

1.0 OVERALL PROJECT SUMMARY AND APPROACH

1.1 DESCRIPTION OF GHG REDUCTION MEASURES

Seward County, Kansas, on behalf of the Seward County Regional Landfill, is applying for the Climate Pollution Reduction Act Grant. The Seward County Regional Landfill is located at 8th Street & US Highway 54, approximately 1/2 mile east of Liberal, Kansas on the north side of US Highway 54 (Southeast 1/4 of Section 27, Township 34 South, Range 33 West). The landfill has been in operation since 1975 and is currently receiving approximately 350 tons of municipal solid waste per day. According to the Environmental Protection Agency's (EPAs) Facility Level Information on Greenhouse Gases Tool (FLIGHT), the Seward County Landfill emitted a carbon dioxide equivalent of 42,504 metric tons of methane in 2022. In accordance with the Kansas Emission Reduction and Mitigation Plan (E-RAMP), capturing methane and other gases coming out of the landfill is of the utmost importance.

A gas collection and control system (GCCS) system installed in Cell 2 and expanded in Cell 1 would be a reliable way to prevent unwanted greenhouse gases (GHG) from escaping into the atmosphere while also helping to improve the air quality in the neighboring city of Liberal by reducing the amount of volatile organic compounds (VOCs) and hazardous air pollutant (HAP) emissions present in the landfill gas. The existing landfill gas system is very small and limited to only the old landfill cell. The expanded system would be connected to the neighboring National Beef which utilizes the landfill gas to supplement the gas needed to run the plant's boilers. This assists National Beef to reduce costs and pass on savings to the consumers and community while at the same time creating additional GHG reduction through the use of renewable energy in lieu of fossil fuel. At times when the processing plant is not in production, an on-site flare will be utilized to burn the gases.

The first step of the system is a complete design followed by permitting. Design and permitting is estimated to take 3 months. Following this will be approximately 2 months of contractor selection, material procurement, and mobilization. Complete installation and delivery of the GCCS is estimated to be 3 months.

Delays in installing the system mean further release of methane into the atmosphere, exacerbating effects of climate change in the area. Currently, the EPA New Source Performance Standards (NSPS) do not apply to the Seward County Landfill; however, NSPS may apply in the near future. Once these regulations are triggered, the landfill will be required to install a GCCS. The landfill will submit its next Tier 2 review in early 2026. If that report finds the landfill's non-methane organic compounds emissions rate is below the EPA threshold, their next review will be in 2031. Thus, completing the project as early as possible will create surplus GHG, VOC, and HAP emission reductions. The City of Liberal accounts for nearly 90% of the county population with a majority of it being within a disadvantaged community census area. It would be beneficial to the entire county to have the GCCS installed with grant funds which would then allow tax dollars or bond monies to be used in other areas of need.

1.2 DEMONSTRATION OF FUNDING NEED

Seward County is a very rural area with a limited ability to raise funds. According to United States Census data, the county and City of Liberal population during the 2010 and 2020 Census were as follows:

Location	April 2010 Population	April 2020 Population	Percent Change
Seward County, KS	22,952	21,964	-4.3%
Liberal, KS	20,525	19,825	-3.4%

A decrease in population and pressure to keep taxes low means fewer sources of revenue for the county. It also means the county has to be more selective about which projects are funded. A project whose benefits are not as visible to the public could easily be bypassed for funding until required by NSPS. The poverty rate in Liberal and Seward County is estimated to be 14.8% and 13.7%, respectively. This is noticeably higher than the 2022 United States poverty rate of 11.5%.

1.3 TRANSFORMATIVE IMPACT

From the Kansas E-RAMP, the state has thirteen landfills. Five of those capture landfill gas but do not generate energy from that gas. While the Seward County Regional Landfill does currently have a small GCCS system which feeds the boiler of a neighboring industrial facility, expanding it would enable them to capture a much larger amount which would then reduce fuel costs for National Beef.

Multiple studies show that GHG's from landfills are emitted into the atmosphere. According to information presented by the EPA's Landfill Methane Outreach Program, municipal solid waste landfills are the third-largest source of human-related methane in the United States in 2021 (EPA, 2024). Aside from the odor pollution associated with a landfill, methane is a significant contributor to climate change. Landfill gas also contains additional VOCs, which are a major contributor to ground-level ozone, and HAP, which create health risks for local populations.

