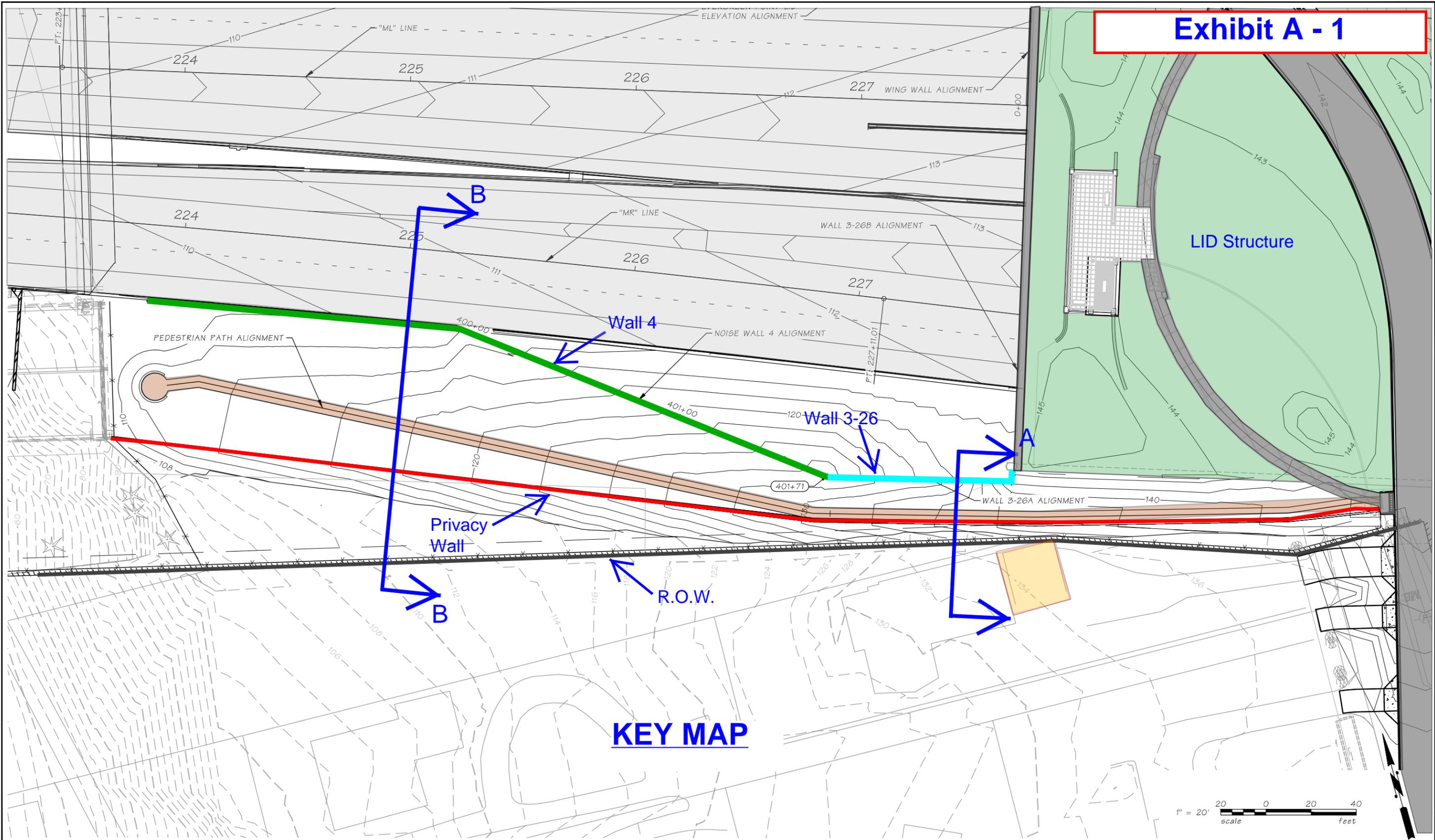


Exhibit A - 1



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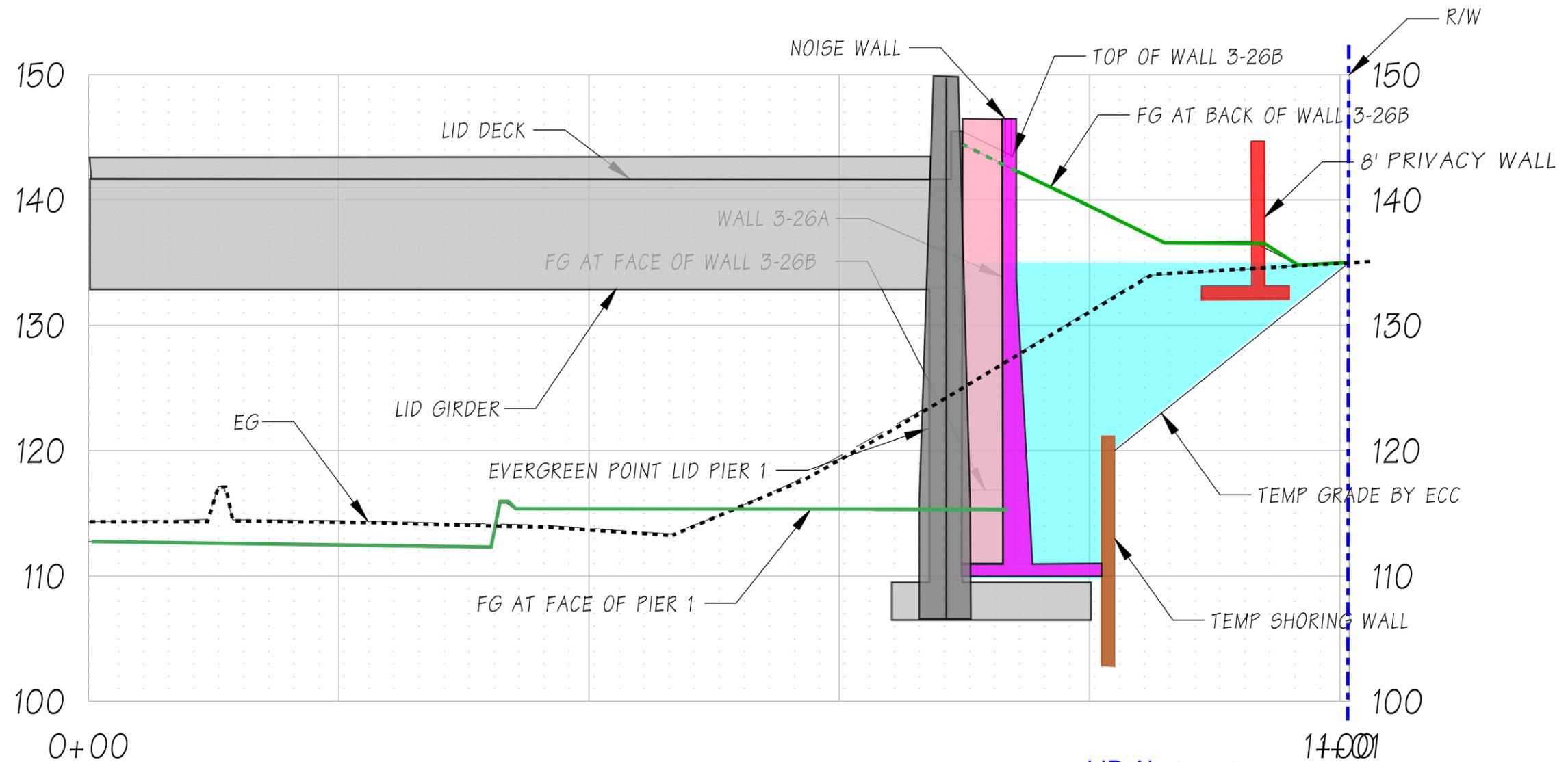
Washington State Department of Transportation

