9. NOISE AND VIBRATION

This chapter describes the Surface Transportation Board's (STB or the Board) Section of Environmental Analysis' (SEA) analysis of potential noise and vibration impacts to humans from construction and operation of the Proposed Port MacKenzie Rail Extension. Section 9.1 describes the noise and vibration regulatory setting. Section 9.2 describes the analysis methodology. Section 9.3 describes the affected environment for noise and vibration and provides noise measurement data. Section 9.4 describes potential noise and vibration impacts, including modeled noise contours and estimated numbers of receptors (i.e., noise-sensitive locations) potentially affected.

9.1 Regulatory Setting

Federal laws, regulations, and guidelines that specify requirements and provide guidance on noise and vibration impacts analysis include:

- STB environmental regulations at 49 Code of Federal Regulations (CFR) 1105.7
- Noise Control Act of 1972 (42 United States Code [U.S.C.] 4910)
- Federal Railroad Administration (FRA) Guidelines (Report Number 293630-1, December 1998)
- Occupational Safety and Health Administration Occupational Noise Exposure Hearing Conservation Amendment (29 CFR 1910.95)
- U.S. Environmental Protection Agency (USEPA) Railroad Noise Emission Standards (40 CFR 201)
- FRA Railroad Noise Emission Compliance Regulations (49 CFR 210)
- FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR Parts 222 and 229)
- Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)

STB's environmental review regulations for noise analysis (49 CFR 1105.7e(6)) have the following thresholds:

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

If the estimated noise level increase at a location would exceed either of these thresholds, SEA identifies and estimates the number of affected noise-

Day-night average noise level (DNL or L_{dn}): The energy average of A-weighted decibels (dBA) sound level over a 24-hour period; includes a 10 decibel 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.

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

sensitive receptors (such as residences, schools, libraries, retirement communities, and nursing homes) and quantifies the noise increase. The two STB thresholds (greater than 3 dBA increase and greater than 65 DNL) are implemented separately to determine an upper bound of the area of potential noise impact. However, noise research indicates that both thresholds must be met or exceeded to cause an adverse noise impact (STB, 1998a; Coate, 1999). That is, noise levels would have to be greater than or equal to 65 DNL and increase by 3 dBA or more to result in an adverse noise impact.

No State of Alaska or local regulations exist that govern railroad noise and vibration.

9.2 Study Area

The proposed Port MacKenzie Rail Extension could be in relatively developed or undeveloped portions of the Matanuska-Susitna Borough (MSB or the Borough), depending on the alternative, in the area between the Susitna River to the west, the Knik Arm to the south and east, and the Talkeetna Mountains to the north. SEA focused the study of potential noise impacts to humans on those areas where noise-sensitive receptors would be located in the vicinity of a rail line alternative.

9.3 Analysis Methodology

This section describes the methods SEA used to determine if the rail line alternatives would result in a 3 dBA or greater increase in noise levels, railroad noise levels (due to wayside noise and locomotive warning horn) that would equal or exceed a 65 decibel DNL, or vibration impacts. Appendix K provides the equations and further describes the methods SEA used to perform the noise and vibration analysis.

Ambient noise: The sum of all noise (from human and naturally occurring sources) at a specific location over a specific time.

Wayside noise: Train noise adjacent to a rail line that comes from sources other than the locomotive horn, such as engine noise, exhaust noise, and noise from steel train wheels rolling on steel rails

Equivalent sound level (L_{eq}): The energy-averaged sound pressure level averaged over a specified unit of time, frequently 1 hour.

SEA used an environmental noise computer program (Computer Aided Noise Abatement) and wayside and horn reference levels from previous studies to generate noise level contours. The overall noise model results are sensitive to horn noise, locomotive and railcar noise, train length, and train speed. SEA used information on train length and speed provided by the Alaska Railroad Corporation (ARRC or the Applicant). SEA based wayside noise estimates on information compiled for previous SEA analyses, including the Conrail Acquisition Environmental Impact Statement (STB, 1998a) and the Draft Environmental Assessment for the Canadian National/Illinois Central Railway Acquisition (STB, 1998b). SEA used data on horn noise compiled by the FRA (1999). SEA used these sources because of the size of the noise measurement databases, statistical reliability, and other factors.

To establish a baseline for determining if there would be a 3 dBA or greater increase in noise, SEA measured ambient noise in the study area.

SEA estimated noise exposure that would result from rail line operations in terms of DNL using future operations plans and information on distances and noise propagation paths to sensitive receptors. SEA estimated noise exposure that would result from construction in terms of equivalent sound level (L_{eq}).

SEA estimated the number of noise-sensitive receptors within the 65 DNL noise contours for the alternatives or where the DNL would increase by at least 3 dBA. SEA used digital aerial photographs and Geographic Information Systems software to identify and estimate the number of noise-sensitive receptors within the 65 DNL noise contour for future train volumes. The result of this analysis was an estimate of the total number of sensitive receptors likely to be exposed to 65 DNL or greater and the number of receptors where the DNL would increase by at least 3 dBA because of the alternatives. The accuracy of the estimated numbers of potentially affected receptors is limited by the resolution and age of the available aerial photographs, and the interpretation or identification of structures in these photographs.

For the reasons discussed in Chapter 1 of this Draft EIS, SEA's analysis of potential impacts includes the potential impacts on Section 4(f) properties, including a state game refuge and state recreation areas (see Appendix M of this Draft EIS). As a result, on behalf of FRA, SEA analyzed the potential noise impacts on Section 4(f) properties using FRA/FTA methods (FRA, 2005). Train noise potentially could disturb visitors within game refuges and recreation areas. Because noise impact analyses using fixed receptor locations may not be representative of potential area-wide impacts, SEA estimated the area within Section 4(f) properties where the potential noise impact would be considered "severe" based on FRA criteria[1] and compared the estimated affected area within each Section 4(f) property to the total area of each property (i.e., the percent of the total area of each Section 4(f) property that could be affected). For this analysis, SEA used FRA source noise levels (SEL), which are slightly different than the historical source terms typically used in SEA analyses that are described in the paragraphs above. SEA also used FRA's method of estimating ambient noise level based on population density using U.S. Census population data in GIS format, because of its suitability in determining ambient noise levels over large geographic areas, such as those covered by the Section 4(f) properties. In general, the calculated ambient noise levels are lower (and therefore more conservative) than the actual on-site measured ambient noise levels.

SEA based the analysis of potential vibration impacts on published train and construction equipment vibration data and FTA methods.

9.4 Affected Environment

Existing noise conditions vary considerably within the study area. In general, existing ambient sound levels are higher in populated areas than in unpopulated areas. In areas with low ambient sound levels (such as remote areas), rail noise could be more noticeable than in areas with higher ambient sound levels.

