Vaulted Deep Great Plains Facility Organic Waste Sequestration: Isometric PDD

Version 0.3

Section A – Key Project Data

Title
Please provide the title of your Project. This will be displayed as your Project's name on the Isometric Registry and all related documentation.
Great Plains Organic Waste Sequestration

Description
Please provide a brief description (50-100 words) of your carbon removal Project. A more detailed written technical description must be provided later.
Vaulted deploys slurry injection technology to geologically sequester organic wastes for the purpose of permanent carbon removal. Vaulted owns and operates a built and permitted injection well site in Hutchinson, Kansas. This site hosts a network of 60 salt caverns, with the total capacity to hold 2-3 million metric tons of organic waste and room to expand beyond that. Vaulted secures a range of organic wastes (including biosolids, livestock and agricultural waste, paper sludge, and others) through sustainable sourcing practices from the surrounding area. Vaulted then minimally processes the waste on-site and geologically injects them, permanently (10,000+ years) sequestering the carbon.

Project Location(s)
● *Please submit at least one Address and/or specific geo-coordinates for the project.* ● *You may submit multiple Project locations – please specify what role each location plays in the Project.*
For each of these locations, please provide address and/or specific geo-coordinates: ● Project well location ○ Hutchinson, Kansas 7513 KS-14, Hutchinson, KS 67501 37.96676121453887, -97.94108576138514 60 salt caverns covered under a Class V organic waste injection permit and 1 commercial Class I well for displaced brine injection ● Feedstock provider locations – covered in Biomass Feedstock Information appendix

Project Participants
Please provide a complete list of organizations participating in the project, with a contact person for each organization. (*Please duplicate the below rows for each additional organization you wish to add)*
Organization 1 – Vaulted Deep
Company registration number (Unique business identification number in your country of registration): 92-2524153 (IRS Number)
Organization Name: Carbon Removal Co., Inc. dba Vaulted Deep (Vaulted)
Organization Address: 11000 Richmond Avenue, Suite 191, Houston, TX, USA
Contact Person: Julia Reichelstein
Contact Email Address: info@vaulteddeep.com
[Optional] Contact Phone Number:
Organization role in project: The carbon removal company who will own and operate the Great Plains well site and sell the CDR.

Organization 2 – Advantek Waste Management Services LLC
Company registration number (Unique business identification number in your country of registration): 47-1601123 (IRS Number)
Organization Name: Advantek Waste Management Services LLC
Organization Address: 11000 Richmond Avenue, Suite 190, Houston, TX, USA
Contact Person: Colin Stevenson
Contact Email Address: info@advantekwms.com
[Optional] Contact Phone Number: (713) 532-7627
Organization role in project: Ongoing technology and operating partner; incubated Vaulted

Organization 3 – Kansas Department of Health and Environment (KDHE)
Company registration number (Unique business identification number in your country of registration):
Organization Name: Kansas Department of Health and Environment (KDHE)
Organization Address: 1000 SW Jackson Street Topeka, KS 66612

Contact Person:
Contact Email Address:
[Optional] Contact Phone Number: 785-296-1500
Organization role in project: Regulatory oversight - state permitting agency for facility's Class I and V permits.

Legal ownership of carbon removal claims
Please provide reasoning and evidence for legal ownership over the rights to all removals that will be claimed from the Project and refer to Section 3.1 "Ownership" of the Isometric Standard.
Vaulted wholly owns Advantek Cavern Solutions LLC, which is the sole operator of the Great Plains Facility and takes ownership over, and liability for, all injected materials. Vaulted owns the carbon rights to all sourced organic waste, as signed over by each organic waste partner.

Technical description of Project activity
Please provide a brief technical description of your carbon removal Project activity in accessible language. This should include information on facilities and equipment, the age and average lifespan of equipment, and all further information essential to understanding how carbon removal is achieved by the Project.
Vaulted targets moisture-intensive and often pathogenic wastes (biosolids, livestock and agricultural wastes, food waste, paper sludge, etc.) that today are sent to landfills, dumped into waterways, land applied unproductively, or otherwise left to decompose. Utilizing a proprietary slurry injection technology, Vaulted redirects those wastes from being disposed of, minimally processes them, and injects them underground for geologic storage. Vaulted's slurry injection technology allows for the safe sequestration of solids underground, enabling permanent carbon removal. The Great Plains Facility is a network of 60 existing salt caverns across 232 acres. The wells were originally drilled around the 1970s by the natural gas industry to store propane gas products. Today, the caverns are filled with a saturated salt-brine water. For the past 7 years, the site has been operating as a waste disposal operation, beneficially and safely reusing non-organic, non-hazardous waste at small volumes by injecting it into the caverns to enhance their stability. The wells are between 500 and 800 ft under the earth's surface. The entire facility has the capacity to store 2-3 million metric tons of waste. This facility was originally developed for petroleum product storage. After Vaulted acquired the operator of the site in September 2023, the site was re-purposed for dedicated carbon removal. Vaulted is not adding additional equipment for the purpose of carbon removal.

Declaration of exclusive registration
Please confirm that your Project may only claim credits for activities that are exclusively registered with the Isometric Registry.

Yes	Vaulted confirms that the Project for which it aims to generate credits under the Isometric Standard is not registered with any other voluntary or compliance scheme.

Public funding
Please describe briefly whether your Project has received any public funding, e.g., grants or subsidies
No

Estimated carbon removal capacity	
Please give an estimate of the net carbon removal capacity of this project in the coming years (metric tons CO_2e)	
Year	**Estimated carbon removal capacity (metric tons CO_2e)**
2023	2,000
2024	30,000 – 50,000
2025	30,000 – 50,000
2026	30,000 – 50,000
2027	30,000 – 50,000
2028	30,000 – 50,000

Section B – Protocol and Monitoring Data

Selected Certified Protocol	
Please select the Isometric Certified Protocol you wish to use for this Project. *Please note that, as per the Isometric Standard, you must use the latest available version of a Certified Protocol, unless a grace period has been explicitly specified by Isometric, whereby a former version of a Protocol may continue to be used for a defined time period.*	
Protocol Name: Biomass Geological Storage	
Protocol Version Number: v1.0.0	
Yes	Vaulted confirms that it is using the most recent available Certified Protocol version, or that a grace period has been explicitly specified allowing the use of an earlier protocol version.

Project Eligibility
Please explain why this Project is eligible under the selected Protocol.
This Project meets the eligibility criteria for the Biomass Geological Storage protocol. ● All feedstocks used in this project accord with the framework set out in the Feedstock Accounting module. Please see the Biomass Feedstock Information appendices for details on each feedstock and demonstration of eligibility. ● The project is injecting biomass into a US-based geologic formation for long duration storage via a permitted underground injection well. Further information is provided in the Storage well overview section of this PDD. ● The project is additional, as demonstrated in the section of this PDD covering Additionality.