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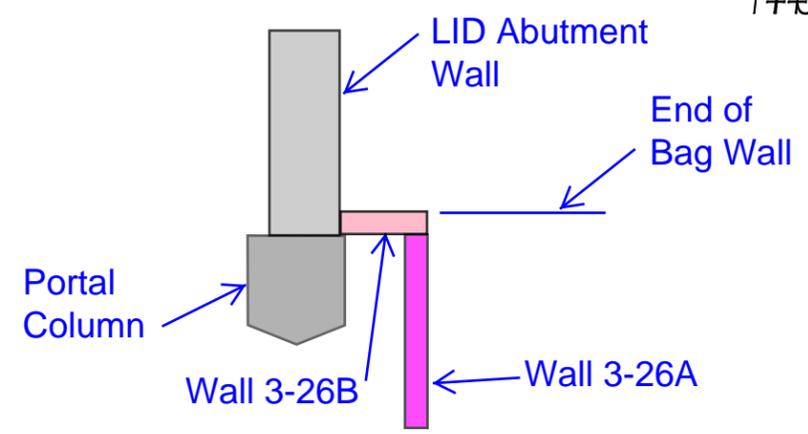
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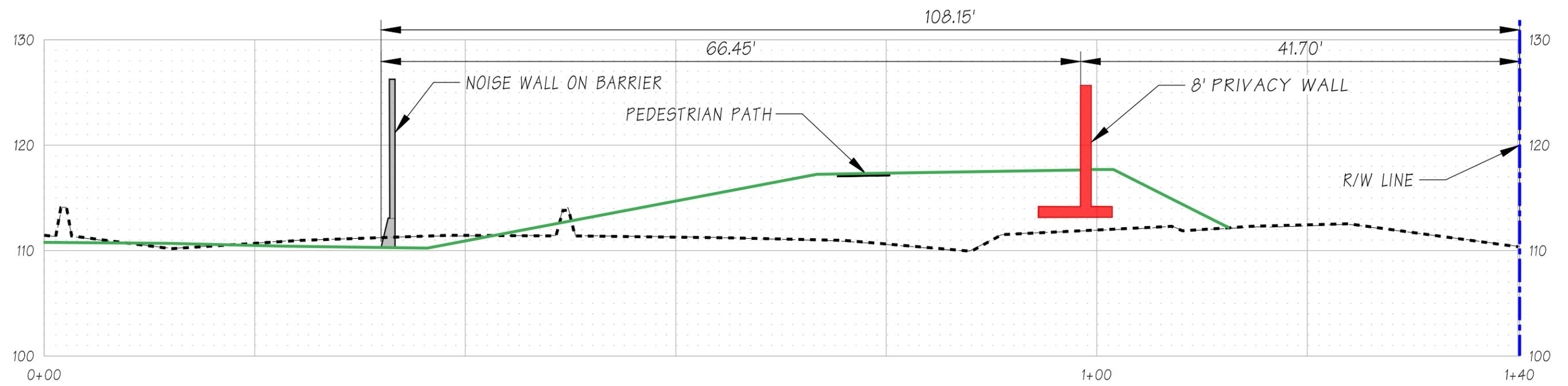
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SR 520		PLAN REF NO.
I-5 TO MEDINA - STG. 1 EVERGREEN PT.		
FLOATING BRIDGE AND LANDINGS		SHEET 1 OF
MAINTENANCE FACILITY CIVIL PLAN		SHEETS
LID WALL EXHIBITS		

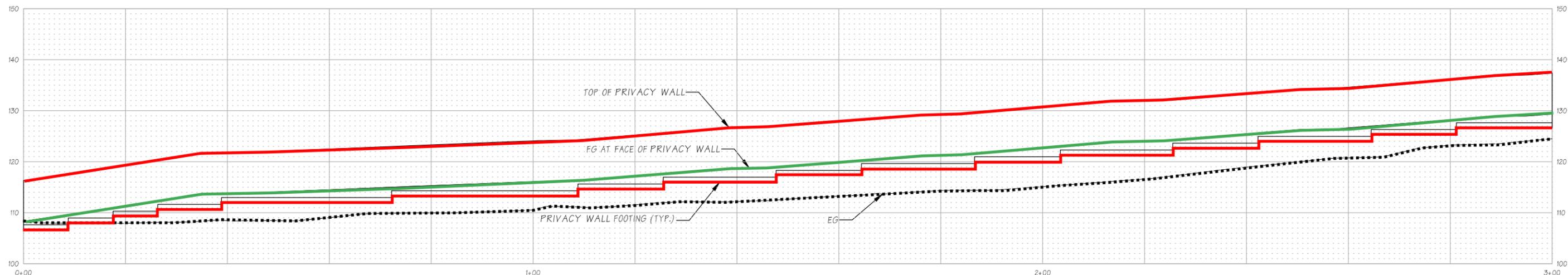


SECTION A-A





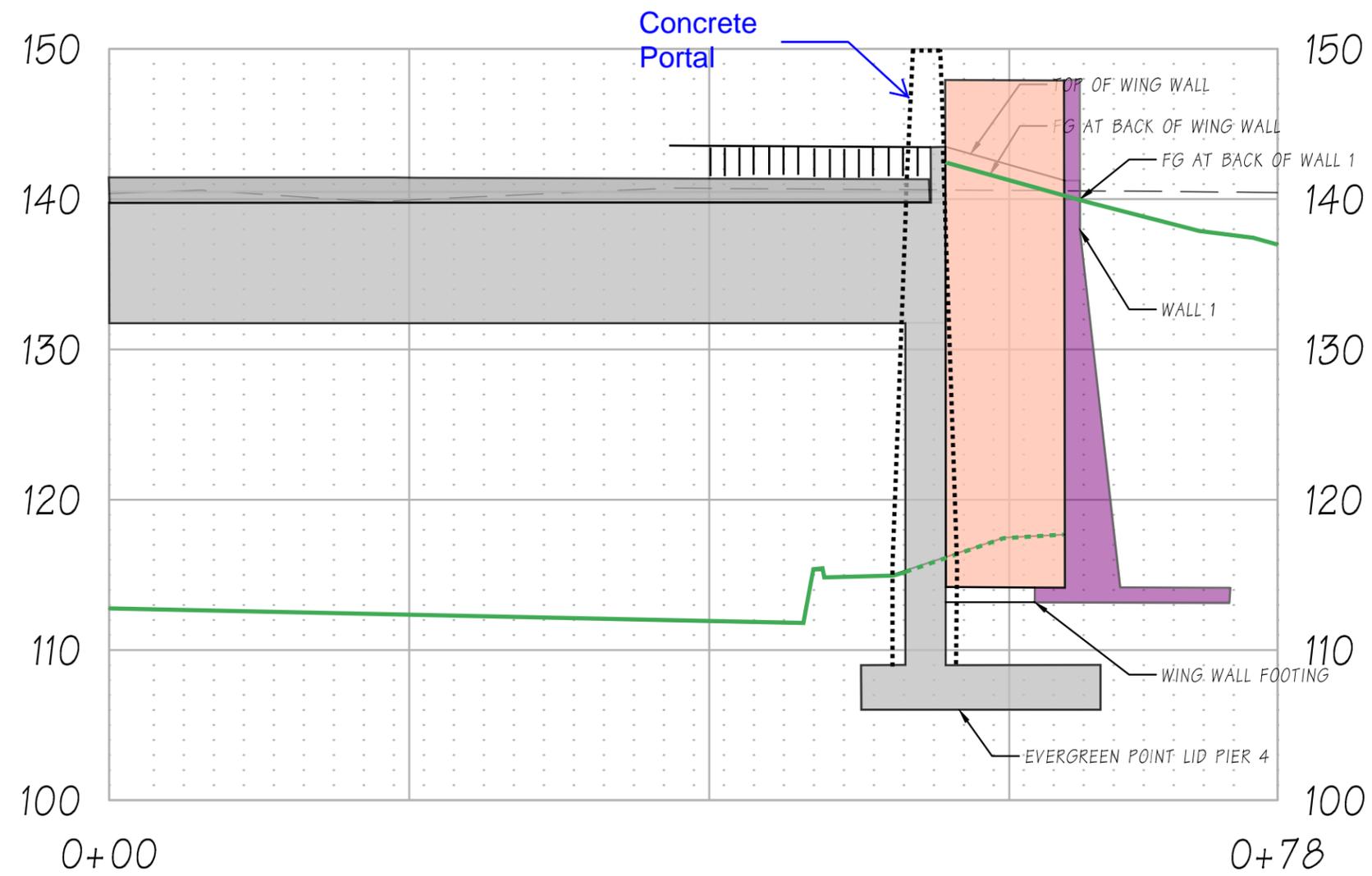
SECTION B-B



ELEVATION - PRIVACY WALL



ELEVATION - PRIVACY WALL CONT.



ELEVATION - NORTH WING WALL

Exhibit B - 1

5.7 Noise

The noise analysis for the project followed the guidance of state and federal transportation agencies in order to identify the project's potential noise effects and mitigation. The guidelines and standards for analyzing and mitigating highway noise are established by the FHWA and state departments of transportation. The results of the analysis are summarized below. This information draws from the information included in the Noise Discipline Report Addendum and Errata (Attachment 7).

The potential effects of the Preferred Alternative were evaluated using the same methods used to evaluate the potential effects of the No Build Alternative and Options A, K, and L. As discussed in Section 5.1, however, the No Build Alternative and the Preferred Alternative traffic analysis was updated for this Final EIS to include the most current assumptions about future population and employment levels, road improvements, and transit services that will be in place by 2030. Since noise analysis is based on traffic data, this updated transportation information (traffic volumes, mixture, speed projections, etc.) was then used to evaluate the noise effects of the Preferred Alternative and the updated No Build Alternative. Section 5.1 provides more information on the updated transportation analysis. In addition, the Medina area was re-evaluated for the Final EIS to account for the removal of several homes occurring prior to project construction, which reduced the total number of residences in the project corridor.

The design files used in the model included a full three-dimensional plan and profile of the proposed highway, ramps, retaining walls, and other design elements that could affect the transmission of noise. WSDOT also used updated topographical maps for the surrounding areas and reviewed and verified all noise modeling locations.

Under FHWA and WSDOT policy, all alternatives and design options are initially modeled without noise mitigation, and an analysis is then performed to determine whether consideration of noise abatement measures (typically noise walls) is warranted. If so, abatement measures are modeled to determine their feasibility and cost-effectiveness. Thus, initial results without mitigation are described for the Preferred Alternative and the SDEIS options, followed by a discussion of whether further mitigation is warranted. The traffic noise models for the Preferred Alternative and Options A, K, and L without noise mitigation do not include the noise-reducing effects of a traffic barrier.

How would the project affect noise levels without mitigation?