[1] Based on FRA criteria, noise levels that would cause a "severe" impact depend on the ambient noise level and the type of land use. For this analysis, the Section 4(f) properties were considered to be in land use Category 3 (for primarily daytime and evening use) except for camping areas, which were considered to be a Category 1 (where quiet is an essential element in their intended purpose). For Category 3, a "severe' impact would occur where the noise level would increase by 20 dBA. For Category 1, a "severe" impact would occur where the noise level would increase by 15 dBA. (FRA, 2005)

In the southern part of the study area toward Port MacKenzie, ambient noise levels are influenced by the local population and related human activities and by air traffic to and from Ted Stevens Anchorage International Airport. Ambient noise levels are higher due to these sources; therefore, rail noise would be less noticeable than in quieter areas. Along the northern edge of the study area, noise levels are influenced by the Parks Highway, the existing rail line, and the activities of area residents and visitors.

To characterize the existing noise environment, SEA measured ambient sound levels in the vicinity of potential receptors throughout the study area for 24 hours at 15 locations from July 22 through July 30, 2008. Table 9-1 lists those sound measurements.

Table 9-1
Measured Ambient Sound Levels in the Proposed Port MacKenzie Rail Extension Study Area

Segment	Location Identification	Latitude/Longitude	DNL (dBA)[a]
Big Lake	BL1	N61° 35’ 02.5” W149° 44’ 45.8”	54
Big Lake	BL2	N61° 33’ 52.0” W149° 45’ 03.3”	52
Big Lake	BL3	N61° 31’ 52.1” W149 45’ 01.8”	54
Big Lake	BL5	N61° 26’ 48.0” W149° 53’ 05.7”	51
Big Lake	BL6	N61° 25’ 45.8” W149° 58’ 35.0”	53
Willow	W1	N61° 47’ 15.7” W150° 05’ 11.8”	45
Willow	W2	N61° 43’ 29.1” W150° 09’ 44.3”	49
Houston	H1	N61° 30’ 49.6” W150° 04’ 05.7”	45
Houston	HS1	N61° 37’ 03.2” W149° 50’ 29.3”	47
Houston	HS2	N61° 34’ 55.3” W149° 55’ 42.3”	47
Mac East	ME1	N61° 22’ 32.2” W150° 02’ 45.2”	55
Mac West	MW1	N61° 22’ 39.7” W150° 07’ 28.0”	57
Mac West	MW2	N61° 20’ 24.3” W150° 04’ 28.0”	57
Connector 2	C2-1	N61° 25’ 03.1” W150° 04’ 26.6”	50
Connector 3	C3-1	N61° 26’ 03.3” W150° 02’ 43.5”	54

[a] DNL = day-night average sound level; dBA = A-weighted decibels.

Ambient sound levels measured in the vicinity of the Big Lake Segment fall within the USEPA “small town residential” category (see Figure 9-1). Ambient sound levels measured in the vicinity of the Willow and Houston segments are lower than those for small town residential because of very low population density. Population density is also low near Connector Segments 2 and 3, but ambient sound levels are somewhat higher in the vicinity of these segments because of aircraft noise in the area. Ambient sound levels in these areas fall within the small town residential category. SEA did not take sound measurements in the vicinity of the Houston North Segment and Connector Segment 1 because no nearby receptors were identified.

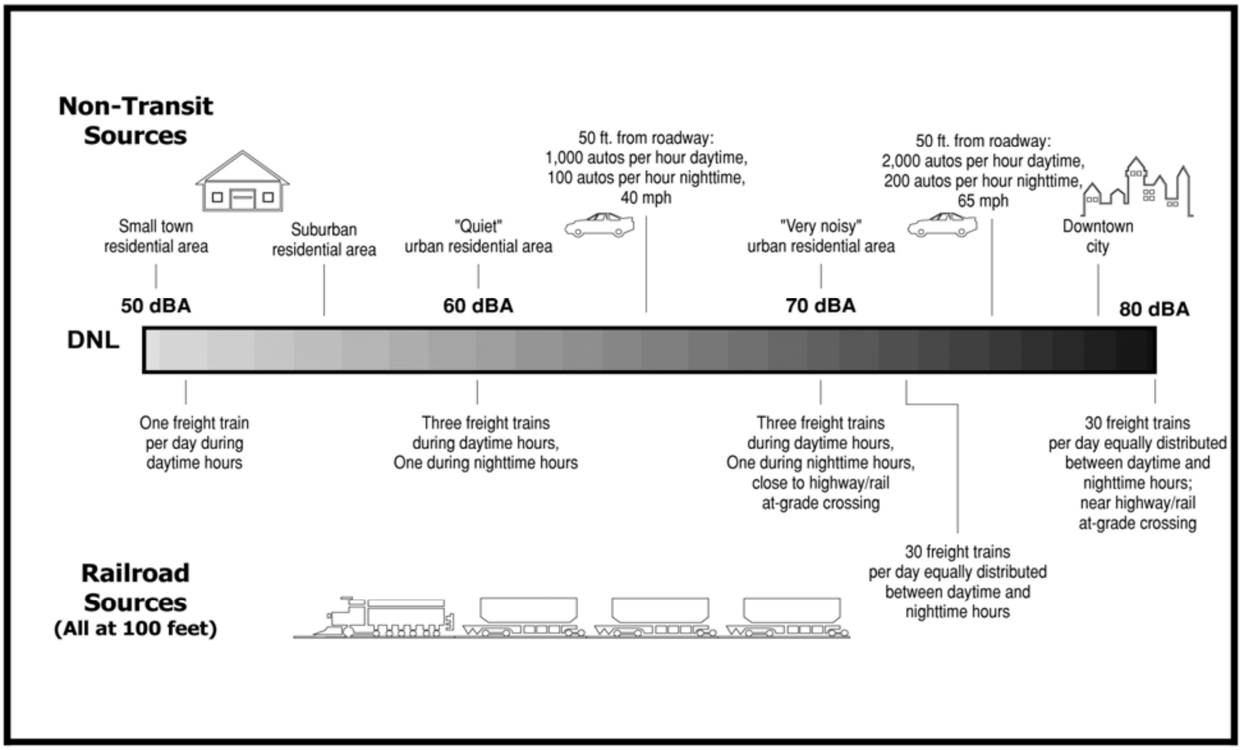


Figure 9-1. Typical Day-Night Average Noise Levels (USEPA, 1974)

9.5 Environmental Consequences

9.5.1 Proposed Action

9.5.1.1 Construction Noise and Vibration

SEA used the FTA general assessment method (FTA, 2006) to evaluate potential impacts from construction noise and vibration. This method is used when the details of the construction schedule are not known. Using this method, the two noisiest pieces of general construction equipment are identified and it is assumed that both pieces of equipment would be operating simultaneously. Table 9-2 shows the assumed two noisiest pieces of general construction equipment (heavy truck and bulldozer), corresponding noise levels, and combined noise level. Table 9-2 also shows the noise level for an impact pile driver – the noisiest piece of specialized construction equipment – which is analyzed separately below. The combined noise level for general construction equipment is then estimated at the receptor nearest each segment, and compared with the assessment criteria in Table 9-3, which are the noise levels above which there could be adverse community reaction (FTA, 2006).

In addition, representative vibration-producing general construction equipment are identified, and based on FTA data corresponding vibration levels at the nearest receptor are estimated. SEA selected a bulldozer for the analysis of vibration from general construction equipment because this equipment is commonly used for rail construction projects and it produces relatively high vibration levels.