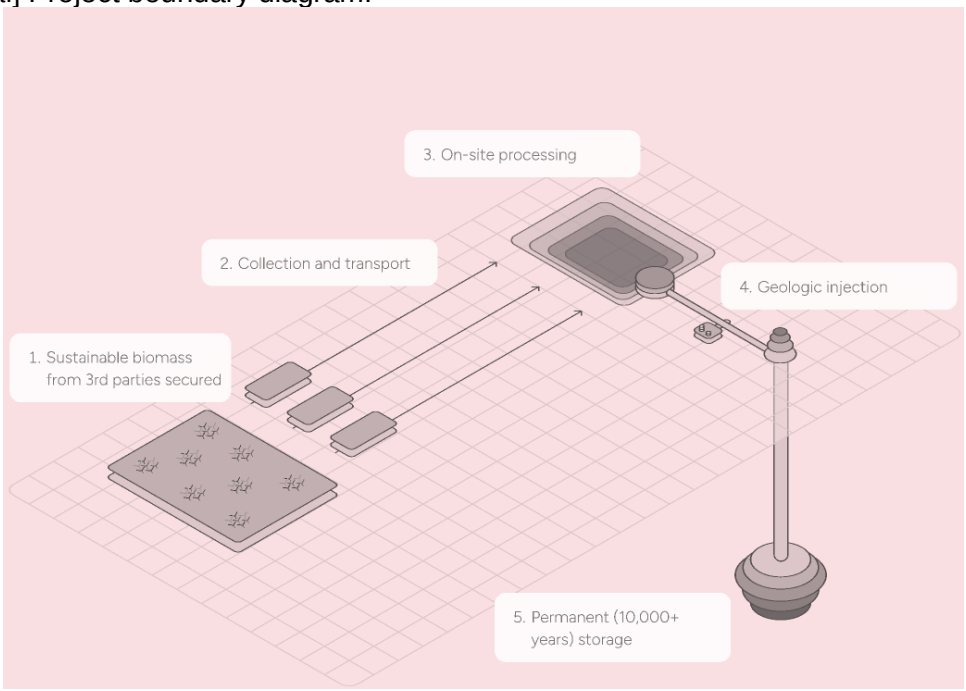
Acknowledgement of responsibility for providing notification of changes to operations	
Please confirm that you acknowledge responsibility for notifying Isometric of changes to operations which deviate from this submitted PDD	
Yes	Vaulted acknowledges responsibility for notifying Isometric of any changes to operations

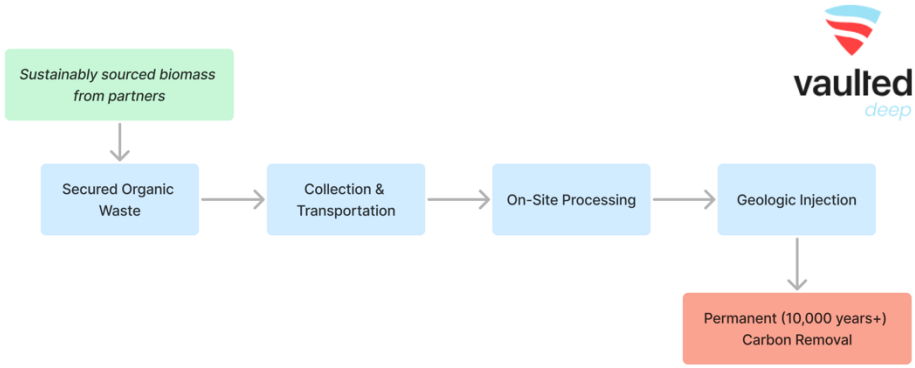
Project Boundary
Complete the below table detailing the Project boundary, including all GHGs considered across all Sources, Sinks and Reservoirs (SSRs) in both the Project and Baseline scenario. *Additionally, please give a description of the Project boundary. You may also optionally provide a diagram of the Project boundary.*
All activities undertaken to permanently sequester carbon, at the point of taking ownership of the organic waste, are included in the system boundary. Activities within the system boundary include waste transportation, processing, injection, monitoring, and sequestration activities. As a part of these activities, emissions associated with the procurement of all necessary equipment to run the facility are included, considering standard lifespans. Direct and embedded (upstream) emissions in fuels, materials, and infrastructure are included. Also included is the counterfactual use case of the organic waste biomass and any relevant replacement emissions. Excluded from the system boundary are all upstream inputs to biomass cultivation and production (all inputs into growing the biomass itself, as well as transportation and other processing activities involved in creating the waste). These upstream inputs were excluded because the biomass taken is waste – not purpose grown biomass – so these upstream activities occur without Vaulted's involvement.

Also excluded is the avoided CO_2 and methane emissions that would have occurred in the counterfactual scenario of the waste decomposing above-ground without Vaulted's intervention.

Geographic Boundary: This well facility is located in Hutchinson, Kansas, USA. Waste is sourced from within the geographic boundary that supports net-negative carbon removal. Location is considered when looking at grid emissions estimates for energy consumption.

[Optional] Project boundary diagram:





Baseline / Project	**Carbon Flux / Emission Source**	**Included/ excluded from project boundary?**	**Greenhouse Gas(es)**	**Justification/description**
Baseline	Counterfactual Emissions: Fuel Use	Included	CO_2, CH_4, NO_2	No additional fuel usage on part of waste supplier due to Vaulted

	from Feedstock Sourcing			activities. The emissions are 0.
Baseline	Counterfactual Emissions: Electricity Use from Feedstock Sourcing	Included	CO_2, CH_4, NO_2	No additional electricity usage on part of waste supplier due to Vaulted activities. The emissions are 0.
Baseline	Counterfactual Emissions: Replacement of Feedstock Function	Included	CO_2, CH_4, NO_2	This project meets sustainable feedstock sourcing eligibility criteria to allow for a replacement emissions value of 0 to be used.
Baseline	Counterfactual Emissions: Temporary Carbon Storage from Feedstock	Included	CO_2, CH_4	Vaulted will demonstrate the counterfactual fate is incineration within 5 years, thus the counterfactual temporary storage in the baseline is 0 (as none of the feedstock carbon would be stored at the 15 year threshold).
Project	Fuel Use from Feedstock Transport	Included	CO_2, CH_4, NO_2	CO_2 included as the primary emission from electricity consumption. CH_4 and NO_2 included for completeness as may also be released during electricity generation.
Project	Embodied Emissions from Feedstock Transport	Included	CO_2, CH_4, NO_2	CO_2 included as the primary emission from manufacture of vehicles. CH_4 and NO_2 included for completeness as may also be released during manufacture.
Project	Electricity Use from Biomass Pre-processing	Included	CO_2, CH_4, NO_2	CO_2 included as the primary emission from electricity consumption. CH_4 and NO_2 included for completeness as may also be released during electricity generation.
Project	Embodied Emissions from Equipment and Consumables for Biomass Pre-processing	Included	CO_2, CH_4, NO_2	CO_2 included as the primary emission from manufacture of equipment and consumables due to electricity consumption. CH_4 and NO_2 included for completeness as may also be released during electricity generation.
Project	Electricity Use from Biomass Injection	Included	CO_2, CH_4, NO_2	CO_2 included as the primary emission from electricity consumption. CH_4 and NO_2 included for completeness as may also be released during electricity generation.

