



Verification Report

Morehead Landfill

Morehead, Kentucky

Reserve Project ID: CAR592

Reporting Period:

March 1, 2018 to February 28, 2019

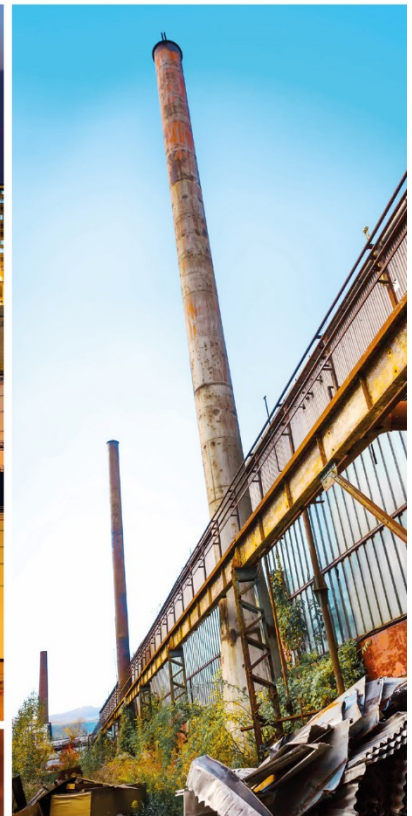
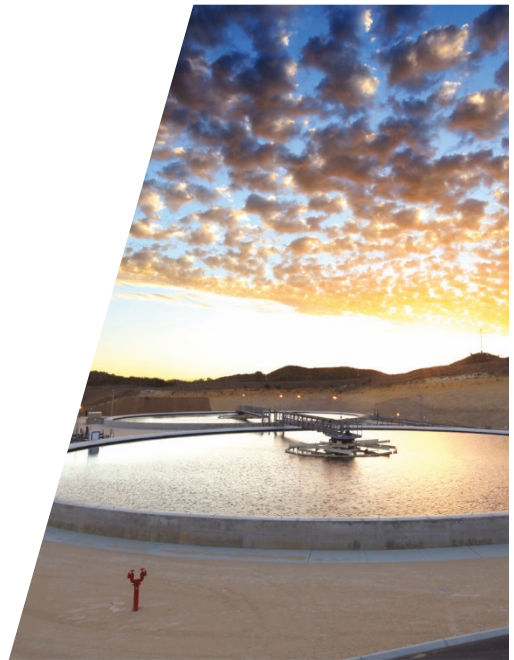
Pursuant to:

Climate Action Reserve Voluntary Offset Program
Landfill Project Protocol

Presented to:

Advanced Disposal Services Morehead Landfill, Inc.

Element Markets





Executive Summary

GHD Services Inc. (GHD) was engaged by Element Markets (Technical Consultant) and Advanced Disposal Services Morehead Landfill, Inc. (Project Developer or PD) to conduct greenhouse gas (GHG) offset verification services for the "Morehead Landfill" Project (Project) under the Climate Action Reserve's (the Reserve) Voluntary Offset Program. The Project is located in Morehead, Kentucky (Facility or Site). The Reserve Project ID for the Project is CAR592.

The GHG offset verification services were completed for the Project by GHD pursuant to the Reserve's Verification Program Manual, dated February 8, 2017 and in accordance with the Landfill Project Protocol Version 4.0 (Protocol), dated June 29, 2011.

This verification covers reported emission reductions claimed by the Project Developer during the reporting period of March 1, 2018 to February 28, 2019.

For the March 1, 2018 to February 28, 2019 reporting period, the Project claimed 26,095 metric tonnes CO₂e emission reductions in accordance with the Protocol. GHD completed the verification in accordance with the Protocol. The verification was conducted by GHD to a reasonable level of assurance. The verification criteria were selected per the Protocol and associated guidance documents. GHD determined, with a reasonable assurance, that the reported emission reductions are free of offset material misstatement and result in the issuance of a Positive Offset Verification Statement for the emission reductions.



Table of Contents

1.	Introduction.....	1
2.	Verification Procedures and Methodology	1
2.1	Verification Objective	1
2.2	Verification Standard.....	1
2.3	Verification Criteria.....	1
2.4	Verification Team.....	2
2.4.1	Roles and Responsibilities	2
2.4.2	Team Member Qualifications.....	2
2.5	Verification Methodology.....	3
2.5.1	Notification of Verification Activities and COI Form.....	3
2.5.2	Verification Plan and Project Kick-Off	3
2.5.3	Document Review.....	3
2.5.4	Site Visit.....	4
2.5.5	Senior Internal Review	4
2.6	Level of Assurance	4
2.7	Materiality Threshold.....	4
2.7.1	Quantitative Materiality Threshold.....	4
2.7.2	Qualitative Materiality Threshold	5
3.	Project Description	5
4.	Eligibility	5
4.1	Location	5
4.2	Project Start Date.....	5
4.3	Project Crediting Period	6
4.4	Additionality.....	6
4.4.1	The Performance Standard Test	6
4.4.2	The Legal Requirement Test	6
4.5	Regulatory Compliance.....	7
4.6	Registration with other Registries	8
5.	Conformance with the Protocol	9
5.1	GHG Assessment Boundary.....	9
5.2	Quantifying GHG Emission Reductions.....	9
5.2.1	Baseline Emissions	9
5.2.2	Project Emissions	9
5.3	Project Monitoring	9
5.3.1	Monitoring Requirements	10
5.3.2	Instrument QA/QC	11
5.3.3	Other Monitoring Requirements	13



Table of Contents

5.3.4	Data Substitution	14
5.4	Calculation Review and Sampling	14
5.5	Findings and Basis of Opinion	17
5.5.1	Quantitative Materiality Threshold	17
5.5.2	Qualitative Materiality Threshold	18
5.5.3	Findings and Basis of Opinion	18
6.	Verification Statement and Closing	19

Table Index

Table 2.1	Quantitative Materiality Threshold	4
Table 5.1	Baseline Calculation Parameters	9
Table 5.2	Instrument Monitoring Requirements	10
Table 5.3	Instrument QA/QC	11
Table 5.4	Data Substitution	14
Table 5.5	Risk Assessment	14
Table 5.6	Sampling Plan	16
Table 5.7	Project Developer GHG Reductions Estimation	18
Table 5.8	GHD's GHG Reductions Estimation	18

Appendix Index

Appendix A	Offset Verification Statement
------------	-------------------------------



1. Introduction

GHD Services Inc. (GHD) was engaged by Element Markets (Technical Consultant) and Advanced Disposal Services Morehead Landfill, Inc. (Project Developer or PD) to conduct greenhouse gas (GHG) offset verification services for the "Morehead Landfill" Project (Project) under the Climate Action Reserve (the Reserve)'s Voluntary Offset Program. The Project is located in Morehead, Kentucky (Facility or Site). The Reserve Project ID for the Project is CAR592.