Table 9-2
Construction Equipment Noise Levels (dBA)[a]

Equipment	Noise Level at 50 Feet[b]
1 Heavy truck	88
2 Bulldozer	85
3 1 and 2 combined	90
4 Pile driver (impact style)	101

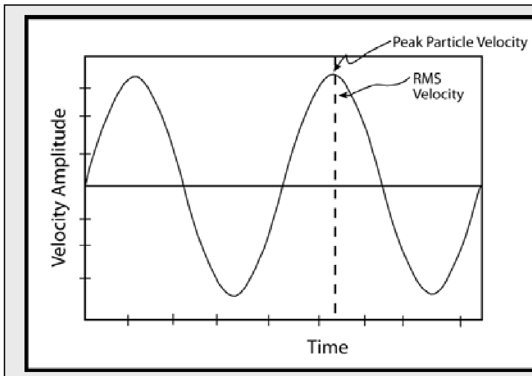
[a] dBA = A-weighted decibels.
[b] Source: FTA 2006

Table 9-3
Federal Transit Administration Construction Noise Criteria[a]

Land Use	Daytime 1-Hour L_{eq}[b] (dBA)[c]	Nighttime 1-Hour L_{eq} (dBA)
Residential	90	80
Commercial	100	100
Industrial	100	100

[a] Source: FTA, 2006
[b] L_{eq} = equivalent sound level
[c] dBA = A-weighted decibels.

There are two types of potential impacts from rail-related ground vibration – annoyance to humans and damage to buildings. Each of these two types of potential impacts is evaluated using a different measure – peak particle velocity (PPV) for building damage and root-mean square (RMS in the adjoining figure) velocity for human annoyance. PPV is the maximum instantaneous positive or negative peak of the vibration signal, measured as a distance per unit of time (such as millimeters or inches per second). This measurement has been used historically to evaluate shock-wave type vibrations from actions like blasting, pile-driving, and mining activities, and their relationship to building damage. Root-mean-square velocity is an average, or smoothed vibration amplitude, commonly measured over one-second intervals. It is expressed on a log scale in velocity decibels (VdB) referenced to 0.000001×10^{-6} inch per second and is not to be confused with noise decibels. It is more suitable for addressing human annoyance and characterizing background vibration conditions because it correlates better with human response to ground vibration.



Peak Particle Velocity (PPV)

Table 9-4 presents estimated general construction (combined) noise levels and bulldozer vibration levels by rail line segment. As shown, the estimated construction noise level would be below the FTA criteria in Table 9-3 and, thus, below the level at which there would be an adverse impact. Similarly, estimated vibration levels from general construction activity would

Table 9-4
Estimated Construction Noise and Vibration Levels

Segment	Distance to Nearest Receptor (feet)	Bulldozer Vibration (PPV[a] [inches per second])	Construction Noise Level (dBA)[b]
Big Lake	177	0.004724	79
Houston North[c]	–	–	–
Houston South	213	0.003579	77
Houston	2,129	0.000113	57
Willow	398	0.001401	72
Connector 3	200	0.003933	78
Mac East	770	0.000521	66
Mac West	209	0.003682	77
Connector 2	3,400	0.000056	53
Connector 1	2,700	0.000079	55

[a] PPV = peak particle velocity.
[b] dBA = A-weighted decibels.
[c] There are no receptors near this segment.

be below the FTA fragile building damage criterion of 0.20 inch per second (FTA, 2006), so no building damage due to vibration from construction of the proposed rail line extension would be anticipated. Vibration due to general construction might be perceptible in some locations, but the frequency of vibration events would be low (and temporary) and below building damage and human annoyance levels.

There could be pile driving during construction of bridges over water bodies or at rail/roadway crossings. SEA estimated pile-driving noise and vibration levels at the nearest receptors for ARRC-proposed bridge locations. Table 9-5 shows the estimated noise and vibration levels at three bridge locations planned for grade separations at rail/roadway crossings and two bridge locations for stream crossings. These noise and vibration levels assume impact pile driving; use

Table 9-5
Estimated Pile-Driving Noise and Vibration Levels at ARRC-Proposed Bridge Locations along the Port MacKenzie Rail Extension

Segment	Road or Stream Crossing	Distance to Nearest Receptor (feet)	Pile Driving PPV[a] (inches per second)	Pile Driving Noise Level (dBA)[b]
Big Lake	Parks Highway	500	0.0170	81
Big Lake	Big Lake Road	596	0.0130	79
Big Lake	Hollywood Road	480	0.0180	81
Mac East	Holstein Avenue	2,340	0.0017	68
Houston South	The Little Susitna River	960	0.0064	75
Willow	Rodgers Creek	3,000	0.0012	65

[a] PPV = peak particle velocity.
[b] dBA = A-weighted decibels.

of other techniques, such as vibratory or sonic pile driving, could result in lower noise and vibration levels. No receptors were identified near the other ARRC-proposed bridges, so no noise impacts would be expected at these other locations.

ARRC has proposed drainage structures for crossing some water bodies; the specific type of structure would be determined during final design and permitting if the proposed rail line is authorized by the Board. ARRC has indicated that such structures could include bridges (ARRC, 2008a). Because bridge construction could involve pile driving, SEA also analyzed potential noise and vibration impacts at these locations. Table 9-6 lists the calculated noise and vibration levels. No receptors were identified near the other ARRC-proposed locations for drainage structures, so no noise impacts would be expected at these other locations.

Table 9-6
Estimated Pile-Driving Noise and Vibration Levels at Potential Bridge Locations along the Port MacKenzie Rail Extension

Segment	Crossing Identification	Distance to Nearest Receptor (feet)	Pile Driving PPV[a] (inches per second)	Pile Driving Noise Level (dBA)[b]
Willow	W-112	2,929	0.0012	66
Big Lake	BL-005	744	0.0094	78
Big Lake	BL-007R	632	0.0119	79
Big Lake	BL-008R	530	0.0156	80
Big Lake	BL-010	830	0.0079	77
Connector 1	C1-027	2,800	0.0013	66

[a] PPV = peak particle velocity.
[b] dBA = A-weighted decibels.

ARRC has indicated that there could be construction activity at night. Estimated noise levels during pile driving could equal or exceed the FTA criteria for nighttime construction shown in Table 9-3 at three locations – bridges at crossings of the Parks Highway and Hollywood Road (see Table 9-5) and a potential bridge location on the Big Lake Segment (see Table 9-6). If pile driving would occur at these locations, the activity would be temporary and noise levels would exceed FTA criteria only if conducted during nighttime hours.

Estimated construction vibration levels (based on pile driving and bulldozing activities) would be below the FTA 0.20 inch per second fragile building damage criterion. Therefore, no building damage due to vibration from construction of the proposed rail line extension would be expected. Construction vibration might be perceptible in some locations, but the frequency of vibration events would be low (and temporary) and below annoyance standards.

