Noise Technical Report

for the Seattle Public Utilities Solid Waste Division Environmental Checklist for the North Recycling and Disposal Station

Environalysis, LLC
March 2008

Table of Contents

List of Tables

List of Figures

Glossary of Technical Terms

A-weighted sound level (abbreviated dBA) – Frequency-weighted sound pressure level approximating the frequency response of the human ear. The A-weighting de-emphasizes lower frequency sounds below 1 kilohertz (kHz) and higher frequency sounds above 4 kHz. It emphasizes sounds between 1kHz and 4 kHz. A-weighting is the most used measure for traffic and environmental noise.

Background noise – The total of all noise in a system or situation, independent of the presence of the noise source of interest (i.e., without the noise of interest).

Decibels – The decibel (dB) scale is a common measure of sound energy. A decibel is one-tenth of a Bel. The scale is logarithmic, so each unit increase in Bels (or 10 decibels) equates to a tenfold increase in the magnitude of sound energy (i.e., 110 dB is 10 times more powerful than 100 dB).

Existing noise levels – The noise resulting from the natural and mechanical sources and human activity considered to be usually present in a particular area.

Equivalent average sound level (abbreviated L_{eq}) –The continuous dBA level with the same A-weighted sound energy as the actual noise measurement.

Hourly equivalent average sound level ($L_{eq\ (h)}$) –The Leq of noise over a one-hour period**.**

Maximum sound level (abbreviated L_{max}) – The maximum sound pressure level that occurred during the measurement period.

Noise abatement measures – Methods to reduce noise effects, such as noise walls, relocating transportation facilities, reduction of allowable traffic speeds or retrofitting insulation or improved windows in buildings.

Sound pressure level- often termed “noise level” or “sound level”. It is the sound energy measured or heard at varying distances from the sound source.

Sound power level- (SPL) The sound energy emitted by the sound source at the source.

CHAPTER 1: SUMMARY

Affected Environment

The potential noise impacts created by the project are assessed using published information from equipment noise data from other solid waste operations and standard acoustical calculations. Existing noise levels in the vicinity of the North Recycling and Disposal Station (NRDS) are due to a complex mixture of traffic on local streets, arterials and freeways, aircraft, and local construction. To this acoustic background, the station adds noise from on-site machinery and from the traffic entering the site, moving within the site and then exiting. There are residential neighborhoods close to the NRDS site and noise from the facility is audible in these neighborhoods. The current operations of NRDS generate noise levels close to but not exceeding the City of Seattle's Maximum Permissible Sound Level of 60 dBA during daytime hours. The NRDS is open 8am to 5:30 pm seven days a week and does not operate during nighttime (10 pm-7 am) hours, or on weekends when nighttime is defined as 10 pm-9 am. The nighttime noise standard of 50 dBA is likely currently exceeded on weekends during the 8am-9am period. The amount of increase in residential sound levels currently caused by the facility varies moment-to-moment but is approximately 3-4 dBA.

Project Impacts

Construction Impacts

The construction phase will generate a wide range of noise levels, depending upon the specific activities, with the demolition of the concrete tipping buildings being the loudest. Residential areas north of NRDS will be the most sensitive to construction noise. SPU will meet all applicable noise regulations and adhere to best management practices during construction. In addition, the following practices would be employed:

- Maintaining heavy equipment and mufflers in good condition.
- Buffering stationary generators or compressors (if used) with portable sound barriers.
- Informing local residents of the duration and timing of the construction work and the typical noise levels to be expected for each phase.
- Establishing a "noise complaint" hotline and a process to systematically record complaints and respond to them.
- Monitoring construction noise levels during the noisiest phases of work
- Erecting a solid plywood screen fastened to the existing chain fence.

Operational Impacts

Operational noise would result from a number of activities at the reconstructed NRDS, including noise from the vehicles using and servicing the facilities, and from on-site machinery both inside and outside the tipping building.

Design details of specific project elements have not been determined at this time. However, the Proposal would reduce noise impacts of NRDS upon residential areas by:

- Replacing the open-sided tipping buildings with solid walled structures with much greater noise reduction qualities, resulting in approximately a 10 dBA reduction in noise passing through the sides of the tipping building.

- Buffering the noise from ventilation fans with a three-sided enclosure (open to the south).
- Examining the site plan to minimize the noise from backup alarms when trucks and loaders are moving in reverse.
- Investigating the use of backup alarms that vary their loudness depending upon ambient noise levels.
- Investigating the possibility of adding rubber seals to the doors of the transfer trailers. (Reduces impact noise when doors are slammed closed and reduces leakage of liquids from trailers).
- Restricting the movement of trucks moving to and from NRDS on N. 35th between Interlake Avenue North and Carr Place North.

SPU's plans to implement some or all of these measures would likely reduce the noise impacts of the station to levels less than the City of Seattle's Maximum Permissible Sound Level of 60 dBA at residential receivers during the day, resulting in no significant adverse impacts. There will be no operations at night.

Indirect Impacts

The Project will have no indirect effects on noise.

Mitigation Measures

Construction Impacts Mitigation

Because construction best practices would be adopted as part of the project, construction of the proposed project would not result in significant adverse impacts from noise, and no additional mitigation measures to reduce noise are needed.

Operational Impacts Mitigation

The project design, and operational practices implemented by SPU, will likely reduce the sound levels generated at NRDS, and will reduce it's noise impacts in residential neighborhoods close to the facility. No additional noise mitigation is required to meet the City of Seattle's maximum permissible sound levels.

Indirect Impacts Mitigation

The Project will have no indirect effects on noise, and therefore no additional mitigation is required associated with this project.

Significant Unavoidable Adverse Impacts

The Proposal will have no significant unavoidable adverse impacts due to the noise it generates.