The GHG offset verification services were completed for the Project by GHD pursuant to the Reserve's Verification Program Manual, dated February 8, 2017 and in accordance with the Landfill Project Protocol Version 4.0 (Protocol), dated June 29, 2011.

This verification covers reported emission reductions claimed by the Project Developer during the reporting period of March 1, 2018 to February 28, 2019. The crediting period is from December 3, 2009 to December 2, 2019. GHD is an accredited verification body under the Reserve's Voluntary Offset Program.

2. Verification Procedures and Methodology

2.1 Verification Objective

The objective of the verification is to provide Element Markets and the Reserve with an opinion on whether the Project's reporting period contains any material discrepancies and whether the Climate Reserve Tonnes (CRTs) were determined in accordance with the Reserve requirements detailed in the Protocol and Program Manual (as detailed below).

2.2 Verification Standard

The verification was conducted to the standards set out in ISO 14064 and the following documents:

- Reserve Offset Program Manual, Climate Action Reserve, dated November 12, 2019.
- Reserve Offset Program Manual Summary of Changes, Climate Action Reserve, dated November 12, 2019.
- Landfill Project Protocol Version 4.0, Climate Action Reserve, dated June 29, 2011 (Protocol).

2.3 Verification Criteria

GHD adhered to the requirements outlined in the followings documents as verification criteria:

- ISO 14064-3:2006 Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions, ISO, March 2006 (ISO 14064-3)
- ISO 14065:2013 – Greenhouse Gases – Requirements for greenhouse gas validation and Verification Bodies for use in accreditation or other forms of recognition
- Reserve Offset Program Manual, Climate Action Reserve, dated November 12, 2019.
- Reserve Offset Program Manual Summary of Changes, Climate Action Reserve, dated November 12, 2019.



- Landfill Project Protocol Version 4.0, Climate Action Reserve, dated June 29, 2011 (Protocol).

2.4 Verification Team

2.4.1 Roles and Responsibilities

Lead Verifier – Jason Clarke, P.Eng. – Mr. Clarke led the verification and was responsible for development of the verification plan. Mr. Clarke reviewed the risk assessment, recalculation of raw data, data management and draft findings. Mr. Clarke prepared and signed the verification statement and verification report. Mr. Clarke conducted a Site visit of the facility.

Verifier – Callie Churchill, B.Eng. – Ms. Churchill developed and revised the verification plan and sample plan, developed a risk assessment, recalculated raw data, reviewed management of data quality and prepared draft findings. Ms. Churchill conducted a Site visit of the facility.

Senior Internal Reviewer – Michelle Hirst – Ms. Hirst conducted a peer review of the verification plan, risk assessment, verification report and findings.

2.4.2 Team Member Qualifications

The team member qualifications are detailed below.

Jason Clarke	Role: Lead Verifier
Professional Summary Mr. Clarke is a Professional Engineer registered in Ontario and has been with GHD since 2012. Mr. Clarke has practical and facility-specific experience associated with a range of greenhouse gas (GHG) validation and verification activities. Mr. Clarke is also Lead Verifier for the verification of a variety of Ontario based facilities under O. Reg. 452/09 and 390/18. Further, Mr. Clarke has been a validation/verification team member for a variety of GHG Validation and Verification projects registered under ANSI and UNFCCC Clean Development Mechanism (CDM). Mr. Clarke has been involved in the preparation of GHG Validation and Verification plans, issues logs, draft and final validation/verification reports, and findings assessments for various GHG projects associated with the Ontario Ministry of the Environment and Parks (MECP), ANSI, TCR, Massachusetts Department of Environmental Protection (MassDEP), Verra (VCS), and the UNFCCC CDM. Jason also has experience with the internal and external auditing related to GHG Verification and Validation projects in Ontario, Quebec, Alberta, British Columbia, and Massachusetts. Mr. Clarke is an ARB accredited Lead Verifier and Offset Project Specialist for livestock and ODS projects, and a CAR accredited Lead Verifier and Landfill Project Specialist. In addition, Mr. Clarke is a CAR accredited Team Leader under the Climate Forward program.	

Callie Churchill	Verification Team Role: Verifier
Professional Summary Ms. Churchill is a Junior Engineer at GHD and graduated from the University of Guelph with a Bachelor's Degree in Environmental Engineering. Ms. Churchill has been with GHD since 2016. Ms. Churchill has greenhouse gas validation and verification experience under the Alberta Environment and Parks Specified Gas Reporting Regulation, Ontario Regulation 390/18, the British Columbia Reporting Regulation, the Alberta Emissions Offset Registry, the California Air Resources Board, and the UNFCCC Clean Development Mechanism. Ms. Churchill has been involved in the preparation of verification plans, sampling plans, calculation workbooks, verification reports, and findings assessments for the projects.	



Michelle Hirst

Verification Team Role: Senior Internal Reviewer

Professional Summary | Ms. Hirst holds a Master of Science in Environmental Governance from the Albert-Ludwig Universität in Germany and a Bachelor of Environmental Science (Hons.) from The University of Newcastle in Australia. Ms. Hirst has held roles in greenhouse gas teams in Germany, Canada, and the USA. Ms. Hirst has over 8-years of experience preparing emission reports, as well as verifying offset projects and emission reports. Her capabilities have involved verifying fugitive emissions, ozone depleting substances, forestry, mine methane capture, and livestock offset projects under the ARB, Climate Action Reserve (CAR), American Carbon Registry (ACR), and Verra (formerly Verified Carbon Standard), as well as verifying emission reports submitted under the British Columbia (BC) Reporting Regulation, Alberta Environment and Parks (AEP) Specified Gas Emitters Regulation (SGER), and Ontario Regulation (O.Reg.) 390/18 in Canada, and corporate emission reports submitted under the Global Reporting Initiative.