2.0 IMPACT OF GHG REDUCTION MEASURES

Based on preliminary designs, the GCCS will be comprised of 50 gas wells within Cells 1 and 2. These wells are estimated to have a flowrate of 14 standard cubic feet per minute (SCFM) and a methane concentration of approximately 50%. Utilizing the 100-year Global Warming Potentials (GWP) located in IPCC's Fifth Assessment Report (28 for methane), an estimated 3,463 metric tons of methane per year could be captured. This is a carbon dioxide equivalent of 96,949 metric tons per year.

According to the Center for Disease Control's (CDC) Agency for Toxic Substances & Disease Registry, landfills produce gases in four distinct phases. While most gases are produced within the first 20 years of a landfill's life, methane can be produced for 50 or more years. This investment has the potential to benefit the public good for decades to come.

2.1 MAGNITUDE OF GHG REDUCTIONS FROM 2025 THROUGH 2030

When utilizing an estimated flowrate of 14 SCFM per well and a methane concentration of approximately 50%, it is estimated the GCCS will collect the following over a five-year period:

Methane Captured Over 5 Years (metric tons)	100-year Carbon Dioxide Equivalent Over 5 years (metric tons)	20-year Carbon Dioxide Equivalent Over 5 Years (metric tons)
17,312	484,745	1,454,235

2.2 MAGNITUDE OF GHG REDUCTIONS FROM 2025 THROUGH 2050

When utilizing an estimated flowrate of 14 SCFM per well and a methane concentration of approximately 50%, it is estimated the GCCS will collect the following over a twenty-five-year period:

Methane Captured Over 25 Years (metric tons)	100-year Carbon Dioxide Equivalent Over 25 years (metric tons)
86,562	2,423,725

2.3 COST EFFECTIVENESS OF GHG REDUCTIONS

As expressed in the Section 7 budget table, this project will cost an estimated \$4,977,000 over the next five years with approximately \$4,647,000 in year one costs. These estimates include engineering design, construction, construction quality assurance, and maintenance.

This would be a cost effectiveness of emission reductions of \$287.49 per ton of methane over that same time frame. When utilizing the 20-year GWM value, this equates to \$3.42 per ton of carbon dioxide over five years. Regular maintenance and proper maintenance will allow the system to function over the lifetime of the landfill.

2.4 DOCUMENTATION OF GHG REDUCTION ASSUMPTIONS

Calculations for GHG reductions were based on the IPCC's Fifth Assessment Report using methane's 100-year Global Warming Potential for Greenhouse Gases. A 20-year GWP estimate was also presented from the same publication. The methane content was estimated using project experience and EPA studies which show the typical long-term methane concentrations for landfills in the anaerobic stage is between 45 and 60% (Centers for Disease Control and Prevention, 2001) as well as the EPA Landfill Gas Emissions Model (LandGEM). See the Technical Appendix for more details.

3.0 ENVIRONMENTAL RESULTS – OUTPUTS, OUTCOMES, AND PERFORMANCE MEASURES

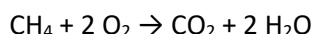
3.1 EXPECTED OUTPUTS AND OUTCOMES

It can be calculated based on similar experiences that a new GCCS could capture from the waste mass and prevent release into the atmosphere an estimated 3,817 tons of methane per year. This does not include

the capture of other common and more dangerous landfill gases, such as hydrogen sulfide, benzene, and various other toxic chemicals, or smog causing VOCs and odorous emissions. And because gas will be used to displace natural gas at the neighboring meat packing plant, there will be additional GHG and other emission reductions due to the use of landfill gas as a renewable fuel.

3.2 PERFORMANCE MEASURES AND PLAN

To track the performance of the system, a multi-component gas analyzer can be integrated with the GCCS to measure methane, hydrogen sulfide, and carbon dioxide. Air samples can be collected twice a year and analyzed for other VOCs and HAPs to track the concentrations during the life of the system. The flow of landfill gas will be measured to calculate the estimated amount of GHG and other pollutants recovered. Because there is typically no stack in a landfill gas flare, measuring gas content post flare is very difficult. The combustion and conversion of methane to carbon dioxide is well documented. At its most simple explanation, the chemical reaction is as follows:



3.3 AUTHORITIES, IMPLEMENTATION TIMELINE, AND MILESTONES

To estimate this cost, a very preliminary design has been provided. However, the design has not been thoroughly modeled. Therefore, the following schedule is suggested:

- November 2024 through January 2025 - Engineering design by SCS Engineers
- December 2024 – Semi-annual report identifying completed tasks and the future schedule for the project by Seward County Regional Landfill and SCS Engineers
- February through March 2025 - Contractor materials procurement and mobilization by a to-be-named contractor
- April through June 2025 - GCCS installation, construction, and startup by a to-be-named contractor with SCS Engineers providing construction quality assurance oversight
- July 2025 – Final report for EPA and close out grant paperwork

4.0 LOW-INCOME AND DISADVANTAGED COMMUNITIES

4.1 COMMUNITY BENEFITS

Landfill gas inherently contains hydrogen sulfide which, in addition to having a “rotten egg” smell, is also toxic at low concentrations. The hydrogen sulfide would be extracted by the system along with the other landfill gases, which include numerous cancer-causing and otherwise toxic chemicals, such as benzene and vinyl chloride. Gas from the small existing system is connected to the National Beef processing plant located on the western adjoining property. National Beef uses that landfill gas to help run the plant’s boilers. Increasing gas extraction from the Seward County Landfill could further reduce the plants need to supplement fuel for these boilers. This would allow National Beef to keep costs low and pass savings onto the consumers and the community while creating emission reductions by displacing fossil fuels.

The City of Liberal (tract numbers 20175966000, 20175965800, and 20175965900), located southeast of the facility, has been identified as disadvantaged by the Council of Environmental Quality’s Climate and

Economic Justice Screening Tool based on low income (91st percentile), expected agriculture loss rate (90th percentile), projected wildfire risk (90th percentile), and linguistic isolation (98th percentile) (*Climate and Economic Justice Screening Tool*). According to the EPA's EJScreen Environmental Justice Screening and Mapping Tool, the area immediately south of the landfill is in the 50th percentile for air toxics cancer risk. A reduction of GHG could also help lessen extreme weather events, including droughts and wildfires in the area.

EPA EJScreen Socioeconomic Indicators			
Socioeconomic Indicators	Liberal, Kansas	State Average	Percentile in State
Demographic Index	55%	28%	90
People of Color	74%	25%	94
Low Income	37%	30%	66
Limited English Speaking Households	16%	2%	96
Less than High School Education	30%	9%	94

4.2 COMMUNITY ENGAGEMENTS

Seward County Regional Landfill will foster interactions with community organizations and local residents. Information about the project will be posted at the office, on the website, and on the county's social media account. Any comments will be reviewed and evaluated during quarterly meetings. After the project is complete, landfill gas sample data will be available for review by local residents.

5.0 JOB QUALITY

An increase of one full-time employee utilizing approximately half the time on the system can be expected. This employee would monitor the wells and destruction equipment (flare, burners). The system will require some operations and maintenance, including adjusting the flow rate of each well so as to not over-pull the system (which would introduce oxygen into the waste mass causing a potential underground fire) or under-pull (which would underutilize the system).

There would also be a short-term increase in employment during construction of the GCCS. Between gas well drilling, trenching and laying of piping to transport the gas, electrical installation, and startup, construction is estimated to take 7 months. This would provide a temporary boost to the local hotel and restaurant economy.

6.0 PROGRAMMATIC CAPABILITY AND PAST PERFORMANCE

6.1 PAST PERFORMANCE

Seward County Regional Landfill has not specifically received an EPA grant; however, Seward County has received funds from the American Rescue Plan Act (ARPA). The grant was from the Federal Emergency Management Agency for the purpose of responding to the Coronavirus Disease 2019. The county received \$30,500 in January 2021 and \$32,200 in March 2022. In June 2023, the Seward County Sheriff's Office also received a grant of \$153,000 for the purpose of updating equipment within the department.

6.2 REPORTING REQUIREMENTS

The grants received did have reporting requirements, all of which have been met by the county and iParameters.

6.3 STAFF EXPERTISE

The grant will be managed by Marjorie Townsend, senior grant writer and researcher, Michelle Fidelia, associate manager, and Ben Redifer, associate manager, from iParameters. Marjorie reviews sub-recipient agreements and ensures adherence to federal grant regulations. She has helped to manage grants totaling over \$131,000,000. Michelle manages large-scale projects, ensuring reporting requirements. Ben has served on teams for grants across the country where he has provided management, compliance review, and reporting requirements.

