



Memorandum

Date:	November 16, 2011
To:	Rob Brueck Hauge Brueck Associates 2233 Watt Avenue, Suite 230 Sacramento, CA 95825
Cc:	Laura Yoon, ICF International
From:	Shannon Hatcher ICF International
Subject:	HMR Ski Area Master Plan Air Quality and Greenhouse Gas Analysis for the Transfer of TAU/ERU

Introduction

The transfer and conversion of tourist accommodation units (TAU) and equivalent residential units (ERU) proposed as part of the Master Plan will affect regional air pollutant emissions in the Lake Tahoe Air Basin (LTAB). This memorandum quantifies criteria and greenhouse gas (GHG) emissions associated with vehicle miles traveled (VMT) from existing TAU and ERU that will be used by Homewood. Portions of these emissions will be subsumed into the Master Plan through the operation of transferred and converted TAU and ERU at the HMR. However, a portion of the emissions will be eliminated through changes in regional traffic volumes. This would result in regional benefits to air quality.

Emissions Quantification

Vehicle exhaust generates both criteria pollutant and GHG emissions. Criteria pollutants include ozone precursors (reactive organic gases [ROG] and nitrogen oxides [NO_x]), carbon monoxide (CO), and particulate matter (PM₁₀ and PM_{2.5})¹. GHG emissions include carbon dioxide (CO₂), methane (CH₄), and nitrogen dioxide (N₂O).

¹ PM₁₀ refers to particulate matter less than or equal to 10 microns in diameter, whereas PM_{2.5} refers to particulate matter less than or equal to 2.5 microns in diameter

The URBEMIS2007 (version 9.2.4) model and traffic assumptions provided by Fehr & Peers were used to quantify criteria pollutant and CO₂ emissions associated with VMT for existing TAU and ERU. URBEMIS utilizes the California Air Resources Board (ARB) EMFAC2007 (version 2.3) program to estimate vehicular emissions. Average trip lengths and daily VMT provided by Fehr & Peers² were assumed in the modeling. Consistent with the analysis performed for the Master Plan, emissions were estimated for both winter and summer conditions within the LTAB.

URBEMIS does not generate emissions estimates for CH₄ or N₂O. The vehicle fleet profile and VMT generated by the URBEMIS2007 simulations were used to calculate total CH₄ emissions based on the EMFAC2007 running exhaust and starting emissions factors. Emissions of N₂O were calculated based on annual fuel use by vehicle type and emission factors for diesel and gasoline provided by the ARB. For additional information on the vehicle fleet profile and emission factors assumed in the analysis, please refer to Chapter 23 in the Final EIR/EIS for the Master Plan.

Results

Fehr & Peers analyzed VMT for the TAU and ERU using two trip generation methodologies. Scenario 1 analyzes the TAU to be converted to ERU as ERU, whereas Scenario 2 analyzes the TAU that will be converted to ERU as TAU (recognizing their current use and what they could be used for elsewhere).

Emissions were quantified for each scenario and are summarized in the following sections. Note that neither scenario considers internal capture or alternative mode reductions. Emissions estimates would likely be lower if these factors were considered, but would depend on how banked units were operated in a new development.

Scenario 1 Analysis

Tables 1 and 2 summarize criteria pollutants associated with VMT generated by the TAU and ERU. Emissions are presented for both winter (Table 1) and summer (Table 2) conditions in 2021 (full build out year assumed for the Master Plan in the Final EIR/EIS).

² For additional information the traffic modeling assumptions, please refer to the Fehr & Peers memorandum submitted on November 14, 2011 to Hauge Brueck Associates.

Table 1. Criteria Pollutant Emissions at HMR Buildout (2021), Scenario 1 Winter (pounds per day)

Scenario	ROG	NO_x	CO	PM10	PM2.5	SO₂
<i>Tourist Accommodation Units</i>						
TAU Units Currently In Use (Tahoe Inn)	5.53	7.45	53.81	10.58	2.01	0.05
TAU Banked Units (North Shore Lodge)	0.81	1.09	7.86	1.55	0.29	0.01
<i>Equivalent Residential Units</i>						
TAU Banked Units to be Converted to ERUs (Tahoe Inn)	1.28	1.57	12.31	2.05	0.39	0.01
TAU Units Currently In Use to be Converted to ERUs (Tahoe Inn)	0.11	0.14	1.08	0.18	0.03	0
ERU Banked Units/ Development Rights	0.73	0.89	6.96	1.16	0.22	0.01
<i>Summary of all Units</i>						
TAU Units Currently In Use	5.53	7.45	53.81	10.58	2.01	0.05
TAU Banked Units	0.81	1.09	7.86	1.55	0.29	0.01
TAU Banked Units Converted to ERUs	1.28	1.57	12.31	2.05	0.39	0.01
TAU Units Currently In Use Converted to ERUs	0.11	0.14	1.08	0.18	0.03	0
ERU Banked Units /Development Rights	0.73	0.89	6.96	1.16	0.22	0.01
Total Emissions	8.46	11.14	82.02	15.52	2.94	0.08