CHAPTER 2: PROJECT DESCRIPTION

Proposed Project: North Recycling and Disposal Station

The proposed project involves the demolition of the existing structures and building a new transfer station, recycling facilities, employee facilities, office, parking, and other associated utility facilities. The rebuild will encompass not only the existing site, but will also include Carr Place North between N. 34th St. and N. 35th St. and the lot at 1550 N. 34th St. The parking lot north of N. 35th St. between Carr Pl. N. and Woodlawn Ave. N. will continue to be used for vehicle parking, such as employee parking and utility trucks. The parking area would not be used for tractor-trailer truck parking or garbage truck parking.

The site boundaries and vicinity of the NRDS facility are shown in Figure 1. A new transfer building would be located in the existing parcel. The building would be fully enclosed except for vehicle entrances. The building would contain an engineered ventilation system to provide air quality and odor control. The top of the roof of the new building would be within height limits allowed by code. Drainage from the interior of the main transfer building and any exterior areas that collect potentially contaminated water would be conveyed to the sanitary sewer system. Drainage from the roof of the main building and the remainder of the site may be reused on site or would be conveyed to the sanitary sewer/stormwater collection system.

The site would also contain a small fueling station for onsite equipment. Carr Place North between North 34th Street and North 35th Street would be vacated and incorporated into the facility site. The structures on the site on the east side of Carr Place North immediately east of the existing transfer station site would be demolished and new facilities would be developed. The new facilities will include, but not limited to, a recycling drop-off area with recycling bins, an office, employee facilities, a meeting room, parking spaces, and other utility facilities. A portion of the existing building may be reused or remodeled if feasible. An existing parking lot north of N. 35th St. between Carr Place N. and Woodlawn Ave. N. would be used for vehicle parking. The main facility access would be located off of N. 34th Street. A secondary access for transfer trailers would be located off of N. 35th Street.

Activities within the industrial buffer zone in the northeast section of the existing station parcel will remain essentially the same, which include solid waste transfer activities. The industrial buffer was developed after the facility was in place and existing uses would continue. The site boundaries and vicinity of the NRDS facility are shown in Figure 1.

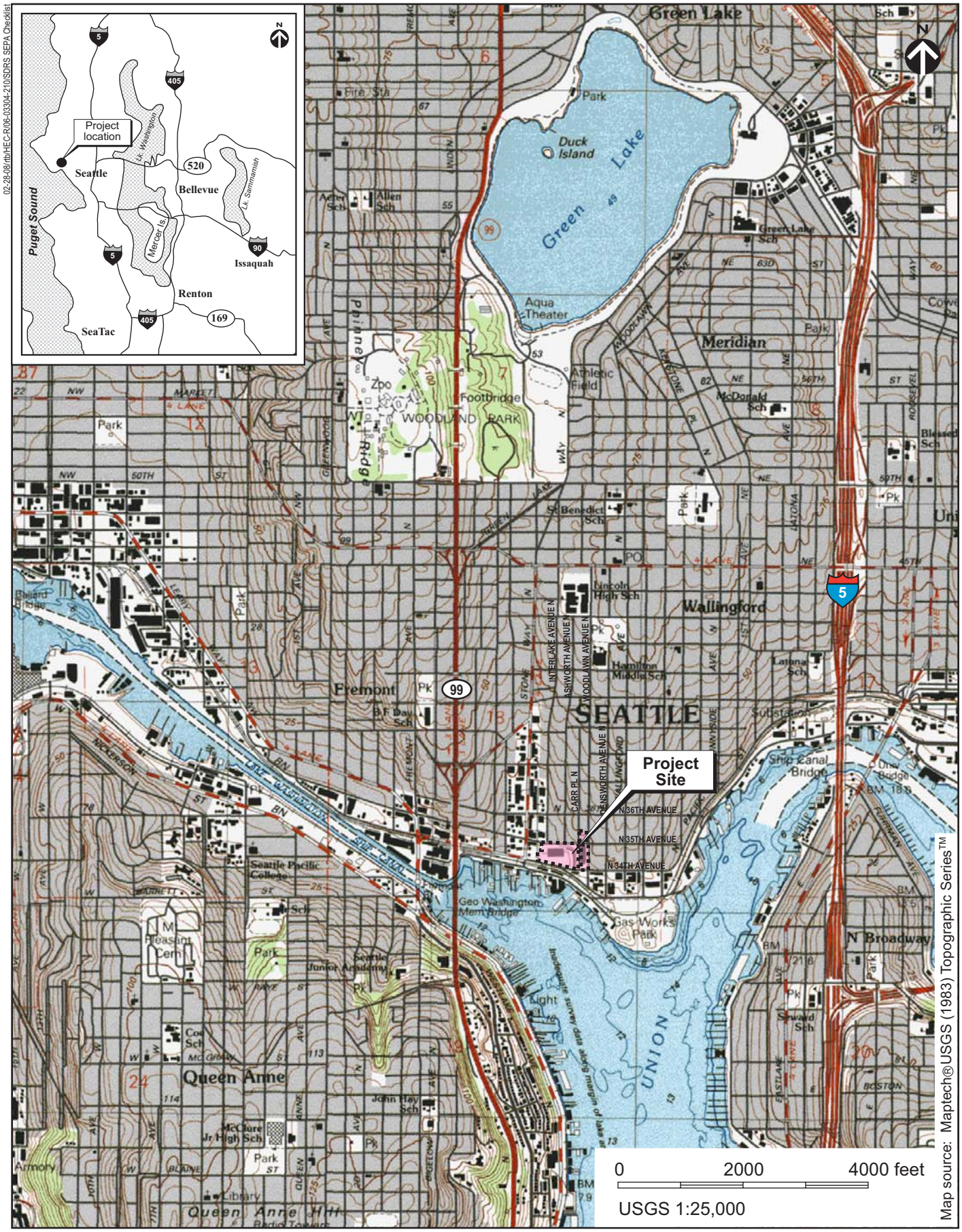

Figure 1. Vicinity map for the North Recycling and Disposal Station (NRDS), 1350 North 34th Street, Seattle, Washington.