Project	Embodied Emissions from Equipment and Consumables for Biomass Injection	Included	CO_2, CH_4, NO_2	CO_2 included as the primary emission from manufacture of equipment and consumables due to electricity consumption. CH_4 and NO_2 included for completeness as may also be released during electricity generation.
Project	Carbon Content of Injected Biomass	Included	CO_2e	Primary negative emission from process.

Baseline scenario

Please describe the baseline scenario of what would have happened if your Project did not take place (refer to Section 2.5.2 "Baselines" of the Isometric Standard and the requirements outlined in the relevant Protocol). Projects will only be credited for Removals above this counterfactual baseline.

Vaulted sources organic wastes that, in their baseline counterfactual, would have decomposed above ground, re-releasing the CO_2e back into the atmosphere. As per the Isometric Biomass Feedstock Accounting Module, all organic wastes which would have decomposed within 15 years do not require counterfactual storage emissions calculations. Since the counterfactual fate of these feedstocks is burning, it meets the criteria. Vaulted does not credit avoided methane emissions, and thus takes the most conservative baseline, that 100% of the carbon would have been released into the atmosphere as CO_2. Counterfactual use of all wastes is taken into account, including energy and replacement emissions.

The counterfactual scenarios of each individual feedstock used for this Project, and their eligibility under the Biomass Feedstock Accounting Module, are further described in the Biomass Feedstock Information appendix.

Leakage Assessment

Please give a robust assessment of how you have considered potential increases in GHG emissions outside the defined Project boundary that occur as a result of the Project activity. Where the potential for such Leakage is identified, it must be quantified and deducted from the CO_2e Removals in accordance with the relevant Protocol. Please refer to Section 2.5.4 "Leakage" of the Isometric Standard.

Vaulted measures and assesses all leakage risk across each stage of removal activities. The largest area of potential leakage with Vaulted's approach is in the biomass replacement, which is fully measured and accounted for as per the Biomass Accounting Framework.

Demonstration of Additionality: Financial Additionality

Please describe and provide evidence for how your Project is financially additional. Refer to Section 2.5.3. "Additionality" of the Isometric Standard and the requirements outlined in the relevant Protocol.

At the time of Project registration, revenue from the sale of carbon credits is the only material revenue stream for this Project, so this Project meets the Financial Additionality criteria of the Isometric Standard.

During this Project, additional feedstock sources may be added for which tipping fees may be received – information will be provided allowing Financial Additionality to be assessed for these feedstocks as they are used.

Vaulted currently does not qualify for the 45Q tax credit.

Demonstration of Additionality: Environmental Additionality

Please describe and provide evidence for how your Project is environmentally additional. Refer to Section 2.5.3. "Additionality" of the Isometric Standard and the requirements outlined in the relevant Protocol.

The project breaks the carbon cycle and facilitates the removal of carbon metric tons captured from the atmosphere via vegetation. In the absence of the project, organic wastes would have decomposed and this carbon back to the atmosphere (as described above in the *Baseline Scenario)*. The project will durably remove carbon from the atmosphere with net negativity, considering all project emissions and counterfactuals as described in this PDD.

Demonstration of Additionality: Regulatory Additionality

Please describe and provide evidence for how your Project is regulatorily additional. Refer to Section 2.5.3. "Additionality" of the Isometric Standard and the requirements outlined in the relevant Protocol.

This project is not required by any existing laws or regulations. The purpose of the project is to geologically sequester carbon-filled organic waste, resulting in verified carbon removal credits, which can be sold to buyers in the voluntary carbon markets. Therefore, the project meets the Regulatory Additionality requirements of the Isometric Standard.

Note: while not in any way required by existing laws or regulations, the project's storage mechanism is fully regulated. In the US, Vaulted injects under existing permits written for the express purpose of organic waste injection. These permits are issued by, and regulated under, the EPA or its delegated state agency.

Sampling plan

Please describe and provide evidence for how your Project has complied with the sampling requirements laid out in section 7.3.3.1.1 Biomass Carbon Content Measurement. If Method B (Sampling a Production Process) has been chosen by the Project, then describe the agreed upon random sampling approach.

Vaulted has chosen Method B (Sampling a Production Process) to measure carbon content. The specific sampling cadence can be viewed in the 'Vaulted Deep GHG Statement_12.20.23' spreadsheet. Here you will see that after an initial period of conducting triplicate measurements for the first 25 batches Vaulted has then proceeded to conduct a triplicate measurement on every 10th batch.

To comply with the random sampling requirement, Vaulted and Isometric have agreed that Isometric can contact the Great Plains Biomass Facility before 9am MT to request the first three batches that day to be sampled. Isometric may request this random sampling approximately 1 day every 3 weeks.

Durability Assessment

Please provide justification for how the Project adheres to the durability requirements outlined in the selected Protocol, which may include references to published literature or internal research. You may further expand on the Monitoring approach used to support the claimed Durability assessment in the "Overview of monitoring for durability" section of the next section.

Vaulted's Great Plains Facility stores the waste in sealed salt caverns 500+ feet underground for permanent (10,000+ year) geologic storage. Neither leakage nor re-emissions of the waste and its carbon content is expected.

Durability is expected to exceed much further than 10,000 years. This expectation is based on a combination of direct measurement, and modelling. Vaulted employs a monitoring program both during and post operation which includes regular testing for mechanical integrity of the wells and cavern integrity. This monitoring program enables the confirmation that the cavern is stable and does not have any subsurface leak pathways. This testing is done when a new cavern is opened, during pre-injection, injection, and post-injection operations. Vaulted monitors the displaced brine returned from the cavern for any waste, which is then filtered out and recycled back into the injection stream.

