



Greenhouse Gas Assessment

Hudson Valley Wine Village
Town of Lloyd, Ulster County, New York

January 2013
Revised December 2013

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LIST OF ABBREVIATIONS AND ACRONYMS

CB ECS	Commercial Building Energy Consumption Survey
CEQ	Council on Environmental Quality
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
DGEIS	Draft Generic Environmental Impact Statement
DOE	U.S. Department of Energy
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gases
HVAC	heating, ventilation, and air conditioning
HVWV	Hudson Valley Wine Village
MSW	municipal solid waste
N ₂ O	nitrous oxide
NEPA	National Environmental Policy Act
NYSDEC	New York State Department of Environmental Conservation
SEQR	State Environmental Quality Review

1.0 INTRODUCTION

The Scoping Document, adopted by the Town of Lloyd, the Lead Agent for the proposed Hudson Valley Wine Village (HVWV), requires that the use of energy and the emissions of greenhouse gases be evaluated for this project. This evaluation is being undertaken in accordance with the New York State Department of Environmental Conservation's (NYSDEC) *Policy on Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements* (July 15, 2009).

The Hudson Valley Winery Village is a 429± acre integrated development project at the intersection of NYS Route 9W and Blue Point Road in the Town of Lloyd, Ulster County. (see *Figure 2.1 Overall Master Site Development Plan*) The project would include:

- A maximum of 913 residential housing units including up to 584 apartments, 282 townhouses, and 47 single-family homes
- 51,727 square feet (SF) of renovated commercial and office space and 50,000 SF of new commercial and office space
- 450,000 SF of light industrial, manufacturing, and/or institutional space
- A 34,048 SF conference center with an associated 8,222 SF restaurant
- A 103-room suite hotel overlooking the Hudson River

A proposed phasing plan has been completed for the HVWV project. However, due to the many variables that can affect construction, especially market demand, the proposed phasing is generalized and is subject to change as the project moves forward, depending on many factors, including market demand. For purpose of this analysis, it is anticipated the HVWV project will be built out over a 20 year period.

2.0 ASSESSING GREENHOUSE GAS EMISSIONS

The carbon footprint for the HVWV is the total set of all GHG emissions and is calculated as metric tons of carbon dioxide equivalent (CO₂e) per year, as directed by NYSDEC. As per NYSDEC's *Policy on Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*, the assessment identifies total project emissions from direct stationary and non-stationary sources, indirect stationary and non-stationary sources, and waste generation from the HVWV project. Direct GHG emissions includes those from combustion processes conducted on-site, and from fleet vehicles owned and operated by the project proponent and associated with the project. Indirect GHG emissions include those generated by energy plants offsite supplying energy used on the site of the proposed project during operation and from vehicle trips to or from the project site during its operation where vehicles are not owned or operated by the project proponent. Waste generation is also considered an indirect emission.

The HVWV is proposed to be built over a 20 year period. Construction of buildings and related infrastructure is anticipated to occur at a pace supported by market demand and a number of other related variables. As such, it is difficult to anticipate the exact timeline when construction will occur. For the purposes of identifying GHG emissions, the analysis will consider the buildability of the entire project as a single action.

As noted above, site-specific design specifications such as size of heating units, quantity of Tuscan Village Conference Center and light industrial owned vehicles, and an equipment inventory for open space maintenance have not been developed, thus precluding an estimate of site specific GHG emissions. However, generic energy consumption factors for buildings can be used to estimate energy consumption and associated GHG emissions from building operation.

Direct Sources of GHG Emissions

Stationary Sources

Direct GHG emissions from stationary sources at the Hudson Valley Wine Village include emissions from combustion of on-site fossil fuels for heat, hot water, steam generation, and industrial processes. This can include, but is not limited to, boilers, heaters, furnaces, oven, internal combustion engines, and any other equipment or machinery that combusts carbon-containing fuels or waste streams. Fugitive emissions of GHGs from heating, ventilation, and air conditioning (HVAC) and kitchen refrigeration systems are relatively small compared with the overall project. The primary fuel for the project is anticipated to be natural gas, a low polluting fuel.

