ENVIRON

November 20, 2009

MEMORANDUM

To: Susan Graham
CC: David Sherrard

ENVIRON Project No: 03-21287C

From: Richard Steffel
Lisa Graham

Project Name: Yarrow Bay Black Diamond Projects EIS Review

Subject: Cumulative Environmental Noise Impact Analysis – Summary

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At the request of Yarrow Bay and Parametrix, in the spring of 2009 ENVIRON conducted noise modeling in support of an analysis of the environmental noise implications of Yarrow Bay's proposed Lawson Hills and The Villages developments in Black Diamond, WA. ENVIRON provided the results of our limited portion of the noise assessment to Parametrix in the form of tables summarizing several additional sound level measurements and model-calculated noise levels. Because the methods used in the analysis were essentially the same as were employed and documented in earlier stages of these projects, ENVIRON was not asked to provide any information or documentation other than the tabular results of the latest combined form of the projects. Now, in order to clarify the context and purpose of the most recent noise modeling, this memo summarizes the methods employed and comments briefly on the findings of the analysis.

Background Regarding Methods

The noise impact analysis was based in part on sound level measurements ENVIRON had conducted previously for both development projects and also included a few additional sound level measurements. The additional measurements represented two residential areas in the expanded traffic study area north of Black Diamond as well as residences on Green Valley Road that may be affected by traffic on the south portion of the Villages development. The newly collected data are presented in **Table 1** of this memo. Note that this information was intended to supplement the previously collected sound level measurement data reported in earlier documentation.

The Lawson Hills and The Villages development projects would create new noise sources including retail and commercial businesses, schools, parks, and additional traffic. These sources could affect both on-site and off-site locations. But the focus of all the noise impact analyses was not to determine the suitability of such sources in relation to the project site parcels, but rather to discern potential impacts the developments would have at off-site locations. And the primary sources of off-site noise associated with the projects would be traffic to and from the project areas. Accordingly, ENVIRON conducted traffic noise modeling using the FHWA TMN Lookup software (a simplified version of the full-blown Traffic Noise Model) that estimates noise based on traffic volumes, speeds, and the distance between the road and the receptor locations of interest. Because the study area had expanded and the designs of the developments were slightly changed compared with the original project impact analyses, ENVIRON conducted the noise modeling using revised and additional model "receptor" locations to assess potential impacts based on direction from Parametrix.

Modeling Results

ENVIRON's role in the ultimate noise analysis for the DEIS analysis was to calculate traffic noise levels based on the revised traffic data. We modeled traffic conditions at 16 locations to consider existing, future baseline, and cumulative development scenarios, as well as considering several locations potentially affected by an Alternative Southeast Connector. ENVIRON submitted the TNM Lookup results to Parametrix in tabular form, attached as **Table 2**. Please note that we have corrected information in **Table 2** for receptor TNM9 which has been corrected and highlighted and in **blue text**. ENVIRON was not tasked with interpreting the measurements or the modeling results.

Analytical Differences with Previous Analyses

The intent of the earlier noise analyses conducted for the Lawson Hills and The Villages projects (i.e., prior to those conducted for the DEIS) was to provide information to assist decision makers and the public in comparing impacts of the different land use planning alternatives. In the absence of applicable noise rules within the Black Diamond jurisdiction, ENVIRON applied current regulations and guidelines to consider potential impacts. Using this approach, impacts are based on noise limits or guidelines that do not strictly pertain to the project but that provide a reasonable and objective basis for making this assessment. For example, WSDOT policies provide a reasonable basis for assessing potential traffic noise impacts from new or expanded project-related roads. Similarly, state and local noise rules provide reasonable target levels for suitable sound levels for a variety of purposes.

Based on this approach to assessing the potential impacts of project-related noise ENVIRON offers the following summary of our impression of the traffic noise affects associated with the proposed projects.