The Great Plains Facility employs slurry injection into salt caverns. Salt is an impermeable formation, thus making it an effective method for securely storing waste materials without risk of leakage into surrounding environments. The caverns at the facility exist at depths where waste is no longer buoyant; if the wells have integrity (confirmed using the same techniques as described above) and are property plugged, waste is permanently sequestered. Safe and durable sequestration of waste in salt caverns has been confirmed in literature, including here, here, and here. To further reduce any risks, Vaulted injects at minimal pressure (80 psig at the wellhead, which maintains total pressure – injection plus hydrostatic – below 0.75 psi / ft to the cavern top). This pressure threshold maintains cavern integrity (the triaxial stress capacity of salt is 1 psi/ft of depth).

In addition to direct measurement, the broader literature models durability of Vaulted's sequestration approach. Salt caverns have been identified in the literature as a viable location for permanent storage of CO_2.

Monitoring Plan	
Please submit the formulae used to calculate net negativity, specification of parameters to be monitored, as well as the values of any 'upfront' parameters via the Isometric tracking system. *Additionally, please give an overview of how monitored parameters and/or models will be used to support the assessment of durability. You may also provide any additional information here about how Project monitoring will be conducted.*	
Yes	Vaulted has submitted a completed monitoring plan alongside this PDD

Reversals
Please complete a reversal risk assessment for your Project, including consideration of the guidance in the Risk of Reversal Questionnaire below.
Overall risk of reversal (based on risk reversal questionnaire score; please select one): **Very low (0) - 2%** Low (1-3) - 5% Medium (4-5) - 10% High (>6) - 20%
[Optional] Additional details/assessment of reversal risk mechanisms: Vaulted does not expect there to be any reversals. Vaulted continuously monitors sequestered carbon: on a daily basis, Vaulted analyses real time pressure data to identify signals of containment integrity, constantly monitoring for sequestration efficacy, and would know immediately if change signalling a possible reversal had occurred. At Vaulted's Great Plains cavern, pressure gauges at the injection wells and monitoring wells on the facility boundary allow ensuring no material escapes the caverns into the earth. Vaulted will regularly conduct surveys within the cavern wells to understand remaining capacity and to ensure injected materials are not escaping. Should injected solid particulates return with the displaced cavern brine, they will be captured and reinjected. When injecting organic waste geologically, there is the chance of methane generation through anaerobic decomposition. However, Vaulted does not expect significant methane generation in the selected caverns. If methane is generated downhole, it will be trapped within the salt cavern. It would take a loss in cavern, well integrity (for which Vaulted regularly monitors) or returning with the displaced brine to release the methane from the caverns. Vaulted will use gas monitors in the return brine tanks to measure for signals of methane generation, and, if methane is detected, Vaulted will capture and quantify it and, based on its final disposition, will adjust claimed CDR accordingly.

#	Question	If answered “Yes”	If answered “No”	Biomass Storage answers
1	Is a reversal directly observable with a physical or chemical measurement as opposed to a modeled result?	Proceed to questions 2-8	Proceed to questions 7-8	Yes
2	Is the carbon being stored in a closed or impermeable system? (e.g., salt cavern)	Proceed to questions 10-11	Proceed to questions 3-11	Yes
3	Is the carbon being stored organic?	Add 1 to Risk Score		N/A
4	Does scientific consensus suggest that the carbon storage reservoir has a less than 10,000 year durability?	Add 1 to Risk Score		N/A
5	Is methane production a Project risk?	Add 1 to Risk Score		N/A
6	Does this approach have a material risk of reversal due to natural disasters including, but not limited to, floods, storms, earthquakes, fires, etc.?	Add 1 to Risk Score		N/A
7	Does this approach have a material risk of reversal due to human-induced events from outside actors, such as change in farming practices, change in ownership and management of Project sites, or similar?	Add 1 to Risk Score		N/A
8	[Applicable only for subsurface storage] Is the carbon being stored in the deep subsurface with multiple trapping mechanisms preventing reversals? (e.g., multiple confining layers, CO_2 dissolves or solidifies)	Minus 1 to risk (unless 0)		N/A
9	Is there 10+ years of monitoring and/or lab data demonstrating low project risk?	Minus 1 to risk (unless 0)		N/A
10	Does this pathway have a documented history of reversals?	Please consider the frequency and severity of previous reversals, and the shared characteristics between documented		0

		reversals and the present project. For pathways with no documented history of reversals, add 0 to the Risk Score. For pathways with a history of frequent reversal, add 2 to Risk Score. For pathways with a limited history of reversals, add 1 to Risk Score.		
11	Is there one or more Project-specific factors that merit a high risk level?	Please consider the number and severity of risks identified. If one low or medium severity risk is identified, add 1 to Risk Score. If multiple risks are identified, or if any high severity risks are identified, add 2 to Risk Score		0
Risk Score				0

Uncertainty assessment

Specify how uncertainty is considered, and how removals are to be conservatively estimated, in accordance with Section 2.5.7 "Uncertainty" of the Isometric Standard.

Please specify which option(s) were used in consideration of uncertainty (*one or multiple options*).

No	Conservative estimate of input parameters
Yes	**Variance propagation**
No	Monte Carlo Simulations

Please provide a sensitivity analysis.

Yes	Vaulted has uploaded a sensitivity analysis in accordance with the guidance in the Isometric Standard

Parameter	Data used	Initial assumption	Sensitivity Analysis assumption	Source / justification	% Change