CHAPTER 3: AFFECTED ENVIRONMENT

Definition of Noise and How It Is Measured

Noise is defined as excessive or undesired sound. Human sensitivity to sound depends on its intensity, frequency composition and duration. Noise intensity is measured on a scale whose units are termed decibels (dB). In order to represent the wide range of sounds audible to the human ear this scale is logarithmic. With this scale an increase of 10 dB is perceived as a doubling of apparent loudness and an increase of 3 dB is noticeable under typical listening conditions. Sound levels from a number of sources combine nonlinearly, e.g. doubling the number of stationary or slow moving noise sources machines such as cardboard compactors or front-end loaders will increase sound levels by 3 dB. The dB sound level emitted by the source is termed the sound power level; the noise reaching a specific location is called the sound pressure level.

The greater sensitivity of the human ear to certain frequencies is approximated by skewing (or weighing) the decibel scale towards those frequencies. The weighted decibel scale which best approximates the response of the human ear is known as the A- weighted scale (dBA). A metric, which is widely used for analysis purposes, is the energy equivalent sound level (LEQ). The energy equivalent sound level is the level of a constant sound having the same sound energy as the fluctuating levels measured over a period of time. Another metric frequently used in this report is LMAX; the maximum instantaneous sound level recorded during the measurement. This is the noise metric used when comparing a project's impacts to the City of Seattle Maximum Permissible Sound Levels. LMIN is the minimum sound level measured.

The magnitudes of typical noises are shown in Table 1.

Table 1. Weighted Sound Levels and Human Response

Sound Source	dBA	Human Response
Aircraft carrier operation	140	
Jet takeoff (200 ft away)	120	Painfully Loud
Riveting Machine	110	Maximum vocal effort
Shout (0.5 foot away)	100	
Heavy truck (50 ft. away)	90	
Busy street	80	Hearing damage with continuous exposure
Freeway traffic (50 ft. away)	70	Telephone use difficult
Air Conditioning unit (20 ft)	60	
Light Auto Traffic	50	Quiet
Bedroom, Library	40	
Soft whisper	30	Very Quiet
Broadcasting Studio	20	
	10	Just Audible
	0	Threshold of Hearing

Source: U.S. Council on Environmental Quality

Noise levels are affected by distance and physical buffers. Noise levels decrease as the distance from the source increases. As the distance from a stationary or slow moving point source (such as a bulldozer) doubles, the noise levels will decrease by 6 dBA. Noise attenuation is greater over soft or rough ground compared to hard smooth surfaces such as concrete, asphalt or water. Dense trees can reduce noise levels if their trunks and branches completely block the view between source and receptor and/or their roots loosen the soil. A dense and deep (100 meters) buffer of evergreen vegetation can reduce noise by a maximum of 10 dBA. Massive barriers such as hills, earthen berms or concrete walls are effective in reducing sound levels by up to 10-15 dBA if they block the line-of-sight between the noise source and a receiver. An example of a topographical barrier that partially blocks the line-of-sight is the difference in elevation between the floor of the NRDS transfer building and residential areas on North 35th Street.

Regulation of Noise

The Washington State Dept. of Ecology has developed maximum permissible noise levels (termed "Environmental Designation for Noise Abatement" or EDNA), which vary depending upon the land uses of the noise source and the receiving property. The maximum permissible noise level is the decibel level of noise generated by the project as measured at the property line of adjacent land uses; it is not the combined noise of a project and background. The City of Seattle has developed noise regulations based upon those of Washington State's Dept. of Ecology. The City's standards are shown in Table 2.

The transfer station is located on property zoned for industrial uses. NRDS is bordered on the north by residential zoning, on the west by industrial and on the east by commercial zones. The nearest residential areas are within 100 feet of the north property line. The standards applicable to this project are shown in **bold**.

Table 2. Maximum Permissible Sound Levels in dBA

	Land Use of Receiving Property		
Land Use of Source:	**Residential**	**Commercial**	**Industrial**
Residential	55	57	60
Commercial	57	60	65
Industrial	**60**	**65**	**70**

Between the hours of 10pm and 7am on weekdays and 10pm and 9am during weekends, the maximum limits for receivers within residential zones are to be reduced by 10 dBA. For noises of short duration these limits can be exceeded by a maximum of 5 dBA for 15 minutes/hour, 10 dBA for 5 minutes/hour or 15 dBA for 1.5 minutes/hour.

In the City of Seattle noise from construction activities is allowed to exceed the levels shown in Table 2 by the following amounts during daytime hours (Seattle Municipal Code 25.08.425):

- 25 dBA (measured at affected property line or 50 feet, whichever is greater) for crawlers, tractors, dozers, cranes, compressors etc.
- 20 dBA for portable powered equipment such as chainsaws, chippers and powered hand tools.
- 15 dBA for power tools used for lawn maintenance and landscaping
- Sounds from impact machinery such as pavement breakers, pile drivers, jackhammers may exceed the levels in Table 2 for a period of one hour from 8 AM to 5PM but cannot exceed 90 dBA LEQ continuously, 93 dBA LEQ for 30 minutes out of the hour, 96 dBA for 15 minutes or 99 dBA LEQ for 7.5 minutes.

Some types of noise are fully exempt from the Maximum Permissible Noise Level standards such as noises from construction activities upon commercial /industrial zones. Safety equipment such as backup alarms for heavy equipment is also exempt for these standards.

Motor vehicle traffic traveling on public roads is exempt from the EDNA noise standards, but the City of Seattle and the Dept. of Ecology have motor vehicle performance standards setting forth the maximum noise level from individual vehicles (and not applicable to general traffic noise) measured under specific testing criteria. Noise from motor vehicles and heavy equipment operating within the NRDS site is subject to the EDNA standards.

It is clear from Table 2 that the relevant noise standard is determined by the land use of the noise source and the where the noise is received. It is assumed for the purposes of this study that the zoning currently in place at the properties adjoining NRDS will also be applicable in the future.

