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APPENDIX C: GRADE CROSSING DELAY AND SAFETY METHODOLOGY

C.1 GRADE CROSSING DELAY METHODOLOGY

For each at-grade crossing analyzed, the time that a particular crossing would be blocked for each train-crossing event was calculated and the average delay per vehicle at that crossing in a 24-hour period was estimated. The average delay per vehicle for at-grade crossings was used to determine the Level of Service (LOS). LOS is also used as a qualitative measure of road operating conditions and the comfort level of vehicle passengers. The average traffic delays for all vehicles over a 24-hour period was analyzed and the average delay per vehicle was used to determine LOS for each at-grade crossing based on ratings described in Table C-1.

Table C-1
Grade Crossings Level of Service

Level of Service (LOS)	Average Total Delay (seconds/vehicle)
A	<= 10
B	> 10 and <= 20
C	> 20 and <= 35
D	> 35 and <= 55
E	> 55 and <= 80
F	> 80

Source: Transportation Research Board, 2001

The following calculations were used to determine traffic delay for at-grade crossings. The traffic delay at a crossing includes the time for the train to pass, along with the time for any warning device to engage. For simplification purposes, it is assumed that both rail and road traffic are uniform throughout the day.

The first step includes the calculation of gate-down time per train event (T).

$$T = T_W + \frac{L}{V}$$

T_W = Gate warning time
L = Average train length (weighted average between freight and passenger trains)
V = Average train speed (weighted average between freight and passenger trains)

The number of stopped vehicles delayed per day (N_V) can be calculated as follows:

$$N_V = \frac{T}{24} * N * ADT$$

N = Number of trains per day
ADT = Average daily traffic[58]

[58] Also referred to as annual average daily traffic (AADT).

24 = Hours per day

The average delay per vehicle in a 24-hour period (D_V) is:

$$D_V = \frac{N_V}{ADT} * \frac{T * \frac{R_D}{R_D - R_A}}{2}$$

R_D = Departure rate (vehicles/lane/hour)[59]
R_A = Arrival rate, average daily traffic converted to vehicles/lane-hour
2 = Denominator to reflect that vehicles do not experience the entire time the train is blocking the grade crossing. They are assumed to arrive on average at the midpoint of the train crossing period.

Total vehicle delay (D) is the product of average delay per vehicle (D_V) and the average daily traffic (ADT).

$$D = D_V * ADT$$

Table C-2 presents the results of the grade crossing delay analysis for the Transaction.

C.2 GRADE CROSSING SAFETY METHODOLOGY

To characterize grade crossing safety conditions, several data sources were used:

- Information on current and future rail traffic from the Applicants, as presented in Chapter 2.
- The FRA *Highway-Rail Crossing Inventory* for information on road and train traffic characteristics at highway/rail crossings, including the number of tracks, number of road lanes, warning devices, daily vehicle traffic volume, road paving, road classifications, and the most recent five years of accident history (FRA, 2007a).
- The *2006 Traffic Data Report for New York State*, prepared by the New York State Department of Transportation (NYSDOT), as the primary source for annual average daily traffic (AADT) information. For crossings where AADT information was not available from the NYSDOT report, the values included in the FRA *Highway-Rail Crossing Inventory* were used in this analysis. Such AADT values were converted to 2012 values based on annual growth rates. Annual growth rates between 1978 and 2004 were estimated based on traffic statistics on local roads in the state of New York (FHWA, multiple years). Annual vehicular traffic growth rates between Year 2004 and 2007 and between Year 2008 and 2012 were based on *New Visions for Capital District Transportation—New Visions 2025 Amendment* (CDTC, 2004).
- The FRA Personal Computer Accident Prediction System (PCAPS) to predict accident frequencies at existing grade crossings (FRA, 2007b).

[59] Based on the *Highway Capacity Manual* (Transportation Research Board, 2001), departure rates (in vehicles/lane-hour) are the following: highways (1,800), arterials (1,400), collectors (900), and local roads (700).

Traffic safety at public at-grade crossings was analyzed using the accident history from the past five years and calculated the potential change in the predicted accident frequency (accidents per year) resulting from the Transaction. This calculation involved information on public at-grade crossings provided in the FRA *National Highway-Rail Crossing Inventory* (FRA, 2007a), with the exception of train count and AADT information, which was obtained from the sources indicated above.

PCAPS takes into account factors including the number of day trains, the number of night trains, and the number of switching trains. For this analysis, trains were assumed to be distributed uniformly throughout a 24-hour period. For safety analysis purposes, FRA daytime hours were set as 6 a.m. to 6 p.m. Thus, it was assumed that 50 percent of the trains would be night trains and 50 percent day trains.[60] It was also assumed that none of the trains would be switch trains. Table C-2 shows the results of the at-grade crossing safety analysis with and without the Transaction.

[60] Train counts entered into the PCAPS model must be integer values. For rail segments with an odd number of trains, it was assumed for this analysis that there would be one more day train than night train. For example, for a segment with 21 trains, it was assumed 11 trains would be day trains and 10 trains would be night trains. This is a conservative assumption in that it yields a higher predicted accident frequency than would result from the opposite assumption. Further, non-integer train traffic estimates were rounded upwards for input into PCAPS, which also results in conservative (higher) predicted accident frequencies.

Table C-2
Results from Grade Crossing Delay and Safety Analysis[a]

Rail Segment	Crossing ID	Road	Municipality	Annual average daily traffic in both directions (veh/day)	Number of daily trains (including loaded and empty)		Number of vehicles delayed per day (veh/day)		Average delay per stopped Vehicle (min/veh)		Average delay per vehicle in a 24-hour period (sec/veh)		Total delay in a 24-hour period (hours)		Predicted accident frequency (accidents/year)	
					No Action	With Transaction	No Action	With Transaction	No Action	With Transaction	No Action	With Transaction	No Action	With Transaction	No Action	With Transaction
Mechanicville, NY – Hoosick Junction, NY	052593M	Eagle Bridge Road	NA	573	6.8	9.3	9	7	1.64	0.89	1.50	0.61	0.24	0.10	0.0133	0.0151
	052594U	Beck Road	NA	393	6.8	9.3	6	4	1.63	0.89	1.50	0.61	0.16	0.07	0.0105	0.0119
	052595B	Potterhill Road C-103	East Buskirk	423	6.8	9.3	6	5	1.64	0.89	1.50	0.61	0.18	0.07	0.0107	0.0122
	052596H	Hunt Road	NA	439	6.8	9.3	7	5	1.64	0.89	1.50	0.61	0.18	0.07	0.0132	0.0153
	052531P	Fisherman’s Lane	Schaghticoke	169	6.8	9.3	3	2	1.62	1.10	1.49	0.92	0.07	0.04	0.0223	0.0284
	052534K	Buttermilk Falls Road	NA	108	6.8	9.3	2	2	1.62	1.09	1.48	0.92	0.04	0.03	0.0074	0.0084
	052537F	Depot Hill Road	NA	372	6.8	9.3	6	5	1.63	1.10	1.50	0.93	0.15	0.10	0.0103	0.0118
	052539U	Howland Avenue	Mechanicville	3,346	6.8	9.3	51	47	1.75	1.18	1.60	1.00	1.49	0.93	0.0184	0.0207
	052547L	Viall Avenue	Mechanicville	1,432	6.8	9.3	42	51	3.26	2.89	5.75	6.21	2.29	2.47	0.0148	0.0168
Summary of Mechanicville, NY – Hoosick Junction, NY Segment				7,255			131	128	2.20	1.81	2.39	1.92	4.81	3.87	0.1208	0.1405
Hoosick Junction, NY – East Deerfield, MA	052586C	River Street	Hoosick Falls	7,499	6.8	8.3	117	84	2.00	1.17	1.87	0.78	3.91	1.63	0.0224	0.0246
Mohawk Yard, NY- Crescent, NY	052562N	Waite Road	NA	372	9.1	10.6	5	8	1.69	2.24	1.21	2.72	0.13	0.29	0.0118	0.0124
	249585U	Blue Barns Road	NA	5,410	9.1	10.6	56	88	1.37	1.78	0.70	1.53	1.12	2.36	0.0233	0.0245
	250226A	Alplaus Road	Alplaus	6,859	9.1	10.6	72	111	1.51	1.96	0.77	1.68	1.56	3.29	0.0279	0.0292
Summary of Mohawk Yard, NY – Crescent, NY Segment				12,641			133	207	1.27	1.72	0.80	1.69	2.81	5.94	0.0630	0.0061