The noise analysis was performed for 230 receptors along the project corridor. The 230 receptors represent 617 single and multi-family

KEY POINTS

Noise

The Preferred Alternative and all options would have a lower number of residences where noise levels exceed the NAC than the No Build Alternative. This is because of the noise-reducing elements of the proposed design, which include lids, depressed roadway sections, and roadway realignments. Noise walls, if used, would further reduce the effects.

Noise Modeling

In the FEIS, noise levels were modeled at 230 locations (representing 838 residences) for the Preferred Alternative.

In the SDEIS, noise levels were modeled at 211 receiver locations (representing 862 residences) for the No Build and Existing Conditions, at 208 receiver locations (representing 858 residences) for Options A and K, and 207 receiver locations (representing 855 residences) for Option L. The locations were chosen based on aerial mapping and onsite visits.

Exhibit B - 2

residences and residential equivalents and 220.8 residential equivalents, which are used to represent noise sensitive non-residential areas, such as parks and schools. As shown in Table 5.7-1 the Preferred Alternative, would result in 206.6 residences exceeding the noise abatement criteria (NAC) without noise mitigation as compared to 287.2 under the updated No Build Alternative. The primary reasons for this reduction are the modifications in the horizontal and vertical alignment, construction of new retaining walls, and expanded Montlake lid design. Within the corridor along the Portage Bay Bridge between I-5 and the Montlake lid, the posted speeds would be reduced to 45 mph, which also aids in lowering the traffic noise levels within this area. Modifying speed limits is an approved abatement measure that can be considered under WSDOT policy. Typically a speed reduction of 10 mph can result in a reduction in traffic noise of up to 3 A-weighted decibels (dBA). The Montlake lid design for the Preferred Alternative would cover a larger portion of SR 520 and would also result in lower traffic noise level projections near the lid compared to lid designs developed for Options A, K, and L.

Table 5.7-1. Residences where Noise Levels Would Approach or Exceed the NAC in 2030 for the Preferred Alternative without Mitigation

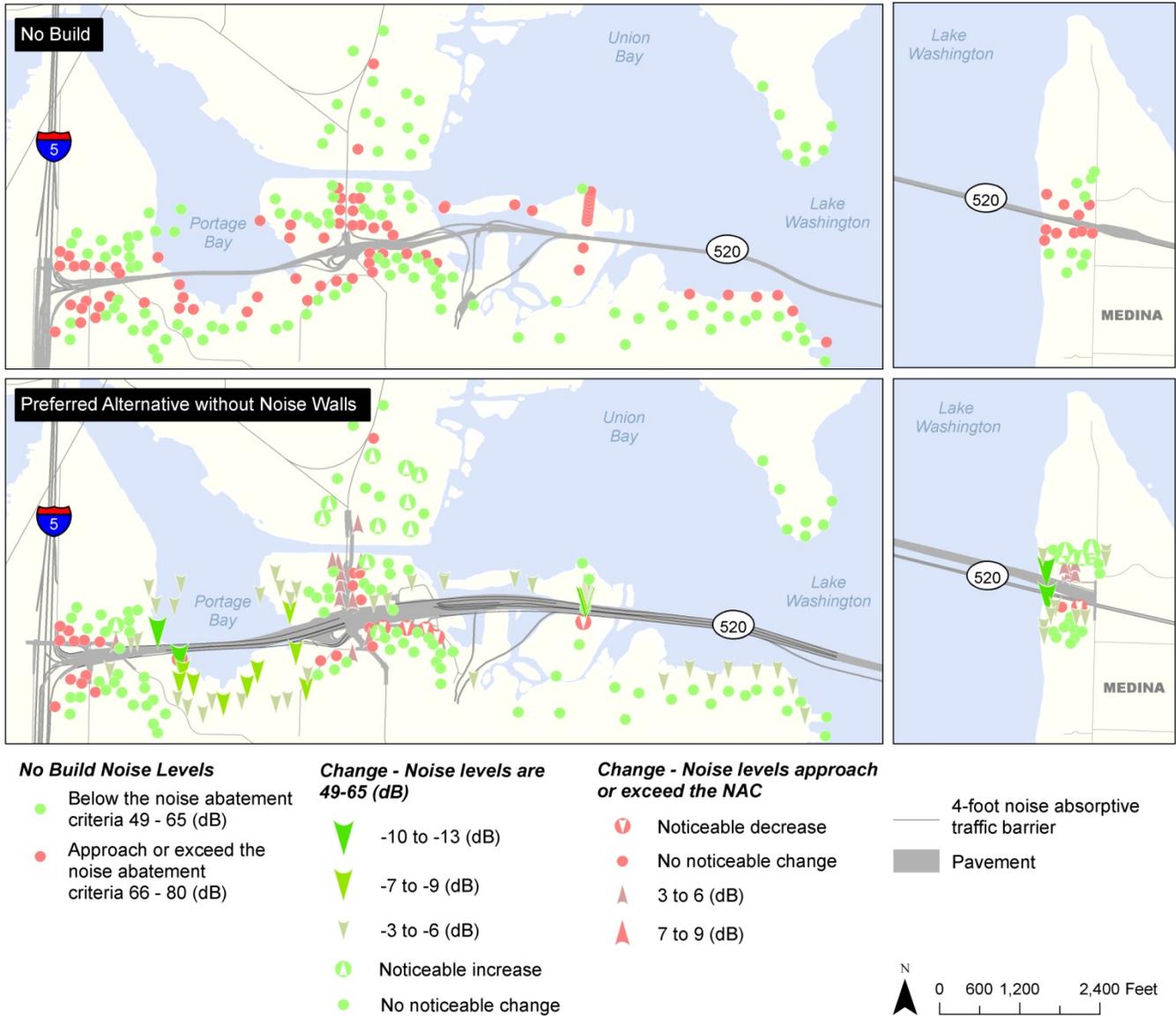
	Total Residences	2004 Existing	2030 Updated No Build	2030 without Noise Walls- Preferred Alternative	2030 with Traffic Barriers and Noise Walls- Preferred Alternative
Project Corridor	837.8	270.3	287.2	206.6	142.8
Portage Bay/Roanoke ^a	83	24	24	22	22
North Capitol Hill	219	99	101	53	44
Montlake North of SR 520 ^a	106.4	37	41.6	34.3	28
Montlake South of SR 520	141.6	63	66.6	48.2	39
University of Washington ^a	82.7	2	4.4	7.1	4.4
Washington Park Arboretum ^a	54	22	21.6	27	5.4
Madison Park	99.4	16	16	7	0
Laurelhurst	15	0	0	0	0
Medina	37	8	12	8	0

^a This area also includes residential equivalents.

Exhibit 5.7-1 shows the locations where modeling occurred and the results for the updated No Build Alternative and Preferred Alternative without mitigation. The map shows the noise modeling sites, notes which receivers

Exhibit B - 3

Exhibit 5.7-1. Noise Modeling Results for Receivers without Noise Walls (2030) - Preferred Alternative



would approach or exceed the NAC, and provides a symbol indicating whether an average person would notice an increase, decrease, or no change in traffic noise. Changes in traffic noise are typically noticeable at 3 dBA. Noise levels at locations shown as having no noticeable change would remain within 2 dBA of current levels.

As shown in Table 5.7-2 and Exhibit 5.7-2, Options A, K, and L would also decrease the number of residences where noise levels exceed the NAC, although the decrease would be less than with the Preferred Alternative. Under Option A, the number of residences exceeding the NAC would decrease to 249. Under Options K and L, the number of residences exceeding the NAC would decrease to 256 and 235, respectively. The

Exhibit B - 4

addition of lids and landscape features over the highway would be the primary reasons for the reduction in noise levels.

Table 5.7-2. Residences where Noise Levels Would Approach or Exceed the NAC for SDEIS Options in 2030 for Options A, K, and L

	Total Residences	2004 Existing	2030 No Build	2030 without Noise Walls			2030 w/ Noise Walls		
				Option A	Option K	Option L	Option A	Option K	Option L
Project Corridor	862	288	327	249	256	235	94	123	119
Portage Bay/Roanoke ^a	83	24	24	26	27	27	13	16	16
North Capitol Hill	219	99	109	89	89	83	35	35	35
Montlake North of SR 520 ^a	106	37	47	27	28	28	0	19	18
Montlake South of SR 520	142	63	70	57	52	45	28	24	24
University of Washington ^a	83	2	4	2	2	4	2	2	4
Washington Park Arboretum ^a	54	22	27	16	27	22	16	27	22
Madison Park	99	16	16	10	10	5	0	0	0
Laurelhurst	15	0	0	0	0	0	0	0	0
Medina	61	26	30	21	21	21	0	0	0

^a This area also includes residential equivalents.

Note: Adding the suboptions to Option A, K, or L would not change the noise effects listed in this table.

What policies apply to noise mitigation for WSDOT/FHWA projects?

Under FHWA regulations (23 Code of Federal Regulations [CFR] Part 772), noise abatement must be considered when highway noise levels approach or exceed the thresholds set in FHWA's noise abatement criteria, as they currently do along much of the SR 520 corridor and would continue to do under the No Build Alternative. (See section 4.7 for information on existing noise levels and the FHWA criteria.) Abatement measures must meet FHWA and WSDOT guidelines for feasibility and reasonableness, including a WSDOT requirement of making every reasonable effort to attain a 10-decibel or greater reduction in the first row of properties affected by project noise. WSDOT works with these property owners during detailed project design to determine some of the mitigation measures planned for the project.

