HDVine LLC

Haas Vineyard (P23-00355): Analysis of Greenhouse Gas Impacts from Land Conversion REVISED

October 30, 2024

Introduction

The vineyard project proposes developing a 5.0 ac portion of the 23.9 acre site into vineyard (see APPENDIX B, Figure 1 for overview of site parcel). A site-specific greenhouse gas (GHG) analysis was conducted to evaluate the impact of converting the land from its natural habitat to vineyard. The project site was significantly damaged by the 2020 Glass Fire, which would be considered a high-severity fire. Wildfires impact carbon storage and carbon sequestration abilities of the resulting landscape.

- Carbon stock is the amount of carbon physically present in the existing vegetation and other organic material inside of the project boundary.
- Carbon sequestration is the rate at which carbon is captured from the atmosphere and stored in the vegetation and organic matter within the project boundary (primarily through photosynthesis).

The methods section below outlines the handling of wildfire impacts on the GHG analysis. The scope of this analysis was kept small (vineyard and landscaping) to focus on project impacts. However, the net positive balance on the parcel is underestimated due to a site specific reforestation plan that was not included as part of this quantitative analysis.

The framework for this analysis was designed based on metrics presented in the *Regional Carbon Stock Inventory Report for Napa County* prepared by Ascent in August 2023 [1]. The Ascent report relied heavily on metrics presented in the *Technical Documentation for the California Natural and Working Lands Carbon and Greenhouse Gas Model (CALAND)*, prepared by Lawrence Berkely National Lab (June 2019) [11]. The CALAND report and associated journal articles were referenced for additional metrics and for context[1].

Methods

GHG impacts for the land conversion aspect of the project were evaluated by comparing two scenarios over a 40-yr duration: a baseline scenario and a vineyard scenario. The analysis compares the cumulative carbon stored and sequestered over 40 years between the two scenarios. The components of carbon stock and carbon sequestration for each scenario scenarios is summarized below:

Table 1 Summary of Analysis Scenarios

	Description of Land Cover Types	Quantitative Components of Carbon Stock	Quantitative Components of Carbon Sequestration
Baseline Scenario	Post-Fire Scenario **(5.4 ac total)** that includes: • Area that will be converted to vineyard (5 ac) • Disturbed land around main residence for future landscaping plants (0.4 ac)	Mixed Shrubland Disturbed Land	Mixed Shrubland Disturbed Land
Vineyard Scenario	Post-Development scenario **(5.4 ac total)** that includes: • All vineyard areas, grassy avenues and conservation management practices (5 ac) • Landscaping area around main residence where native and non-native species will be planted (0.4 ac)	Vineyard Grassland Mixed Shrubland	Vineyard Grassland Landscaping Trees Vineyard Conservation Management Practices

[1] The property owner engaged Ascent Environmental Inc. to review and comment on the GHG analysis presented herein. Valuable feedback was received and incorporated into this work. An email acknowledgement from Ascent staff is attached to this report.

a) BASELINE SCENARIO

i. Description: The Baseline Scenario includes the remaining carbon stock and sequestration associated with the recovery potential of post-fire conditions within areas that will be converted to vineyard and residential landscaping plan. The Baseline scenario is representative of post-fire conditions after initial fire cleanup activities (timber milling, burn piles, chipping, non-commercial export of wood, etc.). The Glass Fire occurred in 2020 and the Baseline Scenario would be representative of 2024 pre-development conditions (i.e. after initial vegetation recovery in shrubland areas has occurred but before the proposed vineyard and landscaping plan have been put in place. The calculations consider the following components:

- Carbon Stock in Land Cover: The CALAND documentation [11] categorizes non-regeneration of forest after a high-severity wildfire as a conversion of land cover type to shrubland. As such, baseline landcover type for the future vineyard conversion area was assumed to be shrubland for carbon stock and carbon sequestration rates. Carbon stock values were obtained from Table 1 of the Ascent 2023 Napa County Inventory Report [1]. The shrubland designation assumes natural post-fire regeneration of ground cover without outside intervention or additional plantings. The landscaping area was included as a line item although there is no carbon stock component for the disturbed land around the residence and driveway.