- At locations along heavily-traveled roads such as SR-169 and Auburn-Black Diamond Road, existing sound levels reach or nearly reach the WSDOT residential noise impact criterion of 66 dBA. With or without the project in future years, this level will increase due to overall growth in the area of Black Diamond. The difference between noise levels with and without the projects cannot be determined based on the revised baseline traffic data, but project-related traffic would have a relatively small effect.
- Along more moderately traveled roads in Black Diamond such as Lake Sawyer Road and Roberts Drive, existing noise levels are less than the WSDOT noise impact criterion but are likely to increase in future years with and without the project. Under cumulative traffic conditions, traffic-related noise levels reach or nearly reach the noise impact criterion.
- Near the proposed project access roads and the Lawson Hills Connector, the project is likely to increase noise levels at some existing residences because there are currently no dominant traffic noise sources. With the development of new road networks in future years, new noise sources would be introduced near some residences and noise levels would likely increase. The extent of the increase depends on the distance of the travel lanes from the residence and the speed of the traffic on these access roads. It is at such locations that actual project-related noise impacts are most likely to occur (if at all).

Based on these studies ENVIRON additionally offers the following information regarding possible noise mitigation measures for any identified noise impacts.

- Noise mitigation would not be warranted at most locations along heavily traveled roadways because noise levels would not be considered impacts under WSDOT noise criteria. At locations along heavily traveled roads, project-related mitigation is not likely warranted because noise levels are only partially attributable to the projects. In addition, in most locations, barriers would likely be infeasible and/or unreasonable based on cost (i.e., if considered in relation to WSDOT policy regarding these issues).[1]
- Depending on the location and design of the access road for the southeast portion of The Villages and near the Lawson Connector, noise mitigation may or may not be warranted for existing homes in these areas. The effectiveness and constructability (i.e., feasibility) and the relative cost of noise reduction achieved (i.e., reasonableness) for any proposed should be determined with further quantitative analysis.

Table 1. Measured Existing Sound Levels (dBA)

SLM Location	SLM Period	Range of Measured Hourly Level		
		L_{eq}	L_{25}	L_{max}
SLM-C1 SR-169 (DEIS A)	2:45 PM March 18, 2009	66.4	68.0	79.2
SLM-C2 Lake Sawyer Road (DEIS J)	2:01 PM March 18, 2009	60.4	53.8	78.4
SLM-C3 Green Valley Road (DEIS M)	3:01 PM June 30, 2008	60.4	53.0	77.8

Sound level measurement locations and sound source descriptions:
SLM-C1 was measured along SR-169, 50 feet from the edge of pavement, north of the Diamond Glen residential development in Black Diamond. This 15 minute measurement began March 18, 2009 at 2:45 PM. Because the major source of noise at this location was traffic on SR-169, this measurement is representative of midday traffic, traveling 50 mph, on SR-169.
SLM-C2 was taken 50 feet west of the center of Lake Sawyer Road, south of the Sawyer Woods Elementary School. This 15 minute measurement began March 18, 2009 at 2:01 PM. Major sources of noise observed during the measurement included traffic on Lake Sawyer Road and aircraft. This measurement represents sound levels along Lake Sawyer Road, near the elementary school.
SLM-C3 was measured June 30, 2008 at 3:01 PM and represents noise along Green Valley Road. This measurement was taken 50 feet from the edge of Green Valley Road. Major sources of noise observed included traffic on Green Valley Road and aircraft.

NOTES:
The L_{eq} is the "energy average" sound level, a constant sound with the same sound energy as the actual fluctuating sound. This metric is used extensively in characterizing and describing sound levels.
The L_{25} is the sound level exceeded 25% of the time, in this case during a 15-minute period. These values can be compared with the 60-dBA L_{25} noise limit for residential locations.

The L_{max} is the maximum sound level recorded during the measurement period. The L_{max} is a useful metric for determining the contribution from sources which emit short-term, high energy sounds.

