2019 ANNUAL ENVIRONMENTAL MONITORING REPORT

Hansville Landfill, Kitsap County, Washington Prepared for: Kitsap County Public Works - Solid Waste Project No. 160423-004-2019 • February 28, 2020 Final





2019 ANNUAL ENVIRONMENTAL MONITORING REPORT Hansville Landfill, Kitsap County, Washington Prepared for: Kitsap County Public Works - Solid Waste

Project No. 160423-004-2019 • February 28, 2020 Final

Aspect Consulting, LLC



Peter S. Bannister, PE Associate Engineer pbannister@aspectconsulting.com



Meilani Lanier-Kamaha'o, LG Project Geologist mlkamahao@aspectconsulting.com

v:\160423 Kitsap County Hansville Landfill\Deliverables\2019 Reports\2019Annual\Final\Hansville LF 2019 Annual Report_Final.docx

earth + water

Contents

Ac	ronyms	. iii
1	Introduction	1
2	Site Background. 2.1 Site Location and Description 2.1.1 Engineering Controls 2.1.2 Current Property Uses 2.1 Regulatory Framework 2.3 Surrounding Land Use 2.4 Hydrogeology 2.5 Environmental Monitoring Network 2.5.1 Subsurface Gas 2.5.2 Groundwater 2.5.3 Surface Water 2.5.4 Cleanun Criteria	2 3 3 4 4 5 5 6
3	Site Activities	7
4	Landfill Gas Conditions 4.1 Landfill Gas Monitoring 4.1.1 Minor Changes to Landfill Gas Collection 4.2 Landfill Gas System Performance 4.3 Explosive Gas Control	8 8 9 9
5	Groundwater and Surface Water Conditions	10 .10 .10 .11 .12 .12 .12 .13 .13
6	Annual Inspections	15
7	Operations and Maintenance Updates7.1Landfill Gas Monitoring7.2Condensate System Improvements	16 .16 .16

8	References17
9	Limitations18

List of Tables

	1	Hansville Landfill Site Cleanup Levels6
--	---	---

List of Appendices

Α	Landfill Gas Data
	Table A-1. Landfill Gas Data, First Quarter, 2019
	Table A-2. Landfill Gas Data, Second Quarter, 2019
	Table A-3. Landfill Gas Data, Third Quarter, 2019
	Table A-4. Landfill Gas Data, Fourth Quarter, 2019
	Figure A-1. Landfill Gas System
В	Water Quality Results
	Table B-1. Water Level Elevations 2019
	Table B-2. Groundwater Quality Results
	Table B-3. Surface Water Quality Results
	Figure B-1. Compliance Monitoring Locations
С	Groundwater Statistics and Time-Series Plots
	Table C-1. Statistical Analysis
	Table C-2. Statistical Limit Analysis
	Figure C-1. Dissolved Arsenic Sampling Results
	Figure C-2. Vinyl Chloride Sampling Results
	Figure C-3. 10-Year Attenuation Curves
D	Fourth Quarter Field Forms and Laboratory Reports
Е	Annual Inspection Forms – Kitsap Public Health District
F	Memorandum: Hansville Landfill – Minor Changes to Landfill Gas Collection

Acronyms

Aspect	Aspect Consulting, LLC
CAP	Cleanup Action Plan
СМР	Compliance Monitoring Plan
COCs	contaminants of concern
Ecology	Washington Department of Ecology
KCSL	Kitsap County Sanitary Landfill
mg/L	milligrams per liter
μg/L	micrograms per liter
MSW	municipal solid waste
MTCA	Model Toxics Control Act
NAVD88	North American Vertical Datum of 1988
RASR	Remedial Action Status Report
RI/FS	Remedial Investigation/Feasibility Study
scfm	standard cubic feet per minute
Site	Hansville Landfill Site
SHA	Site Hazard Assessment
UCL / LCL	upper confidence limit / lower confidence limit
VOCs	volatile organic compounds
WAC	Washington Administrative Code
WMW	Waste Management of Washington

1 Introduction

This combined fourth quarter 2019 and 2019 annual monitoring report documents site activities conducted at and environmental monitoring results for the Hansville Landfill Site (Site; or the Landfill). This report was prepared by Aspect Consulting, LLC (Aspect) on behalf of Kitsap County (County) Public Works Solid Waste Division and Waste Management of Washington (WMW). Cleanup activities at the Site have been conducted under the Washington State Model Toxics Control Act (MTCA). Ongoing environmental monitoring at the Site supports the remedy of natural attenuation of groundwater with enhanced monitoring and institutional controls that was established with the final Cleanup Action Plan (CAP) provided with the Amended Consent Decree No. 95-2-03005-1 (August 5, 2011). The data sets presented in this report were collected in accordance with the Ecology-approved Compliance Monitoring Plan (CMP; SCS Engineers, 2011; SCS Engineers, 2012), except where otherwise noted.

During 2019, conditions monitored at the Site were consistent with historical trends and continued to show improvements in protection of human health and the environment. This report is organized to include topics listed in the CMP (SCS Engineers, 2011).

- Section 2 summarizes Site background, including general Site information, regulatory framework, surrounding land use, hydrogeologic conditions, the environmental monitoring network, and cleanup criteria.
- Section 3 describes Site activities during the fourth quarter 2019 and provides a summary of previous Site activities in 2019.
- Section 4 describes landfill gas collection activities and monitoring results during the fourth quarter 2019. The landfill gas collection system was safely operated to improve groundwater protection.
- Section 5 describes groundwater and surface water conditions observed during the fourth quarter 2019, including statistical analysis of trends in groundwater concentrations for 2019 and an assessment of natural attenuation processes.
- Section 6 summarizes landfill inspection reports prepared by the Kitsap Public Health District.
- Section 7 summarizes operations and maintenance updates associated with groundwater sampling and the condensate system improvements.
- Section 8 lists reference sources used in this report.

2 Site Background

Details on Site background were provided in the Remedial Investigation (RI) report (Parametrix, 2007), and the Feasibility Study (FS) report (Parametrix, 2009). This section summarizes Site background to provide context for ongoing Site activities and compliance monitoring.

2.1 Site Location and Description

The closed Hansville Landfill is located on an approximately 73-acre parcel within the northeast quarter of Section 9, Township 27 North, Range 2 East of the Willamette Meridian, in Kitsap County, Washington. The Landfill is approximately five miles south of the unincorporated community of Hansville on the northernmost reach of the Kitsap Peninsula, and is situated on the upper portions of several sloping drainages with perennial creeks that ultimately discharge into Port Gamble Bay. The topography ranges between approximately 310 and 390 feet elevation North American Vertical Datum of 1988 (NAVD88). A Site location map is provided in Figure B-1, showing property boundaries and other Site features.

The Site includes the Landfill, the Landfill property (Property), and a portion of land owned by the Port Gamble S'Klallam Tribe. The Landfill was active between 1962 and 1989, and consists of three separate disposal areas, or cells. These include the following:

- 1. 13-acre municipal solid waste disposal cell (main municipal solid waste (MSW) cell) situated within the central portion of the Property.
- 2. 4-acre demolition disposal cell situated on the northeast corner of the property, which accepted construction, demolition, and land clearing wastes.
- 3. 1/3-acre septage lagoon located immediately southwest of the demolition disposal area, which accepted residential septic tank waste until 1982. A second septage disposal area was reportedly located near the northeast corner of the demolition disposal area.

2.1.1 Engineering Controls

The engineering controls at the Landfill include engineered cover systems and an active landfill gas collection system. The engineered cover systems incorporate a geomembrane, vegetated surface, and integrated surface water control to prevent erosion. The layout of the landfill gas collection system is shown on Figure A-1, and includes:

- 13 vertical collection wells installed within the main MSW cell.
- 10 perimeter collection wells installed outside the western edge of the main MSW cell.
- Approximately 3,200 feet of horizontal collector trench installed below the engineered cover system at the main MSW cell and the demolition disposal cell with 8 monitoring and control points.
- Laterals and a perimeter header leading to the blower and flare compound.

2.1.2 Current Property Uses

The County owns the Property, and has operated a transfer station east of the Landfill for solid waste transfer and/or recycling operations since 1989. The remaining portions of the Property are largely comprised of a former soil borrow area and wooded land. Prior to development of the landfill, the Property was undeveloped forested land.

2.2 Regulatory Framework

The Hansville Landfill is a former MSW landfill that stopped accepting waste and closed in 1989. The closure met requirements of Chapter 173-304 of the Washington Administrative Code (WAC), and included the following engineering controls (for example):

- Installation of horizontal gas collector trenches in the main MSW cells and the demolition disposal cell to prevent landfill gas migration.
- Installation of an engineered cover system over all three distinct disposal areas to reduce or eliminate precipitation infiltration through refuse.

In 1991, the Bremerton-Kitsap County Health Department required corrective actions to better control landfill gas migration and prevent groundwater impacts. Kitsap County Sanitary Landfill¹ (KCSL) converted the landfill gas collection system from passive to active. KCSL also conducted additional investigations, continued environmental monitoring, and implemented additional improvements at the Site as part of a corrective action program. The active landfill gas collection and flare system has been in operation since 1991.

Also, in 1991, the Washington Department of Ecology (Ecology) performed a Site Hazard Assessment (SHA) under MTCA, which resulted in an initial ranking of 3. In 1992, this ranking was subsequently changed to a 1 (the highest rank on a scale of 1 to 5) based on changes in the state ranking model.

In October 1995, Ecology signed a consent decree with the County and KCSL to conduct a RI/FS for the Site. The RI/FS reports (Parametrix, 2007; Parametrix, 2009) identified contaminants of concern (COCs) related to the landfill in groundwater and in seepage to surface water. Based on these findings, Site-specific cleanup levels were developed for arsenic, vinyl chloride, and manganese in groundwater, and arsenic and vinyl chloride in surface water. The highest concentrations of these COCs were observed adjacent to the waste disposal areas, with decreasing concentrations at increasing distances to the landfill.

In preparing the 2011 Amended Consent Decree and CAP, Ecology selected the remedy involving natural attenuation of groundwater with enhanced monitoring and institutional controls (including a restrictive covenant for the Landfill Property). A CMP (SCS Engineers, 2011; SCS Engineers, 2012) provides monitoring program details, including the Sampling and Analysis Plan and the Quality Assurance Plan. Ongoing compliance monitoring under the CAP has been conducted since the fourth quarter of 2011.

¹ By 1998, WMW assumed control of KCSL through a series of sales, mergers, and acquisitions.

During the summer of 2016, Ecology initiated the first five-year review of the Hansville Landfill MTCA remedy as defined under the 2011 Amended Consent Decree. Consistent with Section XXVI of the Amended Consent Decree, a Remedial Action Status Report (RASR; SCS Engineers, 2016) was prepared and submitted to Ecology. In August 2016, Ecology prepared a draft memorandum that included an evaluation of the previous five years of groundwater data and comments to the RASR. Based on Ecology's review, the current monitoring program will continue to be implemented through the next five-year MTCA review cycle.

2.3 Surrounding Land Use

The Property is bordered to the south and west by lands owned by the Port Gamble S'Klallam Tribe. Tribal lands in the immediate vicinity of the Landfill Property consists of woodland and recreational land. The Point Casino and Hotel is located approximately 1,000 feet from the Landfill. The nearest Tribal residential land use is approximately 2,000 feet from the Landfill.

Surrounding areas to the north and east of the Property are zoned by the County as light industrial use, low-density residential, and rural woodland. The nearest off-property structures include a shop and office approximately 200 feet from the demolition disposal cell.

2.4 Hydrogeology

The regional near-surface geology in the vicinity of the Landfill is dominated by glaciofluvial and glacio-lacustrine deposits associated with the Vashon glaciation. The RI (Parametrix, 2007) identifies the following main stratigraphic units at the Site (from ground surface downward):

- Sand This unit was reported in all the investigative borings from the ground surface to depths ranging from 62 to 142 feet below ground surface (bgs), and is also called the upper aquifer. All the monitoring wells are completed in the upper aquifer. The sand deposit consists primarily of poorly graded, fine- and medium-grained sand with trace amounts of silt and gravel. The material is dark yellowish brown to dark gray in color, dense to very dense, and dry to saturated. The RI references the sand unit as the upper aquifer. This unit has been interpreted as outwash associated with the Vashon Drift.
- **Transition Zone** This zone was reported at three boring locations (MW-8, MW-9, and MW-14), occurs at the bottom of the upper aquifer, and is approximately 15 feet thick. It consists of interbedded layers of sand, silty sand, and silt, and does not appear to be extensive.
- Silt This unit was reported in all borings advanced through the upper aquifer. It occurred at depths ranging from approximately 66 feet bgs (at MW-9) to 163 feet bgs (at MW-14). The silt is dark gray, silty to moderately plastic, very dense, and dry. This unit has been interpreted to be the Kitsap Formation.

Groundwater in the upper aquifer near the Landfill is approximately 50 feet below the bottom extent of refuse. Groundwater flows towards the west-southwest, and discharges into the headwaters of perennial creeks, including Creek A, Creek B, and Middle Creek

(see Figure B-1). The dense silts reported for the Kitsap Formation underlying the upper aquifer restrict downward groundwater flow.

2.5 Environmental Monitoring Network

This section summarizes historical development of the Site performance and compliance monitoring network. The following are the conditional points of compliance for the Hansville Site described in the CAP:

- The Upper Aquifer at the Landfill Property boundary.
- The Upper Aquifer downgradient of the Landfill Property boundary and upgradient of the creek headwaters on Tribal property.
- Groundwater discharge to surface water at the headwaters of Creek A, Creek B, and Middle Creek on Tribal property.

2.5.1 Subsurface Gas

The landfill gas collection system and gas probes have been monitored since 1990 to assess potential landfill gas migration from the Landfill, and landfill gas concentrations within the waste.

All (nine) subsurface gas probes were installed outside the waste in native soils to measure for potential landfill gas migration. Six subsurface gas probes (GP-1, GP-2S, GP-2I, GP-2D, GP-3, and GP-4) were installed in 1990 at four on-Property locations, monitoring the southern portion of the Landfill. Gas probes GP-5 and GP-6 were installed in 1994 and 1996, for monitoring the northern portion of the Landfill. Gas probe GP-7 was installed in 1996, for monitoring the off-Property area west of the Landfill, adjacent to groundwater monitoring well MW-9.

Per the CAP, landfill gas performance monitoring includes quarterly field measurements at the nine subsurface gas probes at seven locations, and the landfill gas collection system (21 vertical well and horizontal trench monitoring locations, the blower inlet and outlet ports). Subsurface gas compliance monitoring locations are shown on Figures A-1 and B-1.

2.5.2 Groundwater

Groundwater monitoring was initiated at the Site in 1982 with the installation of three monitoring wells (MW-1 through MW-3). Three additional monitoring wells (MW-4 through MW-6) were added to the monitoring program in 1988. Beginning in 1996, 10 monitoring wells were installed as part of a phased RI (Parametrix, 2007):

- Phase I included wells MW-7 through MW-12
- Phase II included wells MW-8D, MW-12I, MW-13S, MW-13D, and MW-14

Based on the RI groundwater monitoring results, the CAP includes the following six points of compliance: MW-5, MW-6, MW-7, MW-12I, MW-13D, and MW-14. See Figure B-1 for the groundwater compliance monitoring locations.

2.5.3 Surface Water

Surface water monitoring commenced in 1991 at two locations on Middle Creek (SW-1 and SW-2). Two additional locations (SW-SB and SW-3) were added in 1992 and 1994, respectively. Seven new surface water sampling locations (SW-4, SW-5, SW-6, SW-7, SW-8, SW-9, SW-10) were established in 1996 during the RI (Parametrix, 2007). Based on the RI surface water monitoring results, the CAP includes the following four points of compliance: SW-1, SW-4, SW-6, and SW-7. See Figure B-1 for the surface water compliance monitoring locations.

2.5.4 Cleanup Criteria

The CAP established the final Site-specific cleanup levels for groundwater and surface water, summarized in the table below.

Chemical	Media	Site Cleanup Level (µg/L)	Origin of Cleanup Level	
Vinyl Chloride		0.025	EPA Human Health, 2004	
Arsenic	Groundwater 5		Background	
Manganese		2,240	Method B Formula Value	
Vinyl Chloride	Surface Water	0.025	EPA Human Health, 2004	
Arsenic	Surface water	5	Background	

Table 1. Hansville Landfill Site Cleanup Levels

The performance standard for on-Property probes is to operate the landfill gas collection system to maintain methane concentrations below five percent by volume (see WAC 173-304-460).

3 Site Activities

2019 Site activities included environmental monitoring of landfill gas, groundwater, and surface water. A chronology of on-Site activities performed during the fourth quarter of 2019 is provided below.