- Carbon Sequestration in Land Cover: Appendix B of the CALAND report compiles the net exchange of carbon for soil and vegetation over time [11]. The appendix breaks down the net carbon exchange by land cover type, region, and ownership. Each carbon exchange value includes a value and a margin of error, from which a maximum and minimum estimate of carbon sequestration per acre per year was calculated, where a negative value indicates a net loss of carbon over time. This scenario utilized shrubland for the future vineyard conversion area. The shrubland designation assumes natural post-fire regeneration of ground cover without outside intervention or additional plantings. The landscaping area was included as a line item although there is no carbon sequestration component for the disturbed land around the residence and driveway.

b) VINEYARD SCENARIO

i. Description: The Vineyard Scenario considers post-development conditions within the boundaries of the vineyard project and gives credit for residential landscaping planned for the property (see APPENDIX B, Figure 1). The calculations consider the following four components:

- Carbon Stock in Land Cover: The post-development scenario used cultivated land cover type (for vineyard) and grassland (for grassy avenues) per Table 1 of the Ascent 2023 Napa County Inventory Report [1].

- Carbon Sequestration in Land Cover: Appendix B of the CALAND report compiles the net exchange of carbon for soil and vegetation over time [7]. The appendix breaks down the net carbon exchange by land cover type, region, and ownership in a table. Each carbon exchange value includes a value and a margin of error, from which a maximum and minimum estimate of carbon sequestration per acre per year was calculated, where a negative value indicates a net loss of carbon over time. This scenario utilized “Cultivated Land” (for vine area) and “Grassland” (for grassy avenues).

- Carbon Sequestration from Site Enhancements: Conservation Management Practices (CMPs): The California COMET-Planner tool [4] was designed to evaluate the carbon sequestration potential of conservation practices over conventional agriculture practices. The CALAND “Cultivated Land” metric is assumed to be for conventional annual and perennial crops (explained more in the Discussion section). As such, results from the CA COMET-Planner tool were used to quantify benefits from sustainable farming practices outlined in the vineyard Erosion Control Plan including compost application(s), permanent grasses cover crop, mulch applications, and no-till management. CMP sequestration rates and Vineyard Scenario assumptions are summarized in Table 2 below (see

APPENDIX B, Figure 3 for raw outputs from the CA COMET-Planner[2]). Table 2 lists the total number of years that each CMP is assumed to be representative of site conditions according to the vineyard Erosion Control Plan and results in a sequestration rate by acre that was used in this analysis.

Table 2 Results from CA COMET-Planner Tool

NRCS Conservation Practice	MT CO_2e / acre / yr	# years
Compost (C/N <= 11), 2 tons/ac	1.53	5
Compost (C/N >= 11), 6 tons/ac	4.44	
Permanent Cover (grasses)	1.45	35
Permanent Cover (legume mix)	2.95	5
Mulch (wood chips)	0.34	
Mulch (natural materials)	0.34	5
No Till	0.34	35
PROJECT TOTAL (MT CO_2e / ac)		**85**

- Carbon Sequestration – Site Enhancements: Landscaping Area: The analysis considered carbon sequestration for new landscape plantings, specifically tree plantings, located on the subject parcel and outside the vineyard development area using the iTree Planting Calculator (APPENDIX B, Figure 2) [9]. New landscape plan metrics were assembled based on Haas Residence Landscaping Plan, which plans for 331 individual plantings over 18 species [8]. It is assumed that iTree Planting Calculator output accounts for both carbon Stock and carbon sequestration potential of the plantings, but the metric was listed under the sequestration totals since the tool evaluated sequestration potential over a set time period. Planted trees were assumed to be 1 in to 2 in diameter at breast height (DBH) at planting depending on the pot size specified in the planting plan (a 5-15 gal pot was assumed to have 1 in DBH and a 24 in box was assumed to have 2 in DBH). In the landscaping area, a 40-year duration was considered with a 20% mortality rate.

Results

The analysis demonstrated that the Vineyard Scenario will sequester more carbon over the 40-year analysis period than the Baseline Scenario. The following summary tables (Table 3, Table 4) include maximum, minimum, and average carbon storage inventory for each component outlined in the Methods section above. The inventory refers to the amount of carbon stored within the project area under the baseline and vineyard scenarios over a 40-year period. One item has MAX and MIN values:

- Sequestration Land Cover calculations use values from Appendix B of the CALAND report [11], which includes margins of error, from which Max and Min values were calculated.