9.5.1.2 Noise from Operations

Rail operations noise is composed of diesel locomotive engine and wheel/rail noise (collectively referred to as wayside noise) as well as locomotive warning horn sounding at at-grade rail-highway crossings. Wayside noise is primarily a function of train speed, train length, and number of locomotives. For all rail line alternatives, SEA estimated rail-related noise levels based on a train with three locomotives pulling 80 cars at an average train speed of 40 miles per hour. The Applicant's December 5, 2008, petition for exemption (ARRC, 2008b) indicates that anticipated train traffic would include trains ranging from 40 to 80 cars. To be conservative, SEA assumed 80 cars per train for this analysis. SEA assumed that each locomotive would be 74 feet long, rail cars would be on average 60 feet long, and overall train length would be approximately 5,000 feet. Given these assumptions and the Applicant's projection of two train trips per day (which could occur randomly at any time during a 24-hour period), the distance from the rail line to the 65 DNL wayside noise contour would be 80 feet, and the distance to the 65 DNL horn noise contour would be 215 feet. Beyond these contours, train-related noise would be less than 65 DNL.

Figures 9-2 through 9-8 show 65 DNL and 3 dBA increase contours for alternative rail segments that have sensitive receptors in the vicinity of the proposed rail line. Figures do not include noise contours for the Houston North Segment and Connector Segments 1 and 2 because no sensitive receptors were identified in the immediate vicinity of these proposed segments. Similarly, noise contours are not shown for rail yard activities at the terminal reserves at the southern end of the Mac East and Mac West segments because no sensitive receptors were identified in the immediate vicinity and so no noise impacts would be anticipated. SEA calculated the DNL and the 3 dBA increase contours using the ambient sound measurements listed in Table 9-1 to characterize the existing (baseline) noise conditions. The area within the 3 dBA increase contour can be quite large if the ambient sound level is sufficiently low. An example of this can be seen along the Houston South Segment, where measured sound levels were relatively low.

SEA used Geographic Information Systems software to count receptors identified (based on aerial photographs) within the calculated noise contours. Table 9-7 presents the resulting receptor count information.

As defined by STB's regulation, an adverse noise impact resulting from railroad operation would occur if project noise levels meet or exceed 65 DNL and increase by at least 3 dBA DNL. Table 9-7 shows that no receptors near any of the build alternatives would experience an adverse noise impact due to operation of the proposed rail extension (i.e., meet or exceed 65 DNL and increase by at least 3 dBA DNL). Because of the relatively low ambient noise level and proximity to receptors, the 3 dBA increase contour associated with the Big Lake Segment would include 16 receptors, Willow would include 5 receptors, Houston South would include 8 receptors, and Mac West would include 2 receptors. Because of relatively low ambient noise levels in these areas, train noise would be more noticeable than in other areas with higher ambient noise levels. Even though these segments contain receptors that would experience an increase of 3 dBA, and because noise levels would be below 65 DNL for all identified potential receptors, there would be no adverse noise impacts associated with any of the build alternatives.

Because the Big Lake Segment would involve a change in the location of a grade crossing on the existing ARRC main line, SEA also analyzed the potential noise impact to sensitive receptors in the vicinity of the existing grade crossing that would be eliminated (at Cheri Lake Drive) and the proposed new crossing that would be constructed (at Ray Street). SEA found that the proposed change in the grade crossing location would cause a minor change in noise impacts. Specifically, SEA estimates that the grade crossing relocation would reduce train noise to levels below 65 DNL for four receptors that currently experience levels at or above 65 DNL, while

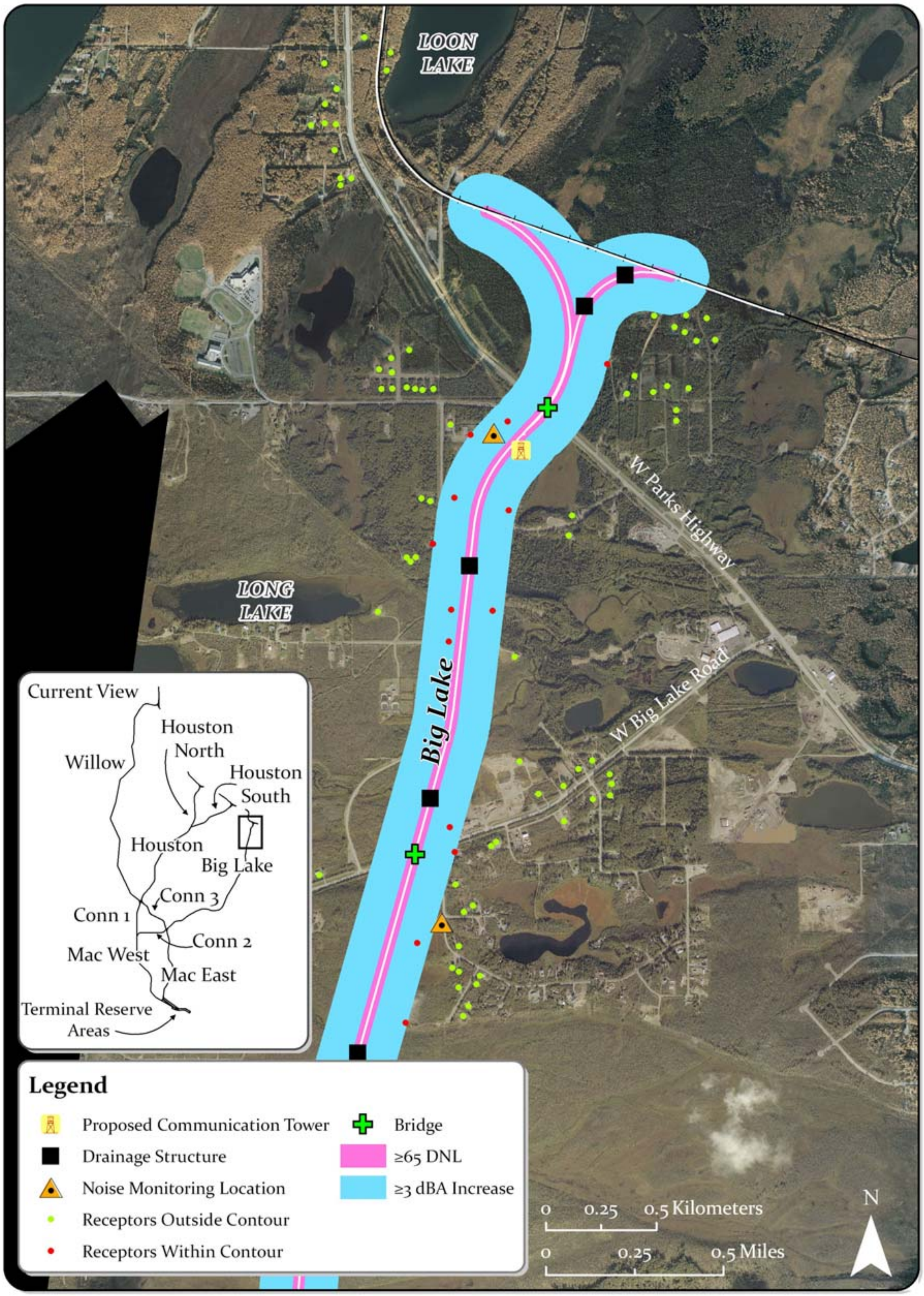


Figure 9-2. Big Lake Segment at Parks Highway – 3 dBA Increase and 65 DNL Contours

