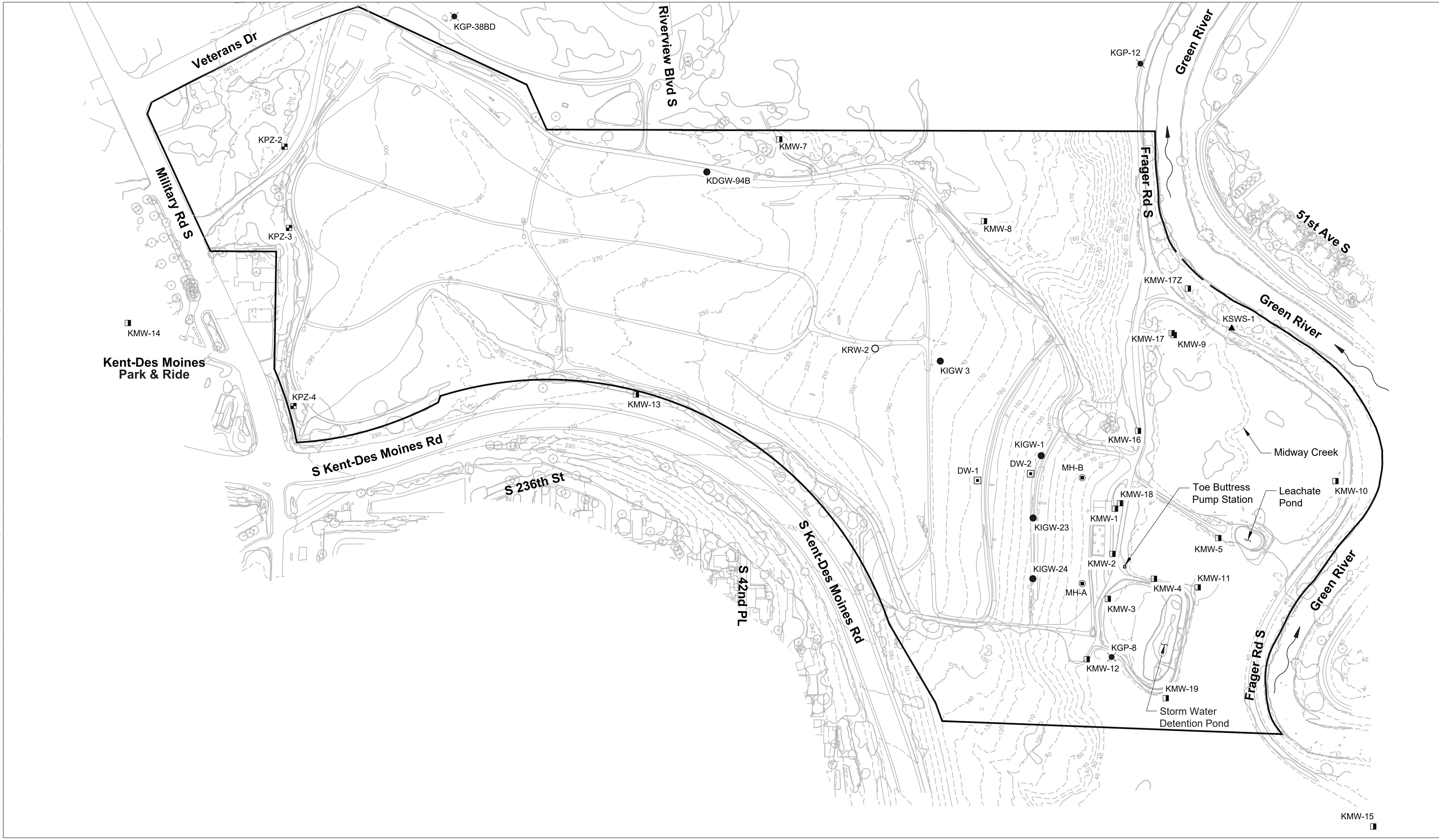
N

0 300 600 900

Feet

City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 2
Changes in Land Use Between 2018 and 2023
Kent Highlands Landfill



DATE: August 7, 2024 FILE: PS1550063F-01_KH_2019-2023

Parametrix

N

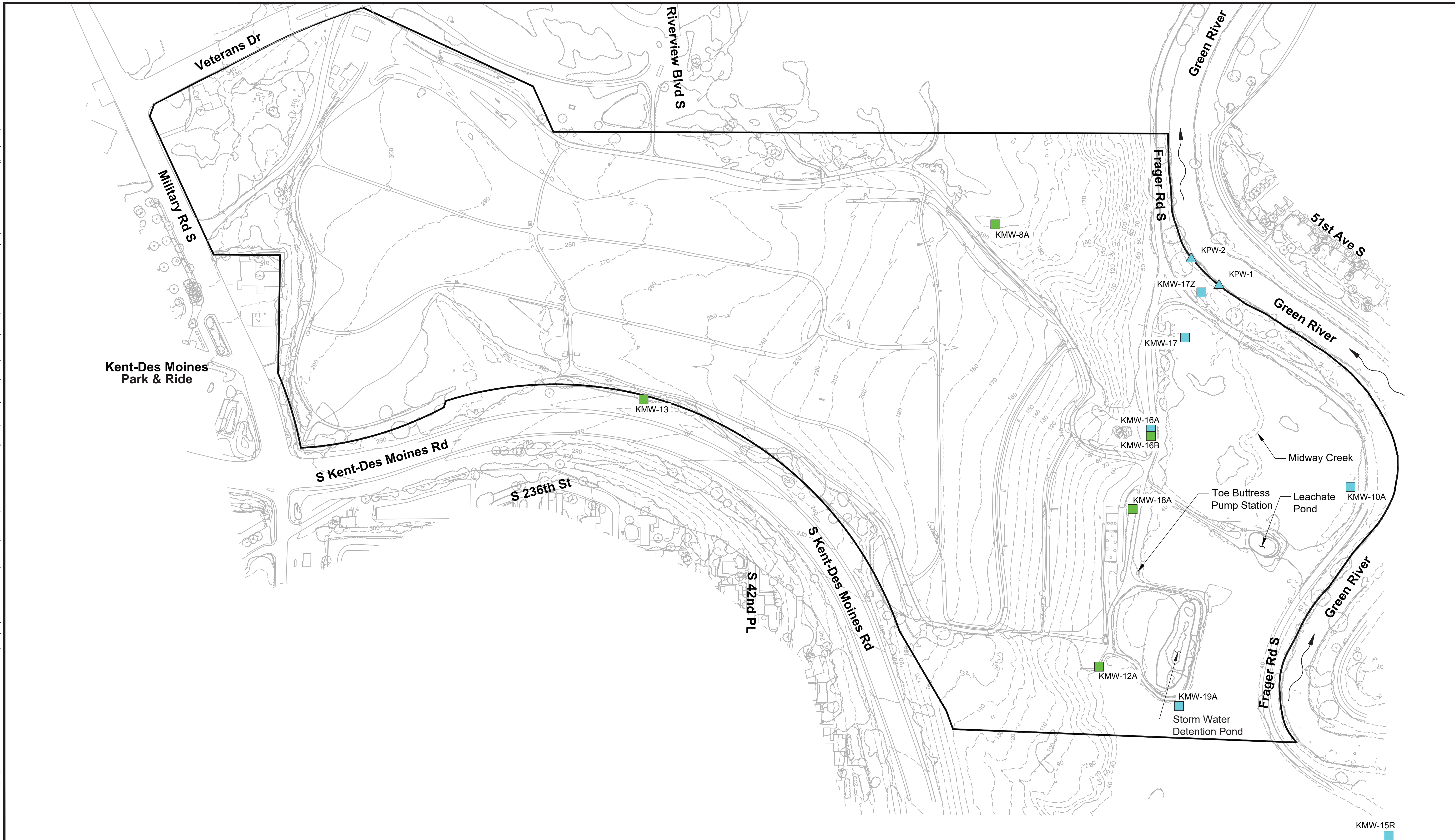
0 300

1 INCH = 300 FT.

Legend:

- Groundwater Monitoring Well (MW)
- Piezometer (PZ)
- Gas Probe (GP)
- Gas Extraction Well (GW)
- Dewatering Wells
- Surface Water Station
- Manhole (MH)
- Refuse Monitoring Well
- City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 3
Water Level Monitoring Locations
Kent Highlands Landfill



DATE: August 7, 2024 FILE: PS1550063F-01_KH_2019-2023

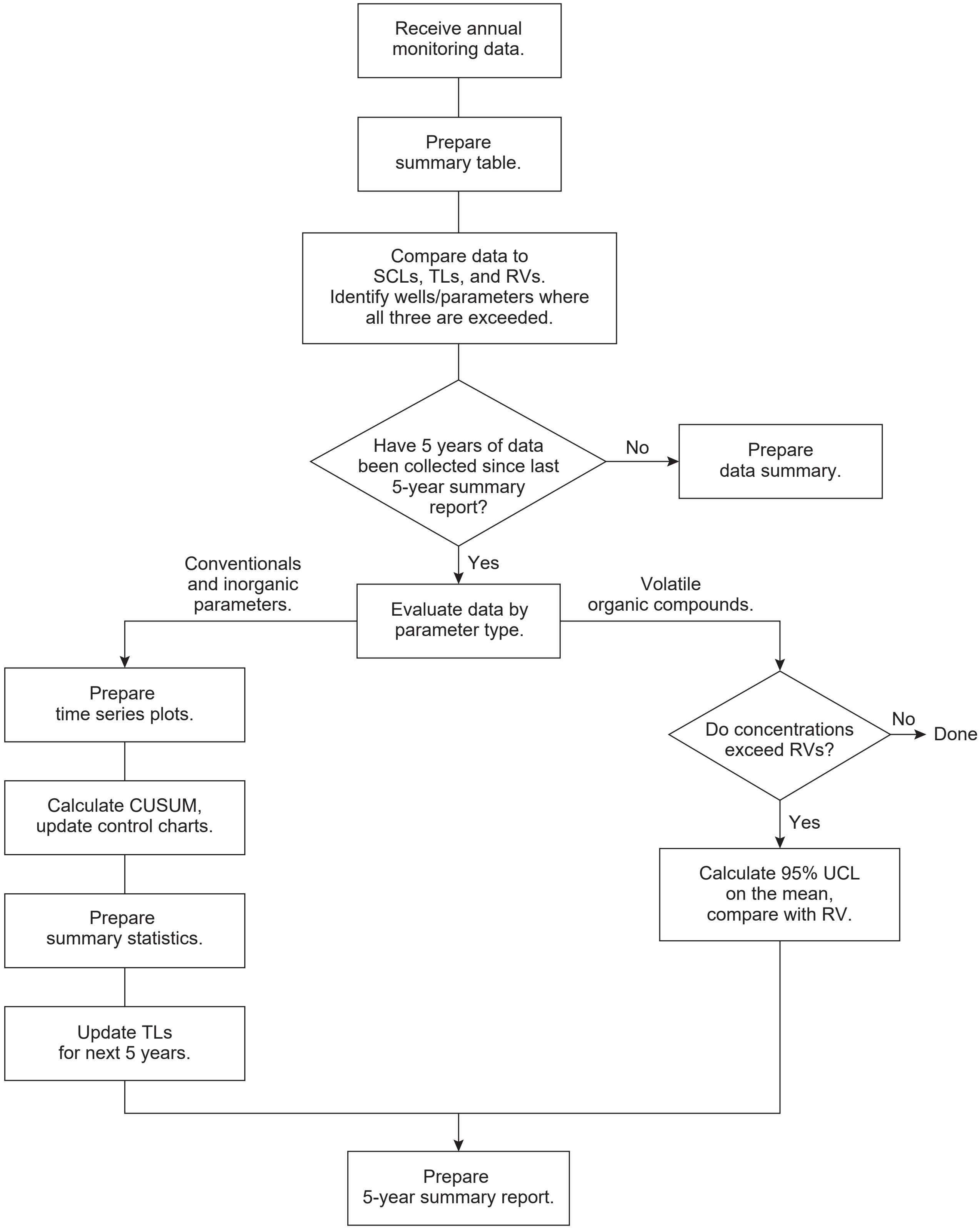
Parametrix

0 N 300
1 INCH = 300 FT.

Legend:

- RAA Groundwater Monitoring Well (MW)
- SA Groundwater Monitoring Well (MW)
- RAA Temporary Porewater Piezometer
- City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

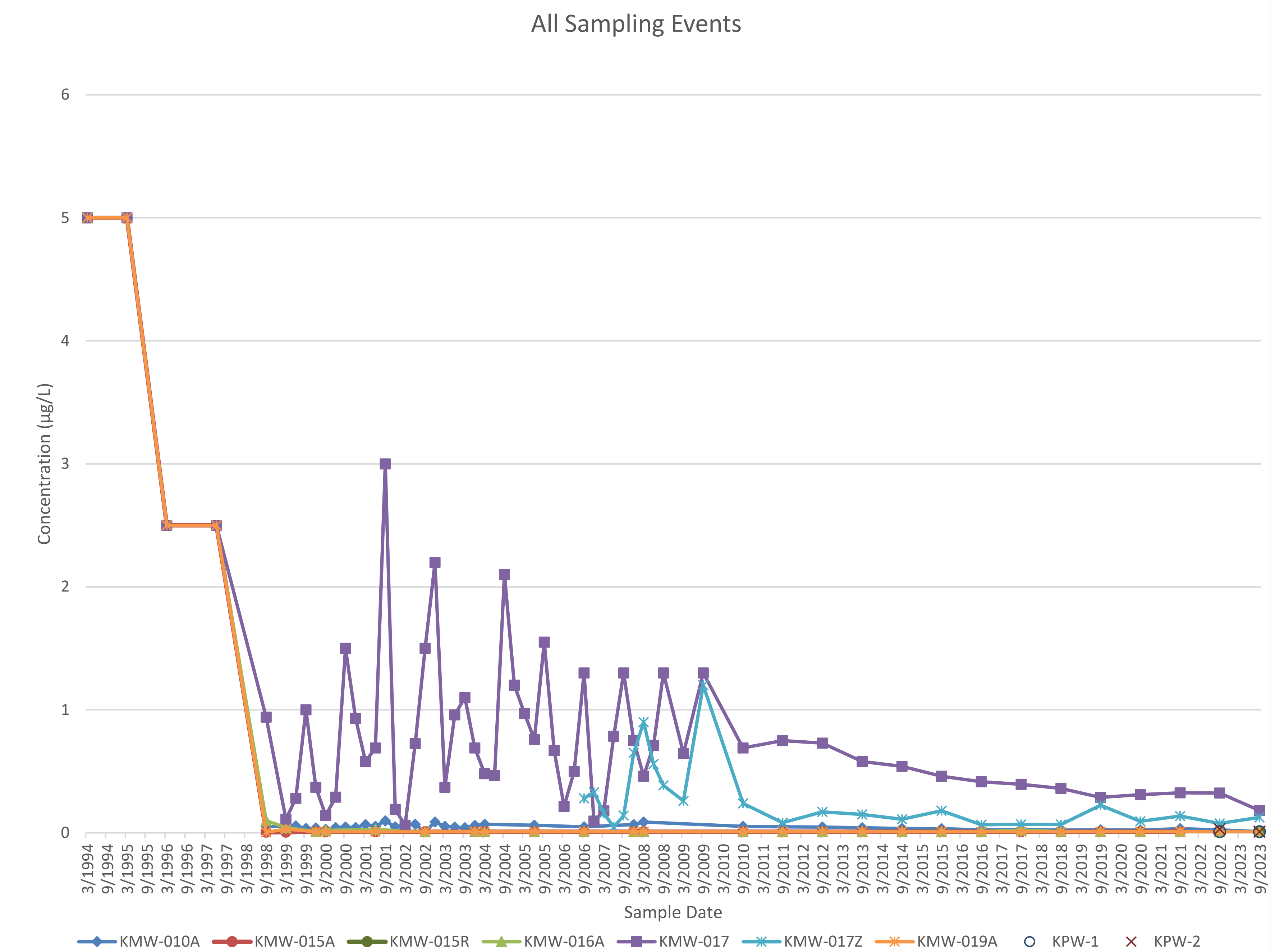
Figure 4
Groundwater Quality Monitoring Locations
Kent Highlands Landfill



Reference: Modified from CH2M Hill (1996), Groundwater Compliance Monitoring Plan

Parametrix

Figure 5
Water Quality Data Evaluation During Confirmational Monitoring
Kent Highlands Landfill



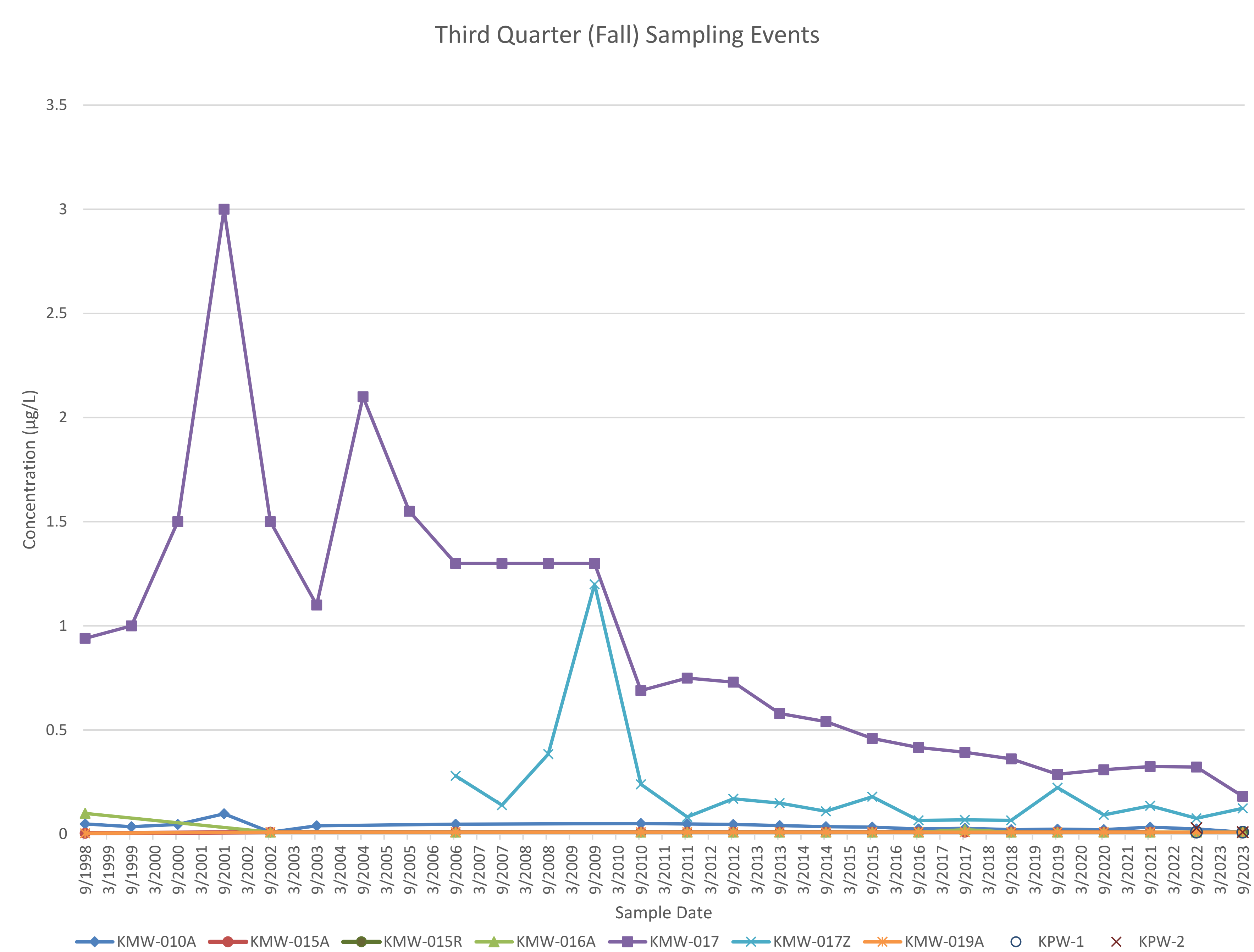
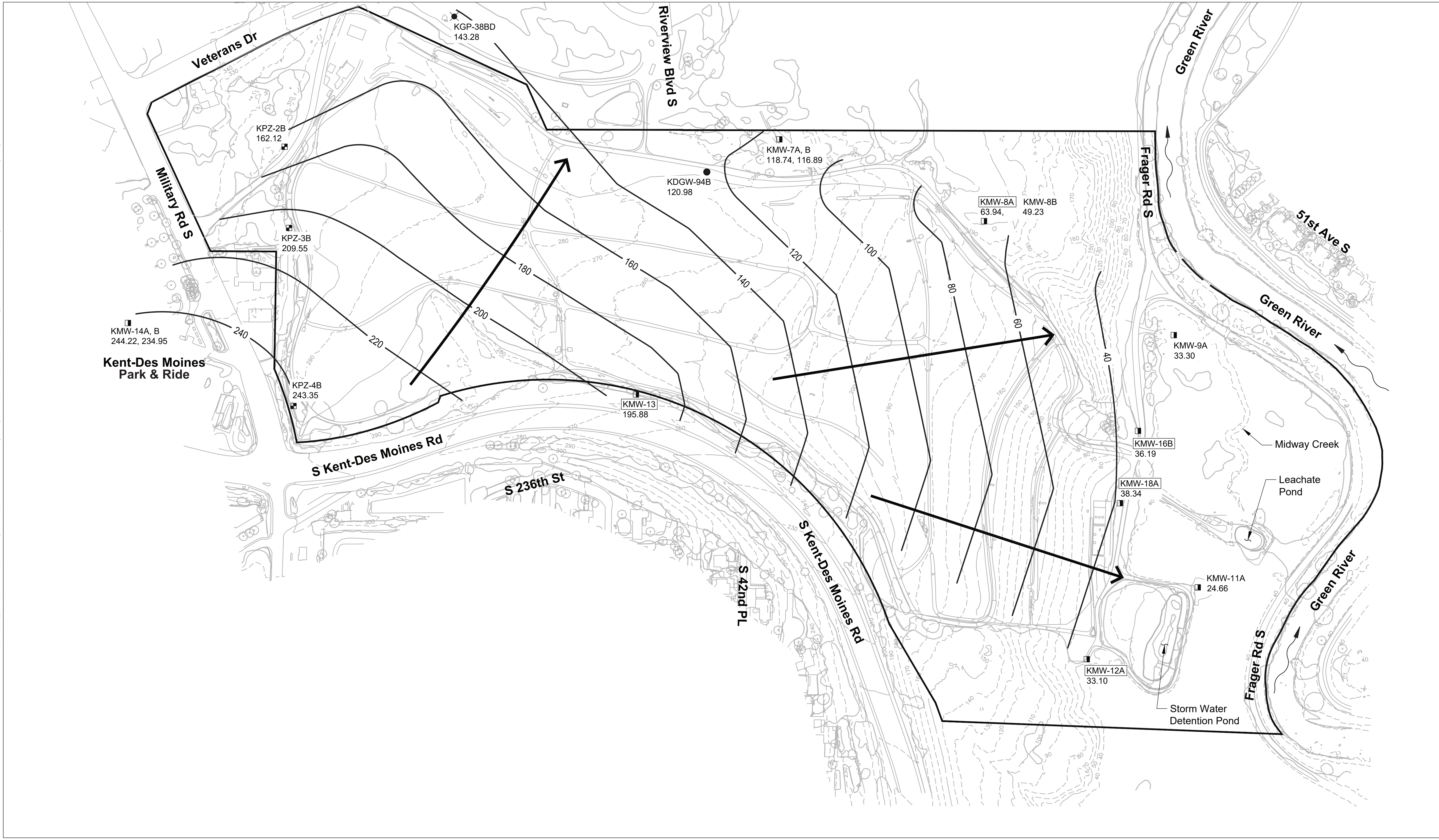