All other metrics are constants in Min and Max fields. Complete calculation tables are included in Appendix C for reference.

Table 3 Carbon Storage Inventory: Baseline Scenario

BASELINE SCENARIO: SUMMARY		MIN	MAX	AVE
CARBON STOCK	*MT CO_2e*	297	297	297
CARBON SEQUESTRATION	*MT CO_2e/40 yrs*	244	475	359
Baseline Scenario Total	*MT CO_2e*	**540**	**772**	**656**

Table 4 Carbon Storage Inventory: Vineyard Scenario

VINEYARD SCENARIO: SUMMARY		MIN	MAX	AVE
CARBON STOCK	*MT CO_2e*	31	31	31
CARBON SEQUESTRATION	*MT CO_2e/40 yrs*	804	1093	949
Vineyard Scenario Total	*MT CO_2e*	**836**	**1125**	**980**

[2] The COMET-Planner tool results are rounded to the nearest integer. Therefore, a unit of 100-acres was used as an input and the results were divided by 100 to obtain sequestration per acre with additional significant figures.

Table 5 Scenario Comparison and Greenhouse Gas Balance

BALANCE ---REVISED---		MIN	MAX	AVE
Vineyard Scenario Total	*MT CO2e*	836	1125	980
Baseline Scenario Total	*MT CO2e*	540	772	656
$BALANCE_{MIN}$ = $(VINEYARD)_{MIN}$ - $(BASELINE)_{MAX}$	*MT CO2e*	63		
$BALANCE_{MAX}$ = $(VINEYARD)_{MAX}$ - $(BASELINE)_{MIN}$	*MT CO2e*		584	
$BALANCE_{AVE}$ = $(VINEYARD)_{AVE}$ - $(BASELINE)_{AVE}$	*MT CO2e*			324

Discussion

The results show that the Vineyard Scenario will sequester enough carbon for a net positive balance compared to the baseline scenario over the 40-year time span used in this study.

The scope of this analysis was kept small (vineyard and landscaping) to focus on project impacts. However, the net positive balance on the parcel is underestimated due to a site specific reforestation plan that was not included as part of this quantitative analysis.

- The property has a USDA Emergency Forest Management Plan [7] that covers a total of 10 acres and is comprised of approximately 75% Coast Live Oak Woodland and 25% Doug Fir Forest. The management plan includes management of natural regrowth as well as planting new trees via local seed collection (acorns, pinecones, bay nuts, madrone seeds, etc.). The reforestation plan would add carbon stock and sequestration potential to the property, but was not accounted for in this study.

The CALAND report [11] and other literature contain further discussion to indicate that the overall calculation methodology used in this analysis likely underestimated the sequestration potential of the Vineyard Scenario due to lack of sufficient data to quantify the effects described:

- The CALAND Land Cover Type “Cultivated Land” is a general category that does not differentiate between annual crops (alfalfa, wheat, maize, beets, corn, etc.) and perennial crops such as orchards and vineyards. To keep the model universally applicable to all categories, CALAND did not include any vegetative carbon exchange. Because CALAND's "Cultivated Land" cover type is based on a representation of all existing cultivated land types in California, this cover type designation is assumed to represent conventionally managed agriculture. In 2019, only 4 percent of agricultural land in California was certified organic [3]. The Cultivated land soil carbon exchange is 0.19 ± 0.26 Mg C / ha / yr, which has a negative (emission) value for the Min case. The CALAND values listed in Appendix B of their report are assumed to be for “conventional” agriculture that do not include CMPs (e.g., no-till, mulch, compost, cover crop). The CALAND documentation acknowledged that perennial crops would sequester carbon in the vegetation, but left it out of the model to keep it applicable to annual crops and because there was a lack of reliable data of vegetation sequestration in perennial crops [11].
- Carlisle et al with the California Sustainable Winegrowing Alliance performed a literature review on factors related to greenhouse gas emissions in vineyards. They acknowledge that land clearing has a CO_2e emission component, but further discuss ample evidence that vineyards provide a valuable carbon sink over time. They found that root biomass is likely an important contributor to soil carbon sequestration in vineyards due to the deep root system that develops over time. They also compile studies on enhanced carbon sequestration with conservation management practices including compost soil amendments, no till farming, targeted irrigation/fertilizer, and cover crops. The report discusses that not all data presented in their literature review was collected in California and that more work is needed is needed to quantify GHG vegetative sequestration in California vineyards [4]. While conservation management practices were accounted for in the Vineyard Scenario of this study, the full benefit of carbon sequestration from plant biomass was not accounted for.