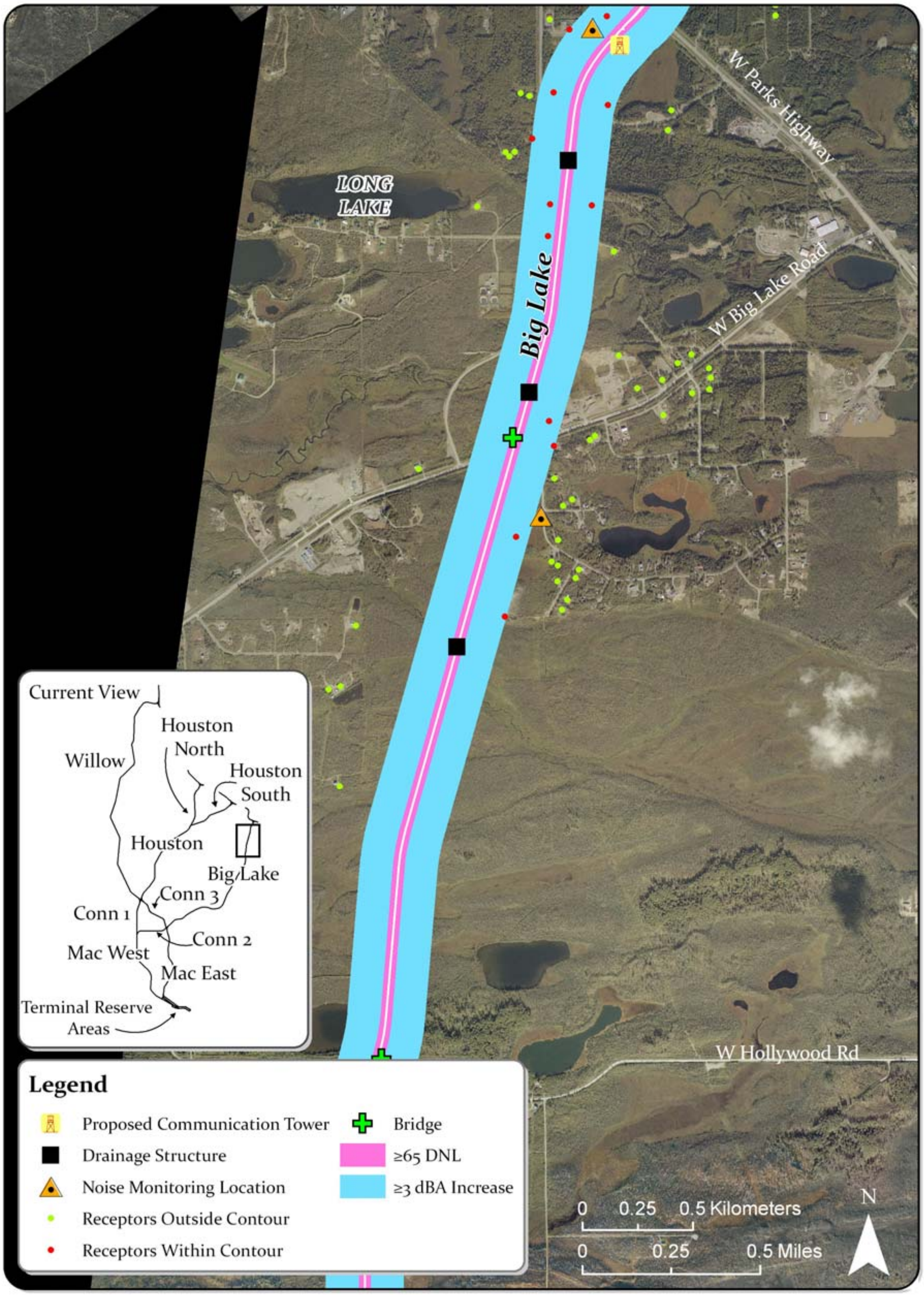


Figure 9-3. Big Lake Segment at West Hollywood Road – 3 dBA Increase and 65 DNL Contours