Exhibit B - 5

Exhibit 5.7-2. Noise Modeling Results for Receivers without Noise Walls (2030) - Options A, K, and L

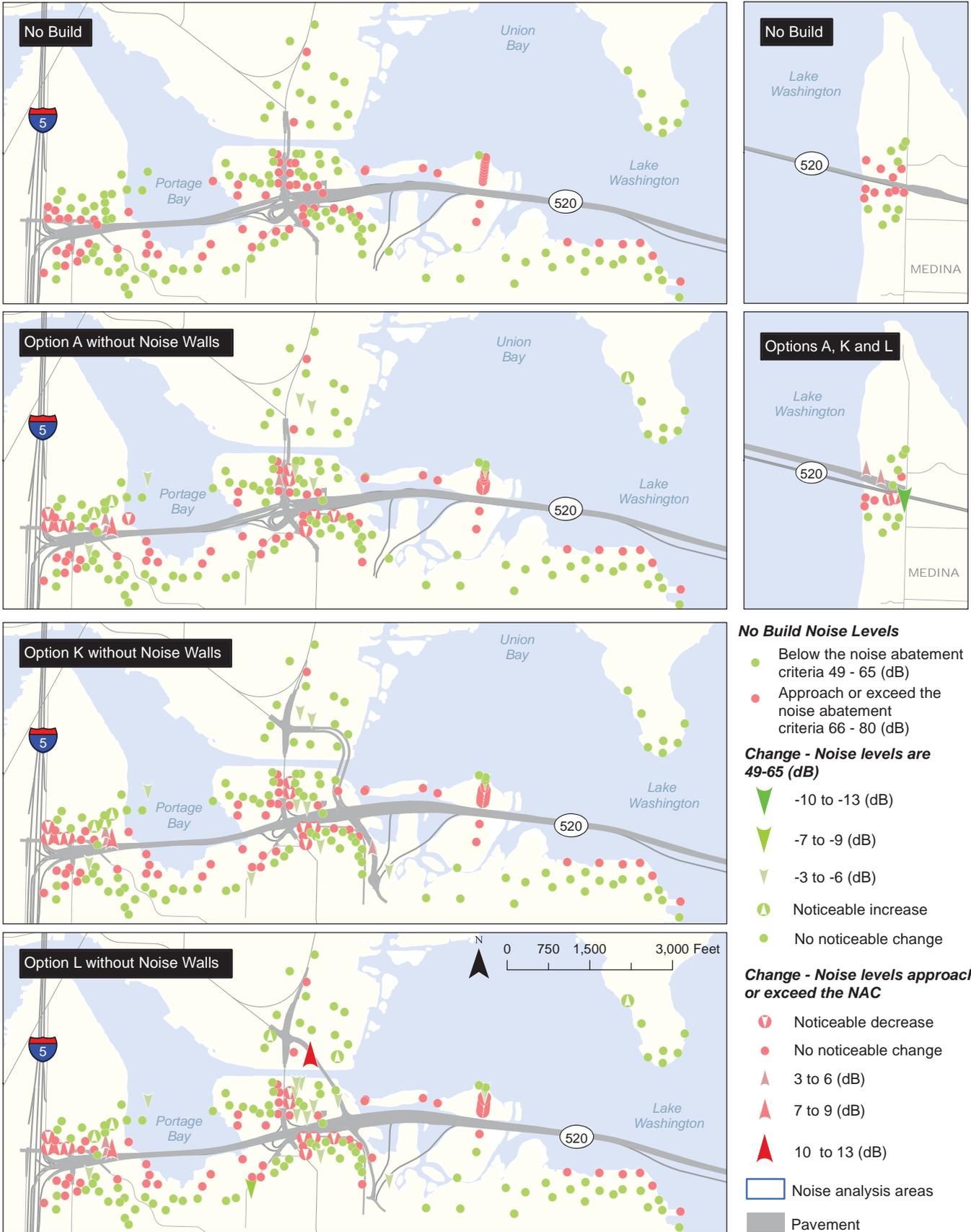


Exhibit B - 6

What has been done to avoid or minimize negative effects from noise?

Several design elements and general corridor improvements that were added to the Preferred Alternative as a result of the SR 520 Noise Expert Review Panel and in response to community input. In particular, many comments on the SDEIS and in other public forums expressed concern about the aesthetic impacts of noise walls, coupled with requests that WSDOT explore different and more innovative noise reduction measures. As a result, the Preferred Alternative design includes 4-foot noise-absorptive concrete traffic barriers along both sides of the SR 520 project alignment. The median planter on the Portage Bay Bridge will also be constructed using the barriers. These noise reduction measures could also be added to Options A, K, and L if one of these options became the preferred alternative.

The noise analysis for the Preferred Alternative includes the results of modeling standard concrete-type traffic barrier, but does not include any benefits from the acoustically absorptive material on the surface of the barriers. The noise-reducing effects of the 4-foot concrete traffic barriers were added to the traffic noise model as a corridor design element, and it was concluded that these barriers would reduce the number of traffic noise impacts along the project alignment by approximately 57 residences and residential equivalents compared to the model without traffic barriers. A WSDOT report on special noise barrier applications suggests that single-wall absorptive barriers may provide an additional 2-dBA decrease in noise levels compared to standard concrete barriers.

Additionally, within the corridor along the Portage Bay Bridge, between I-5 and the Montlake lid, the posted speeds would be reduced to 45 mph, which also aids in lowering the traffic noise levels within this area. Modifying speed limits is one of the abatement measures that can be considered under WSDOT policy and, typically, a reduction in traffic noise of up to 3 dBA can be expected with a speed reduction of 10 mph.

The final design element, which includes expanding the Montlake lid to cover a larger portion of SR 520, would also result in lower traffic noise levels near the lid compared to lid designs considered in previous analyses.

The combined effect of the design elements discussed above would result in overall lower noise levels along the project alignment. However, there would continue to be project-related noise effects and, therefore, additional mitigation measures must be considered under WSDOT policy. As described in the 2009 Noise Discipline Report section “What has been done to avoid or minimize negative effects from noise?” (see page 107), noise walls were determined to be the only viable mitigation option for the remaining noise-affected residences.

Alternative Noise-Reducing Design Measures

In addition to the 4-foot noise-absorptive traffic barriers and lower speed limits, the project team is currently evaluating quieter concrete pavement. The FHWA noise program policy related to tire/pavement noise (USDOT 1995) reads as follows:

Pavement is sometimes mentioned as a factor in traffic noise. While it is true that noise levels do vary with changes in pavements and tires, it is not clear that these variations are substantial when compared to the noise from exhausts and engines, especially when there are a large number of trucks on the highway. Additional research is needed to determine to what extent different types of pavements and tires contribute to traffic noise.

It is very difficult to forecast pavement surface condition into the future. Unless definite knowledge is available on the pavement type and condition and its noise generating characteristics, no adjustments should be made for pavement type in the prediction of highway traffic noise levels. Studies have shown open-graded asphalt pavement can initially produce a benefit of 2–4 dBA reduction in noise levels. However, within a short time period (approximately 6-12 months), any noise reduction benefit is lost when the voids fill up and the aggregate becomes polished. The use of specific pavement types or surface textures must not be considered as a noise abatement measure.

Sound measurements have increased over time for the three different types of quieter asphalt pavement installed along the SR 520 corridor. In general, the asphalt testing did not produce a pavement type that meets all WSDOT criteria; however, WSDOT is committed to continuing to test other types of pavements and is also committed to using a pavement type that will meet overall pavement standards for state highways while potentially providing some level of noise reduction when compared to most standard pavement types.

What noise walls were modeled and recommended for the project area?

The mediation group recommended different traffic noise mitigation and design elements intended to reduce noise for Options A, K, and L. Option A was defined as including noise walls and/or quieter rubberized asphalt pavement. Option K was defined as including only quieter rubberized asphalt pavement. Option L would include noise walls similar to those defined in the Draft EIS, which would extend along most of the corridor. Although these recommendations reflect the preferences of the mediation participants and the community, they do not affect FHWA's and WSDOT's responsibility to identify and consider effective and allowable noise

Exhibit B - 8

abatement measures under existing laws. For this reason, as noted above, the Preferred Alternative and all of the SDEIS options were modeled both with and without noise walls.

In accordance with FHWA and WSDOT guidance, WSDOT evaluated noise walls for all areas along the SR 520 corridor from I-5 to Medina where traffic noise levels in 2030 are expected to approach or exceed the NAC. Because noise wall configuration depends on roadway design, the location, length, and height of noise walls would vary for each design option. Based on the evaluation, WSDOT recommended noise walls only where modeling indicated that they would meet the guidelines for reasonableness and feasibility.

Preferred Alternative

Because design features such as reduced speeds, expanded lids, and 4-foot concrete traffic barriers were incorporated into the Preferred Alternative at many locations in the Seattle portion of the SR 520 corridor, noise walls would not provide enough additional reduction to be considered cost-effective. Therefore, the Preferred Alternative includes only two recommended noise walls: noise walls along both sides of SR 520 from just east of the floating span to Evergreen Point Road. If the recommended noise walls are included in the Preferred Alternative, the overall length would be 1,713 feet with height varying between 10 and 20 feet.

Noise abatement along I-5 in the North Capitol Hill area was also considered in the analysis for the Preferred Alternative. A noise wall along WSDOT right-of-way between I-5 and Harvard Avenue East and along a small spur of Broadway East near 10th Avenue East and SR 520 was evaluated for cost-effectiveness. However, further structural review is required to conclude if including the wall is reasonable and feasible before recommending it to the communities. This review will take place during final design.