Ms. Hirst is an ARB accredited Lead Verifier and Offset Project Specialist for livestock, mine methane capture and ODS projects, and a CAR accredited Lead Verifier and Landfill Project Specialist. In addition, Ms. Hirst is accredited by the Climate Action Reserve as a Team Leader in the Climate Forward program.

2.5 Verification Methodology

2.5.1 Notification of Verification Activities and COI Form

GHD submitted the Notification of Verification Activities and Request for Evaluation for Potential Conflict of Interest (NOVA/COI) form to the Reserve Project Database on July 22, 2019. Approval from the Reserve for verification activities to proceed was provided on July 30, 2019.

2.5.2 Verification Plan and Project Kick-Off

GHD prepared and submitted the Verification Plan to the Project Developer and Technical Consultant on August 1, 2019.

The kick off call was held on August 1, 2019 and attended by Julia Guarino (Technical Consultant), Bill Reynolds (Technical Consultant), Curtis Jarrell (Project Developer), Jason Clarke (GHD), and Callie Churchill (GHD).

2.5.3 Document Review

The GHD Project Team's document review during the review process included, but was not limited to, an evaluation of whether or not:

- The documentation is complete and comprehensive and follows the structure and criteria given in the Program Manual, Protocol, and its associated guidance.
- The methodologies are justified and appropriate.
- The assumptions behind the inventory are conservative and appropriate.
- The GHG emission calculations are appropriate and use conservative assumptions for estimating GHG emissions.
- The GHG information system and its controls are sufficiently robust to minimize the potential for errors, omissions, or misrepresentations
- The Facility GHG calculations are justified and appropriate.



2.5.4 Site Visit

A Site visit was conducted by Mr. Jason Clarke and Ms. Callie Churchill of GHD on August 27, 2019. During the Site visit, GHD interviewed Project personnel (Curtis Jarrell) involved in the development of the Project Design Document (PDD), witnessed the Project's operations, and inspected data management systems. The following personnel were present at all times during the Site visit: Curtis Jarrell (Project Developer), Jason Clarke (GHD), and Callie Churchill (GHD).

Further to the Site Visit, GHD also interviewed Zack Ankney (MCC) to discuss the issues associated with the continuous gas analyzer.

2.5.5 Senior Internal Review

GHD's Senior Internal Reviewer reviewed the Verification Report, Verification Statement, and the List of Findings prior to issuing the Final Verification Report and Verification Statement to the PD or the Reserve.

2.6 Level of Assurance

GHD conducted the verification to a reasonable level of assurance.

2.7 Materiality Threshold

Per the Verification Program Manual, "A *materiality threshold* is used to assess an error, omission, or misstatement that may impact the GHG assertion made by a project developer. This threshold is also known as the "minimum quality standard" and differentiates those errors, omissions, or misstatements that are considered by the Reserve to be significant from those that are insignificant."

The materiality threshold has both a quantitative and qualitative aspect, as outlined below.

2.7.1 Quantitative Materiality Threshold

Table 2.1 below outlines the quantitative materiality thresholds.

Table 2.1 Quantitative Materiality Threshold

CRTs registered over a 12-month period	Required accuracy level
≤25,000	>95%
>25,000	>97%
>100,000	>99%

The Project falls into the second category outlined above (>25,000 CRTs) therefore the required accuracy level for this verification is greater than 97 percent.

Percent error is defined by the following:

$$\% \text{ Error} = \text{abs}\left(\frac{\text{Stated Reductions} - \text{Verified Reductions}}{\text{Verified Reductions}}\right) \times 100$$

The accuracy level is defined by the following:

$$\text{Accuracy} = 100\% - \% \text{ Error}$$



These equations will be utilized below in the quantification of the accuracy level of the verification to determine if the Project meets the materiality threshold and be issued a positive Verification Statement.

2.7.2 Qualitative Materiality Threshold

Per the Verification Program Manual, *"A qualitative non-conformance occurs when a prescriptive protocol requirement (e.g., metering, monitoring, management systems, record-keeping, etc.) is not met."* and *"A prescriptive requirement is defined as any specific guidance mandated by the protocol that does not allow for deviation, variance or verifier professional judgement."*

All qualitative non-conformances must be corrected for GHD to be able to issue a positive Verification Statement.

3. Project Description

GHD understands Element Markets is the Technical Consultant, and Advanced Disposal Services Morehead Landfill, Inc. is the Project Developer. The Project utilizes the Reserve's *Landfill Project Reporting Protocol, Version 4.0 (June 29, 2011)*.

The landfill gas collection and combustion system (LFGCCS) consists of twenty-four (24) wells (both horizontal and vertical) and one open flare. No pre-project destruction of methane occurred at the Site. Drilling was completed in April 2009 and installation of laterals and headers were completed in June 2009, however the system was not brought online until December 3, 2009. The Project is not a bioreactor project.

4. Eligibility

The following sections outline how the Project meets the eligibility requirements of the Protocol.

4.1 Location

The Project landfill is located in Morehead, Kentucky, United States, and therefore eligible under the Protocol. GHD verified the location during the Site Visit on August 27, 2019.

4.2 Project Start Date

GHD reviewed the start date requirements for the Project and confirmed that they are in accordance with the Protocol and associated Reserve requirements. GHD notes that prior to the Project start date it was verified that there was no LFGCCS and associated destruction device installed. Methane was first destroyed in a Project device on December 3, 2009 as evidenced by a flare start-up invoice from Shaw LFG Specialties, LLC who was the flare skid installer. Therefore, the Project start date is December 3, 2009 which also represents the start of the Project reporting and the beginning of the Project crediting period. GHD confirmed that the Project has been registered with the Reserve from the initial reporting period to the current reporting period.