a. Totals may not add due to rounding. Analysis of the Mohawk Yard, NY to Crescent, NY segment does not include Canadian Pacific Railway Company (CP) freight traffic because information on trains per day and train length is not publicly available. Based on non-public waybill information, CP traffic levels are such that inclusion of CP traffic in the analysis would not change the conclusion that all crossings on this segment would remain at LOS Level A under post-Transaction conditions.

APPENDIX D: NOISE AND VIBRATION

Section 3.9 presents a summary of the noise and vibration analysis and findings. The estimated noise and vibration due to the Transaction would be below relevant levels and, thus, no adverse noise impacts are expected to result from the proposed Transaction. This appendix provides additional information on the methodology used for the analysis and the analysis results.

D.1 Noise From Facility Operations and Trucks

The Board's environmental rules establish thresholds for noise analysis.[61] These thresholds are shown in Table D-1. As discussed in Chapter 3, the projected increased truck traffic is the only Transaction-related change that would require analysis based on the Board's thresholds. To conservatively evaluate the contribution of the increased truck traffic at the two new facilities, however, a noise analysis was performed to determine the potential impacts of the projected additional truck traffic in conjunction with the nearby rail line segments and projected activity at the proposed new facilities.

Table D-1
Board Thresholds for Noise Analysis

System Component	Noise Analysis Thresholds
Rail Line Segments	Increase of 8 trains per day, or 100% increase in annual gross ton-miles
Rail Yards, Facilities	100% increase in carload activity per day
Truck Traffic	Increase of 50 trucks per day, or 10% increase in average daily traffic volumes on any affected road segment

Source: 49 CFR §1105.7(e)(6).

Potential impacts were analyzed based on the following conditions:

- An increase in noise exposure as measured by day-night average noise level (DNL)62 of 3 A-weighted decibels (dBA)[63] or more.
- An increase to a DNL of 65 or greater.

Both of these components (3 dBA increase, 65 DNL) are employed to determine an upper bound of any area of potential noise impact. Both components – together resulting in a +3 dBA/65 DNL level – must be met to cause an adverse noise impact (STB 1998b, Coate 1999). That is, an adverse noise impact would not occur in any location unless post-Transaction noise levels both increase by 3 dBA or more and are equal to at least 65 DNL. If the estimated noise would exceed this +3 dBA/65 DNL level, the number of affected receptors was then estimated (*e.g.*,

[61] 49 CFR § 1105.7e(6)

[62] Day-night average noise level (DNL) is the energy average of A-weighted decibels (dBA) sound level over a 24-hour period. DNL includes an adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the daytime.

[63] A-weighted decibels (dBA) is a measure of noise level used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.

schools, libraries, residences, retirement communities, nursing homes). No receptors would experience both an increase of 3 dBA or greater and a noise level of at least 65 DNL due to Transaction-related changes in rail line or facility operations or associated truck traffic. The approach used and the findings are presented below.

D.1.1 Methodology

The following discussion summarizes the procedures used to estimate the noise levels near the Mechanicville Facility and the San Vel Automotive Facility. Train operations and related activities within and near the proposed facilities involve numerous noise sources. The primary noise sources are: (1) existing rail traffic, including warning horn soundings at nearby at-grade crossings on existing rail lines that run through (at the Mechanicville Facility) or adjacent to (at the San Vel Automotive Facility) the facility sites, (2) switch locomotive movements within the facilities, (3) idling locomotives and trucks, (4) cranes (to be used only at the intermodal portion of the Mechanicville Facility), and (5) automobile unloaders. Projected noise increases due to Transaction-related changes at the existing Ayer Intermodal Facility were not analyzed in detail because the post-Transaction changes in noise levels would be small in the context of current rail operations, carload and other yard activity and truck traffic at the facility and the surrounding industrial area in which the facility is located. Furthermore, no receptors were identified near the Ayer Intermodal Facility. Based on review of aerial photography, the closest receptor is more than 3,000 feet from the Ayer Intermodal Facility, well beyond the expected 65 DNL contour for the Ayer Intermodal Facility of less than 500 feet based on the noise analysis conducted for the proposed San Vel Automotive Facility and Mechanicville Facility.

The analysis utilizes previously developed noise models (STB, 1997; STB, 1998a), based on field measurements of noise levels produced by these sources, and information from equipment manufacturers. Operations at both facilities are projected to add new truck traffic to the local roadways. Both truck traffic and noise were analyzed on and near the facilities using CADNA, an environmental noise computer program which produces noise contours. The resulting noise contours were used in combination with aerial photographs in Geographic Information System (GIS) to identify receptors within areas with an estimated increase in noise of 3 dBA or greater and the receptors within areas where the overall noise level would be 65 DNL or greater.

Existing noise levels at the sites were modeled based on existing rail-related activities and post-Transaction conditions were modeled with the additional facility-related noise sources. For both the Mechanicville Facility and the San Vel Automotive Facility, existing vehicular traffic on roads with the projected largest increases in truck volumes were modeled as well as existing rail activity.[64] When estimating noise levels, the following factors were considered: the number of movements by blocks of railcars in and out of the facilities; the number of carloads per day; the average number of locomotives and cars per train; the average number of truck trips per day; and the reference sound levels for locomotives, warning horns, freight cars, idling locomotives,

[64] Estimated noise increases were analyzed on the road segments with the lowest current traffic volumes for the truck route anticipated to and from each facility because the added truck traffic would create the largest increase in noise where the current traffic volume is lowest. For the Mechanicville Facility, the road segment with the lowest average daily traffic is NY Route 67, adjacent to the facility. For the San Vel Automotive Facility, this segment is Willow Road. The projected Transaction-related truck traffic to and from the Ayer Intermodal Facility is not expected to use Willow Road.

trucks, and equipment operations. Table D-2 shows modeling parameters and equations used to estimate noise levels due to these activities.