Table 2. Criteria Pollutant Emissions at HMR Buildout (2021), Scenario 1 Summer (pounds per day)

Scenario	ROG	NO_x	CO	PM10	PM2.5	SO₂
<i>Tourist Accommodation Units</i>						
TAU Units Currently In Use (Tahoe Inn)	4.49	4.97	48.32	10.58	2.01	0.06
TAU Banked Units (North Shore Lodge)	0.66	0.73	7.06	1.55	0.29	0.01
<i>Equivalent Residential Units</i>						
TAU Banked Units to be Converted to ERUs (Tahoe Inn)	1.04	1.06	10.25	2.05	0.39	0.01
TAU Units Currently In Use to be Converted to ERUs (Tahoe Inn)	0.10	0.09	0.9	0.18	0.03	0
ERU Banked Units/ Development Rights	0.59	0.6	5.79	1.16	0.22	0.01
<i>Summary of all Units</i>						
TAU Units Currently In Use	4.49	4.97	48.32	10.58	2.01	0.06
TAU Banked Units	0.66	0.73	7.06	1.55	0.29	0.01
TAU Banked Units Converted to ERUs	1.04	1.06	10.25	2.05	0.39	0.01
TAU Units Currently In Use Converted to ERUs	0.10	0.09	0.9	0.18	0.03	0
ERU Banked Units /Development Rights	0.59	0.6	5.79	1.16	0.22	0.01
Total Emissions	6.88	7.45	72.32	15.52	2.94	0.09

Table 3 presents GHG emissions associated with VMT generated by the TAU and ERU. Emissions are presented in metric tons per year and summarized in terms of CO₂ equivalents (CO₂e)³.

Table 3. Greenhouse Gas Emissions at HMR Buildout (2021), Scenario 1 (metric tons per year)

Scenario	CO₂	CH₄	N₂O	CO₂e
<i>Tourist Accommodation Units</i>				
TAU Units Currently In Use (Tahoe Inn)	1,081	0.03	0.04	1,094
TAU Banked Units (North Shore Lodge)	158	0.00	0.01	160
<i>Equivalent Residential Units</i>				
TAU Banked Units to be Converted to ERUs (Tahoe Inn)	212	0.01	0.01	214
TAU Units Currently In Use to be Converted to ERUs (Tahoe Inn)	18	0.00	0.00	19
ERU Banked Units/ Development Rights	120	0.00	0.00	121
<i>Summary of all Units</i>				
TAU Units Currently In Use	1,081	0.03	0.04	1,094
TAU Banked Units	158	0.00	0.01	160
TAU Banked Units Converted to ERUs	212	0.01	0.01	214
TAU Units Currently In Use Converted to ERUs	18	0.00	0.00	19
ERU Banked Units /Development Rights	120	0.00	0.00	121
Total Emissions	1,589	0.04	0.06	1,608

As shown in Tables 1 and 2, emissions generated by vehicle trips associated with the TAU and ERU are typically highest in the winter. Total GHG emissions generated by the TAU and ERU equate to 1,608 metric tons of CO₂e.

³ CO₂e is a standard reporting metric that allows one to characterize the complex mixture of GHGs as a single unit taking into account that each gas has a different global warming potential (GWP).

Scenario 2 Analysis

Tables 4 and 5 summarize criteria pollutants associated with VMT generated by the TAU and ERU. Emissions are presented for both winter (Table 4) and summer (Table 5) conditions in 2021.

Table 4. Criteria Pollutant Emissions at HMR Buildout (2021), Scenario 2 Winter (pounds per day)

Scenario	ROG	NO _x	CO	PM10	PM2.5	SO ₂
<i>Tourist Accommodation Units</i>						
TAU Units Currently In Use (Tahoe Inn)	5.53	7.45	53.81	10.58	2.01	0.05
TAU Banked Units (North Shore Lodge)	0.81	1.09	7.86	1.55	0.29	0.01
<i>Equivalent Residential Units</i>						
TAU Banked Units to be Converted to ERUs (Tahoe Inn)	2.86	3.85	27.81	5.47	1.04	0.03
TAU Units Currently In Use to be Converted to ERUs (Tahoe Inn)	0.25	0.33	2.42	0.48	0.09	0
ERU Banked Units/ Development Rights	0.73	0.89	6.96	1.16	0.22	0.01
<i>Summary of all Units</i>						
TAU Units Currently In Use	5.53	7.45	53.81	10.58	2.01	0.05
TAU Banked Units	0.81	1.09	7.86	1.55	0.29	0.01
TAU Banked Units Converted to ERUs	2.86	3.85	27.81	5.47	1.04	0.03
TAU Units Currently In Use Converted to ERUs	0.25	0.33	2.42	0.48	0.09	0
ERU Banked Units /Development Rights	0.73	0.89	6.96	1.16	0.22	0.01
Total Emissions	10.18	13.61	98.86	19.24	3.65	0.10