Figure 6
Vinyl Chloride Results
Recent Alluvium Aquifer
Kent Highlands Landfill



DATE: August 7, 2024 FILE: PS1550063F-01_KH_2019-2023

Parametrix

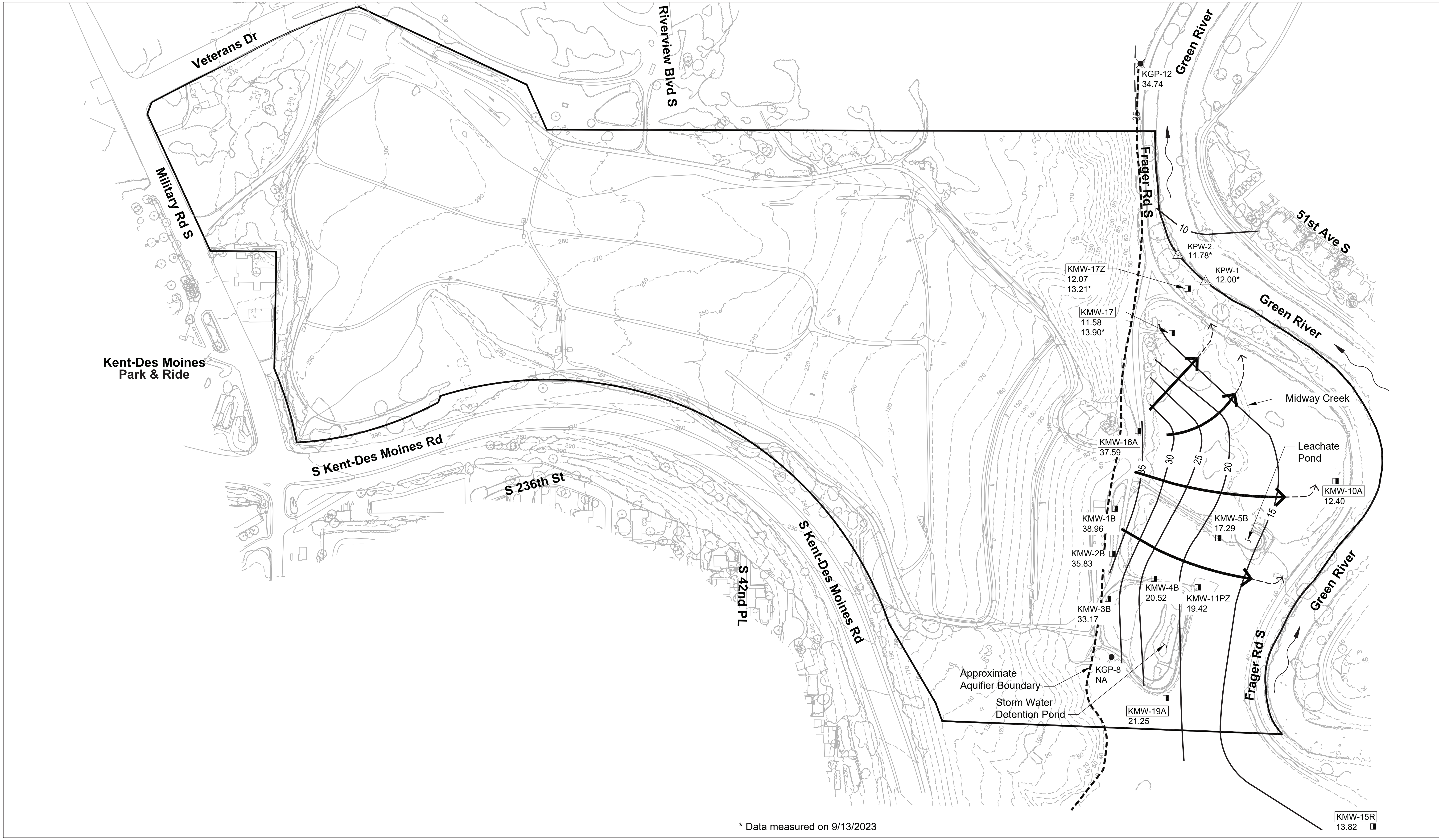
0 N 300

1 INCH = 300 FT.

Legend:

- Groundwater Monitoring Well (MW)
  - A=Shallow completion
  - B=Intermediate completion
  - C=Deep completion
- Piezometer (PZ)
- Gas Probe (GP)
- Gas Extraction Well (GW)
- Groundwater Quality Monitoring Well
- Surface Water Station
- City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill
- 100 Potentiometric Surface Elevation Contour
- General Direction of Groundwater Flow
- NA Water Level Data Not Available

Figure 7
Potentiometric Surface Map of the Sand Aquifer September 5, 2023 Kent Highlands Landfill



DATE: August 7, 2024 FILE: PS1550063F-01_KH_2019–2023

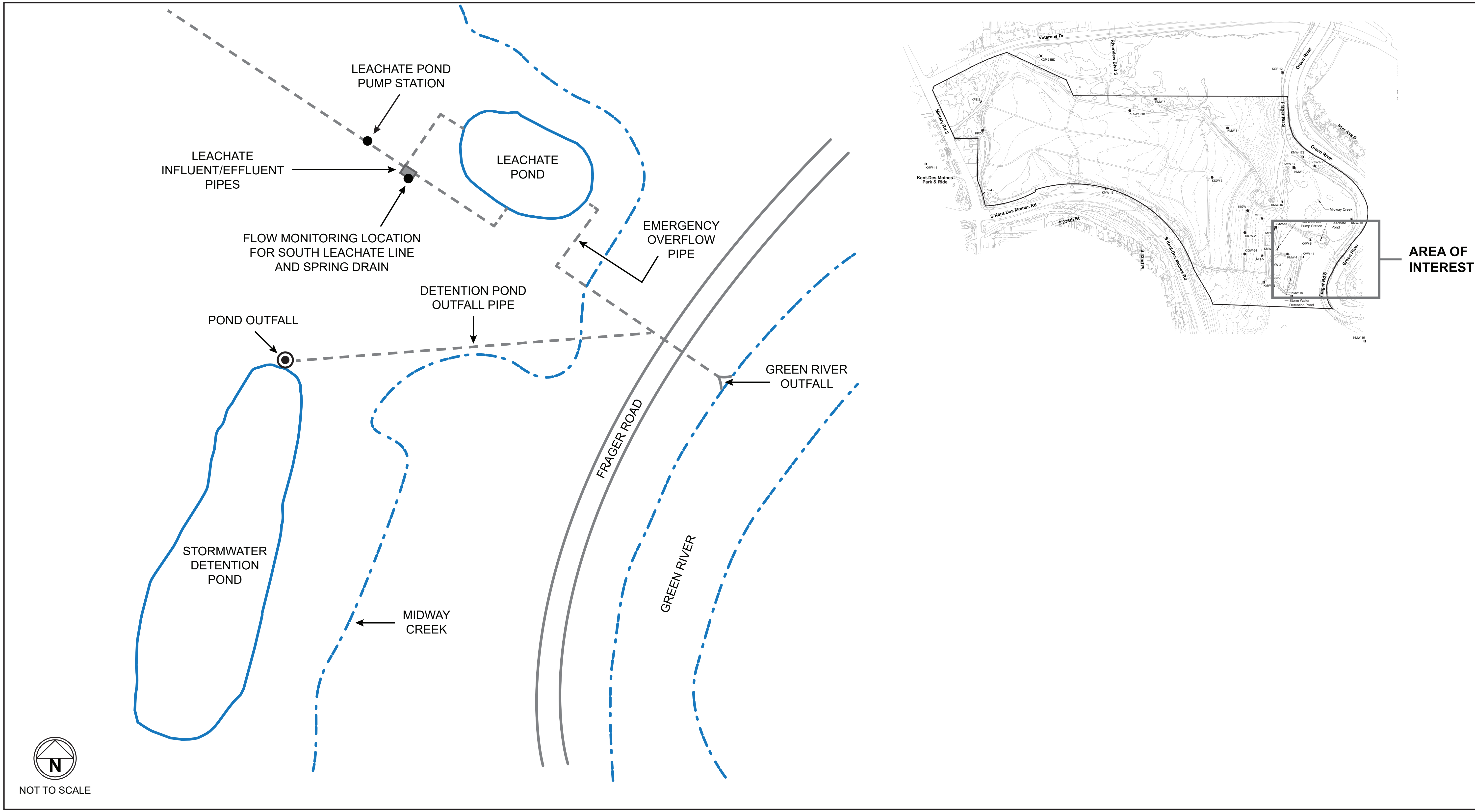
Parametrix

0 300
1 INCH = 300 FT.

Legend:

- Groundwater Monitoring Well (MW)
  - A=Shallow completion
  - B=Intermediate completion
  - C=Deep completion
- Temporary Piezometer
- Gas Probe (GP)
- Groundwater Quality Monitoring Well
- City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill
- 100 Potentiometric Surface Elevation Contour
- General Direction of Groundwater Flow
- Inferred Direction of Groundwater Flow

Figure 8
Potentiometric Surface of the Recent Alluvium Aquifer September 5, 2023 Kent Highlands Landfill

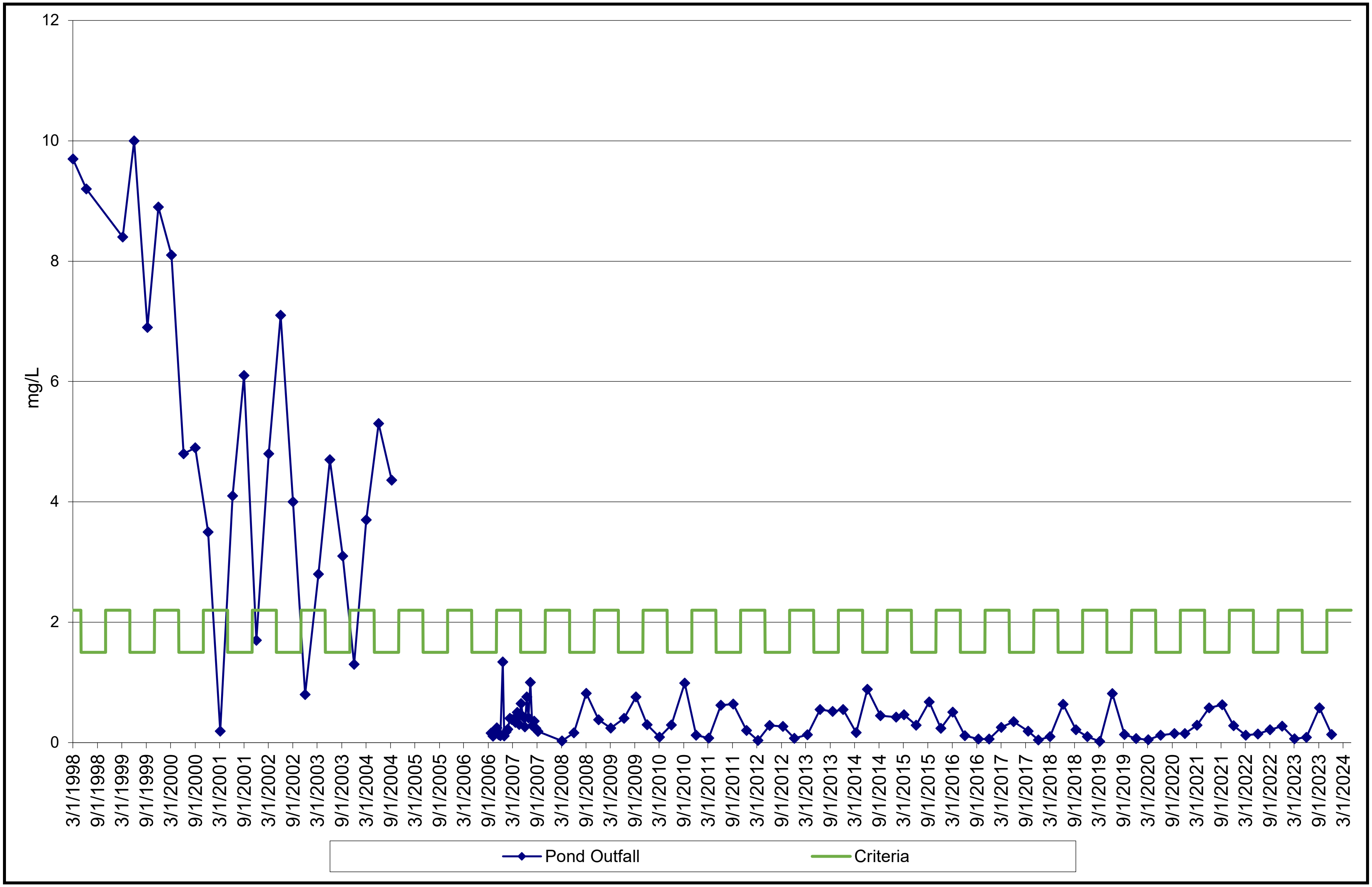


Parametrix

Figure 9
Spring Drain and Leachate Flow Monitoring Locations
Kent Highlands Landfill

◉ Sample Location

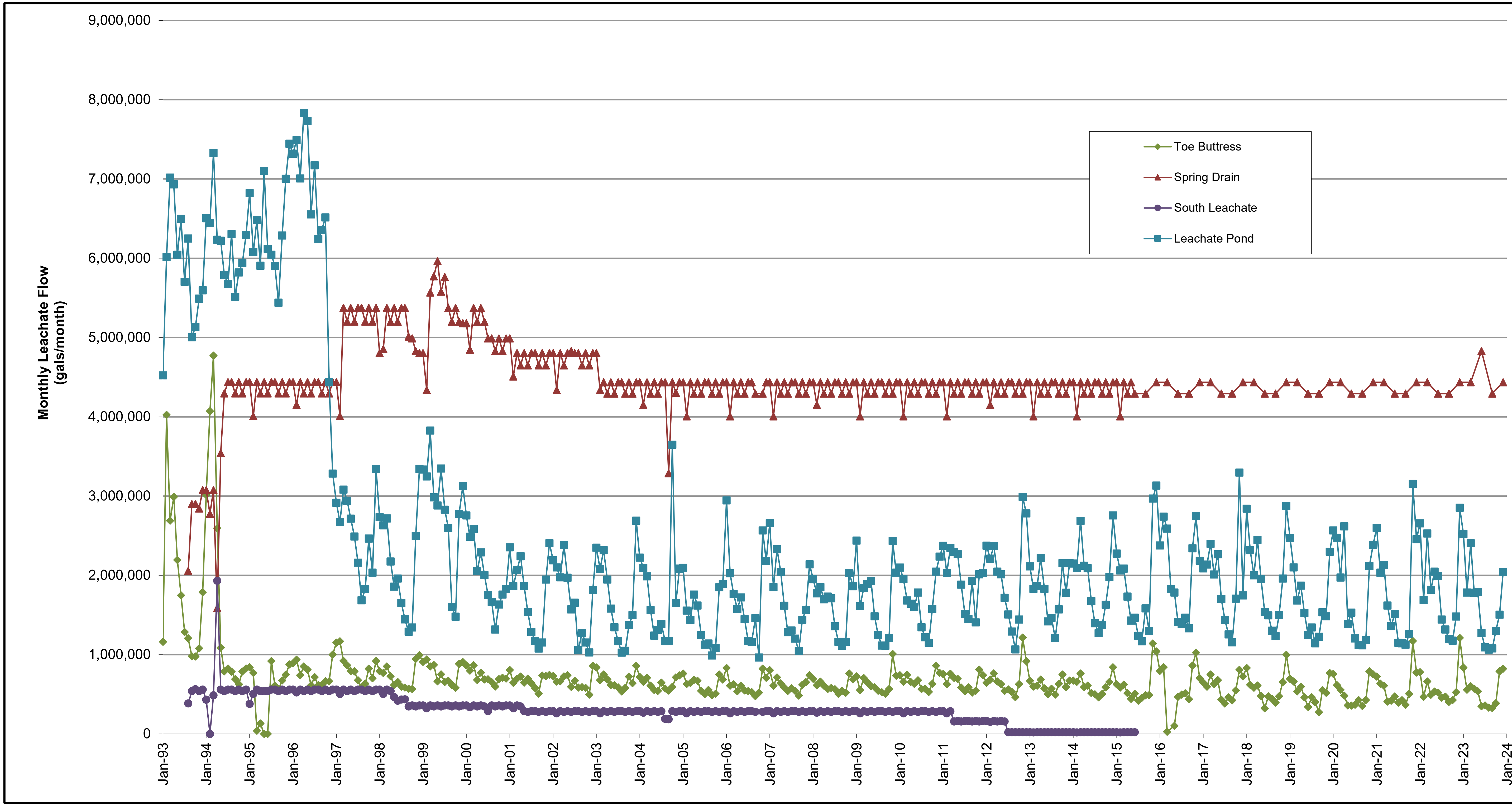
Pond Outfall: Monitoring location for the Spring Drain as defined in the *Kent Highlands Landfill Spring Drain Separation Technical Memorandum (1995)*.



Parametrix

Winter criteria = 2.2 mg/L
Summer criteria = 1.5 mg/L

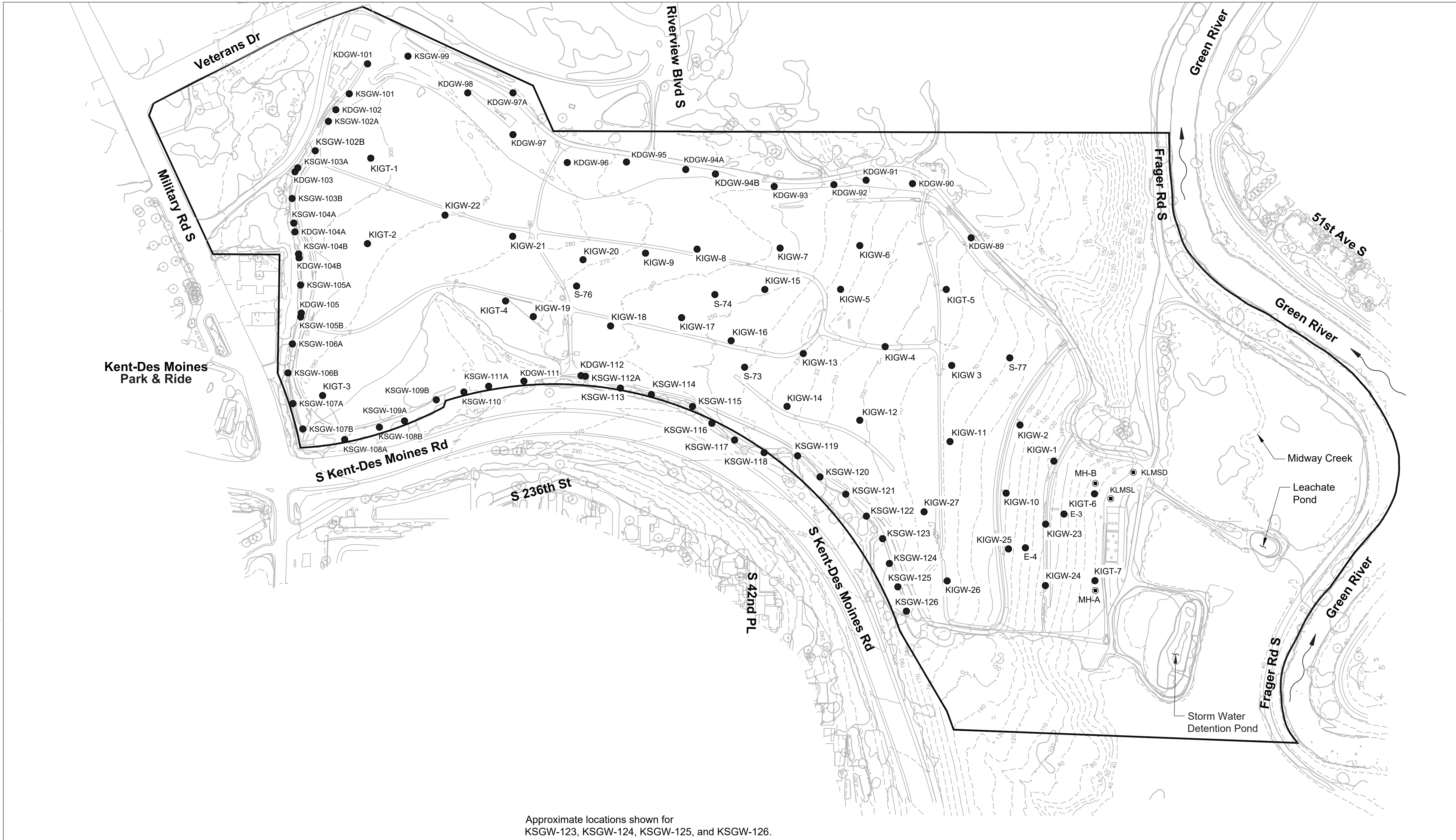
Figure 10
Ammonia Trends in Spring Drain Samples
Kent Highlands Landfill



Parametrix

Figure 11
Monthly Total Leachate and Spring Drain Flows
Kent Highlands Landfill

Note: Total leachate flow is calculated using flow data collected on the last working day of each month; therefore, the number of days included in each month will vary depending on when the week-ends occur. In mid-November 1996, Spring Drain leachate was rerouted to the surface water lagoon.