However, given the current stage of the HVWV project, detailed building utility and fuel consumption information has not been developed. The NYSDEC Policy recognizes that accurate estimates of energy use may be complicated by the preliminary nature of project design during

EIS review. Therefore, building energy consumption factors have been used from the U.S. Department of Energy (DOE) Energy Information Administration (EIA). Specific factors for generic lodging, office, and food service have been applied to the Residential and Tuscan Village Conference Center project components. An emissions factor for businesses with more than 250 employees was used for the Light Industrial component given that it is unknown at this time what type of business will operate the space. These factors are applied to building square foot estimates to estimate energy use.

From these energy estimates, approximate GHG emissions from operations are determined by applying appropriate emission factors. Emission factors, from The Climate Registry (2008), General Reporting Protocol (2008), for natural gas reflect use of pipeline-quality natural gas. Hudson Valley Wine Village, Inc estimated the amount of building area to be constructed over the 20 year construction period. Table 1 below shows the building area and natural gas use estimates for each of the three HVVWV project components as well as a total CO₂e for the entire project.

Table 1, Estimate of Greenhouse Gas Emissions from Building Natural Gas Consumption

Residential				Natural Gas Use (ft³x10⁶)	GHG Emissions (metric tons)			
Units	Beds	SF	CO ₂		CH ₄	N ₂ O	CO ₂ e	
Type 1 Apartment	264	432	318,576	23.2	1,264	119	2.2	4,449
Type 2 Apartment	320	480	356,250	25.9	1,413	133	2.5	4,975
Type 3 Townhouse	148	296	250,416	18.2	994	93	1.8	3,497
Type 4 Townhouse	86	172	176,085	12.8	699	66	1.2	2,459
Type 5 Townhouse	48	144	102,456	7.5	407	38	0.7	1,431
Type 6 Single Family	47	141	124,832	9.1	495	47	0.9	1,743
TOTAL	916	1,665	1,328,615	96.7	5,271	495	9.3	18,554

Tuscan Village Conference Center				Natural Gas Use (ft³x10⁶)	GHG Emissions (metric tons)			
Units	Beds	SF	CO ₂		CH ₄	N ₂ O	CO ₂ e	
Conference Center	--	--	34,048	0.5	26	2	0.0	91
Hotel	103	--	89,906	6.5	357	34	0.6	1,256
Restaurant	--	--	8,222	1.1	60	6	0.1	212
Commercial/Office - Existing	--	--	51,727	0.7	39	4	0.1	139
Commercial/Office - New	--	--	50,000	0.7	38	4	0.1	134
Total	103	0	233,903	9.6	521	49	0.9	1,832

Manufacturing Park				Natural Gas Use (ft³x10⁶)	GHG Emissions (metric tons)			
Units	Beds	SF	CO ₂		CH ₄	N ₂ O	CO ₂ e	
Light Industrial	--	--	450,000	26.6	1,449	136	2.6	5,102
Total	0	0	450,000	26.6	1,449	136	2.6	5,102

HVVVWV TOTAL GHG EMISSIONS	25,599
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Notes:

Natural Gas consumption estimates based on lodging, office, food service, and businesses with more than 250 employee factors from

Commercial Building Energy Consumption Survey 2006, Table C30

Emissions from natural gas consumption based on 2012 The Climate Registry Default Emission for pipeline natural gas (Released January 6, 2012)

Mobile Sources

Direct non-stationary sources of GHG emissions include fleet vehicles owned and operated by the project proponent and would include freight trucks, delivery trucks, and on-site mobile equipment such as forklifts, tractors, and maintenance vehicles. Given that much of the HVWV Project is residential in nature, there will be little in the way of GHG emissions resulting from direct non-stationary sources. However it is likely the case that commercial/office space, industrial space, and the Tuscan Village Conference Center will require the use of freight/delivery trucks and on-site vehicles. Since specific uses and operators have not been identified for these project components, estimates of fuel usage to calculate GHG emissions would be unreliable.

Direct non-stationary sources of GHG emissions for the HVWV project were not included in the quantitative analysis because of the lack of sufficient input data or reliable methods to estimate this information based on other generic data.

Indirect Sources of GHG Emissions

Stationary Sources

Indirect GHG emissions are emissions that are not from HVWV owned or leased equipment but that are associated with HVWV activity. The NYSDEC Policy identifies indirect emissions from stationary sources as those that are generated by off-site energy plants supplying energy used on the site of the proposed project during its operation, such as the off-site production of electricity which will be used on-site.