4.3 Project Crediting Period

The crediting period for the Project is ten (10) years. The crediting began at the Project start date of December 3, 2009 and extends until December 2, 2019. The current reporting period of March 1, 2018 to February 28, 2019 falls within the current Project crediting period.

4.4 Additionality

The following sections demonstrate that GHG reductions are additional to what would have occurred in the absence of a carbon offset market.

4.4.1 The Performance Standard Test

The Project involves the following project activity:

- Installation of a landfill gas collection and control system (LFGCCS) and a new qualifying destruction device at an eligible landfill where landfill gas (LFG) has never been collected and destroyed prior to the project start date.

GHD verified that the landfill did not have a historic LFGCCS prior to the Project start date through interviews with the Project personnel (Curtis Jarrell and Julia Guarino), review of historic documentation (flare start-up invoice), and review of historic aerial photographs of the Project Site. GHD notes that the Project destroys LFG through a flare and does not generate electricity, therefore the performance standard size threshold does not apply to this Project.

4.4.2 The Legal Requirement Test

Federal Regulations

There are several United States Environmental Protection Agency (EPA) regulations for municipal solid waste (MSW) landfills that impact eligibility on this Project as part of the Legal Requirement Test, including the following:

- New Source Performance Standards (NSPS) for MSW Landfills, codified in 40 CFR 60 subpart WWW – Targets landfills that commenced construction or made modifications after May 1991
- New Source Performance Standards (NSPS) for MSW Landfills, codified in 40 CFR 60 subpart XXX
- Emission Guidelines (EG) for MSW Landfills, codified in 40 CFR 60 subpart Cc. – Targets existing landfills that commenced construction before May 30, 1991, but accepted waste after November 8, 1987
- The National Emission Standards for Hazardous Air Pollutants (NESHAP), codified in 40 CFR 63 subpart AAAA – Regulates new and existing landfills

GHD reviewed the Summary Report for New Source Performance Standards Tier 2 Sampling, Analysis, and Landfill NMOC Emission Estimates applicable to the Project and prepared by SCS Engineers dated September 30, 2016 which is valid for calendar years 2016 through 2020. NSPS regulations state that Tier 2 site-specific NMOC concentration is valid for a period of five years, or until NMOC emissions are estimated to be greater than 50 Mg/year, whichever occurs first. The emission estimates demonstrate that the 50 Mg NMOC threshold per NSPS Subpart WWW will not be exceeded at the Site prior to 2021. In addition, the NMOC emissions will remain below the 34 Mg



threshold per NSPS Subpart XXX. Therefore, a LFGCCS is not required to be installed and operating, therefore, the Site meets the legal requirement test. Per the Project's Title V Operating Permit No. V-18-045, 40 CFR 60 subpart WWW applies to the Project, therefore the NMOC threshold is 50 Mg per year.

The Summary Report for New Source Performance Standards Tier 2 Sampling, Analysis, and Landfill NMOC Emission Estimates states a waste design capacity of 6,984,246 short tons, which equates to 6,336,001 megagrams (Mg), which means the landfill is subject to the NSPS or EG rules. State and Local Regulations, Ordinances, and Permitting Requirements

GHD reviewed the following Kentucky regulations associated with landfills along with the permits that were associated with the Project:

- 401 KAR 47:030 – Environmental Performance Standards
- 401 KAR 47:120 – Conditions applicable to all solid waste permits
- 401 KAR 48:070 – Design requirements for contained landfills
- 401 KAR 48:090 – Operating requirements for contained landfills

Additional local and state regulations were also reviewed to ensure an exhaustive review was completed. Further details regarding regulatory compliance are provided in the following section.

4.5 Regulatory Compliance

GHD has reviewed the Project Developer's Attestation of Regulatory Compliance for the reporting period, which was signed by the PD on August 1, 2019. GHD also reviewed the Attestation of Title and Attestation of Voluntary Implementation for the reporting period, signed on August 1, 2019 and August 1, 2019, respectively.

GHD confirms that the Attestation of Regulatory Compliance, Attestation of Title, and Attestation of Voluntary Implementation have been completed correctly for the reporting period March 1, 2018 to February 28, 2019, and signed by a representative from Advanced Disposal Services Morehead Landfill, Inc.

The following permits were provided to GHD for review:

- Kentucky Pollutant Discharge Elimination System (KPDES) Permit No. KY0094749, valid from April 1, 2016 to March 31, 2021.
- Title V Operating Permit No. G-12-001 issued February 19, 2013 and expired February 19, 2018.
- Annual Compliance Certification: January 1, 2018 through December 31, 2018 for Title V Operating Permit Number G-12-001.
- Title V Operating Permit No. V-18-045 issued May 16, 2019 and expires May 16, 2024.
- Morehead Utility Plant Board Industrial User Permit No. 002-18, valid from April 1, 2018 to March 31, 2019. GHD reviewed a letter dated February 13, 2018 that states the permit would expire March 31, 2018, which confirms the Facility had a permit covering March 2018.



- Kentucky Energy and Environment Cabinet Department for Environmental Protection Division of Waste Management, Solid Waste Permit No. SW10300007, valid from July 1, 2017 to June 30, 2022.

GHD identified that there appeared to be a gap in the Title V permitting period from February 19, 2018 when the historic permit expired to May 16, 2019 when the new permit was issued. This was discussed with the Technical Consultant and subsequently the Project Developer. It was identified that the Site submitted the application for permit renewal in August 2017 to replace the historic permit and therefore the historic permit was valid through until the permit was renewed on May 16, 2019.

In addition to confirming regulatory compliance at the state level, GHD performed a search of the US Environmental Protection Agency Enforcement and Compliance History Online (ECHO) database on September 5, 2019 and identified there were "Other Violations" identified under the Clean Water Act (CWA) Permit No. KY0094749 for the reporting period. GHD reviewed the "Other Violations" and identified that there multiple "Other Violations" associated with the Clean Water Act (e.g. total suspended solids and iron). Based on the review of the violations and discussions with the Project Proponent, GHD identified that the violations are associated with surface water effluent discharge. A Notice of Violation dated October 3, 2019 was provided to GHD as an example. The Notice of Violation covered non-compliances per Permit No. KY0094749. The PD stated these non-compliances are ongoing and the landfill will not be back in compliance until the pollutant concentrations fall back under the permitted discharge limits for surface water. GHD reviewed the PD's response to the Kentucky Department of Environmental Protection (KDEP) regarding the NOV, and the subsequent response from KDEP stating that the corrective actions taken/will be taken to address the NOV, issued on October 3, 2019 to the Morehead Landfill, as sufficient.