Table 5. Criteria Pollutant Emissions at HMR Buildout (2021), Scenario 2 Summer (pounds per day)

Scenario	ROG	NO _x	CO	PM ₁₀	PM _{2.5}	SO ₂
<i>Tourist Accommodation Units</i>						
TAU Units Currently In Use (Tahoe Inn)	4.49	4.97	48.32	10.58	2.01	0.06
TAU Banked Units (North Shore Lodge)	0.66	0.73	7.06	1.55	0.29	0.01
<i>Equivalent Residential Units</i>						
TAU Banked Units to be Converted to ERUs (Tahoe Inn)	2.33	2.57	24.98	5.47	1.04	0.03
TAU Units Currently In Use to be Converted to ERUs (Tahoe Inn)	0.21	0.22	2.17	0.48	0.09	0
ERU Banked Units/ Development Rights	0.59	0.6	5.79	1.16	0.22	0.01
<i>Summary of all Units</i>						
TAU Units Currently In Use	4.49	4.97	48.32	10.58	2.01	0.06
TAU Banked Units	0.66	0.73	7.06	1.55	0.29	0.01
TAU Banked Units Converted to ERUs	2.33	2.57	24.98	5.47	1.04	0.03
TAU Units Currently In Use Converted to ERUs	0.21	0.22	2.17	0.48	0.09	0
ERU Banked Units /Development Rights	0.59	0.6	5.79	1.16	0.22	0.01
Total Emissions	8.28	9.09	88.32	19.24	3.65	0.11

Table 6 presents GHG emissions associated with VMT generated by the TAU and ERU. Emissions are presented in metric tons per year and summarized in terms of CO₂ equivalents (CO₂e).

Table 6. Greenhouse Gas Emissions at Full Buildout (2021), Scenario 2 (metric tons per year)

Scenario	CO₂	CH₄	N₂O	CO₂e
<i>Tourist Accommodation Units</i>				
TAU Units Currently In Use (Tahoe Inn)	1,081	0.03	0.04	1,094
TAU Banked Units (North Shore Lodge)	158	0.00	0.01	160
<i>Equivalent Residential Units</i>				
TAU Banked Units to be Converted to ERUs (Tahoe Inn)	559	0.02	0.02	565
TAU Units Currently In Use to be Converted to ERUs (Tahoe Inn)	49	0.00	0.00	49
ERU Banked Units/ Development Rights	120	0.00	0.00	121
<i>Summary of all Units</i>				
TAU Units Currently In Use	1,081	0.03	0.04	1,094
TAU Banked Units	158	0.00	0.01	160
TAU Banked Units Converted to ERUs	559	0.02	0.02	565
TAU Units Currently In Use Converted to ERUs	49	0.00	0.00	49
ERU Banked Units /Development Rights	120	0.00	0.00	121
Total Emissions	1,967	0.05	0.07	1,989

As shown in Tables 4 and 5, emissions generated by vehicle trips associated with the TAU and ERU are typically highest in the winter. Total GHG emissions generated by the TAU and ERU equate to 1,989 metric tons of CO₂e.

Emissions Relative to HMR Master Plan

A portion of the emissions generated by vehicles trips associated with the TAU and ERU will be subsumed into the Master Plan. The Final EIR/EIS quantifies total emissions associated with project operations, but did not take into account changes in regional emissions from the transfer and conversion of existing TAU and ERU. Because emissions from the TAU and ERU have been modeled as part of the HMR transportation analysis and will no longer be independently generated, the TAU and ERU emissions totals should be removed from the HMR traffic estimates assumed in the Final EIR/EIS to avoid double counting of VMT.

Tables 7 and 8 summarize total operational criteria pollutant emissions for Alternative 1/1A, accounting for vehicular emissions generated by the TAU and ERU under Scenario 1 and 2, respectively. Emissions are presented for Alternative 1/1A, as it includes the proposed project and maximum emissions alternative. Emissions are presented for all mobile and area sources analyzed in the Final EIR/EIS. Vehicular emissions generated by existing TAU and ERU have been subtracted from the summer and winter traffic emissions presented in the tables. Negative values indicate regional emission reductions.