Methodology used to Assess Existing Noise Levels

The analysis of noise impacts from the current operations of NRDS involved the monitoring of existing background noise levels and the calculation of future levels. Larson-Davis model 814 integrating Type 1 sound level meters were used to measure existing noise levels. Long-term 24-hour measurements were taken at two locations simultaneously, one location within the station site and the other in the closest residential neighborhood. Short-term (15-minute) measurements were taken at nearby residential areas in order to pinpoint the facility's impact in these areas at those moments when NRDS was audible over the background noise environment. The weather during the monitoring was suitable for accurate noise measurements; dry with light winds. The calibration of the meter was checked before and after each reading with an acoustic calibrator, itself calibrated to a known source.

The noise levels from heavy equipment and machinery were determined using a combination of manufacturer's data and on-site noise measurements.

Existing Noise Levels

North Recycling and Disposal Station

The residential areas closest to NRDS are subject to noise from a variety of sources, with traffic noises being predominant. Residences immediately north of the NRDS are close to arterial streets and bus routes (on North 35th and on Stone Way). A series of noise measurements were taken to characterize the existing noise environment. Figure 2 shows the location of the measurements, Table 3 provides a description of each receiver site and Table 4 summarizes the noise monitoring data. Figure 3 compares the sound levels at NRDS with those in the adjacent residential neighborhood.

Table 3. Noise Monitoring Sites at the North Recycling and Disposal Site

Noise Measurement Site	Type of Measurement	Location of Measurement	Land Use of Measurement Location	Noise Sources during Measurement
M-1	24-hour	1502 N. 35th St. On roof of garage	Residential zone	Traffic on N. 34th & N. 35th, NRDS, distant traffic
M-2	24-hour	Within NRDS- on roof of scale-house	Industrial zone	NRDS traffic and machinery, traffic on N. 34th & N. 35th
M-3	30-minute	Inside NRDS Tipping Building	Industrial zone	Noise from on-site machinery
M-4	15-minute	3428 Woodlawn Ave. N	Residential zone	Local traffic, distant traffic
M-5	15-minute	1412 N. 35th	Residential zone	NRDS, local traffic, distant traffic

Existing noise sources are from traffic on N. 34th and 35th streets, distant traffic, large and small aircraft, the NRDS facility, work at construction sites and residential activities. The sound level meters were placed on the roofs of a single-story garage building (M-1) and the scale house (M-2). Rooftop locations were selected in order to minimize the chances of events such as animals and people interfering with the microphones causing sudden noise “spikes” and contaminating the measurements. The residential rooftop site (M-1) had a clear line-of-site to the NRDS tipping building. Measurements of machinery compacting and loading waste were taken inside the tipping building near the north wall at site M-3. Measurement site M-4 represents the residences immediately east of NRDS on Woodlawn Avenue. Measurements of 15-minute duration were taken at site M-5 using two sound level meters simultaneously, one sound level meter was paused to ignore non-NRDS noises such as local traffic on N. 35th and aircraft, the other meter recorded the total noise environment.

Figure 2. Location of Noise Measurements at NRDS

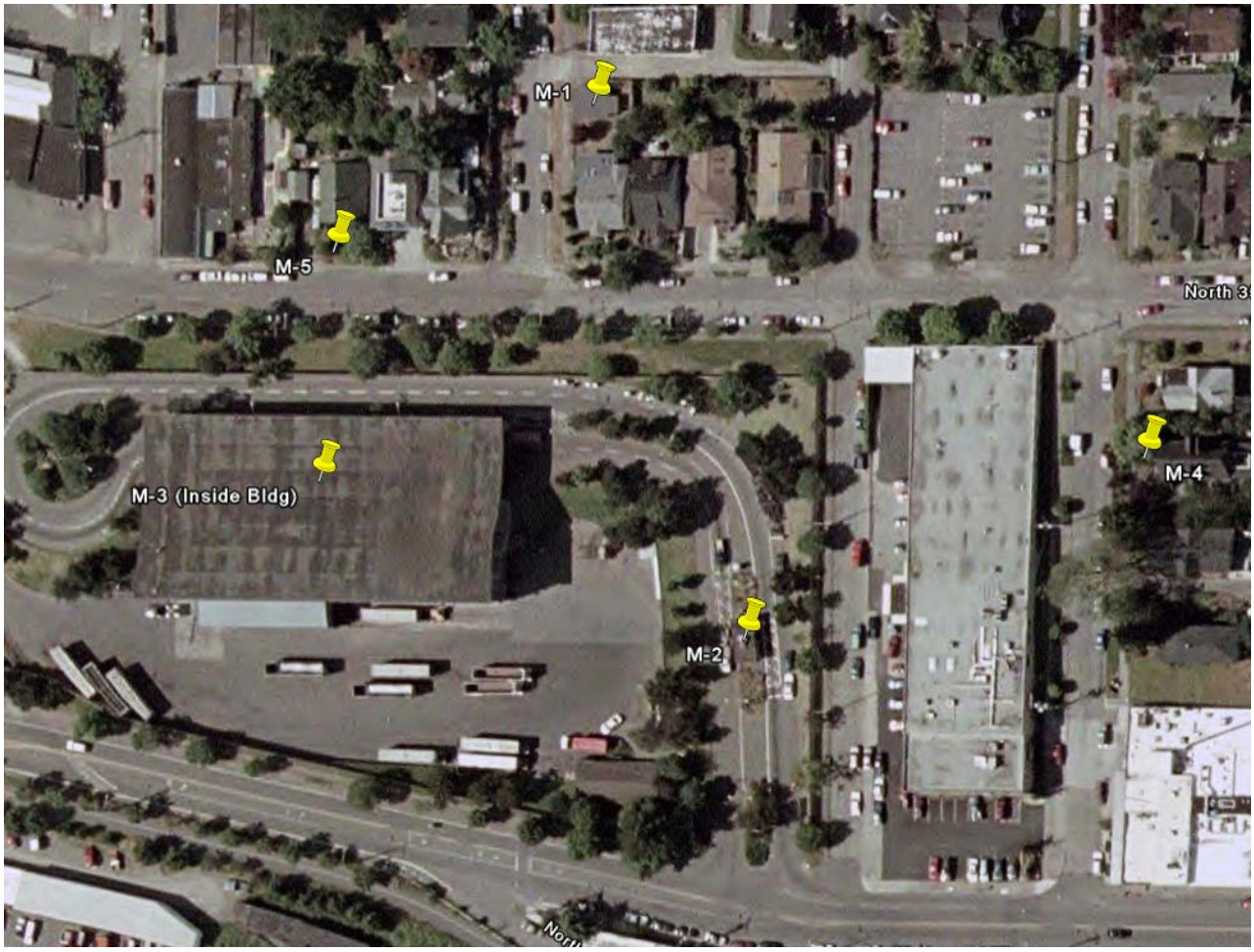

Figure 3. Short-Term Sound Levels at M-5 (dBA LEQ)