For both the Mechanicville Facility and San Vel Automotive Facility, local through-train activity generates noise in terms of both locomotive warning horn and wayside noise. Wayside noise collectively refers to noise generated by railcars and locomotives (*i.e.*, without including horn noise). The analysis utilized noise measurements from past noise studies including the Final Environmental Impact Statement for the Conrail Acquisition and the Draft Environmental Assessment for the Canadian National/Illinois Central Acquisition to provide the basis for the wayside noise level projections.

Table D-2
Modeling Parameters for Rail Facility Noise Projections[a]

	Equation No.	SEL	Lmax	n	k (dBA/ft)
Switch Engines	1	98	83	1	0.001
Car Coupling Impacts	1	94	99	2	0.005
Automobile Loader	2	N/A	76[b]	N/A	0.001
Crane	2	N/A	72[c]	N/A	0.0025
Idling Locomotives	3	N/A	67	N/A	0.0025

1) $DNL = SEL + 10\log(N_d + 10N_n) - 49.4 - 10\log(D/100)^n - k(D-100)$
2) $DNL = L_{max} + 10\log(NH_d + 10NH_n) - 13.8 - 20\log(D/100) - k(D-100)$
3) $DNL = L_{max} + 10\log(NH_d + 10NH_n) - 13.8 - 20\log(D/100) - k(D-100) + 8\log(1.33N_l) + 10\log(NR)$

Sound Exposure Level (SEL) is the event-specific noise level with the sound level normalized to one second; L_{max} is the maximum noise level which occurs during the event; n is an exponent used in the equations where n=1 for moving sources and n=2 for stationary sources; and k is the combined air/ground absorption coefficient. D is the distance in feet; N_d and N_n are the number of daytime and nighttime operations; NH_d and NH_n are the number of hours of daytime and nighttime operations; N_l is the number of noise sources per row; and NR is the number of rows of noise sources.

a. STB, 1998, except as otherwise indicated

b. Based on field noise measurements presented in "Noise Impact Assessment Auto Unloading Terminal II Ayer, Massachusetts, 1999"

c. Based on Applicants' anticipated use of Taylor Machine Works, Inc. rubber tired gantry crane model RTGP-10065I. Manufacturer/model subject to final design.

The basic equations used for the wayside noise model are:

- $SELcars = L_{eq}ref + 10\log(Tpassby) + 30\log(S/Sref)$

For locomotives, which can be modeled as moving monopole point sources, the corresponding equation is as follows:

- $SELlocos = SELref + 10\log(Nlocos) - 10\log(S/Sref)$

The total train sound exposure level is computed by logarithmically adding SELlocos and SELcars

- $DNL100' = SEL + 10\log(Nd + 10*Nn) - 49.4$
- $DNL = DNL100' + 15\log(100/D)$

The parameters which apply to the equations above are:

- SELcars = Sound Exposure Level of rail cars

- $L_{eq}ref$ = Level Equivalent of rail car
- Tpassby = Train passby time, in seconds
- S = Train speed, in miles per hour
- Sref = Reference train speed
- SELlocos = Sound Exposure Level of locomotive
- SELref = Reference Sound Exposure Level of locomotive
- Nlocos = Number of locomotives
- Nd = Number of trains during daytime
- Nn = Number of trains during nighttime
- D = Distance from tracks, in feet

Tables D-3 and D-4 show the reference wayside noise and horn noise levels, respectively, used in this analysis.

Table D-3
Reference Wayside Noise Levels

Description	Average Level (dBA)
Locomotive SEL (40 mph at 100 feet)[a]	95
Rail car L_{eq}[b]	82

Notes: dBA=A-weighted decibels; L_{eq}=level equivalent; and SEL=Sound Exposure Level.

a. STB, 1998a

b. STB, 1998b

Table D-4
Reference Horn Noise Levels

Description	Average Level (dBA)
Horn SEL 1st 0.25 mile[a]	110
Horn SEL 2nd 0.25 mile[a]	107

Notes: dBA=A-weighted decibels; L_{eq}=level equivalent; and SEL=Sound Exposure Level.

a. FRA, 1999

Tables D-5 and D-6 show the modeled facility and through-train activity levels, based on Applicants' projected 2012 operations, and the calculated 65 DNL contour distances for facility and through-train activity, respectively. Table D-7 shows the modeled truck activity levels.

Table D-5
2012 Projected Facility Activity Modeling Data

	Mechanicville Facility (2012)	San Vel Automotive Facility (2012)
Carloads/day	46	58
Number of daytime car impacts	2	24
Number of nighttime car impacts	2	0
Daytime hours of switch engine noise	3.8	6
Nighttime hours of switch engine noise	3.8	0
Daytime hours of automobile loader noise	2.4	8
Nighttime hours of automobile loader noise	0	0
Daytime hours of crane lift noise	4.3	0
Nighttime hours of crane lift noise	4.3	0
Distance (feet) from source to 65 DNL contour	420	235

Table D-6
2012 Projected Through-Train Modeling Data[a]

	Mechanicville Facility				San Vel Automotive Facility[b]	
	Crescent, NY – Mechanicville, NY (without Transaction)	**Crescent, NY – Mechanicville, NY (with Transaction)**	**Mechanicville, NY – Hoosick Jct., NY (without Transaction)**	**Mechanicville, NY – Hoosick Jct., NY (with Transaction)**	**Willows, MA – Littleton, MA (with or without Transaction)[c]**	**Willows, MA – CPF312, MA (with or without Transaction)**
Number of locomotives	3	3	3	3	1	3
Number of cars	63	68	64	56	4	55
Total train length (feet)	3853	4159	5048	4433	340	3215
Train speed (mph)	30	30	10[d]	10[d]	40	40
Number of trains in 24 hours	6.6	8.1	6.8	9.3	22	9.4
Number of trains/day[e]	4.1	5.1	4.3	5.8	17	5
Number of trains/night[e]	2.5	3	2.6	3.5	5	4.4
Distance (feet) to 65 DNL wayside contour[f]	155	180	260	320	100[g]	230[g]
Distance (feet) to 65 DNL horn noise contour[f]	N/A[h]	N/A[h]	490	600	1070	600

a. Freight train traffic from Applicant-supplied information; see in particular Tables 2-7 and 2-8.
b. Through-train activity is not projected to change on these rail line segments as a result of the Transaction.
c. Passenger activity is based on publicly available Metropolitan Boston Transit Authority (MBTA) timetable and train assignment information dated June 2007.
d. Speed near the Mechanicville Facility and the Vaill Road at-grade crossing.
e. Assumes freight trains are evenly distributed throughout a 24 hour day. Day/night distribution of passenger trains based on timetables.
f. Calculated farthest distance from each rail line where 65 DNL is estimated to occur.
g. West of Willow Road on the Ayer, MA – Willows, MA rail line segment, where the MBTA and PARI traffic is combined and running on this single rail line segment, the distance to the 65 DNL contour is 275 feet.
h. On the Crescent, NY to Mechanicville, NY rail segment, the at-grade crossing where warning horns are sounded that is closest to the Mechanicville Facility is more than one mile away, so warning horn noise from this rail segment does not materially contribute to noise levels in the vicinity of the Mechanicville Facility.