Exhibit 5.7-3 shows the locations of the recommended noise walls and identifies those receivers that would benefit. With the noise walls recommended for the Preferred Alternative, the number of residences that exceed the NAC would be reduced to 143 (Table 5.7-2) and a total of approximately 8 residences would benefit. The walls would meet WSDOT cost criteria.

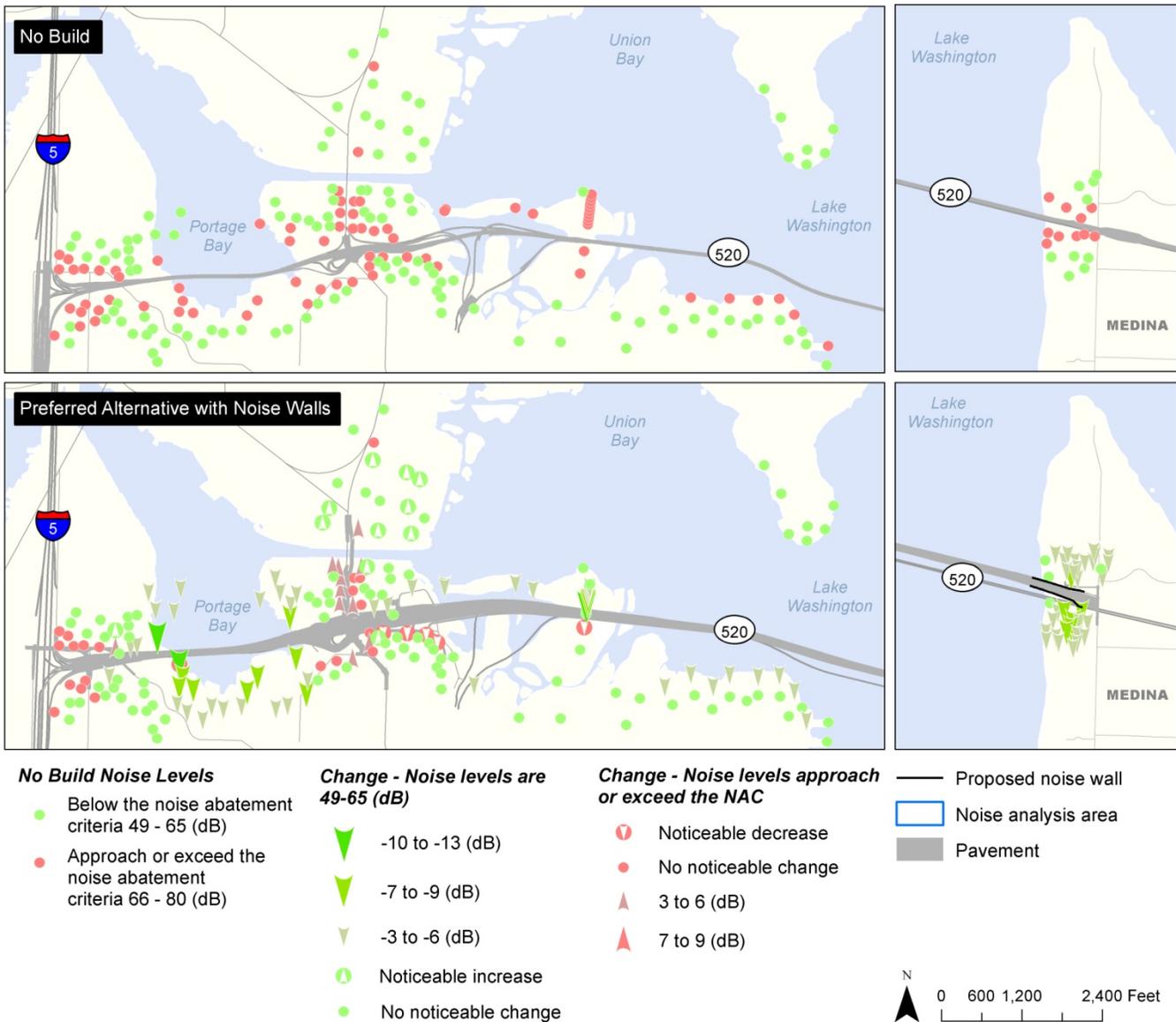
Options A, K, and L

Options A, K, and L included the following recommended noise walls (Exhibit 5.7-4):

- Noise walls along the north side of SR 520 from the 10th and Delmar lid to the Montlake lid
- Noise walls along the south side of SR 520 from the 10th and Delmar lid to just west of Montlake Boulevard

Exhibit B - 9

Exhibit 5.7-3. Noise Modeling Results for Receivers with Noise Walls (2030) - Preferred Alternative

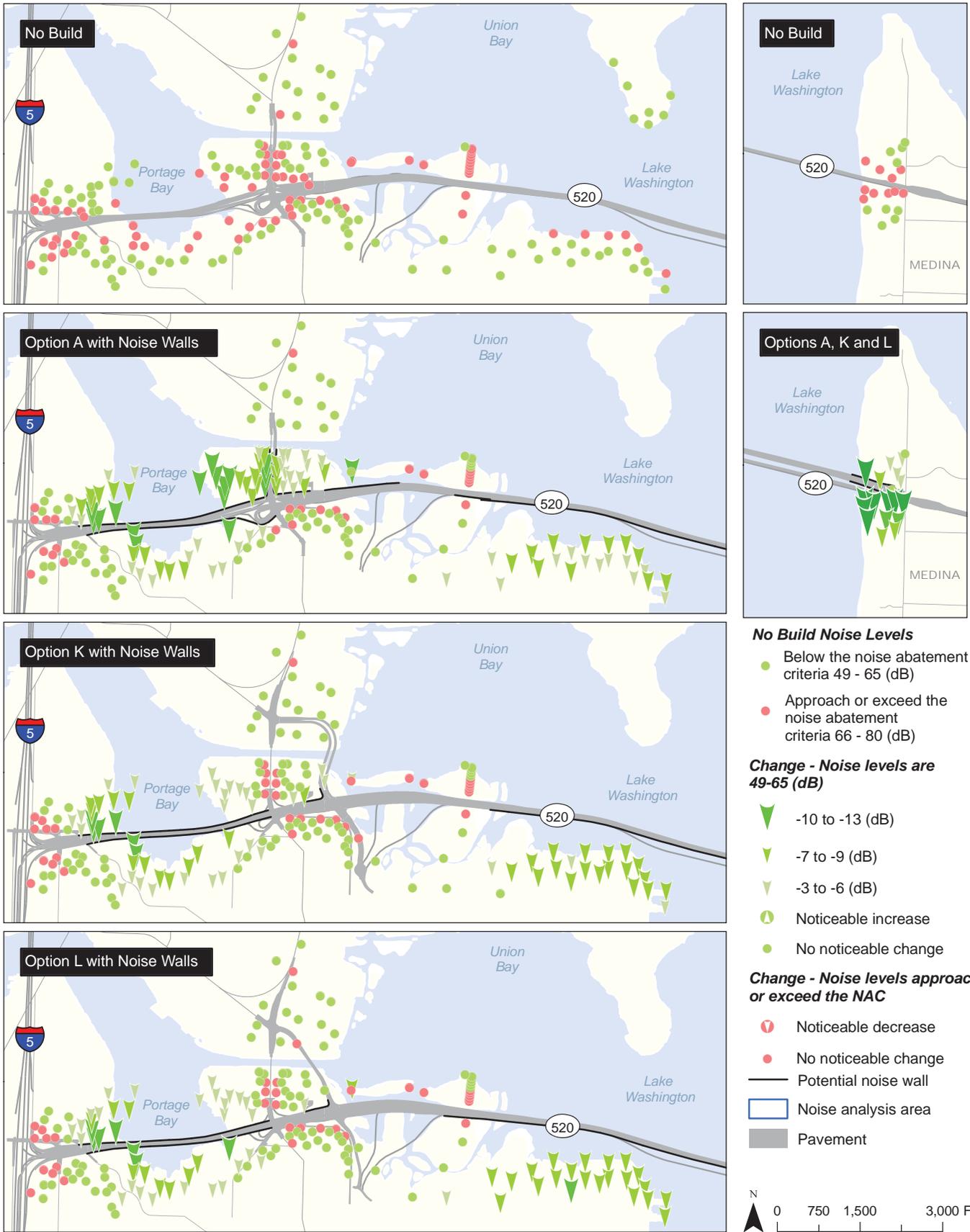


- Noise walls on the south side of SR 520 along the Madison Park neighborhood
- Noise walls along both sides of SR 520 from just east of the floating span to Evergreen Point Road

In areas where the evaluated noise walls did not meet the WSDOT reasonableness and/or feasibility criteria (for example, between Montlake Boulevard NE and the Arboretum), noise walls were not recommended. Exhibit 5.7-4 shows the receiver locations where noise walls would be located and the changes in noise levels.

Exhibit B - 10

Exhibit 5.7-4. Noise Modeling Results for Receivers - Noise Walls (2030)



Note: No noise walls were evaluated for the Laurelhurst neighborhood because noise levels from SR 520 would remain below the NAC for the 6-Lane Alternative with the design options.