The analysis presented herein used established metrics from Ascent, CALAND, and the CA COMET-Planner Tool to evaluate the Vineyard Scenario versus the Baseline Scenario. Even with the conservative methods and with the limitations noted above, the results predict the Vineyard Scenario will most likely sequester more carbon than the baseline condition.

Conclusions

- The Vineyard Scenario predicts the project will most likely sequester more carbon than the Baseline Scenario.
- The carbon sequestration estimates in the Vineyard Scenario are likely conservatively low since vegetative carbon sequestration is not considered in the CALAND metrics for cultivated land or grassland.
- The property has a 10-acre USDA Emergency Forest Management Plan that would enhance carbon stock and sequestration potential to the project, but was not accounted for in this study.

References:

1. Ascent, 2023 (August). *Regional Carbon Stock Inventory Report for Napa County*.
2. *Biological Resources Reconnaissance Survey, 2 Swanston Road, prepared by WRA, December 2023*
3. *California Has 4th Largest Organic Farmland Share in the U.S.*, from the California Ag Network, 1/25/22, (https://californiaagnet.com/2022/01/25/california-has-4th-largest-organic-farmland-share-in-the-u-s/#:~:text=The%20analysis%20found%20that%20there,a%20percentage%20of%20total%3A%203.97%25)
4. Carlisle et al (2010). *California Vineyard Greenhouse Gas Emissions: Assessment of the Available Literature and Determination of Research Needs*, California Sustainable Winegrowing Alliance
5. *COMET-Planner, Carbon and Greenhouse gas evaluation for NRCS conservation practice planning, A companion report to www.comet-planner.com*, prepared by USDA NRCS and Colorado State University, June 2020
6. COMET-Planner Tool for the CA Department of Food and Agriculture Healthy Soils Program, http://comet-planner-cdfahsp.com/, prepared by staff at USDA National Resource Conservation District and Colorado State University. Accessed: October 2023
7. *Emergency Forest Restoration Program; Forest Management Plan for Charles J and Ellen J Haas*, prepared by Napa County Resource Conservation District, July 2023
8. HALL Landscape Design for Haas Residence (LandscapingPlan_HaasPrelim8.pdf), prepared 3-19-2024
9. iTree Planting Calculator, https://planting.iTree Planting Calculators.org/app/report/, Accessed: May-June 2024
10. Pearson, T., Brown, S., and Netzer, N. (2009). *Baseline greenhouse gas emissions and removals for forests and rangelands in California*. Winrock International, for the California Energy Commission. PIER Energy-Related Environmental Research.
11. Vittorio and Simmonda, (2019). *California Natural and Working Lands Carbon and Greenhouse Gas Model (CALAND), Technical Documentation*, Lawrence Berkeley National Labs.

Attachments

- APPENDIX A: Email from Brenda Hom, Senior Climate Change Specialist at Ascent Environmental Inc.
- APPENDIX B: Figures
  - Figure 1 Overview of Project Parcel including Vineyard Area, Reforestation Area, and Landscaping Area
  - Figure 2 iTree Planting Calculator results for Landscaping Plan
  - Figure 3 Outputs from California COMET-Planner tool regarding conservation management practices.
- Appendix C: Greenhouse Gas Calculation Tables
- Separate File: HALL Landscape Design for Haas Residence (LandscapingPlan_HaasPrelim8.pdf)

APPENDIX A
ASCENT review email

Coda Rainsford

From: Brenda Hom <Brenda.Hom@ascent.inc>
Sent: Wednesday, November 6, 2024 12:42
To: Coda Rainsford
Cc: Honey Walters
Subject: Ascent Review of Memo_GHG Memo_Haas_24-10-30.pdf
Attachments: Memo_GHG_Haas_REVISED_24-10-30.pdf

Hello Coda,

Ascent has reviewed the following attached document and associated calculations:

Haas Vineyard (P23-00355):
Analysis of Greenhouse Gas Impacts from Land Conversion
REVISED
October 30, 2024
(Memo_GHG_Haas_REVISED_24-10-30.pdf)

We found no substantial errors with the calculations and text and approve of its analysis.