Source: ENVIRON International Corporation

[1] See for example: http://www.wsdot.wa.gov/NR/rdonlyres/26528ACC-7437-427C-BE81-F6FFA9C3BFD2/0/WSDOTNoisePolicy.pdf, pages 10-13

Table 2. TNM Lookup Setup and Results

TNM Location	Analysis Scenario	Noise Source	Direction	Distance	Total Volume	Heavy Truck %	Automotive vph	Heavy Truck vph	Speed	Calculated dBA	Total Calculated Traffic Noise
TNM1 **DEIS C**	Existing	SR-169, N of RR Ave	NB	44	242	5%	230	12	35	61	**65.2**
			SB	56	632	3%	613	19	35	63.2	
	Baseline		NB	44	316	5%	300	16	35	62.2	**66.4**
			SB	56	826	3%	801	25	35	64.3	
	Cumulative		NB	44	973	5%	924	49	35	67	**70.2**
			SB	56	1,668	3%	1618	50	35	67.4	
TNM3 **DEIS A**	Existing	SR-169, N of Summit	NB	63	292	5%	277	15	35	60.1	**65.3**
			SB	51	532	5%	505	27	35	63.8	
	Baseline		NB	63	385	5%	366	19	35	61.2	**66.6**
			SB	51	731	5%	694	37	35	65.1	
	Cumulative		NB	63	1,337	5%	1270	67	35	66.6	**71.6**
			SB	51	2,197	5%	2087	110	35	69.9	
	Alternative		NB	63	1,336	5%	1269	67	35	66.6	**71.6**
			SB	51	2,198	5%	2088	110	35	69.9	
TNM4 **DEIS K**	Existing	SR-169, S of Jones Lake	NB	96	238	5%	226	12	50	61.1	**65.9**
			SB	108	602	3%	584	18	50	64.1	
	Baseline		NB	96	311	5%	295	16	50	62.3	**67.0**
			SB	108	787	3%	763	24	50	65.2	
	Cumulative		NB	96	939	5%	892	47	50	67	**70.7**
			SB	108	1,549	3%	1503	46	50	68.2	
TNM5	Existing	Roberts Dr, W of SR 169	EB	66	99	6%	93	6	35	55.5	**57.8**
			WB	54	108	0%	108	0	35	53.9	
	Baseline		EB	66	134	6%	126	8	35	56.7	**59.0**
			WB	54	141	0%	141	0	35	55.1	
	Cumulative		EB	66	279	6%	262	17	35	60	**62.8**
			WB	54	386	0%	386	0	35	59.5	
	Alternative		EB	66	379	6%	356	23	35	61.3	**64.2**
			WB	54	565	0%	565	0	35	61.1	
TNM6 **DEIS D & H**	Existing	Roberts Dr, E of Lk Sawyer Dr	EB	49	240	7%	223	17	25	59.3	**61.0**
			WB	61	186	5%	177	9	25	56	
	Baseline		EB	49	314	7%	292	22	25	60.5	**62.2**
			WB	61	243	5%	231	12	25	57.2	
	Cumulative		EB	49	780	7%	725	55	25	64.5	**66.5**
			WB	61	786	5%	747	39	25	62.3	
TNM7 **DEIS F**	Existing	Roberts Dr E of 226th Ave SE	EB	54	230	7%	214	16	25	58.6	**60.4**
			WB	66	160	6%	150	10	25	55.6	
	Baseline		EB	54	301	7%	280	21	25	59.8	**61.6**
			WB	66	209	6%	196	13	25	56.8	
	Cumulative		EB	54	618	7%	575	43	25	62.9	**64.9**