DATE: August 7, 2024 FILE: PS1550063F-01_KH_2019-2023

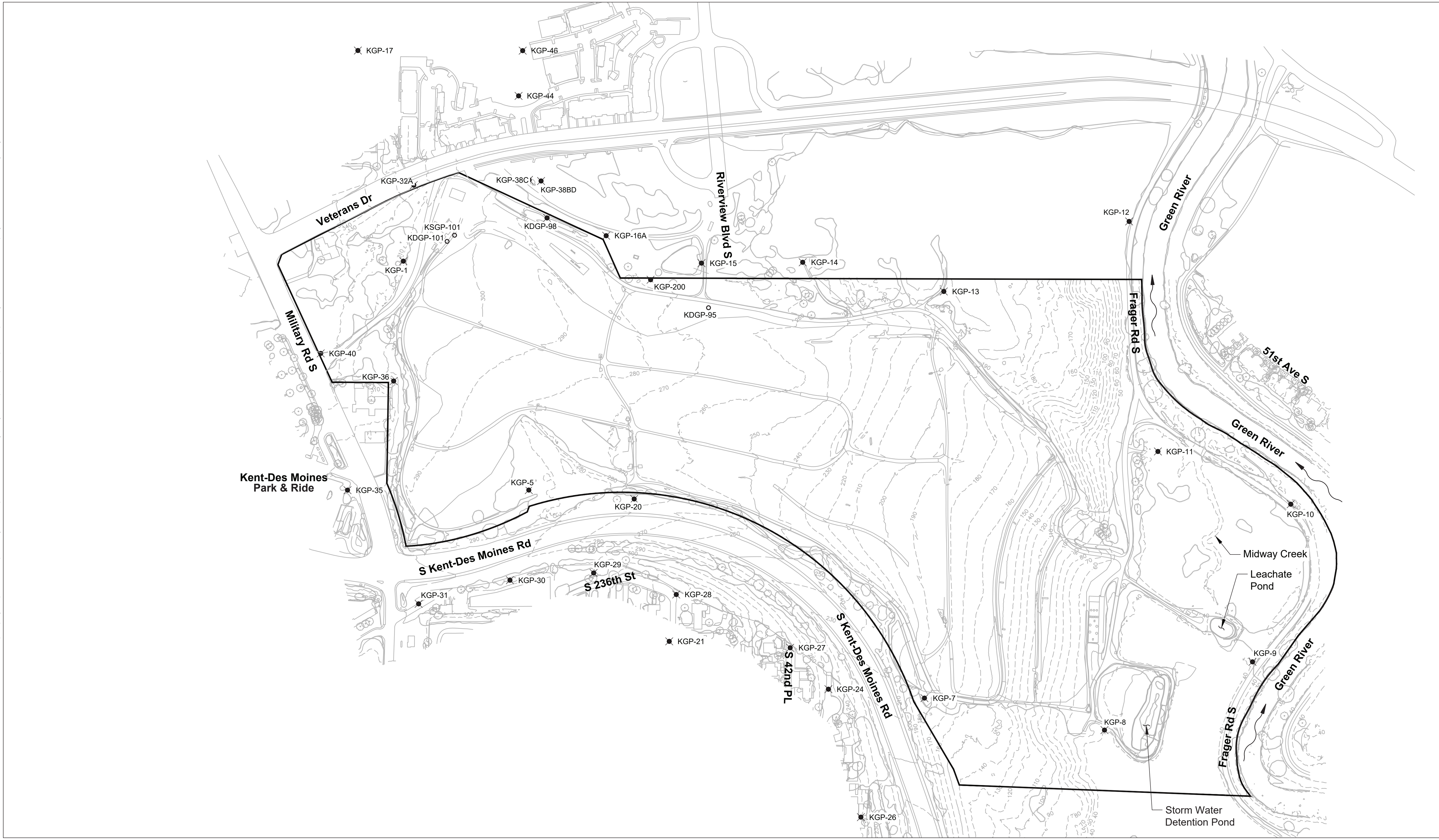
Parametrix

0 N 300
1 INCH = 300 FT.

Legend:

- ● Gas Extraction Well
- ◙ Manhole (MH)
- —— City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 12
Landfill Gas Well Locations
Kent Highlands Landfill



FILE: PS1550063F-01_KH_2019-2023 LAYOUT: F13 PATH: U:\PSO\Projects\ConfidClients\1550-CityofSeattle\553-1550-063 KentHighMidwyLFPost\99Svcs\CADD\FIGURES\KentHighland PLOTTED BY: purgabut DATE: Wednesday, August 7, 2024 2:06:21 PM

DATE: August 7, 2024 FILE: PS1550063F-01_KH_2019-2023

Parametrix

0 N 350

1 INCH = 350 FT.

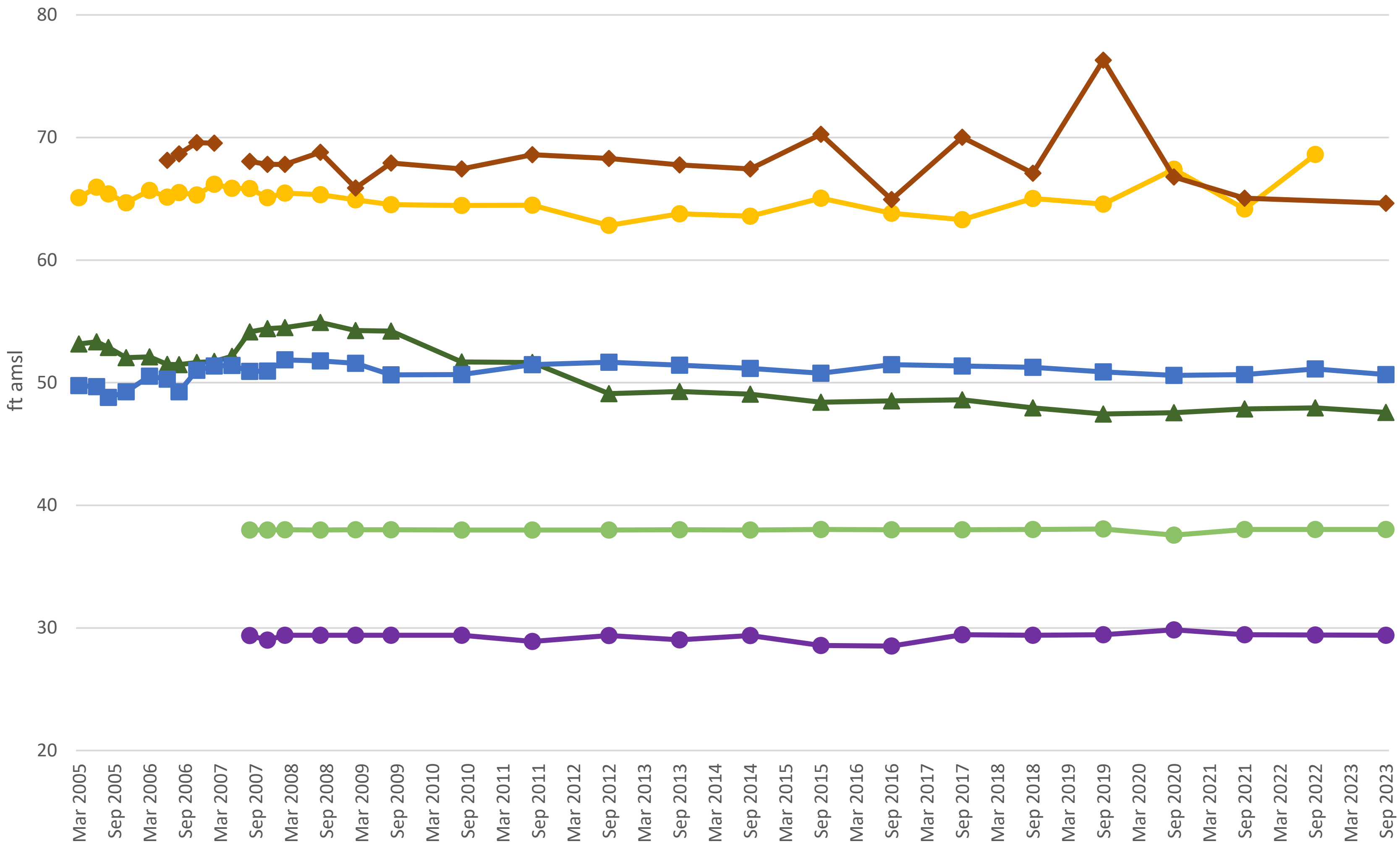
Legend:

Gas Probe (GP)

Operational Gas Probe

City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 13
Landfill Gas Probe Locations
Kent Highlands Landfill

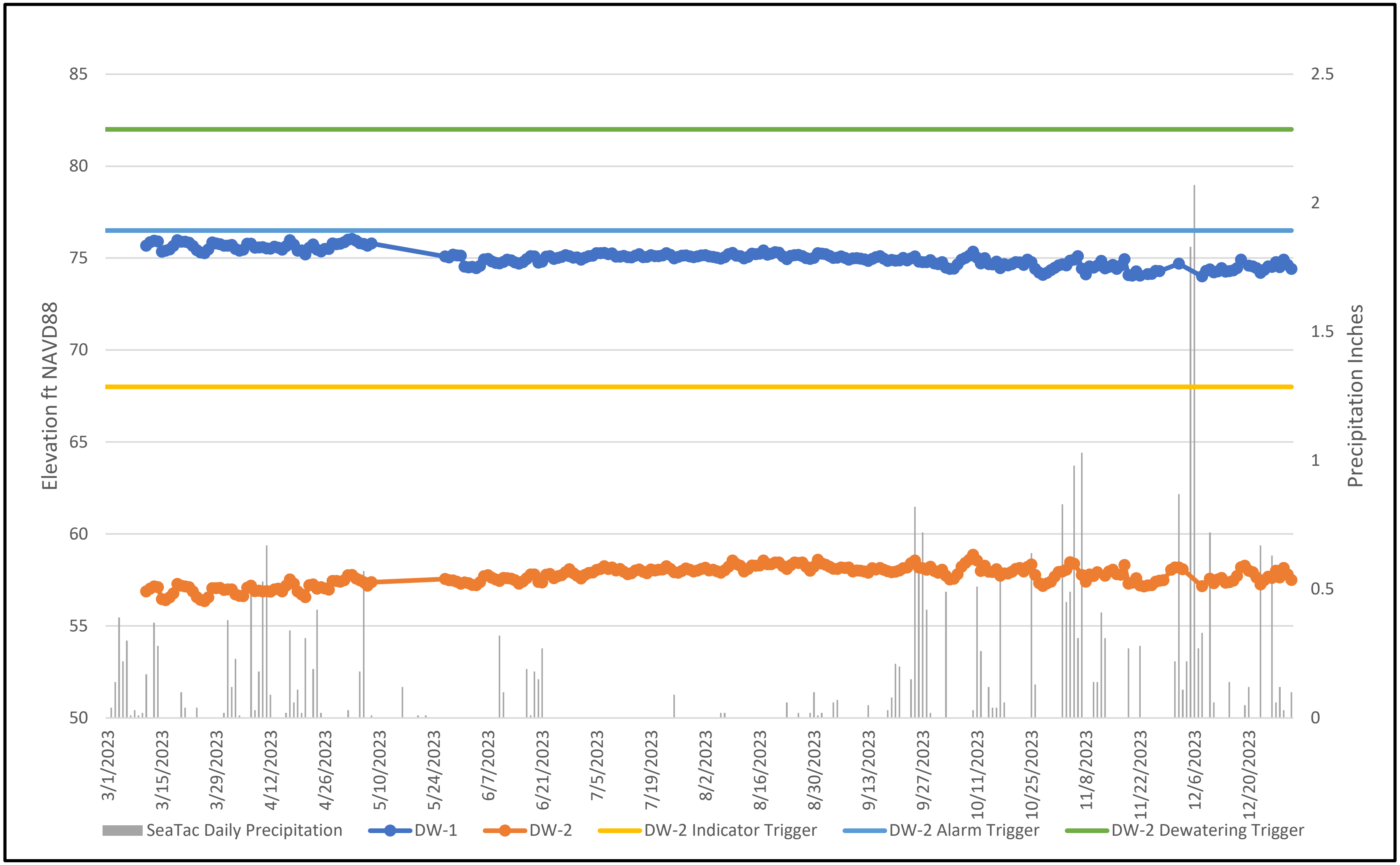


	Mar 2005	Jun 2005	Aug 2005	Nov 2005	Mar 2006	Jun 2006	Aug 2006	Nov 2006	Feb 2007	May 2007	Aug 2007	Nov 2007	Feb 2008	Aug 2008	Feb 2009
KIGW-1	65.10	65.95	65.40	64.68	65.68	65.13	65.50	65.32	66.18	65.86	65.83	65.10	65.47	65.33	64.91
KIGW-3						68.14	68.67	69.59	69.54		68.06	67.80	67.80	68.79	65.89
KIGW-23	53.16	53.34	52.88	52.05	52.10	51.50	51.47	51.65	51.73	52.15	54.15	54.40	54.50	54.92	54.26
KIGW-24	49.77	49.68	48.80	49.27	50.53	50.30	49.27	51.02	51.37	51.41	50.93	50.95	51.86	51.78	51.59
Manhole A											29.39	29.01	29.41	29.40	29.41
Manhole B											37.99	37.99	38.00	37.99	38.00

	Aug 2009	Aug 2010	Aug 2011	Sep 2012	Sep 2013	Sep 2014	Sep 2015	Sep 2016	Sep 2017	Sep 2018	Sep 2019	Sep 2020	Sep 2021	Sep 2022	Sep 2023
KIGW-1	64.52	64.46	64.48	62.83	63.78	63.58	65.04	63.83	63.30	65.03	64.56	67.42	64.17	68.61	
KIGW-3	67.93	67.44	68.59	68.30	67.76	67.44	70.26	64.95	70.03	67.09	76.31	66.77	65.04		64.64
KIGW-23	54.22	51.70	51.65	49.10	49.28	49.07	48.42	48.51	48.60	47.94	47.45	47.55	47.87	47.95	47.58
KIGW-24	50.65	50.67	51.47	51.67	51.43	51.17	50.78	51.48	51.37	51.25	50.89	50.6	50.67	51.13	50.67
Manhole A	29.41	29.40	28.89	29.39	29.03	29.38	28.57	28.52	29.45	29.41	29.45	29.85	29.45	29.43	29.41
Manhole B	38.00	37.99	37.99	37.99	38.01	37.99	38.03	38.01	38.00	38.04	38.07	37.57	38.04	38.04	38.02