Thank you,

Brenda Hom and Honey Walters

Brenda C. Hom
Senior Climate Action Specialist
Senior Associate
Pronouns: she/her/hers - [Why do pronouns matter?]
D 916.842.3174
E brenda.hom@ascent.inc
ASCENT Careers @ Ascent
Ascent Environmental, Inc.
455 Capitol Mall, Suite 300
Sacramento, CA 95814
O 916.444.7301

Note: My email address has changed, please update your address book.

APPENDIX B
FIGURES

Figure 1 Overview of Project Parcel including Vineyard Area, Reforestation Area, and Landscaping Area

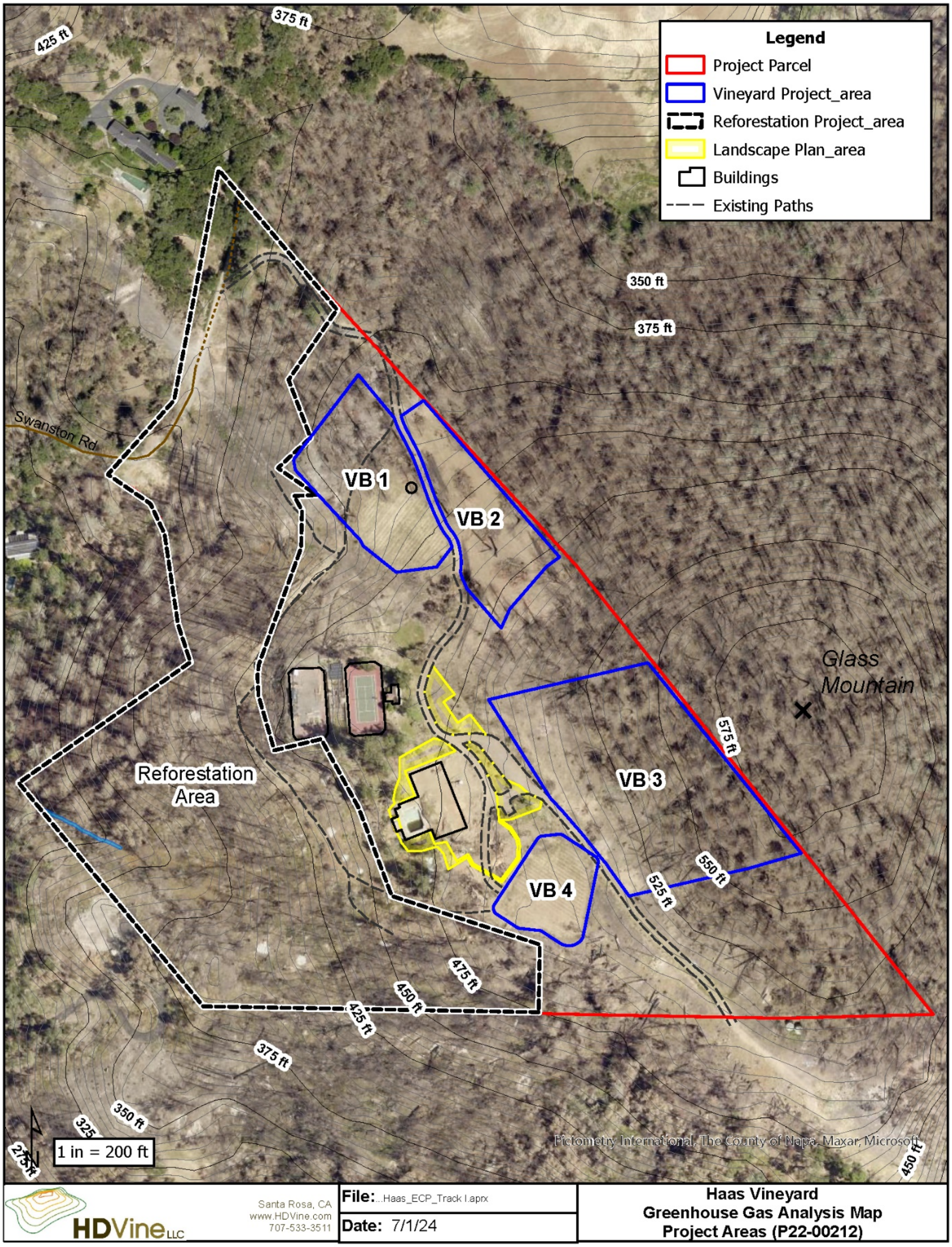

Figure 2 **iTree Planting Calculator results for Landscaping Plan**

This data was produced from the i-Tree Planting Calculator version 2.7.0 for St. Helena; CA.				
Location: St. Helena; CA 94574				
Total number of trees planted in this project: 331				
Electricity Emissions Factor: 252.4				
Fuel Emissions Factor: 52				
Lifetime: 40				
Project Lifetime Tree Mortality: 20				
Run Date: 5-17-2024				
LANDSCAPING				
Group Identifier	Initial Numberof Trees	Species	Initial DBH (cm)	CO2 Sequestered (kilograms)
1	3	Acer mandshuricum(Acer mandshuricum)	2.54	7437.7
5	4	Red Beach Hibiscus(Talipariti tiliaceum v. rubra)	2.54	12526.5
6	16	Strawberry tree(Arbutus unedo)	2.54	19555.9
7	104	Manzanita spp(Arctostaphylos)	2.54	232008.6
8	17	Butterflybush spp(Buddleja)	2.54	12998.2
9	58	Ceanothus spp(Ceanothus)	2.54	105134.8
11	1	Tangerine(Citrus reticulata)	2.54	2239
13	1	Citrus spp(Citrus)	2.54	2268.2
14	66	Cotoneaster spp(Cotoneaster)	2.54	177385.5
15	26	Myoporum spp(Myoporum)	2.54	55735.2
17	6	European Olive(Olea europaea ssp. europea)	5.08	13177.3
18	29	Rose spp(Rosa)	2.54	77942.1
			Total (kg)	**718,409.00**
			Total (MT)	**718.41**

Figure 3 Outputs from California COMET-Planner tool regarding conservation management practices.