Table 2. TNM Lookup Setup and Results

TNM Location	Analysis Scenario	Noise Source	Direction	Distance	Total Volume	Heavy Truck %	Automotive vph	Heavy Truck vph	Speed	Calculated dBA	Total Calculated Traffic Noise
			WB	66	541	6%	509	32	25	60.7	
TNM8	Existing	Morgan St. E of Terrace Pl	EB	66	144	3%	140	4	25	53	**54.7**
			WB	54	108	0%	108	0	25	49.8	
	Baseline		EB	66	194	3%	188	6	25	54.6	**56.1**
			WB	54	141	0%	141	0	25	50.9	
	Cumulative		EB	66	515	3%	500	15	25	58.7	**60.5**
			WB	54	439	0%	439	0	25	55.9	
TNM9 **DEIS K**	Existing	Lawson St E of SR 169	EB	44	111	0%	111	0	25	50.8	**52.3**
			WB	56	61	0%	61	0	25	**47.1**	
	Baseline		EB	44	145	0%	145	0	25	52	**53.5**
			WB	56	80	0%	80	0	25	48.3	
	Cumulative		EB	44	338	0%	338	0	25	55.6	**56.7**
			WB	56	126	0%	126	0	25	50.3	
	Alternative		EB	44	450	0%	450	0	25	56.9	**58.5**
			WB	56	254	0%	254	0	25	53.3	
TNM10 **DEIS J**	Existing	Lk Sawyer Rd north of Roberts Dr	NB	94	131	0%	131	0	45	55.6	**59.4**
			SB	106	202	0%	202	0	45	57	
	Baseline		NB	94	171	0%	171	0	45	56.8	**60.6**
			SB	106	264	0%	264	0	45	58.2	
	Cumulative		NB	94	557	0%	557	0	45	61.9	**65.7**
			SB	106	865	0%	865	0	45	63.3	
TNM11 **DEIS M**	Existing	Green V Rd W of SR 169	EB	59	28	18%	23	5	35	53.6	**54.4**
			WB	71	26	0%	26	0	35	46.4	
	Baseline		EB	59	36	18%	30	6	35	54.4	**55.2**
			WB	71	34	0%	34	0	35	47.6	
	Cumulative		EB	59	146	18%	120	26	35	60.7	**61.5**
			WB	71	151	0%	151	0	35	54	
TNM12 **DEIS N**	Existing	SR 169 S of SR 516	NB	69	585	3%	567	18	45	64.6	**68.0**
			SB	87	792	4%	760	32	45	65.3	
	Baseline		NB	69	765	3%	742	23	45	65.7	**69.1**
			SB	87	1,036	4%	995	41	45	66.4	
	Cumulative		NB	69	1,386	3%	1344	42	45	68.3	**71.7**
			SB	87	1,852	4%	1778	74	45	69	
TNM14	Cumulative	New LH Conn Rd E of 169	EB	61	491	0%	491	0	30	57.9	**60.6**
			WB	49	331	0%	331	0	30	57.3	
	Alternative		EB	61	736	0%	736	0	30	59.6	**62.9**
			WB	49	640	0%	640	0	30	60.1	
TNM15	Cumulative	New LH Access	NB	49	253	0%	253	0	25	53.9	**57.8**
			SB	61	471	0%	471	0	25	55.5	
	Alternative		NB	49	596	0%	596	0	25	57.6	**60.2**

Table 2. TNM Lookup Setup and Results

TNM Location	Analysis Scenario	Noise Source	Direction	Distance	Total Volume	Heavy Truck %	Automotive vph	Heavy Truck vph	Speed	Calculated dBA	Total Calculated Traffic Noise
		Rd E of Lawson Rd	SB	61	635	0%	635	0	25	56.8	
TNM16	Cumulative	New Conn Rd S of N. Triangle	EB	51	1,623	0%	1623	0	25	61.8	**63.7**
			WB	63	1,137	0%	1137	0	25	59.2	
TNM17 **DEIS L**	Cumulative	Village Access Rd S of Roberts Dr	NB	61	754	0%	754	0	25	57.6	**62.4**
			SB	49	1,191	0%	1191	0	25	60.6	
TNM18	Cumulative	Village Access Rd E of SR 169	EB	56	387	0%	387	0	25	55.1	**59.7**
			WB	44	567	0%	567	0	25	57.9	
TNM19	Cumulative	Alt Vill Access Rd to Green V. Rd	NB	44	567	0%	567	0	35	57.9	**59.7**
			SB	56	387	0%	387	0	35	55.1	

Calculated dBA based on noise propagation over hard surfaces, such as pavement or bodies of water.

Heavy Truck percentages from Parametrix, 2007 traffic counts.