Transportation fuel use	Measured - Fuel use mpg provided by transport company	As provided per delivery	20% increase in fuel use	Measured data - low uncertainty. An increase of 20% of transportation fuel use would not affect results up to the third significant figure (less than 1% in overall total net CO2e removals). Therefore, the original value has been used.	-0.803%
Transportation fuel use distance travelled	Google maps: road miles between supplier and well site	38 miles	8% increase in transportation distance	Measured data - low uncertainty. The biomass supplier and the well are connected by highway KS-96. The only uncertainty in transportation distance is on how trucks access KS-96 from the storage site. The transportation company provided a value of 38 miles, which means accessing KS-96 by West 53rd St N (see screenshots). An alternative scenario accessing KS-96 through N Broadway Avenue exits, making total transportation distance 40.9 miles, an 8% increase. This alternative scenario has been considered in the uncertainty assessment. The increase would not affect results up to the third significant figure (less than 1% in overall total net CO2e removals). Therefore, the original value has been used.	-0.321%
Biomass carbon content	Measured at a laboratory following the required standards	As measured per delivery	N/A	Measured and estimated data. Because not every truck is sampled for the carbon content of the biomass, the standard error (0.095) is subtracted from the average carbon content for the unsampled trucks. This provides a conservative estimate. With this, total net CO2e removals are reduced by 1%. This is in line with the requirements outlined in the Isometric Protocol and has been included as uncertainty estimation in the original assumption. Therefore, no further sensitivity analysis included.	N/A
Truck load	Measured using the on-site scale	As measured per delivery	N/A	Measured data – high certainty. The scale is calibrated annually, measurements must be within 100 lb (confirmed by email, screenshot added to evidence base). The uncertainty of the measurement is 0.23% (considering a 20 ton load). Because the uncertainty is well-below the 1% significance threshold, it has not been accounted for.	N/A
Injection electricity consumption	Measured with the electricity reader	As measured per delivery	2.5% increase in electricity use	Measured data. Electricity readers typically have an uncertainty range of +-2.5% (Electricity Meters – Disputed Meter Accuracy Report, National Measurement and Regulation Office, UK). If electricity use was increased by 2.5%, the impact on total net CO2e removals would be lower than 1%. Because of this, the original value has been used.	-0.018%
Injection fuel consumption	Measured on site	As measured per delivery	20% increase in injection fuel consumption	Measured data - low uncertainty. The increase would not affect results up to the third significant figure (less than 1% in overall total net CO2e removals). Therefore, the original value has been used.	-0.002%

Site material: steel	Estimated by the site manager	3.5E-05 ton	20% increase in steel used	Low to medium uncertainty, based on expert judgment. An increase of 20% of steel use would not affect results up to the fourth significant figure (<1%). The increase would not affect results up to the third significant figure (less than 1% in overall total net CO2e removals). Therefore, the original value has been used.	-0.012%
Site material: concrete	Calculated based on actual data provided by the site manager	7.7E-05 m3	20% increase in concrete used	Low uncertainty, based on expert judgment. An increase of 20% of concrete use would not affect results up to the fourth significant figure (<1%). B The increase would not affect results up to the third significant figure (less than 1% in overall total net CO2e removals). Therefore, the original value has been used.	-0.002%
CO2 monitoring -Lab sampling	Calculated based on mass x distance emission factors, knowing the mass of samples and the distance to the lab	0.0008 t*km	20% increase in tonne.km	Low uncertainty, based on expert judgment. The increase would not affect results up to the third significant figure (less than 1% in overall total net CO2e removals). Therefore, the original value has been used.	0.001%

Full sensitivity analysis and calculations can be found in the Vaulted GHG Statement_12.20.23.

Use of Models

Please describe your use of models (if any) for quantification, monitoring, and meeting specified Protocol requirements. Describe the specific model and simulations used, with enough detail so that the work could be replicated.

Please provide model validation results to demonstrate model accuracy, and include an assessment of model uncertainty.

No models were used for quantification or monitoring of this Project.

[Storage Module] Storage well overview

Please describe the storage well used and complete the following information.

Storage well description:

Vaulted operates a built and permitted injection well site in Hutchinson, Kansas. This site is a network of 60 salt caverns, with the total capacity to hold 2-3 million metric tons of organic waste. The wells are permitted under Class UIC V well permits by KDHE.

Monitoring overview (*please summarise the current monitoring in place, as required by the well permit and in accordance with the protocol monitoring requirements. You may provide more information on individual monitoring parameters in the Project Monitoring Plan):*
At the Great Plains Facility, Vaulted maintains a robust monitoring program. Vaulted employs a variety of direct (logging, monitoring, wireline, analysis of well returns, pressure testing) and indirect methods (simulation studies) to confirm containment of injected materials and their decomposition products if any during operations and during project decommissioning. This includes real time data acquisition of the injection and post injection pressure data. Vaulted also takes periodic measurements, such as depth checks, and sonar or other surveys, which provide a second method for confirming the same containment. At the Great Plains Facility, pressure gauges at the injection wells and monitoring wells on the facility boundary allow Vaulted to ensure no material escapes the caverns. Regular surveys and depth checks are conducted within the cavern wells to understand remaining capacity and to ensure injected materials are accounted for. Vaulted regularly interfaces with the Kansas Department of Health and Environment (KDHE), particularly their Underground Injection Control Division. Monthly and quarterly reports are submitted to KDHE showing that the site is running safely, including data on groundwater quality, emplaced material spec, volume of injected material, and pressures and stability in the subsurface caverns. Vaulted has a strong ongoing relationship with KDHE, with monthly calls to ensure they’re comfortable with the facility. Additionally, the US EPA issued a comfort letter on June 19, 2018 attesting to the safety of Vaulted’s slurry injection technique and the appropriateness of using Class V wells for organic waste injection.
Storage well location (Address / GPS coordinates): 37.966, -97.941
EPA Well Class: Class V
Permit number: KS-05-155-003
Permitting authority: Kansas Department of Health and Environment (KDHE)
Permit validity start date: Feb 8th 2022
Permit validity end date: Feb 8th 2027
Well storage capacity (total): 2-3M metric tons of wet organic waste
Well storage capacity (used): <10,000 metric tons of wet organic waste
Well storage capacity (available): 2-3M metric tons of wet organic waste

Section C – Duration & Crediting Period

Project timeline
Please indicate the projected start date of your Project and, if applicable, its expected operational closure date.
Start date of Project: 2023-08-22
[Optional] Expected operational closure date of Project:

Project closure
Please describe the conditions under which the Project will be considered closed, and describe the Project Closure Plan – outlining any post-cessation actions that will be undertaken upon Closure of the Project.
Definition of Project cessation: Once all salt caverns reach capacity and are properly plugged.
As a cavern reaches its capacity, Vaulted shuts the well in and places the cavern on monitoring status (post-injection monitoring) for a period of time to confirm the well is static and to comply with KDHE rules. Once the appropriate post monitoring period is complete, each at-capacity cavern will be plugged with cement in a manner that prevents the movement of fluids either into or between underground source of drinking water (USDW).