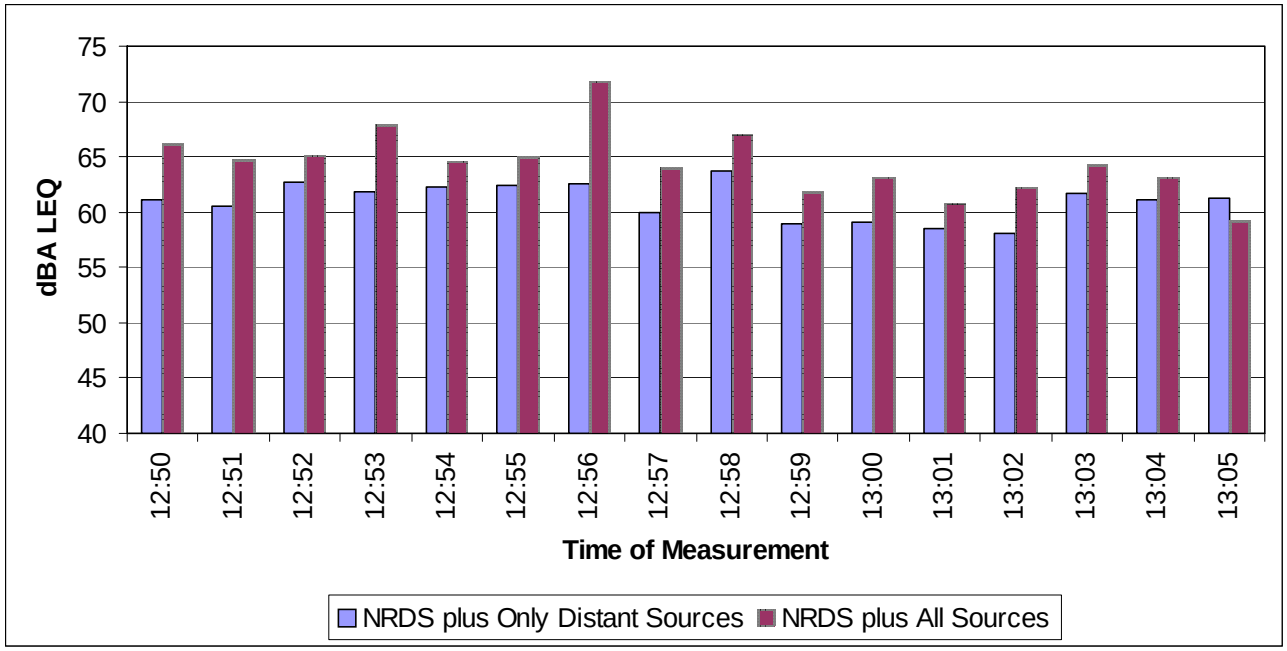

Table 4. Summary of Noise Measurements

Noise Measurement Site	Type of Measurement	Sound Level in dBA LEQ	Maximum Level dBA and Time it Occurred	Minimum Level dBA and Time it Occurred
M-1 Residential garage	24-hour	53.7	84.1 (3:50 PM)	33.4 (3:35 AM)
M-2 Within NRDS site	24-hour	62.1	94.1 (10:28 AM)	44.9 (2:56 AM)
M-3 Inside Tipping Bldg	30-minute	77.4	89.2	71.4
M-4 3428 Woodlawn Ave. N	15-minute	57.8	71.1	53.3
M-5 1412 N. 35th				
a. NRDS plus traffic on N. 35th & distant background	15-minute	65.8	84.3	55.1
b. NRDS Operations & distant background only	15-minute	61.1	74.6	55.3
NRDS minus distant background	Based on 15-minute data	58.0	74.6	NA

The short-term measurements shown in Table 4 and Figure 3 provide a snapshot of the mid-day noise impacts of NRDS. Two simultaneous measurements with identical sound level meters were taken at M-5, one measured noise from all sources during a 15-minute period, and the other captured only noise from NRDS and distant sources. Figure 3 indicates that the front yards of residences immediately adjacent to NRDS on N. 35th Street (M-5) currently experience short-term daytime noise levels in the 61-72 dBA LEQ range. Table 4 shows that the backyards of these residences and houses further away (represented by M-1 and M-4) are less affected by NRDS and traffic on N. 35th and thus have lower short-term levels. The minimum measurement of 55.1 dBA, taken at M-5 while the local non-NRDS noise sources were ignored by pausing the SLM for traffic on N. 35th St., represents background noise from distant sources such as traffic on N. 34th, Stone Way, the Aurora bridge and I-5. When this distant background noise is subtracted from the "NRDS + distant background" level (61.1dBA minus 55.1dBA) the net impact of NRDS is (when rounded to the nearest whole decibel) 58 dBA, i.e. less than the City's daytime standard. The maximum measurement of 84.3 dBA occurs when commercial waste-haulers traveling on N. 35th passed the SLM at M-5. Noise from traffic on public streets is exempt from the City's Maximum Permissible Noise Level standards. Noise sources within the NRDS site generate a LMAX that is 10 dBA lower, 74.6 dBA at M-5.