- On October 16, 2019, Aspect conducted monthly landfill gas system tuning. Details of landfill gas monitoring are provided in Section 4.
- On October 23, 2019, Aspect completed groundwater and surface water sampling in accordance with the CMP (SCS Engineers, 2011). Details of groundwater and surface water sampling are provided in Section 5.
- On October 25, 2019, Aspect disconnected the perimeter gas wells from the landfill gas collection system. A memorandum was prepared to document the end of collection and monitoring at these wells (Aspect, 2020) and is included in Appendix F.
- On November 21, 2019, Aspect conducted monthly landfill gas system tuning. Details of landfill gas monitoring are provided in Section 4.
- On December 11, 2019, Aspect conducted compliance landfill gas monitoring in accordance with the CMP (SCS Engineers, 2011). Details of landfill gas monitoring are provided in Section 4.
- In November and December 2019, Aspect completed improvements to the condensate collection system. A minor modification in operations and maintenance of the condensate system is discussed in Section 7.

Previously during 2019, Site activities were documented in quarterly reports (Aspect 2019a; Aspect 2019b; Aspect 2019c) and included the following:

- Monthly landfill gas system tuning and maintenance
- Quarterly landfill gas compliance monitoring
- Quarterly groundwater and surface water performance and compliance monitoring

3.1 Deviations from the Compliance Monitoring Plan

There was one deviation from the CMP (SCS, 2011) during the fourth quarter of 2019 reporting period. On October 25, 2019, Aspect disconnected the perimeter gas wells from the landfill gas collection system. An addendum to the CMP was prepared to document the end of collection and monitoring at these wells (Aspect, 2020), and is included in Appendix F.

4 Landfill Gas Conditions

The following sections provide a discussion of landfill gas monitoring, landfill gas collection system performance, and explosive gas control. The layout of the landfill gas collection system is shown on Figure A-1.

Since active landfill gas collection started in 1991, the system has historically been operated to control landfill gas migration and to protect groundwater. Little to no methane has been observed at gas compliance probes since 1992. In 1995, the maximum methane concentration was 38 percent, and the balance gas concentration was 44 percent, indicating that approximately half of the gas collected was from the atmosphere. Until approximately January 2013, landfill gas collection rates decreased steadily due to low methane concentrations and difficulty in sustaining flare operation.

Since 2013, the landfill gas collection rate has been maintained at approximately 70 standard cubic feet per minute (scfm) to improve groundwater protection. Since 2013, the average methane concentration has been about 4 percent, and the average carbon dioxide concentration has been about 12 percent.

4.1 Landfill Gas Monitoring

During the fourth quarter of 2019, the landfill gas collection system was turned on October 16 and November 21, and compliance monitoring of the landfill gas collection system and compliance probes performed on December 11.

Measurements were made with a GEM-5000 multigas meter. Landfill gas monitoring parameters collected for the quarterly compliance monitoring events during 2019 are listed in Tables A-1 through A-4, and summarized below:

- Landfill gas composition measurements included methane (CH4), carbon dioxide (CO2), oxygen (O2), and balance gas (Balance) concentrations.
- Collection system pressure measurements included the static pressure measured before and after any valve adjustments, reported as "initial" and "adjusted," respectively. No valve adjustments were made during the December 11 compliance monitoring round.
- Collection system flow-rate measurements were obtained at locations with orifice plates, including differential pressure and gas temperature.

4.1.1 Minor Changes to Landfill Gas Collection

In January 2017, Aspect observed that the perimeter gas wells were under vacuum, and oxygen concentrations typically reflected atmospheric air. On March 31, 2017, valves at perimeter gas wells were closed to redirect vacuum to in-refuse landfill gas collection locations. Landfill gas migration control was maintained based on compliance probe monitoring. Over time, it became apparent that several of the 26-year-old valves were occasionally leaking and landfill gas was unintentionally being collected.

In October 2019, the perimeter gas wells were disconnected from the landfill gas collection system by cutting and capping the polyvinyl chloride (PVC) piping at each of

the 10 perimeter gas wells and the laterals from the landfill gas collection system. Details on these minor changes to the landfill gas system, including photos, historical, and regulatory context were documented in a memorandum dated February 21, 2020 (Aspect, 2020, Appendix F).

4.2 Landfill Gas System Performance

During the fourth quarter of 2019, the flow at the blower inlet was approximately 69 scfm. Methane and carbon dioxide concentrations at the blower inlet were 4.3 and 14.3 percent by volume, respectively. The oxygen concentration was 4.0 percent by volume. The explosive range for methane in air is approximately 5 to 15 percent by volume, whereas the minimum methane concentration to sustain a flame is approximately 20 percent. Landfill gas measured at the blower inlet has contained less than 20 percent methane since 2012.

During the fourth quarter of 2019, methane concentrations measured at individual collection locations ranged between 0.0 and 14.1 percent by volume, similar to methane concentrations observed during the third quarter 2019. The landfill gas concentrations across the wellfield have remained relatively stable since mid-2017. Wellfield optimization will continue to focus on maximizing methane and carbon dioxide collection rates. Therefore, valves at trench collectors TR-3 and TR-5 are kept closed except during monitoring, while other locations are operated with valves wide open.

The condensate system storage tank held 550 gallons on December 11, 2019, and was accumulating approximately 100 gallons per month during colder months of the year. The County will be notified when the volume reaches 1,500 gallons.

4.3 Explosive Gas Control

Methane was not detected at any of the landfill gas compliance monitoring locations during the fourth quarter of 2019. Routine compliance monitoring continues to show that the Site remains in compliance with explosive gas control per WAC 173-304-460. Carbon dioxide concentrations in the compliance monitoring probes ranged from 0.1 to 4.7 percent by volume, and oxygen concentrations ranged from 15.5 to 21.8 percent by volume.

5 Groundwater and Surface Water Conditions

The following sections describe groundwater and surface water monitoring, address observed groundwater elevations and flow, water quality results, and an evaluation of statistical trends to ensure progress toward Site-specific cleanup levels.

5.1 Groundwater and Surface Water Monitoring

During the fourth quarter of 2019, groundwater and surface water was monitored and sampled by Aspect on October 23, 2019.

Measurements of field parameters were made with a calibrated YSI multiparameter probe, and a calibrated Hach turbidimeter. Samples for laboratory analysis were collected in supplied bottles and delivered using standard chain-of-custody methods. Field parameters and laboratory results (see Appendix D for laboratory data certificates) for all sampling events in 2019 are organized in Tables B-2 and B-3 (Appendix B), and listed below:

- Field parameters included dissolved oxygen, pH, oxidation reduction potential, specific conductivity, temperature, and turbidity.
- Conventional parameters included alkalinity, ammonia (as N), bicarbonate, carbonate, chloride, nitrate (as N), nitrite (as N), orthophosphate (as P), sulfate, and total organic carbon.
- Dissolved metals included arsenic and manganese.
- Detected volatile organic compounds (VOCs) included total 1,2-dichloroethene, cis-1,2-dichloroethene, diethyl ether, and vinyl chloride.

5.2 Groundwater Elevations and Flow

Depth to groundwater measurements and calculated water table elevations for the fourth quarter of 2019 are presented in Table B-1, and a potentiometric surface map is provided in Figure B-1. Groundwater elevations ranged from 238.1 feet NAVD88 in MW-12I to 267.1 feet NAVD88 in MW-5. Groundwater at the Site flowed generally towards the west-southwest. Groundwater gradients ranged from 0.006 feet/feet in the upgradient areas, to 0.01 feet/feet further downgradient, with the gradient steepening and becoming more southwest oriented as it approaches the groundwater discharge area (Figure B-1). Groundwater elevation and gradient conditions were consistent with those observed during previous monitoring events.

5.3 Water Quality Results

Groundwater quality results from the fourth quarter 2019 are presented in Table B-2, including field parameters, conventional parameters, dissolved metals, and VOCs. During the fourth quarter 2019 monitoring event, field parameters were within the range of observed values during previous monitoring events. Analytical results for groundwater COCs are summarized below (see Appendix B for water quality results tables and figures).

- The dissolved arsenic concentrations in monitoring wells MW-14 and MW-13D were 0.0125 mg/L and 0.00517 mg/L, respectively, and exceeded the 0.005 mg/L cleanup level. Dissolved arsenic was detected at concentrations below the cleanup level at the other groundwater points of compliance. See Section 5.5 for statistical evaluation of the arsenic concentrations.
- Dissolved manganese concentrations were less than the 2.24 mg/L cleanup level at all groundwater points of compliance. During 2019, dissolved manganese concentrations in MW-14 decreased significantly compared with previous years.
- The vinyl chloride concentrations at monitoring wells MW-6, MW-12I, and MW-14 were 0.061 ug/L, 0.170 ug/L, and 0.061 ug/L, respectively, and exceeded the 0.025 ug/L cleanup level. Vinyl chloride was not detected at a reporting limit of 0.020 ug/L at other groundwater points of compliance. See Section 5.5 for statistical evaluation of the vinyl chloride concentrations

Surface water quality results from the fourth quarter 2019 are presented in Table B-3, including field parameters, conventional parameters, dissolved metals, and VOCs. During the fourth quarter 2019 monitoring event, stream flows appeared seasonally low at the end of the dry season. Field parameters and analyte concentrations observed during the fourth quarter 2019 monitoring event were within the range of observed values during other monitoring events in 2019. During the fourth quarter of 2019, all analytical results for surface water COCs were either not detected at their respective reporting limits or were detected at concentrations below the site cleanup levels.

- Dissolved arsenic was detected at concentrations below the site cleanup level of 0.005 mg/L at all locations.
- Dissolved manganese was detected at concentrations below the site cleanup level of 2.24 mg/L at SW-4, SW-6, and SW-7 and was not detected at SW-1.
- Vinyl chloride has not been detected in surface water samples since the third quarter of 2013, and reporting limits have been less than the cleanup level of $0.025 \ \mu g/L$.

5.4 Geochemical Parameters

Geochemical parameters in groundwater and surface water serve as indicators of landfill effects and can distinguish leachate impacts from gas-to-groundwater impacts. As shown in Tables B-2 and B 3, geochemical parameters collected at the Site include field parameters (dissolved oxygen, pH, Redox [reduction-oxidation potential], specific conductivity, and temperature), alkalinity/carbonate/bicarbonate, chloride, nitrate/nitrite/ammonia, sulfate, and total organic carbon.

Based on low concentrations of geochemical parameters identified as leachate indicators (such as chloride, sulfate, alkalinity, and bicarbonate) across the Site, there appears to be little if any leachate effect on groundwater and surface water quality. Historically, the downgradient monitoring wells show lower dissolved oxygen concentrations than the upgradient well (MW-5) or surface water sampling locations (SW-1, SW-4, SW-6, and SW-7). Carbon dioxide in landfill gas readily dissolves in groundwater, reducing

dissolved oxygen concentrations. Optimizing landfill gas collection will reduce the gasto-groundwater pathway that appears to be affecting groundwater geochemistry.

5.5 Statistical Evaluation

The groundwater quality data were evaluated following the description provided in the CAP (Appendix D). Time-series graphs show arsenic and vinyl chloride concentrations since 2007. Trend analysis and projected average concentrations are based on data collected since 2007, following Ecology guidance from the first five-year review. See Appendix C for time-series graphs for groundwater quality.

5.5.1 Time-Series Graphs

Groundwater sampling results since 2007 are shown on time-series plots for dissolved arsenic (Figure C-1) and vinyl chloride (Figure C-2) at all compliance monitoring locations. Figure C-1 shows that dissolved arsenic concentrations in groundwater have been less than the cleanup level of 0.005 mg/L at MW-5 (background well), MW-6, MW-7, and MW-12I. Dissolved arsenic concentrations at MW-14 have been decreasing over time. In contrast, a slow and steady increase in dissolved arsenic concentrations has been observed at MW-13D, and exceedances have triggered a statistical trend analysis (described in the next sub-section).

Figure C-2 shows vinyl chloride concentrations in groundwater have been less than the cleanup level of $0.025 \mu g/L$ at MW-5 (background well), MW-7, and MW-13D. Vinyl chloride concentrations at MW-6 and MW-14 continued to trend downward over the long-term. During 2019, the vinyl chloride concentration at MW-12I showed both a decreasing long-term trend and seasonality with maximum concentrations during the fourth quarter, previously observed in 2015, 2013, 2012, for example.

5.5.2 Statistical Trend Analysis

Based on the results of statistical analysis, the dissolved arsenic concentrations in groundwater at MW-14, and vinyl chloride concentrations in groundwater at MW-6, MW-12I, and MW-14, have statistically significant downward trends. These results show continued progress toward achieving cleanup levels.

Statistical analysis of groundwater data was performed in accordance with the CMP (SCS Engineers, 2011). The program Sanitas WQStat (ver. 9.0.34) was used to evaluate the Mann-Kendall Test and Sen's Slope. Mann-Kendall testing was performed to assess whether there were statistically significant trends in groundwater concentrations using the two-tailed test (alpha = 0.05). Mann-Kendall results are reported as an approximated normal distribution Test Value "Z" (where the number of data points was greater than 40). Sen's slope analysis was performed to identify the trend direction for statistically significant trends, and reflects the median of the slopes of all pairs of historical data.

Table C-1 provides results of statistical trend analysis, including the Mann-Kendall Test and Sen's Slope analysis. In all cases, the trends are statistically significant because the magnitude of the Mann-Kendall Test Value (Z) was greater than the Critical Value (which is based on the number of data points and alpha). In cases where the Sen's Slope is negative, it indicates a decreasing trend, and where the Sen's Slope is positive it indicates an increasing trend. For the first time, a statistical trend analysis was conducted for dissolved arsenic concentrations in MW-13D due to concentrations that exceeded the cleanup limit in 2018 (once) and 2019 (three times). The results in Table C-1 confirm the statistically significant increasing trend since 2007. However, the arsenic results from MW-13D have shown a history of long-term oscillating concentrations dating back to the beginning of the remedial investigation in 1996 (see Figure 9-13b from the *Remedial Investigation Report* (Parametrix, 2006)). Based on the data available, it is likely that arsenic concentrations since 2007 reflect natural variations or off-Site influences, as opposed to effects from the Hansville Landfill Site. Dissolved arsenic concentrations in MW-13D and other locations will continue to be closely monitored and evaluated.

5.5.3 Trend Projections

To qualitatively evaluate the convergence of downward trending groundwater exceedances with cleanup levels, exponential attenuation curves are shown on Figure C-3. These curves are projected 10 years, through the end of 2028. Based on these long-term projections, the findings include the following:

- Within 10 years, the average vinyl chloride concentrations will meet the cleanup levels in MW-6, MW-12I and MW-14.
- In more than 10 years, the average dissolved arsenic in MW-14 will meet the cleanup levels.

Optimizing the landfill gas collection system may reduce the time to meet cleanup levels. This is consistent with elements of the contaminant fate and transport model presented in the RI/FS (Parametrix, 2007; Parametrix, 2009). Increasing landfill gas collection reduces the potential for landfill gas (containing carbon dioxide, methane, and VOCs) to come in contact with groundwater, which results in low dissolved oxygen.

- For vinyl chloride, this means reducing the mass transfer from vapor-phase to groundwater, and increasing the natural attenuation rates.
- For dissolved metals, this means maintaining a higher pH in groundwater, and preventing mobilization of naturally occurring arsenic and manganese.

A linear trend was calculated for increasing dissolved arsenic concentrations at MW-13D, as shown on Figure C-3. This projected trend biases future concentrations high because it does not account for the historical oscillation in concentrations. For reference, the graph for MW-13D on Figure C-3 shows the average natural background concentration for the Puget Sound basin, based on Ecology's 2016 publication: *Natural Background Groundwater Arsenic Concentrations in Washington State*. Based on the statistical trendline, the mean dissolved arsenic concentration at MW-13D is projected to exceed the cleanup level by the end of 2020, but is not expected to exceed the natural background concentration in the next 10 years.

5.5.4 Calculation of Statistical Limits

Where historical concentrations have consistently exceeded groundwater cleanup levels, statistical limit concentrations were evaluated to assess the approach toward cleanup levels (CAP, Appendix D). Table C-2 shows the calculated annual statistics—including

the mean², 95 percent upper confidence limit (UCL), and 95 percent lower confidence limit (LCL)—for sampling results from 2011 through 2019.

The statistical limits for vinyl chloride concentrations at MW-6, MW-12I, and MW-14 are all approaching the cleanup level. At MW-14, the statistical mean and UCL arsenic concentrations were decreasing at less than 0.001 ug/L per year in 2019, as shown in Figure C-3.

Statistical limits were not determined for the dissolved arsenic concentrations at MW-13D due to the history of oscillating concentrations. This approach will be reconsidered during the next annual report.