Crediting Period
Please indicate the planned start date and duration of your crediting period. The crediting start date may either be your Project's start date or up to two years prior to design submission, whichever is later. Unless otherwise specified in the relevant Protocol, the maximum crediting period is 5 years.
Start date of crediting period: 2023-08-22
Total length of crediting period: 5 years

Section D – Environmental and social impacts

Analysis of environmental and social impacts	
Please provide an assessment of the environmental and social impacts of the Project, in accordance with Section 3.7 "Environmental and Social Impacts" of the Isometric Standard. *For each aspect of the assessment, demonstrate how the risks have been assessed and if applicable, what mitigation plan is in place to prevent them. If some aspects are not applicable to your project, justify how you determined it.* *A full Environmental and/or Social Impact Assessment (EIA and SIA) is only required if impacts are considered significant and/or if required by the host jurisdiction.*	
No	[Optional] Vaulted has attached a full EIA document.
No	[Optional] Vaulted has attached a full SIA document.
Yes	Vaulted acknowledges responsibility for reporting potential environmental and social impacts identified to Isometric and environmental regulators
Environmental Impacts	
***Resource efficiency and pollution prevention**, including pollutant emissions to air, pollutant discharges to water, noise and vibration, generation of waste and release of hazardous materials, chemical pesticides and fertilizers.*	
Yes	Above risks are applicable to this Project
All necessary pre-injection studies and analyses were conducted before the facility was built, including geologic feasibility studies, local environment and groundwater assessments, and engagement with local community groups and regulators. The Great Plains Facility is already fully permitted and operational. The Great Plains Facility underwent environmental assessment prior to securing Class V injection permits. The assessment found no material environmental issue with the site. Regular monitoring is undertaken at the facility, including: - Quarterly groundwater testing to ensure no groundwater contamination - Lab analysis on all emplaced material to ensure complies with non-hazardous organic permit - Monthly reporting on total volume of emplaced material - Daily readouts of pressures and stability of the subsurface caverns - Bi-yearly elevation surveys to ensure ground stabilization (and no cavern sinking is occurring)	
***Biodiversity conservation and sustainable management of living natural resources**, including terrestrial & marine biodiversity and ecosystems, protecting habitats of rare &*	

endangered species, avoiding conversion of natural forests, grasslands or wetlands, minimizing soil degradation or erosion, minimizing water consumption and stress.	
Yes	Above risks are applicable to this Project
The Great Plains Facility underwent environmental assessment prior to securing Class V injection permits. The assessment found no material environmental issue with the site.	
Social Impacts	
***Labor rights and working conditions**, including providing safe & healthy working conditions for employees, fair treatment and equal opportunities in your organization; considerations of prevention of forced labor, child labour or trafficked persons protecting workers employed by third parties.* *This is required for all Projects.*	
Yes	Above risks are applicable to this Project
Vaulted provides a safe and healthy working environment at the Great Plains Facility. Standard safety protocol is in place, including daily safety meetings at the start of each shift and providing proper Personal Protective Equipment (PPE). Workers are provided with safety training updated annually based on periodic evaluations of site conditions. Operators are rewarded through their variable incentive compensation for identification of risks and proposing remediations. Moreover, the company provides an anonymous hotline for employees to raise concerns related to any aspect of their work. Additionally, Vaulted pays living wages and commits to paying living wages in the future. Site operators are paid significantly higher wages than the state median income.	
***Land acquisition and involuntary resettlement** in the context of your deployment site selection*	
Yes	Above risks are applicable to this Project
The land is owned by Underground Cavern Stabilization (UCS). The salt caverns on the land were originally leached for the storage of propane gas products. No known involuntary resettlement happened as a result the site's development.	
***Environmental and social justice, Indigenous Peoples, Local Communities, cultural heritage, human rights and gender equality (equal opportunities and pay)**, as it relates specifically to deployment site selection.*	
Yes	Above risks are applicable to this Project
While there are not known environmental or social justice risks associated with deployment site selection, there are major potential benefits to environmental and social justice associated with Vaulted's activities. The wastes Vaulted takes today can pollute the local environments they are disposed in. When manure is land applied, runoff can cause algae blooms, which produce toxins seriously harmful to human health. It is also well-documented that manure lagoons lead to groundwater contamination, despite the safety	

measures sometimes put in place. Additionally, when sent to landfill, biosolids mix with other wastes and generate leachate, a toxic liquid that contaminates groundwater and soil. When sent to incineration, biosolids can release a wide variety of harmful substances including heavy metals, PFAS, and dioxins – proximity to incineration is associated with negative health outcomes like cancer and birth defects. Research shows that residents living near organic waste land application sites and landfills are also more likely to experience a variety of negative health consequences. Decades of research have found that waste sites, polluting facilities, and other unwanted land uses are disproportionately located in BIPOC and low-income communities. By sequestering these wastes, Vaulted reduces local environmental and human health harm and advances environmental justice.

Section E – Stakeholder Input Process

Stakeholder Input Process Summary
Please provide a description and documentation of how comments by local stakeholders have been invited and compiled, a summary of comments received, and report on how due account was taken of comments received. Refer to Section 3.5 "Stakeholder Input Process" of the Isometric Standard for full requirements.
At the Great Plains Facility, multiple sessions were held to solicit feedback from the surrounding community on the site. A site tour was conducted as well as two community meetings held to address concerns and questions. The main voiced question was to inquire about job opportunities at the site. The second question was around maintaining safe drinking water at and around the site. The community was told about the regular monitoring for containment of the formation and the regular groundwater checks. In general, for future wells, Vaulted sees working with local communities, governments, and other stakeholders as essential to both scaling CDR work and ensuring maximum positive social and environmental impact. Generally, stakeholders include: - Local, state, and federal regulators (generally, state and local EPA) - Members of local government - Nearby residents and landowners (especially within the anticipated radius of injectate migration / influence) - The waste partners from whom Vaulted offtakes the waste - Environmental interest groups / NGOs Vaulted engages with each of these stakeholders across the lifespan of the work of the site - before Vaulted even begins the well permitting process. Before any steel is in the ground, Vaulted submits detailed well plans to the regulators at the start of the permitting process, holds community meetings to answer questions, and works with waste partners to finalize offtake. Vaulted continues to engage each stakeholder throughout the project - as Vaulted secures the permit, builds the well, and operates it on an ongoing basis. Vaulted's sites require regular re-permitting and regular reporting to regulatory and local government agencies, the outputs of which are publicly available. These activities generally entail public engagement via notices, hearing, regular quantification and reporting of net environmental impacts, and public access. The cadence of these activities provides Vaulted with regular input from the public via their elected representatives, responses to public notices, feedback from public presentation, and other vehicles.

Grievance Mechanism

Please outline the mechanism for stakeholders to voice, process and resolve grievances.