Option A

If the recommended noise walls were included in Option A, their overall length would be 18,819 feet, with heights varying from 8 to 14 feet. The taller noise walls would be necessary in areas where residents are located uphill from the project corridor. Exhibit 5.7-4 shows the locations of the recommended noise walls.

With the noise walls recommended for Option A the number of residences that would exceed the NAC would be reduced to 94 (Table 5.7-2) and a total of 468 residences would benefit. Each wall would meet WSDOT cost criteria.

Option K

If the recommended noise walls were included in Option K, overall length would be 16,528 feet, with heights varying from 8 to 16 feet. Exhibit 5.7-4 shows the locations of the recommended noise walls.

With the noise walls recommended for Option K the number of residences that would exceed the NAC would be reduced to 123 (Table 5.7-2) and a total of 409 residences would benefit. All the walls would meet the WSDOT cost criteria with the exception of the one wall in Washington Park Arboretum. Although with Option A the noise walls on the south and north sides of SR 520 would be cost-effective for the Arboretum, the project roadway profile with Option K would require higher (more expensive) noise walls near the Arboretum to achieve similar noise level reductions. The wall that would extend along the south side of SR 520 in the Arboretum would not be cost-effective.

Option L

If the recommended noise walls were included in Option L, overall length would be 16,738 feet, with heights varying from 8 to 16 feet. Exhibit 5.7-4 shows the locations of the recommended noise walls with Option L.

With the noise walls recommended for Option L the number of residences that would exceed the NAC would be reduced to 119 (Table 5.7-2) and a total of 400 residences (8 with noise levels of 70 dBA or higher) would benefit. Each wall would meet WSDOT cost criteria.

What indirect effects would the project likely have on noise?

WSDOT considered all noise-related effects of project operation to be direct. This is because project-related noise would be detected by people only while they were in or close to the SR 520 corridor and at the same time the noise was being generated. No indirect noise effects were identified from operation.

Exhibit B - 12

What has been done to avoid or minimize negative effects?

The Preferred Alternative includes WSDOT approved noise abatement such as reduced speed limits and increased roadway heights, expanded lids, as well as noise-reducing design elements including absorptive treatments on 4-foot traffic barriers. By reducing noise levels, the Preferred Alternative design results in fewer recommended noise walls compared to those recommended under the SDEIS options. In areas where the number of affected residences is higher with the Preferred Alternative compared to the SDEIS options, the difference is primarily due to the fact that only two noise walls (in Medina) are recommended under the Preferred Alternative.

The Preferred Alternative and Options A, K, and L include up to five landscaped lids (depending on the design option) over depressed sections of the roadway. Although these lids are included as community enhancements rather than noise mitigation, they would also help prevent noise from reaching noise-sensitive receiver locations near the lidded areas. The Noise Discipline Report Addendum and Errata (Attachment 7) provides a detailed explanation of where the lids will reduce noise levels.

Changes in the horizontal or vertical alignment of a roadway can reduce noise levels depending on the modification and surrounding conditions. These types of changes can qualify as noise mitigation. A depressed (lowered) roadway can provide substantial noise reduction, depending on the amount of depression. Under the Preferred Alternative and all design options, SR 520 would be depressed at the approach to the I-5 interchange and the Montlake interchange. With Option K, the depressed SPUI and tunnel under the Montlake Cut would substantially reduce noise levels in the immediate surrounding areas compared to Option L with the elevated SPUI. Options K and L also include a depressed intersection at NE Pacific Street/Montlake Boulevard East.

What negative effects would remain after mitigation?

Overall, with the Preferred Alternative, 143 residences or residential equivalents would continue to have noise levels that meet or exceed the NAC. With SDEIS Options A, K, and L, the residual noise effects totaled 94, 123, and 119 residences, respectively. With the Updated No Build Alternative, there would be 287 traffic noise effects within the project area. Currently, there are 270 residences that have noise levels exceeding the NAC.

There would be no negative effects remaining in Laurelhurst or Madison Park under the Preferred Alternative. Also, with the recommended mitigation measures in Medina, no negative effects would remain in Medina under the Preferred Alternative.

Exhibit B - 13

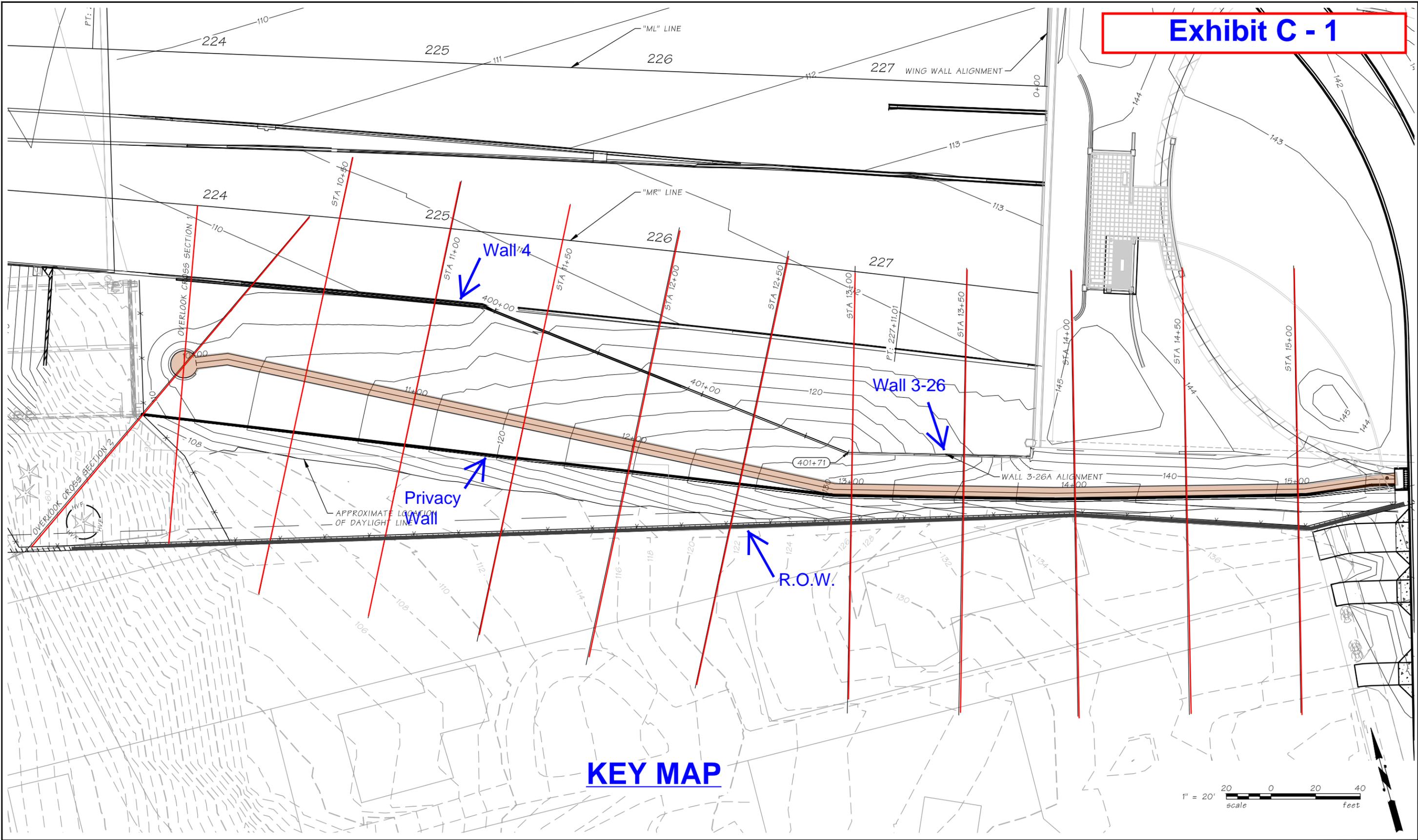
Within the Arboretum, five residential equivalents would have noise levels that exceed the NAC with the Preferred Alternative compared to 22 under the No Build Alternative. Similarly, within the North Capitol Hill neighborhood, 44 residences would have noise levels exceeding the NAC with the Preferred Alternative with recommended mitigation compared to 101 under the No Build Alternative.

Compared to the No Build Alternative, the numbers of affected residences within the Montlake neighborhoods north and south of SR 520 are reduced from 42 to 28 and 67 to 39, respectively. Within the University of Washington, the number of affected residences remains the same as the No Build Alternative.

Within the Portage Bay/Roanoke neighborhood, there would be 22 affected residences with the Preferred Alternative, which is less than the 24 predicted under the No Build Alternative.

Overall, the number of affected residences under the Preferred Alternative without the recommended noise walls or the 4-foot concrete traffic barrier would be lower than the number under either the No Build Alternative or under any of the SDEIS options without mitigation. However, the number of affected residences under the Preferred Alternative with the 4-foot traffic barrier in Seattle is somewhat higher than any of the SDEIS options with mitigation. This is primarily because the project design elements and the barrier reduce noise to levels where other noise abatement, such as noise walls, is no longer feasible and reasonable. Design elements that could not be modeled, such as absorptive treatment on traffic barriers, lid portals, and bridge joints may further reduce noise levels below the values reported in this analysis.