Table D-7
2012 Projected Truck Traffic for Noise Analysis

	Mechanicville Facility (NY Route 67)	San Vel Automotive Facility (Willow Road)
AADT without Transaction	4420[a]	4388[b]
Truck percentage without Transaction	5.5[b]	6[a]
Number of truck trips without Transaction	243	263
Speed (mph)	45	45
Additional truck trips with Transaction	334	82
AADT with Transaction	4754	4470
Truck percentage with Transaction	12	8

a. Estimated for 2012 based on average of traffic counts taken on 9/9/08 and 9/10/08 and a 2 percent annual growth factor.
b. Estimated for 2012 based on average of traffic counts taken on 9/10/08 and 9/11/08 and a 3 percent annual growth factor

The data shown in Tables D-5, D-6, and D-7 were used as input to CADNA along with the positions of these activities relative to geo-referenced aerial photographs of the sites and CAD-based drawings of the facility layouts.

D.1.2 Results

As discussed in Section 3.9, the Transaction would not cause any receptors to experience both an increase of 3 dBA or greater and 65 DNL or greater and thus, there would be no adverse noise impacts.

Mechanicville Facility

Figure D-1 shows (in the red area) areas where the DNL is estimated to increase by 3 dBA or greater on or near the Mechanicville Facility as a result of the Transaction. The facility and associated rail lines are shown in the figure in black. As shown in Figure D-1, areas to both the north and south of the facility would experience a noise increase of 3 dBA or greater, while a portion of the facility itself would not. The increase in noise level shown takes into account the effects of relocating the existing main line to the south, increased horn sounding to the east (as the result of an increase of 2.5 trains per day, on average, on the relevant rail line segment), increased truck traffic on NY Route 67 to the west of the facility entrance, and increased noise caused by the activities at the proposed Mechanicville Facility. Part of the facility footprint would experience less of a noise increase because of the pre-existing noise levels resulting from the rail main line that currently runs through the location of the proposed facility. Based on the review of aerial photographs, a total of 50 receptor locations, all of which are located to the south of the Mechanicville Facility, (identified in Figure D-1 by yellow dots) would experience an increase of 3 dBA or greater. Noise levels at these locations would be less than 65 DNL – ranging from 55 to 62 DNL – with the Transaction, as shown in Figure D-2.

Figure D-2 shows the area (in dark purple) where noise levels are estimated to be 65 DNL or greater in 2012 with the Transaction. The 65 DNL or greater noise level without the Transaction is shown in light purple and the facility and associated rail lines are shown in black. The area that would experience a 65 DNL or greater noise level with the Transaction (dark purple) extends beyond (and thus covers over) the area projected to experience a 65 DNL or greater noise level in 2012 without the Transaction except along the northern edge of the facility footprint. In this area, the noise level is projected to decrease with the Transaction, relative to without Transaction conditions, due to the relocation of the existing main line to run near the southern edge of the proposed facility. As shown, 65 DNL or greater noise levels are projected to occur over most of the facility, along the main line leading to and from the facility, and along NY Route 67. As also shown, the area at 65 DNL or greater would extend farther from the existing rail line to east of the facility where the rail line turns toward the north, due to warning horn sounding at an at-grade crossing of Viall Road. Based on the review of aerial photographs, the Transaction is projected to increase by 18 the number of receptors at 65 DNL or greater (from 45 without the Transaction (in 2012) to 63 with the Transaction (in 2012)).

Figure D-1
Mechanicville Facility Post-Transaction 2012 ≥3 dBA Increase Contour

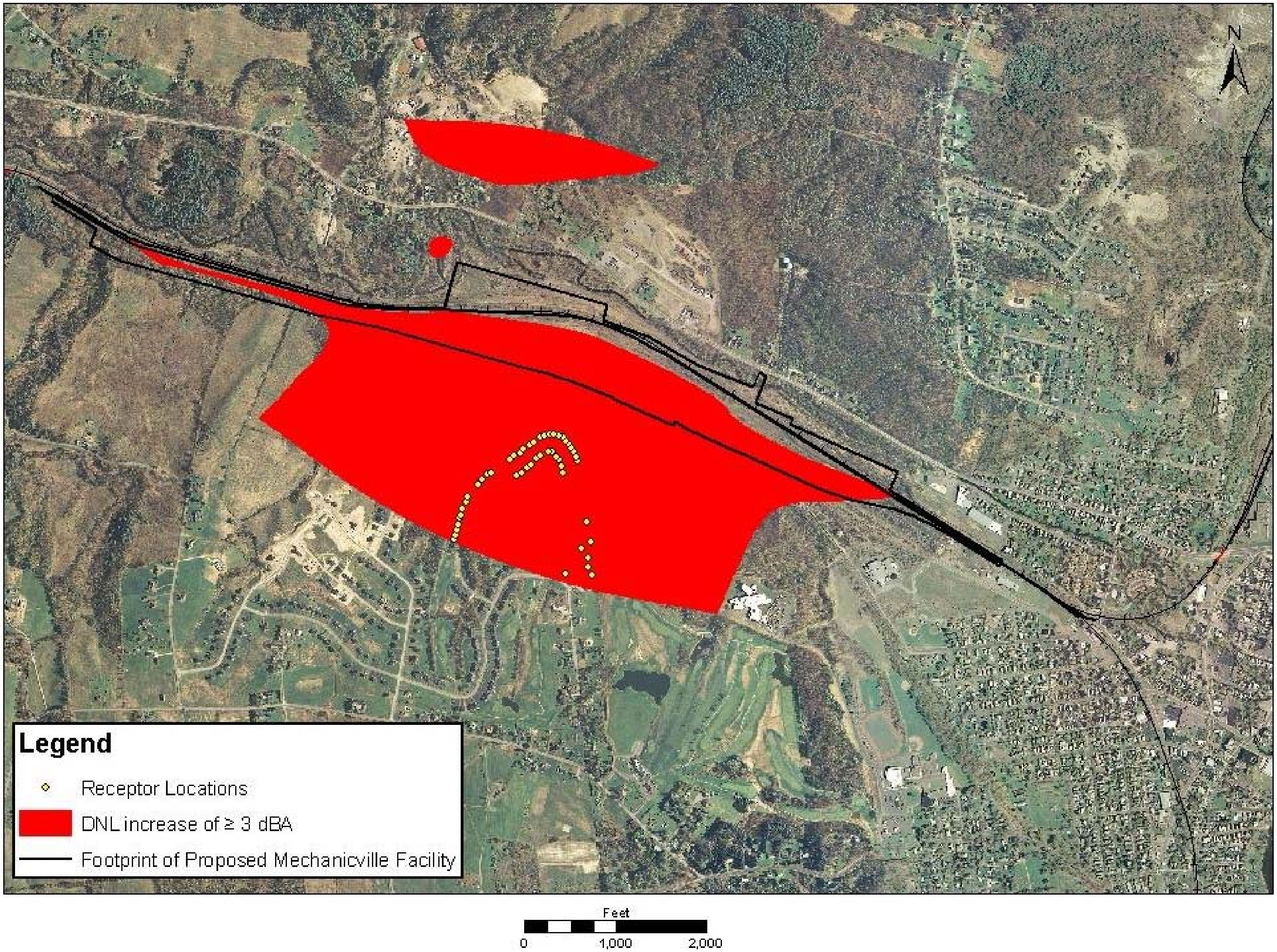


Figure D-2
Mechanicville Facility With and Without Transaction 2012 >65 DNL Contours

