BRC
Acoustics & Technology Consulting

October 13, 2011

Ms. Minnie Dhaliwal, Noise Abatement Coordinator
City of Tukwila Department of Community Development
6300 Southcenter Boulevard
Tukwila, WA 98188

Re: Technical Review III
Sound Transit Link Light Rail Tukwila Segment:
Year 2010 Noise and Vibration Compliance Testing Report

Dear Ms. Dhaliwal:

This letter presents our technical review of the noise report prepared by Michael Minor & Associates (MM&A) on November 17, 2010 and Sound Transit's Supplement to 2010 results, prepared by Ahmad Fazel on September 6, 2011. The MM&A report represents the second of three annual noise and vibration compliance testing results. This letter reviews the noise portion of the MM&A report. A review of the vibration portion will follow.

The scope and methodology for the compliance testing were established in Sound Transit's Compliance Testing Plan dated May 16, 2009 and revised July 2, 2009 (hereafter referred to as the Compliance Testing Plan).

In preparing this letter, BRC Acoustics and Technology Consulting reviewed the following materials:

- Letter by Mr. Jack Pace of City of Tukwila DCD to Mr. Ahmad Fazel of Sound Transit, dated October 26, 2010;

- Letter by Michael Minor & Associates to James Irish of Sound Transit on November 17, 2010 (referred to hereafter as the 2010 Compliance Testing Report);

- Letter by Ahmad Fazel of Sound Transit to Jack Pace of City of Tukwila DCD titled *Sound Transit's Supplement to 2010 (2nd year) Noise Test Results*, dated September 6, 2011.

In addition, BRC Acoustics conducted sound level measurements during Sound Transit light-rail pass-bys at selected receiver locations.

General Comments Regarding the Scope of the Noise Annual Review

The 2010 Compliance Testing Report generally follows the prescriptions of Sound Transit's Compliance Testing Plan dated May 16, 2009. The report presents sound measurements at the locations listed in the Compliance Testing Plan, results derived from the measurements, applicable criteria for identifying impacts, and proposed noise mitigation measurements.

Baseline Sound Levels

The data entered in the updated Tables 1, 4, and Attachment A tables for Existing Ldn are consistent with the Monitoring Plan at all sites.

Allowable Project Sound Levels

The Federal Transit Administration (FTA) criteria shown in Figure 4 and in Tables 2 and 3 of the 2010 Compliance Testing Report are consistent with the FTA Manual and with Sound Transit's Compliance Testing Plan. The FTA criteria are applied consistently to all measurement sites in Table 4. Please note that for sites analyzed using Method 2, the FTA criteria and the Project Ldn entries in Table 4 are *cumulative* sound levels, including background noise from traffic or other ambient sources. These sites are N2, N5, N6, N6A, and N8A.

Sound Measurement and Calculation Methodology

The sound measurements reported in Attachment A of the 2010 Compliance Testing Report were conducted appropriately for evaluating potential noise impacts from Sound Transit trains. The calculations of 24-hour Ldn were conducted according to FTA methods, consistent with the Operational Schedule shown in Attachment D.

In order to confirm the noise results of the 2010 Compliance Testing Report, BRC Acoustics conducted independent measurements of train pass-bys at selected receiver locations. Sound levels were measured on September 29, 2011 between 8:30 a.m. and 4 p.m. The measurements were conducted using a Larson Davis 831 Sound Level Meter. The weather during the measurements was calm and clear, with temperatures in the mid-60s degrees Fahrenheit.

Sound measurements of train pass-bys were conducted at Locations N3, N6A, N7, and N8. Observations of train pass-bys were also made on September 29, 2011 at Location N1 in the Duwamish area. At this location, sound levels from traffic were found to be higher than sound levels from pass-bys, which made it impossible to obtain reliable measurements of the trains. Locations N1, N3, N6A, N7, and N8 were identified by Sound Transit as experiencing noise impacts during the first Noise Compliance Testing in 2009, and sound mitigation was added at these locations prior to the 2010 Compliance Testing.

The results of the sound-level measurements by BRC Acoustics are tabulated in Attachment A to this letter. The tables also contain 24-hour Ldn levels from the measured pass-bys, calculated by BRC Acoustics using the operational schedule found in Attachment D of the 2010 Compliance Testing Report. The results confirm the findings of the Sound Transit report regarding noise impacts.

Compliance Verification

The characterization of noise impacts is correctly identified at all the test sites listed in Tables 1, 4, A-1 to A-17, and in the discussion in the 2010 Compliance Testing Report.

Sound Mitigation Measures

Three sound mitigation measures were implemented by Sound Transit between the 2009 and 2010 Compliance Testing reports. These were grinding the tracks along the entire light-rail corridor in Tukwila, installation of automated wayside track lubricators near curves in the alignment, and Type 2 barriers (curtains) in the vicinity of sites N1, N3, N6A, N7, and N8.

According to the results presented in the 2010 Noise compliance Testing report and the measurements and calculations conducted by BRC Acoustics, the noise mitigation measures have brought sound levels into compliance with FTA criteria.

