Chapter 12: Noise

12.1 Introduction

This chapter describes existing noise conditions in the West Davis Corridor (WDC) noise impact analysis area and the expected noise impacts of the proposed alternatives. Traffic noise impacts are evaluated using noise models and methodologies approved by the Federal Highway Administration (FHWA) and the Utah Department of Transportation (UDOT).

What is the noise impact analysis area?

The noise impact analysis area is the land adjacent to the proposed alternatives that could be affected by changes in noise levels due to construction and operation of the alternatives.

Where appropriate, noise barriers or other noise-abatement measures are evaluated to mitigate noise impacts, and recommendations are made for noise-abatement measures consistent with UDOT’s noise policy (UDOT 2017).

Noise Impact Analysis Area. The noise impact analysis area is the land adjacent to the proposed alternatives that could be affected by changes in noise levels due to construction and operation of the alternatives.

12.1.1 Characteristics of Noise

Sound travels through the air as waves of minute air-pressure fluctuations caused by vibration. In general, sound waves travel away from the noise source as an expanding spherical surface. As a result, the energy contained in a sound wave is spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the noise source.

Sound-level meters measure the actual pressure fluctuations caused by sound waves and record separate measurements for different sound frequency ranges. The decibel (dB) scale used to describe sound is a logarithmic scale that accounts for the large range of sound pressure levels in the environment. A logarithmic scale is commonly used when measuring variables (such as noise) that change exponentially instead of linearly. People generally perceive a 10-dBA (A-weighted decibel) increase in a noise source as a doubling of loudness.

Most sounds consist of a broad range of sound frequencies. Several frequency-weighting schemes have been used to develop composite decibel scales that approximate the way the human ear responds to sound levels. The A-weighted decibel (dBA) scale is most widely used for this purpose. Typical A-weighted noise levels for various types of sound sources are summarized below in Table 12-1.

Varying noise levels are often described in terms of the equivalent noise level (L_{eq}). Equivalent noise levels are used to develop single-value descriptions of average noise exposure over stated periods of time. The L_{eq} data used for these average noise exposure descriptors are generally based on A-weighted sound-level measurements. Most often, units of hourly L_{eq} values are used to describe traffic noise.

The logarithmic nature of decibel scales is such that individual decibel ratings for different noise sources cannot be added directly to give the noise level for the combined noise source. For example, two noise sources that produce equal decibel ratings at a given location will produce a combined noise level that is 3 dBA greater than either sound alone. When two noise sources differ by 10 dBA, the combined noise level will be 0.4 dBA greater than the louder source alone.

People generally perceive a 10-dBA increase in a noise source as a doubling of loudness. For example, a 70-dBA sound will be perceived by an average person as twice as loud as a 60-dBA sound. People generally cannot detect differences of 1 to 2 dBA between noise sources. Under ideal listening conditions, differences of 2 or 3 dBA can be detected by some people. A 5-dBA change would probably be perceived by most people under normal listening conditions.

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the noise source. When the noise source is a continuous line (for example, vehicle traffic on a highway), noise levels decrease by about 3 dBA for every doubling of distance away from the source.

Table 12-1. Weighted Noise Levels and Human Response

Sound Source	dBA[a]	Response Descriptor
Carrier deck jet operation	140	Limit of amplified speech
	130	Painfully loud
Jet takeoff (200 feet) Auto horn (3 feet)	120	Threshold of feeling and pain
Riveting machine Jet takeoff (2,000 feet)	110	
Shout (0.5 foot) New York subway station	100	Very annoying
Heavy truck (50 feet) Pneumatic drill (50 feet)	90	Hearing damage (8-hour exposure)
Passenger train (100 feet) Helicopter (in-flight, 500 feet) Freight train (50 feet)	80	Annoying
Freeway traffic (50 feet)	70	Intrusive
Air conditioning unit (20 feet) Light auto traffic (50 feet)	60	
Normal speech (15 feet)	50	Quiet
Living room, bedroom, library	40	
Soft whisper (15 feet)	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Threshold of hearing

Source: CEQ 1970

[a] Typical A-weighted noise levels taken with a sound-level meter and expressed as decibels on the "A" scale. The "A" scale approximates the frequency response of the human ear.

Noise levels at different distances can also be affected by factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease noise levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can also affect the degree to which sound is reduced over distance.

Reflections off of topographical features or buildings can sometimes result in higher noise levels (lower sound-attenuation rates) than what would normally be expected. Temperature inversions and wind conditions can also diffract and focus a sound wave to a location at a considerable distance from the noise source. Focusing effects are usually noticeable only for very intense noise sources, such as blasting operations. As a result of these factors, the existing noise environment can be highly variable depending on local conditions.

12.2 Regulatory Setting

The Federal Noise Control Act of 1972 (Public Law 92-574) requires that all federal agencies administer their programs in a manner that promotes an environment free from noises that could jeopardize public health or welfare. The federal regulation that FHWA uses to assess noise impacts is 23 Code of Federal Regulations (CFR) 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. This regulation was updated on July 13, 2010.