 $^{^2}$ The mean statistic was based on the least-squares regression method for log-transformed data, as shown by the curved trend lines in Figure C-3.

6 Annual Inspections

During 2019, the Kitsap Public Health District inspected the Landfill once each quarter. Appendix E provides the inspection letters and forms. The inspection dates and comments included the following:

- March 9, 2019: Compliant; condensate system to be inspected; no items noted during inspection.
- June 4, 2019: Compliant; condensate system to be inspected; mowing required.
- September 18, 2019: Compliant; new condensate system to be installed; landfill survey to be completed in next year; no issues during site visit.
- December 17, 2019: Compliant; slight pooling in the northwest corner of the cap, monitor over time.

7 Operations and Maintenance Updates

Minor updates in operations and maintenance are summarized below for landfill gas and condensate system improvements.

7.1 Landfill Gas Monitoring

With the perimeter gas collection wells disconnected from the landfill gas collection system, these wells do not require future monitoring.

7.2 Condensate System Improvements

Operations and maintenance updates for condensate system improvements include the following activities:

- Monitor the new aboveground storage tank for condensate volume. Increases in volume confirm proper operation of the condensate system. If no increase was observed, confirm water level in condensate riser is below actuation level for the sump pump.
- Notify the County for bulk condensate disposal when the tank is approximately ³/₄ full.

8 References

- Aspect Consulting, LLC (Aspect), 2019a, First Quarter 2019 Environmental Monitoring Report, Hansville Landfill, Kitsap County, WA, May 28, 2019.
- Aspect Consulting, LLC (Aspect), 2019b, Second Quarter 2019 Environmental Monitoring Report, Hansville Landfill, Kitsap County, WA, August 29, 2019.
- Aspect Consulting, LLC (Aspect), 2019c, Third Quarter 2019 Environmental Monitoring Report, Hansville Landfill, Kitsap County, WA, November 29, 2019.
- Aspect Consulting, LLC (Aspect), 2020, Final memorandum re: Hansville Landfill Minor Changes to Landfill Gas Collection, February 21, 2020.
- Parametrix, 2007, Hansville Landfill Remedial Investigation/Feasibility Study, Remedial Investigation Report, July 2007.
- Parametrix, 2009, Hansville Landfill Remedial Investigation/Feasibility Study, Final Feasibility Study Report, June 2009.
- SCS Engineers (SCS), 2011, Compliance Monitoring Plan with Sampling & Analysis Plan and Quality Assurance Plan – Remedial Action at the Hansville Landfill, September 15, 2011.
- SCS Engineers (SCS), 2012, Addendum to the Hansville Landfill Compliance Monitoring Plan, January 27, 2012.
- SCS Engineers (SCS), 2016, Remedial Action Status Report (RASR), May 2016
- Washington State Department of Ecology (Ecology), 2016, Natural Background Groundwater Arsenic Concentrations in Washington State, Ecology Publication No. 14-09-044, March, 2016.

9 Limitations

Work for this project was performed for the Kitsap County Public Works Division (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

APPENDIX A

Landfill Gas Data



Basemap Layer Credits || Copyright:© 2014 Esri Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Table A-4. Landfill Gas Data, Fourth Quarter, 2019

Project No. 160423, Hansville Landfill, Hansville, WA

			Methane	Carbon Dioxide	Oxygen	Balance	Static F	Pressure	Gas Ten	nperature	Flov	v Rate
			CH4	CO2	02	Bal	(inche	s H2O)	(degr	rees F)	(SC	CFM)
Location	Device ID	Date	(% by vol)	(% by vol)	(% by vol)	(% by vol)	Initial	Adjusted	Initial	Adjusted ²	Initial	Adjusted
Blower Inlet	HANSBLIN	12/11/2019	4.30	14.30	4.00	77.40	-4.55	-4.57	46.90	46.90	68.60	68.60
Blower Outlet	HANSBLOT	12/11/2019	4.40	14.20	4.10	77.30	N/A	N/A	N/A	N/A	N/A	N/A
Extraction Well 001	HANSR001	12/11/2019	7.10	15.30	0.00	77.60	-0.12	-0.16	54.90	54.90	1.10	1.00
Extraction Well 002	HANSR002	12/11/2019	2.20	15.20	4.40	78.20	N/A	N/A	N/A	N/A	N/A	N/A
Extraction Well 003	HANSR003	12/11/2019	8.50	15.00	0.00	76.50	-0.53	-0.37	57.30	57.40	3.00	3.70
Extraction Well 004	HANSR004	12/11/2019	3.60	18.40	0.10	77.90	-1.09	-1.09	61.20	61.30	2.40	2.10
Extraction Well 005	HANSR005	12/11/2019	4.70	19.40	0.00	75.90	-0.59	-0.59	67.80	67.80	2.90	2.70
Extraction Well 006	HANSR006	12/11/2019	3.60	17.90	2.40	76.10	-0.74	-0.77	79.10	79.10	3.50	3.50
Extraction Well 007	HANSR007	12/11/2019	0.60	16.70	0.30	82.40	-0.01	-0.01	64.40	64.40	2.90	2.70
Extraction Well 008	HANSR008	12/11/2019	5.80	19.00	0.00	75.20	-0.12	-0.13	54.00	54.10	1.60	1.80
Extraction Well 009	HANSR009	12/11/2019	2.10	16.20	1.60	80.10	N/A	N/A	N/A	N/A	N/A	N/A
Extraction Well 010	HANSR010	12/11/2019	5.70	11.00	4.40	78.90	-0.15	-0.15	55.40	55.60	0.50	0.70
Extraction Well 011	HANSR011	12/11/2019	3.60	9.30	0.00	87.10	-0.21	-0.21	53.60	53.60	1.50	1.40
Extraction Well 012	HANSR012	12/11/2019	9.40	4.70	0.00	85.90	-0.33	-0.35	51.30	51.50	1.10	1.80
Extraction Well 013	HANSR013	12/11/2019	3.80	14.70	1.40	80.10	N/A	N/A	N/A	N/A	N/A	N/A
Trench Collector TD-1	HANSTD01	12/11/2019	2.10	21.30	0.00	76.60	-0.06	-0.06	50.80	50.80	12.80	12.80
Trench Collector TR-1	HANSTR01	12/11/2019	0.70	16.50	2.00	80.80	-0.27	-0.25	56.90	57.00	2.90	2.40
Trench Collector TR-2	HANSTR02	12/11/2019	10.90	17.90	0.00	71.20	N/A	N/A	N/A	N/A	N/A	N/A
Trench Collector TR-3	HANSTR03	12/11/2019	0.00	0.20	21.50	78.30	N/A	N/A	N/A	N/A	N/A	N/A
Trench Collector TR-4	HANSTR04	12/11/2019	2.10	18.30	0.00	79.60	-0.20	-0.21	52.30	52.40	3.10	2.90
Trench Collector TR-5	HANSTR05	12/11/2019	0.00	0.10	21.80	78.10	N/A	N/A	N/A	N/A	N/A	N/A
Trench Collector TR-6	HANSTR06	12/11/2019	14.10	14.50	0.10	71.30	N/A	N/A	N/A	N/A	N/A	N/A
Trench Collector TR-7	HANSTR07	12/11/2019	11.70	15.40	1.10	71.80	-0.23	-0.23	53.60	53.60	3.60	3.90
Native Soil Extraction Well 1 Shallow	HANSN01S	-							-			
Native Soil Extraction Well 1 Deep	HANSN01D	-									-	
Native Soil Extraction Well 2 Shallow	HANSN02S											
Native Soil Extraction Well 2 Deep	HANSN02D											
Native Soil Extraction Well 3 Shallow	HANSN03S											
Native Soil Extraction Well 3 Deep	HANSN03D	-										
Native Soil Extraction Well 4 Shallow	HANSN04S	-										
Native Soil Extraction Well 4 Deep	HANSN04D	-										
Native Soil Extraction Well 5 Shallow	HANSN05S	-										
Native Soil Extraction Well 5 Deep	HANSN05D	-										
Gas Probe 1	HANSGP01	12/11/2019	0.00	1.90	19.10	79.00	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 2 Shallow	HANSGP2S	12/11/2019	0.00	1.30	20.30	78.40	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 2 Middle	HANSGP2M	12/11/2019	0.00	1.20	20.30	78.50	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 2 Deep	HANSGP2D	12/11/2019	0.00	0.20	21.80	78.00	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 3	HANSGP03	12/11/2019	0.00	1.30	20.80	77.90	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 4	HANSGP04	12/11/2019	0.00	1.90	20.40	77.70	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 5	HANSGP05	12/11/2019	0.00	1.40	20.70	77.90	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 6	HANSGP06	12/11/2019	0.00	4.70	15.50	79.80	N/A	N/A	N/A	N/A	N/A	N/A
Gas Probe 7	HANSGP07	12/11/2019	0.00	2.60	19.40	78.00	N/A	N/A	N/A	N/A	N/A	N/A

Notes

Flow rates measured using orifice plates

N/A = indicates parameter not measured

inches H2O = inches water column

degrees F = degrees Fahrenheit

SCFM = standard cubic feet per minute

(--) = indicates location was not monitored and is to be decommissioned due to little to no landfill gas collection

APPENDIX B

Water Quality Results



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community Copyright:(c) 2014 Esri

Table B-1. Water Level Elevations

Project No. 160423, Hansville Landfill, Hansville, WA

					First Qua	rter 2019	Second Quarter 2019					
	Ground Elevation	Top of Casing Elevation	Screen Elevation (ft NAVD88)		Screen Elevation (ft NAVD88)		Screen Elevation (ft NAVD88)		Depth to Water	Water Level Elevation	Depth to Water	Water Level Elevation
Well	(ft NAVD88)	(ft NAVD88)	Тор	Bottom	(ft)	(ft NAVD88)	(ft)	(ft NAVD88)				
MW-5	363.7	366.9	244	234	98.10	268.8	98.82	268.1				
MW-6	332.0	332.7	260	245	72.58	260.1	73.12	259.6				
MW-7	344.3	346.0	259	244	83.55	262.5	83.68	262.3				
MW-12I	245.6	248.1	217	207	9.39	238.7	9.58	238.5				
MW-13D	258.1	260.4	205	195	10.38	250.0	10.59	249.8				
MW-14	338.6	341.1	262	247	79.50	261.6	81.76	259.3				

					Third Quarter 2019		Fourth Quarter 2019			
	Ground Elevation	Top of Casing Elevation	Screen Elevation (ft NAVD88)		Screen Elevation (ft NAVD88)		Depth to Water	Water Level Elevation	Depth to Water	Water Level Elevation
Well	(ft NAVD88)	(ft NAVD88)	Тор	Bottom	(ft)	(ft NAVD88)	(ft)	(ft NAVD88)		
MW-5	363.7	366.9	244	234	99.06	267.8	99.76	134.2		
MW-6	332.0	332.7	260	245	73.40	259.3	75.87	169.1		
MW-7	344.3	346.0	259	244	83.87	262.1	94.44	149.6		
MW-12I	245.6	248.1	217	207	9.42	238.7	10.05	197.0		
MW-13D	258.1	260.4	205	195	11.00	249.4	11.25	183.8		
MW-14	338.6	341.1	262	247	83.87	257.2	94.44	152.6		

Notes

Depths to water collected January 16 (Q1), April 17 (Q2), July 17 (Q3), and October 23 (Q4) of 2019.

Elevations relative to North American Vertical Datum of 1988 (NAVD88).

ft - feet

Table B-2. Groundwater Quality Results Project No. 160423, Hansville Landfill, Hansville, WA

Data			MW-5	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6
		Date	01/16/2019	04/17/2019	0//1//2019	10/23/2019	01/16/2019	04/1//2019	0//1//2019	10/23/2019
Parameter	Units	Site Cleanup Level								
Field Parameters										
Dissolved Oxygen	mg/L		8.82	9.08	8.93	9.95	0.32	0.16	0.47	0.22
рН	pH units		7.36	7.23	7.35	7.21	7.14	7.05	7	7.05
Oxidation Reduction Potential	mV		100.9	22.0	105.1	110.2	144.4	115.7	154.5	74.2
Specific Conductivity	uS/cm		146.8	152.3	162.2	159	332.7	332.9	375.8	377.2
Temperature	deg C		10.2	10.1	11	10.4	12.3	12.8	13.5	12.8
Turbidity	NTU		1.88	0.56	0.31	8	0.87	3.89	0.74	0.32
Conventional Parameters						-				
Alkalinity	mg/L		61	64	67	69	140	150	170	180
Ammonia (as N)	mg/L		0.030 U	0.030 U	0.030 U	0.031	0.88	0.030 U	0.030 U	1.0
Bicarbonate	mg/L		61	64	67	69	140	150	170	180
Carbonate	mg/L		5.0 U	10 U	10 U	10 U	5.0 U	10 U	10 U	10 U
Chloride	mg/L		1.6	1.7	1.8	3.0 U	7.0	5.0	5.7	4.4
Nitrate (as N)	mg/L		4.01	2.03	2.00	3.93 J	0.753	0.696	0.676	0.764 J
Nitrite (as N)	mg/L		0.100 U	0.1 U	0.100 U	0.100 R	0.246	0.176	0.194	0.100 R
Orthophosphate (as P)	mg/L		0.10 U							
Sulfate	mg/L		8.3	7.9	8.4	6.9	25	24	27	23
Total Organic Carbon	mg/L		1.0 U	1.0 U	1.0 U	1.0 U	1.6	1.4	1.6	1.9
Dissolved Metals										
Arsenic	mg/L	0.005	0.00207	0.00203	0.00186	0.00192	0.00171	0.00176	0.00155	0.00153
Manganese	mg/L	2.24	0.0010	0.0010 U	0.0010 U	0.0010 U	0.4	0.41	0.4	0.43
Volatile Organic Compounds (dete	ected only)									
1,2-Dichloroethene (total)	ug/L		2.0 U				2.0 U			
cis-1,2-Dichloroethene	ug/L		1.0 U				1.0 U			
Vinyl Chloride	ug/L	0.025	0.020 U	0.020 U	0.02 U	0.02 U	0.088	0.096	0.061	0.061

Notes

Bold - detected

Shaded - Exceeded Site Cleanup Level U - Not detected at or above reporting limit

J or UJ - Estimated "usable"

NA - parameter not measured

mg/L - milligrams per liter mV - millivolts uS - microSiemens degrees C - degrees Celcius NTU - Nephthalometric Turbidity Units

Table B-2. Groundwater Quality Results

Project No. 160423, Hansville Landfill, Hansville, WA

	MW-7 01/16/2019	MW-7 04/17/2019	MW-7 07/17/2019	MW-7 10/23/2019	MW-12I 01/16/2019	MW-12I 04/17/2019	MW-12I 07/17/2019	MW-12I 10/23/2019		
Parameter	Units	Site Cleanup Level								
Field Parameters										
Dissolved Oxygen	mg/L		1.36	1.09	1.2	1.31	0.47	0.73	0.55	0.7
рН	pH units		6.59	6.34	6.52	6.43	7.33	7.14	7.2	7.16
Oxidation Reduction Potential	mV		79.9	14.2	77.5	887	96.4	6.8	120	102.3
Specific Conductivity	uS/cm		228	236.3	242.5	229.5	147.7	158.4	190.2	184.6
Temperature	deg C		9.4	9.5	10.2	9.7	9.5	9.8	10.6	10.1
Turbidity	NTU		4.46	0.67	0.62	8	0.94	0.44	0.28	8
Conventional Parameters						-				
Alkalinity	mg/L		120	130	140	130	72	84	93	92
Ammonia (as N)	mg/L		0.030 U	0.030 U	0.030 U	0.030 UJ	0.063	0.030 U	0.030 U	0.033
Bicarbonate	mg/L		120	130	140	130	72	84	93	92
Carbonate	mg/L		5.0 U	10 U	10 U	10 U	5.0 U	10 U	10 U	10 U
Chloride	mg/L		1.0 U	1.0 U	1.0 UJ	3.0 U	1.9	2.3	3.4	3.3
Nitrate (as N)	mg/L		0.331	0.324	0.284	0.239 J	0.100 U	0.1 U	0.100 U	0.100 UJ
Nitrite (as N)	mg/L		0.100 U	0.1 U	0.100 U	0.100 R	0.100 U	0.1 U	0.100 U	0.100 UJ
Orthophosphate (as P)	mg/L		0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Sulfate	mg/L		2.4	2.8	5.9 J	5.0 U	4.0	4.5	6.8	5.9
Total Organic Carbon	mg/L		1.9	2.0	1.8	2.0	3.0	2.8	2.3	2.3
Dissolved Metals										
Arsenic	mg/L	0.005	0.00127	0.00118	0.00117	0.00118	0.00230	0.00215	0.00207	0.00224
Manganese	mg/L	2.24	0.0010 U	0.0010 UJ	0.0010 U	0.0010 U	0.031	0.027	0.035	0.04
Volatile Organic Compounds (dete	ected only)									
1,2-Dichloroethene (total)	ug/L		2.0 U				2.0 U			
cis-1,2-Dichloroethene	ug/L		1.0 U				1.0 U			
Vinyl Chloride	ug/L	0.025	0.020 U	0.020 U	0.02 U	0.02 U	0.039	0.054	0.082	0.17