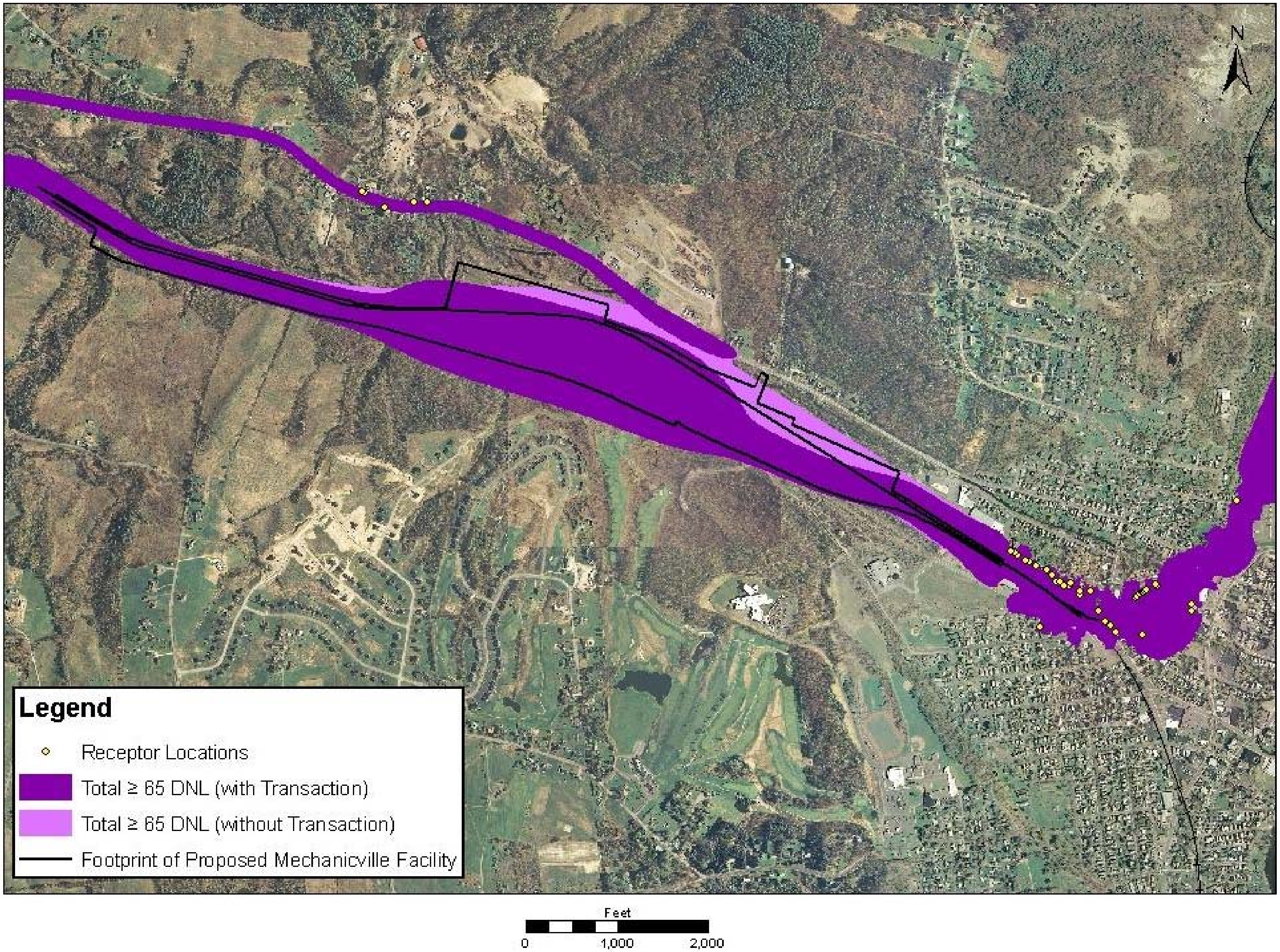


Figure D-3
Mechanicville Facility Post-Transaction 2012 >3 dBA Increase and >65 DNL Contour