There are no components of the Project that have a direct impact on surface water effluent and therefore GHD determined that the Other Violations do not fall within the boundary of the Project and associated compliance. The Other Violations identified also do not warrant EPA/state review. Significant Non-compliances (SNCs) or Reportable Non-compliances (RNCs) are violations that warrant EPA/state review, however, "Other Violations" do not.

Through review of the provided permits, the ECHO database review, and discussions held during the site visit, GHD can confirm that the Project met the regulatory compliance requirements associated with the Project.

4.6 Registration with other Registries

GHD performed an internet search of the American Carbon Registry (ACR), the Reserve, the Verified Carbon Standard (VCS), the Gold Standard (GS), and the Social Carbon project databases, to confirm that the Project is not currently registered in any other carbon offset registry or program. GHD notes that this type of project activity can only be registered under the above noted programs based on the Project type and location.



5. Conformance with the Protocol

5.1 GHG Assessment Boundary

GHD understands the GHG assessment boundary for the Project must conform to Table 4.1 of the Protocol. During the site visit and the document review, GHD confirmed that all sources, sinks, and reservoirs included in Table 4.1 of the Protocol were accounted for and quantified in the GHG emission reduction calculations.

5.2 Quantifying GHG Emission Reductions

5.2.1 Baseline Emissions

Baseline emissions include the following:

- Emissions from waste breakdown in landfill (CH₄)
- Emissions from project LFG flare destruction – flare (calculated in reference to destruction efficiency) (CH₄)

Table 5.1 below outlines the calculation parameters used in the calculation of the baseline emissions.

Table 5.1 Baseline Calculation Parameters

Calculation Parameters	Value Applied	Justification
DF Discount Factor	0.0 (Continuous) 0.1 (Weekly)	Methane monitoring is a combination of continuous and weekly throughout the monitoring period
Oxidation Discount Factor	0.1	No synthetic liner, per the Protocol and based on Project conditions
Open Flare	0.96	Per the Protocol

5.2.2 Project Emissions

Project emissions include the following:

- Emissions from gas collection system [pilot fuel and operation] (propane and electricity, respectively) (CO₂e)

GHD confirmed the consumption values were appropriate through review of invoices and internal data management, and ensured the calculations were performed in accordance with the Protocol.

5.3 Project Monitoring

GHD has reviewed the Project Developer's PDD which outlines the monitoring and reporting responsibilities for the Project.

LFG flow to the destruction device (flare) is continuously monitored every eight (8) minutes. Temperature data is measured continuously by a two thermocouples installed on the flare. LFG flow is monitored via Fluid Components Intl (FCI) ST98 thermal mass flow meter (serial number [SN.] 322620-A) which was verified by GHD during the Site visit. This flow meter compensates for



temperature and pressure by normalizing the flow to 70 degrees Fahrenheit and 14.7 psia. The standard temperature and pressure required by the Protocol is 60 degrees Fahrenheit and 14.7 psia, therefore the data is corrected by the Project Proponent or Technical Consultant to meet the Protocol requirements. GHD notes that a rental thermal mass flow meter similar to the main meter was used in March 2018 during calibration of the main meter. GHD requested that PDD be corrected to include the rental meter and the period of use.

Flow data from the flare is collected from a Yokogawa data recorder. The data is regularly downloaded by Site staff approximately weekly to monthly.

The PDD also identifies that an Elkins Earthworks EDGE unit was installed in 2012 to monitor LFG flow, methane concentration, oxygen concentration, pressure, and temperature. It was identified to GHD during the Site visit that this unit was not currently connected or being used as it was found to be inaccurate and therefore this unit was not used for a portion of 2018 and was not connected in 2019 during the Site visit. The Elkins Earthworks EDGE units was used to obtain continuous methane monitoring data during the crediting period from March 1, 2018 to June 30, 2018. After June 30, 2018, portable gas analyzer units were used to obtain the methane concentrations on a weekly basis. Emission reductions were only calculated for weeks in which methane measurements were taken with the exception of data substitutions, where possible. Two data substitutions were made during the reporting period and are further detailed in Section 5.3.4.

In lieu of the Earthworks unit, the Project Proponent used portable gas analyzers to measure the methane content of the LFG. The Project Proponent used two Envision ENV 100 units and one Envision ENV 200 unit for weekly measurement of methane concentrations. GHD verified that each of the above methane monitoring devices is detailed in the PDD.

5.3.1 Monitoring Requirements

The Project Proponent collects the following monitoring data for the Site pursuant to Table 6.1 of the Protocol. Calculated or reference parameters specified in Table 6.1 of the Protocol were determined and used at the frequency specified based on operating data records. Table 5.2 outlines the instrument monitoring requirements for the Project.

Table 5.2 Instrument Monitoring Requirements

Instrument	Unit	Measurement Frequency	Measurement Temperature and Pressure	Operating Parameters
Flare Flow Meter	Fluid Components Intl ST98 thermal mass flow meter (SN. 322620-A)	Measured continuously, recorded every 8 minutes	70°F and 14.7 psia	Thermocouple readings >500°F
Portable Gas Analyzer	Envision ENV 100s (SN. 1101004 and 1003018) Envision ENV 200 (SN. 1705204B)	Measured weekly	N/A	N/A



5.3.2 Instrument QA/QC

Table 5.3 below outlines the monitoring instruments for the project, the model and serial numbers, the relevant dates of manufacturer calibrations, and the field checks performed on the instruments throughout the reporting period.