7.0 BUDGET

7.1 BUDGET DETAIL

Gas Collection and Control System							
Categories	Line Item & Itemized Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total EPA Funding
Personnel							
	Full-time employee, 0.5 FTE, with salary increases	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$159,274
	Total Personnel	\$30,000	\$30,900	\$31,827	\$32,782	\$33,765	\$159,274
Fringe Benefits							
	Full-time employees @ 17% of salary	\$5,100	\$5,253	\$5,411	\$5,573	\$5,741	\$27,077
	Total Fringe Benefits	\$5,100	\$5,253	\$5,411	\$5,573	\$5,741	\$27,077

Gas Collection and Control System							
Categories	Line Item & Itemized Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total EPA Funding
Travel							
	Travel for conference						
	Conference registration - \$215 per person	\$430	\$430	\$430	\$430	\$430	\$2,150
	Hotel - \$150 per day @ 3 days per year	\$450	\$450	\$450	\$450	\$450	\$2,250
	Per Diem - \$64 per day @ 3.5 days per year	\$224	\$224	\$224	\$224	\$224	\$1,120
	Mileage for travel (500 miles per year at \$0.67/mile)	\$335	\$335	\$335	\$335	\$335	\$1,675
	Total Travel	\$1,439	\$1,439	\$1,439	\$1,439	\$1,439	\$7,195
Equipment							
	PVC vertical gas wells	\$562,500	\$0	\$0	\$0	\$0	\$562,500
	HDPE pipe (various sizes)	\$1,133,695	\$0	\$0	\$0	\$0	\$1,133,695
	Valves (various sizes)	\$87,300	\$0	\$0	\$0	\$0	\$87,300
	QED Wellheads	\$50,000	\$0	\$0	\$0	\$0	\$50,000
	Remote Wellheads	\$68,000	\$0	\$0	\$0	\$0	\$68,000
	HDPE Condensate Sump	\$777,000	\$0	\$0	\$0	\$0	\$777,000
	Candlestick blower and flare	\$450,000	\$0	\$0	\$0	\$0	\$450,000

Gas Collection and Control System							
Categories	Line Item & Itemized Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total EPA Funding
	HDPE Condensate Drain	\$17,200	\$0	\$0	\$0	\$0	\$17,200
	CMP Road Crossing Casing	\$90,420	\$0	\$0	\$0	\$0	\$90,420
	6" Bollards	\$63,800	\$0	\$0	\$0	\$0	\$63,800
	Concrete pad	\$62,000	\$0	\$0	\$0	\$0	\$62,000
	Gravel surfacing	\$20,250	\$0	\$0	\$0	\$0	\$20,250
	Siemens Ultramat 23 Gas Analyzer	\$36,024	\$0	\$0	\$0	\$0	\$36,024
	Total Equipment and Installation	\$3,418,189	\$0	\$0	\$0	\$0	\$3,418,189
Supplies							
	Total Supplies	-	-	-	-	-	-
Construction or Installation							
	Mobilize/Demobilize	\$303,000	\$0	\$0	\$0	\$0	\$303,000
	Surveying	\$63,000	\$0	\$0	\$0	\$0	\$63,000
	Tie-in to existing piping	\$39,000	\$0	\$0	\$0	\$0	\$39,000
	Well boring abandonment	\$23,550	\$0	\$0	\$0	\$0	\$23,550
	Drilling estimate	\$72,750	\$0	\$0	\$0	\$0	\$72,750
	Electrical	\$105,000	\$0	\$0	\$0	\$0	\$105,000
	Restore final cover	\$11,000	\$0	\$0	\$0	\$0	\$11,000
	Start up	\$13,000	\$0	\$0	\$0	\$0	\$13,000
	Payment and bonds	\$40,600	\$0	\$0	\$0	\$0	\$40,600
	Total Construction or Installation	\$670,900	\$0	\$0	\$0	\$0	\$670,900

Gas Collection and Control System							
Categories	Line Item & Itemized Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total EPA Funding
Contractual							
	GCCS Engineering Design	-	-	-	-	-	-
	Consultant - Associate Professional - assumes 280 hours @ \$105/hr	\$29,400	\$0	\$0	\$0	\$0	\$29,400
	Consultant - Staff Professional - assumes 230 hours @ 115/hr	\$26,450	\$0	\$0	\$0	\$0	\$26,450
	Consultant - Project Professional - assumes 200 hours @ \$135/hr	\$29,700	\$0	\$0	\$0	\$0	\$29,700
	Consultant - Senior Project Manager - assumes 100 hours @ \$185/hr	\$18,500	\$0	\$0	\$0	\$0	\$18,500
	Consultant - Senior Project Director - assumes 75 hours @ \$225/hr	\$16,875	\$0	\$0	\$0	\$0	\$16,875
	Consultant - Specialty Software	\$1,500	\$0	\$0	\$0	\$0	\$1,500
	Construction Quality Assurance (CQA)	-	-	-	-	-	-
	Daily CQA Monitor	\$335,800	\$0	\$0	\$0	\$0	\$335,800
	CQA Monitor Mob/Demob	\$6,075	\$0	\$0	\$0	\$0	\$6,075
	Certifying Engineer Site Visit	\$18,000	\$0	\$0	\$0	\$0	\$18,000