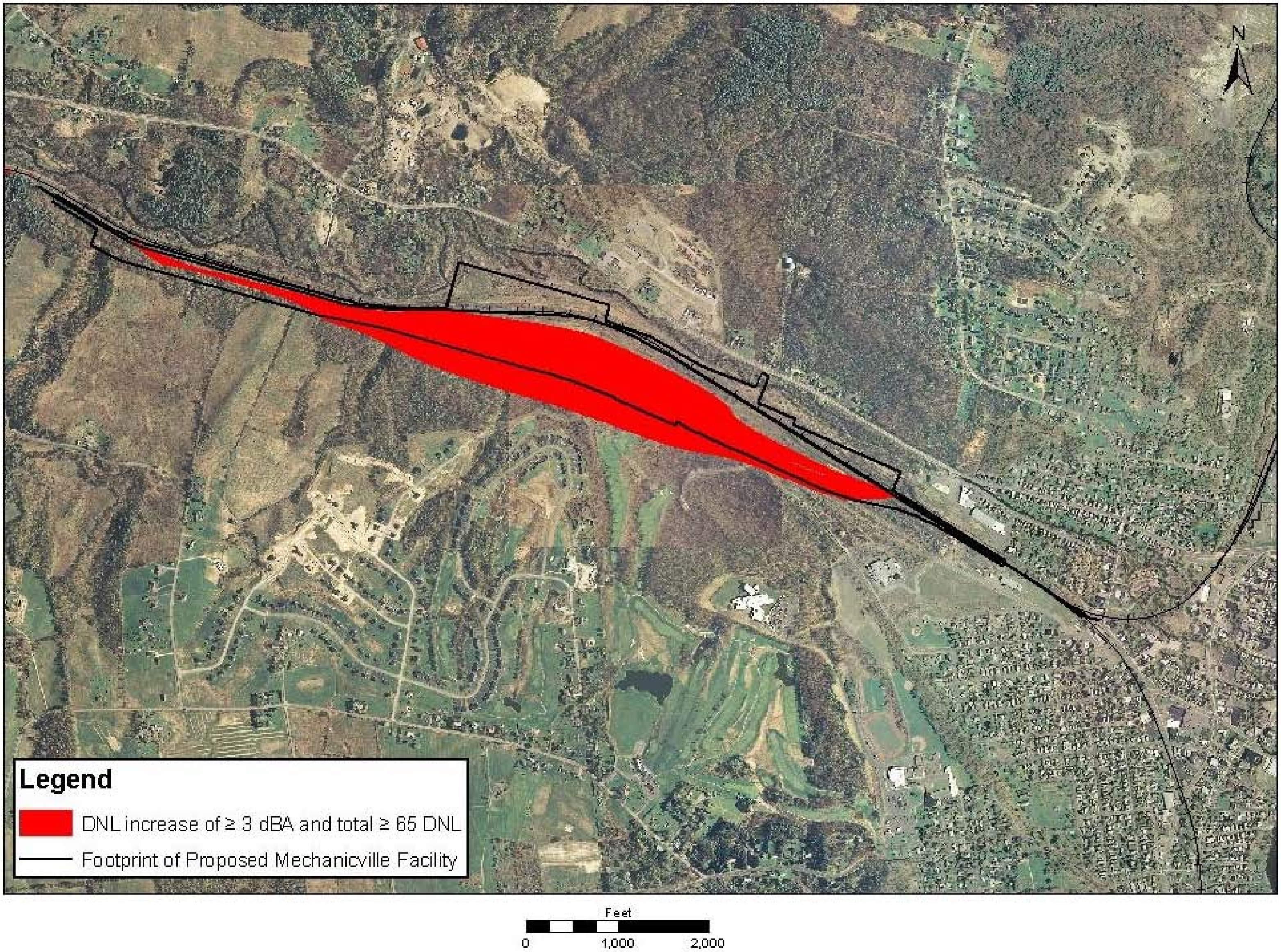


Figure D-3 illustrates (in red) where noise levels are estimated to increase as a result of the Transaction by 3 dBA or more and the noise level would be 65 DNL or greater in the vicinity of the Mechanicville Facility. Only within the red area would the +3 dBA/65 DNL level for adverse noise impacts related to the Transaction be met. As shown, no receptors are located within this area, *i.e.*, no receptors would experience both an increase of 3 dBA or more and a noise level of 65 DNL or greater. Thus, no adverse noise impacts are anticipated related to the Mechanicville Facility.

San Vel Automotive Facility

Figure D-4 illustrates (in red) where noise levels are estimated to increase as a result of the Transaction by 3 dBA or greater on or near the San Vel Automotive Facility. In the vicinity of the San Vel Automotive Facility, ambient noise levels are currently relatively high and are dominated by noise from existing rail operations, in particular warning horn sounding on both Metropolitan Boston Transit Authority (MBTA) and Pan Am Railways, Inc (PARI) rail lines at the at-grade crossings on Willow Road. As a result, the area that would experience an increase of 3 dBA or greater as a result of the Transaction is relatively small and limited to an area on or near the San Vel Automotive Facility where there are no receptors. Thus, no receptors would experience an increase of 3 dBA or greater as a result of the Transaction.

Figure D-5 illustrates (in purple) where noise levels are estimated to be 65 DNL or greater with the Transaction. Due to the relatively high existing noise levels, resulting primarily from existing warning horn sounding at the at-grade crossings of Willow Road on both the MBTA and PARI rail lines, the area at 65 DNL or above without the Transaction in 2012 is essentially the same as it would be with the Transaction in 2012. Without the Transaction, 78 receptor locations would be within the 65 DNL contour. After the Transaction, the same 78 receptor locations would continue to experience overall noise levels of 65 DNL or greater. Thus, no additional receptors would experience 65 DNL or greater noise levels as a result of the Transaction.

A comparison of Figures D-4 and D-5 shows that the area with an increase of 3 dBA or greater (the red area in Figure D-4) is entirely within a portion of the area that would experience a noise level of 65 DNL or greater in 2012 with or without the Transaction. As discussed above, no receptors are located within the area shown in red on Figure D-4, indicating that no receptor locations would experience an increase of 3 dBA or greater. The post-Transaction contour at the San Vel Automotive Facility that represents both an increase of at least 3 dBA and within the 65 DNL contour (illustrated in Figure D-6) is identical to the contour depicted in Figure D-4. No receptors are located within the area where the +3 dBA/65 DNL level for potential adverse noise impacts related to the Transaction would be met, *i.e.*, no receptors would experience both an increase of 3 dBA or more and a noise level of 65 DNL or greater. Thus, no adverse noise impacts are anticipated at the San Vel Automotive Facility.

Figure D-4
San Vel Automotive Facility Post-Transaction 2012 ≥3 dBA Increase Contour