Exhibit C - 1



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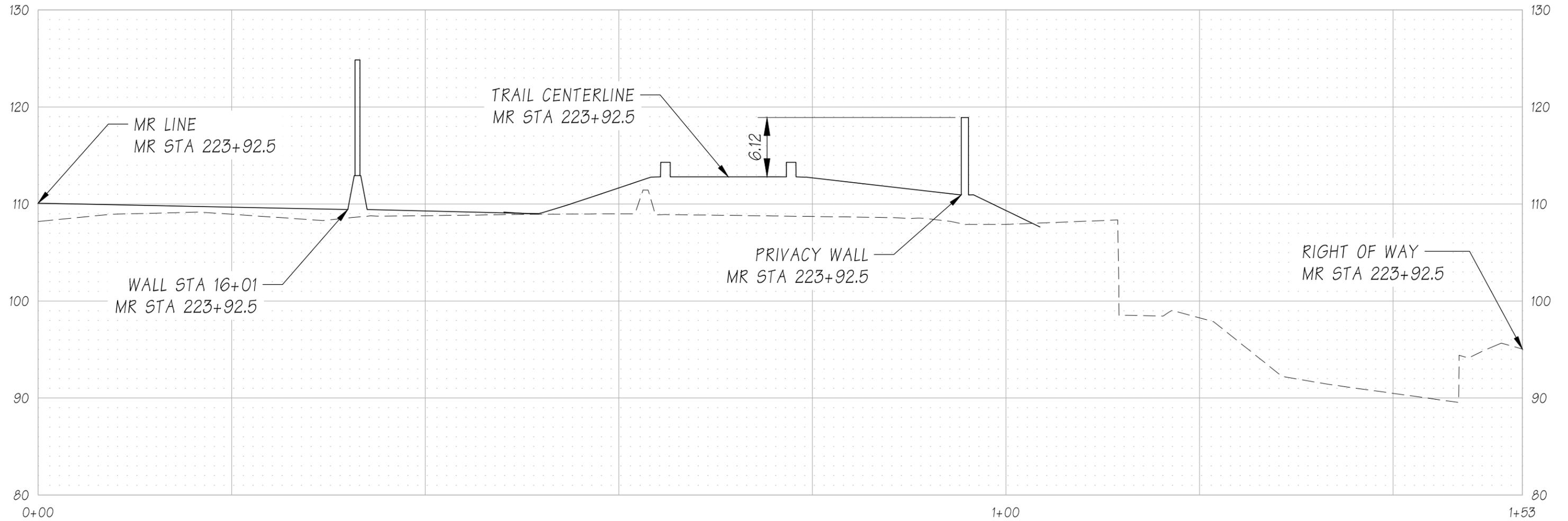
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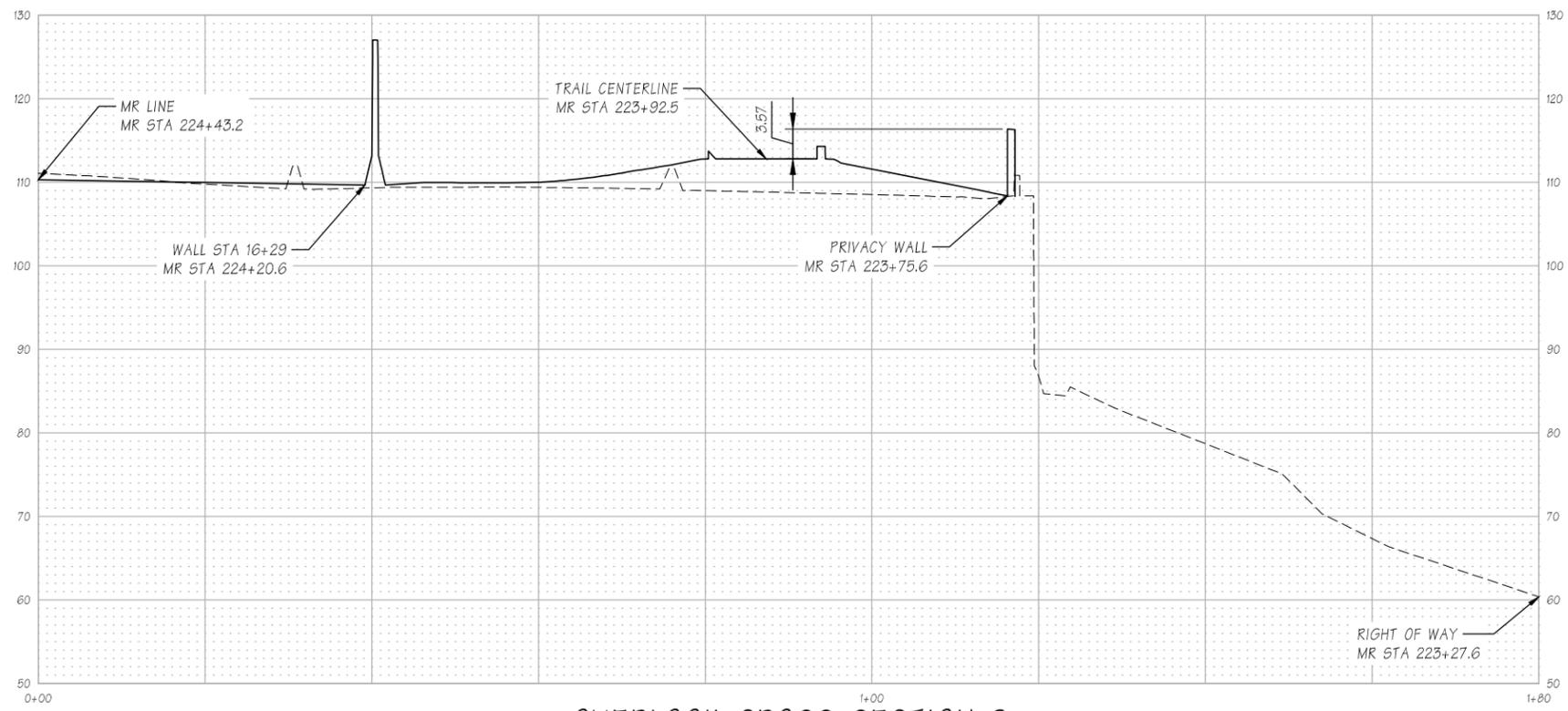
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BergerABAM

SR 520		PLAN REF NO.
I-5 TO MEDINA - STG. 1 EVERGREEN PT.		
FLOATING BRIDGE AND LANDINGS		SHEET 1 OF
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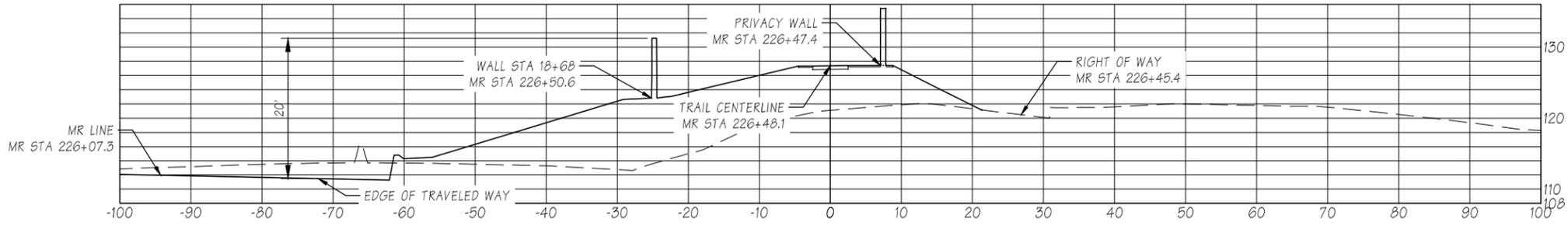


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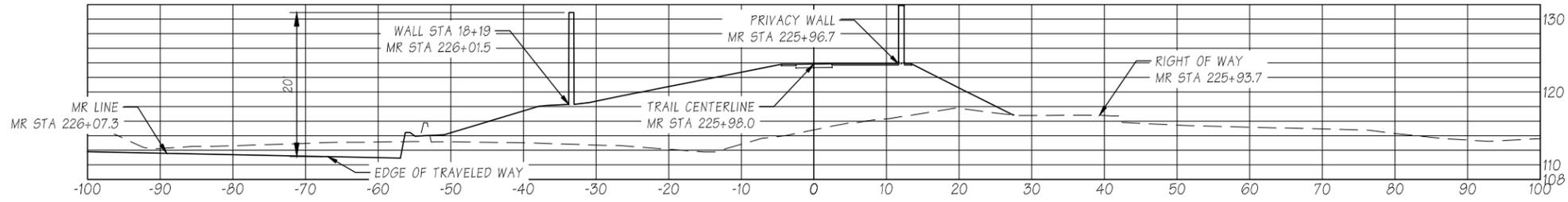