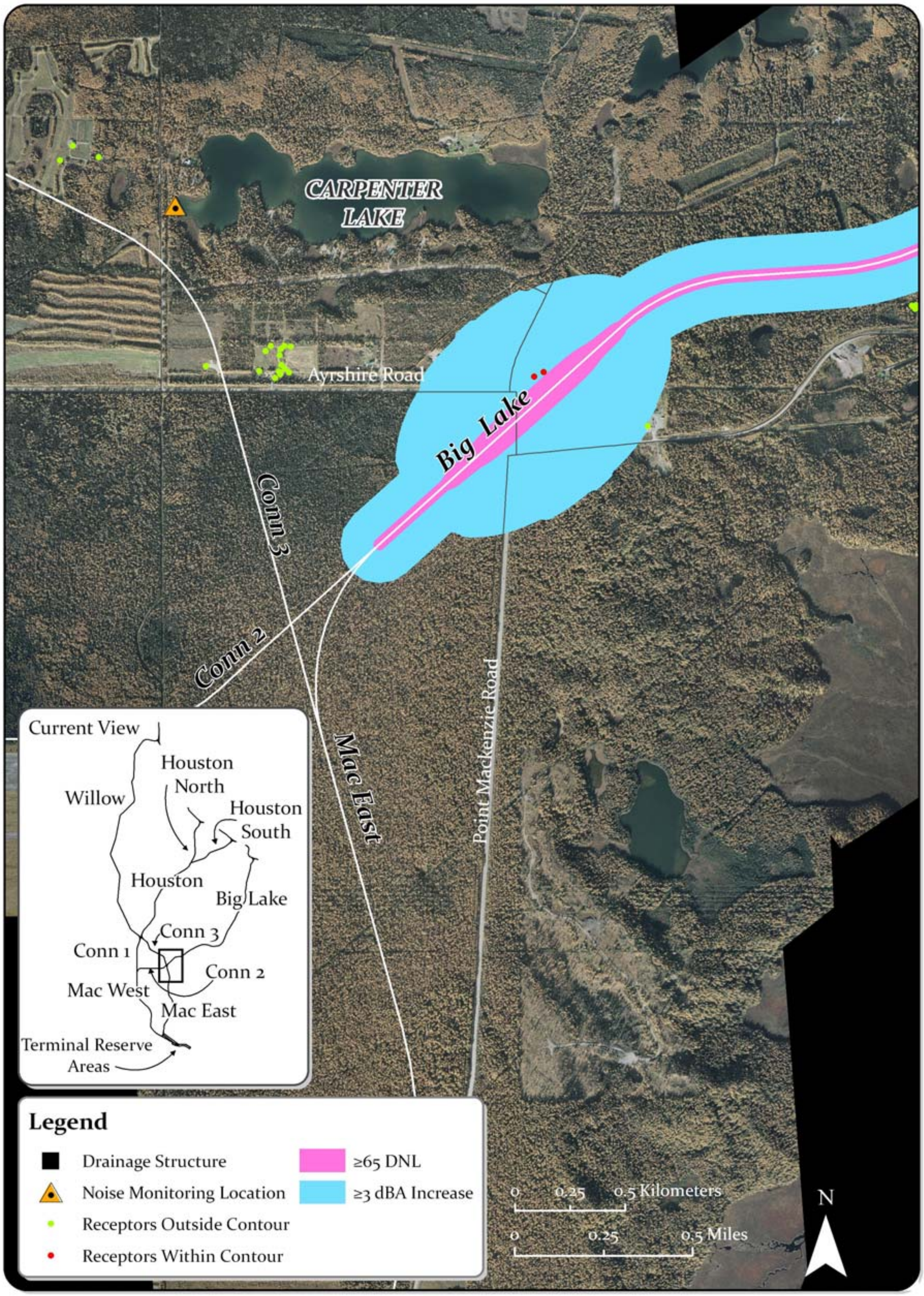


Figure 9-4. Big Lake Segment at Point MacKenzie Road – 3 dBA Increase and 65 DNL Contours