Table 5.3 Instrument QA/QC

Instrument, Model, and SN.	Date of Calibration	Field Checks
Methane Analyzer (Continuous) Elkins Earthworks EDGE Model 4.11 SN. 12002	An email provided from Elkins Earthworks, LLC states the EDGE analyzer does not require any factory calibrations after installation because the unit incorporates an auto-calibration facility. Therefore, per the Protocol the EDGE methane analyzers should be calibrated within the last five (5) years. Calibrated by a Monitoring Control and Compliance, Inc. (MCC) technician on March 27, 2018. The as found calibration results and percent drift were recorded along with the as left calibration results.	The Project Proponent noted that analyzers are cleaned and inspected on a monthly basis by MCC. The monthly reports provided by MCC provide details of the measurements taken by MCC during each monthly event which represent the completion of the inspections throughout the reporting period. Field checked on a monthly basis for calibration accuracy by a third party technician (MCC) with both data points recorded. The continuous methane analyzer was out of service starting in July 2018, and continued to be out of service for the remainder of the reporting period. Further information pertaining to this unit is provided following this Table.
Methane Analyzer (Portable) Envision ENV100 SN. 1101004	The Envision Operator's Manual states the gas analyzer should be returned to the factory at a minimum once per year for inspection and factory calibration. The meter was calibrated by Elkins Earthworks (third-party) on May 22, 2018. As found/as left conditions were recorded, in this case both conditions were very similar, within $\pm 1\%$.	The Project Proponent noted that analyzers are cleaned and inspected on a monthly basis by MCC. The monthly reports provided by MCC provide details of the measurements taken by MCC during each monthly event which represent the completion of the inspections throughout the reporting period.
Methane Analyzer (Portable) Envision ENV100 SN. 1003018	The Envision Operator's Manual states the gas analyzer should be returned to the factory at a minimum once per year for inspection and factory calibration. The meter was calibrated by Elkins Earthworks (third-party) on April 25, 2018. As found/as left conditions were recorded, in this case both conditions were very similar, within $\pm 1\%$.	Used for the following monthly reports: - March 20, 2018 - April 10, 2018 - June 13, 2018 - July 10, 2018 - August 7, 2018 - September 27, 2018 - October 10, 2018 - November 7, 2018 - December 20, 2018 - January 23, 2019 - February 12, 2019
Methane Analyzer (Portable) Envision ENV200 SN. 1705204B	The Envision Operator's Manual states the gas analyzer should be returned to the factory at a minimum once per year for inspection and factory calibration. The meter was calibrated by Elkins Earthworks (third-party) on February 17, 2019. As found/as left conditions were	The monthly reports document the following: - Field calibrated prior to use - Gas quality recorded



Instrument, Model, and SN.	Date of Calibration	Field Checks
	recorded, in this case both conditions were very similar, within $\pm 1\%$.	
Flare Flow Meter Fluid Components Intl ST98 SN. 322620-A	The Installation, Operation and Maintenance Manual states Fluid Components Intl (FCI) recommends calibration every 18 months at a minimum. The meter was calibrated by FCI on February 27, 2018. The meter was found to be out of tolerance however this was outside the reporting period and it was found to be in tolerance in March 2018. Field checked by an MCC technician on the following dates: March 20, 2018 January 23, 2019	It is noted in Section 4.4.1 PDD that the flow meter is "cleaned and inspected when calibrated and/or field checked, as seen in the monthly MCC monitoring reports." The monthly reports provided by MCC provide details of the measurements taken by MCC during each monthly event which represent the completion of the inspections throughout the reporting period. In operation for the following monthly reports: - April 10, 2018 - May 8, 2018 - June 13, 2018 - July 10, 2018 - August 7, 2018 – No totalizer reading - September 27, 2018 – No totalizer reading - October 10, 2018– No totalizer reading - November 7, 2018– No totalizer reading - December 20, 2018– No totalizer reading - January 23, 2019– No totalizer reading - February 12, 2019– No totalizer reading The monthly MCC reports document the following: - Totalizer reading (excluding the months noted above) - O&M activities completed throughout the month including compliance related issues and recommendations for improvement Field checked for calibration accuracy by a third party technician (MCC) on January 23, 2019 which is within two months of the end of the reporting period



Instrument, Model, and SN.	Date of Calibration	Field Checks
Flare Flow Meter (back up flow meter) Fluid Components Intl ST98 SN. 619445	January 10, 2018	In operation for the following monthly reports: - March 20, 2018 The monthly reports document the following: - Totalizer reading - The monthly MCC reports detail O&M activities and inspections that are performed each month. Field checked for calibration accuracy by a third party technician (MCC) on March 20, 2018.

GHD confirmed the information presented above is consistent with the monitoring procedure presented in the PD's PDD. GHD also verified that during the previous reporting period from March 1, 2017 to February 28, 2018 there were no on-going calibration related issues, but did identify that a variance was requested related to the cleaning, inspection, and field checks related to the flow meter(s) and methane analyzer. GHD understands that the Monitoring Plan was historically updated during the previous reporting period.

GHD reviewed the information associated with the Elkins Earthworks EDGE continuous gas analyzer and the operation of the unit prior to July 1, 2018. After July 1, 2018 the EDGE unit was disconnected and the Project Proponent completed weekly methane monitoring using 3 different portable gas analyzers as detailed in the Table above. It is understood that through regular maintenance in March and May 2018 that there was a leak identified in the internal Dwyer flow meter. Based on discussions with the Project Proponent it was understood that when the leak was identified it was temporarily sealed until replacement parts could be ordered and installed. The Project Proponent elected to stop using the EDGE unit as of July 1, 2018. GHD notes that the leak was identified on the inlet to the EDGE unit. The EDGE unit was due for annual maintenance in August 2018 which was completed, however during the annual maintenance it was identified that the EDGE unit was also causing power surges which was detailed in the August 2018 MCC report. Therefore the Project Proponent elected to continue to perform weekly methane measurements with the portable gas analyzers through the remainder of the reporting period.

5.3.3 Other Monitoring Requirements

GHD reviewed the PDD for the Project and did not identify any issues. Data is managed by the Project Proponent and Technical Consultant. The Technical Consultant also backs up all their data on an independent system in Austin Texas in addition to data storage in their head office in Houston Texas. The Project Developer has confirmed all information required by the Protocol will be retained for a period of 10 years after the information is generated or 7 years after the last verification in accordance with the Protocol.