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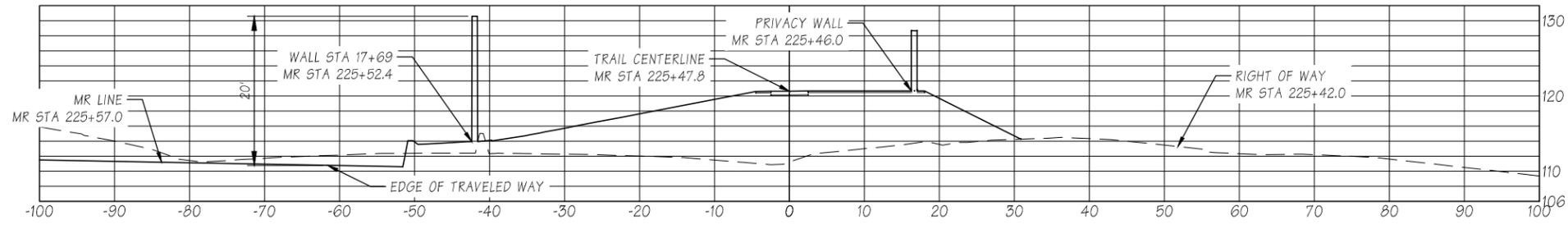
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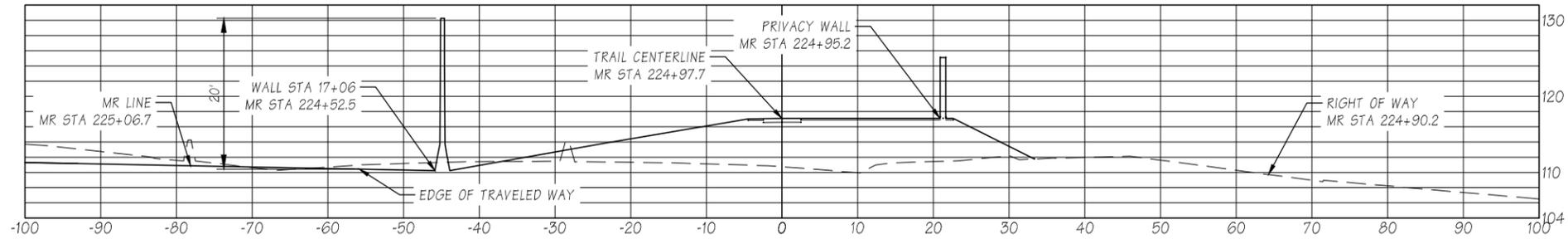
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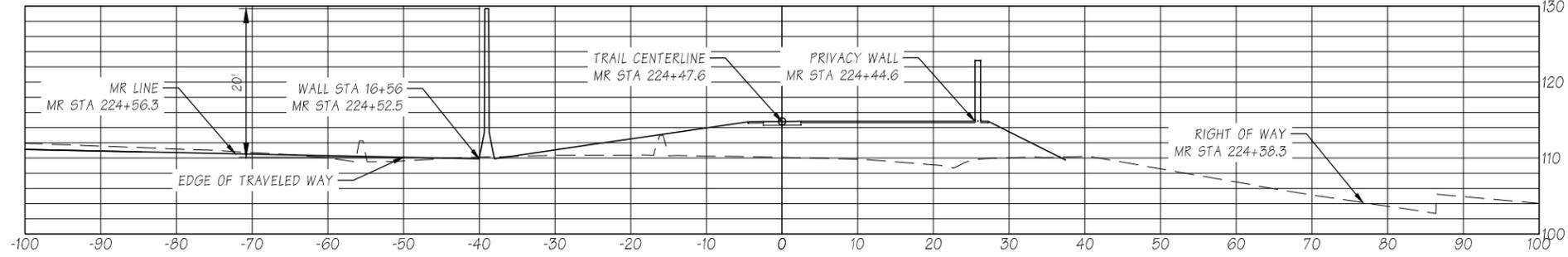
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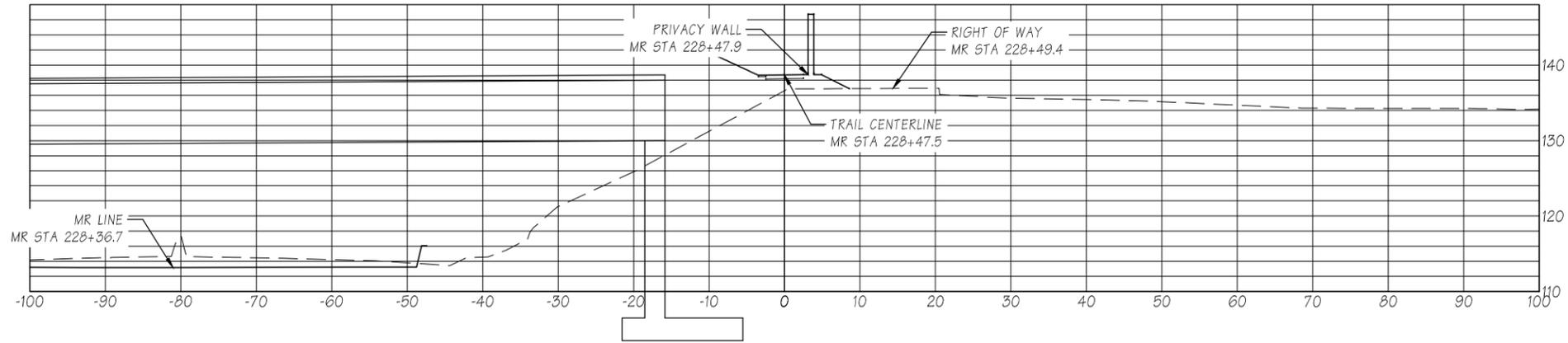
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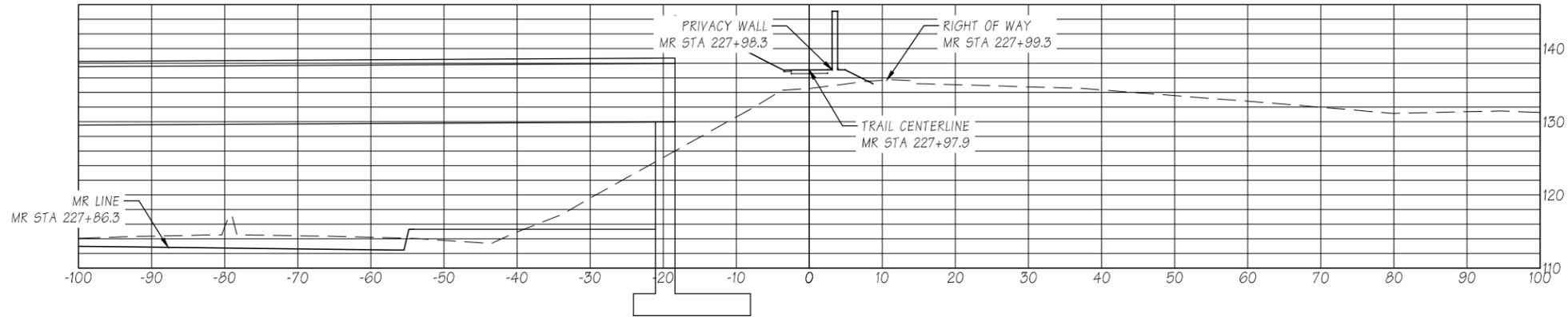
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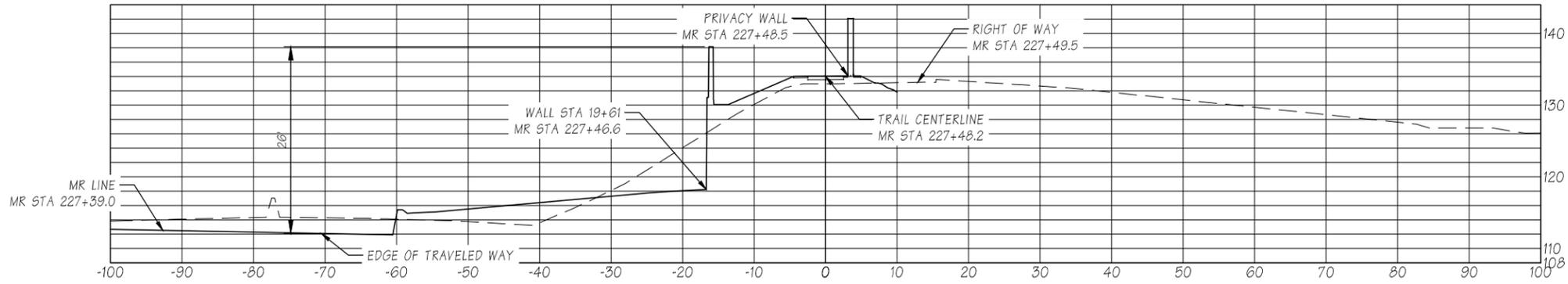
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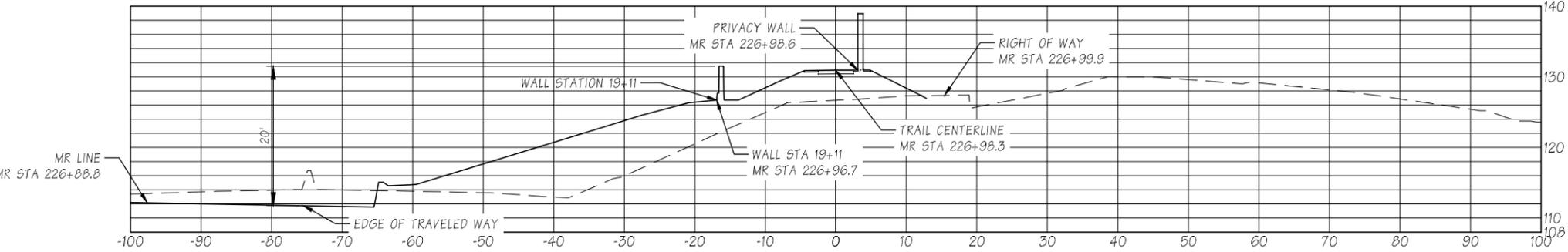
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