Gas Collection and Control System							
Categories	Line Item & Itemized Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total EPA Funding
	Certification Report	\$7,000	\$0	\$0	\$0	\$0	\$7,000
	Annual Air Quality Compliance	\$7,700	\$8,085	\$8,489	\$8,914	\$9,359	\$42,547
	Green House Gas Rule Compliance	\$3,800	\$3,990	\$4,190	\$4,399	\$4,619	\$20,997
	OM&M Services	-	-	-	-	-	-
	Consultant - Senior Technician - assumes two visits per year for well balancing, 23 hours per trip for travel and onsite work @ \$95	\$4,370	\$4,370	\$4,370	\$4,370	\$4,370	\$21,850
	Consultant - GEM5000 gas monitor for well balancing	\$200	\$200	\$200	\$200	\$200	\$1,000
	Consultant - hotel (\$130/night) and per diem (\$55/day) for well balancing	\$240	\$240	\$240	\$240	\$240	\$1,200
	Estimated maintenance	\$9,000	\$18,000	\$18,000	\$18,000	\$18,000	\$81,000
	Total Contractual	\$514,610	\$34,885	\$35,489	\$36,123	\$36,788	\$657,895
Other							
	-	-	-	-	-	-	-
Indirect Costs							
	Indirect Costs (23% of personnel costs)	\$6,900	\$7,107	\$7,320	\$7,540	\$7,766	\$36,633
	Total Indirect Costs	\$6,900	\$7,107	\$7,320	\$7,540	\$7,766	\$36,633
	Total funding for GCCS design, construction, and maintenance	\$4,647,138	\$79,584	\$81,486	\$83,456	\$85,499	\$4,977,163

7.2 EXPENDITURE OF AWARDED FUNDS

The management team and their level of expertise, qualifications, and experience will result in an efficient and timely expenditure of funds for all of the grant's requirements. The team will compare the project and grant schedules to ensure all reports and findings are submitted on time.

7.3 REASONABLENESS OF COSTS

Preliminary estimates have been completed by SCS Engineers (SCS). As national experts, SCS completes much of the landfills engineering and permitting activities. Once designs are finalized, bids for key items (driller, flare vendor, etc.) will be procured prior to the beginning of construction. The original Kansas E-RAMP estimate of \$3,500,000 did not account for the expansion of infrastructure necessary for the new cell. This updated construction estimate includes additional gas wells in Cells 1 and 2, the accompanying piping, condensate sumps, and a new flare pad.

8.0 REFERENCES

Centers for Disease Control and Prevention. (2001, November). *Landfill Gas Primer - an overview for environmental health professionals*. Centers for Disease Control and Prevention.

<https://www.atsdr.cdc.gov/hac/landfill/html/ch2.html>

Council on Environmental Quality. *Climate and Economic Justice Screening Tool*.

<https://screeningtool.geoplatform.gov/en/#11.95/37.03863/-100.91504>.

Kansas Department of Health and Environment Emission Reduction and Mitigation Plan. (2024, February). *Kansas Emission Reduction and Mitigation Plan*.

<https://www.epa.gov/system/files/documents/2024-02/kansas-pcap.pdf>.

United States Census Bureau. *QuickFacts*. Accessed March 27, 2024.

<https://www.census.gov/quickfacts/fact/table/liberalcitykansas,sewardcountykansas/PST045223>

United States Environmental Protection Agency (EPA) Landfill Methane Outreach Program (LMOP), Last Updated March 22, 2024. Accessed March 18, 2024. <https://www.epa.gov/lmop/basic-information-about-landfill-gas#:~:text=Methane%20Emissions%20from%20Landfills,-Note%3A%20All%20emission&text=The%20methane%20emissions%20from%20MSW,energy%20use%20for%20one%20year>.

United States EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT), 2022 Greenhouse Gas Emissions from Large Facilities, Seward County Landfill, Accessed March 28, 2024.

<https://ghgdata.epa.gov/ghgp/service/facilityDetail/2022?id=1011499&ds=E&et=&popup=true>.