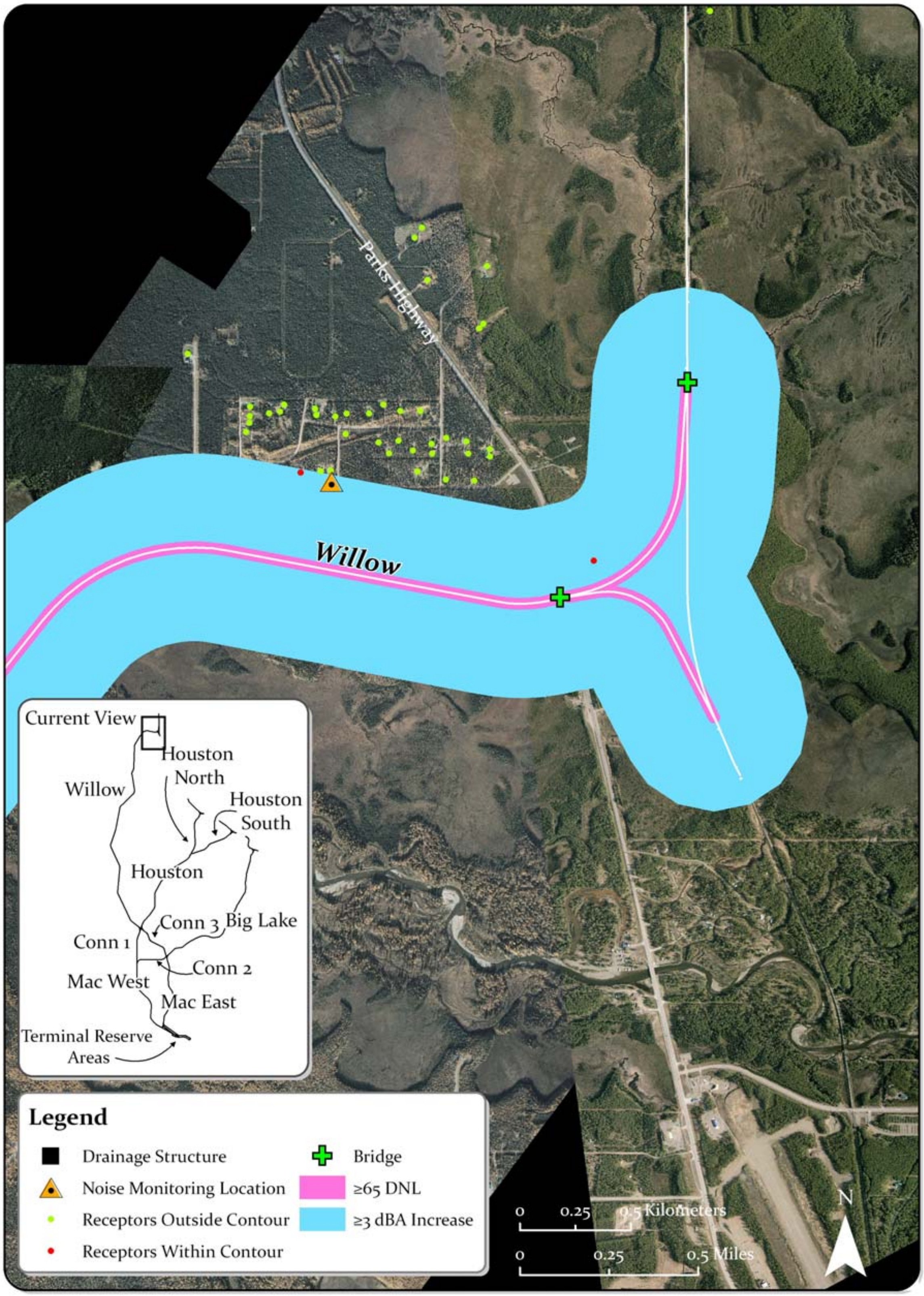


Figure 9-5. Willow Segment at Parks Highway – 3 dBA Increase and 65 DNL Contours

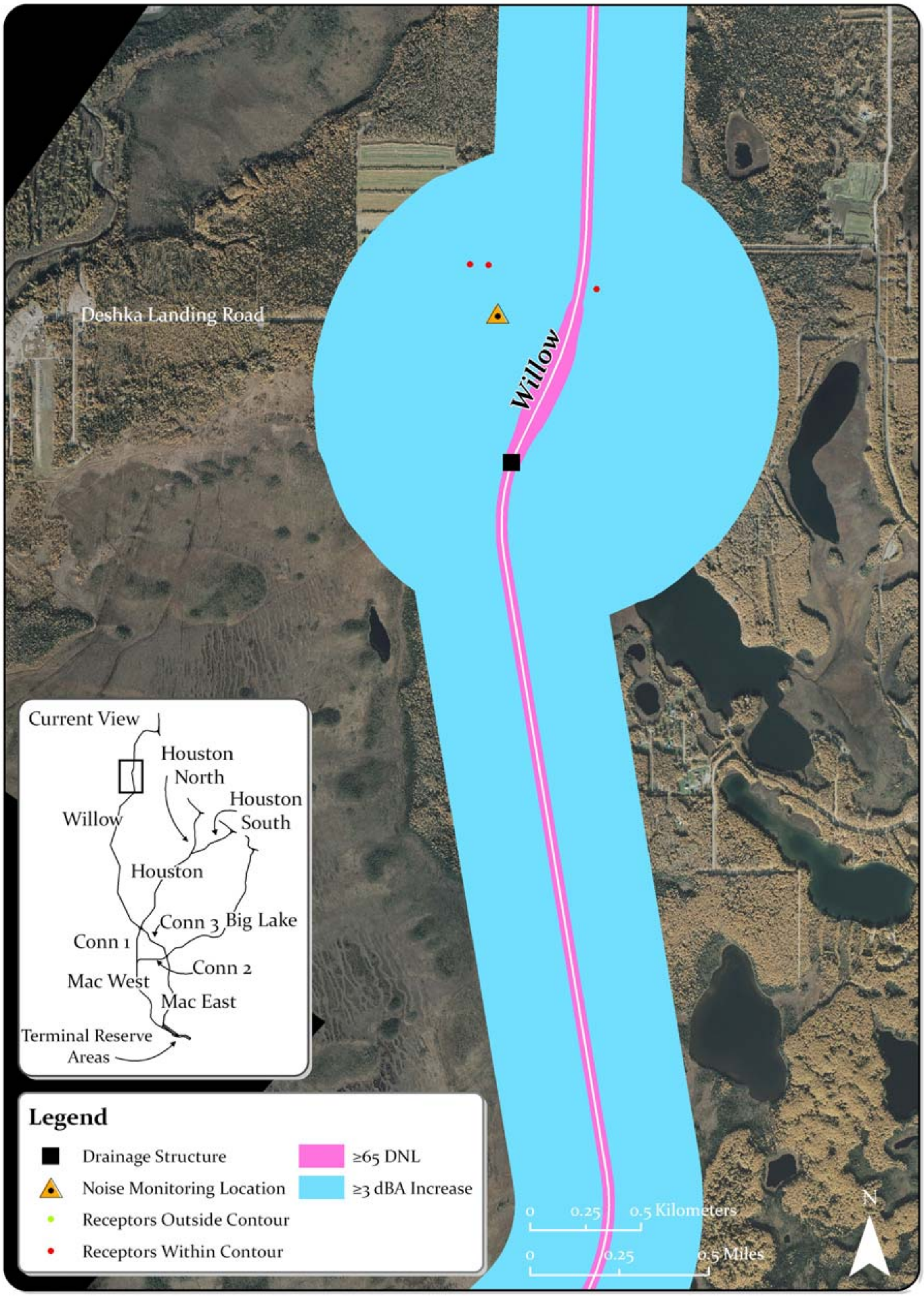


Figure 9-6. Willow Segment at Deshka Landing Road – 3 dBA Increase and 65 DNL Contours

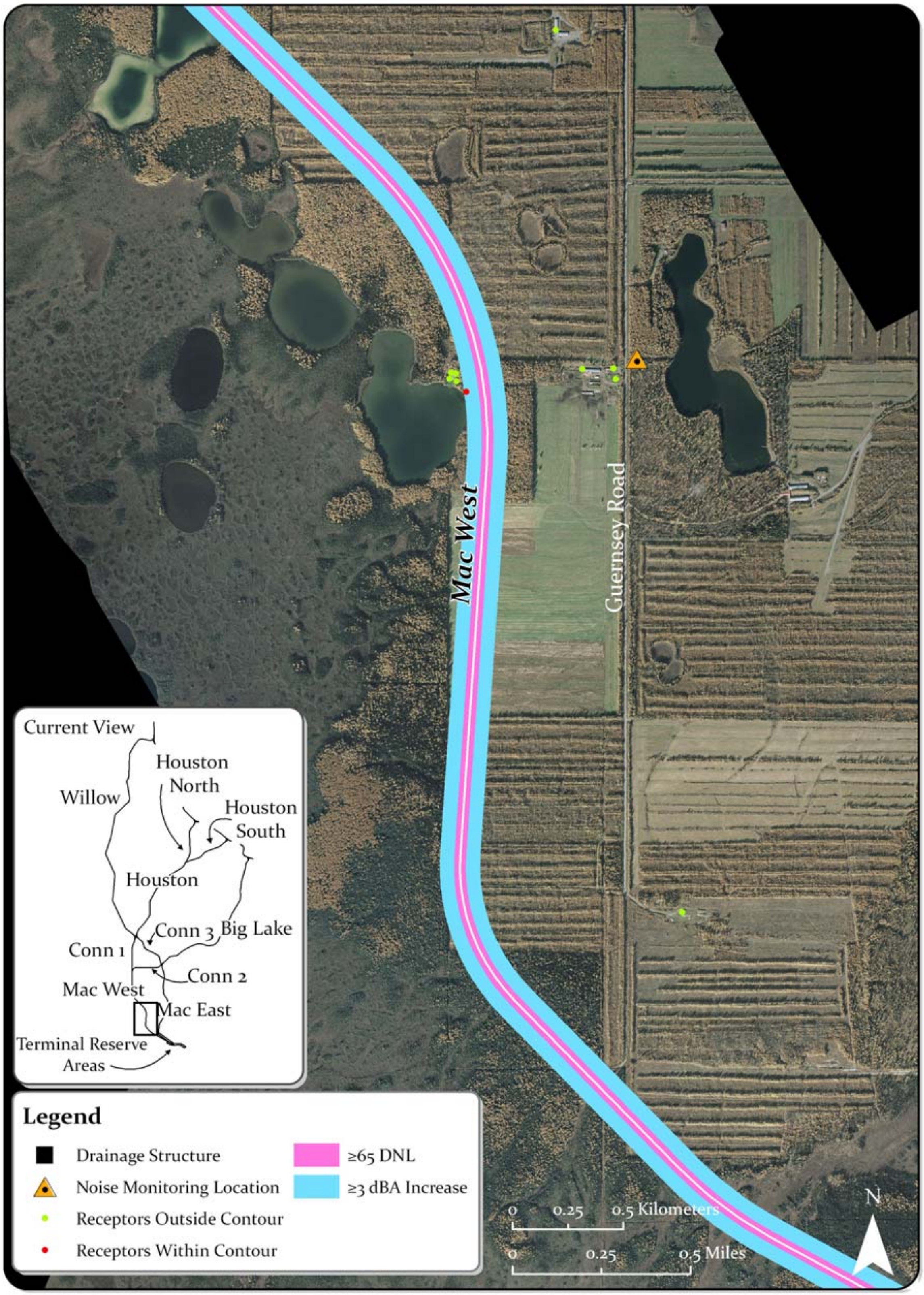


Figure 9-7. Mac West Segment west of Guernsey Road – 3 dBA Increase and 65 DNL Contours