Parametrix

Figure 14
East Slope Water Elevations
Kent Highlands Landfill



Parametrix

Figure 15

Water Level Measurements in Dewatering Wells

Kent Highlands Landfill

Tables

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Recent Alluvium Aquifer														
			KMW-010A Compliance					KMW-015A[†] Background				KMW-015R Background	KMW-016A Indicator				
Parameter	Units	Regulatory Value	9/9/2019	9/14/2020	9/8/2021	9/13/2022	9/12/2023	9/9/2019	9/14/2020	9/8/2021	2022	9/13/2023	9/9/2019	9/16/2020	9/9/2021	9/13/2022	9/12/2023
Field Parameters																	
pH	s.u.		6.98	6.89	6.94	6.48	6.71	6.93	6.75	6.84	NS	6.57	7.15	6.99	7.11	6.63	6.89
Conductivity	µmhos/cm	700	348.1	317.4	347.8	252.8	261.3	304.6	314.3	333.4	NS	264.1	230.3	293.8	186.2	155.1	134.7
Temperature	C		12.4	12.7	12.6	11.9	12.0	11.5	12.0	12.8	NS	11.3	13.4	13.4	13.1	12.5	12.3
Dissolved Oxygen	m/L		0.73	1.52	1.52	0.1	0.5	1.61	1.30	1.89	NS	1.6	0.80	2.80	1.23	0.2	0.8
Redox	mV		149.3	153.9	135.6	23.60	-191.30	151.4	154.6	135.9	NS	-220.81	182.2	198.8	201.4	104.90	-232.00
Turbidity	NTU		--	--	--	0.02	2.78	--	--	--	NS	9.80	--	--	--	0.24	1.58
Conventional Parameters																	
Chloride	mg/L	250	8.52	8.40	8.28	10.7	14.7	10.0	9.38	9.38	NS	11.9	2.63	4.90	1.43	2.54	2.34
Ammonia	mg-N/L		2.85	2.53	2.81	2.93 J-	2.32	0.920	1.04	1.19	NS	0.858	2.12	2.41	1.71	1.30	1.19
N-Nitrate	mg-N/L	10	0.0300 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0300 U	0.0200 U	0.0200 U	NS	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U
N-Nitrite	mg-N/L	1	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.015	NS	0.014	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Nitrate + Nitrite	mg-N/L		0.020 U	0.010 U	0.014	0.017	0.010 U	0.020 U	0.010 U	0.020	NS	0.011	0.010 U	0.010 U	0.010 U	0.011	0.010 U
Sulfate	mg/L	250	2.96	2.42	2.00 U	2.43	2.32	2.00 U	2.40	2.00 U	NS	2.43	10.4	9.20	7.25	8.84	10.4
Chemical Oxygen Demand	mg/L		10.0 U	10.0 U	11.1	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NS	10.0 U	19.3	16.4	20.8	15.8	11.5
Total Organic Carbon	mg/L		3.92	3.43	3.35	2.97	3.03	2.04	2.54	2.30	NS	1.87	7.60	6.24	7.41	6.83	6.05
Total Coliforms	CFU/100 mL	0	1 U	1 U	1 UH	1 U	1 U	1 U	1 U	1 UH	NS	1 U	1 U	1 U	1 U	1 U	1 U
Total Alkalinity	mg/L		--	153	161	144	137	--	130	139	NS	146	--	130	73.0	82.3	63.4
Ferrous Iron	mg/L		--	5.76	6.65	5.81	5.08	--	13.5	14.4	NS	5.73	--	1.43	0.795	0.975	0.446
Dissolved Metals																	
Cadmium	mg/L	0.005	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	NS	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0021	0.0045
Chromium	mg/L	0.05	0.0050 U	0.0050 U	0.0090 U	0.0090 U	0.0090 U	0.0082	0.0050 U	0.0090 U	NS	0.0090 U	0.0100	0.0050 U	0.0090 U	0.0090 U	0.0090 U
Copper	mg/L	0.64	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	0.0020 U	0.0020 U	0.0030 U	NS	0.0030 U	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U
Iron	mg/L	0.3	5.73	5.53	5.47	5.85	6.17	11.1	13.2	12.5	NS	6.43	0.862	1.30	0.689	0.811	0.380
Lead	mg/L	0.015	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000100 U	0.0001 U	0.0001 U	0.0001 U	NS	0.000100 U	0.0001 U	0.0001 U	0.0001 U	0.00013	0.000100 U
Manganese	mg/L	0.05	1.45	1.44	1.38	1.34 J+	1.35	0.527	0.618	0.571	NS	0.561	0.999	1.42	0.804	0.876	0.676
Nickel	mg/L	0.32	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	NS	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U
Zinc	mg/L	4.8	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	0.0100 U	0.0100 U	0.0200 U	NS	0.0200 U	0.0141	0.0100 U	0.0200 U	0.02 U	0.0200 U
Natural Attenuation Parameters																	
Methane	µg/L		--	3710	6310	3980 J	7290	--	5480	7820	NS	2820	--	68.5	25.2	11.9	9.33
Ethane	µg/L		--	1.23 U	1.23 U	1.23 U	1.23 U	--	1.23 U	1.23 U	NS	1.23 U	--	1.23 U	1.23 U	1.23 U	1.23 U
Ethene	µg/L		--	1.14 U	1.14 U	1.14 U	1.14 U	--	1.14 U	1.14 U	NS	1.14 U	--	1.14 U	1.14 U	1.14 U	1.14 U
Acetylene	µg/L		--	1.06 U	1.06 U	1.06 U	1.06 U	--	1.06 U	1.06 U	NS	1.06 U	--	1.06 U	1.06 U	1.06 U	1.06 U
Volatile Organics																	
Chloromethane	µg/L		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	µg/L	0.025	0.024	0.0222	0.0345	0.0252	0.0200 U	0.020 U	0.020 U	0.020 U	NS	0.0200 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U
Bromomethane	µg/L	11.2	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NS	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	µg/L		0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichlorofluoromethane	µg/L	2400	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acrolein	µg/L	4.00	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	NS	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	240000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone	µg/L	7200	5.00 U	5.00 U	5.15	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	NS	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1-Dichloroethene	µg/L	7.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	µg/L	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NS	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acrylonitrile	µg/L	0.081	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NS	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Recent Alluvium Aquifer (cont.)															
			KMW-017 Compliance						KMW-017Z Indicator						KPW-1		KPW-2	
		Regulatory					Duplicate			Duplicate								
Parameter	Units	Value	9/9/2019	9/14/2020	9/7/2021	9/12/2022	9/12/2022	9/12/2023	9/9/2019	9/9/2019	9/14/2020	9/8/2021	9/13/2022	9/12/2023	9/21/2022	9/13/2023	9/21/2022	9/13/2023
Field Parameters																		
pH	s.u.		6.94	6.80	6.86	6.34	--	6.60	6.39	--	6.46	6.41	6.02	6.14	7.46	6.74	6.82	6.98
Conductivity	µmhos/cm	700	313.3	277.3	285.6	216.4	--	231.9	356	--	357.0	339.7	174.1	252.2	473.1	477	226.6	231
Temperature	C		12.3	12.2	12.4	11.4	--	11.7	12.0	--	12.3	12.3	11.4	11.7	14.0	--	12.0	--
Dissolved Oxygen	m/L		0.89	2.08	1.33	0.5	--	0.5	1.02	--	1.42	1.33	0.1	0.4	1.72	1.32	0.05	0.22
Redox	mV		154.5	173.9	174.3	55.40	--	-241.70	212	--	220.1	181.8	28.70	-242.30	-162.8	-141.7	-110.6	-114.9
Turbidity	NTU		--	--	--	0.36	--	5.37	--	--	--	--	0.04	10.50	--	--	--	--
Conventional Parameters																		
Chloride	mg/L	250	7.32	6.77	6.47	6.39	6.35	6.81	7.37	7.30	7.05	5.70	3.57	7.33	--	--	--	--
Ammonia	mg-N/L		0.300	0.287	0.249	0.216	0.201	0.262	0.257	0.260	0.269	0.240	0.173	0.223	--	--	--	--
N-Nitrate	mg-N/L	10	0.0300 U	0.0200 U	0.0200 UH	0.0200 U	0.0200 U	0.0200 U	0.0600 U	0.0100 U	0.0200 U	0.0200 U	0.020 U	0.0200 U	--	--	--	--
N-Nitrite	mg-N/L	1	0.010 U	0.010 U	0.010 UH	0.010 U	0.010 U	0.010 U	0.010 U	--	0.010 U	0.016	0.010 U	0.010 U	--	--	--	--
Nitrate + Nitrite	mg-N/L		0.020 U	0.010 U	0.010 U	0.013	0.016	0.010 U	0.050 U	0.020 U	0.010 U	0.021	0.017	0.010 U	--	--	--	--
Sulfate	mg/L	250	15.1	13.6	10.8	12.0	12.1	13.5	10.9	10.9	24.6	14.5	8.42	10.4	--	--	--	--
Chemical Oxygen Demand	mg/L		10.0 U	10.0 U	75.8	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.7	10.0 U	10.0 U	--	--	--	--
Total Organic Carbon	mg/L		1.12	1.04	0.98	1.44	1.42	1.35	3.08	3.05	3.25	3.20	2.35	3.27	--	--	--	--
Total Coliforms	CFU/100 mL	0	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UH	1 U	1 U	--	--	--	--
Total Alkalinity	mg/L		--	118	123	123	121	120	--	--	146	146	97.8	132	--	--	--	--
Ferrous Iron	mg/L		--	4.77	4.70	3.52	3.66	4.82	--	--	10.7	10.5	6.79	9.34	--	--	--	--
Dissolved Metals																		
Cadmium	mg/L	0.005	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	--	--	--	--
Chromium	mg/L	0.05	0.0061	0.0050 U	0.0090 U	0.0090 U	0.0090 U	0.0090 U	0.0058	0.0050 U	0.0050 U	0.0090 U	0.0090 U	0.0090 U	--	--	--	--
Copper	mg/L	0.64	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0020 U	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	--	--	--	--
Iron	mg/L	0.3	5.18	4.58	4.88	4.38 J	0.253 J	4.91	9.65	10.0	10.7	9.04	6.35	10.4	--	--	--	--
Lead	mg/L	0.015	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000100 U	0.000100 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000236	--	--	--	--
Manganese	mg/L	0.05	0.248	0.205	0.182	0.211	0.190	0.232	0.268	0.280	0.282	0.242	0.175	0.252	--	--	--	--
Nickel	mg/L	0.32	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	--	--	--	--
Zinc	mg/L	4.8	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0100 U	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	--	--	--	--
Natural Attenuation Parameters																		
Methane	µg/L		--	540	816	924	875	579	--	--	396	783	365	791	--	--	--	--
Ethane	µg/L		--	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U	--	--	1.23 U	1.23 U	1.23 U	1.23 U	--	--	--	--
Ethene	µg/L		--	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	--	--	1.14 U	1.14 U	1.14 U	1.14 U	--	--	--	--
Acetylene	µg/L		--	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U	--	--	1.06 U	1.06 U	1.06 U	1.06 U	--	--	--	--
Volatile Organics																		
Chloromethane	µg/L		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	µg/L	0.025	0.288	0.310	0.325	0.323	0.365	0.182	0.224	0.239	0.093	0.136	0.0768	0.125	0.0200 U	0.0200 U	0.0300 J+	0.0200 U
Bromomethane	µg/L	11.2	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	µg/L		0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichlorofluoromethane	µg/L	2400	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acrolein	µg/L	4.00	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	240000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone	µg/L	7200	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1-Dichloroethene	µg/L	7.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	µg/L	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acrylonitrile	µg/L	0.081	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Recent Alluvium Aquifer (cont.)						Sand Aquifer									
			KMW-019A Compliance						KMW-008A Indicator					KMW-012A Indicator				
Parameter	Units	Regulatory Value	9/9/2019	9/16/2020	9/7/2021	Duplicate 9/7/2021	9/12/2022	9/11/2023	9/10/2019	9/15/2020	9/9/2021	9/12/2022	9/11/2023	9/10/2019	9/15/2020	9/7/2021	9/12/2022	9/11/2023
Field Parameters																		
pH	s.u.		6.70	6.70	6.63	--	6.20	6.63	8.27	8.08	8.09	7.35	7.97	7.17	7.15	7.07	6.73	6.94
Conductivity	µmhos/cm	700	376.3	375.7	415.2	--	317.8	320.1	169.2	176.9	189.3	127.8	140.5	288.2	287.5	300.1	210.5	212.0
Temperature	C		12.4	11.9	11.7	--	11.6	11.8	11.1	11.5	10.9	10.6	10.7	11.1	11.4	11.2	10.8	10.8
Dissolved Oxygen	m/L		1.14	1.79	1.72	--	0.5	0.3	1.17	1.76	1.35	0.2	1.6	0.61	1.62	2.07	0.5	0.7
Redox	mV		167.3	159.9	142.4	--	22.80	-243.90	189.2	196.7	373.9	65.40	-215.10	226.1	257.1	183.5	58.10	-234.70
Turbidity	NTU		--	--	--	--	7.32	7.79	--	--	--	4.34	4.53	--	--	--	0.02	6.80
Conventional Parameters																		
Chloride	mg/L	250	15.4	10.1	9.84	10.4	19.9	21.8	3.97	4.13	4.08	3.18	4.48	1.34	1.41	1.44	1.81	2.11
Ammonia	mg-N/L		1.45	1.40	1.26	1.31	1.16	1.08	0.076	0.072	0.074	0.057	0.069	0.584	0.624	0.599	0.598	0.688
N-Nitrate	mg-N/L	10	0.0300 U	0.0200 U	0.0200 UH	0.0200 UH	0.020 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 UH	0.0200 U	0.0200 U
N-Nitrite	mg-N/L	1	0.010 U	0.011	0.010 UH	0.010 UH	0.010 U	0.015	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 UH	0.010 U	0.010 U
Nitrate + Nitrite	mg-N/L		0.020 U	0.010 U	0.010 U	0.010 U	0.020	0.010 UJ	0.010 U	0.010 U	0.010 U	0.016	0.010 U	0.010 U	0.010 U	0.011	0.010 U	0.010 U
Sulfate	mg/L	250	3.05	2.61	2.00 U	2.00 U	2.57	3.28	13.7	15.7	12.9	10.0	14.6	14.0	13.9	13.1	13.1	13.0
Chemical Oxygen Demand	mg/L		13.5	21.0	44.9 J	75.6 J	14.1	12.9	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	11.3	11.6	55.4	10.0 U	10.0 U
Total Organic Carbon	mg/L		4.88	6.60	5.19	5.10	5.17	5.07	0.50 U	0.50 U	0.50 U	0.50 U	0.72	4.37	4.33	4.18	4.33	4.40
Total Coliforms	CFU/100 mL	0	1 U	1 U	1 UH	1 UH	1 UH	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UH	1 U	1 U
Total Alkalinity	mg/L		--	172	154	156	157	171	--	74.9	76.5	74.0	73.2	--	143	142	134	129
Ferrous Iron	mg/L		--	23.7	24.3	25.1	19.5 D	22.9	--	0.040 U	0.081	0.118	0.083	--	0.115	0.264	0.171	0.325
Dissolved Metals																		
Cadmium	mg/L	0.005	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0029	0.0040	0.0043	0.0023	0.0020 U
Chromium	mg/L	0.05	0.0073	0.0050 U	0.0090 U	0.0090 U	0.0090 U	0.0090 U	0.0050 U	0.0050 U	0.0090 U	0.0090 U	0.0090 U	0.0088	0.0050 U	0.0090 U	0.0090 U	0.0090 U
Copper	mg/L	0.64	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	0.0020 U	0.0038	0.0030 U	0.003 U	0.0030 U
Iron	mg/L	0.3	16.0	23.5	24.1	24.0	18.7	25.6	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.200	0.136	0.224	0.137	0.328
Lead	mg/L	0.015	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000113	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000100 U	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000100 U
Manganese	mg/L	0.05	1.37	2.24	4.36	3.88	5.15	2.51	0.130	0.131	0.124	0.124	0.133	1.57	1.59	1.41	1.41	1.47
Nickel	mg/L	0.32	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U
Zinc	mg/L	4.8	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	0.0141	0.0200	0.0200 U	0.0200 U	0.0200 U
Natural Attenuation Parameters																		
Methane	µg/L		--	10700	11800	13500	13200	12400 J		0.65 U	0.65 U	1.17 U	0.65 U	--	0.65 U	3.85	3.56	2.57
Ethane	µg/L		--	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U		1.23 U	1.23 U	1.23 U	1.23 U	--	1.23 U	1.23 U	1.23 U	1.23 U
Ethene	µg/L		--	1.14 U	1.14 U	1.14 U	1.14 U	1.14 UJ		1.14 U	1.14 U	1.14 U	1.14 U	--	1.14 U	1.14 U	1.14 U	1.14 U
Acetylene	µg/L		--	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U		1.06 U	1.06 U	1.06 U	1.06 U	--	1.06 U	1.06 U	1.06 U	1.06 U
Volatile Organics																		
Chloromethane	µg/L		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	µg/L	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.020 U	0.020 U	0.020 U	0.02 U	0.0200 U	0.0582	0.0532	0.0589	0.0575	0.0315
Bromomethane	µg/L	11.2	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	µg/L		0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichlorofluoromethane	µg/L	2400	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acrolein	µg/L	4.00	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	240000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone	µg/L	7200	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.44	5.00 U	5.00 U
1,1-Dichloroethene	µg/L	7.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	µg/L	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acrylonitrile	µg/L	0.081	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Sand Aquifer (cont.)																
			KMW-013						KMW-016B					KMW-018A					
			Background						Indicator					Indicator					
Parameter	Units	Regulatory Value	9/9/2019	9/14/2020	9/8/2021	9/13/2022	9/12/2023	Duplicate 9/12/2023	9/9/2019	9/15/2020	9/9/2021	9/13/2022	9/12/2023	9/10/2019	9/15/2020	Duplicate 9/15/2020	9/7/2021	9/12/2022	9/11/2023
Field Parameters																			
pH	s.u.		7.52	7.27	7.41	6.69	6.92	--	7.52	7.58	7.49	6.97	7.34	7.12	7.06	--	7.09	6.62	6.96
Conductivity	µmhos/cm	700	363.4	342.9	363.1	286.7	289.2	--	208.9	188.3	201.9	164.7	168.6	509.6	539.1	--	545.8	460.8	447.0
Temperature	C		13.5	13.5	14.2	13.1	13.1	--	14.5	14.7	14.8	14.4	14.4	17.3	17.5	--	17.4	16.9	16.9
Dissolved Oxygen	m/L		2.18	1.72	1.80	0.2	0.4	--	0.67	1.74	1.25	0.1	0.4	1.12	1.6	--	1.03	0.2	0.4
Redox	mV		165.7	144.4	128.7	214.70	-235.70	--	239.5	351.3	209.3	134.90	-236.60	318.1	327.3	--	222.2	387.50	-205.80
Turbidity	NTU		--	--	--	0.16	1.16	--	--	--	--	5.34	0.90	--	--	--	--	0.14	0.55
Conventional Parameters																			
Chloride	mg/L	250	42.8	42.4	42.7	35.9	37.0	37.0	3.30	3.10	3.07	2.97	3.37	12.8	10.3	10.0	10.2	11.7	11.7
Ammonia	mg-N/L		0.286	0.287	0.271	0.259	0.274	0.273	0.482	0.451	0.418	0.376	0.410	0.590	0.598	0.589	0.579	0.534	0.547
N-Nitrate	mg-N/L	10	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 UH	0.0200 UH	0.0200 U
N-Nitrite	mg-N/L	1	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 UH	0.010 UH	0.010 U
Nitrate + Nitrite	mg-N/L		0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.012	0.010 U	0.010 U	0.011	0.010 U	0.010 U	0.010 U	0.020	0.010 U	0.011	0.010 U
Sulfate	mg/L	250	25.2	25.9	22.0	23.5	21.5	22.5	11.5	10.7	8.82	8.99	9.01	10.9	12.4	12.1	9.82	11.1	11.5
Chemical Oxygen Demand	mg/L		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	48.1	10.0 U	10.0 U
Total Organic Carbon	mg/L		0.50 U	0.50 U	0.50 U	0.54	0.70	0.51	0.52	0.50 U	0.50 U	0.61	0.71	1.26	1.19	1.43	1.15	1.43	1.45
Total Coliforms	CFU/100 mL	0	1 U	1 U	1 UH	1 UH	1 UH	1 UH	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UH	1 UH
Total Alkalinity	mg/L		--	87.1	89.5	90.9	93.7	93.7	--	92.0	85.9	90.2	88.8	--	285	287	277	264	250
Ferrous Iron	mg/L		--	1.05	1.08	1.13	1.03	1.00	--	0.040	0.048	0.040 U	0.040 U	--	0.040 U	0.040 U	0.040 U	0.040 U	0.043
Dissolved Metals																			
Cadmium	mg/L	0.005	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
Chromium	mg/L	0.05	0.0061	0.0050 U	0.0090 U	0.0090 U	0.0090 U	0.0090 U	0.0050 U	0.0050 U	0.0090 U	0.0090 U	0.0090 U	0.0086	0.0050 U	0.0050 U	0.0090 U	0.0090 U	0.0090 U
Copper	mg/L	0.64	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U	0.0020 U	0.0020 U	0.0020 U	0.0030 U	0.0030 U	0.0030 U
Iron	mg/L	0.3	1.07	1.07	1.07	1.03	1.18	1.17	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Lead	mg/L	0.015	0.0001 U	0.0001 U	0.0001 U	####### U	0.000100 U	0.000100 U	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000100 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.000100 U	0.000100 U
Manganese	mg/L	0.05	0.662	0.683	0.630	0.648	0.675	0.677	1.61	1.63	1.39	1.46	1.51	2.99	3.16	3.20	3.07	2.97	2.89
Nickel	mg/L	0.32	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U
Zinc	mg/L	4.8	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U	0.0100 U	0.0100 U	0.0100 U	0.0200 U	0.0200 U	0.0200 U
Natural Attenuation Parameters																			
Methane	µg/L		--	0.65 U	5.87	7.57	9.57	8.72	--	33.7	46.2	36.0	29.8	--	16.7	17.1	21.1	24.7	19.9
Ethane	µg/L		--	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U	--	1.23 U	1.23 U	1.23 U	1.23 U	--	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U
Ethene	µg/L		--	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	--	1.14 U	1.14 U	1.14 U	1.14 U	--	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U
Acetylene	µg/L		--	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U	--	1.06 U	1.06 U	1.06 U	1.06 U	--	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U
Volatile Organics																			
Chloromethane	µg/L		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	µg/L	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.02 U	0.0200 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.021	0.020 U	0.020 U	0.0232	0.0247	0.0200 U
Bromomethane	µg/L	11.2	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	µg/L		0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichlorofluoromethane	µg/L	2400	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acrolein	µg/L	4.00	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	240000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone	µg/L	7200	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1-Dichloroethene	µg/L	7.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	µg/L	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acrylonitrile	µg/L	0.081	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Trip Blanks														
			KMW-401	KMW-402	KMW-401	KMW-402	KMW-403	KMW-401	KMW-402	KMW-403	KMW-401	KMW-402	Pore Water TB	KMW-401	KMW-402	KMW-403	Pore Water TB
Parameter	Units	Regulatory Value	9/9/2019	9/10/2019	9/14/2020	9/15/2020	9/16/2020	9/7/2021	9/8/2021	9/9/2021	9/12/2022	9/13/2022	9/21/2022	9/11/2023	9/12/2023	9/13/2023	9/13/2023
Field Parameters																	
pH	s.u.		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity	µmhos/cm	700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Temperature	C		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Oxygen	m/L		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Redox	mV		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	NTU		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conventional Parameters																	
Chloride	mg/L	250	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia	mg-N/L		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrate	mg-N/L	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrite	mg-N/L	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate + Nitrite	mg-N/L		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	250	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	mg/L		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	mg/L		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Coliforms	CFU/100 mL	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Alkalinity	mg/L		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ferrous Iron	mg/L				--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Metals																	
Cadmium	mg/L	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/L	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/L	0.64	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	mg/L	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/L	0.015	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	mg/L	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	mg/L	0.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/L	4.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Natural Attenuation Parameters																	
Methane	µg/L		--	--	0.65 U	0.65 U	0.65 U	0.72	0.65 U	0.65 U	1.28	0.65 U	--	0.65 U	0.71	0.65 U	--
Ethane	µg/L		--	--	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U	1.23 U	--	1.23 U	1.23 U	1.23 U	--
Ethene	µg/L		--	--	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	1.14 U	--	1.14 U	1.14 U	1.14 U	--
Acetylene	µg/L		--	--	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U	1.06 U	--	1.06 U	1.06 U	1.06 U	--
Volatile Organics																	
Chloromethane	µg/L		0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	µg/L	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U
Bromomethane	µg/L	11.2	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	µg/L		0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichlorofluoromethane	µg/L	2400	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acrolein	µg/L	4.00	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	240000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone	µg/L	7200	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1-Dichloroethene	µg/L	7.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methylene Chloride	µg/L	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acrylonitrile	µg/L	0.081	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Recent Alluvium Aquifer														
			KMW-010A Compliance					KMW-015A† Background				KMW-015R Background	KMW-016A Indicator				
Parameter	Units	Regulatory Value	9/9/2019	9/14/2020	9/8/2021	9/13/2022	9/12/2023	9/9/2019	9/14/2020	9/8/2021	2022	9/13/2023	9/9/2019	9/16/2020	9/9/2021	9/13/2022	9/12/2023
Volatile Organics (cont.)																	
Carbon Disulfide	µg/L	800	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Acetate	µg/L	8000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethane	µg/L	7.68	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Butanone	µg/L	4800	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	NS	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	µg/L	16	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	µg/L	1.40	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1-Trichloroethane	µg/L	200	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	µg/L	0.63	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	µg/L	0.48	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Benzene	µg/L	0.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	µg/L	4.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloropropane	µg/L	1.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromodichloromethane	µg/L	0.71	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chloroethylvinylether	µg/L		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NS	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	640	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	NS	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	µg/L	640	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Hexanone	µg/L	40	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	NS	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloroethane	µg/L	0.77	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Tetrachloroethene	µg/L	5.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromochloromethane	µg/L	0.52	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chlorobenzene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Ethylbenzene	µg/L	700	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
o-Xylene	µg/L	1600	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Xylenes, total	µg/L	1600	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	NS	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Styrene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoform	µg/L	5.5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2,2-Tetrachloroethane	µg/L	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NS	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichlorobenzene	µg/L		0.20 U	--	--	--	--	0.20 U	--	--	NS	--	0.20 U	--	--	--	--
1,4-Dichlorobenzene	µg/L	8.1	0.20 U	--	--	--	--	0.20 U	--	--	NS	--	0.20 U	--	--	--	--
1,2-Dichlorobenzene	µg/L	600	0.20 U	--	--	--	--	0.20 U	--	--	NS	--	0.20 U	--	--	--	--