Notes

Bold - detected

Shaded - Exceeded Site Cleanup Level

U - Not detected at or above reporting limit

J or UJ - Estimated "usable"

NA - parameter not measured

mg/L - milligrams per liter mV - millivolts uS - microSiemens degrees C - degrees Celcius NTU - Nephthalometric Turbidity Units

Table B-2. Groundwater Quality Results

Project No. 160423, Hansville Landfill, Hansville, WA

		Date	MW-13D 01/16/2019	MW-13D 04/17/2019	MW-13D 07/17/2019	MW-13D 10/23/2019	MW-14 01/16/2019	MW-14 04/17/2019	MW-14 07/17/2019	MW-14 10/23/2019
Parameter	Units	Site Cleanup Level								
Field Parameters										
Dissolved Oxygen	mg/L		0.17	0.73	0.39	1.16	0.51	1.46	0.97	0.52
рН	pH units		7.65	7.51	7.66	7.59	7.13	7.05	7	7.13
Oxidation Reduction Potential	mV		100.1	6.5	126.4	59.8	95.1	35.4	172.6	72.6
Specific Conductivity	uS/cm		184.1	182.9	191.2	185.1	205.8	330.5	340.7	282.7
Temperature	deg C		10.2	10.4	11.3	10.7	10.9	11.4	12.3	11.1
Turbidity	NTU		0.82	0.68	0.59	8	7.73	0.86	0.82	8
Conventional Parameters										
Alkalinity	mg/L		71	74	77	77	94	120	120	110
Ammonia (as N)	mg/L		0.030 U	0.030 U	0.030 U	0.030	0.030 U	0.030 U	0.030 U	0.030 UJ
Bicarbonate	mg/L		71	74	77	77	94	120	120	110
Carbonate	mg/L		5.0 U	10 U	10 U	10 U	5.0 U	10 U	10 U	10 U
Chloride	mg/L		5.1	5.4	5.4	4.3	3.8	21	19	13
Nitrate (as N)	mg/L		0.100 U	0.1 U	0.100 U	0.100 UJ	0.124	0.548	1.53	0.100 UJ
Nitrite (as N)	mg/L		0.100 U	0.1 U	0.100 U	0.100 UJ	0.100 U	0.1 U	0.100 U	0.100 UJ
Orthophosphate (as P)	mg/L		0.14	0.10 U	0.10 U	0.10 U	0.14	0.10 U	0.10 U	0.10 U
Sulfate	mg/L		17	16	17	14	11	14	14	10
Total Organic Carbon	mg/L		1.0 U	1.0 U	1.0 U	1.0 U	1.9	2.4	2.3	2.4
Dissolved Metals										
Arsenic	mg/L	0.005	0.00473	0.00513	0.00512	0.00517	0.0146	0.0121	0.0115	0.0125
Manganese	mg/L	2.24	0.0065	0.0056	0.0053	0.0065	1.6	0.12	0.16	1.5
Volatile Organic Compounds (dete	ected only)									
1,2-Dichloroethene (total)	ug/L		2.0 U				2.5			
cis-1,2-Dichloroethene	ug/L		1.0 U				2.5			
Vinyl Chloride	ug/L	0.025	0.020 U	0.020 U	0.02 U	0.02 U	0.033	0.020 U	0.020 U	0.061

Notes

Bold - detected

Shaded - Exceeded Site Cleanup Level

U - Not detected at or above reporting limit J or UJ - Estimated "usable"

NA - parameter not measured

mg/L - milligrams per liter mV - millivolts uS - microSiemens degrees C - degrees Celcius NTU - Nephthalometric Turbidity Units

Table B-3. Surface Water Quality Results

Project No. 160423, Hansville Landfill, Hansville, WA

			SW-1	SW-1	SW-1	SW-1	SW-4	SW-4	SW-4	SW-4
		Date	01/16/2019	04/17/2019	07/17/2019	10/23/2019	01/16/2019	04/17/2019	07/17/2019	10/23/2019
		Site Cleanup								
Parameter	Units	Level								
Field Parameters						-	-	-	-	
Dissolved Oxygen	mg/L		11.19	9.80	18.93	10.46	10.39	8.89	16.6	9.21
рН	pH units		7.3	6.95	7.63	7.2	7.76	7.2	7.97	7.73
Oxidation Reduction Potential	mV		108.8	117.8	34.1	76	102.7	87.6	112.9	79
Specific Conductivity	uS/cm		167.3	170.6	167	184.4	307.7	113.1	354.2	347
Temperature	deg C		8.6	9.7	11.5	10.2	6.6	10.1	12.8	10.3
Turbidity	NTU		1.73	25.9	6.96	8.2	2.62	9.71	7.55	4.03
Conventional Parameters										
Alkalinity	mg/L		66	72	76	75	140	140	180	150
Ammonia (as N)	mg/L		0.030 U	0.030 U	0.030 U	0.074	0.030 U	0.030 U	0.030 U	0.030 U
Bicarbonate	mg/L		66	72	76	75	140	140	180	150
Carbonate	mg/L		5.0 U	10 U	10 U	10 U	5.0 U	10 U	10 U	10 U
Chloride	mg/L		4.0	4.5	4.8	3.9	12	12	15	10
Nitrate (as N)	mg/L		1.79	1.71	1.66	1.84 J	0.877	0.804	0.876	0.773 J
Nitrite (as N)	mg/L		0.100 U	0.1 U	0.100 U	0.100 R	0.100 U	0.1 U	0.100 U	0.100 R
Orthophosphate (as P)	mg/L		0.10 U							
Sulfate	mg/L		10	9.4	10	8.5	17	17	22	15
Total Organic Carbon	mg/L		2.8	2.0	1.4	2.6	10	9.0	3.8	12
Dissolved Metals										
Arsenic	mg/L	0.005	0.00160	0.00164	0.00170	0.00163	0.00200	0.00215	0.00190	0.00240
Manganese	mg/L	2.24	0.0020	0.0010 U	0.0010 U	0.0010 U	0.051	0.031	0.055	0.04
Volatile Organic Compounds										
1,2-Dichloroethene (total)	ug/L		2.0 U				2.0 U			
cis-1,2-Dichloroethene	ug/L		1.0 U				1.0 U			
Vinyl Chloride	ug/L	0.025	0.020 U							

Notes

Bold - detected Shaded - Exceeded Site Cleanup Level U - Not detected at or above reporting limit J or UJ - Estimated "usable" NA - parameter not measured mg/L - milligrams per liter mV - millivolts uS - microSiemens degrees C - degrees Celcius NTU - Nephthalometric Turbidity Units

Table B-3. Surface Water Quality Results

Project No. 160423, Hansville Landfill, Hansville, WA

		Data	SW-6	SW-6	SW-6	SW-6	SW-7	SW-7	SW-7	SW-7
		Site Cleanup	01/10/2019	04/17/2019	07/17/2019	10/23/2019	01/10/2019	04/17/2019	07/17/2019	10/23/2019
Parameter	Units	Level			(ary)					
Field Parameters										
Dissolved Oxygen	mg/L		10.34	8.89		9.01	11.81	10.37	7.37	10.59
рН	pH units		7.36	7.25		7.02	7.54	7.65	7.14	7.56
Oxidation Reduction Potential	mV		85	87.6		64.4	94.3	101.5	171.3	67.4
Specific Conductivity	uS/cm		105.8	113.1		143.8	124.9	130.1	197.2	150.8
Temperature	deg C		4.9	10.1		10.4	6.2	9.6	14.2	10.4
Turbidity	NTU		6.19	24.5		8.67	4.63	3.24	8.46	4.32
Conventional Parameters										
Alkalinity	mg/L		42	50		62	43	52	68	61
Ammonia (as N)	mg/L		0.039	0.031		0.030	0.030 U	0.030 U	0.030 U	1.0
Bicarbonate	mg/L		42	50		62	43	52	68	61
Carbonate	mg/L		5.0 U	10 U		10 U	5.0 U	10 U	10 U	10 U
Chloride	mg/L		3.7	3.6		3.6	3.7	3.9	3.7	3.5
Nitrate (as N)	mg/L		0.194	0.135		0.421 J	1.47	0.973	0.706	0.996 J
Nitrite (as N)	mg/L		0.100 U	0.1 U		0.100 R	0.100 U	0.1 U	0.100 U	0.100 R
Orthophosphate (as P)	mg/L		0.10 U	0.10 U		0.10 U				
Sulfate	mg/L		3.8	4.6		6.8	7.8	10	7.5	7.3
Total Organic Carbon	mg/L		23	19		21	9.8	11	5.8	12
Dissolved Metals										
Arsenic	mg/L	0.005	0.00259	0.00348		0.00348	0.00111	0.00126	0.00160	0.00138
Manganese	mg/L	2.24	0.051	0.057		0.086	0.0023	0.0025	0.0055	0.0042
Volatile Organic Compounds										
1,2-Dichloroethene (total)	ug/L		2.0 U				2.0 U			
cis-1,2-Dichloroethene	ug/L		1.0 U				1.0 U			
Vinyl Chloride	ug/L	0.025	0.020 U	0.020 U		0.020 U				

Notes

Bold - detected Shaded - Exceeded Site Cleanup Level U - Not detected at or above reporting limit J or UJ - Estimated "usable" NA - parameter not measured

mg/L - milligrams per liter mV - millivolts uS - microSiemens degrees C - degrees Celcius NTU - Nephthalometric Turbidity Units

APPENDIX C

Groundwater Statistics and Time-Series Plots


Note: Non-detected values are shown at 1/2 the reporting limit. Results from First Quarter 2017 were rejected. See text.

Result Flags O Detected

U - Non-Detect



Figure C-1 - Dissolved Arsenic Sampling Results 2019 Annual Environmental Monitoring Report Hansville Landfill Kitsap County, WA



Note: Non-detected values are shown at 1/2 the reporting limit.

Detected

+ J - Estimate O U - Non-Detect







Aspect

CONSULTING 1/10/2020 Trend Plots (VC)

Figure C-3 - 10 Year Attenuation Curves 2019 Annual Environmental Monitoring Report Hansville Landfill Kitsap County, WA

Table C-1. Statistical Analysis

Project 160423, Hansville Landfill, Hansville, WA

Dissolved Arsenic Statistical Results

			Mann-Ker	ndall Test ²		Sen's	Slope
Well	Statistical Trend ¹	Test Value, Z	Critical Value	Number of data points, n	Statistical Significance	(ug/L per day)	(ug/L per year)
MW-5	³						
MW-6							
MW-7							
MW-12I							
MW-13D	Increasing	6.4	1.960	51	Yes	4.6E-07	0.00017
MW-14	Decreasing	-7.2	-1.96	51	Yes	-3.4E-06	-0.0012

Vinyl Chloride Statistical Results

			Mann-Kei	ndall Test ²		Sen's	Slope
Well	Statistical Trend ¹	Test Value, Z	Critical Value	Number of data points, n	Statistical Significance	(ug/L per day)	(ug/L per year)
MW-5	³						
MW-6	Decreasing	-6.6	-1.96	52	Yes	-7.0E-05	-0.025
MW-7							
MW-12I	Decreasing	-7.0	-1.96	52	Yes	-9.9E-05	-0.036
MW-13D							
MW-14	Decreasing	-8.5	-1.96	52	Yes	-1.1E-04	-0.038

Notes

1 - The Statistical Trend indicates:

"Non-significant" if the magnitude of the Test Value is less than the Critical Value,

"Increasing" if the magnitude of the Test Value is greater than the Critical Value and the Sen's Slope is positive, or

"Decreasing" if the magnitude of the Test Value is greater than the Critical Value and the Sen's Slope is negative.

2 - Mann-Kendall tests were performed with alpha = 0.05 (95% confidence level).

For N>40, Mann-Kendall uses an approximation of a normal distribution, represented by Test Value Z.

3 - "--" Indicates statistical analysis not conducted.

ug/L - micrograms per liter

Table C-2. Statistical Limit Analysis

Project 160423, Hansville Landfill, Hansville, WA

				. <u></u> , eee							
Well	Statistic	2011	2012	2013	2014	2015	2016	2017	2018	2019	Site-specific Cleanup Level
	LCL	0.018	0.017	0.016	0.015	0.014	0.013	0.012	0.011	0.010	
MW-14	Trend	0.020	0.019	0.018	0.017	0.016	0.015	0.015	0.014	0.013	0.005
	UCL	0.023	0.021	0.020	0.019	0.019	0.018	0.018	0.017	0.017	

Dissolved Arsenic Statistical Concentrations (mg/L) since 2011

Vinyl Chloride Statistical Concentrations (ug/L) since 2011

Well	Statistic	2011	2012	2013	2014	2015	2016	2017	2018	2019	Site-specific Cleanup Level
	LCL	0.231	0.204	0.180	0.156	0.135	0.117	0.100	0.085	0.073	
MW-6	Trend	0.261	0.228	0.200	0.175	0.153	0.134	0.117	0.102	0.090	
	UCL	0.295	0.255	0.223	0.195	0.173	0.154	0.137	0.122	0.110	
	LCL	0.232	0.196	0.164	0.136	0.112	0.092	0.074	0.060	0.049	
MW-12I	Trend	0.268	0.223	0.186	0.154	0.129	0.108	0.089	0.074	0.062	0.025
	UCL	0.308	0.254	0.211	0.176	0.148	0.126	0.107	0.092	0.078	
	LCL	0.259	0.210	0.170	0.135	0.107	0.084	0.066	0.051	0.040	
MW-14	Trend	0.298	0.238	0.192	0.153	0.123	0.099	0.079	0.063	0.050	
	UCL	0.342	0.271	0.217	0.174	0.141	0.115	0.094	0.077	0.063	

Notes

LCL is the 95% Lower Confidence Limit calculated using log-normal transformed concentrations.

Trend is the average concentration calculated using least-squares fit a line for log-normal transformed concentrations.

UCL is the 95% Upper Confidence Limit calculated using log-normal transformed concentrations.

UCL, LCL calculated based on method described in CMP (SCS Engineers, 2011), except using data collected since January 2007.