In the Great Plains Facility, Vaulted regularly interfaces with the Kansas Department of Health and Environment (KDHE), particularly their Underground Injection Control Division. Vaulted submits monthly and quarterly reports to KDHE showing that the site is running safely, including data on groundwater quality, emplaced material spec, volume of injected material, and pressures and stability in the subsurface caverns. Vaulted has a strong ongoing relationship with KDHE, with regular calls and site visits to ensure they're comfortable with the facility's operations. Vaulted has also engaged with federal, local and county representatives, as well as residents and landowners proximate to the site. Because the site is in a small community rural setting, Vaulted made neighbourhood outreach a top priority. Vaulted engaged the community before filing for permits at the project definition stage, throughout the permitting process, and once the permit was issued before commencing operations. These touch points included when the landowner originally permitted the site for waste emplacement, as well as when Vaulted filed for an organic waste permit in 2021 year through Advantek, Vaulted's incubating company. In both cases, Vaulted/Advantek used county records to identify interested parties, sent letters to the nearby residents and landowners, hosted open houses (information sessions and site tours). On each occasion, Vaulted had local regulators from KDHE and local government officials present. Additionally, Vaulted posted the facility permits into the federal register and other publications as applicable to provide adequate public notice and opportunities for feedback, engagement, or protest.

For any issues or questions that arise community members and other stakeholders can reach out to the facility via phone at 620-662-6367.

Appendix 1: Biomass Feedstock Information – Mixed woody waste

This Appendix must be completed for each feedstock type and feedstock provider used in this Project.

Feedstock Summary
Please describe your Feedstocks used.
The first feedstock used under this PDD is mixed woody waste diverted from a local landfill. Mixed woody waste is a mix of organic woody wastes including tree limbs, branches, pallets and smaller organic waste like lawn clippings. Evergreen Companies is a 3rd party that diverts mixed woody waste from the local landfill, getting paid to take the waste (Evergreen does not pay anyone for this waste, as they divert it from the local landfill). Evergreen then endeavours to repurpose the mixed woody waste but has large amounts of excess material. Everything that cannot be repurposed gets incinerated on-site. Evergreen sells Vaulted the excess waste that cannot be repurposed and would otherwise be incinerated on-site at Evergreen. Vaulted pays Evergreen per metric ton for this waste.

Feedstock Hazardous status
Please describe how you are demonstrating that the feedstock you are using is not hazardous. This may either be done by providing evidence from tests of the feedstock or by providing evidence that the relevant injection permits only allow non-hazardous materials.
Evergreen waste is non-hazardous, in line with Class V permit.

Feedstock Provider Organizations
Please provide a complete list of organizations involved in providing the feedstock, clarifying the organization's role and providing contact information for each. (*Please duplicate the below rows for each additional organization you wish to add)*
Organization – Evergreen Companies
Company registration number (*Unique business identification number in your country of registration*): 26-1728441
Organization Name: Evergreen Companies
Organization Address: 302 W 53rd St N. Wichita, KS 67204
Contact Person: Jeff Ralls

Contact Email Address: Info@evergreencompaniesks.com
[Optional] Contact Phone Number:
Organization role in project: Supplier of mixed woody waste

Potential Market Leakage Impacts Eligibility	
Please select which of the Potential Market Leakage Impact Eligibility Criteria you're using to demonstrate eligibility for this feedstock.	
No	EC1: Project Proponent does not pay for the feedstock
No	EC2: Project Proponent receives a payment for the feedstock
No	EC3: Project Proponent pays for recovery & replacement activities only
Yes	EC4: Project Proponent pays to a 3rd party, not entity producing feedstock
No	EC5: Publicly managed forest management activity
No	EC6: Certified forest management activity in increasing carbon stock areas
No	EC7: Certified forest management activity in exceptional circumstances
No	EC8: Sustainably sourced agricultural crop residue
No	EC9: Surplus residue with no demonstrated growth of supply
Demonstrate how your feedstock meets it by providing the required documentation or analysis.	
Vaulted pays a third-party firm, Evergreen Companies, who diverts mixed woody waste from the landfill. Evidence ● Purchase contracts with Evergreen ● Signed letter from Evergreen saying they don't pay other parties for the biomass	

Counterfactual Storage Eligibility
Please describe and attach any relevant evidence to demonstrate that your feedstock would have emitted the biogenic CO_2 to the atmosphere sooner than the required threshold period. If only a portion of your feedstock would have emitted the CO_2 after the threshold period, attach relevant evidence and confirm that you have incorporated the relevant calculation into your GHG Statement.
Evergreen diverts mixed woody biomass from the local landfill. Vaulted takes Evergreen's leftover waste it cannot repurpose that it otherwise would have incinerated on site at Evergreen. This burning process releases the full carbon content of the biomass

immediately, leading to a counterfactual storage of the carbon below the threshold time in the Isometric Protocol of 15 years. Evidence in attestation from Evergreen.

Dedicated Energy Feedstock Eligibility
This is only applicable to non-forestry feedstocks. *Please describe your analysis in how you determined that your feedstock isn't grown for the purposes of energy production.*
N/A

Counterfactual Fate of Feedstock
Please describe and attach any relevant evidence to demonstrate what the most likely counterfactual scenario would be for your feedstock, using guidance outlined in Section 3.2.1 of the Biomass Feedstock Module.
Evergreen diverts mixed woody biomass from the local landfill where it would be incinerated (without energy capture) at Evergreen site. Thus, there was no productive alternative counterfactual use for the diverted wastes so no replacement use. [Evidence is the same as "**Counterfactual Storage Eligibility**" response + evidence of no energy capture]

Replacement Emissions	
Please select which method of replacement emissions accounting you've selected given the nature of your feedstock	
No	Accounting for the feedstock replacement emissions in the GHG Assessment
Yes	Not accounting for replacement emissions due to exemption C1 *(Feedstock has no counterfactual use)*
No	Not accounting for replacement emissions due to exemption C2 *(Feedstock counterfactual use is most likely replaced with a feedstock with no counterfactual use)*
No	Not accounting for replacement emissions due to exemption C3 *(Feedstock has no counterfactual use due to surplus)*
If you selected an exemption above, please demonstrate how your feedstock meets it by providing the required documentation or analysis.	

Evidence provided in “Counterfactual Fate of Feedstock” response.

Appendix 2: GHG Statement Information

GHG Assessment information for net Removal of 1,401.27 tCO_2e over period spanning /22/2023 to 11/16/2023. To be read in conjunction with the 'Vaulted Deep GHG Statement_12.20.23' spreadsheet Model.