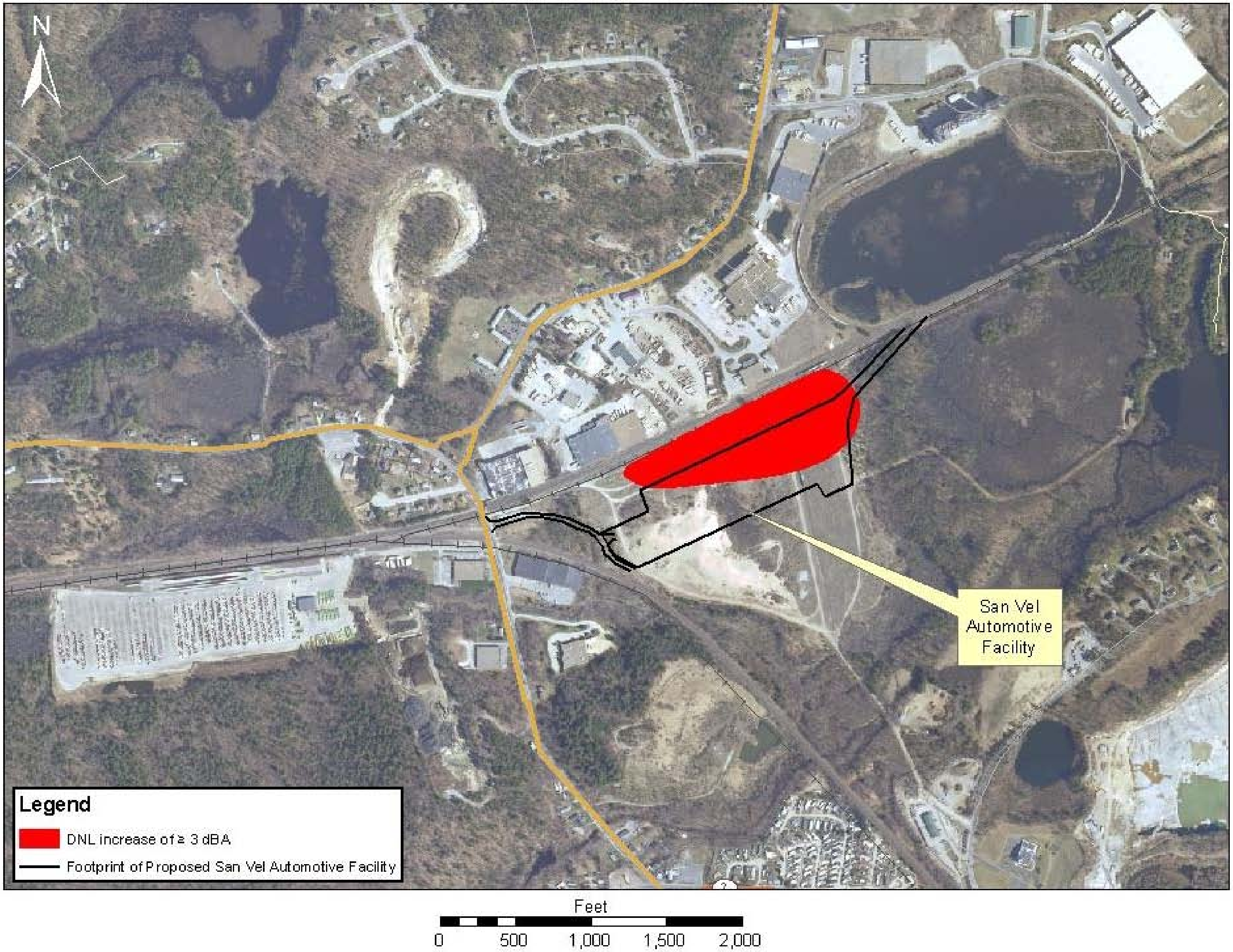


Figure D-5
San Vel Automotive Facility Post-Transaction 2012 >65 DNL Contour

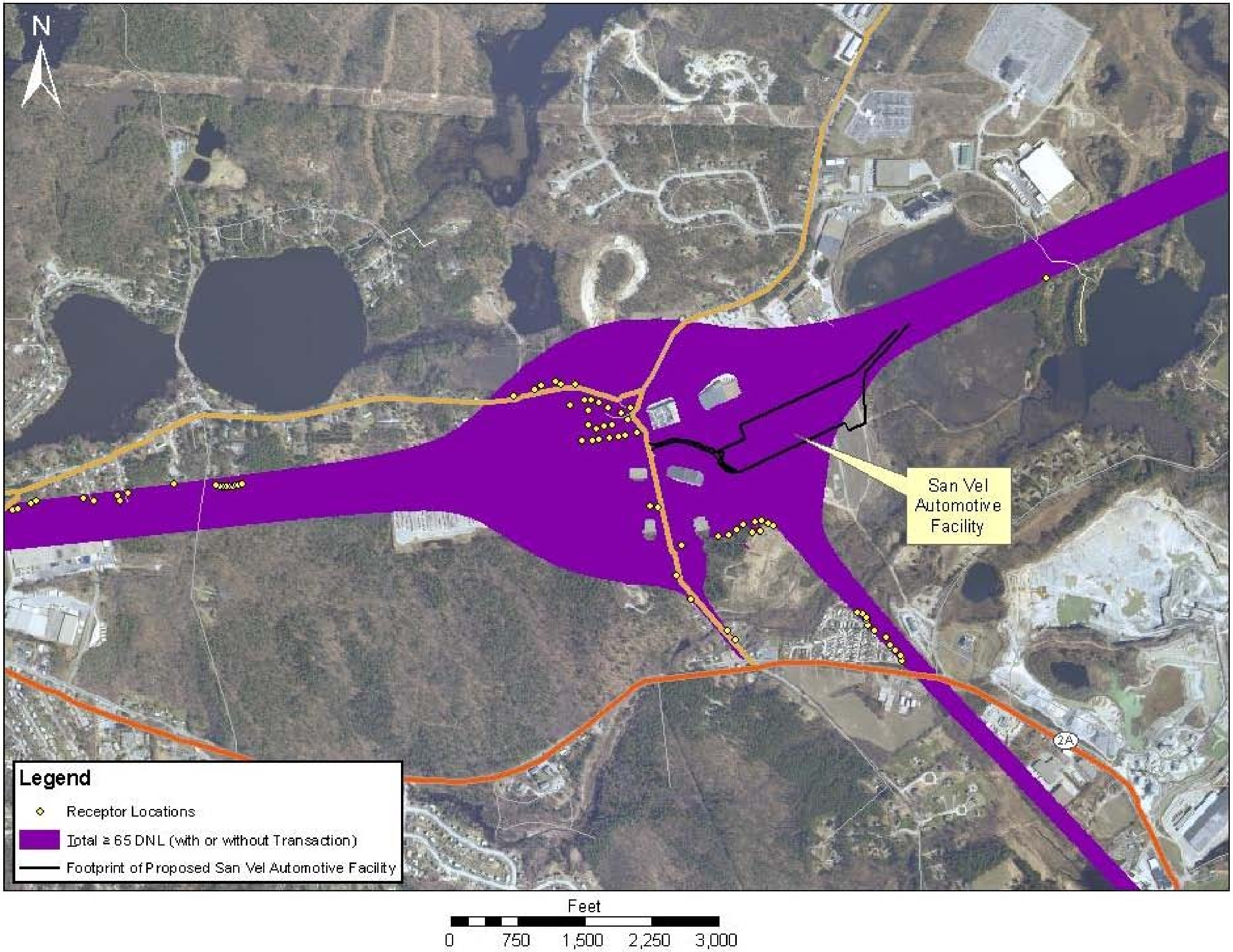
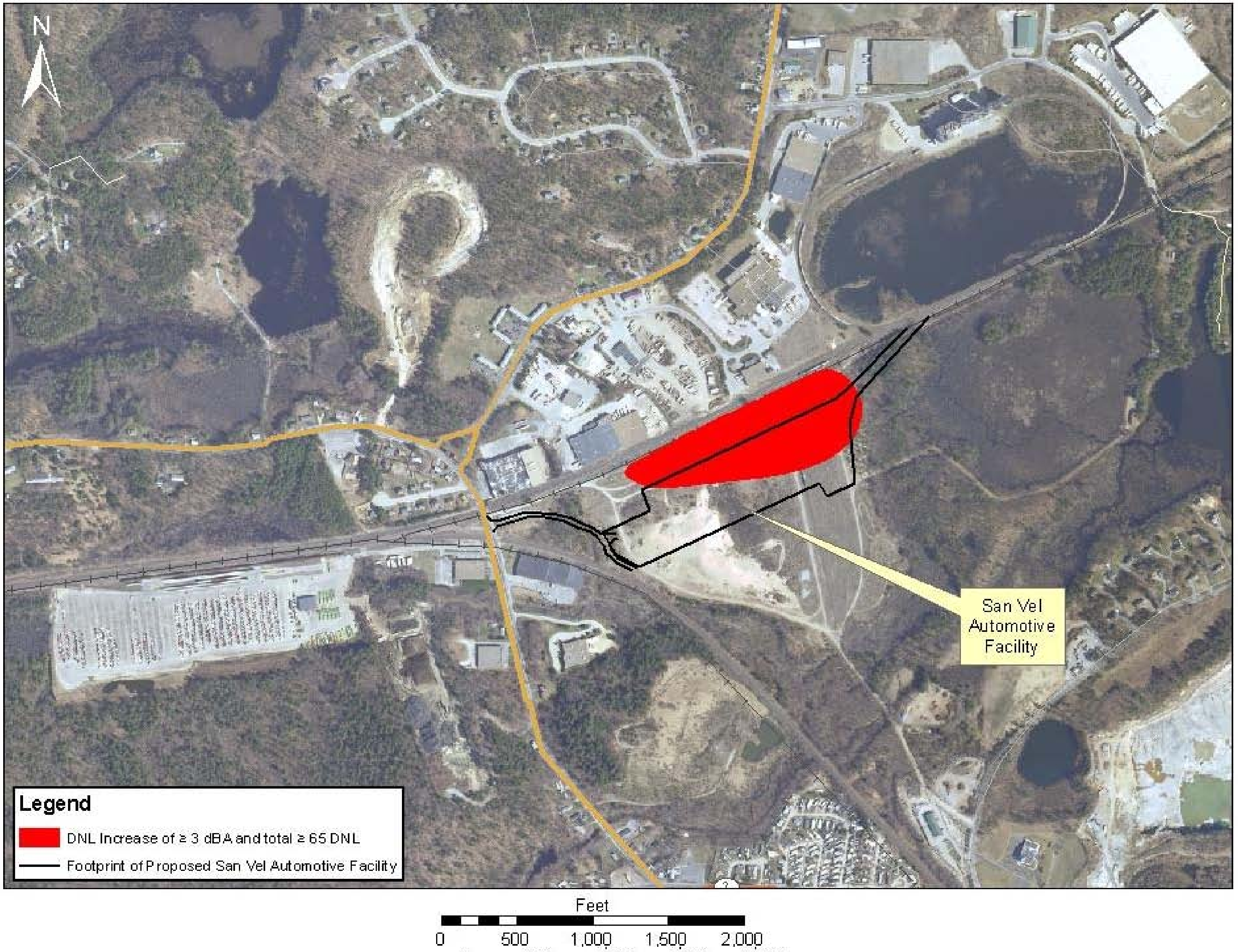