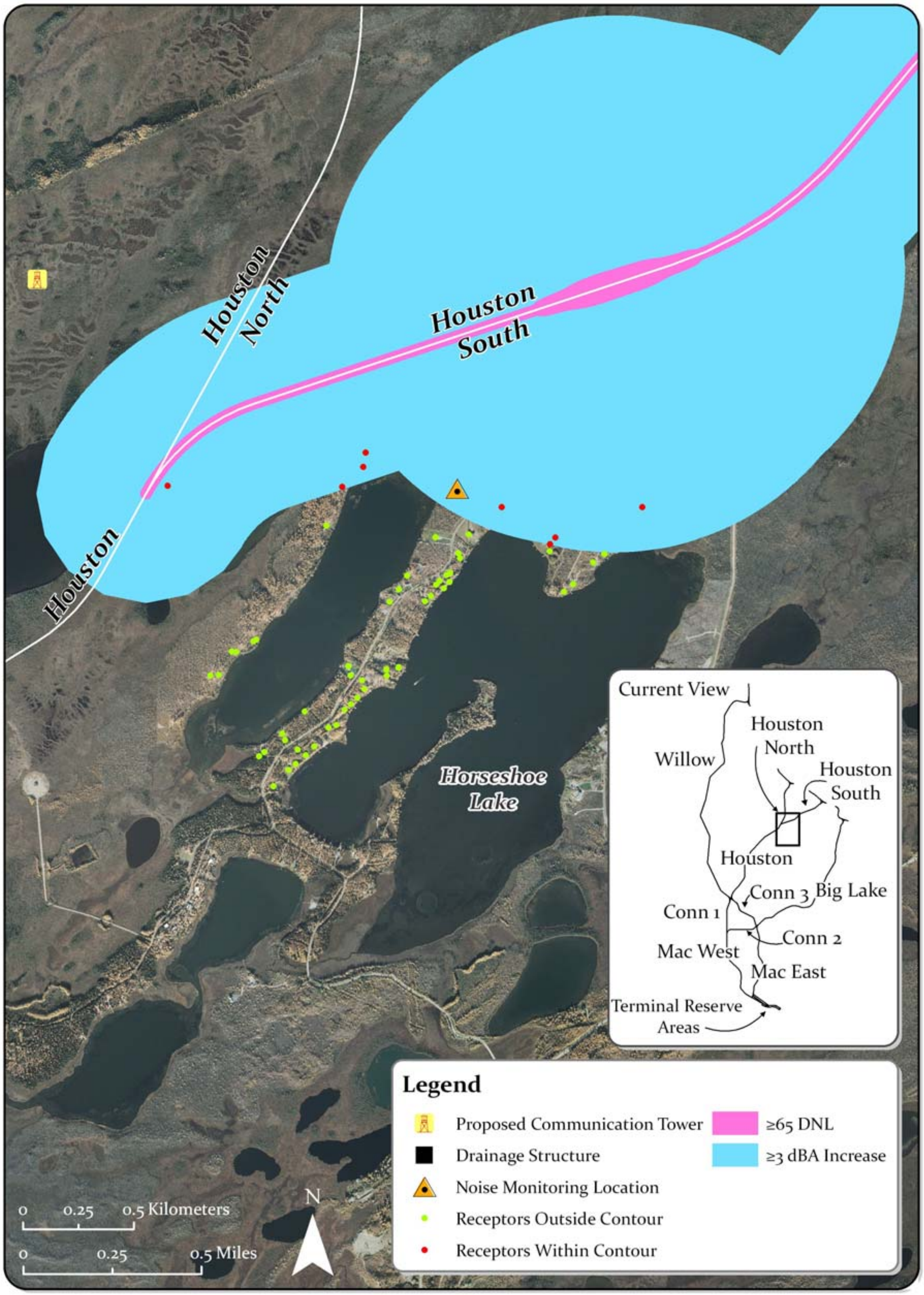


Figure 9-8. Houston South Segment near Horseshoe Lake – 3 dBA Increase and 65 DNL Contours

Table 9-7
Noise Receptor Counts for the Proposed Port MacKenzie Rail Extension – Rail Operations

Segment	65 DNL[a]	Plus 3 dBA[b]
Big Lake	0	16
Willow	0	5
Houston North	0	0
Houston South	0	8
Houston	0	0
Mac East	0	0
Mac West	0	2
Connector 1	0	0
Connector 2	0	0
Connector 3	0	0

[a] DNL = day-night average sound level.
[b] dBA = A-weighted decibels.

increasing the noise level to 65 DNL or greater for one receptor that currently experiences train noise levels below 65 DNL. The estimated increase in noise level for the one newly exposed receptor would be 6 dBA assuming (to be conservative) that the train traffic to and from Port MacKenzie would be additional traffic on the existing main line.

At this time, it is not known whether rail traffic to and from Port MacKenzie over the proposed rail line, if approved by the Board and constructed and operated by ARRC, would result in additional rail traffic on the existing ARRC main line or whether the Port MacKenzie traffic would have otherwise been shipped on the ARRC system to another destination such as Anchorage or Seward. If all of the Port MacKenzie rail traffic were to be new rail traffic, an increase of two trains per day would be an approximately 20 percent increase relative to the existing rail traffic on the main line. The increase in noise along the existing main line from this additional rail traffic would be less than 3 dBA, the STB DNL threshold, and would not cause adverse noise impacts. At least a doubling of rail traffic would be required for the DNL to increase by 3 dBA or more.

The results of SEA's analysis of the potential noise impacts on Section 4(f) properties are provided in Table 9-8. As shown, all project alternatives that include the Willow Segment would result in potential noise impacts to the Little Susitna State Recreation River, the Susitna Flats State Game Refuge, the Willow Creek State Recreation Area, and the Nancy Lake State Recreation Area. None of these refuges and recreation areas are anticipated to experience noise impacts as a result of either the Mac East-Connector 3-Houston-Houston South or Mac East-Big Lake alternative. The estimated acreage of potential noise impacts within the Willow Creek State Recreation Area is approximately 9 percent of the total acreage of the state recreation area, while the acreage of potential noise impacts within the Little Susitna Recreation River would range from 3 percent (for alternatives that include the Willow Segment) to 4 percent (for alternatives that include the Houston North Segment) of the recreation river. All other estimated

Table 9-8
Estimated Areas of Potential Noise Impact within Section 4(f) Properties (Acres)

Alternative	Willow Creek State Recreation Area	Nancy Lake State Recreation Area	Susitna Flats State Game Refuge	Little Susitna State Recreation River
Mac West – Connector 1 – Willow	334	219	1,762	450
Mac West – Connector 1 – Houston-Houston North	0	0	1,489	769
Mac West – Connector 1 – Houston–Houston South	0	0	1,489	0
Mac West – Connector 2 – Big Lake	0	0	992	0
Mac East – Connector 3 – Willow	334	219	273	450
Mac East – Connector 3 – Houston–Houston North	0	0	0	769
Mac East – Connector 3 – Houston–Houston South	0	0	0	0
Mac East – Big Lake	0	0	0	0

potential noise impacts would affect less than 1 percent of the total acreage of the Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, although the total acreage potentially affected would be greatest within the Susitna Flats State Game Refuge, ranging from 992 to 1762 acres, depending on the alternative.

9.5.1.3 Vibration from Operations

Based on the anticipated average train speed of 40 miles per hour on the proposed rail line and assuming a crest factor (the difference between average and peak vibration levels) of four, the building damage contour for the FTA fragile building damage criterion of 0.20 inch per second would be 10 feet wide (5 feet on each side of the track centerline). There would be no buildings within 5 feet of the rail line, so no there would be no damage to buildings due to vibration from rail line operations.

For an average speed of 40 miles per hour, the vibration annoyance contour along the proposed rail line, using the FTA infrequent event criterion of 80 VdB, would be 80 feet from the track centerline. There would not be any receptors within that distance, which would be within the proposed rail line’s 200-foot right-of-way. Therefore, there would be no vibration impacts from proposed rail line operations.

9.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no noise or vibration impacts.