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Recent Alluvium Aquifer (cont.)															
			KMW-017 Compliance						KMW-017Z Indicator						KPW-1		KPW-2	
Parameter	Units	Regulatory Value	9/9/2019	9/14/2020	9/7/2021	9/12/2022	Duplicate 9/12/2022	9/12/2023	9/9/2019	Duplicate 9/9/2019	9/14/2020	9/8/2021	9/13/2022	9/12/2023	9/21/2022	9/13/2023	9/21/2022	9/13/2023
Volatile Organics (cont.)																		
Carbon Disulfide	µg/L	800	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Acetate	µg/L	8000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethane	µg/L	7.68	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Butanone	µg/L	4800	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	µg/L	16	2.37	2.99	2.16	2.08	2.07	2.06	0.66	0.81	0.58	0.57	0.41	0.47	0.20 U	0.20 U	2.23	1.71
Chloroform	µg/L	1.40	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1-Trichloroethane	µg/L	200	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	µg/L	0.63	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	µg/L	0.48	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Benzene	µg/L	0.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	µg/L	4.00	0.31	0.30	0.20 U	0.20 U	0.20 U	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.69	0.58
1,2-Dichloropropane	µg/L	1.20	0.23	0.22	0.20 U	0.22	0.21	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromodichloromethane	µg/L	0.71	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chloroethylvinylether	µg/L		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 UJ	1.00 U	1.00 UJ	1.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	640	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	µg/L	640	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Hexanone	µg/L	40	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloroethane	µg/L	0.77	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Tetrachloroethene	µg/L	5.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromochloromethane	µg/L	0.52	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chlorobenzene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Ethylbenzene	µg/L	700	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
o-Xylene	µg/L	1600	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Xylenes, total	µg/L	1600	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Styrene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoform	µg/L	5.5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2,2-Tetrachloroethane	µg/L	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichlorobenzene	µg/L		0.20 U	--	--	--	--	--	0.20 U	0.20 U	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	µg/L	8.1	0.20 U	--	--	--	--	--	0.20 U	0.20 U	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	µg/L	600	0.20 U	--	--	--	--	--	0.20 U	0.20 U	--	--	--	--	--	--	--	--

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

Parameter	Units	Regulatory Value	Recent Alluvium Aquifer (cont.)						Sand Aquifer									
			KMW-019A Compliance						KMW-008A Indicator					KMW-012A Indicator				
			9/9/2019	9/16/2020	9/7/2021	Duplicate 9/7/2021	9/12/2022	9/11/2023	9/10/2019	9/15/2020	9/9/2021	9/12/2022	9/11/2023	9/10/2019	9/15/2020	9/7/2021	9/12/2022	9/11/2023
Volatile Organics (cont.)																		
Carbon Disulfide	µg/L	800	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Acetate	µg/L	8000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethane	µg/L	7.68	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Butanone	µg/L	4800	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	µg/L	16	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.60	0.54	0.50	0.49	0.33
Chloroform	µg/L	1.40	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1-Trichloroethane	µg/L	200	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	µg/L	0.63	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	µg/L	0.48	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Benzene	µg/L	0.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	µg/L	4.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.29	0.28	0.22	0.22	0.20 U
1,2-Dichloropropane	µg/L	1.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromodichloromethane	µg/L	0.71	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chloroethylvinylether	µg/L		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	640	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	µg/L	640	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Hexanone	µg/L	40	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloroethane	µg/L	0.77	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Tetrachloroethene	µg/L	5.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromochloromethane	µg/L	0.52	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chlorobenzene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.98	0.76	0.58	0.52	0.22
Ethylbenzene	µg/L	700	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
o-Xylene	µg/L	1600	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Xylenes, total	µg/L	1600	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 UJ	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Styrene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoform	µg/L	5.5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2,2-Tetrachloroethane	µg/L	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichlorobenzene	µg/L		0.20 U	--	--	--	--	--	0.20 U	--	--	--	--	0.20 U	--	--	--	--
1,4-Dichlorobenzene	µg/L	8.1	0.20 U	--	--	--	--	--	0.20 U	--	--	--	--	0.45	--	--	--	--
1,2-Dichlorobenzene	µg/L	600	0.20 U	--	--	--	--	--	0.20 U	--	--	--	--	0.20 U	--	--	--	--

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Sand Aquifer (cont.)																
			KMW-013 Background						KMW-016B Indicator					KMW-018A Indicator					
Parameter	Units	Regulatory Value	9/9/2019	9/14/2020	9/8/2021	9/13/2022	9/12/2023	Duplicate 9/12/2023	9/9/2019	9/15/2020	9/9/2021	9/13/2022	9/12/2023	9/10/2019	9/15/2020	Duplicate 9/15/2020	9/7/2021	9/12/2022	9/11/2023
Volatile Organics (cont.)																			
Carbon Disulfide	µg/L	800	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Acetate	µg/L	8000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethane	µg/L	7.68	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Butanone	µg/L	4800	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	µg/L	16	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	µg/L	1.40	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1-Trichloroethane	µg/L	200	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	µg/L	0.63	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	µg/L	0.48	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Benzene	µg/L	0.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	µg/L	4.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloropropane	µg/L	1.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromodichloromethane	µg/L	0.71	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chloroethylvinylether	µg/L		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	640	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	µg/L	640	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Hexanone	µg/L	40	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloroethane	µg/L	0.77	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Tetrachloroethene	µg/L	5.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromochloromethane	µg/L	0.52	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chlorobenzene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Ethylbenzene	µg/L	700	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
o-Xylene	µg/L	1600	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Xylenes, total	µg/L	1600	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Styrene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoform	µg/L	5.5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2,2-Tetrachloroethane	µg/L	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichlorobenzene	µg/L		0.20 U	- -	- -	- -	- -	- -	0.20 U	- -	- -	- -	- -	0.20 U	- -	- -	- -	- -	- -
1,4-Dichlorobenzene	µg/L	8.1	0.20 U	- -	- -	- -	- -	- -	0.20 U	- -	- -	- -	- -	0.20 U	- -	- -	- -	- -	- -
1,2-Dichlorobenzene	µg/L	600	0.20 U	- -	- -	- -	- -	- -	0.20 U	- -	- -	- -	- -	0.20 U	- -	- -	- -	- -	- -

Table 1. Groundwater Quality Data Summary, 2019-2023, Kent Highlands Landfill

			Trip Blanks														
			KMW-401	KMW-402	KMW-401	KMW-402	KMW-403	KMW-401	KMW-402	KMW-403	KMW-401	KMW-402	Pore Water TB	KMW-401	KMW-402	KMW-403	Pore Water TB
Parameter	Units	Regulatory Value	9/9/2019	9/10/2019	9/14/2020	9/15/2020	9/16/2020	9/7/2021	9/8/2021	9/9/2021	9/12/2022	9/13/2022	9/21/2022	9/11/2023	9/12/2023	9/13/2023	9/13/2023
Volatile Organics (cont.)																	
Carbon Disulfide	µg/L	800	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Acetate	µg/L	8000	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethane	µg/L	7.68	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Butanone	µg/L	4800	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	µg/L	16	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	µg/L	1.40	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1-Trichloroethane	µg/L	200	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	µg/L	0.63	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	µg/L	0.48	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Benzene	µg/L	0.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	µg/L	4.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloropropane	µg/L	1.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromodichloromethane	µg/L	0.71	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chloroethylvinylether	µg/L		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	640	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	µg/L	640	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,3-Dichloropropene	µg/L	0.438	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Hexanone	µg/L	40	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloroethane	µg/L	0.77	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Tetrachloroethene	µg/L	5.00	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromochloromethane	µg/L	0.52	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chlorobenzene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Ethylbenzene	µg/L	700	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
o-Xylene	µg/L	1600	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Xylenes, total	µg/L	1600	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Styrene	µg/L	100	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoform	µg/L	5.5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2,2-Tetrachloroethane	µg/L	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichlorobenzene	µg/L		0.20 U	0.20 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1,4-Dichlorobenzene	µg/L	8.1	0.20 U	0.20 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1,2-Dichlorobenzene	µg/L	600	0.20 U	0.20 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Notes:
= Exceeds regulatory value
- - = Not analyzed
† = KMW-15 was decommissioned and replaced with KMW-15R in 2023.
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The result is an estimated quantity, but the result may be biased high.
J- = The result is an estimated quantity, but the result may be biased low.
U = The analyte was analyzed for, but was not detected above the level of the adjusted detection limit or quantitation limit, as appropriate.
UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
H = Hold time violation. Hold time was exceeded.

Table 2. Comparison of 2019-2023 Groundwater Quality Data to Groundwater Quality Limits, Kent Highlands Landfill

		Units	SCL & CCL	TL (2019-2023)	RV	Third Quarter 2019 Value	CLs	TL	RV	Third Quarter 2020 Value	CLs	TL	RV	Third Quarter 2021 Value	CLs	TL	RV	Third Quarter 2022 Value	CLs	TL	RV	Third Quarter 2023 Value	CLs	TL	RV
KMW-008A (Indicator)																									
	pH	s.u.	6.296 - 9.424	8.065	- -	8.27		√		8.08		√		8.09		√		7.35				7.97			
	Conductivity	μmhos/cm	257	382.3	700	169.2				176.9				189.3				127.8				140.5			
	Ammonia	mg-N/L	0.2063	0.3792	- -	0.076				0.072				0.074				0.057				0.069			
	Chloride	mg/L	8	73.13	250	3.97				4.13				4.08				3.18				4.48			
	Chemical Oxygen Demand	mg/L	5	10	- -	10.0 U				10.0 U				10.0 U				10.0 U				10.0 U			
	N-Nitrate	mg-N/L	0.07633	0.02	10	0.0200 U				0.0200 U				0.0200 U				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.01	0.01	1	0.010 U				0.010 U				0.010 U				0.010 U				0.010 U			
Sand Aquifer	Sulfate	mg/L	11.25	27.38	250	13.7	√			15.7	√			12.9	√			10.0				14.6	√		
	Total Organic Carbon	mg/L	3	2.387	- -	0.50 U				0.50 U				0.50 U				0.50 U				0.72			
	Total Coliform	CFU/100 mL	80	1	0	1 U				1 U				1 U				1 U				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0050 U				0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.003	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	0.07206	1.18	0.3	0.0500 U				0.0500 U				0.0500 U				0.0500 U				0.0500 U			
	Lead	mg/L	0.02	0.0001	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese	mg/L	0.1651	0.7343	0.05	0.130			√	0.131			√	0.124			√	0.124			√	0.133			√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.004	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	μg/L	- -	- -	0.025	0.020 U				0.020 U				0.020 U				0.02 U				0.0200 U			
KMW-012A (Indicator)																									
	pH	s.u.	5.503 - 7.845	8.065	- -	7.17				7.15				7.07				6.73				6.94			
	Conductivity	μmhos/cm	5627	382.3	700	288.2				287.5				300.1				210.5				212.0			
	Ammonia	mg-N/L	- -	0.3792	- -	0.584		√		0.624		√		0.599		√		0.598		√		0.688		√	
	Chloride	mg/L	443.7	73.13	250	1.34				1.41				1.44				1.81				2.11			
	Chemical Oxygen Demand	mg/L	371.5	10	- -	11.3		√		11.6		√		55.4		√		10.0 U				10.0 U			
	N-Nitrate	mg-N/L	3.1	0.02	10	0.0200 U				0.0200 U				0.0200 UH				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.01	0.01	1	0.010 U				0.010 U				0.010 UH				0.010 U				0.010 U			
	Sulfate	mg/L	1293	27.38	250	14.0				13.9				13.1				13.1				13.0			
Sand Aquifer	Total Organic Carbon	mg/L	105.2	2.387	- -	4.37		√		4.33		√		4.18		√		4.33		√		4.40		√	
	Total Coliform	CFU/100 mL	17	1	0	1 U				1 U				1 UH				1 U				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0029	√	√		0.0040	√	√		0.0043	√	√		0.0023	√	√		0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0088	√	√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0038	√	√		0.0030 U				0.003 U				0.0030 U			
	Iron	mg/L	- -	1.18	0.3	0.200				0.136				0.224				0.137				0.328			√
	Lead	mg/L	0.02	0.0001	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese	mg/L	23.98	0.7343	0.05	1.57		√	√	1.59		√	√	1.41		√	√	1.41		√	√	1.47		√	√
	Nickel	mg/L	0.1091	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.004	0.01	4.8	0.0141	√	√		0.0200	√	√		0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	μg/L	- -	- -	0.025	0.0582			√	0.0532			√	0.0589			√	0.0575			√	0.0315			√
KMW-013 (Background)																									
	pH	s.u.	7.08 - 8.2	8.065	- -	7.52				7.27				7.41				6.69	√			6.92	√		
	Conductivity	μmhos/cm	- -	382.3	700	363.4				342.9				363.1				286.7				289.2			
	Ammonia	mg-N/L	0.5297	0.3792	- -	0.286				0.287				0.271				0.259				0.274			
	Chloride	mg/L	- -	73.13	250	42.8				42.4				42.7				35.9				37.0			
	Chemical Oxygen Demand	mg/L	8.5	10	- -	10.0 U				10.0 U				10.0 U				10.0 U				10.0 U			
	N-Nitrate	mg-N/L	1.38	0.02	10	0.0200 U				0.0200 U				0.0200 U				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.01	0.01	1	0.010 U				0.010 U				0.010 U				0.010 U				0.010 U			
	Sulfate	mg/L	- -	27.38	250	25.2				25.9				22.0				23.5				21.5			
Sand Aquifer	Total Organic Carbon	mg/L	1.6	2.387	- -	0.50 U				0.50 U				0.50 U				0.54				0.70			
	Total Coliform	CFU/100 mL	2	1	0	1 U				1 U				1 UH				1 UH				1 UH			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0061	√	√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	- -	1.18	0.3	1.07			√	1.07			√	1.07			√	1.03			√	1.18		√	√
	Lead	mg/L	0.02	0.0001	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese	mg/L	- -	0.7343	0.05	0.662			√	0.683			√	0.630			√	0.648			√	0.675			√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.006	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	μg/L	- -	- -	0.025	0.020 U				0.020 U				0.020 U				0.020 U				0.02 U			
KMW-016B (Indicator)																									
	pH	s.u.	5.852 - 8.638	8.065	- -	7.52				7.58				7.49				6.97				7.34			
	Conductivity	μmhos/cm	869.8	382.3	700	208.9				188.3				201.9				164.7				168.6			
	Ammonia	mg-N/L	0.1642	0.3792	- -	0.482	√	√		0.451	√	√		0.418	√	√		0.376	√			0.410	√	√	
	Chloride	mg/L	98.65	73.13	250	3.30				3.10				3.07				2.97				3.37			
	Chemical Oxygen Demand	mg/L	12.75	10	- -	10.0 U				10.0 U				10.0 U				10.0 U				10.0 U			
	N-Nitrate	mg-N/L	0.032	0.02	10	0.0200 U				0.0200 U				0.0200 U				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.01	0.01	1	0.010 U				0.010 U				0.010 U				0.010 U				0.010 U			
	Sulfate	mg/L	- -	27.38	250	11.5				10.7				8.82				8.99				9.01			
Sand Aquifer	Total Organic Carbon	mg/L	- -	2.387	- -	0.52				0.50 U				0.50 U				0.61				0.71			
	Total Coliform	CFU/100 mL	960	1	0	1 U				1 U				1 U				1 U				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0050 U				0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	- -	1.18	0.3	0.0500 U				0.0500 U				0.0500 U				0.0500 U				0.0500 U			
	Lead	mg/L	0.02	0.0001	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese*	mg/L	- -	0.7343	0.05	1.61		√	√	1.63		√	√	1.39		√	√	1.46		√	√	1.51		√	√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.004	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	μg/L	- -	- -	0.025	0.020 U				0.020 U				0.020 U				0.020 U				0.0200 U			
KMW-018A (Indicator)																									
	pH	s.u.	6.76 - 9.66	8.065	- -	7.12				7.06				7.09				6.62	√			6.96			
	Conductivity	μmhos/cm	1665	382.3	700	509.6		√		539.1		√		545.8		√		460.8		√		447.0		√	
	Ammonia	mg-N/L	1.283	0.3792	- -	0.590		√		0.598		√		0.579		√		0.534		√		0.547		√	
	Chloride	mg/L	85.14	73.13	250	12.8				10.3				10.2				11.7				11.7			
	Chemical Oxygen Demand	mg/L	33.99	10	- -	10.0 U				10.0 U				48.1	√	√		10.0 U				10.0 U			
	N-Nitrate	mg-N/L	0.036	0.02	10	0.0200 U				0.0200 U				0.0200 UH				0.0200 UH				0.0200 U			
	N-Nitrite	mg-N/L	0.01	0.01	1	0.010 U				0.010 U				0.010 UH				0.010 UH				0.010 U			
	Sulfate	mg/L	8.493	27.38	250	10.9	√			12.4	√			9.82	√			11.1	√			11.5	√		
Sand Aquifer	Total Organic Carbon	mg/L	10	2.387	- -	1.26				1.19				1.15				1.43				1.45			
	Total Coliform	CFU/100 mL	1	1	0	1 U				1 U				1 U				1 UH				1 UH			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0086	√	√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	0.124	1.18	0.3	0.0500 U				0.0500 U				0.0500 U				0.0500 U				0.0500 U			
	Lead	mg/L	0.03	0.0001	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese	mg/L	6.678	0.7343	0.05	2.99		√	√	3.16		√	√	3.07		√	√	2.97		√	√	2.89		√	√
	Nickel	mg/L	0.02	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.004	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	μg/L	- -	- -	0.025	0.021				0.020 U				0.0232				0.0247				0.0200 U			

Table 2. Comparison of 2019-2023 Groundwater Quality Data to Groundwater Quality Limits, Kent Highlands Landfill