Table 7. Operational Emissions (2021) from the Proposed Project (Alternative 1/1A) Accounting for Vehicle Emissions Generated by Transferred and Converted TAU and ERU (Scenario 1)

Source	ROG	NO _x	CO	PM10	PM2.5	SO ₂
Mobile						
Traffic (Winter) ¹	3.89	4.28	36.22	5.25	1.02	0.02
Traffic (Summer) ¹	3.82	-0.28	-0.50	-1.01	-0.17	-0.01
Hybrid Water Taxi	0.96	3.28	1.44	0.09	0.08	0.00
Area						
Natural Gas	30.94	25.89	41.27	0.77	0.77	0.00
Landscape	0.74	0.12	9.27	0.03	0.03	0.00
Consumer Product	10.47	0.00	0.00	0.00	0.00	0.00
Exterior Coatings	2.45	0.00	0.00	0.00	0.00	0.00
Diesel Generator	0.00	0.02	0.02	0.00	0.00	0.00
Total for the Proposed Project (Alternative 1/1A) (Winter)	49	33	79	6	2	0.02
Total for the Proposed Project (Alternative 1/1A) (Summer)	49	29	52	0	1	-0.01
Total for No Project (Alternative 2) (Winter)	15	20	140	24	5	0
Total for No Project (Alternative 2) (Summer)	1	3	6	0	0	0
Comparison to No Project (Alternative 2) (Winter)	(+34)	(+14)	(-61)	(-18)	(-4)	(0)
Comparison to No Project (Alternative 2) (Summer)	(+49)	(+27)	(+45)	(0)	(+1)	(0)

¹ Emissions generated by the TAU and ERU (Tables 1 and 2) have been subtracted from traffic emissions generated by the HMR, as presented in the Final EIR/EIS.

Table 8. Operational Emissions (2021) from the Proposed Project (Alternative 1/1A) Accounting for Vehicle Emissions Generated by Transferred and Converted TAU and ERU (Scenario 2)

Source	ROG	NO _x	CO	PM10	PM2.5	SO ₂
Mobile						
Traffic (Winter) ¹	2.17	1.81	19.38	1.53	0.31	0.00
Traffic (Summer) ¹	2.42	-1.92	-16.50	-4.73	-0.88	-0.03
Hybrid Water Taxi	0.96	3.28	1.44	0.09	0.08	0.00
Area						
Natural Gas	30.94	25.89	41.27	0.77	0.77	0.00
Landscape	0.74	0.12	9.27	0.03	0.03	0.00
Consumer Product	10.47	0.00	0.00	0.00	0.00	0.00
Exterior Coatings	2.45	0.00	0.00	0.00	0.00	0.00
Diesel Generator	0.00	0.02	0.02	0.00	0.00	0.00
Total for the Proposed Project (Alternative 1/1A) (Winter)	47	31	62	2	1	0.00
Total for the Proposed Project (Alternative 1/1A) (Summer)	48	27	36	-4	0	-0.03
Total for No Project (Alternative 2) (Winter)	15	20	140	24	5	0
Total for No Project (Alternative 2) (Summer)	1	3	6	0	0	0
Comparison to No Project (Alternative 2) (Winter)	(+32)	(+11)	(-78)	(-22)	(-4)	(0)
Comparison to No Project (Alternative 2) (Summer)	(+47)	(+25)	(29)	(-4)	(0)	(0)
¹ Emissions generated by the TAU and ERU (Tables 4 and 5) have been subtracted from traffic emissions generated by the HMR, as presented in the Final EIR/EIS.						

Table 9 summarizes total operational GHG emissions for Alternative 1/1A, accounting for vehicular emissions generated by the TAUs and ERUs under Scenario 1 and 2.

Table 9. Operational Emissions (2021) from the Proposed Project (Alternative 1/1A) Accounting for Vehicle Emissions Generated by Transferred and Converted TAUs and ERUs

Source	CO ₂ e	
	Scenario 1	Scenario 2
Transportation ¹	298	-83
Area Source	18	18
Refrigeration/AC	862	862
Electricity Usage	22,700	22,700
Natural Gas Combustion	5,666	5,666
Water Supply	453	453
Wastewater Treatment	12,825	12,825
Total Emissions	42,821	42,440

¹ Emissions generated by the TAU and ERU (Tables 3 and 6) have been subtracted from traffic emissions generated by the HMR, as presented in the Final EIR/EIS.

As shown in Tables 7 through 9, the transfer and conversion of TAU and ERU to the HMR project site will affect regional emissions within the LTAB. Regional reductions in NO_x, CO, PM10, PM2.5, and SO₂ are observed for summer traffic under both Scenarios 1 and 2. Total operational emissions for all criteria pollutants and GHG emissions are reduced relative to what is presented in the Final EIR/EIS. Note that this analysis only accounts for transportation emissions associated with the TAU and ERU. It is likely that additional reductions in area source emissions are likely as the existing units are older and less energy efficient than those being constructed as part of the Master Plan.