Approximate Carbon Sequestration and Greenhouse Gas Emission Reductions and Payments Associated with Selected Conservation Practices*

(metric tonnes CO_2 equivalent per year)

NRCS Conservation Practices	Unit Value (acres or feet)	Carbon Dioxide	Nitrous Oxide	Methane	Total CO2 Equivalent
Compost (C/N < or = 11) Application to Orchards or Vineyards, Purchased from a certified composting facility - 2 tons/acre	100 Acre(s)	169	-16	--	153
Plant Permanent Grass Cover in Orchard/Vineyard Alleys - Orchard or Vineyard Alleyways	100 Acre(s)	137	8	--	145
Plant Permanent Grass/Legume Cover in Orchard/Vineyard Alleys - Orchard or Vineyard Alleyways	100 Acre(s)	300	-5	--	295
Add Mulch to Orchard/Vineyards - Wood Chips	100 Acre(s)	53	-19	--	34
Add Mulch to Orchard/Vineyards - Natural Materials	100 Acre(s)	53	-19	--	34
Conventional Till to No Till in Orchard/Vineyard Alleys - No-till or Strip-till	100 Acre(s)	32	3	--	34
Compost (C/N > 11) Application to Orchards, On-farm produced compost - 6 tons/acre	100 Acre(s)	462	-18	--	444
Totals		1,205	-66	1	1,139

APPENDIX C

Greenhouse Gas Calculation Tables

BASELINE SCENARIO HAAS - 2 Swanston Rd **(REVISED)**

CARBON STOCK[1]	Area	Carbon Stock	Total Carbon	Total CO2e	Source
	acres	*MT C/acre*	*MT C*	*MT CO2e*	
Vineyard Conversion Area					
Mixed Shrubland	5	16.18	80.90	296.90	ASCENT, Table 1
Future Landscaping Area					
Disturbed Land[2]	0.4	-	-	-	
Total CARBON STOCK	**5.4**	-	**80.90**	**296.90**	

[1] The Baseline scenario is representative of post-fire conditions after initial fire cleanup activities (timber milling, burn piles, chipping, etc.). The Glass Fire occurred in 2020 and the Baseline Scenario would be representative of 2024 pre-developmnent conditions (i.e. after initial vegetation recovery in shrubland areas has occurred).

[2] Area around residence and driveway that will be used for future landscape plantings.