		Units	SCL & CCL	TL (2019-2023)	RV	Third Quarter 2019				Third Quarter 2020				Third Quarter 2021				Third Quarter 2022				Third Quarter 2023			
						Value	CLs	TL	RV	Value	CLs	TL	RV	Value	CLs	TL	RV	Value	CLs	TL	RV	Value	CLs	TL	RV
KMW-010A (Compliance)																									
Recent Alluvium Aquifer	pH	s.u.	5.469 - 8.358	7.464	- -	6.98				6.89				6.94				6.48				6.71			
	Conductivity	µmhos/cm	1303	304.8	700	348.1		√		317.4		√		347.8		√		252.8				261.3			
	Ammonia	mg-N/L	1.158	1.252	- -	2.85	√	√		2.53	√	√		2.81	√	√		2.93 J-	√	√		2.32	√	√	
	Chloride	mg/L	101.3	18.26	250	8.52				8.40				8.28				10.7				14.7			
	Chemical Oxygen Demand	mg/L	59.27	10.3	- -	10.0 U				10.0 U				11.1		√		10.0 U				10.0 U			
	N-Nitrate	mg-N/L	1.3	0.02	10	0.0300 U				0.0200 U				0.0200 U				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.026	0.02	1	0.010 U				0.010 U				0.010 U				0.010 U				0.010 U			
	Sulfate	mg/L	4.2	18.39	250	2.96				2.42				2.00 U				2.43				2.32			
	Total Organic Carbon	mg/L	15.07	3.1	- -	3.92		√		3.43		√		3.35		√		2.97				3.03			
	Total Coliform	CFU/100 mL	4	1	0	1 U				1 U				1 UH				1 U				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0050 U				0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	21.11	12.31	0.3	5.73			√	5.53			√	5.47			√	5.85			√	6.17			√
	Lead	mg/L	0.02	0.0002	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese	mg/L	4.5	0.548	0.05	1.45		√	√	1.44		√	√	1.38		√	√	1.34 J+		√	√	1.35		√	√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.005	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	µg/L	- -	- -	0.025	0.024				0.0222				0.0345			√	0.0252			√	0.0200 U			
KMW-015A/R (Background)																									
Recent Alluvium Aquifer	pH	s.u.	5.761 - 8.347	7.464	- -	6.93				6.75				6.84				NS				6.57			
	Conductivity	µmhos/cm	292	304.8	700	304.6	√			314.3	√	√		333.4	√	√		NS				264.1			
	Ammonia	mg-N/L	1.392	1.252	- -	0.920				1.04				1.19				NS				0.858			
	Chloride	mg/L	5.5	18.26	250	10.0	√			9.38	√			9.38	√			NS				11.9	√		
	Chemical Oxygen Demand	mg/L	21.48	10.3	- -	10.0 U				10.0 U				10.0 U				NS				10.0 U			
	N-Nitrate	mg-N/L	0.36	0.02	10	0.0300 U				0.0200 U				0.0200 U				NS				0.0200 U			
	N-Nitrite	mg-N/L	0.01	0.02	1	0.010 U				0.010 U				0.015	√			NS				0.014	√		
	Sulfate	mg/L	13.92	18.39	250	2.00 U				2.40				2.00 U				NS				2.43			
	Total Organic Carbon	mg/L	5.362	3.1	- -	2.04				2.54				2.30				NS				1.87			
	Total Coliform	CFU/100 mL	2	1	0	1 U				1 U				1 UH				NS				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				NS				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0082	√	√		0.0050 U				0.0090 U				NS				0.0090 U			
	Copper	mg/L	0.003	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				NS				0.0030 U			
	Iron*	mg/L	- -	12.31	0.3	11.1			√	13.2		√	√	12.5		√	√	NS				6.43			√
	Lead	mg/L	0.03	0.0002	0.015	0.0001 U				0.0001 U				0.0001 U				NS				0.000100 U			
	Manganese	mg/L	0.5979	0.548	0.05	0.527			√	0.618	√	√	√	0.571		√	√	NS				0.561		√	√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				NS				0.0100 U			
	Zinc	mg/L	0.004	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				NS				0.0200 U			
	Vinyl Chloride	µg/L	- -	- -	0.025	0.020 U				0.020 U				0.020 U				NS				0.0200 U			
KMW-016A (Indicator)																									
Recent Alluvium Aquifer	pH	s.u.	5.723 - 7.872	7.464	- -	7.15				6.99				7.11				6.63				6.89			
	Conductivity	µmhos/cm	- -	304.8	700	230.3				293.8				186.2				155.1				134.7			
	Ammonia	mg-N/L	- -	1.252	- -	2.12		√		2.41		√		1.71		√		1.30		√		1.19			
	Chloride	mg/L	531	18.26	250	2.63				4.90				1.43				2.54				2.34			
	Chemical Oxygen Demand	mg/L	102.4	10.3	- -	19.3		√		16.4		√		20.8		√		15.8		√		11.5		√	
	N-Nitrate	mg-N/L	3.4	0.02	10	0.0200 U				0.0200 U				0.0200 U				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.012	0.02	1	0.010 U				0.010 U				0.010 U				0.010 U				0.010 U			
	Sulfate	mg/L	42.44	18.39	250	10.4				9.20				7.25				8.84				10.4			
	Total Organic Carbon	mg/L	51.03	3.1	- -	7.60		√		6.24		√		7.41		√		6.83		√		6.05		√	
	Total Coliform	CFU/100 mL	- -	1	0	1 U				1 U				1 U				1 U				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0021	√	√		0.0045	√	√	
	Chromium	mg/L	0.005	0.005	0.05	0.0100	√	√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	- -	12.31	0.3	0.862			√	1.30			√	0.689			√	0.811			√	0.380			√
	Lead	mg/L	0.02	0.0002	0.015	0.0001 U				0.0001 U				0.0001 U				0.000128				0.000100 U			
	Manganese*	mg/L	- -	0.548	0.05	0.999		√	√	1.42		√	√	0.804		√	√	0.876		√	√	0.676		√	√
	Nickel	mg/L	0.02	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	0.004	0.01	4.8	0.0141	√	√		0.0100 U				0.0200 U				0.02 U				0.0200 U			
	Vinyl Chloride	µg/L	- -	- -	0.025	0.020 U				0.020 U				0.020 U				0.020 U				0.0200 U			
KMW-017 (Compliance)																									
Recent Alluvium Aquifer	pH	s.u.	5.483 - 8.139	7.464	- -	6.94				6.80				6.86				6.34				6.60			
	Conductivity	µmhos/cm	1473	304.8	700	313.3		√		277.3				285.6				216.4				231.9			
	Ammonia	mg-N/L	1.081	1.252	- -	0.300				0.287				0.249				0.216				0.262			
	Chloride	mg/L	34.91	18.26	250	7.32				6.77				6.47				6.39				6.81			
	Chemical Oxygen Demand	mg/L	23	10.3	- -	10.0 U				10.0 U				75.8	√	√		10.0 U				10.0 U			
	N-Nitrate	mg-N/L	3	0.02	10	0.0300 U				0.0200 U				0.0200 UH				0.0200 U				0.0200 U			
	N-Nitrite	mg-N/L	0.041	0.02	1	0.010 U				0.010 U				0.010 UH				0.010 U				0.010 U			
	Sulfate	mg/L	167.9	18.39	250	15.1				13.6				10.8				12.0				13.5			
	Total Organic Carbon	mg/L	- -	3.1	- -	1.12				1.04				0.98				1.44				1.35			
	Total Coliform	CFU/100 mL	2	1	0	1 U				1 U				1 U				1 U				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0061	√	√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.003	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	25.89	12.31	0.3	5.18			√	4.58			√	4.88			√	4.38 J			√	4.91			√
	Lead	mg/L	0.02	0.0002	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000100 U			
	Manganese	mg/L	3.352	0.548	0.05	0.248			√	0.205			√	0.182			√	0.211			√	0.232			√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	- -	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	µg/L	- -	- -	0.025	0.288			√	0.310			√	0.325			√	0.323			√	0.182			√
KMW-017Z (Indicator)																									
Recent Alluvium Aquifer	pH	s.u.	- -	7.464	- -	6.39				6.46				6.41				6.02				6.14			
	Conductivity	µmhos/cm	- -	304.8	700	356		√		357.0		√		339.7		√		174.1				252.2			
	Ammonia	mg-N/L	- -	1.252	- -	0.257				0.269				0.240				0.173				0.223			
	Chloride	mg/L	- -	18.26	250	7.37				7.05				5.70				3.57				7.33			
	Chemical Oxygen Demand	mg/L	- -	10.3	- -	10.0 U				10.0 U				10.7		√		10.0 U				10.0 U			
	N-Nitrate	mg-N/L	- -	0.02	10	0.0600 U				0.0200 U				0.0200 U				0.020 U				0.0200 U			
	N-Nitrite	mg-N/L	- -	0.02	1	0.010 U				0.010 U				0.016				0.010 U				0.010 U			
	Sulfate	mg/L	- -	18.39	250	10.9				24.6		√		14.5				8.42				10.4			
	Total Organic Carbon	mg/L	- -	3.1	- -	3.08				3.25		√		3.20		√		2.35				3.27		√	
	Total Coliform	CFU/100 mL	- -	1	0	1 U				1 U				1 UH				1 U				1 U			
	Cadmium	mg/L	- -	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	- -	0.005	0.05	0.0058		√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	- -	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron	mg/L	- -	12.31	0.3	9.65			√	10.7			√	9.04			√	6.35			√	10.4			√
	Lead	mg/L	- -	0.0002	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000236		√	
	Manganese	mg/L	- -	0.548	0.05	0.268			√	0.282			√	0.242			√	0.175			√	0.252			√
	Nickel	mg/L	- -	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	- -	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	µg/L	- -	- -	0.025	0.224			√	0.093			√	0.136			√	0.0768			√	0.125			√

Table 2. Comparison of 2019-2023 Groundwater Quality Data to Groundwater Quality Limits, Kent Highlands Landfill

		Units	SCL & CCL	TL (2019-2023)	RV	Third Quarter 2019				Third Quarter 2020				Third Quarter 2021				Third Quarter 2022				Third Quarter 2023			
						Value	CLs	TL	RV	Value	CLs	TL	RV	Value	CLs	TL	RV	Value	CLs	TL	RV	Value	CLs	TL	RV
KMW-019A (Compliance)																									
Recent Alluvium Aquifer	pH	s.u.	- -	7.464	- -	6.70				6.70				6.63				6.20				6.63			
	Conductivity	µmhos/cm	- -	304.8	700	376.3		√		375.7		√		415.2		√		317.8		√		320.1		√	
	Ammonia	mg-N/L	2.294	1.252	- -	1.45		√		1.40		√		1.26		√		1.16				1.08			
	Chloride	mg/L	14.09	18.26	250	15.4	√			10.1				9.84				19.9	√	√		21.8	√	√	
	Chemical Oxygen Demand	mg/L	37.76	10.3	- -	13.5		√		21.0		√		44.9 J	√	√		14.1		√		12.9		√	
	N-Nitrate	mg-N/L	2.3	0.02	10	0.0300 U				0.0200 U				0.0200 UH		√		0.020 U				0.0200 U			
	N-Nitrite	mg-N/L	0.021	0.02	1	0.010 U				0.011				0.010 UH				0.010 U				0.015			
	Sulfate	mg/L	13.04	18.39	250	3.05				2.61				2.00 U				2.57				3.28			
	Total Organic Carbon	mg/L	9.693	3.1	- -	4.88		√		6.60		√		5.19		√		5.17		√		5.07		√	
	Total Coliform	CFU/100 mL	- -	1	0	1 U				1 U				1 UH				1 UH				1 U			
	Cadmium	mg/L	0.002	0.002	0.005	0.0020 U				0.0020 U				0.0020 U				0.0020 U				0.0020 U			
	Chromium	mg/L	0.005	0.005	0.05	0.0073	√	√		0.0050 U				0.0090 U				0.0090 U				0.0090 U			
	Copper	mg/L	0.002	0.002	0.64	0.0020 U				0.0020 U				0.0030 U				0.0030 U				0.0030 U			
	Iron*	**mg/L**	**- -**	**12.31**	**0.3**	**16.0**		√	√	**23.5**		√	√	**24.1**		√	√	**18.7**		√	√	**25.6**		√	√
	Lead	mg/L	0.02	0.0002	0.015	0.0001 U				0.0001 U				0.0001 U				0.000100 U				0.000113			
	Manganese*	**mg/L**	**- -**	**0.548**	**0.05**	**1.37**		√	√	**2.24**		√	√	**4.36**		√	√	**5.15**		√	√	**2.51**		√	√
	Nickel	mg/L	0.01	0.01	0.32	0.0100 U				0.0100 U				0.0100 U				0.0100 U				0.0100 U			
	Zinc	mg/L	- -	0.01	4.8	0.0100 U				0.0100 U				0.0200 U				0.0200 U				0.0200 U			
	Vinyl Chloride	µg/L	- -	- -	0.025	0.020 U				0.020 U				0.020 U				0.020 U				0.0200 U			

Notes:
SCL = Shewhart control limit
CCL = CUSUM control limit
CL = Control limits
TL = Tolerance Limit
RV = Regulatory Value
-- = No SCL, TL, or RV established.
U = Not detected
J = Estimated value
J+ = Estimated value, may be biased high
H = Estimated value, holding time exceeded
√ Value exceeded this criterion.
*** Exceeded TL and RV for two or more consecutive quarters, no SCL established. (BOLD for compliance wells)**

Table 3. Groundwater Elevations, 2019-2023, Kent Highlands Landfill

Well	Reference Elevation (ft amsl)	2019				2020				2021				2022				2023			
		Date	Time	Depth to Water (ft)	Groundwater Elevation (ft amsl)	Date	Time	Depth to Water (ft)	Groundwater Elevation (ft amsl)	Date	Time	Depth to Water (ft)	Groundwater Elevation (ft amsl)	Date	Time	Depth to Water (ft)	Groundwater Elevation (ft amsl)	Date	Time	Depth to Water (ft)	Groundwater Elevation (ft amsl)
KIGW-1	109.78	9/3/2019	9:17	45.22	64.56	9/1/2020	10:17	42.36	67.42	9/1/2021	08:39	45.61	64.17	9/6/2022	10:17	41.17	68.61	9/5/2023	11:33	dry @ 54.10	NA
KIGW-3	188.64	9/3/2019	8:53	112.33	76.31	9/1/2020	10:51	121.87	66.77	9/1/2021	09:35	123.60	65.04	9/6/2022	13:03	dry @ 123.9 ft	NA	9/5/2023	9:30	124.00	64.64
KIGW-23	112.85	9/4/2019	7:28	65.40	47.45	9/1/2020	10:22	65.30	47.55	9/1/2021	08:30	64.98	47.87	9/6/2022	10:03	64.90	47.95	9/5/2023	8:57	65.27	47.58
KIGW-24	105.27	9/3/2019	9:03	54.38	50.89	9/1/2020	10:26	54.67	50.60	9/1/2021	08:06	54.60	50.67	9/6/2022	9:52	54.14	51.13	9/5/2023	9:06	54.60	50.67
KDGW-94B	264.99	9/3/2019	08:23	blocked @ 90.32 ft	NA	9/1/2020	11:04	100.30	164.69	9/1/2021	11:13	143.60	121.39	9/6/2022	08:43	99.83	165.16	9/5/2023	12:05	144.01	120.98
KGP-08	41.30	9/3/2019	10:29	8.91	32.39	9/1/2020	09:37	8.44	32.86	9/1/2021	09:33	8.40	32.90	9/6/2022	09:36	8.24	33.06	9/5/2023	13:45	dry @ 8.31	NA
KGP-12	41.76	9/3/2019	09:26	7.14	34.62	9/1/2020	08:25	7.50	34.26	9/1/2021	13:43	7.52	34.24	9/6/2022	10:41	6.87	34.89	9/5/2023	12:55	7.38	34.38
KGP-38BD	291.03	9/3/2019	11:07	148.51	142.52	9/1/2020	12:50	149.35	141.68	9/1/2021	13:13	143.90	147.13	9/6/2022	13:20	147.74	143.29	9/5/2023	09:45	147.75	143.28
KMW-01B	49.76	9/3/2019	10:49	10.70	39.06	9/1/2020	09:14	10.86	38.90	9/1/2021	09:05	10.89	38.87	9/6/2022	09:08	10.26	39.50	9/5/2023	13:20	10.80	38.96
KMW-01C	49.76	9/3/2019	10:50	10.59	39.17	9/1/2020	09:15	10.76	39.00	9/1/2021	09:07	10.67	39.09	9/6/2022	09:09	10.15	39.61	9/5/2023	13:24	10.78	38.98
KMW-02B	49.11	9/3/2019	10:16	13.20	35.91	9/1/2020	09:18	13.05	36.06	9/1/2021	09:11	13.20	35.91	9/6/2022	10:37	12.84	36.27	9/5/2023	13:29	13.28	35.83
KMW-02C	49.11	9/3/2019	10:17	16.82	32.29	9/1/2020	09:19	16.88	32.23	9/1/2021	09:13	16.90	32.21	9/6/2022	10:35	16.53	32.58	9/5/2023	13:33	17.05	32.06
KMW-03B	41.66	9/3/2019	10:21	7.92	33.74	9/1/2020	09:24	8.17	33.49	9/1/2021	09:17	7.65	34.01	9/6/2022	09:15	7.96	33.70	9/5/2023	13:38	8.49	33.17
KMW-03C	41.66	9/3/2019	10:20	10.07	31.59	9/1/2020	09:26	9.30	32.36	9/1/2021	09:19	9.51	32.15	9/6/2022	09:16	8.56	33.10	9/5/2023	13:37	9.58	32.08
KMW-04B	38.06	9/3/2019	10:41	17.35	20.71	9/1/2020	10:01	17.38	20.68	9/1/2021	09:51	17.40	20.66	9/6/2022	09:53	17.13	20.93	9/5/2023	12:27	17.54	20.52
KMW-05B	38.46	9/3/2019	10:45	20.90	17.56	9/1/2020	13:47	21.00	17.46	9/1/2021	09:57	21.20	17.26	9/6/2022	10:44	20.96	17.50	9/5/2023	13:52	21.17	17.29
KMW-07A	255.11	9/3/2019	08:29	137.10	118.01	9/1/2020	11:15	137.30	117.81	9/1/2021	10:46	137.30	117.81	9/6/2022	12:51	137.20	117.91	9/5/2023	09:59	136.37	118.74
KMW-07B	255.11	9/3/2019	08:33	137.94	117.17	9/1/2020	11:18	138.44	116.67	9/1/2021	10:47	138.82	116.29	9/6/2022	12:37	137.42	117.69	9/5/2023	10:25	138.22	116.89
KMW-08A	202.73	9/3/2019	08:40	138.72	64.01	9/1/2020	10:37	138.74	63.99	9/1/2021	09:57	138.99	63.74	9/6/2022	12:22	137.99	64.74	9/5/2023	10:39	138.79	63.94
KMW-08B	202.73	9/3/2019	08:44	153.37	49.36	9/1/2020	10:40	153.46	49.27	9/1/2021	10:06	153.60	49.13	9/6/2022	12:28	152.40	50.33	9/5/2023	10:45	153.50	49.23
KMW-09A	38.31	9/3/2019	09:59	4.62	33.69	9/1/2020	08:10	5.04	33.27	9/1/2021	10:13	5.30	33.01	9/6/2022	10:14	4.65	33.66	9/5/2023	13:45	5.01	33.30
KMW-09PZ	38.31	9/3/2019	10:00	3.42	34.89	9/1/2020	08:12	3.87	34.44	9/1/2021	slug in casing, unable to remove and read			9/6/2022	13:50	0.92	37.39	9/5/2023	13:41	3.71	34.60
KMW-10A	38.99	9/3/2019	09:40	26.16	12.83	9/1/2020	08:43	26.37	12.62	9/1/2021	13:33	26.59	12.40	9/6/2022	10:27	26.39	12.60	9/5/2023	13:30	26.59	12.40
KMW-10B	38.99	9/3/2019	09:39	22.57	16.42	9/1/2020	08:38	23.06	15.93	9/1/2021	13:32	23.10	15.89	9/6/2022	06:43	22.82	16.17	9/5/2023	13:34	23.15	15.84
KMW-11A	38.82	9/3/2019	10:36	14.20	24.62	9/1/2020	13:41	15.22	23.60	9/1/2021	09:44	15.10	23.72	9/6/2022	09:43	13.89	24.93	9/5/2023	12:15	14.16	24.66
KMW-11PZ	38.82	9/3/2019	10:37	19.78	19.04	9/1/2020	13:39	19.56	19.26	9/1/2021	09:47	29.60	9.22	9/6/2022	09:49	dry @ 29.95 ft	NA	9/5/2023	13:14	19.40	19.42
KMW-12A	53.58	9/3/2019	10:25	12.31	41.27	9/1/2020	09:34	17.36	36.22	9/1/2021	09:25	20.08	33.50	9/6/2022	09:28	16.68	36.90	9/5/2023	11:59	20.48	33.10
KMW-13	273.75	9/3/2019	08:12	77.21	196.54	9/1/2020	13:17	78.15	195.60	9/1/2021	09:06	78.47	195.28	9/6/2022	08:53	76.77	196.98	9/5/2023	09:11	77.87	195.88
KMW-14A	321.73	9/3/2019	07:21	77.24	244.49	9/1/2020	12:40	78.28	243.45	9/1/2021	13:51	78.00	243.73	9/6/2022	13:07	75.77	245.96	9/5/2023	08:23	77.51	244.22
KMW-14B	321.73	9/3/2019	07:23	86.82	234.91	9/1/2020	12:42	87.63	234.10	9/1/2021	14:14	87.60	234.13	9/6/2022	13:10	85.37	236.36	9/5/2023	08:25	86.78	234.95
KMW-15A	40.30	9/3/2019	09:48	25.61	14.69	9/1/2020	08:35	25.63	14.67	9/1/2021	13:21	25.81	14.49	9/9/2022	NA	24.86	15.44	9/5/2023	NA	NA	NA
KMW-15R	39.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9/5/2023	13:18	25.97	13.82
KMW-15B	40.30	9/3/2019	09:46	13.62	26.68	9/1/2020	08:36	19.94	20.36	9/1/2021	13:23	19.90	20.40	9/9/2022	NA	16.40	23.90	9/5/2023	13:16	21.10	19.20
KMW-16A	47.56	9/3/2019	10:04	9.55	38.01	9/1/2020	07:45	9.83	37.73	9/1/2021	10:09	9.97	37.59	9/6/2022	09:59	9.07	38.49	9/5/2023	12:34	9.97	37.59
KMW-16B	47.56	9/3/2019	10:06	10.99	36.57	9/1/2020	07:47	11.38	36.18	9/1/2021	10:12	11.42	36.14	9/6/2022	10:03	10.67	36.89	9/5/2023	12:40	11.37	36.19
KMW-17	38.42	9/3/2019	09:55	25.21	13.21	9/1/2020	08:08	25.49	12.93	9/1/2021	10:14	25.64	12.78	9/6/2022	10:08	26.54	11.88	9/5/2023	12:43	26.84	11.58
KMW-17Z	39.33	9/3/2019	09:30	26.82	12.51	9/1/2020	09:00	26.98	12.35	9/1/2021	13:39	27.26	12.07	9/6/2022	10:21	26.96	12.37	9/5/2023	13:02	27.26	12.07
KMW-18A	48.94	9/3/2019	10:12	10.17	38.77	9/1/2020	09:13	10.38	38.56	9/1/2021	08:58	23.90	25.04	9/6/2022	10:28	9.90	39.04	9/5/2023	11:49	10.60	38.34
KMW-19A	37.68	9/5/2019	08:22	14.57	23.11	9/1/2020	09:55	15.68	22.00	9/1/2021	09:40	19.83	17.85	9/6/2022	09:34	15.93	21.75	9/5/2023	12:07	16.43	21.25
KPZ-02B	308.21	9/3/2019	07:30	148.17	160.04	9/1/2020	12:35	148.23	159.98	9/1/2021	12:45	148.55	159.66	9/6/2022	12:59	146.57	161.64	9/5/2023	08:13	146.09	162.12
KPZ-03B	297.92	9/3/2019	07:35	88.99	208.93	9/1/2020	13:02	98.90	199.02	9/1/2021	08:48	89.91	208.01	9/6/2022	08:33	87.99	209.93	9/5/2023	08:34	88.37	209.55
KPZ-04B	284.97	9/3/2019	07:39	55.38	229.59	9/1/2020	13:07	44.52	240.45	9/1/2021	08:38	54.41	230.56	9/6/2022	08:41	52.97	232.00	9/5/2023	08:45	41.62	243.35
KSWS-1	37.89	9/3/2019	09:34	22.12	15.77	9/1/2020	08:56	21.40	16.49	9/1/2021	12:02	21.63	16.26	9/6/2022	10:35	21.56	16.33	9/5/2023	13:08	21.31	16.58
A(South)	55.83	9/3/2019	10:55	26.38	29.45	9/1/2020	10:06	25.98	29.85	9/1/2021	08:49	26.38	29.45	9/6/2022	10:58	26.40	29.43	9/5/2023	13:11	26.42	29.41
B(North)	64.04	9/3/2019	10:53	25.97	38.07	9/1/2020	10:09	26.47	37.57	9/1/2021	08:45	26.00	38.04	9/6/2022	10:54	26.00	38.04	9/5/2023	13:04	26.02	38.02

Notes: All elevations are groundwater elevations on the Green River, except for surface water station KSWS-1.
ft amsl = feet above mean sea level
Elevation datum NAVD 83
NA = Not available

Table 4. 2019-2023 Spring Drain Quality Data, Field Parameters, Kent Highlands Landfill

		WAC 173-201A-200 Fresh Water Designated Uses and Criteria		Pond Outfall																										
				2019				2020				2021				2022				2023				Number of Samples	Spring Drain Water Quality Concentrations [a]			Green River Stations 3106 and 0311[k]		
Analyte	Units	Value	Notes	3/8/19	6/11/19	9/10/19	12/6/19	3/6/20	6/5/20	9/16/20	12/4/20	3/5/21	6/4/21	9/10/21	12/3/21	3/4/22	6/3/22	9/2/22	12/2/22	3/3/23	6/1/23	9/7/23	12/7/23		Max	Avg	Min	Max	Avg	Min
Field Parameters																														
Dissolved Oxygen	mg/L	8.0 [1]		12.20	8.96	9.71	11.41	11.46	10.44	10.07	- -	- -	9.86	9.71	11.16	10.71	9.77	9.39	11.88	10.37	10.7	10.16	10.13	18	12.20	10.45	8.96	12.4	9.97	7.20
pH	s.u.	6.5-8.5 [2]		7.70	8.05	8.09	7.69	8.14	8.03	8.19	8.1	7.99	8.05	8.19	7.80	7.52	7.78	7.37	7.64	7.21	7.52	7.52	7.11	20	8.19	7.78	7.11	7.57	7.23	6.75
Temperature (C)	C	17.5 [3]		6.6	16.2	15.0	9.7	9.8	13.2	15.2	8.0	9.9	14.8	15.3	9.1	9.5	14.8	15.7	5.9	10.0	14.3	15.2	10.8	20	16.20	11.95	5.90	20	11.3	2.8
Turbidity	NTU	5 [4]		1.3	3.16	3.00	2.0	2.1	1.6	2.6	- -	- -	2.6	2.1	1.4	3.1	1.4	9.8	4.25	10.1	1.98	6.99	4.86	18	10.10	3.57	1.30	108	7.32	1.5

WAC 173-201A-200 Fresh Water Designated Uses and Criteria

[1] WAC 173-201A-200 (1)(d)- Dissolved Oxygen (DO) shall meet or exceed 8.0 mg/L. When water body DO is lower than the criteria due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease by more than 0.2 mg/L.