Building equipment, lighting, and other equipment typically associated with lodgings, office, food service, and businesses with more than 250 employees will be the major users of electricity at the HVWV. As stated regarding the review of direct stationary and non-stationary sources, detailed building utility and electricity use information has not been developed given the stage of the HVWV project.

Therefore, electricity consumption factors have been used from the U.S. Department of Energy (DOE) Energy Information Administration (EIA). Specific factors for generic lodging, office, and food service have been applied to the Residential and Tuscan Village Conference Center project components. A factor for businesses with more than 250 employees was used for the Light Industrial component given that it is unknown at this time what type of business will operate the space. These factors are applied to building square foot estimates to estimate electricity use. Using this estimate, indirect emissions from electricity consumption were quantified based on DOE eGRID factors for upstate New York and following NYSDEC Policy guidance. Table 2

below shows the building area and electricity use estimates for each of the three HVWV project components as well as a total CO²e for the entire project.

Table 2, Estimate of Greenhouse Gas Emissions from Building Electricity Consumption

Residential				Electric Use (kWhx10 ⁶)	GHG Emissions (metric tons)			
Units	Beds	SF	CO ₂		CH ₄	N ₂ O	CO ₂ e	
Type 1 Apartment	264	432	318,576	4.3	1,409	0.05	0.02	1,417
Type 2 Apartment	320	480	356,250	4.8	1,576	0.05	0.02	1,584
Type 3 Townhouse	148	296	250,416	3.4	1,108	0.04	0.02	1,114
Type 4 Townhouse	86	172	176,085	2.4	779	0.03	0.01	783
Type 5 Townhouse	48	144	102,456	1.4	453	0.02	0.01	456
Type 6 Single Family	47	141	124,832	1.7	552	0.02	0.01	555
TOTAL	916	1,665	1,328,615	17.9	5,877	0.20	0.09	5,909

Tuscan Village Conference Center				Electric Use (kWhx10 ⁶)	GHG Emissions (metric tons)			
Units	Beds	SF	CO ₂		CH ₄	N ₂ O	CO ₂ e	
Conference Center	--	--	34,048	0.6	193	0.01	0.00	194
Hotel	103	--	89,906	1.2	398	0.01	0.01	400
Restaurant	--	--	8,222	0.3	103	0.00	0.00	104
Commercial/Office - Existing	--	--	51,727	0.9	293	0.01	0.00	295
Commercial/Office - New	--	--	50,000	0.9	283	0.01	0.00	285
Total	103	0	233,903	3.9	1,271	0.04	0.02	1,278

Manufacturing Park				Electric Use (kWhx10 ⁶)	GHG Emissions (metric tons)			
Units	Beds	SF	CO ₂		CH ₄	N ₂ O	CO ₂ e	
Light Industrial	--	--	450,000	10.1	3,303	0.11	0.05	3,321
Total	0	0	450,000	10.1	3,303	0.11	0.05	3,321

GRAND TOTAL								10,508
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Notes:

Electric use estimates based on lodging, office, food service, and businesses with more than 250 employee factors from Commercial Building Energy Consumption Survey 2006, Table C14

Emissions from electric consumption based on eGrid emission factors for Upstate New York (2004).

Mobile Sources

The NYSDEC Policy identifies indirect emissions from non-stationary sources as those that are generated by vehicles that are associated with HVWV but are not owned and operated by the project proponent. This primarily includes emissions associated with residents in addition to those associated with commuting employees, suppliers/vendors, and customers/users of the project.

Indirect emissions from residents of the HVWV project were calculated based on a total of 913 housing units to be constructed and the EIA estimated average household consumption of fuel of 1,027 gallons. A total of 937,651 gallons of gasoline is estimated to be consumed by

residents within HVWV project annually at full build out. Using these values and emission factors from EPA Climate Leaders Mobile Combustion Sources Guidance, GHG emissions from residents living with the HVWV project are estimated at 7,303 metric tons of CO₂e annually at full build out.

The Economic and Fiscal Impact Analysis completed by Camoin Associates estimates a total of 1,645 direct and indirect jobs will be created as a result of full build out of the HVWV project. An estimated 10 percent of employees will use public transportation or carpool, and an additional five percent will live within the HVWV project. Taking these percentages and emission factors from EPA Climate Leaders Mobile Combustion Sources Guidance into consideration, GHG emissions from employee commuting are estimated at 5,827 metric tons of CO₂e annually at full build out.