The current operations of NRDS generate sustained (dBA LEQ) noise levels close to but not exceeding the City of Seattle's Maximum Permissible Sound Level of 60 dBA during daytime hours. The NRDS is open 8am to 5:30pm seven days a week and does not operate during nighttime (10pm-7am) hours, except on weekends when nighttime is defined as 10pm-9am. The nighttime noise standard of 50 dBA is likely currently exceeded on weekends during the 8am-9am period. The City's EDNA standards allow higher short-term noise levels for a few minutes per hour (see Table 2). However the net NRDS noise impact (when extrapolated from the 15-minute measurement) appears to exceed the noise standard more times than is permitted hourly.

In order to determine how much NRDS operations add to the existing long-term noise environment, noise was measured simultaneously within the solid waste facility and at the closest residential location. A comparison of the two sets of measurements will indicate how much the facility is increasing local noise levels if there are no

background noise events affecting one site more than another or after any differences in background sound levels are compensated for before comparing the sites. Table 5 and Figure 4 compare the two sets of measurements.

Table 5. Comparison of LMAX Sound Levels at NRDS and 1502 N. 35th Avenue

Noise Descriptor	Within NRDS site (M-2)	1502 N. 35th Avenue (M-1)	Comparison of LMAX Levels
LMAX- over 24 hour measurement period	94.1	84.1	
Average LMAX when NRDS is operating	72.6	63.7	+8.9 dBA
Average LMAX when NRDS is closed	59.9	55.3	+4.6 dBA
Net effect of NRDS upon 1502 35th Avenue during operating hours			**+4.3 dBA**

The sites selected for comparison (M-1/M-2) experience similar but somewhat different levels of background (i.e. non-NRDS) noise as indicated by the levels measured when the stations are closed. These differences averaged 4.6 dBA at NRDS and are primarily due to the differing noise impacts of local traffic at the measurement sites. (In particular traffic on North 34th Street would affect site M-2 much more than M-1). The net impacts (averaged over the 8AM-5: 30PM working day) of NRDS upon the closest residential areas is 4.3 dBA, this is an increase that would be audible under ordinary listening conditions. Some noise from NRDS may be especially audible because it is of a frequency that differs from that of the general facility noise—the high-pitched backup alarms or the dropping of heavy metal items are examples of such noise.

Figure 4. Comparison of LMAX at 1502 N. 35th Street (M-1) and onsite (M-2)

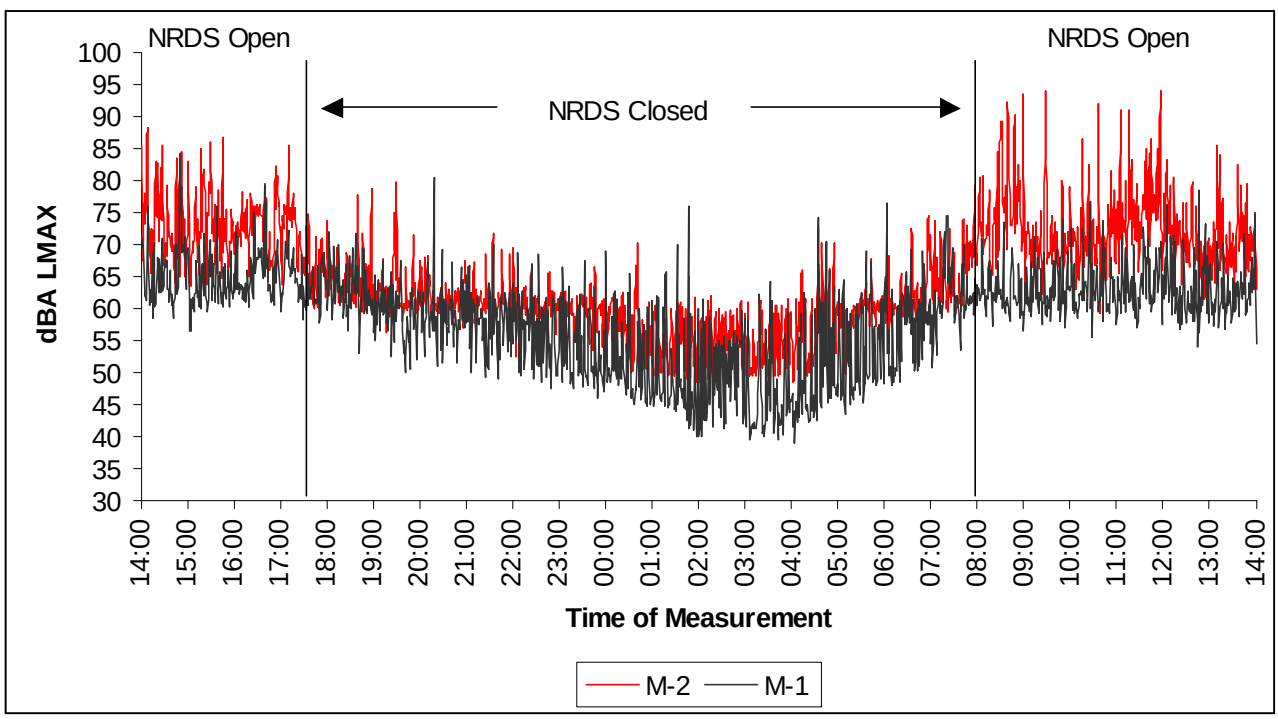

Figure 4 compares LMAX sound levels at receivers M-1 and M-2 and illustrates that maximum noise levels in residential areas are lower when NRDS is closed than when it is operating. The general pattern of noise levels

shown in Figure 4 is typical of areas where traffic noise is dominant; rising in the morning and evening peak commute periods. The peak period for commercial garbage trucks using the facility does not coincide with peak general traffic flows, it occurs earlier in the afternoon. The higher maximum noise levels generated within the NRDS site (shown in red on Figure 4) cause higher maximum levels at the residential receiver M-2. The difference between the data points at any given moment is from the reduction of NRDS noise due to distance and physical barriers (and minute-to-minute differences in background noise at each site). Figure 4 demonstrates that NRDS contributes to residential noise levels during its operating hours. Nighttime LMAX sound at levels range higher than the City of Seattle's Maximum Permissible Sound Level of 50 dBA about half of the time. Daytime levels are consistently higher than the 60 dBA standard.