GHD confirmed the following personnel were properly trained for their roles:

- Ms. Julia Guarino – Individual responsible for managing and reporting GHG emissions



GHD also reviewed the third party's that performed the calibration checks for the flow meters and methane analyzers (FCI, Elkin Earthworks, and MCC) and determined that they were competent to be performing the associated calibrations, monitoring, and inspections, as applicable.

5.3.4 Data Substitution

GHD confirmed that all data substitutions adhered to the requirements and methods presented in Appendix D of the Protocol. Information regarding the data substitutions is presented in Table 5.4 below. Data substitutions are only permissible when two monitoring parameters corroborate proper function of the destruction device. No flow data was substituted during the reporting period. Methane concentration data was substituted for two independent weeks. The substitutions were only performed for one consecutive missing weekly measurement.

Table 5.4 Data Substitution

Parameter	Missing Data Period	Two Monitored Parameters Corroborating Proper Functioning	Substitution Methodology
Methane Concentration	October 1, 2018 – October 7, 2018 February 18, 2019 – February 24, 2019	Thermocouple readings Flow rates during the data gap consistent with normal operation	The lower of the weekly measurement before and after the substituted measurement, per Appendix E of the Protocol.

5.4 Calculation Review and Sampling

GHD developed a risk assessment to determine risk and magnitude of potential errors, omissions, or misrepresentations. The final risk assessment is presented as Table 5.5 below.

Table 5.5 Risk Assessment

Potential Risk Area	Percentage of Baseline or Project Emissions (%)	Risk Type (Inherent, Control, Detection)	Risk Level (High, Medium, Low)	Justification
Baseline Emissions				
LFG Destruction	100% of Baseline Emissions	Inherent	High	An on-site Yokogawa data recorder records flow to the flare at least every 15 minutes. Methane composition was measured with a continuous analyzer until July 2018 when the flow meter went down. Weekly methane compositions were recorded for the remainder of the reporting period. Significant contributor to emission reductions. Therefore, the inherent risk has been set to high.
		Control	Low	Flow meter and methane gas analyzers are factory



Potential Risk Area	Percentage of Baseline or Project Emissions (%)	Risk Type (Inherent, Control, Detection)	Risk Level (High, Medium, Low)	Justification
				calibrated per manufacturers manuals. Monthly field calibrations are performed by a third-party on the portable gas analyzers prior to use. The flow meter is field checked by a third-party with a pitot tube within two months of the end of the reporting period. Data is downloaded on a weekly basis. This leads to a low control risk related to data acquisition and control.
		Detection	Low	GHD reviewed recorded data related to methane composition and flow for the entire monitoring period. There is a low risk that a material error would not be detected.
Project Emissions				
Fossil Fuel Consumption	0.28% of Project Emissions	Inherent	Low	Fossil fuel (propane) consumption is determined with thirty-party billing from Tractor Supply Co. Low magnitude source of emissions. Therefore, the inherent risk has been set to low.
		Control	Low	Fossil fuel consumption is determined with third-party billing, therefore the control risk is low.
		Detection	Low	GHD reviewed the propane consumption bills, and defaults and emission factors used in the calculations. There is a low risk that a material error was not detected.
Electricity Consumption	99.72% of Project Emissions	Inherent	Medium	Electricity consumption is the main source of Project emissions, therefore the inherent risk is medium.
		Control	Low	Electricity consumption is determined from third-party invoices, therefore the control risk is low.
		Detection	Low	GHD reviewed third-party invoices and all defaults and emission factors used in the



Potential Risk Area	Percentage of Baseline or Project Emissions (%)	Risk Type (Inherent, Control, Detection)	Risk Level (High, Medium, Low)	Justification
				calculations. There is a low risk that a material error was not detected.
Data Management				
Data Management Systems	N/A	Inherent	Medium	Baseline data is supplied by internal records/meters. Electricity consumption is determined via invoices. Propane consumption is determined with bills from Tractor Supply Co. This results in a medium inherent risk.
		Control	Medium	Data is downloaded on a weekly to monthly basis, and sent to corporate and Element Markets. The data is processed using SQL and stored by Element Markets. The control risk is medium.
		Detection	Low	GHD reviewed all available data management data. There is a low risk that a material error was not detected.

GHD developed a Sampling Plan at the outset of the verification which determined the course of the verification. The final sampling plan is presented as Table 5.6 below.

Table 5.6 Sampling Plan

Data/Information Description	Percentage of Baseline or Project Emissions (%)	Data/Information Source	Collection Frequency	Sample size/Action
Detailed Process Overview	N/A	Process flow diagram for the Facility	N/A	- Reviewed Process Details - Reviewed during the Site Visit
Baseline Emissions				
LFG Destruction	100% of Baseline Emissions	Yokogawa data recorder	Continuous and aggregated hourly and weekly	- Reviewed full year of data - Reviewed calibrations and QA/QC procedures for relevant monitoring equipment



Data/Information Description	Percentage of Baseline or Project Emissions (%)	Data/Information Source	Collection Frequency	Sample size/Action
Project Emissions				
Project Fossil Fuel Consumption	0.28% of Project Emissions	Propane consumption	Bills compiled as needed	- Reviewed calculations for fossil fuel consumption and defaults and emission factors used - Reviewed propane consumption bills from Tractor Supply Co.
Project Electricity Consumption	99.72% of Project Emissions	Electricity consumption	Bills are compiled monthly	- Reviewed full reporting period of electricity consumption data - Reviewed calculations for electricity consumption, default factors, and emission factors used
Back up of data acquisition systems	N/A	- General Data Management System - Controls and QA/QC procedures - Document retention	N/A	Reviewed frequency of data backup and interviewed Facility personnel
Data Acquisition and flow from meters to data collection/process monitoring system software to data historian	N/A	Facility	N/A	Reviewed data systems at Facility and interviewed Facility personnel
Compliance of PDD	N/A	PDD	N/A	Reviewed PDD
Accuracy	N/A	Flow and methane meters	As collected	Reviewed available calibration certificates and field checks

GHD performed a complete recalculation of the Project emission reductions based on the received data.