[2] WAC 173-201A-200 (1)(g)- Human-caused pH variations must be within a range of less than 0.5 units.

[3] WAC 173-201A-200(1)(c) - When natural conditions exceed 17.5 C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3 C.
When the background condition of the receiving water is cooler than 17.5 C, incremental temperature increases resulting from individual point sources must not exceed 28/(T+7) as measured at the edge of the mixing zone (where T is the background temperature).

[4] WAC 173-201A-200 (1)(e)- Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

- - = Not analyzed

a. Criteria from WAC 173-201A-200 for Salmonid Spawning, Rearing and Migration Category
b. Dissolved Oxygen (DO) shall exceed 8.0 mg/L. When water body DO is lower than the criteria due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease by more than 0.2 mg/L.
c. Human-caused pH variations must be within a range of less than 0.5 units.
d. When natural conditions exceed 17.5 C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3 C.
e. Incremental temperature increases resulting from individual point sources must not exceed 28/(T+7) as measured at the edge of the mixing zone (where T is the background temperature).
f. Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
g. Dilution calculated for 0.2 mg/L decrease in average DO concentration in the Green River when Spring Drain DO is at the minimum value (8.96 mg/L). The maximum DO concentration for the Spring Drain is not more than 0.2 mg/L lower than the respective concentration in the Green River, while the the average and minimum DO concentrations are higher; however, the values still meet water quality criteria. Therefore, dilution is not required when comparing those conditions.
h. Spring Drain pH measurements are all within the criteria range, as are the data for the Green River.
i. Dilution calculated for a 0.3 C increase in the average Green River temperature based on the maximum Spring Drain temperature (16.2 C). The maximum temperature for the Spring Drain is lower than the respective concentration in the Green River, while the the average and minimum temperatures are higher; however, the values still meet water quality criteria. Therefore, dilution is only required for the average and minimum temperatures (below what is shown in the table), and no dilution is required for the maximum temperature when comparing those conditions.
j. The maximum, average and minimum turbidity values for the Spring Drain are lower than those respective values in the Green River, so no dilution is required when comparing those conditions. Turbidity does not have a linear response to dilution, so analyses of other scenarios were not conducted.
k. King County 2024 http://green2.kingcounty.gov/streamsdata/DataDownload.aspx.

Assumptions:

Hardness = 20 mg/L. Confirmed by 2019 testing (Parametrix 2019)
pH = 7.4 summer season/7.6 winter season (2019–2023 maximum values for Green River Station 3106 and Station 0311; King Co 2024)
T = 21.4 degrees C summer season/10.5 degrees C winter season (2019–2023 maximum values for Green River Station 3106 and Station 0311; King County 2024)
Summer season = 5/1 through 10/31
Winter season = 11/1 through 4/30

Table 5a. 2019 2023 Spring Drain Quality Data, Conventional Parameters and Metals, Kent Highlands Landfill

		WAC 173-201A -240 (Toxic Substances)						Pond Outfall																			
		Aquatic Life Criteria- Freshwater						2019				2020				2021				2022				2023			
		Chronic		Acute		Human Health																					
Analyte	Units	Value	Notes	Value	Notes	Value	Notes	3/8/19	6/11/19	9/10/19	12/6/19	3/6/20	6/5/20	9/16/20	12/4/20	3/5/21	6/4/21	9/10/21	12/3/21	3/4/22	6/3/22	9/2/22	12/2/22	3/3/23	6/1/23	9/7/23	12/7/23
Conventional Parameters																											
Total Suspended Solids	mg/L							2	2	1	3	2	1	2	8	2	2	2	2	4	2	4	4	11	1 U	2	2
N-Ammonia (summer)	mg-N/L	1.5	(g,d)	11.4	(f,c)			--	0.814	0.135	--	--	0.122	0.152	--	--	0.578	0.627	--	--	0.141	0.214	--	--	0.09	0.579	--
N-Ammonia (winter)	mg-N/L	2.2	(g,d)	13.2	(f,c)			0.040 U	--	--	0.067	0.047	--	--	0.150	0.290	--	--	0.281	0.123	--	--	0.272	0.062	--	--	0.135
Biological Oxygen Demand	mg/L							1.2 U	6.4	2.4	2.9	3.9	1.6	3.4	2.1	3.0	4.8	4.3	3.4	2.0	1.9	3.6	2.9	2.5	4.4	2.3	2.8
Dissolved Metals																											
Antimony, Dissolved	mg/L							--	--	--	0.0036 U	0.0036 U	--	--	--	--	0.0233 U	--	--	--	--	0.000101 U	--	--	--	--	0.000434
Arsenic, Dissolved	mg/L	0.19	(d,dd)	0.36	(c,dd)			--	--	--	0.0176 J	0.0150 J	--	--	--	--	0.0230 U	--	--	--	--	0.00356	--	--	--	--	0.00187
Beryllium, Dissolved	mg/L							--	--	--	0.0002 U	0.0002 J	--	--	--	--	0.0018 U	--	--	--	--	0.0006 J	--	--	--	--	0.0004 U
Cadmium, Dissolved	mg/L	0.00031	(j,d,dd)*	0.00065	(i,c,dd)*			--	--	--	0.0000300 U	0.0000300 U	--	--	--	--	0.0000300 U	--	--	--	--	0.0000300 U	--	--	--	--	0.0000600 U
Chromium, Dissolved	mg/L	0.01	(d,jj,dd)	0.015	(c,l,ii,dd)			--	--	--	0.0017 J	0.0013 U	--	--	--	--	0.0221 U	--	--	--	--	0.0044 U	--	--	--	--	0.0044 U
Copper, Dissolved	mg/L	0.00287	(p,d,dd)	0.00374	(o,c,dd)			--	--	--	0.0007 U	0.0026	--	--	--	--	0.0070 U	--	--	--	--	0.0014 U	--	--	--	--	0.0168
Lead, Dissolved	mg/L	0.00042	(r,d,dd)	0.01079	(q,c,dd)			--	--	--	0.0000680 U	0.0000680 U	--	--	--	--	5.13E-05 U	--	--	--	--	0.0000513 U	--	--	--	--	0.0000513 U
Mercury, Dissolved	mg/L			0.0021	(c,kk,dd)			--	--	--	0.000010 U	0.000010 U	--	--	--	--	0.000010 UH	--	--	--	--	--	--	--	--	--	--
Nickel, Dissolved	mg/L	0.04028	(u,d,dd)	0.3627	(t,c,dd)			--	--	--	0.0028 U	0.0040 J	--	--	--	--	0.0194 U	--	--	--	--	0.0039 U	--	--	--	--	0.0081 J
Selenium, Dissolved	mg/L							--	--	--	0.000440 U	0.000440 U	--	--	--	--	0.000179 U	--	--	--	--	0.000179 U	--	--	--	--	0.000358 U
Silver, Dissolved	mg/L			0.00022	(y,a,dd)			--	--	--	0.0005 U	0.0005 U	--	--	--	--	0.0039 U	--	--	--	--	0.0000220 U	--	--	--	--	0.0000220 U
Thallium, Dissolved	mg/L							--	--	--	0.0037 U	0.0037 U	--	--	--	--	0.0372 J	--	--	--	--	0.0000234 U	--	--	--	--	0.000117 U
Zinc, Dissolved	mg/L	0.02672	(bb,d,dd)	0.02927	(aa,c,dd)			--	--	--	0.0021 U	0.0021 U	--	--	--	--	0.0400 U	--	--	--	--	0.0080 U	--	--	--	--	0.0080 U
Total Metals																											
Antimony, Total	mg/L					0.006		--	--	--	0.0036 U	0.0036 U	--	--	--	--	0.0047 U	--	--	--	--	--	--	--	--	--	0.000460
Arsenic, Total	mg/L					0.01	(A)	--	--	--	0.0167 J	0.0098 J	--	--	--	--	0.0046 U	--	--	--	--	0.0092 J	--	--	--	--	0.00219
Beryllium, Total	mg/L							--	--	--	0.0002 U	0.0002 U	--	--	--	--	0.0004 U	--	--	--	--	0.0004 U	--	--	--	--	0.0004 U
Cadmium, Total	mg/L							--	--	--	0.0000300 U	0.0000300 U	--	--	--	--	0.0000300 U	--	--	--	--	--	--	--	--	--	0.000600 U
Chromium, Total	mg/L	0.04764	(n,d,gg)	0.14686	(m,c,gg)			--	--	--	0.0013 U	0.0013 U	--	--	--	--	0.0044 U	--	--	--	--	0.0044 U	--	--	--	--	0.0044 U
Copper, Total	mg/L					1.3	(C)	--	--	--	0.0007 J	0.0024	--	--	--	--	0.0014 U	--	--	--	--	0.0014 U	--	--	--	--	0.0131
Lead, Total	mg/L							--	--	--	0.0000680 U	0.0000680 U	--	--	--	--	0.0000680 U	--	--	--	--	--	--	--	--	--	0.000136 U
Mercury, Total	mg/L	1.2E-05	(d,ff,s)			0.0001	(G)	--	--	--	0.000013 J	0.000010 U	--	--	--	--	0.000022 JH	--	--	--	--	--	--	--	--	--	--
Nickel, Total	mg/L					0.08		--	--	--	0.0028 U	0.0044 J	--	--	--	--	0.0039 U	--	--	--	--	0.0074 J	--	--	--	--	0.0069 J
Selenium, Total	mg/L	0.005	(d,ff)	0.02	(c,ff)	0.06		--	--	--	0.000440 U	0.000456 J	--	--	--	--	0.000440 U	--	--	--	--	--	--	--	--	--	0.000880 U
Silver, Total	mg/L							--	--	--	0.0005 U	0.0005 U	--	--	--	--	0.0008 U	--	--	--	--	--	--	--	--	--	0.0000440 U
Thallium, Total	mg/L					0.0002		--	--	--	0.0037 U	0.0037 U	--	--	--	--	0.0097 J	--	--	--	--	--	--	--	--	--	4.68E-05 U
Zinc, Total	mg/L					1		--	--	--	0.0064 J	0.0021 U	--	--	--	--	0.0080 U	--	--	--	--	0.0080 U	--	--	--	--	0.0132 J

[1] WAC 173-201A-200 (1)(d)- Dissolved Oxygen (DO) shall meet or exceed 8.0 mg/L. When water body DO is lower than the criteria due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease by more than 0.2 mg/L.

[2] WAC 173-201A-200 (1)(g)- Human-caused pH variations must be within a range of less than 0.5 units.

[3] WAC 173-201A-200(1)(c) - When natural conditions exceed 17.5 C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3 C.
Incremental temperature increases resulting from individual point sources must not exceed 28/(T+7) as measured at the edge of the mixing zone (where T is the background temperature).

[4] WAC 173-201A-200 (1)(e)- Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

-- = Not analyzed
U = Compound undetected at the specified detection limit
H = Hold time was exceeded
J = Estimated concentration

Table 5a. 2019 2023 Spring Drain Quality Data, Conventional Parameters and Metals, Kent Highlands Landfill

Notes from Table 240(3) Chapter 173-201A WAC

-240 (Toxic Substances) for aquatic life criteria

a. An instantaneous concentration not to be exceeded at any time.
c. A 1-hour average concentration not to be exceeded more than once every three years on the average.
d. A 4-day average concentration not to be exceeded more than once every three years on the average.
f. Shall not exceed the numerical value in total ammonia nitrogen (mg N/L) given by formula listed in WAC 173-201A-240 (for salmonids present).
g. Unionized ammonia concentration for waters where salmonid habitat is an existing or designated use.
See formula based on pH, T
i. ≤ (0.944)(e(1.128[ln(hardness)]-3.828)) at hardness = 100. Conversion factor (CF) of 0.944 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.136672 - [(ln hardness)(0.041838)].
j. ≤ (0.909)(e(0.7852[ln(hardness)]-3.490)) at hardness = 100. Conversions factor (CF) of 0.909 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.101672 - [(ln hardness)(0.041838)].
l. Salinity dependent effects. At low salinity the 1-hour average may not be sufficiently protective.
m. ≤ (0.316)(e(0.8190[ln(hardness)] + 3.688))
n. ≤ (0.860)(e(0.8190[ln(hardness)] + 1.561))
o. ≤ (0.960)(e(0.9422[ln(hardness)] - 1.464))
p. ≤ (0.960)(e(0.8545[ln(hardness)] - 1.465))
q. ≤ (0.791)(e(1.273[ln(hardness)] - 1.460)) at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].
r. ≤ (0.791)(e(1.273[ln(hardness)] - 4.705)) at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].
s. If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.
t. ≤ (0.998)(e(0.8460[ln(hardness)] + 3.3612))
u. ≤ (0.997)(e(0.8460[ln(hardness)] + 1.1645))
y. ≤ (0.85)(e(1.72[ln(hardness)] - 6.52))
aa. ≤ (0.978)(e(0.8473[ln(hardness)] + 0.8604))
bb. ≤ (0.986)(e(0.8473[ln(hardness)] + 0.7614))
dd. These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced by USEPA or ecology. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173-220-060 or 173-226-110, as appropriate, and shall be made available for the public comment period required pursuant to WAC 173-220-050 or 173-226-130(3), as appropriate. Ecology has developed supplemental guidance for conducting water effect ratio studies.
ff. These criteria are based on the total-recoverable fraction of the metal.
gg. Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.
ii. The conversion factor used to calculate the dissolved metal concentration was 0.982.
jj. The conversion factor used to calculate the dissolved metal concentration was 0.962.
kk. The conversion factor used to calculate the dissolved metal concentration was 0.85.

Table 5a. 2019 2023 Spring Drain Quality Data, Conventional Parameters and Metals, Kent Highlands Landfill

-240 (Toxic Substances) for human health criteria

A. This criterion for total arsenic is the maximum contaminant level (MCL) developed under the Safe Drinking Water Act. The MCL for total arsenic is applied to surface waters where consumption of organisms-only and where consumption of water + organisms reflect the designated uses. When the department determines that a direct or indirect industrial discharge to surface waters designated for domestic water supply may be adding arsenic to its wastewater, the department will require the discharger to develop and implement a pollution prevention plan to reduce arsenic through the use of AKART. Industrial wastewater discharges to a privately or publicly owned wastewater treatment facility are considered indirect discharges.

C. This criterion is based on a regulatory level developed under the Safe Drinking Water Act.

G. The human health criteria for mercury are contained in 40 C.F.R. 131.36.

-200 (Fresh Water)

The salmonid spawning, rearing, and migration category was used for criteria.

* USEPA. 2016. Aquatic Life Ambient Water Quality Criteria, Cadmium -- 2016, EPA 820-R-16-002.
USEPA Federal Human Health Criteria for Washington State Waters- Nov. 2022

Table 5b. 2019-2023 Spring Drain Quality Data, Volatile Organic Compounds, Kent Highlands Landfill

		Pond Outfall					Trip Blanks				
Analyte	Units	12/6/19	3/6/20	6/4/21	9/2/22	12/7/23	12/6/19	3/6/20	6/4/21	9/2/22	12/7/23
Volatile Organic Compounds											
Chloromethane	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromomethane	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichlorofluoromethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acrolein	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1-Dichloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoethane	µg/L	0.20 U	0.20 U	- -	- -	- -	0.20 U	0.20 U	- -	- -	- -
Iodomethane	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acrylonitrile	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Carbon Disulfide	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,2-Dichloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Acetate	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Butanone	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
2,2-Dichloropropane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chloroform	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromochloromethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1-Trichloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1-Dichloropropene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Carbon Tetrachloride	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Benzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloropropane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromodichloromethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromomethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chloroethyl vinyl ether	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,3-Dichloropropene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Toluene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
trans-1,3-Dichloropropene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Hexanone	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,1,2-Trichloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichloropropane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Tetrachloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Dibromochloromethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dibromoethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Chlorobenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Ethylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,1,2-Tetrachloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
m,p-Xylene	µg/L	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
o-Xylene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Xylenes, total	µg/L	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Styrene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromoform	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2,2-Tetrachloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2,3-Trichloropropane	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,4-Dichloro-2-butene	µg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
n-Propylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Bromobenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Isopropylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
2-Chlorotoluene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
4-Chlorotoluene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
tert-Butylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3,5-Trimethylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2,4-Trimethylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
sec-Butylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
4-Isopropyltoluene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,3-Dichlorobenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,4-Dichlorobenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
n-Butylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichlorobenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dibromo-3-chloropropane	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Hexachlorobutadiene	µg/L	0.50 U	0.50 U	0.50 U	2.00 U	2.00 U	0.50 U	0.50 U	0.50 U	2.00 U	2.00 U
Naphthalene	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methyl tert-butyl Ether	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Pentanone	µg/L	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U

- - = Not analyzed
U = Compound undetected at the specified detection limit

Table 6. 2019-2023 Evaluation of Spring Drain Compliance with Surface Water Quality Standards and Dilution Requirements[a]