APPENDIX D

Fourth Quarter Field Forms and Laboratory Reports

	DWATER	SAMPLING F	RECORD			WELL NUM	BER: _}	1W-7		Page: 1_ of 1_
Project Na	me: Hans	ville Landfill				Project Num	ber: 1604	423		
Date:	10/23/1	4	-			Starting Wat	ter Level (ft	TOC):	64.44'	
Sampled I	by:	TUC				Casing Stick	up (ft):			
Screened	Interval (ft. T	00)		_		Casing Dian	neter (inche	es): Z	41	
ilter Pacl	Interval (ft. 1	OC)						,		
Casing Vo	lume	(ft Wate	r) x	(Lpfv	(gpf) =	(L)(gal)			
Casing vo	lumes: 3/4"=	0.02 gpf	2" = 0.16 gp	4"	= 0.65 gpf	6" = 1.47	gpf		Sample Int	ake Depth (ft TOC): Mill-Screen
	3/4"= 0	.09 Lpf 2"	= 0.62 Lpf	4" = 2	2.46 Lpf	6* = 5.56 Lp	of			
PURGIN	IG MEASU	Turrical								
Criteria	: Cumul	0.1-0.5 Lpm	Stable	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
Time	Volume	Purge Rate	Level	Temp.	Conductance	Oxygen	рН	ORP	Turbidity	Comments
A \$ 10	(gal)or L)	(gpm or Lpm)	(ft)	(°C)	(µS/cm)	(mg/L)		(mv)	(NTU)	Charles and the second
0014	0	n 05	04.44			1.0	1 +1 2	()) (stan purge
0819	0.315	0.25	84.44	9.0	230.6	6.15	6.43	103.6	8	No coor y udor
0824	0.65	0.25	0444	9.7	219.4	42,33	6,33	96.4	1	
0824	1.0	0.25	84.45	9.6	222.5	1.35	6.37	92.3	9	<i>n</i>
0834	1375	0.25	84.45	9.7	226.4	1.33	6.42	89.6	8	и
0839	1.5	0.25	84.45	9.7	227.2	1.31	6.43	88.1	8	11
0844	1.675	0.25	84.45	9.7	220.5	1-31	6.43	88.7	8	
X845										Step purge, collect
										1.1
otal Gallo	ns Purged:	2				Total Casing	Volumes F	Removed:		
		24	42			0				
Ending Wa	iter Level (ft T	OC): 01.	-12			Ending Total	Depth (ft T	OC):		-
	INVENTO	RY			-					
SAMPLE	Volume	Bottle Type	Quantity	Filtration	Preservation	Appear	ance			Remarks
SAMPLE Time						Color	Sediment			
SAMPLE Time	- n - 0				litat		0	No of	1sr	
Time	Чо	VOA	3		HCL	clear	4	140 01		
Time	40 250	Voia Poly	3	1	HCI -	clear		140 01		
Time	40 250 500	Voia Poly Duly	3 1 2	Ţ	HCI HNO2	clear				
Time	40 250 5の 500	Voia Poly Doly Poly	3 1 2 2	122	HTCI HTNO3	Clear				
	40 250 500 500 500	Voia Poly Doly Poly Amber	3 1 2 2 1	17222	HTCI HTNO2 H12SO4					

Project Number: 160423 Sampled by: DAP 13 U Droject Number: 160423 Sampled by: DAP 13 U Casing Volume: (It TOC): /// (Valer) x Casing Volume: 3/4* 0.00 µf 2* 0.60 µf 2* 0.61 µf 4* 0.62 µf 4* 0.6	GROUN	DWATER	SAMPLING F	RECORD			WELL NUM	BER: Mu	us		Page: of	
Date: Dr.23/14 The starting Water Level (ft TOC): 44.74 Sampled by: DL2 1 3 J Casing Stakup (ft): Casing Stakup (ft): Screened Informal (ft TOC): Total Depth (ft TOC): Casing Stakup (ft): Casing Stakup (ft): Screened Informal (ft TOC): (ft Water) × (Lippi)gen) = (Lippi)gen) = (Lippi)gen) = Screened Informal (ft TOC): (ft Water) × (ft Water) × (Lippi)gen) = (Lippi)gen) = (Lippi)gen) = Screened Informal (ft TOC): (ft Water) × (ft Water) × (Lippi)gen) = (Proiect Na	me: Hans	sville Landfill				Project Nurr	ber: 1604	423			
Sample Dr. Dr. M. 1 - 1 - 1 Casing Stokup (ft)::	Date: _/	1/23/19	1 1 1	2			Starting Wa	ter Level (ft	тос): 🥠	1.76		
Intersecting Full of Verter (IT CO)	Sampled b	y: Dul	111	_	_		Casing Sticl	(the TOC):		_		
Time Pack Interval (ft. TOC)	Screened I	nterval (ft. T	OC)				Casing Dian	neter (inche	es): 2"			
Casing Volume	Filter Pack	Interval (ft.	тос)									
Casing volumes: 34*= 0.08 gpf 2*= 0.16 gpf 4*= 0.26 gpf 6*= 5.47 gpf Sample Intake Depth (ft TOC): MILL Time volume 2*= 0.08 gpf 4*= 0.06 gpf 4*= 0.06 gpf 6*= 5.68 Lpf Sample Intake Depth (ft TOC): MILL Time volume Controls Time volume Purge Rate Velocity Temp. Conductance Oxygen PH ORP Turbidity Comments 01:05:05:07:07 0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:	Casing Vol	ume	(ft Wate	r) x	(Lpfv))(gpf) =	(L)(ga	I) ·			in the	
34 - 0.000 cm 0 - 2.000 cm Typical Typical Typical Stable na ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% ± 10% Ending Volume Sector ORE Turbidity Comments 0 0 0 2 91 17 10 0 3 9 1 118 10.0 8 10.1 100 0 2 8 10.1 100.2 8 10.1 100.2 8 10.1 100.2 8 10 0.05 0.2 91 150.0 91 57.2 100.2 8 10.1 100.2 8 10 0.05 0.2 91 150.0 91 150.0 91 10.2 8 10 0.05 0.2 91 151.0 <th colspa<="" td=""><td>Casing vol</td><td>umes: 3/4"=</td><td>= 0.02 gpf</td><td>2" = 0.16 gpt</td><td>F 4":</td><td>= 0.65 gpf</td><td>6" = 1.47</td><td>gpf f</td><td></td><td>Sample Int</td><td>ake Depth (ft TOC): Machael</td></th>	<td>Casing vol</td> <td>umes: 3/4"=</td> <td>= 0.02 gpf</td> <td>2" = 0.16 gpt</td> <td>F 4":</td> <td>= 0.65 gpf</td> <td>6" = 1.47</td> <td>gpf f</td> <td></td> <td>Sample Int</td> <td>ake Depth (ft TOC): Machael</td>	Casing vol	umes: 3/4"=	= 0.02 gpf	2" = 0.16 gpt	F 4":	= 0.65 gpf	6" = 1.47	gpf f		Sample Int	ake Depth (ft TOC): Machael
Criteria: Typical 0.10.5 Lm Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Time Curnul, Valume Purge Rate Water Level Temp. Conductance Dissolved Oxygen pH ORP Turbidity Comments 04-25 O	PURGIN		REMENTS	= 0.62 Lpi	4 - 2	2.40 Lpi	0 - 5.50 L					
Time Currul, Valume Purge Rate (mor Law) Water Level Temp, (c) Specific Conducate Dissolved Oxygen pH ORP Turbidity Comments 04725 0 91.72 91.72 Start Purge Rate Value (max) Start Purge Rate 04725 0 91.74 10.4 159.4 9.11 1.04 108.0 9 No Cotby Conducate 0.02 91.74 10.4 100.3 9.91 7.15 109.0 9	Criteria:	•	Typical	Stable	па	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Volume Volume Conductance Oxygen PL Out	Time	Cumul.	Purge Pate	Water	Temp	Specific	Dissolved	nH	ORP	Turbidity	Comments	
0 0	TITLE	Volume	(app or Lam)	Level	(°C)	Conductance	e Oxygen	Pri	(my)	(NTU)	Commonto	
2433-0.61 0.2 99 74 10.4 159.4 9.11 7.04 108.0 9 No edor odor 2433-1.0 0.2 99 74 10.4 100.3 9.91 7.18 189.0 9 No edor odor 2433-1.15 0.2 99 75 10.3 159.3 10.56 7.20 1094 8 " 0956 2.25 0.2 49.78 10.4 159.0 9.15 7.21 180.2 8 " 0957 2.25 0.2 49.78 10.4 159.0 9.15 7.21 180.2 8 " 0957 0.4 159.0 9.15 7.21 180.2 8 " " 0957 0.4 159.0 9.15 7.21 180.2 8 " " <td>09-25</td> <td>O</td> <td></td> <td>99.70</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Start purge</td>	09-25	O		99.70							Start purge	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0932	0.67	0.2	99 74	10,4	159.4	9.71	1.04	108.0	9	No color odor	
1.15 0.2 99.1% 10.3 159.3 10.06 7.20 109.4 % " 0956 2.25 0.2 44.18 0.4 159.0 94.5 7.21 110.2 8 " 0957 10 10.0 159.0 94.5 7.21 110.2 8 " 0957 10 10 10.0 94.5 7.21 110.2 8 " 0957 10 10 10.0 94.5 7.21 110.2 8 " 0957 10 10 10.0 94.5 7.21 110.2 8 " 0957 10 10 159.0 94.5 7.21 110.2 8 " 0957 10 159.0 94.5 10.0 159.0 94.5 10.0	0938	1.0	0.2	99.7%	10.4	100.3	9.91	718	109.0	8	11	
0956 2.25 0.2 49.18 10.4 159.0 945 7.21 110.2 8 " 0957 1 1 159.0 945 7.21 110.2 8 " 0957 1 1 159.0 945 7.21 110.2 8 " 0957 1 1 1 1 1 1 1 1 0957 1 </td <td>0143</td> <td>1.15</td> <td>0.2</td> <td>99.78</td> <td>10.3</td> <td>159.3</td> <td>10.06</td> <td>7.20</td> <td>1094</td> <td>8</td> <td>11</td>	0143	1.15	0.2	99.78	10.3	159.3	10.06	7.20	1094	8	11	
0957 Stop purge.cdl 1 1	0956	2.25	0.2	49.78	10.4	139.0	915	7.2	110.2	8	28	
Image: Solution of the type Quantity Filtration Preservation Appearance Remarks Solution of the type Quantity Filtration Preservation Appearance Remarks 1500 40 40 40 40 40 40 40 1500 40 10 40 40 40 40 40 40 1500 40 10 40 40 40 40 40 40 40 40	0957										Stop purge collec	
Image: Selection of the se											11.5.	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $												
Image: Solution of the second seco												
Image: Solution spling bit is spling to splin												
Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Quantity Filtration Preservation Appearance Remarks Image: Source of the type Image: Source of the type Image: Source of the type Image: Source of the t												
indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication indication SAMPLE INVENTORY Indication Preservation Appearance Remarks Remarks 16D0 YO YOA 3 YOA YOA YOA YOA YOA 15D0 YO YOA 3 YOA												
Time Volume Bottle Type Quantity Filtration Preservation Appearance 1500 40 40 3 11 11/20/4 1 11/20/4 1500 40 40 3 11 11/20/4 1 11/20/4 1500 700 700 700 700 700 700										_		
Total Gallons Purged: 2.5 Total Gallons Purged: 2.5 Ending Water Level (ft TOC): <u>41.8</u> Ending Total Depth (ft TOC): <u>11.8</u> Ending Total Depth (ft TOC): <u>11.8</u> SAMPLE INVENTORY Ending Total Depth (ft TOC): Time Volume Bottle Type Quantity Filtration Preservation Appearance Remarks 1500 40 1500 40 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1										
Total Gallons Purged: 2.5 Total Casing Volumes Removed:												
Total Gallons Purged: 2.5 Total Casing Volumes Removed:												
Ending Total Depth (ft TOC): Ending Total Depth (ft TOC): SAMPLE INVENTORY Time Volume Bottle Type Quantity Filtration Preservation Appearance Remarks 1000 40 00A 3 N H/L1 Clear 1 1000 40 00A 3 N H/L1 Clear 1 1000 40 20A 4 4 4 4 4 1000 40 20A 3 N H/L1 Clear 1 1 1000 40 40 40 40 40 40 40 40 1000 40<	otal Gallo	ns Purged:	2.5		_		Total Casing	Volumes F	Removed:		1	
SAMPLE INVENTORY Time Volume Bottle Type Quantity Filtration Preservation Appearance 1500 40 $10A$ 3 $14L1$ $Clerry$ 9 1500 40 $10A$ 3 $14L1$ $Clerry$ 9 1500 $40LY$ 1 14204 1 14204 1 1500 700 704 1 14204 1 1 1500 704 1 14204 1 1 1500 704 1 1 1 1 1500 704 1 1 1 1 1500 704 1 1 1 1	nding Wa	ter Level (ft *	TOC): 11.1	8			Ending Total	Depth (ft T	OC):		<u>.</u>	
Time Volume Bottle Type Quantity Filtration Preservation Appearance 1500 40 10A 3 N HL1 Clear 9 1500 40 1 1 H204 1 1 1500 700 700 1 1 1 1500 700 700 1 1 1 1500 700 700 1 1 1 1500 700 700 1 1 1	SAMPLE	INVENTO	DRY				5					
Loto Yemarks 1500 Yo Yo Yo	Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appea	rance		-	Domerko	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							Color	Turbidity & Sediment	1		Remarks	
500 America 1 4204 500 Pdy 2 + My 350 Pdy 1 4 +	1000	40	VOA	3	N	HLI	Clear	9				
SOO Pdy 2 + M	1	500	Amer	1	1	4.04						
250 Daly Y Y		500	Ddy	2	*	N						
		250	DOL	1	¥	*						
500 POV 1 V HADDE V V	V	500	FOR	1	+	HAD2		¥				
		aug	17-1			and a						
AFTHODS	AETHOP	90							1		. 1	
promotors massured with (instrument model & social number): VE- OFIDDLE- Tube bush - blue iWLT - Oral with		magaurad	with (inclument	model ^e cor	al number	VE-190	map	Tabel	metr-	6/10	WIT-Oral duto	
uraine Equipment: Addated have been a serial number. For orong of provident and on a serial number.		uipmont:		houer a ser		1000	Decon Fou	inment:	Himar	tude	(vigrus are	
Decon Equipment. The angle of the second Water and	urging ⊏q		Materia Concel	1-2	port		- Deconiciqu		HI CHUN	1 wat s		

GROUN	DWATER	SAMPLING I	RECORD			WELL NUM		1-1		Page: of
Project Na	ame: Hans	ville Landfill				Project Nun	nber:_1604	123		
Date:	10/22/14					Starting Wa	ter Level (ft	TOC):		
Sampled I	by: DW	1			_	Casing Stic	kup (ft):	1		
Measuring	g Point of Wel		_	_		Total Depth	(ft TOC):			
Screened	Interval (ft. 1)		_			Casing Diar	neter (inche	s):		
	k intervar (it. i	(00)								
Casing Vo		(ft Wate	r) x	(Lpfv)(gpf) =	(L)(ga	I)			
Casing vo	3/4"= 0	0.02 gpr	z = 0.16 gp	n 4' ∧"−'	= 0.65 gpt	6" - 5 56 1	gpr		Sample Intal	ke Depth (ft TOC):
DURGIN	IG MEASU	DEMENTS	- 0.02 Lpi	4	2.40 Lpi	0 - 0.00 L	51			
UKGIN	IG MEASU	Typical								
Criteria		0.1-0.5 Lpm	Stable	па	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
Time	Cumul.	Purge Rate	Water	Temp.	Specific	Dissolved	рН	ORP	Turbidity	Comments
	(gal or L)	(gpm or Lpm)	(ft)	(°C)	(µS/cm)	(mg/L)		(mv)	(NTU)	
				10.2	144.14	10.46	7,20	20	8.20	
-				1	011	1.10	1.00	100	~	
			-	-						
	-									
	-									
				1		-				
								-		
					-	-				
		-								
_							-			
otal Gallo	ons Purged:					Total Casing	Volumes Re	emoved:		
	_									09
nding Wa	ater Level (ft T	OC):			_	Ending Total	Depth (ft TC	DC):		
AMPLE	INVENTO	RY								
Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appear	ance			
						Calor	Turbidity &		I	Remarks
1000	1/12	100	2	11	1171	71	Sediment			
	70	004	4	10	174	cler	5.90		_	
1 gu	000	Kamba	6		Horey					
	200	POY	3	¥	N					
	05.01	1'	1	Y	N		T			
	20	S	2	1						
	50			T						
	500							_	_	
	500				·				_	
	500 500					1	. 11	2		
	500 Someasured w	ith (instrument r	model & seri	al number):	VST-r.	d : R	artall	M. D.	no D -	Blue Tralate
METHOD arameters	500 500	ith (instrument r	model & seri	al number <u>):</u>	YSI-re	$d : \bar{R}$	writelt	2 por	<u>mp -</u>	Blue; Tort-W
IETHOD arameters urging Eq	DS s measured w uipment:	ith (instrument r	nodel & seri	al number <u>):</u>	XSI-re	Decon Equi	oment:	T Por	<u>mp -</u>	Blue; Torl-b
IETHOD arameters urging Eq isposal of	DS s measured w uipment:	ith (instrument r	nodel & seri	al number <u>):</u>	YSI-re	Decon Equi	oment:	Por por	<u>mp - </u>	Blue; Tort-w
IETHOD arameters Jrging Eq sposal of	DS s measured w uipment: Discharged v	ith (instrument r http://www.second.com/ Vater:	nodel & seri	al number <u>):</u>	YSI-re	Decon Equi	oment:	Por Por	mp -	Blue; Tort-w

4

.