Noise Sources at NRDS

The noise that NRDS currently generates is due to a combination of sources, primarily automobile and truck traffic using the stations and the machinery used to process the solid waste for transfer to an intermodal facility. Handling many tons of solid waste hourly requires the use of heavy machinery of various types. Table 6 lists the equipment used by Seattle Public Utilities and its typical sound pressure levels.

Table 6. Sound Pressure Levels in dBA LMAX of Machinery used at NRDS

Equipment	Number of Machines	Sound Pressure Level at a distance of 50 feet
Bulldozer- (Cat D6R or H)[1]	1	85
Track loader (Cat 963C)[1]	2	79
Loader-Packer (Pettibone 445)[2]	1	89
Compactor for cardboard[3]	1	63
Yard trucks (Ottawa)[3]	1	75
Front-end loader (Case 1840)[4]	1	79
Front-end loader (Case 721)[4]	1	80
Front-end loader (Case W11B[4]	1	Not operating
Loader-Packer (Komatsu G212[3]	1	Not operating
Sum of Sound Pressure Levels		91 dBA
Total Sound Level inside Tipping Building – 50' from pit		**75-85 dBA LEQ**

Sources:
[1] NC Machinery, Seattle, WA
[2] Pettibone, Inc.
[3] Environalysis- from measurements at South Recycling & Disposal Site, Seattle, WA Sept. 1999, Sept. 2004 and North Recycling and Disposal Site Sept. 2004.
[4] Case Machinery

The Case front-end loaders and the Ottawa yard trucks are used outside. The other machines listed in Table 6 operate inside the tipping building, but rarely all at the same time. This intermittent pattern of operation results in energy equivalent noise levels (LEQ) of 75-85 $dBA_{LEQ30minute}$ at a distance of 50 feet from the tipping pit with momentary maximum noise levels of over 100 dBA. Some of the loudest momentary noises are produced by commercial haulers when unloading (the slamming of steel doors and backup alarms).

CHAPTER 4: ENVIRONMENTAL IMPACTS

Methodology used to Assess Future Noise Levels

The proposal will re-design the NRDS tipping building and encourage the delivery of material for recycling. This report will first introduce the examination of the proposal's impacts with a qualitative discussion and then will present a more detailed quantitative analysis for each facility where there is sufficient data. The Proposal will alter existing noise impacts in several ways as summarized in Table 7.

Table 7. Relative Change in Noise Sources and the Noise They Generate

Noise Sources	Effect of Proposal upon Existing Noise Generation	Notes
Automobile- self-haulers	No change	
Automobiles dropping off recyclables	Increase	More convenient drop-off location may increase the number of vehicles delivering recyclables
Trucks-self haulers	No change	
Trucks- commercial	No change	
Solid waste handling machinery	Reduced	The Proposal will utilize more frontend loaders and less bulldozers than at the present time
Trucks maneuvering containers on-site	No change	
Noise transmitted from tipping building	Reduced	New tipping buildings will likely have solid walls and block noise more effectively

Impacts from Operation of the North Recycling and Disposal Station

Noise from Traffic Using NRDS

The effect of the proposal will be to enhance recycling, resulting in fewer "self-haul" trips (customers bringing their own waste to NRDS) and slightly more trips by trucks and automobiles hauling recyclables. There will also be a small increase in the number of employees commuting to NRDS. The overall vehicle trips will increase about 1.4% on an average day and 2.0% on a peak day (Heffron Transportation, Trip Generation Memo. 2007) compared to the 2030 No Action scenario. The total sound energy generated by NRDS traffic during a peak hour will change very little. However, certain design standards and operational practices would be implemented by SPU to further reduce noise impacts from traffic using the NRDS on residential areas adjacent to the facility, including restricting the movement of trucks moving to and from NRDS on N. 35th between Interlake Avenue North and Carr Place North.

Noise from on-site Machinery Outside of Transfer Building

The proposal will slightly reduce trips by trucks transferring solid waste from NRDS to an intermodal transfer site and it will slightly increase truck trips hauling recyclables from the NRDS site. A small reduction in the number of containers handled on site will translate into a reduction in incidental noises such as the beeping of backup alarms or the slamming of container doors. It is not possible to quantify the overall reduction in noise from these sources.

Design details of specific project elements have not been determined at this time. However, certain design standards and operational practices would be implemented by SPU to further reduce noise impacts on residential areas from machinery outside the transfer building, including:

- Buffering the noise from the rooftop ventilation fans with a three-sided enclosure (open to the south).
- Examining the site plan to minimize the noise from backup alarms when trucks and loaders are moving in reverse.
- Investigating the use of backup alarms that vary their loudness depending upon ambient noise levels.
- Investigating the possibility of adding rubber seals to the doors of the transfer trailers to reduce impact noise when doors are closed.

Noise from on-site Machinery Inside Transfer Building

Table 8 lists the machinery expected to be used at NRDS inside the transfer building.

Table 8. Machinery Proposed for the Project

Equipment	Number of Machines	Sound Pressure Level at a distance of 50 feet
Front loader	2	79
Loader-Packer (Pettibone 445)[2]	1	89
Compactor for cardboard[3]	1	63
Total Sound Level inside Tipping Building – 50' from tipping floor.	1	90 dBA

Sources for noise data:
[1] NC Machinery, Seattle, WA
[2] Personal conversation, J.D. Gaines- station manager Dec. 2007
[3] Environalysis- from measurements at South Recycling & Disposal Site, Seattle, WA Sept. 1999, Sept. 2004 and December 2007.

In order to determine the effect that a new transfer building would have upon noise, measurements were taken of a fairly new solid waste facility (Snohomish County's Airport Road facility). Noise was measured simultaneously inside and outside the building. The outside measurement is biased somewhat higher due to the passage of vehicles on that side of the building as they entered the building, slightly underestimating the noise reduction of the wall. Table 9 presents the measurement data and calculates the noise attenuation (the buffering ability) of the building.