During the observations by BRC Acoustics on September 29, 2011, there was minimal or no wheel squeal along the Tukwila corridor. The rail lubricators at the three locations near SR-518 seem to function properly.

According to Sound Transmission Loss test data provided by the manufacturer, the Acoustiblok material meets the acoustical requirements for Type 2 barriers. In general, the Type 2 barriers have held up to wear and tear. On exception is a location near receiver N3, where some of the barrier material is installed outside the chain-link fence and is accessible to non-Sound Transit personnel. Upon close-up examination of the Type 2 barrier in this location, some cuts/cracks in the material and some missing zip ties were observed.

Summary

The review by BRC Acoustics and independent sound measurements confirm that the most recent noise mitigation efforts undertaken by Sound Transit have brought sound levels from light-rail pass-bys into compliance with FTA criteria. The main concern proceeding forward is with maintaining the effectiveness of the sound mitigation measures. The Central Link Maintenance Matrix submitted by Sound Transit (Attachment 5 to the letter by Ahmad Fazel) includes provisions for regular maintenance of the rail vehicles (including wheel truing) and the tracks (including track grinding). We recommend that provisions be added to the program for maintenance of the Type 2 barriers.

Please let us know if you need additional information.

Sincerely yours,
BRC Acoustics & Technology Consulting

Ioana Park

Ioana Park, P.E.
Senior Acoustical Consultant, LEED® AP BC+D

ATTACHMENT A
SOUND MEASUREMENTS AND Ldn CALCULATIONS

Table A1. Pass-By Measurements and Ldn Levels for Site N3
BRC Measured data from September 29, 2011

Direction	# Cars	Lmax	SEL	Project Ldn
Northbound Trains				
NB	2	64.1	71.9	
NB	2	63.7	72.1	
NB	2	64.3	72.9	
	Minimum	**63.7**	**71.9**	
	Maximum	**64.3**	**72.9**	
	Energy Average	**64.0**	**72.3**	**48.6**
SB	2	66.6	76.3	
SB	2	66.5	76.7	
SB	2	67.2	76.6	
SB	2	66.2	75.8	
	Minimum	**66.2**	**75.8**	
	Maximum	**67.2**	**76.7**	
	Energy Average	**65.2**	**75.0**	**51.3**
Total Ldn and Impact Analysis				
			Pre-Project Ldn	69
			Project Ldn	**53**
			Impact Level = 64 dBA Ldn	**No Impact**

Table A2. Pass-By Measurements and Ldn Levels for Site N6A
BRC Measured data from September 29, 2011

Direction	# Cars	Lmax	SEL	Project Ldn
Northbound Trains				
NB	2	72	80.2	
NB	2	71.3	79.7	
NB	2	72.5	80.9	
	Minimum	**71.3**	**79.7**	
	Maximum	**72.5**	**80.9**	
	Energy Average	**72.0**	**80.3**	**56.6**
SB	2	72.9	82	
SB	2	69.6	80.9	
SB	2	72.5	81.2	
	Minimum	**69.6**	**80.9**	
	Maximum	**72.9**	**82**	
	Energy Average	**71.9**	**81.4**	**57.7**
Total Ldn and Impact Analysis				
			Pre-Project Ldn	73
			Project Ldn	**60**
			Allowable Increase in Ldn = 0.6 dBA	**No Impact**

Table A3. Pass-By Measurements and Ldn Levels for Site N7
BRC Measured data from September 29, 2011

Direction	# Cars	Lmax	SEL	Project Ldn
Northbound Trains				
NB	2	70.5	78.7	
NB	2	70.1	79.1	
NB	2	70.2	79.3	
	Minimum	**70.1**	**78.7**	
	Maximum	**70.5**	**79.3**	
	Energy Average	**70.3**	**79.0**	**55.4**
SB	2	71.4	81	
SB	2	71.9	80.6	
SB	2	70.9	79.8	
	Minimum	**70.9**	**79.8**	
	Maximum	**71.9**	**81**	
	Energy Average	**71.4**	**80.5**	**56.8**
Total Ldn and Impact Analysis				
			Pre-Project Ldn	73
			Project Ldn	**59**
			Impact Level = 66 dBA Ldn	**No Impact**

Table A4. Pass-By Measurements and Ldn Levels for Site N8
BRC Measured data from September 29, 2011

Direction	# Cars	Lmax	SEL	Project Ldn
Northbound Trains				
NB	2	65.9	75.6	
NB	2	66	76	
NB	2	65.9	75.1	
	Minimum	**65.9**	**75.1**	
	Maximum	**66**	**76**	
	Energy Average	**65.9**	**75.6**	**51.9**
SB	2	71.4	76.1	
SB	2	67.9	77	
SB	2	67	76.1	
SB	2	67	76.6	
	Minimum	**67**	**76.1**	
	Maximum	**71.4**	**77**	
	Energy Average	**68.0**	**75.3**	**51.6**
Total Ldn and Impact Analysis				
			Pre-Project Ldn	73
			Project Ldn	**55**
			Impact Level = 66 dBA Ldn	**No Impact**