GROUNDWATER SAMPLING RECORD WELL NUMBER: MW-121 Page: 1 of Project Name: Hansville Landfill Project Number: 160423 Date: 10 / 23/14 Starting Water Level (ft TOC): 10,05 Screened Interval (ft: TOC) Filter Pack Incover (ft: TOC): Casing Obtaineter (inches); M(if - Screener) 2* Gasing Volume:	A	SPEC	G		Sample number	MW-12	2-I-1023	319			_
Project Name: Hansville Landfill Project Number: 160423 Date: 10 / 23/14 Staring Water Level (fi TOC): 10.05 Sampled by: 10 / 23/14 Staring Water Level (fi TOC): 10.05 Sampled by: 10 / 23/14 Staring Water Level (fi TOC): 10.05 Screened Interval (fi: TOC) (Lpfv/(gpf) =(L)(gal) (L)(gal) Sample bit: Casing Volume (fi Water) x((Lpfv/(gpf) =(L)(gal) (L)(gal) Sample bit: Casing Volume (fi Water) x((Lpfv/(gpf) =(L)(gal) (L)(gal) Sample bit: Sample bit: Other is: (Lpfv/(gpf) =(L)(gal) = 1.47 gpf Sample bit: Sample bit: Other is: (Lpfv/(gpf) =(L)(gal) = 1.47 gpf Sample bit: Sample bit: PURGING MEASUREMENTS (Lpfv/(gpf) =(L)(gal) = 0.1 ± 10 mV ± 10% Comments Time (gar) (L)(gal) = 0.1 ± 10 mV ± 10% Comments Time (gar)	GROUI	DWATER	SAMPLING	RECORD			WELL NUN	BER: M	W-12	L	Page: of
Jacking volumes: JAff= 0.02 pt 2* = 0.6 gpt 4* = 0.6 5 gpt 6* = 1.47 gpt Sample Intake Depth (ft TOC): JAff= 0.02 pt 2* = 0.6 2 pt 4* = 2.46 Lpf 6* = 5.56 Lpf Sample Intake Depth (ft TOC): VRGING MEASUREMENTS Criteria: 0,10,5 Lam 10,0 t 10,0 t 10,0 t 10,0 t 10,0 t 1052 0 10,0 t 10,0 t <td>Project N Date: Sampled Measurin Screened Filter Pac</td> <td>ame: Han: v /23/19 by: TV g Point of We Interval (ft. T k Interval (ft. T</td> <td>sville Landfill</td> <td>-</td> <td></td> <td></td> <td>Project Nun Starting Wa Casing Sticl Total Depth Casing Diar</td> <td>hber: <u>160</u> ter Level (fi kúp (ft): (ft TOC<u>):</u> neter (inche</td> <td>423 TOC): 10 es): Mid-S</td> <td>creen</td> <td>2"</td>	Project N Date: Sampled Measurin Screened Filter Pac	ame: Han: v /23/19 by: TV g Point of We Interval (ft. T k Interval (ft. T	sville Landfill	-			Project Nun Starting Wa Casing Sticl Total Depth Casing Diar	hber: <u>160</u> ter Level (fi kúp (ft): (ft TOC <u>):</u> neter (inche	423 TOC): 10 es): Mid-S	creen	2"
V V V PROFING MEASUREMENTS Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% ± 0.1 ± 10 mV ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Office Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel, Vigliant Stable na ± 3% ± 10% Tree Curruel Note Stable na ± 10% Tree Cur	Casing v Casing v	olumes: 3/4"-	= 0.02 gpf	2" = 0.16 gp	f 4"	(gpr) = = 0.65 gpf	6" = 1.47	i) gpf		Sample Int	ake Depth (ft TOC):
Criteria: Typical 0.1-0.5 Lpm Stable na ± 3% ± 10% ± 0.1 ± 10W ± 10% ± 10% Time Qumul. Volume. (galact) Purge Rate (galact) Water Level Temp. (rst) Specific (usion) Dissolved (usion) PH ORP Turbidity Comments 1052 0 10.05 10.11 132.2.2. 4.2.1 7.13 N to columnation Start purge. 102 0.5 0.2.5 10.08 9.4 150.0 1.417 7.44 104.3 5 '' 1102 0.5 0.2.5 10.08 9.4 150.0 1.417 7.44 104.3 5 '' 1102 0.5 0.2.5 10.10 9.4 150.0 0.43 7.45 104.3 5 '' 1112 1.25 0.2 10.10 10.3 155.4 0.70 7.16 102.4 7 112.2 2.3 0.2 10.10 154.4 0.70 7.16	PURGI	NG MEASU	IREMENTS	- 0.02 Lpi	4 - 2	2.40 Lpi	0 - 5.50 L	<u></u>			
Time Cumul. Volume (app or Lpm) Water Level (m) Temp. (n) Specific Conductance (us/cm) Dissolved Oxygen (mg/L) PH ORP Turbidity Comments 1052 0	Criteria		Typical 0.1-0.5 Lpm	Stable	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
1052 0 10.05 10.05 10.05 10.01 </td <td>Time</td> <td>Cumul. Volume</td> <td>Purge Rate</td> <td>Water Level</td> <td>Temp.</td> <td>Specific Conductance</td> <td>Dissolved Oxygen</td> <td>рН</td> <td>ORP</td> <td>Turbidity</td> <td>Comments</td>	Time	Cumul. Volume	Purge Rate	Water Level	Temp.	Specific Conductance	Dissolved Oxygen	рН	ORP	Turbidity	Comments
1057 0.125 0.25 10.56 10.1 132.2 4.21 7.13 97.8 8 No. color 0.cdor 1102 0.5 0.25 10.08 94 150.0 1.47 7.14 104.3 7 1103 1.0 0.23 10.10 9.4 150.0 0.43 7.15 104.3 7 1112 1.5 0.25 10.10 9.4 185.2 0.85 7.16 104.0 7 7 1112 1.5 0.25 10.10 10.1 185.2 0.85 7.16 104.0 7 7 1112 1.5 0.2 10.10 10.3 185.4 0.72 7.47 102.4 7 112.7 2.125 0.2 10.10 10.1 184.6 0.70 7.16 107.3 8 7 112.7 2.125 0.2 10.1 184.6 0.70 7.16 107.3 8 7 10.1 10.1 184.6 0.70 7.16 107.3 8 7 10.1 10.1	1052	0		10.05		(µs/cm)	(mg/L)		(111)	(NTO)	Start purge
1102 0.5 0.25 10.08 9.9 150.0 1.47 7.14 104.3 8 '' 1103 1.0 0.23 10.10 1.9 150.0 0.93 7.15 104.3 8 '' 1112 1.5 0.25 10.11 9.8 185.2 0.85 7.16 104.0 7 '' 1111 1.75 0.2 10.16 10.1 1.85.2 0.85 7.16 104.0 7 '' 1112 2.5 0.2 10.16 10.3 1.85.2 0.85 7.16 102.4 7 112.2 2.5 0.2 10.10 10.3 1.84.6 0.70 7.16 102.3 8 '' 112.7 2.15 0.2 10.10 1.84.6 0.70 7.16 102.3 8 '' 112.8	1057	0.125	0.25	10.00	10.1	182.2	421	7.18	97.8	8	No color / Jodor
IIO7 I.0 0.23 I0.10 9.9 150.0 0.93 7.15 I04.3 8 77 III12 I.5 0.25 I0.11 9.8 185.2 0.85 7.16 I04.0 7 77 III12 I.5 0.25 I0.11 9.8 185.2 0.85 7.16 I04.0 7 77 III12 I.5 0.2 10.16 10.1 185.2 0.85 7.16 I04.0 7 77 III2 2.5 0.2 10.16 10.1 185.2 0.72 7.17 103.1 8 77 II22 2.5 0.2 10.10 10.3 184.6 0.70 7.16 102.4 7 II23 0.2 10.10 184.6 0.70 7.16 102.3 8 I124 2.125 0.2 10.10 184.6 0.70 7.16 102.4 7 I125 0.2 10.10 184.6 0.70 7.16 102.4 7 I126 0.2 10.10 10.10	1102	0.5	0.25	10.08	99	156.0	1.47	714	104.3	8	11
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1107	1.0	0.23	10.10	9.9	186.0	0.93	7.15	1043	8))
1111 1.45 0.2 10.10 10.1 135.3 0.11 7.17 103.1 35 7 1122 2.3 0.2 10.10 10.3 156.9 0.72 7.14 102.4 7 1127 2.125 0.2 10.10 10.1 154.6 0.70 7.16 102.3 8 1128	1112	1.5	0.25	10.11	9.8	185.2	0.85	7.16	1040	7	
1122 2.3 0.2 10.10 10.5 130.9 0.12 144 102.4 4 1123 0.2 10.10 10.1 184.6 0.70 7.6 102.3 8 1128	1122	1.45	0.2	10.10	10.1	185.3	0.11	7.17	103.1	3	
III25 III10 III11 III10 III11 III10 III110 III1100 III11000 III11100 III1100	1122	2 15	0.2	10.10	10.5	18114	0.12	117	102.4	.T 8	
Image: Second State	1128	E. 125	0, 2	10.10		104.0	0.70	1.0	102.5	0	stop purge, colled
Image: Section of the sector of the secto								35			
Total Gallons Purged: 3 inding Water Level (ft TOC): I() - 0) 5 Ending Total Depth (ft TOC): Ending Total Depth (ft TOC): SAMPLE INVENTORY Time Volume Bottle Type Quantity Filtration Preservation Appearance 1125 110 Value Value 0 0 0 0		1									
Total Gallons Purged: 3 Total Casing Volumes Removed: inding Water Level (ft TOC): ID_DS Ending Total Depth (ft TOC): SAMPLE INVENTORY Quantity Filtration Preservation Appearance Time Volume Bottle Type Quantity Filtration Preservation Appearance 1135 110 Volume Bottle Type Quantity Filtration Preservation Appearance											
Total Casing Volumes Removed: Total Casing Volumes Removed: Ending Water Level (ft TOC): 10.05 Ending Total Depth (ft TOC): Ending Total Depth (ft TOC): SAMPLE INVENTORY Preservation Time Volume Bottle Type Quantity Filtration Preservation Appearance Color Turbidity & Sediment											
Inding Water Level (ft TOC): Ending Total Depth (ft TOC): SAMPLE INVENTORY Time Volume Bottle Type Quantity Filtration Preservation Appearance 1125 110 Volume Sediment Remarks	otal Gall	ons Puraed:	3				Total Casing	Volumes R	emoved:		
Ending Water Level (ft TOC):			iD.	05							
Time Volume Bottle Type Quantity Filtration Preservation Appearance 112 110 Value Value 0 112 0 0	nding vv	ater Level (It	TUC):				Ending lotal	Depth (ft 1	00):		-
Image: Second	Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appear	ance			
1/2 11) Van a Hal alart 5							Color	Turbidity &			Remarks
	1135	40	Vola	3		HCI	Clear	Seament			
250 Pdy 1 4 -	1	250	Pdy	1	Ч			1			
SOD POLY 2 4 ITNO3		500	Poly	2	g	itn 03					
SOU Pola 2 -	1	SOU	Polq	2	4			1		-2	
- 500 Amber 1 - H2004 1	-	500	Ambler	1		H2504	+	v			
		ļ,									

And of controls to Controls (Controls (Contro	GROUN			FCOPD			WELL NUM	BER CI	0-4		Page: / of /
Project Runder, 1:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0	GROUN	Hans	ville Landfill	LOOKD			D. L. L.	JER	123		, aye. <u></u> 01 <u>[</u>
American Deputy Control of the fill Measurement IN- TOCL Containing Statute (fr. 100) Measurement IN- ToCL Containing Statute (fr. 100) <td>Project Na</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Project Num</td> <td>tor Lovel (ft</td> <td>100%</td> <td>/</td> <td></td>	Project Na						Project Num	tor Lovel (ft	100%	/	
Description Office Total Depth (# TOC): Casing Damater (mches): itter Pack Interval (#. TOC):	Sampled b	v: Du	N				Casing Stick	up (ft):	1007.		
Discrete Casing Diameter (inches):	leasuring	Point of Well	1				Total Depth	(ft TOC):	-		
ittle Pack Interval (1: TOC)	Screened	Interval (ft. TO					Casing Dian	neter (inche	s):		
Samp Volume: (1V disc) x	Filter Pack	: Interval (ft. T	OC)	_					/		
Description State 0.05 pt 2* = 0.05 pt<	Casing Vo	lume	(ft Water) ×	(Lpfv)	(gpf) =	(L)(ga)		• • • • •	
Over Base Decision The second process of the second proces of the second process of the second proces proces of th	casing vol	umes: 3/4"= 3/4"- 0	0.02 gpt 2	2" = 0.16 gpt = 0.62 Linf	r 4"= ∕!"= 2	= 0.65 gpt	6" = 1.47	gpr		Sample Intake	beptn (π TOC):
Order to micro micr		G MEASU	REMENTS	0.02 LM	4-2		0 - 0.00 E		_		
Christik Conduction Conductance Disk of the second sec	Critorio		Typical	Stabla		+ 39/	+ 10%	+0.1	+ 10 mV	+ 10%	
Time Yolume Page Rate Level Temp. Conductance Oxygen PH ORP Utility Comments 1 (gator L)	Criteria:	Cumul	0.1-0.5 Lpm	Water		Specific	Dissolved	10.1	1 IO III V		
(get or L) (ft) (fc) (fs) (fg) (ft) (ff) I	Time	Volume	Purge Rate	Level	Temp.	Conductance	Oxygen	рН	ORP	Turbidity	Comments
i i	1	(gal or L)	(gpm or Lpm)	(ft)	(°C)	(µS/cm)	(mg/L)	172		UNTU)	
Image: Source of the second	1				103	0,ידנ	1=01	11)	170	10	
Image: Solution products and serial number: Image: Solution product a serial number:											
Image: Solution production with firstrumpen model & seriel number): Image: Solution production with firstrumpen model & seriel number): Image: Solution production production with firstrumpen model & seriel number): Image: Solution production producting production production production production p							<u> </u>				
Image: Solution of the second of the seco	_										
Image: State in the second											
Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & serial number): Image: Sector measured with (instrument model & sector measured with (instrument model & sector measured with (instrument model & sector measured with measured with (instrument model & sector measured with measured with (instrument model & sector measured with measured with (i											
Image: Second state in the second s											
Image: Second								1			
Image: Second							R.				
Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & seriel number): Image: Solution of the series measured with (instrument model & series number): Image: Solution of the series measured with (instrument model & series number): Image: Solution of the series measured with (instrument model & series number): Image: Solution of the series measured with (instrument model & series number): Image: Solution of the series measured with (instrument model & series number): Image: Solution of the series numbe			_								
Image: Solution of the second state											
otal Gallons Purged:	-										
otal Gallons Purged:											
otal Gallons Purged:				-				-			
otal Gallons Purged:							_				
otal Gallons Purged:					_			_	_		
total Gallons Purged:											
Inding Water Level (ft TOC): Ending Total Depth (ft TOC): GAMPLE INVENTORY Time Volume Bottle Type Quantity Filtration Preservation Appearance Remarks 100 40 10A 3 HCI Preservation Appearance Remarks 100 40 10A 3 HCI Preservation Appearance 100 40 10A 3 HCI Preservation Remarks 100 40 10A 40 10A 10A 10A 100 10 1 1 10A 10A 10A 10A 100 10 1 1 10A 10A 10A 10A 10A 100 10 1 10A 10A 10A 10A 10A 1	otal Gallo	ns Purged:		-			Total Casing	Volumes R	lemoved:		2
Ample Level (t 100):		4 / (A	00)				Endine Total	Denth /ft T	00)		
AMPLE INVENTORY Time Volume Bottle Type Quantity Filtration Preservation Appearance Remarks 200 40 UAA 3 HCI Prevention Sediment Remarks 200 40 UAA 3 HCI Prevention Remarks 200 40 UAA 3 HCI Prevention Remarks 200 40 UAA 3 HCI Prevention Remarks 500 Amary 1 HAAA HCI Prevention 500 Amary 1 HAAA HCI Prevention 500 Amary 1 HAAA HCI Prevention 500 Amary 2 HAAAA HAAAA HAAAA 500 A 4 HAAAA HAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	noing wa		DC):				Ending Total	Deptil (it i	00)		
Remarks Remark	Time	Volume	Rottle Type	Quantity	Filtration	Preservation	Anneo	rance	-		
Alo 40 40 43 40 <t< td=""><td>Time</td><td>Volume</td><td>Dome Type</td><td>woantity</td><td>i nu auvri</td><td>i reservation</td><td>Appeal</td><td>Turbidity &</td><td></td><td>F</td><td>Remarks</td></t<>	Time	Volume	Dome Type	woantity	i nu auvri	i reservation	Appeal	Turbidity &		F	Remarks
AIO 40 <t< td=""><td>0/0</td><td></td><td>thereft</td><td>1</td><td>*</td><td>TICL</td><td>Color</td><td>Sediment</td><td>_</td><td></td><td></td></t<>	0/0		thereft	1	*	TICL	Color	Sediment	_		
SOU Andrew Interview	1210	40	UDH	3	XV	HCI	PACYLO				
SOU Day Day Day SOD Day Day Day SOD Day Day Day HETHODS arameters measured with (instrument model & serial number): Day Day Image: Soon and the serial number in the series of the		500	Ampr	1	1	Haspy					
AETHODS arameters measured with (instrument model & serial number): 15-14, Tab-Unite: Proprintiel urging Equipment: Proprint Pomp Decon Equipment: Acortex + work isposal of Discharged Water: On stele		500	DOLY	2	t	N					
NETHODS arameters measured with (instrument model & serial number): <u>ST-VJ</u> , <u>TJ-VJ</u> , <u>TJ-VJ</u> , <u>Promp ikel</u> urging Equipment: <u>Promp Decon Equipment</u> : <u>Aconex + work</u> isposal of Discharged Water: <u>On STE</u>		250	1.		Y	N					
AETHODS arameters measured with (instrument model & serial number): <u>ST-VU</u> , <u>Tub-Unb-e</u> ; <u>Proportible</u> urging Equipment: <u>Prostat Pump</u> Decon Equipment: <u>Aconox + uputr</u> isposal of Discharged Water: <u>On ste</u>		SOD	¥	2	t	14002	Y				
METHODS arameters measured with (instrument model & serial number): <u>JST-Vid</u> , <u>Tirb-Unite</u> ; <u>Priprinpikle</u> urging Equipment: <u>Pristatt Pomp</u> Decon Equipment: <u>Aconos Fluoritz</u> isposal of Discharged Water: <u>Onsite</u>		4.44									
IETHODS arameters measured with (instrument model & serial number): <u>JF-Vd</u> , <u>Trb-Umbe</u> ; <u>Propromptikel</u> urging Equipment: <u>Proprint Hick Pomp</u> Decon Equipment: <u>Accross & Control</u> isposal of Discharged Water: <u>Onstate</u>		I									
arameters measured with (instrument model & serial number): 5 - 743 175 - 1965	TETHOD	DS				1~	1 -	- 1	11	n n	2
urging Equipment:	arameters	s measured w	ith (instrumen) r	nodel & seri	al number):	15-Y	4 1	15-	Whote	i pro)	wmpilel
isposal of Discharged Water: Onside	urging Eq	uipment:	profili	42 F	mp		Decon Equi	pment: 🦯	LOTION	Finh	/ /
		Discharged V	Nater: Or	site	1					1 0.01.11	
	isposal of										
	isposal of oservatio	ns/Comments	:								