The project will likely add a new noise source to NRDS: rooftop exhaust fans for dust and odor control in the transfer building. The noise generated by these fans cannot be precisely determined until later in the design process, however it is estimated to be less than 80 dBA at a distance of 50 feet - not be a significant noise source.

Table 9. Noise Attenuation Capability of Modern Tipping Building Design

Location of Measurement	LEQ	LMAX	LMIN
Inside Snohomish County Tipping Building	77.8	106.0	68.4
Outside Snohomish County Tipping Building	61.6	83.6	50.6
Noise Reduction provided by Modern Building Design	**16.2 dBA**	**22.4 dBA**	**17.8 dBA**
Noise Reduction provided by Existing NRDS Building	**8.0 dBA**	**NA**	**NA**
Net Reduction in Noise Impacts	**8 dBA**	**Assume 10 dBA**	**NA**

The 16 dBA attenuation shown in Table 9 for the LEQ metric is twice as high as the 8 dBA LEQ measured and calculated for SRDS (*Environalysis, Noise Technical Report for SRDS Recycle/Reuse Center*.1999) The SRDS data is representative of NRDS, as the design of these existing buildings is identical. The Snohomish County data will be representative of the reconstructed NRDS also, as the construction of the two transfer buildings is likely to be similar.

Noise Impacts on Adjacent Neighborhoods

Design details of specific project elements have not been determined at this time. However, the proposed building design will likely reduce existing maximum noise levels immediately outside its walls by an amount conservatively estimated at 10 dBA. A reduction of 10 dBA can be understood as reducing the perceived noise by one half. With this reduction the proposed re-construction of NRDS will meet the City's EDNA standards for momentary noises. There will continue to be momentary "spikes" of noise greater than 60 dBA as there are at the current time. Despite such spikes the facility's noise at adjacent residential property will be within the City's limits. This does not mean the new facility will be inaudible, at times individual sounds of a particular volume or frequency will be heard. However, noise from the new facility will be less apparent than today.

Certain design standards and operational practices would be implemented by SPU to further reduce noise impacts on residential areas adjacent to the facility, including:

- Replacing the open-sided tipping buildings with solid walled structures with much greater noise reduction qualities, resulting in approximately a 10 dBA reduction in noise passing through the sides of the tipping building.
- Constructing a solid, preferably masonry, property line fence on the north side of NRDS sufficiently tall to block the view and noise of vehicles entering the tipping building.

There will be no significant noise impacts due to the facility's operations.

Indirect Impacts

The Project will have no indirect effects on noise

Impacts from Construction

The construction phase of the Proposal will require the use of diesel powered heavy construction equipment that generates high noise levels. Table 10 lists the types of equipment needed for the Proposal's construction phase and shows the range of noise levels to be expected from such equipment.

Construction equipment would be muffled in accordance with all applicable noise regulations. SMC Chapter 25.08, which prescribes limits to noise and construction activities, would be fully enforced while the project is under construction. In addition, the following practices would be employed:

- Maintain heavy equipment and mufflers in good condition.
- Buffer stationary generators or compressors (if used) with portable sound barriers.
- Inform local residents of the duration and timing of the construction work and the typical noise levels to be expected for each phase.
- Establish a "noise complaint" hotline and a process to systematically record complaints and respond to them.
- Monitor construction noise levels during the nosiest phases of work
- Erect a solid plywood screen fastened to the existing or temporary chain-link fence.

As a result, there would be no significant adverse noise impacts from the construction work.

Table 10. Range of Noise Levels (dBA) from Construction Equipment at 50 Feet

Equipment	60	70	80	90	100	110
Earth Moving						
Compactors						
Front-end loaders						
Backhoes						
Tractors						
Scrappers/graders						
Pavers						
Trucks						
Materials Handling						
Concrete mixers						
Concrete pumps						
Cranes (movable)						
Stationary Equipment						
Pumps						
Generators						
Compressors						
Impact Equipment						
Pneumatic wrenches						
Jack hammers						
Pile drivers (peak dBA)						

Sources: EPA 1971 and WSDOT 1991.

CHAPTER 5: MITIGATION MEASURES

Construction Impacts Mitigation

Because construction best practices would be adopted as part of the project, construction of the proposed project would not result in significant adverse impacts from noise, and no additional mitigation measures to reduce impacts are needed.

Operational Impacts Mitigation

The project design, and operational practices implemented by SPU, will likely reduce the sound levels generated at NRDS, and will reduce it's noise impacts in residential neighborhoods close to the facility. No additional noise mitigation is required to meet the City of Seattle's maximum permissible sound levels.

Indirect Impacts Mitigation

The Project will have no indirect effects on noise, and therefore no additional mitigation is required associated with this project.

Significant Unavoidable Adverse Impacts

Significant noise impacts are defined as levels of project-generated noise that exceed federal, state or regional standards. The Proposal is unlikely to have significant unavoidable adverse noise impacts.

References

Environalysis, Noise Technical Report for SRDS Recycle/Reuse Center.1999).

Federal Highway Administration Report. “FHWA Highway Traffic Noise Prediction Model” FHWA-RD-77-108.

Federal Highway Administration “Fundamentals and Abatement of Highway Traffic Noise Report” No. FHWA-HH1-HEV-73-79761 (FHWA, 1980).

Federal Highway Administration Report. “Measurement of Highway-Related Noise”. (FHWA, 1996)

Heffron Transportation, Inc. “Transportation Technical Report for the SEIS- Seattle Public Utilities Solid Waste Facilities Waster Plan” November 2004

Heffron Transportation, Inc. “Seattle Public Utilities Technical Memorandum” December 2007

Seattle, Municipal Code, Chapter 15.08 Noise Control.

United State Code of Federal Regulations (23 CFR Part 772), July 9, 1982.

Washington State Department of Transportation “Highway Traffic Noise Analysis and Abatement” (FHWA, 1995)

Washington State Department of Transportation. “Noise Abatement Policy and Procedures”. (WSDOT, 1997)

Washington State. “Revised Code of Washington (RCW) Chapter 70.107. 1987

Washington State. “Washington Administrative Code (WAC) Chapters 173-58, 173-60, 173-60