

FrontRunner Forward Technical Memorandum

To: Utah Transit Authority

From: Lance Meister, Cross-Spectrum Acoustics, Inc.

Date: June 20, 2025

Subject: North of Woods Cross Double Track Project Noise and Vibration Assessment for Design Change to Add Turnout

Summary

The purpose of this memorandum is to summarize the noise and vibration impact assessment of the North of Woods Cross Double Track Project. The project consists of double tracking approximately 2.7 miles of the FrontRunner Commuter Rail system while limiting impacts to the Union Pacific Railroad and adjacent properties. The original project proposed extending from north of the Woods Cross Station to the existing siding at about 2000 North in West Bountiful.

The results of the original noise and vibration assessment, completed in October 2022, indicated that there would be no noise or vibration impacts with the North of Woods Cross Double Track Project.

The updated project includes a 0.3-mile extension to the south of the original project (see Figure 1). The anticipated track work associated with the extension consists of a new high-speed switch (i.e., turnout) installed just to the north of 1500 South to increase train speeds as they approach the station. The new elements would extend new grading rail, embankment fill and ballast along the east side of the existing rail corridor to widen the existing mainline rail parallel with the existing FrontRunner mainline track.

The results of the updated assessment indicate that there would be five moderate noise impacts and five vibration impacts in the expanded project area. All of the noise impacts and most of the vibration impacts are on the east side of the tracks and are due to the new #20 turnout at the southern end of the double track section, just to the north of 1500 South. At all other locations in the expanded project area, there would either be a slight decrease in the noise levels, and no change in vibration levels due to half the FrontRunner trains being moved to a new track further from the sensitive receptors, or a slight increase in noise and vibration levels at locations where tracks are being moved closer to sensitive receptors, but still below the thresholds for impact.

Figure 1. North of Woods Cross Double Track Project



Federal Transit Administration Noise and Vibration Impact Criteria

The Federal Transit Administration (FTA) noise and vibration criteria for transit projects are detailed in the FTA's noise and vibration guidance manual.¹

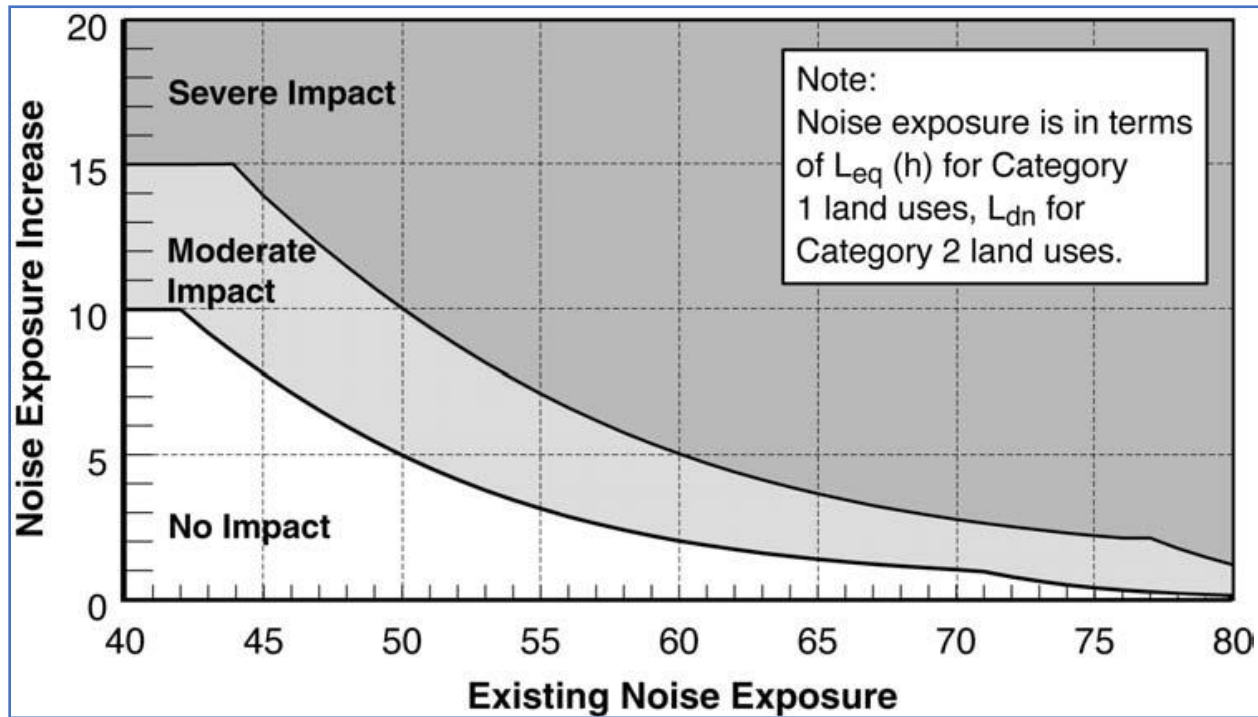
The FTA noise criteria are based on the land use category of the sensitive receptor. The descriptors and criteria for assessing noise impact vary according to land use categories adjacent to the project. For Category 2, land uses where people live and sleep (e.g., residential neighborhoods, hospitals, and hotels), the Day-Night Average Sound Level (Ldn) is the assessment parameter. For other land use types (Category 1 or 3) where there are noise-sensitive uses (e.g., outdoor concert areas, schools, and libraries), the equivalent continuous sound level (Leq) for an hour of noise sensitivity that coincides with train activity is the assessment parameter.