GROU	DWATER	SAMPLING	RECORD			WELL NUN	IBER: 🧲	W-6		Page: of
Project N	ame: Han	sville Landfill				Project Num	nber: 160	423		
Date:	DIAZU	19				Starting Wa	ter Level (fi	TOC):	/	
Sampled	by:	ND	_			Casing Sticl	kup (ft):	/	-	
Measurin	g Point of We		-			Total Depth	(ft TOC):	/	/	
Filter Pac	k Interval (ft. 1		/			Casing Diar	neter (inche	es):	/	
	olumo	/ft \\/oto		11 - 6.	Var 0 -	())(D			
Casing vo	olumes: 3/4"=	= 0.02 apf	2" = 0.16 or	f 4"	(gpi) =	6" = 1.47	u) anf		Sample Intak	(a Dopth /ft TOC);
	3/4*= 0	.09 Lpf 2"	= 0.62 Lpf	4" = :	2.46 Lpf	6" = 5.56 Li	9pi of		Sample mak	te Depth (it 100).
PURGI	NG MEASU	REMENTS								
Criterla		Typical	Stable		+ 20/	+ 10%	+01	1.10 m1/	1.100/	
0110710	Cumul	0.1-0.5 Lpm	Water	1	Specific	Discolvod	10.1	1 101110	± 10%	
Time	Volume	Purge Rate	Level	Temp.	Conductance	Oxygen	pН	ORP	Turbidity	Comments
	(gal or L)	(gpm or Lpm)	(ft)	(°C)	(µS/cm)	(mg/L)	202	(mv)	(NTŲ)	
				10.4	143.8	9.01	107	64.4	867	
			-	1						
							-			
_		_				_				
						_		-		
_	1				1 1					
								-		
_			_							
							-			
_										
otal Gallo	ons Purged:					Total Casing	Volumes R	emoved:		
nding Wa	ater Level (ft T	OC):				Ending Total	Depth (ft T	0C):		
AMPLE		RY			-	_				
lime	Volume	Bottle Type	Quantity	Filtration	Preservation	Appear	ance		F	Remarks
						Color	Sediment		1.	Ventarika
20	40	QQA	3	N	Ha	mtylu	8.07			
	500	Anna	1		4250		1			
	SPA	ROV	2	¥	1 gray			-		
	250	1917	1	V	J		1	_		
	au	1	1	1	MATO		-		_	
	90	0	d.	Ye	HPVUZ	4	-			
					-					
ETHO	20									
		a chian and a second			NED AN	151		sto!	78	
	s measured w	ith (instrument r	nodel & seri	al number):	pt-19	- IUM	2 W	VIC,	port	ave
arameters		245 Falt	12	MD	1	Decon Equip	ment: A	land	XYWM	the
arameters urging Eq	uipment: 🚅	111	11-1-							
arameters irging Eq sposal of	uipment:	Vater: 6n	52fe	1						

	WATER	SAMPLING I	RECORD			WELL NUM	IBER: M	W-23		Page: 1_of _1_
Project Nam	ne: Han	sville Landfill				Project Nurr	ber:_160	423		
Date:	23/1	1	-			Starting Wa	ter Level (f	t TOC):	11.25	
Sampled by	/:					Casing Sticl	cup (ft):			
Screened In	nterval (ft. T	OC)	-			Casing Dian	(π TOC):	es): 2	4	
Filter Pack !	Interval (ft.	TOC)								
Casing Volu	ume	(ft Wate	r) x	(Lpfv)(gpf) =	(L)(ga)			
Casing volu	mes: 3/4"	= 0.02 gpf	2" = 0.16 gp	f 4"	= 0.65 gpf	6" = 1.47	gpf		Sample Int	ake Depth (ft TOC): Mid - Se
	3/4"= 0	0.09 Lpf 2"	= 0.62 Lpf	4" = 2	2.46 Lpf	6" = 5.56 Lp	əf		_	
PURGING	5 MEASU	REMENTS					1			1
Criteria:		0.1-0.5 Lpm	Stable	ла	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
Time	Cumul. V ol ume	Purge Rate	Water Level	Temp.	Specific Conductance	Dissolved	рН	ORP	Turbidity	Comments
1	(gal or L)	(gpm or Lpm)	(ft)	(°°)	(µS/cm)	(mg/L)		(mv)	(NTU)	
1215	0	-	11.25	-						-Start purge
1220	0.25	0.25	11.45	10.7	185.1	5.36	7.36	415	8	No color odor
1225	0.75	0.2	11 64	10.6	184.5	2.09	7.56	66,3	8	11 7
1230	1.25	0.2	11.69	10.6	184.6	1.38	7.59	66.0	8	h
235	1.75	0.2	11.70	10.6	1848	1.18	7.59	62.7	8	17
1240	2.25	0.2	11.45	10.7	184.8	1.15	7.60	60.8	0	11
1245	2.5	0.2	11.45	10.7	185.1	116	7.59	59.8	8	فر
										Stop Duran college
										Old Polle Caller
									-	
		~								
otal Gallons	s Purged: _					Total Casing	Volumes R	emoved:		
nding Wate	r Level (ft T	-OC): 11,	30			Ending Total	Denth (ft T	00)		
	NVENTO	RY					- opti (it i			•
Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Annear	ance			
						Color	Turbidity &			Remarks
230	40	VOID	2	ter statement	HOL	AR	Sediment			· · · · · · · · · · · · · · · · · · ·
	250	bel	5	11	IIU	TO	5			
++;	C mh	D	1	7		CLEAN				
	500	Paul	4	y	ITN03					
	500	Pay	2							
Y.	200	HMO UN	1	-	1t2504	N.	v			

GROUN	DWATER	SAMPLING F	RECORD			WELL NUM	BER: <u>5</u>	U-7		Page: /_ of
	me Hans	ville Landfill				Project Nu~	ber: 1604	23		
Date:	101231	10				Starting Wa	ter Level (ft	TOC):	/	
Sampled b	y: Didu	TUT	-			Casing Stick	<pre>cup (ft):</pre>		/	
/leasuring	Point of Wel	1				Total Depth	(ft TOC):	/	/	
Screened	Interval (ft. T	00)				Casing Dian	neter (inche	s):	-	
ilter Pack	Interval (ft. 1	OC)	_						Contract States	
Casing Vo	lume	(ft Wate	r) x	(Lpfv)(gpf) =	(L)(ga	I)			
Casing vol	umes: 3/4"=	0.02 gpf	2" = 0.16 gp	f 4"	= 0.65 gpf	6" = 1.47	gpf		Sample Intake	Depth (ft TOC):
	3/4"= 0	.09 Lpf 2"	= 0.62 Lpf	4" = 2	2.46 Lpf	6" = 5.56 L	pf			
PURGIN	G MEASU	REMENTS								
Criteria:		Typical 0.1-0.5 Lpm	Stable	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
Time	Cumul.	Purge Rate	Water	Temp.	Specific	Dissolved	рН	ORP	Turbidity	Comments
	(malor L)	(apm or Lam)	Level (ft)	(10)	Conductance	Oxygen (mg/L)		(m)()	(NTU)	
	and the	Series of Lent/	1	104	150.8	10.59	7.56	624	432	
				10.17	150.0	1	1.50	4-10	110-1	
							-	_		
					1					
	-		-	-				_		
			_					_		
							_			
atal Oct	Do Burne di					Total Contra	Value - D	omerie di		
uai Galio	is Furgea:					rotai Casing	volumes R	ernovea:		-
nding Wa	ter Level (ft T	OC):				Ending Total	Depth (ft T	OC):		
	INVENTO	RY								
Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appear	rance			
			,			Color	Turbidity &		Re	emarks
1115	UD	1121	2		1171		Sediment	_		
1412	70	UUT	3	N	1761	17-1/4	4.52		4	
	200	Ampar	1 12	1	1-1224					
	200	POLY	2	¥	N					
-	250	1		Y	+					
V	5727	*	0	J	HAIDS	Y	10			
	July		a	*	1 11/2		-			
				-				-		
ETHOD	S					1 /	- 1	17	122	1
arameters	measured w	ith (instrument	model & seri	al number	VE-1	15.10	-h-u	hyle	- 22/1	Domp-the
	inmort n	2 A Dam		a number].	15	Daga Fre	A A	tim a.	- Lun	21
	10000000 M	- 10000	11			Decon Equi	pment: 1	nono)	Juar	
urging Equ		000	Eato	2						

GROUN	DWATER	SAMPLING	RECORD			WELL NU	MBER: <u>177</u>	41-6		Page: of _
Project Na	me: Han	sville Landfill				Project Nu	mber:_160	423		
Date:	0/23/19	,				Starting Wa	ater Level (f	t TOC): 7	3.87	
Measuring Point of Well: W TOK.							kup (ft):	/	-	
Screened	nterval (ft. T	OC)	-			Casing Dia	meter (inche	es): 7"		
Filter Pack	Interval (ft.	тос)		_			-			
Casing Vo	ume	(ft Wate	er) x	(Lpfv)(gpf) =	(L)(ga	al)			
Jasing vol	-"umes: 3/4 3/4 = 0	= 0.02 gpf	2" = 0.16 gp	f 4"	= 0.65 gpf	6" = 1.4	7 gpf		Sample Int	take Depth (ft TOC): ///
PURGIN	G MEASU	REMENTS	- 0.02 LDI	4 - 4	2.40 LPI	0 - 5.50 L	.µ			
Criteria:		Typical	Stable	na	+ 3%	+ 10%	+ 0.1	+ 10 mV	+ 10%	
Timo	Cumul.	0.1-0.5 Lpm	Water	Tama	Specific	Dissolved	10.1		± 10%	
TIME	Volume	ruige Rate	Level	Temp.	Conductance	Oxygen	рн	ORP	lurbidity	Comments
1923	6	0.2	73.80		(po/cm)	(mg/L)		(mv)		Clear
1524		y n	72 80	128	3701	102	700	Th	1.77	-104
534			TEXO	12X	374.7	AZD	2.62	7-5-	1.76	
1544			73.80	D.X	325	126	7116	14.0	QUY	
544			72.80	12.8	376 6	0.25	505	74.1	DET	
554			73 811	12,8	3777	() 2)	205	747	10 20	Sinola
				in u	2.05	U. M.A	1.4	11-1	0-20	
									_	
otal Gallor	s Purged:	1.5				Total Casing	Volumes R	emoved:		
		73 :	xa					10-		
nding Wat	er Level (ft T	OC):		_		Ending Total	Depth (ft T	OC):	_	
Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Annea	rance			
						Color	Turbidity &			Remarks
500	110	1204	7	11	11/1	Clarc	Sediment		-	
100	TOP	Andres	2	1	11 VI	-124	U230	_	_	
++	San	Dalu	2	0	17304					
	AND	PULY	d	N	9	-		-		
0	CIA	1		1	11.410	+	1			
	ow	1	d	¥	H103		×	_	_	
									8	
ETHOD	S					100	1.1	1 1	Ibila	a 1.1 - 1
rameters	measured wi	ith (instrument n	nodel & seria	al number <u>):</u>	YSE-re	1,10	1691:m	etr-c	orpre	WLT-roll
irging Equ	ipment: 🔔	stated	pligdd	pomi	5	Decon Equi	pment: 너	lanit	twot	w '
sposal of D	Discharged V	Vater: mc	ste.	, ,						

ł

i

GROUN	DWATER	SAMPLING I	RECORD			WELL NUN	IBER: N	1W-14		Page: 1_ of _1_
Project Na	ame: Hans	sville Landfill				Project Nun	nber: 160-	423		
Date:	10/23/1	2	-	4		Starting Wa	ter Level (f	t TOC): 🙎	1.95	+2 D2
Sampled	by:	IVI NTDC				Casing Sticl	kup (ft):			
Screened	Interval (ft. T	0C)				Total Depth	(ft TOC <u>):</u> neter (inche		9	
ilter Pac	k Interval (ft.	TOC)						zs <u>). c</u>	-	
Casing Vo	olume	(ft Wate	r) x	(Lpfv)(gpf) =	(L)(ga	1)			
Casing vo	lumes: 3/4"=	= 0.02 gpf	2" = 0.16 gp	f 4"	= 0.65 gpf	6" = 1.47	gpf		Sample Int	ake Depth (ft TOC): Mid-Sch
	3/4"= 0	.09 Lpf 2"	= 0.62 Lpf	4" = 2	2.46 Lpf	6" = 5.56 L	of		_	
UKGIN	IG MEASU	REMENTS							_	
Criteria	:	0.1-0.5 Lpm	Stable	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
Time	Cumul. Volume	Purge Rate	Water	Temp.	Specific	Dissolved	рН	ORP	Turbidity	Comments
	(ga) or L)	(gpm or Lpm)	(ft)	(°C)	(µS/cm)	(mg/L)		(mv)	(NTU)	
1530	0	0.2	8195							Start purge
1232	0.25	0.2	81.97	-11.5	297.2	3.36	7.10	84.4	16	No color/Jodor
540	0.5	0.2	61.97	11.4	311.0	097	7.09	85.2	10	n d
545	0.65	0.2	81.97	11.4	305.1	0.58	7.12	80.9	8	11
556	1.0	0.2	82.02	11:4	299.2	0.53	7.13	77.4	8	13
555	1.25	0.2	82 02	11.4	289.8	D.52	7.13	75.0	8	ji
600	1.50	0.2	82.02	11.4	284.4	0.51	7.13	73.5	× ×	. j)
1605	1.75	0.2		11.1	282.1	0.50	7.13	7710	8	11
607						0.02		11.0		STAD DULAD SCALLER
										and fulle - contour
									`	
							_			
tal Calla	Da Burgodi	.) T								
nai Galio	ns Furgeu	213 17 N	<i>A</i> (Total Casing	Volumes R	emoved:		
iding Wa	ter Level (ft ⊤	oc):0 1,	16	_		Ending Total	Depth (ft To	C):		
AMPLE	INVENTO	RY								
Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appear	ance			
			- 14 - I			Color	Turbidity & Sediment			Remarks
10-	40	VOA	6	-	Hel	Clear	8	Dublic	ated	
1010	250	Poly	2	Ч	-	1		- Fill		
	500	1010	4	4	HNO:					
	500	Pold	4	0-						
*	500	intmaker	2	-	HASA	1 =	V			
		1.000	-		17504			0	4	
ETHOD	S				224	Crc	1.		. Lī	1 1 . 1
rameters	measured wi	th (instrument m	odel & seria	l number):	orange y	SI, orar	Je/wh	ite wis	t, blue	turbidimeter
rging Equ	uipment: <u>C</u>	<i>ledicated</i>	bladde	rpum	p 50	Decon Equip	ment: alc	onex t	water	
noool of	Discharged M	lator disc	lanvaad	1	tound					

APPENDIX E

Annual Inspection Forms – Kitsap Public Health District



345 6th Street, Suite 300 Bremerton, WA 98337 360-728-2235

March 27, 2019

Alexis McKinnon Kitsap County Public Works 614 Division Street, MS-27 Port Orchard, WA 98366

RE: HANSVILLE LANDFILL INSPECTION, 2019 1st QUARTER

Dear Ms. McKinnon:

The Kitsap Public Health District (Health District) is writing to relay the results of the 1st quarter inspection of 2019 at the Hansville Landfill. Enclosed please find a copy of the inspection checklist/report for the quarterly inspection conducted on March 26, 2019, at 12:15pm.