Figure D-6
San Vel Automotive Facility Post-Transaction 2012 ≥3 dBA Increase and ≥65 DNL Contour



D.2 Construction Noise and Vibration Methodology

This section presents the noise level inputs used in conjunction with the Federal Transit Authority (FTA) General Assessment method to analyze construction noise and vibration. Construction activities, in contrast to facility operations, are temporary and normally occur primarily, if not exclusively, during daytime hours. Consequently, the +3 dBA/65 DNL level utilized to evaluate increased rail traffic, truck traffic and facility activities are not applicable to construction, and instead, the FTA General Assessment method and noise thresholds for evaluating construction noise were used. The analysis indicates that no adverse noise impacts are anticipated from construction of the proposed Mechanicville Facility and San Vel Automotive Facility. The results of the analysis that led to this finding are presented and discussed in Section 3.9.

Construction activities, such as construction of the proposed Mechanicville Facility and San Vel Automotive Facility, typically generate temporary noise and sometimes ground-borne vibration. Construction noise and vibration vary depending upon the duration and complexity of the project.

Table D-8 shows noise levels associated with typical construction equipment at a distance of 50 feet from the source, as published by FTA (FTA, 2006). As described further below, these values are used to estimate noise levels at receptor locations. Receptors located more than 50 feet from a noise source shown in Table D-8 would experience a noise level below that listed in the table because noise levels decline with increasing distance from the source.

Table D-8
Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA) 50 feet from Source
Air Compressor	81
Backhoe	80
Ballast equalizer	82
Ballast tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, mobile	83
Dozer	81
Generator	85
Grader	85
Impact Wrench	85
Jackhammer	88
Loader	85
Paver	89
Pile Driver (impact)	101
Pile Driver (sonic)	96

Equipment	Typical Noise Level (dBA) 50 feet from Source
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

As shown in Table D-8, construction equipment has a range of noise levels. It is unlikely that each piece of construction equipment would be used throughout the entire duration of a construction project. Rather, each phase of a construction project may require use of certain pieces of equipment, and some equipment may be unique to that phase. Therefore, each phase of any construction project may have unique noise characteristics. Construction noise effects related to the Transaction would be temporary and localized around the two proposed new facilities.

Detailed plans for construction activity would depend on final facility designs. FTA's General Assessment method was used for evaluating construction noise, which uses the combined noise level in one hour from the two noisiest pieces of equipment, assuming they both operate at the same time.[5] The locations of the nearest receptors were identified and noise levels calculated for those locations to determine if the values shown in Table D-9 would be exceeded. General construction noise level at the closest receptor location was estimated to be 77 dBA or less at both facilities and, thus, below the FTA 90 dBA criterion for daytime residential land use. Furthermore, temporary pile driving for construction of a vehicular access bridge at the Mechanicville Facility would be less than 90 dBA at the closest receptor location based on the use of either air rotary drill or vibratory pile driving.

Table D-9
Federal Transit Administration Construction Noise Thresholds

Land Use	Daytime 1 hour L_{eq} (dBA)
Residential	90
Commercial	100
Industrial	100

5 The +3 dBA/65 DNL level for noise analysis are based on day-night average noise levels that do not apply to temporary (rather than on-going) activities that normally occur primarily during daytime hours.

Construction activities such as pile driving, drilling, grading and excavation may cause vibration impacts depending on the type of activities, site conditions, and the distance to receptor locations. Assessment for potential building damage is the main thrust of the construction vibration analysis, but especially for longer term construction projects, human annoyance to vibration also may be assessed.

The FTA General Assessment method was used to identify potential vibration impacts to buildings. The analysis involves identifying relevant vibration source levels (based on FTA measurement data) for the anticipated construction activity, and then extrapolating the vibration level from the source to the closest receptor based on the distance between the activity and closest receptor using the following equation:

$$PPV_{equip} = PPV_{ref} \text{ x } (25/D)^{1.5}$$

Where PPVequip is the peak particle velocity in inches per second of the equipment adjusted for distance.

PPVref is the source vibration level in inches per second at 25 feet.

D is the distance from the equipment to the receptor.

According to FTA measurement data, the applicable construction activities with the highest vibratory impacts are pile driving and bulldozing. Thus, vibration source levels utilized for the above equation are based on these two activities.

Following the FTA method, the calculated vibration level at each receptor location was then compared to the FTA building damage criterion for fragile buildings of 0.20 in/sec. Based on this comparison, estimated vibration from general construction activity (represented by either bulldozing, pile driving, or both, depending on the planned activities at each construction site) at the Mechanicville Facility, the San Vel Automotive Facility, and the Mechanicville Facility access bridge would be far below this threshold at the location of the receptor closest to each facility. Additionally, because SEA is not aware of the presence of any fragile buildings near the proposed Mechanicville Facility access bridge location, use of the FTA building damage criterion for fragile buildings is conservative.