Time Duration: 40 yrs

CARBON SEQUESTRATION[1]	Area	Sequestration Rate MIN	Sequestration Rate MAX	Total Sequestration MIN	Total Sequestration MAX	Source
	acres	*MT CO2e/ac/yr*	*MT CO2e/ac/yr*	*MT CO2e / 40 yrs*	*MT CO2e / 40 yrs*	
Vineyard Conversion Area						
Mixed Shrubland (VEG+SOIL)	5	1.22	2.38	243.57	475.26	CALAND, Appendix B
Future Landscaping Area						
Disturbed Land[2]	0.4	-	-	-	-	
Total CARBON SEQUESTRATION	**5.4**			**243.57**	**475.26**	

[1] The Baseline scenario is representative of post-fire conditions after initial fire cleanup activities (timber milling, burn piles, chipping, etc.). The Glass Fire occurred in 2020 and the Baseline Scenario would be representative of 2024 pre-developmnent conditions (i.e. after initial vegetation recovery in shrubland areas has occurred).

[2] Area around residence and driveway that will be used for future landscape plantings.

BASELINE SCENARIO: SUMMARY		MIN	MAX	AVE
CARBON STOCK	*MT CO2e*	297	297	297
CARBON SEQUESTRATION	*MT CO2e/40 yrs*	244	475	359
Baseline Scenario Total	*MT CO2e*	**540**	**772**	**656**

VINEYARD SCENARIO HAAS - 2 Swanston Rd **(REVISED)**

CARBON STOCK	Area	Carbon Stock	Total Carbon	Total CO2e	Source
	acres	*MT C/acre*	*MT C*	*MT CO2e*	
Vineyard Area					
Vineyard	3.9	1.78	6.94	25.48	ASCENT, Table 1
Grassland	1.1	1.42	1.56	5.72	ASCENT, Table 1
Landscaping Area					
Tree Plantings in iTreeTool [1]	0.4	-	-	-	-
Total CARBON STOCK	**5.4**	**-**	**8.50**	**31.19**	

[1] Assume "C Stock" portion of any iTreeTool item (landscape plantings) is captured in CARBON SEQUESTRATION results below

Time Duration: 40 yrs

CARBON SEQUESTRATION	Area	Sequestration MIN	Sequestration MAX	Total Sequestration MIN	Total Sequestration MAX	Source
	acres	*MT CO2e/ac/yr*	*MT CO2e/ac/yr*	*MT CO2e /40 yrs*	*MT CO2e /40 yrs*	-
Vineyard Area						
NET Vine Area						
Vineyard (Soil)	3.9	-0.10	0.67	-16.22	104.26	CALAND, Appendix B
Vineyard Conservation Management Practices (CMPs)				331.50	331.50	CA COMET-Planner
Grassy Avenues						
Grassland (med compost)	1.1	-5.21	-1.38	-229.37	-60.77	CALAND, Appendix B and D1
Sub-Total (Vineyard Area)	**5.0**			**85.91**	**374.99**	
Site Enhancements						
NEW Landscape Planting Plan						
Landscaping Plan; trees and shrubs planted [1]	0.4			718.41	718.41	iTreeTool (20% Mortality)
Sub-Total (Site Enhancements)	**0.4**			**718.41**	**718.41**	
TOTAL CARBON SEQUESTRATION	**5.4**			**804.32**	**1093.40**	

[1] Totals calculated with iTreeTool Calculator in reference to HALL Landscape Design for Haas Residence (3-19-2024). 40 year Lifetime and 20% Mortality over Project Lifetime.

VINEYARD SCENARIO: SUMMARY		MIN	MAX	AVE
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Vineyard Scenario Total	*MT CO2e*	**836**	**1125**	**980**

BALANCE ---REVISED---		MIN	MAX	AVE
Vineyard Scenario Total	*MT CO2e*	**836**	**1125**	**980**
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$BALANCE_{MIN}$ = $(VINEYARD)_{MIN}$ - $(BASELINE)_{MAX}$	*MT CO2e*	**63**		
$BALANCE_{MAX}$ = $(VINEYARD)_{MAX}$ - $(BASELINE)_{MIN}$	*MT CO2e*		**584**	
$BALANCE_{AVE}$ = $(VINEYARD)_{AVE}$ - $(BASELINE)_{AVE}$	*MT CO2e*			**324**