5.5 Findings and Basis of Opinion

5.5.1 Quantitative Materiality Threshold

Table 5.7 and Table 5.8 below outline the Project Developer's and GHD's GHG Reductions Estimation, respectively.



Table 5.7 Project Developer GHG Reductions Estimation

Vintage	Baseline Emissions	Project Emissions	GHG Reductions/Removals (CRTs)
2018-2019	26,164.15	38.75	26,095

Table 5.8 GHD's **Verified** GHG Reductions Estimation

Vintage	Baseline Emissions	Project Emissions	GHG Reductions/Removals (CRTs)
2018-2019	26,177.19	38.74	26,138.46

The required accuracy level for this verification is greater than 97 percent. Percent error is defined by the following:

$$\% \text{ Error} = \text{abs}\left(\frac{\text{Stated Reductions} - \text{Verified Reductions}}{\text{Verified Reductions}}\right) \times 100$$

The accuracy level is defined by the following:

$$\text{Accuracy} = 100\% - \% \text{Error}$$

Based on GHD's verified reduction and the stated reductions, the percent error and accuracy level for the Project is as follows:

$$\% \text{ Error} = \text{abs}\left(\frac{26,095 - 26,138.46}{26,138.46}\right) \times 100$$

$$\text{Accuracy} = 100\% - 0.17\% = 99.83\%$$

Therefore the Project meets the quantitative materiality threshold and may be issued a positive Verification Statement.

5.5.2 Qualitative Materiality Threshold

GHD identified the following qualitative errors:

- Project emissions for fossil fuel and electricity consumption were being double counted in 2018.

The above error was not corrected by the Project Proponent as this error did not result in a material misstatement and resulted in under-reporting. Refer to issue #21 of the Findings Assessment.

5.5.3 Findings and Basis of Opinion

Based on the findings discussed above, GHD will be issuing a positive verification statement. In issuing a Positive Verification Statement, GHD asserts the following:

- The Project meets all eligibility requirements
- The Project was conducted in accordance with all monitoring and record-keeping requirements
- There are no existing material non-conformances or misstatements in the reported data



6. Verification Statement and Closing

For the March 1, 2018 to February 28, 2019 reporting period, the Project claimed 26,095 metric tonnes CO₂e of GHG reductions in accordance with the Protocol. GHD completed the verification in accordance with the Protocol. GHD completed the work to provide a reasonable level of assurance. The verification criteria were selected per the Protocol, and associated guidance documents. GHD determined with a reasonable assurance that the reported emission reductions are free of an offset material misstatement, and resulted Positive Offset Verification Statement for emission reductions.

The Offset Verification Statement will be submitted to the Reserve, and is provided as Appendix A.

All of Which is Respectfully Submitted,

GHD

A handwritten signature in blue ink, appearing to read 'Jason Clarke', written in a cursive style.

Jason Clarke, Lead Verifier

A handwritten signature in black ink, appearing to read 'MHirst', written in a cursive style.

Michelle Hirst, Senior Internal Reviewer

Appendices

Appendix A

Offset Verification Statement

Climate Action Reserve ("Reserve")
Project Verification Statement ("Verification Statement")

Project ID: CAR592

Project Name: Morehead Landfill

Name of Verification Body: GHD Services, Inc.

Date Verification Report Issued: April 3, 2020

Emission Reductions/Removals Generated by Project:

Vintage Year	<u>2018</u>	Reductions/Removals (mtCO ₂ e)	<u>22,018</u>
Vintage Year	<u>2019</u>	Reductions/Removals (mtCO ₂ e)	<u>4,077</u>
Vintage Year	_____	Reductions/Removals (mtCO ₂ e)	_____
Vintage Year	_____	Reductions/Removals (mtCO ₂ e)	_____
Vintage Year	_____	Reductions/Removals (mtCO ₂ e)	_____
Vintage Year	_____	Reductions/Removals (mtCO ₂ e)	_____

Verification Statement:

This is to state that, for the verification period from March 1, 2018 [*beginning Month, Day, Year*] to February 28, 2019 [*ending Month, Day, Year*], Advanced Disposal Services Morehead Landfill, Inc.'s (the "Project Developer"¹) project emission reductions/removals listed above for the aforementioned project:

- ☒ have been verified without qualification
☐ are unable to be verified

with reasonable assurance according to the Reserve's Landfill [*type of project*] Project Protocol Version 4.0, Reserve Offset Program Manual, Verification Program Manual and all of the requirements of the Reserve program. In the case that the emission/reductions removals have been verified, the Project Developer has signed the applicable Reserve attestations for the GHG emission reductions/removals for which Climate Reserve Tonnes are to be issued.

Attestation

Lead Verifier: In signing this Verification Statement, I certify that the information contained herein is true, accurate and complete.

	<u>Jason Clarke</u>	<u>April 3, 2020</u>
Lead Verifier, Signature	Print Name	Date

Senior Internal Reviewer: In signing this Verification Statement, I certify that the information contained herein is true, accurate and complete. I attest that I was not involved in the verification services documented in this Verification Statement, but have conducted an independent review of the verification services and findings of the verification team and concur with this Verification Statement.

	<u>Michelle Hirst</u>	<u>April 3, 2020</u>
Senior Internal Reviewer, Signature	Print Name	Date

Authorization

I authorize the above-named verification body to submit this Verification Statement to the Climate Action Reserve on behalf of the Project Developer. I am a duly authorized signatory for my organization and have the legal authority to bind the Project Developer.

	<u>Jay Warzinski</u>	<u>3/31/2020</u>
Project Developer, Signature	Print Name	Date

¹ For the purposes of this Verification Statement, Project Developer includes: Project Operators (under the Forest Project Protocol), Project Owners (under the Grassland Project Protocol, Canada Grassland Project Protocol, and Nitrogen Management Project Protocol), and Project Developers under all other protocols.



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Jason Clarke
Jason.Clarke@ghd.com
519.340.4270

www.ghd.com