Parameter	Units	Washington State Acute	Washington State Chronic	Human Heath Criteria	Number of Samples	Maximum Concentration[b]	Multiplier Factor for Acute and Chronic Criteria[c]	Multiplier Factor for Human Health Criteria[d]	Green River Background Concentration for Aquatic Life[e]	Green River Background Concentration for Human Health[e]	Minimum Dilution to Meet WQ Standards at Acute Zone Boundary[f,g]	Minimum Dilution to Meet WQ Standards at Mixing Zone Boundary[f,h]
N-Ammonia (summer)	mg-N/L	11.4	1.5		10	0.814	1.7	n/a	0.0001		-----	-----
N-Ammonia (winter)	mg-N/L	13.2	2.2		10	0.29	1.7	n/a	0.0001		-----	-----
Thallium, Dissolved	mg/L				5	0.0372	2.3	n/a			n/a	n/a
Copper, Dissolved	mg/L	0.00374	0.00287		5	0.0168	2.3	n/a			10.3	13.5
Antimony, Dissolved	mg/L				5	0.01165	2.3	n/a			n/a	n/a
Arsenic, Dissolved	mg/L	0.36	0.19		5	0.0176	2.3	n/a			-----	-----
Beryllium, Dissolved	mg/L				5	0.0009	2.3	n/a			n/a	n/a
Cadmium, Dissolved	mg/L	0.00065	0.00031		5	0.00003	2.3	n/a			-----	-----
Selenium, Dissolved	mg/L				5	0.00022	2.3	n/a			n/a	n/a
Silver, Dissolved	mg/L	0.00022			5	0.00195	2.3	n/a			20.4	n/a
Chromium, Dissolved	mg/L	0.015	0.01		5	0.01105	2.3	n/a			1.7	2.5
Nickel, Dissolved	mg/L	0.3627	0.04028		5	0.0097	2.3	n/a			-----	-----
Lead, Dissolved	mg/L	0.01079	0.00042		5	0.000034	2.3	n/a			-----	-----
Mercury, Dissolved	mg/L	0.0021			3	0.00001	3	n/a			-----	n/a
Zinc, Dissolved	mg/L	0.02927	0.02672		5	0.02	2.3	n/a			1.6	1.7
Nickel, Total	mg/L			0.08	5	0.0074	2.3	0.9	0.0087	0.005	n/a	-----
Copper, Total	mg/L			1.3	5	0.0131	2.3	0.9	0.0018	0.001	n/a	-----
Antimony, Total	mg/L			0.006	4	0.00235	2.6	1			n/a	-----
Lead, Total	mg/L				4	0.000068	2.6	n/a	0.0011	0.00061	n/a	n/a
Arsenic, Total	mg/L			0.01	5	0.0167	2.3	0.9	0.00087	0.0005	n/a	1.5
Beryllium, Total	mg/L				5	0.0002	2.3	n/a			n/a	n/a
Selenium, Total	mg/L	0.02	0.005	0.06	4	0.000456	2.6	1	0.0011	0.00065	-----	-----
Zinc, Total	mg/L			1	5	0.0132	2.3	0.9	0.0045	0.0026	n/a	-----
Cadmium, Total	mg/L				4	0.0003	2.6	n/a	0.0017	0.001	n/a	n/a
Mercury, Total	mg/L		0.000012	0.0001	3	0.000022	3	1.2	0	0	n/a	5.5
Silver, Total	mg/L				4	0.0004	2.6	n/a	0.0026	0.0015	n/a	n/a
Thallium, Total	mg/L			0.0002	4	0.0097	2.6	1	0	0	n/a	40.4
Chromium, Total	mg/L	0.14686	0.04764		5	0.0022	2.3	n/a	0.0044	0.0025	-----	-----

a Parameters are not listed if the effluent with multiplier factor met WQS, if detection limit is too high to assess non-detects against WQS, or if no WQS criteria exists
b Maximum of detected concentrations or 1/2 of highest detection limit if no detections occurred
c The reasonable potential multiplier factor is based on a coefficient of variation of 0.6 ($n \le 20$) based on guidance in the Ecology Permit Writer's Manual (Ecology 2018) and the Technical Support Document, TSD (EPA 1991)
d Human health criteria multiplier factor based on guidance in Section 4.2 of Ecology Permit Writer's Manual (Ecology 2018)
e Background concentrations were recalculated following guidance from the Ecology Permit Writer's Manual (Ecology 2018) based on data used for original background concentration calculations from Spring Drain Separation TM
f Calculated using mass balance water quality equation from Chapter 6 of EPA NPDES Permit Writer's Manual (EPA 2010)
g Maximum allowable dilution at the acute zone boundary is 22, under 7Q10 flow conditions in the Green River and high Spring Drain flows per Spring Drain Separation TM
h Maximum allowable dilution at the mixing zone boundary is 210, under 7Q10 flow conditions in the Green River and high Spring Drain flows per Spring Drain Separation TM
n/a = not applicable
----- = Estimated maximum concentration is less than criteria

Table 7. Leachate Quality Data, 2019-2023, Kent Highlands Landfill

Date	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)	Total Dissolved Sulfides (mg/L)	pH (s.u.)	Temperature (C)
EFFLUENT LIMITATIONS FROM WATER DISCHARGE PERMIT									
	Daily Average (mg/L)							Min.	
	0.5	2.75	3.0	2.0	2.5	5.0	NA	5.0	
	Instantaneous Maximum (mg/L)							Max.	
	0.6	5.0	8.0	4.0	5.0	10.0	0.1	12.0	
1/4/2019	0.0020 U	0.0050 U	0.0061	0.0200 U	0.0148	0.0100 U	0.1 U	7.94	12.8
2/8/2019	0.0020 U	0.0050 U	0.0037	0.0200 U	0.0149	0.0100 U	0.1 U	8.00	9.1
3/8/2019	0.0020 U	0.0050 U	0.0029	0.0200 U	0.0173	0.0100 U	0.1 U	7.66	11.2
4/8/2019	0.0020 U	0.0050 U	0.0035	0.0200 U	0.0155	0.0100 U	0.1 U	8.05	14.8
5/3/2019	0.0020 U	0.0073	0.0027	0.0200 U	0.0161	0.0100 U	0.1 U	8.05	16.2
6/11/2019	0.0020 U	0.0050 U	0.0040	0.0200 U	0.0173	0.0100 U	0.1 U	8.05	19.9
7/3/2019	0.0020 U	0.0050 U	0.0020 U	0.0200 U	0.0206	0.0100 U	0.1 U	8.09	25.0
8/2/2019	0.0020 U	0.0055	0.0020 U	0.0200 U	0.0213	0.0100 U	0.1 U	8.10	25.0
9/6/2019	0.0020 U	0.0050 U	0.0044	0.0200 U	0.0189	0.0100 U	0.1 U	8.18	25.0
10/4/2019	0.0020 U	0.0058	0.0021	0.0200 U	0.0196	0.0100 U	0.1 U	8.25	25.0
11/7/2019	0.0020 U	0.0050 U	0.0024	0.0200 U	0.0178	0.0128	0.1 U	8.08	14.2
12/6/2019	0.0020 U	0.0050 U	0.0020 U	0.0200 U	0.0161	0.0100 U	0.1 U	8.06	12.2
1/3/2020	0.0020 U	0.0050 U	0.0040	0.0200 U	0.0133	0.0100 U	0.1 U	8.02	13.6
2/7/2020	0.0020 U	0.0050 U	0.0059	0.0200 U	0.0130	0.0100 U	0.1 U	7.93	13.7
3/6/2020	0.0020 U	0.0050 U	0.0032	0.0200 U	0.0152	0.0100 U	0.1 U	7.93	13.7
4/2/2020	0.0020 U	0.0050 U	0.0044	0.0200 U	0.0191	0.0100 U	0.1 U	7.96	14.1
5/7/2020	0.0020 U	0.0050 U	0.0074	0.0200 U	0.0169	0.0100 U	0.1 U	7.93	17.2
6/4/2020	0.0020 U	0.0050 U	0.0034	0.0200 U	0.0172	0.0100 U	0.1 U	8.05	18.1
7/2/2020	0.0020 U	0.0050 U	0.0026	0.0200 U	0.0202	0.0100 U	0.1 U	8.13	18.2
8/6/2020	0.0020 U	0.0050 U	0.0020 U	0.0200 U	0.0188	0.0100 U	0.1 U	8.09	21.2
9/4/2020	0.0020 U	0.0050 U	0.0020 U	0.0200 U	0.0208	0.0100 U	0.1 U	8.00	23.5
10/2/2020	0.0020 U	0.0063	0.0020 U	0.0200 U	0.0197	0.0100 U	0.1 U	8.02	17.4
11/5/2020	0.0020 U	0.0050 U	0.0022	0.0200 U	0.0185	0.0100 U	0.1 U	7.68	15.9
12/3/2020	0.0020 U	0.0090 U	0.0046	0.0200 U	0.0158	0.0200 U	0.1 U	7.86	9.7
1/8/2021	0.0020 U	0.0090 U	0.0071	0.0200 U	0.0134	0.0200 U	0.1 U	7.81	12.1
2/5/2021	0.000136	0.00131	0.00545	0.000257	0.0139	0.00407	0.1 U	7.78	13.8
3/5/2021	0.00100 U	0.00171	0.00349	0.000165	0.0150	0.00681	0.1 U	7.90	11.5
4/2/2021	0.0020 U	0.0090 U	0.0034	0.0200 U	0.0170	0.0200 U	0.1 U	7.92	13.3
5/7/2021	0.0100 U	0.0180 U	0.0060 U	0.0400 U	0.0214	0.0400 U	0.1 U	7.97	15.7
6/4/2021	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0220	0.0200 U	0.1 U	8.11	18.8
7/2/2021	0.0020 U	0.0104	0.0036	0.0200 U	0.0208	0.0200 U	0.1 U	8.02	22.7
8/6/2021	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0225	0.0200 U	0.1 U	7.45	22.2
9/10/2021	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0185	0.0200 U	0.1 U	8.14	19.8
10/8/2021	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0238	0.0200 U	0.1 U	8.15	25.0
11/5/2021	0.0020 U	0.0090 U	0.0098	0.0200 U	0.0135	0.0200 U	0.1 U	7.84	13.7
12/3/2021	0.0020 U	0.0090 U	0.0069	0.0200 U	0.0158	0.0200 U	0.1 U	7.91	11.3
1/7/2022	0.0020 U	0.0090 U	0.0054	0.0200 U	0.0120	0.0200 U	0.1 U	7.85	10.8
2/4/2022	0.000100 U	0.00171	0.00289	0.000125	0.0145	0.00600 U	0.1 U	8.09	11.4
3/4/2022	0.0020 U	0.0090 U	0.0051	0.0200 U	0.0157	0.0200 U	0.1 U	7.92	12.1
4/8/2022	0.0020 U	0.0090 U	0.0031	0.0200 U	0.0197	0.0200 U	0.1 U	8.06	14.7
5/6/2022	0.000100 U	0.00179	0.00305	0.000159	0.0146	0.00600 U	0.1 U	8.04	14.3
6/3/2022	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0184	0.0200 U	0.1 U	7.14	15.1
7/8/2022	0.0020 U	0.0090 U	0.0030	0.0200 U	0.0176	0.0200 U	0.1 U	7.41	19.6
8/5/2022	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0226	0.0200 U	0.1 U	7.58	18.3
9/2/2022	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0253	0.0200 U	0.1 U	7.58	20.4
10/7/2022	0.00200 U	0.0106	0.0100 U	0.00200 U	0.0202	0.120 U	0.1 U	8.15	16.5
11/4/2022	0.000186	0.00227	0.000621	0.000100 U	0.0180	0.00600 U	0.1 U	8.27	11.7
12/2/2022	0.0020 U	0.0090 U	0.0060	0.0200 U	0.0128	0.0200 U	0.1 U	7.97	4
1/6/2023	0.0020 U	0.0090 U	0.0032	0.0200 U	0.0152	0.0200 U	0.1 U	7.98	9.9
2/3/2023	0.0020 U	0.0090 U	0.0036	0.0200 U	0.0104	0.0200 U	0.1 U	8.19	9.1
3/3/2023	0.0020 U	0.0090 U	0.0038	0.0200 U	0.0177	0.0200 U	0.1 U	7.78	11.6
4/7/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0148	0.0200 U	0.1 U	8.18	12.7
5/5/2023	0.0020 U	0.0090 U	0.0035	0.0200 U	0.0162	0.0200 U	0.1 U	8.06	13.7
6/2/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0149	0.0200 U	0.1 U	7.96	16.1
7/7/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0197	0.0200 U	0.1 U	8.05	19.3
8/4/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0209	0.0200 U	0.1 U	8.02	19.4
9/8/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0133	0.0200 U	0.1 U	8.25	16.9
10/6/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0217	0.0200 U	0.1 U	8.26	16.1
11/3/2023	0.0020 U	0.0090 U	0.0030 U	0.0200 U	0.0242	0.0200 U	0.1 U	8.19	13.7
12/7/2023	0.0020 U	0.0090 U	0.0096	0.0200 U	0.0138	0.0200 U	0.1 U	7.90	13.4

U = Compound undetected at the specified detection limit

Table 8. Total Leachate and Spring Drain Flows by Month, 2019-2023, Kent Highlands Landfill

Year	Month	Toe Buttress (gals)	Leachate Pond (gals)	Spring Drain (gals)
2019	January	692,800	2,469,700	
	February	661,477	2,100,080	
	March	534,698	1,682,500	4,435,609
	April	596,008	1,870,433	
	May	460,642	1,525,605	
	June	340,275	1,248,592	4,292,525
	July	463,945	1,343,068	
	August	398,255	1,143,097	
	September	274,292	1,225,615	4,292,525
	October	552,641	1,534,573	
	November	517,444	1,482,303	
	December	767,223	2,298,809	4,435,609
2020	January	757,825	2,565,703	
	February	614,054	2,473,882	
	March	555,202	1,972,400	4,435,832
	April	481,934	2,617,735	
	May	359,496	1,385,074	
	June	356,064	1,530,526	4,292,741
	July	367,104	1,204,966	
	August	427,009	1,121,700	
	September	352,012	1,115,700	4,292,741
	October	426,150	1,181,800	
	November	789,750	2,116,500	
	December	750,050	2,385,300	4,435,832
2021	January	722,350	2,599,100	
	February	633,750	2,033,200	
	March	608,694	2,130,700	4,435,832
	April	408,714	1,619,500	
	May	417,872	1,359,000	
	June	470,970	1,513,400	4,292,741
	July	394,345	1,149,400	
	August	424,605	1,142,600	
	September	364,150	1,126,100	4,292,741
	October	506,689	1,256,100	
	November	1,172,322	3,153,200	
	December	773,801	2,455,300	4,435,832
2022	January	777,373	2,656,200	
	February	467,834	1,688,300	
	March	660,948	2,527,100	4,435,832
	April	493,088	1,816,400	
	May	532,568	2,046,500	
	June	519,777	1,989,000	4,292,741
	July	455,880	1,442,100	
	August	470,175	1,317,300	
	September	404,445	1,195,000	4,292,741
	October	426,400	1,177,100	
	November	524,177	1,480,700	
	December	1,209,879	2,853,700	4,435,832
2023	January	835,799	2,521,400	
	February	556,201	1,782,500	
	March	601,669	2,403,800	4,435,832
	April	569,878	1,781,700	
	May	536,616	1,791,900	
	June	348,244	1,272,700	4,829,760
	July	359,303	1,090,400	
	August	330,196	1,062,700	
	September	324,072	1,077,900	4,292,741
	October	386,111	1,298,700	
	November	788,308	1,504,200	
	December	822,571	2,040,700	4,435,430

Notes: Leachate Pond includes Toe Buttress and South Leachate.

Table 9. Methane in Landfill Gas Probes, 2019-2023, Kent Highlands Landfill

Probe	Maximum CH4 Measurement (%)	No. of Sampling Events	No. of Detections	No. of LEL Exceedances
10-S	0	20	0	0
11-S	0	20	0	0
12-S	0	20	0	0
13-D	0	60	0	0
13-M	0	60	0	0
13-S	0	60	0	0
14-D	0	59	0	0
14-M	0	59	0	0
15-S	0	60	0	0
16A-D	0	61	0	0
16A-M	0	60	0	0
16A-S	0	60	0	0
17-D	0	20	0	0
17-M	0	20	0	0
17-S	0	20	0	0
1-D	3.7	60	2	0
1-S	0	60	0	0
200-D	1.6	61	1	0
200-M	0	60	0	0
200-S	0	60	0	0
20-D	0	60	0	0
20-I	0.2	60	1	0
20-M	0	60	0	0
20-S	0	60	0	0
21-D	0	20	0	0
21-M	0	20	0	0
21-S	0	20	0	0
24-D	0	60	0	0
24-M	0	60	0	0
24-S	0	60	0	0
26-D	0	60	0	0
26-S	0	60	0	0
27-D	0	60	0	0
27-M	0	60	0	0
27-S	0	60	0	0
28-D	0	60	0	0
28-M	0	60	0	0
28-S	0	60	0	0
29-D	0	20	0	0
29-M	0	20	0	0
29-S	0	20	0	0
30-D	0	20	0	0
30-M	0	20	0	0
30-S	0	20	0	0
31-D	0	20	0	0
31-M	0	20	0	0
31-S	0	20	0	0
32A-D	0	60	0	0
32A-M	0	60	0	0
32A-S	0	60	0	0
35-S	1.9	60	58	0
36-D	0	60	0	0
36-M	0	60	0	0
36-S	0	60	0	0
38B-M	0	60	0	0
38B-S	0	60	0	0
38C-D	0	60	0	0
40-D	0	60	0	0
40-M	0	60	0	0
40-S	0	60	0	0
5-D	0	60	0	0
5-M	0	60	0	0
5-S	0	60	0	0
7A-D	0.3	60	1	0
7A-S	0.1	60	1	0
8-S	0.5	60	2	0
9-S	0	20	0	0

Table 10. Static Pressure Data, Landfill Gas Extraction Wells, 2014-2023, Kent Highlands Landfill

Well	Maximum (IWC)	Minimum (IWC)	Average (IWC)	Number of Monitoring Events
E3	0.60	-0.90	-0.12	118
E4	0.50	-1.00	-0.14	118
KDGW101	0.10	-9.50	-1.45	119
KDGW102	-20.00	-57.00	-27.41	119
KDGW103	-20.10	-46.30	-25.65	118
KDGW104A	0.00	-57.10	-27.24	118
KDGW104B	-3.10	-27.20	-10.48	118
KDGW105	-20.10	-57.10	-27.38	118
KDGW111	-5.90	-24.50	-20.58	118
KDGW112	-2.10	-46.20	-17.23	118
KDGW89	1.00	-1.80	-0.19	118
KDGW90	0.70	-0.80	-0.09	118
KDGW91	1.10	-2.20	-0.27	118
KDGW92	0.70	-23.40	-0.30	118
KDGW93	-0.30	-11.60	-5.51	118
KDGW94A	-0.50	-21.70	-12.43	119
KDGW94B	0.00	-55.10	-25.82	119
KDGW95	-1.50	-24.20	-17.31	119
KDGW96	-0.60	-23.90	-14.17	119
KDGW97	0.00	-57.20	-26.86	119
KDGW97A	0.20	-24.00	-12.08	119
KDGW98	0.00	-57.20	-26.88	118
KIGT1	0.20	-1.50	-0.56	118
KIGT2	0.20	-1.50	-0.42	118
KIGT3	0.40	-0.60	-0.14	118
KIGT4	-0.10	-2.30	-1.35	118
KIGT5	0.60	-1.00	-0.18	118
KIGT6	0.30	-0.50	-0.07	118
KIGT7	0.40	-0.50	-0.06	118
KIGW1	0.70	-1.00	-0.12	118
KIGW10	0.40	-1.20	-0.34	118
KIGW11	0.40	-1.10	-0.36	118
KIGW12	0.10	-2.50	-0.89	118
KIGW13	0.20	-1.20	-0.46	118
KIGW14	0.10	-1.40	-0.66	118
KIGW15	0.20	-1.30	-0.50	118
KIGW16	0.10	-0.50	-0.13	118
KIGW17	0.00	-1.90	-0.76	118
KIGW18	-3.10	-10.20	-5.75	118
KIGW19	-6.60	-24.40	-14.55	118
KIGW2	0.60	-1.40	-0.41	118
KIGW20	0.20	-4.70	-1.10	118
KIGW21	-0.50	-5.10	-2.22	118
KIGW22	-12.10	-24.30	-17.60	118
KIGW23	0.70	-0.90	-0.15	118
KIGW24	0.70	-1.00	-0.18	118
KIGW25	0.70	-1.00	-0.17	118
KIGW26	0.10	-1.50	-0.30	118
KIGW27	0.50	-0.90	-0.21	118
KIGW3	0.60	-0.90	-0.17	118
KIGW4	-1.40	-7.70	-4.51	118
KIGW5	0.40	-1.10	-0.34	118
KIGW6	0.50	-2.20	-0.92	118
KIGW7	-0.30	-2.60	-1.44	118
KIGW8	0.10	-3.30	-1.77	118
KIGW9	0.00	-7.20	-4.66	118
KLMA	0.30	-11.90	-0.12	118
KLMB	0.10	-3.10	-0.58	118
KLMSD	0.20	-1.30	-0.15	118
KLMSL	0.20	-1.30	-0.26	118
KSGW101	0.00	-24.50	-15.55	119
KSGW102A	0.10	-24.60	-17.49	119
KSGW102B	0.00	-39.10	-19.00	119
KSGW103A	0.20	-2.20	-0.21	118
KSGW103B	0.20	-1.50	-0.19	118
KSGW104A	0.70	-2.90	-0.76	118
KSGW104B	0.90	-2.10	-0.33	118
KSGW105A	0.20	-3.60	-0.66	118
KSGW105B	0.20	-46.50	-3.17	118
KSGW106A	0.10	-57.00	-4.37	118
KSGW106B	0.10	-4.00	-0.53	118
KSGW107A	0.00	-3.30	-1.14	118
KSGW107B	0.00	-6.10	-1.58	118
KSGW108A	0.10	-20.90	-0.93	118

Table 10. Static Pressure Data, Landfill Gas Extraction Wells, 2014-2023, Kent Highlands Landfill

Well	Maximum (IWC)	Minimum (IWC)	Average (IWC)	Number of Monitoring Events
KSGW108B	1.70	-2.20	-0.58	118
KSGW109A	0.20	-0.10	0.01	22
KSGW109B	0.50	-0.90	-0.08	118
KSGW110	0.40	-0.60	-0.11	118
KSGW111A	0.10	-0.40	-0.13	118
KSGW112A	0.00	-24.40	-16.23	116
KSGW113	0.70	-9.50	-3.86	118
KSGW114	0.70	-5.60	-2.00	118
KSGW115	0.80	-3.30	-0.57	118
KSGW116	0.20	-0.50	-0.10	118
KSGW117	-4.20	-20.00	-8.06	118
KSGW118	0.70	-4.30	-1.12	118
KSGW119	-1.60	-24.00	-9.91	118
KSGW120	-1.50	-9.80	-6.34	118
KSGW121	0.70	-1.60	-0.32	118
KSGW122	0.00	-3.90	-1.64	118
KSGW123	0.70	-2.10	-0.48	118
KSGW124	0.20	-11.50	-4.97	118
KSGW125	0.20	-3.00	-0.35	118
KSGW126	1.50	-3.20	-0.50	118
KSGW99	0.40	-0.60	-0.13	119
S73	0.10	-0.50	-0.14	118
S74	0.00	-24.20	-3.00	118
S76	0.30	-2.10	-0.76	118
S77	0.60	-1.00	-0.16	118

IWC = Inches water column