The noise impact criteria are defined by the two curves in Figure 2, which compares the change in noise due to the project to the existing noise before the introduction of the project. These criteria are used in projects where there is not a new project, but where there can be changes in noise, such as with the introduction of a second track. The FTA noise impact criteria include three levels of impact, as shown in Figure 2. The three levels of impact include:

- **No Impact:** In this range, the project is considered to have no impact since, on average, the introduction of the project will result in an insignificant increase in the number of people highly annoyed by the new project noise.
- **Moderate Impact:** Project-generated noise in this range is considered to cause impact at the threshold of measurable annoyance. Moderate impacts serve as an alert to project planners for potential adverse impacts and complaints from the community. Mitigation should be considered at this level of impact based on project specifics and details concerning the affected properties.
- **Severe Impact:** Project-generated noise in this range is likely to cause a high level of community annoyance. Noise mitigation should be applied for severe impacts where feasible.

¹ Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, FTA Report No. 0123, September 2018.

Figure 2. FTA Cumulative Noise Impact Criteria



SOURCE: FTA 2018

The FTA vibration criteria for new projects without existing vibration sources are based on the vibration level and number of project operations, and not on the increase in vibration levels. As the number of operations increase, the vibration impact threshold becomes more stringent. In a project location with existing vibration from trains (which is the case for this project), the criterion is based on a change in vibration relative to the existing. For locations with more than 12 operations per day (such as the FrontRunner corridor), vibration impact occurs when the increase in vibration is at least 3 vibration decibels (VdB) over the existing vibration levels.

Noise and Vibration Assessment Methodology

Noise and vibration from the project were modeled using the methods described in the FTA guidance manual. The design change would involve adding a second track (extending the proposed second track for an additional 0.3 miles) and moving half the current UTA FrontRunner operations from the existing track to the new second track. The design change would also add a new turnout at the southern end of the section. The entire FrontRunner corridor is a quiet zone and no horns are sounded during regular operations. Horns might need to be sounded during construction for worker safety, following applicable regulations.

The noise assessment is based on the increase in noise at sensitive receptors due to the addition of the second track. The model assumes that half the trains will utilize the second track, and half the trains will remain on the original track. The noise levels from UTA FrontRunner operations would increase at locations on the side of the double track section where the new track is located, and the noise would decrease at locations on the side of the section adjacent to the existing track, since some of the trains

would be located further away relative to the existing track. New crossovers or turnouts will increase the noise levels for sensitive receptors located within 300 feet of the special trackwork, per FTA guidance.

In order to model the existing noise on the project, operations information was used, including the number of Union Pacific (UP) freight trains, UTA FrontRunner commuter rail trains, speeds and the number of locomotives and cars for each data from the Federal Railroad Administration (FRA) grade crossing database, the UTA website, and field observations.

The existing UP operations included:

- 13 freight trains per day from the FRA database
- 5 locomotives and 120 cars per train on average from field observations and Google Earth imaging
- 40 mph speeds from the FRA database

The existing UTA FrontRunner operations included:

- 54 trains per day, based on the UTA schedule
- 1 locomotive and 4 cars per train
- 79 mph speeds based on track design

The vibration assessment is based on the increase in vibration at sensitive receptors due to the addition of the second track. Similar to noise assessment, the model assumes that half the trains will utilize the second track, and half the trains will remain on the original track. The vibration levels would increase at locations on the side of the double track section where the new track is located, and the vibration would remain the same at locations on the side of the double track section adjacent to the existing track. New crossovers or turnouts will increase the vibration levels for sensitive receptors located within 200 feet of the special trackwork, per FTA guidance.

Affected Environment

The land use adjacent to the expanded project area consists of residential uses. The existing noise levels range from 62-75 decibel A-weighted (dBA) Ldn, depending on the distance from the tracks to the receiver, and the number of rows of intervening buildings. The existing noise is dominated by the UP freight train operations.

Impact Assessment

The new track in the expanded project area would be located on the east side of the existing FrontRunner track. For receivers on the west side of the rail corridor, the noise levels would decrease slightly (less than 0.1 decibel (dB)). For receivers on the east side of the rail corridor, the noise levels would increase slightly (less than 0.1 dB for most receivers) but would be below noise impact threshold.

Because the new track is a maximum of 15 feet east from the existing track, a receiver would need to be located within 40 feet of the existing UTA FrontRunner track on the east for the change in vibration level to be greater than 3 VdB. With the exception of the turnout at the southern end of the section, there

are no sensitive receivers located within that distance, and therefore there is no vibration impact for most of the section.

At the southern end of the expanded project area, the turnout just to the north of W 1500 South would increase the noise and vibration levels in addition to the increase due to the addition of the new track. The increase in noise would be approximately 0.4 to 0.6 dB over the threshold for a moderate noise impact, due to the presence of the turnout. For vibration, a turnout increases vibration levels by 5-10 VdB for receivers located within 200 feet of the turnout, so all the receivers within 200 feet would have increases in vibration greater than the 3 VdB threshold. There would be five moderate noise impacts and five vibration impacts adjacent to the turnout. The locations of the moderate noise impacts and vibration impacts are shown in Figure 3.

Mitigation

The noise and vibration impacts on the North of Woods Cross double track section are due to the presence of the new turnout at the southern end of the section. The two options for mitigation would be moving the turnout to a location not adjacent to sensitive receptors or utilizing a spring-rail frog to limit the additional noise and vibration from the turnout.

There is no location within the extended project area where the turnout could reasonably be moved to that would have no sensitive receptors located within 300 feet. A spring-rail frog is a special type of turnout that closes the gap in the tracks in the main direction of travel but would still have a gap for the diverging movement onto or off of the second track. Because the spring-rail frog would eliminate the gap in the tracks in the main direction, the noise impacts would be eliminated. The vibration impacts would remain, but the number of train events that would generate higher vibration levels would be reduced by half.

A detailed vibration assessment and determination of mitigation measures will be undertaken during final design.

Figure 3. North of Woods Cross Section Noise and Vibration Impact Locations