The following items were noted or discussed:

- A drone survey of the landfill is planned for this year to determine the number of survey points that will be needed for monitoring the landfill and evaluating any future subsidence.
- The landfill cover was wet due to the rain, but no pooling of water anywhere during the inspection.
- The next inspection is scheduled for June 2019.
- A copy of the inspection form is attached.

If you have any questions or comments, please feel free to contact me at (360) 728-2274.

Sincerely,

Pat Al

Patrick Hamel Environmental Health Specialist Solid and Hazardous Waste Program 360-728-2274 phone patrick.hamel@kitsappublichealth.org

enc: Inspection Checklist





File Name: _

SOLID WASTE FACILITY INSPECTION FORM

Facility	Name: Hausville	Landfill Kit	erator: Courty Public Work	Phone #:	37-5665			
Location of Facility: 7791 NE Ecclopy Rol Palsto								
Inspector: Patrick Hamel Date: Time: [2]								
Type of Inspection Checklist Used: Facility Representative Present:								
Reaso	n for Inspection	Type of Inspection	Results	Sample Taken?				
Sche Retu Com	duled rn plaint	Full Quarterly Brief No Entry	Compliant Non-Compliant Approved	Yes	No			
Perm	it Investigation	Consultation	Disapproved	Attachments? (photos, etc.)				
Sample By Request Other		Plan Review Site Review Other	Other	Yes Type?	No			
Item #	# Description (see attached checklist for complete list of items)							
	· Poudiny in places in surrounding drainpart ditch. Plan to							
	have the distributes cloqued this sparting.							
	· Drove survey to determine survey woints will be							
	conducted this year.							
	VID is sups							
Comments:								

a Signatures: Facility Representative **KPHD** Inspector



345 6th Street, Suite 300 Bremerton, WA 98337 360-728-2235

June 19, 2019

Alexis McKinnon Kitsap County Public Works 614 Division Street, MS-27 Port Orchard, WA 98366

RE: HANSVILLE LANDFILL INSPECTION, 2019 2nd QUARTER

Dear Ms. McKinnon:

The Kitsap Public Health District (Health District) is writing to relay the results of the 2nd quarter inspection of 2019 at the Hansville Landfill. Enclosed please find a copy of the inspection checklist/report for the quarterly inspection conducted on June 17, 2019, at 1:00pm.

The following items were noted or discussed:

- The landfill cover was dry and covered with tall grass and several blackberry bushes. The cap and access roads need mowing. As discussed, it is scheduled for mid-July after drone survey work completed.
- Manual survey will be conducted after the drone survey is complete.
- The next inspection is scheduled for September 2019.
- A copy of the inspection form is attached.

If you have any questions or comments, please feel free to contact me at (360) 728-2274.

Sincerely,

Pot that

Patrick Hamel Environmental Health Specialist Solid and Hazardous Waste Program 360-728-2274 phone patrick.hamel@kitsappublichealth.org

enc: Inspection Checklist





SOLID WASTE FACILITY INSPECTION FORM

HANSVILLE	CANDEILL K	erator: ITSAP COUPTY PUBLIC .	Phone #	: 360-337-5665
Facility: 779 (NE)	ECCLOGY RD. POL	JLSBO		
HTRICH H	Da	te: 6-17-19	Time: /	:00pm
ection Checklist	t Used: Fac	cility Representative Present:		
r Inspection	Type of Inspection	Results	Sampl	e Taken?
d nt	Full Quarterly Brief No Entry	Compliant Non-Compliant Approved	Yes	No
vestigation	Consultation	Consultation Disapproved		ts? (photos, etc.)
est	Plan Review Site Review Other	Other	Yes Type?	<u>No</u>
scription (see a	ttached checklist for complet	e list of items)		Correction Date
Landfill c	ap & access voails l	ned fall were grass i	t some	JU17212
blackberry	bush growth. schede	uled for cutting in	mid-	1
July. Con	net survey crew ac	HVA WORK being down	p.	
Initial sur	very will be love,	secondary survey will	he dowe	
maxvally				
	e: $A \rightarrow V T \perp E$ Facility: $779 \mid N \equiv 1$ $T \land T \land$	e: Op HAMSVILLE LANDFILL M Facility: 7791 NE ECCLOGY RD. Pon Da TRICH HAMEL ection Checklist Used: Fac Type of Inspection dUll Quarterly Brief atNo Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry vestigationConsultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation No Entry Consultation Site Review 	e: Operator: HAMSVILLE LANDFILL MITSAP COUPTY PUBLIC O Facility: 7791 NE ECCLOCY RD. POULSBO Date: 7791 NE ECCLOCY RD. POULSBO Plan Review Other 910 Network Other 910 Network Other 910 Network Scheduled for cotting in 7791 Net Survey and Scheduled for cotting in 7791 Network Scheduled for cotting in 7791 Network Scheduled for cotting in 7791 Network Scheduled for c	e: Operator: Phone # HALSVILLE LANFILL NETSAP COUPTY PUBLIC wolks actility: 7791 NE ECCLOCY RD. POULSBO Date: -17-19 Time: 1 PRTCA HAMEL E Facility Representative Present: TINSPECTION Type of Inspection Results Sampl dUll QuarterlyCompliantYes Inspection Type of Inspection Results Sampl dUll QuarterlyCompliantYes BriefNon-CompliantYes Non-CompliantYes Non-CompliantYes Non-CompliantYes Site ReviewOtherYes Site ReviewOtherYes Site ReviewOtherYes ConsultationDisapproved Attachmen Plan ReviewOtherYes Site ReviewOtherYes Site ReviewOtherYes LandFill cap & access roads had fall useds guest & some blackbory bush growth. Scheduled for cotting in mid- Survey will be dowly secondary survey will be dowle maxually

Comments: ______ other issues,

File Name: _____

a 6-17-19 mor Signatures: Facility Representative **KPHD** Inspector

1



345 6th Street, Suite 300 Bremerton, WA 98337 360-728-2235

October 2, 2019

Alexis McKinnon Kitsap County Public Works 614 Division Street, MS-27 Port Orchard, WA 98366

RE: HANSVILLE LANDFILL INSPECTION, 2019 3rd QUARTER

Dear Ms. McKinnon:

The Kitsap Public Health District (Health District) is writing to relay the results of the 2nd quarter inspection of 2019 at the Hansville Landfill. Enclosed please find a copy of the inspection checklist/report for the quarterly inspection conducted on October 1, 2019, at 12:00pm.

The following items were noted or discussed:

- The landfill cover was in good condition but in need of mowing. The ditch surrounding the landfill had considerable amounts of vegetative growth and needs to be cleaned out.
- The survey monuments have been installed and another survey will be conducted in approximately two years to measure any potential subsidence.
- The next inspection is scheduled for December 2019.
- A copy of the inspection form is attached.

If you have any questions or comments, please feel free to contact me at (360) 728-2274.

Sincerely,

Pet that

Patrick Hamel Environmental Health Specialist Solid and Hazardous Waste Program 360-728-2274 phone patrick.hamel@kitsappublichealth.org

enc: Inspection Checklist





SOLID WASTE FACILITY INSPECTION FORM

Facility Name:	O ANDETIL	perator: Kitica (mat Public wa	Phone #: (360) 737-5665	
Location of Facility: 7791 N	E Ecolus Rol	Palsho		
Inspector: Paturch Ham	Di Di	ate: 10/1/19	Time:	
Type of Inspection Checklis	st Used: Fa	acility Representative Present:		
Reason for Inspection	Type of Inspection	Results	Sample Taken?	
Scheduled Full Quarterly Return Brief Complaint No Entry Permit Investigation Consultation Sample Plan Review By Request Site Review Other Other		Compliant Non-Compliant Approved Disapproved Other	Yes No Attachments? (photos, etc.) Yes Type?	
Item # Description (see a	uttached checklist for comple used of cleaning out o	ete list of items) fold brush grouth.	Correction Date 1)/30/29	
Comments: · Survey · Diferes	moruments complete. stanting to Fill in.	Clean out when possib	.le,	
Signatures: AM Fa	chin non acility Representative	K	/ <i>U- 1- 19</i> PHD Inspector	



345 6th Street, Suite 300 Bremerton, WA 98337 360-728-2235

December 11, 2019

Alexis McKinnon Kitsap County Public Works 614 Division Street, MS-27 Port Orchard, WA 98366

RE: HANSVILLE LANDFILL INSPECTION, 2019 4th QUARTER

Dear Ms. McKinnon:

The Kitsap Public Health District (Health District) is writing to relay the results of the 4th quarter inspection of 2019 at the Hansville Landfill. Enclosed please find a copy of the inspection checklist/report for the quarterly inspection conducted on December 11, 2019, at 12:30pm.

The following items were noted or discussed:

- The landfill cover was in good condition and the surrounding ditch did have some water in it but seemed to be draining as intended.
- The native soil wells have been disconnected and capped.
- The next inspection is scheduled for March 2020.
- A copy of the inspection form is attached.

If you have any questions or comments, please feel free to contact me at (360) 728-2274.

Sincerely,

Pat that

Patrick Hamel Environmental Health Specialist Solid and Hazardous Waste Program 360-728-2274 phone patrick.hamel@kitsappublichealth.org

enc: Inspection Checklist





SOLID WASTE FACILITY INSPECTION FORM

Facility Name:	LLE LANDFILL (Operator: KETSAP COURTY PUB	Phone #:	360-337-5665
Location of Facility:	NE FOULLY RD	Paulisad		
Inspector: PATRICH	HAMEL	Date: (2/10)/9	Time:	2:30
Type of Inspection Checklis	st Used:	Facility Representative Present:	R.	
Reason for Inspection	Type of Inspection	Results	Sample	e Taken?
Scheduled Return Complaint	Full Quarterly Brief No Entry	Compliant Non-Compliant Approved	Yes	No
Permit Investigation	Consultation	Disapproved	Attachment	s? (photos, etc.)
Sample By Request Other	Plan Review Site Review Other	Other	Yes Type?	No
Item # Description (see a	uttached checklist for compl	lete list of items)		Correction Date
	NO ISSUES.			
Comments:N	tive Soil wells ha	I ber decersioned.	dos conneu	(a) + cyper.
	t Sh	l.	ntl	
Signatures:F	acility Representative	/a) /k	PHD Inspector	

File Name: _____

APPENDIX F

Memorandum: Hansville Landfill – Minor Changes to Landfill Gas Collection



MEMORANDUM

Project No. 160423

February 21, 2020

To: Ronald Timm, Washington Department of Ecology Patrick Hamel, Kitsap Public Health District

cc: Alexis McKinnon, Kitsap County Solid Waste Pat Campbell, Kitsap County Solid Waste Phillip Perley, Waste Management of Washington, Inc.

From:

Pat St

Peter Bannister, PE Associate Engineer pbannister@aspectconsulting.com

Re: Hansville Landfill – Minor Changes to Landfill Gas Collection

Aspect Consulting, LLC (Aspect) has prepared this memorandum to describe minor changes in landfill gas collection at the Hansville Landfill on behalf of Kitsap County Solid Waste and Waste Management of Washington, Inc. (Clients). An active landfill gas collection system operates at the Hansville Landfill as part of the ongoing cleanup actions under an amended consent decree (No. 95-2-03005) with the Washington State Department of Ecology. A map of the landfill gas collection system layout is provided on Figure 1. The minor changes involved temporarily decommissioning perimeter gas collection wells. These changes are aimed at optimizing landfill gas collection in alignment with the Hansville Landfill Post Closure Permit for 2015 to 2020 (Kitsap Public Health District, 2015) and the Hansville Landfill Compliance Monitoring Plan (SCS Engineers, 2011).

Background

During landfill closure, the landfill gas collection system was installed in three distinct locations (see Figure 1):

- 1. The Solid Waste Disposal Area included 13 vertical wells (R-1 through R-13) and a network of horizontal trench collectors (T-1 through T-7).
- 2. The Demolition Waste Disposal Area included one horizontal trench collector (TD-1).
- 3. The western perimeter of the Solid Waste Disposal Area included shallow and deep vertical wells at five locations, for a total of 10 wells (NS-1S, NS-1D, NS-2S, NS-2D, NS-3S, NS-3D, NS-4S, NS-4D, NS-5S, and NS-5D).

Kitsap County Solid Waste Waste Management of Washington, Inc. February 21, 2020

A description of perimeter landfill gas collection was provided in Section 2.2.2 of the Remedial Investigation Report (Parametrix, 2006):

The perimeter gas wells, installed in the native soils, were designed to remove the gas that had previously migrated from the solid waste disposal area, provide a second line of defense should future gas escape from the Landfill, and to serve as vapor extraction wells to remove VOCs from the surrounding soils and groundwater. The in-refuse wells were installed to a depth of approximately 80% to 90% of the projected refuse depth. The native soil wells extended to depths of approximately 40 to 45 ft below the projected refuse depth...

Within the first 6 months of operation of the gas system, it became necessary to reduce the vacuum in most of the extraction wells on the Property (including the perimeter gas wells) as a result of the reduced gas flow. By June 1993, it became necessary to close the perimeter wells to ensure that the flare had enough high quality gas to burn continuously and efficiently.

Additional modifications to the gas system were completed June 8, 1994. These modifications separated the perimeter gas extraction well flow from the in-refuse gas extraction and trench flow. The perimeter wells were intended to be operated at a stronger vacuum to improve cleanup of the groundwater. The flow from the perimeter wells was almost entirely air. The flow from the perimeter wells was piped into the flare above the landfill gas ignition point to ensure that any VOCs in the perimeter well flow were also combusted.

The perimeter gas extraction system was turned off in 1995 when it was determined that the zone of influence of the in-refuse well was extending to the perimeter wells, as indicated by recorded vacuum, level in the perimeter wells.

Recent Observations

In January 2017, Aspect observed that the perimeter gas wells were under vacuum, and oxygen concentrations typically reflected atmospheric air. On March 31, 2017, valves at perimeter gas wells were closed to redirect vacuum to in-refuse landfill gas collection locations (Aspect, 2017). Landfill gas migration control was maintained based on compliance probe monitoring. Over time, it became apparent that several of the 26-year-old valves were occasionally leaking and landfill gas was unintentionally being collected.

Decommissioning Perimeter Gas Wells

After discussing the benefits and costs of repairing or replacing valves, the Clients decided to temporarily decommission the perimeter gas wells. This work was completed in October 2019 by cutting and capping the polyvinyl chloride (PVC) piping at each of the 10 perimeter gas wells and the laterals from the landfill gas collection system. Photographs of decommissioned perimeter locations are provided in Appendix A; several locations were photographed before and after decommissioning. The perimeter wells will be fully decommissioned in accordance with Chapter 173-160 Washington Administrative Code (WAC): *Minimum Standards for Construction and Maintenance of Wells*.

Kitsap County Solid Waste Waste Management of Washington, Inc. February 21, 2020

MEMORANDUM Project No. 160423

References

- Aspect Consulting, LLC (Aspect), 2017, Letter Re: First Quarter 2017 Environmental Monitoring Report, Hansville Landfill, Kitsap County, WA, May 30, 2017.
- Kitsap County Public Health, 2015, Letter Re: Hansville Landfill Port Closure Permit 2015 to 2020, February 5, 2015.
- Parametrix, 2006, Hansville Landfill Remedial Investigation/Feasibility Study Remedial Investigation Report, Public Review Draft, September 22, 2006.

SCS Engineers, 2011, Hansville Landfill Compliance Monitoring Program, September 2011.

Limitations

Work for this project was performed for the Kitsap County Solid Waste and Waste Management of Washington, Inc. (Clients), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Clients apply only to the services described in the Agreement(s) with the Clients. Any use or reuse by any party other than the Clients is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Attachments: Figure 1 – Landfill Gas System Appendix A – Photographs of Decommissioned Perimeter Locations

V:\160423 Kitsap County Hansville Landfill\Deliverables\2019 Reports\Perimeter Well Update\Hansville_MinorChangesLFGCollection_FINAL_20200221.docx

FIGURES



APPENDIX A

Photographs of Decommissioned Perimeter Locations



Photograph 1. Decommissioned NS-1 Location



Photograph 2. Decommissioned NS-2 Location



Photograph 3. NS-3 Location before decommissioning



Photograph 4. Decommissioned NS-3 Location



Photograph 5. NS-4 Location before decommissioning



Photograph 6. Decommissioned NS-4 Location


Photograph 7. NS-5 Location before decommissioning



Photograph 8. Decommissioned NS-5 Location