General Information	
Practitioner of GHG Assessment and relevant competencies	Javier Antonanzas, Ph.D.
Date of current report	20th December 2023
Has the study has been conducted according to the requirements of ISO 140064-2	Yes

Goal and scope of study	
Reasons for carrying out the study	To provide an understanding of the greenhouse gas (GHG) related to injecting woody waste biomass in salt caverns with the purpose of generating carbon dioxide removals over the period spanning from 8/22/2023 to 11/16/2023.
Intended application	To calculate net carbon dioxide removals for the referenced project.
System boundary including details on exclusions of life cycle stages or processes	Refer to PDD for system boundary. End of life emissions of concrete pads has been excluded because they are assumed to remain in place permanently, and their contribution to total emissions will not surpass the 1% significance threshold. LPG emissions from previous salt cavern uses have been excluded from the assessment given that the cavern in use was open years ago for purposes other than carbon removal. In the future, when a new cavern is open, the gas will be captured, measured, and accounted for in the GHG Statement if it passes the significance criteria. Construction emissions associated with establishment of the removal site have been excluded from the study because the salt cavern was already established and in use for previous uses other than carbon removal.
Cut off criteria for initial inclusion of inputs and outputs (incl description of cut-off criteria and assumptions, effect of selection on results, inclusion of mass, energy and environmental cut-off criteria)	A conservative approach has been followed and no particular cut-off has been applied. Emissions associated with all activities involved in the project processes have been included. Activities not directly related to project operations, such as research and development activities, corporate administrative activities have not been included.

A list of all relevant GHG sources and sinks controlled by the project, as well as those related to or affected by the project, including the defined criteria for inclusion or quantification	Refer to PDD Section B – Protocol and Monitoring Data.
A general description of the criteria, procedures, or good practice guidance used as a basis for the calculations	The GHG Assessment has been prepared in line with the Isometric Standard and the Biomass Geological Storage Protocol.

Methodology	
Provide details of data collection procedures	Truck loads were weighed on site using a well-calibrated scale and recorded by the site manager. Incoming biomass carbon content was measured at a lab following the required standards. Truck drivers provided their truck gas mileage both at full load and on empty returns for each delivery. The site manager provided information on materials such as actual piping length, volume of concrete, and an estimation of the weight of tanks. The site manager provided processing and office electricity readings before and after processing each truck load, diesel consumption associated with front loaders when required. Weight of lab samples was conservatively estimated based on information received from the lab.
Provide details of calculation procedures followed	Project emissions were calculated based on the activities that took place during the period 8/22/2023 to 11/16/2023. Project emissions and net CO_2e removal was calculated for every removal activity. Activity data was multiplied by their respective emission factors to obtain the final CO_2e emissions. For example, for each removal diesel consumption was estimated based on distance from supplier site to removal site (accounting for inbound and outbound journeys) and mpg of the delivery truck used for that specific delivery. Diesel consumption was then multiplied by the appropriate emissions factor, to provide emissions associated transport for that removal activity. Total embodied emissions were calculated based on total materials required for the lifetime operation of the site. Materials were allocated to each metric ton of waste based on a conservative estimate of lifetime processing waste capacity of 2,000,000 metric tons of waste. Emissions associated with

	each removal activity were calculated based on emissions factors which accounted for the lifecycle impacts of the materials produced. Net removals in t CO_2e for each removal activity was rounded to the nearest 0.01t CO_2e in line with Isometric requirements. Emissions factors used were representative of all GHGs.
Provide details of validation of data (including data quality assessment and treatment of missing data)	In most cases the data used is measured primary data. Specifically, regarding biomass transportation, which is the largest contributor to total emissions, the gas mileage from each truck used to transport the biomass was obtained for both full load and empty returns. Carbon content was measured according to the Isometric Standard and Biomass Geological Storage Protocol. For biomass that was not sampled for its carbon content, one standard error was subtracted from the rolling average to work with conservative estimates, as dictated by the Isometric Standard. Winsorization was applied to identify outliers, based on 3 standard deviations above and below the mean and outliers were adjusted.
Details of sensitivity analysis conducted for refining the system boundary	A sensitivity analysis was performed to understand the impact on parameter uncertainty on total carbon removals. Uncertainty estimates were created for each variable based on measured data and expert judgment. If the net CO_2e removal did not change by >1%, the original estimate was kept. If parameter uncertainty introduced a change larger than 1%, then a full uncertainty analysis was performed on the parameter and the conservative parameter estimation was used in calculations.
Limitations of the GHG Assessment results relative to the defined goal and scope of the GHG Assessment	The GHG Assessment results serve the purpose of the defined goal and scope of the study. One limitation is that gas mileage and distance for biomass transportation was used instead of the actual gallons/liters, due to data limitations associated with a third-party transport company. This is not thought to represent a problem because the gas mileage from the actual trucks were used, anticipating very little variations between the reported gas mileage and the actual gallons of diesel consumed.

Results	
Provide the results; assumptions and limitations associated with the interpretation of results, both methodology and data related	Over the study period considered, a total of 1,401.27 t CO_2e were removed.
Provide details of how the data quality was assessed	Data quality was assessed through the sensitivity analysis. Additionally, and following the Isometric Standard, one standard error was subtracted from the average carbon content of the unsampled biomass to account for the uncertainty. Primary data from the equipment used (trucks, pipes, etc.) was collected and emission factors from reputable sources (e.g., Ecoinvent, EPA) were used.
Provide full transparency in terms of value-choices, rationales and expert judgements	All raw data and assumptions have been specified in the 'Vaulted Deep GHG Statement_12.20.23' spreadsheet.
A GHG Statement of the aggregate emissions and/or removals by GHG SSRs for the project that are controlled by the project proponent, stated in CO2e for the relevant time period (e.g., annual, cumulative to date, total)	In the period spanning from 8/22/2023 to 11/16/2023, the site processed 4,492 metric tons of woody waste biomass, resulting in 68.3 t CO_2e emitted and 1,469.5 t CO_2e sequestered, to make a net total of 1,401.27 t CO_2e removed.
A statement of the aggregate GHG emissions and/or removals by GHG SSRs for the baseline that are controlled by the project proponent, stated in CO2e for the relevant time period (e.g., annual, cumulative to date, total). Provide a description of the GHG baseline and demonstration that GHG emission reductions or removal enhancements are not over-estimated	The counterfactual of this project is 0.
A statement of uncertainty, how it affects the GHG Statement and how it has been addressed to minimise misrepresentation	A list with all the parameters used in the calculation of Removals has been provided in the GHG Assessment model provided, along with their estimated uncertainty, as required by the Isometric Standard. Among the parameters that significantly contribute to the calculation of removals, only the biomass carbon content was found to have some uncertainty due to not every truck being sampled for the carbon content of its biomass. For that reason, one standard error was deducted from the average carbon content of the biomass from

	unsampled trucks. The rest of the parameters have very little uncertainty because they are based on measured, primary data.
Explanations of how assumptions and choices are conservative	See Sensitivity Analysis tab in ‘Vaulted Deep GHG Statement_12.20.23’ spreadsheet.