Estimates for mobile sources of GHG emissions are likely high considering the 20 year build out of the project. Over this period of time advancements will be made in fuel economy and sources that will significantly reduce these emissions. Other typical indirect emissions such as those associated with suppliers/vendors and customers/users of the HVWV project were not included in the quantitative analysis because of the lack of sufficient input data or reliable methods to estimate this information based on other generic data.

Solid Waste Generation

The HVWV is estimated to produce approximately 2,000 tons per year of solid waste once full build-out is achieved (after year 2034). During the years prior to full build-out, the quantity of waste generated by operations will ramp up proportional to square feet in operation. The waste generated is assumed to be typical municipal solid waste (MSW). Assumptions were made regarding the percentage of solid waste that would be recycled for commercial and residential waste. Estimated recycling rates were identified from the California Environmental Protection Agency (CEPA) publication *Targeted Statewide Waste Characterization Study: Waste Disposal and Diversion Findings for Selected Industry Groups (CEPA 2006)*. According to this publication, an average of 23 percent of commercial waste, 31 percent of hotel waste, and 32 percent of residential waste is recycled. Based on these assumptions, it is estimated that approximately 590 tons per year will be recycled, and 1,410 tons per year will be transported to an off-site landfill.

The EPA Waste Reduction Model (WARM) Version 11 was used to estimate the life cycle (approximately 30 years) of off-site methane and truck transport GHG emissions associated with the annual waste generation rate. Based on the estimated 2,400 tons per year of solid waste generated for each year after full build-out, the GHG emissions over an approximately 30-year life cycle period would be 2,359 metric tons of CO₂e, or an average of 79 metric tons of CO₂e per year over 30 years for one year of waste generation. However, when recycling assumptions are taken into consideration, the GHG emission over an approximately 30-year life

cycle period would drop to 1,719 metric tons of CO₂e, or an average of 57 metric tons of CO₂e per year over 30 years for one year of waste generation.

Summary of Potential GHG Emissions

The Hudson Valley Wine Village is estimated to generate approximately 49,294 metric tons of CO₂e based on calculations of direct stationary, indirect stationary, indirect mobile and solid waste sources of GHG emissions (see Table 3). These source categories represent all significant GHG sources associated with the HVWV project according to NYSDEC's *Policy on Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*

Table 3 Summary of Hudson Valley Wine Village GHG Emissions	
	Metric Tons CO ₂ e
Direct Stationary	25,599
Indirect Stationary	10,508
Indirect Mobile	13,130
Solid Waste	57
Total	49,294

3.0 GREENHOUSE GAS EMISSIONS FOR PROJECT ALTERNATIVES

The DGEIS for the HVWV project presents eight (9) project alternatives and summarizes qualitative and quantitative impacts of such plans compared to the proposed plan.

- *Alternative 1 – No-Action*
- *Alternative 2 - As of right development plan for 200 +/- units of housing*
- *Alternative 3 - A conservation subdivision plan for 200 +/- units of housing*
- *Alternative 4 - The previously approved Revolutionary Ridge Development consisting of approximately 400 units of housing, a golf course and equestrian facilities*
- *Alternative 5 - A project consisting of 1200 units of housing and 400,000 SF of commercial development*
- *Alternative 6 - A project consisting of 120 room hotel, 240 condominium units and 750 residential units*
- *Alternative 7 - A project consisting of 90 room hotel, conference center, 50,000 SF of commercial and office space, and 50,000 SF of adaptive reuse of winery structures*
- *Alternative 8 - A project consisting of a maximum of 750 residential housing units, 50,000 SF of commercial and office space, and 50,000 SF of adaptive reuse of winery structures, 600,000 SF of light industrial/manufacturing/institutional space, a conference center, and a 90 room capacity suite hotel*
- *Alternate Site Plan 9- 950± Dwelling Units, 100,000 SF Commercial/Office, 50,000 SF Adaptive Reuse, 450,000 SF Industrial/Manufacturing/Institutional, Conference Center, 103 Suite Hotel*

Table 4, GHG Emissions for Alternatives Compared to the Proposed Project

Alternative	Characteristics of Alternative Affecting GHG Emissions	GHG Emissions Change Compared with Preferred Alternative
1	<ul style="list-style-type: none"> • No construction activities 	<ul style="list-style-type: none"> • No construction GHG emission • No additional direct or indirect emissions
2	<ul style="list-style-type: none"> • Significant reduction in residential component • No commercial, conference center, or light industrial components 	<ul style="list-style-type: none"> • Decreased GHG emissions from direct and indirect sources
3	<ul style="list-style-type: none"> • Significant reduction in residential component • No commercial, conference center, or light industrial components 	<ul style="list-style-type: none"> • Decreased GHG emissions from direct and indirect sources
4	<ul style="list-style-type: none"> • Significant reduction in residential component • Additional golf course and equestrian facilities 	<ul style="list-style-type: none"> • Decreased GHG emissions from direct and indirect sources
5	<ul style="list-style-type: none"> • Slight increase in residential units and significant increase in commercial space • No Tuscan Village Conference Center, or 	<ul style="list-style-type: none"> • Decreased GHG emissions from direct and indirect sources

	Light Industrial space	
6	<ul style="list-style-type: none">Alternative similar in nature to proposed project without light industrial or commercial space	<ul style="list-style-type: none">Decreased GHG emissions from direct and indirect sources
7	<ul style="list-style-type: none">Alternative similar in nature to proposed project without residential and industrial components	<ul style="list-style-type: none">No significant change in GHG emissions compared with the proposed project
8	<ul style="list-style-type: none">Alternative is similar in nature proposed project with reduction in residential and increase in light industrial space	<ul style="list-style-type: none">No significant change in GHG emissions compared with the proposed project
9	<ul style="list-style-type: none">Alternative is similar in nature proposed project with increase in commercial space and reduction in housing units	<ul style="list-style-type: none">No significant change in GHG emissions compared with the proposed project

4.0 POTENTIAL MITIGATION MEASURES

The proposed HVWV Project does not reasonably allow for quantitative analysis due to the lack of site specific design proposals that can be evaluated for benefits resulting from implementation of example mitigation measures. As such, the application of mitigation measures identified within the GHG Policy cannot be applied in a quantitative manner. However, a number of design features have been included in the existing project resulting in the added benefit of minimizing the emission of greenhouse gases. The mixed use nature of the project provides opportunities to live, work, and play; thereby reducing the need for travel by residents and employees on the project site. Multi-family dwellings are the primary residential structure on-site which reduce building footprint, amount of construction materials required, and utility cost savings. The project also preserves 60 percent of the site, including 77 acres of the bluff along the Hudson River.

The GHG Policy identifies example mitigation measures that can increase energy efficiency, reduce energy demand, and reduce GHG emissions from proposed projects. As individual site specific development projects are designed and proposed, many of these mitigation measures will be incorporated in individual projects over the 20 year build out period. The GHG Policy identifies example mitigation measures related to the following categories: building design and operation measures, efficiency or mitigation measures for on-site GHG sources, site selection and design measures, transportation measures, and waste reduction or management measures. Some of the specific examples identified within these categories that are commonly accepted design practices, or have been included in the proposed project include:

- Installing high efficiency HVAC systems;
- Maximizing interior daylighting;
- Using efficient, directed exterior lighting; using water conserving fixtures that exceed building code requirements;
- Providing for storage and collection of recyclables in building design;
- Providing design guidelines to facilitate sustainable design for build-out, promote and facilitate recycling;
- Improving traffic flow through roadway and traffic signalization improvements;
- Supporting pedestrian and bicycle safety
- Developing multi-use paths to and through the site,
- Providing on-site amenities;
- Using energy efficient boilers, heaters, furnaces, incinerators, or generators;

At the time of site specific development design and approvals, example mitigation measures as identified in the GHG Policy, along with other design strategies will be considered to reduce

GHG emissions resulting from the HVWV Project. The application of these example mitigation measures will result in a reduction of GHG emitted as a part of the HVWV Project. Further, it is anticipated that over the 20 year build out period technological advancements will be made in building materials, site development, HVAC systems, energy conservation, alternative forms of energy, and fuel economy that will have a significant impact on lowering GHG emissions.

Incorporating these green building principles into the HVWV project would result in a number of important mitigation measures to lower energy consumption and reduce the GHG emissions estimated in this analysis. The impact of the proposed project on the ability of the site to sequester carbon would be mitigated, if feasible. Clearing forested areas would be kept to the minimum required for a successful project. In so doing, trees and other plants remaining on-site would continue to provide carbon sequestration. In addition, as part of landscaping, replacement trees would be planted wherever feasible.

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