Utah Administrative Code R930-3 and UDOT's Noise Abatement Policy 08A2-01, revised March 22, 2017, establish UDOT's noise impact and abatement policies and procedures. Since UDOT's Noise Abatement Policy 08A2-01 is consistent with 23 CFR 772 and has been approved by FHWA, it was used by the WDC team for the noise impact analysis in this EIS.

What is the WDC team?

The WDC team consists of the lead agencies for the WDC Project (FHWA and UDOT).

Noise Policy Applicability. Under UDOT Policy 08A2-01, the WDC Project is considered a Type I project, which is defined as construction of a highway at a new location; a substantial horizontal or vertical alteration of an existing highway; the addition of a through-traffic lane; the addition of a through-traffic lane that acts as a high-occupancy vehicle lane, high-occupancy toll lane, bus lane, or climbing lane; the addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; the addition or relocation of interchange lanes or ramps added to a quadrant to complete a partial interchange; restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or the addition or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza. Per UDOT Policy 08A2-01, UDOT considers noise abatement for all Type I projects where noise impacts are identified.

Noise-Abatement Criteria. Noise-abatement criteria (NAC) are used to define the noise levels that are considered an impact (in hourly A-weighted sound-level decibels) for each land-use activity category. If future noise levels exceed the NAC, they are considered noise impacts per UDOT Policy 08A2-01. The UDOT NAC are summarized below in Table 12-2.

Table 12-2. UDOT's Noise-Abatement Criteria

Activity Category	L_{eq} Noise Levels (dBA)	Description of Activity Category
A	56 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66 (exterior)	Residential.
C	66 (exterior)	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, and trails and trail crossings.
D	51 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	71 (exterior)	Hotels, motels, offices, restaurants/bars, and other undeveloped lands, properties, or activities not included in categories A–D or F.
F	—[a]	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	—[a]	Undeveloped lands that are not permitted.

Source: UDOT 2017

[a] The F and G activity categories do not have specified noise-abatement criteria.

12.3 Affected Environment

12.3.1 Methodology

The impact analysis area consists of a mix of undeveloped land with a variety of residential, recreational, and commercial land uses interspersed throughout the area.

The WDC team determined the existing noise levels along the proposed alternatives by taking short-term (10- or 15-minute) sound-level measurements at 38 locations throughout the impact analysis area. Noise-measurement locations were selected to represent existing residential developments, recreation areas, or other areas where people could be exposed to traffic noise for extended periods. Noise-monitoring locations are listed in Table 12-3 below and are shown in Figures 12-1 through 12-36, Noise Receptor Impacts, in Volume IV.

These measured noise levels were also used to establish background noise levels in the noise model, which was used to predict the future noise impacts from the proposed alternatives (see the section titled FHWA Traffic Noise Model on page 12-9).

12.3.2 Current Noise Conditions in the Noise Impact Analysis Area

Table 12-3 below shows the measured noise level at each monitoring location (ML) in the impact analysis area.

Table 12-3. Measured Noise Levels in the Noise Impact Analysis Area

Monitoring Location[a]	Approximate Address	Activity Category[b]	Land Use	Measured Noise Level in dBA (Noise Sources)	Figure(s)
ML-1	Glovers Lane/Doberman Lane, Farmington	B	Residential	64 (warehouse construction noise)	No figure
ML-2	725 West south of Glovers Lane, Farmington	B	Residential	49 (backup alarms, aircraft overflights, banging in warehouse)	12-3
ML-3	1325 W. Glovers Lane, Farmington	F	Agriculture (near farmstead)	59 (Interstate 15 [I-15]/Legacy Parkway in background, transmission line buzz)	12-4
ML-4	Pedestrian trail near Davis County bus yard (gated; authorized personnel only), Farmington	C (trails and trail crossings)	Trails and trail crossings	53 (traffic on Glovers Lane and Legacy Parkway, I-15 in background)	12-2
ML-5	Buffalo Ranch Road, Farmington	B	Residential	45	12-6
ML-6	Intersection of Ranch Road and Prairie View Drive, Farmington	B	Residential	45 (birds, light breeze, neighbors talking)	12-7
ML-7	Sunset Drive at Davis County Wastewater Treatment Plant, Kaysville	F	Industrial	50 (treatment plant noise, backup alarms, nail guns on nearby roof)	12-8
ML-8	Shepard Lane, Kaysville	B	Residential	59 (wind in trees and bushes, backup alarms, planes to Salt Lake City International Airport)	No figure
ML-9	Intersection of Leola Street and Wellington Drive, Kaysville	B	Residential	44 (I-15 in background)	12-10
ML-10	South end of Roueche Lane, Kaysville	B	Residential	49 (transmission line buzz, I-15 in background, planes descending)	12-10
ML-11	West end of Endicott Circle, Kaysville	B	Residential	49 (planes descending, Hill Air Force Base [AFB] jet, birds)	No figure
ML-12	200 North south of Bonneville Lane, Kaysville	B	Residential	55 (planes descending, nail gun on roof, Hill AFB jet)	12-11
ML-13	Great Salt Lake Shorelands Preserve, 1750 West and Weaver Lane, Layton	G	Undeveloped	51 (planes, horses neighing, birds, light-airplane propeller)	12-12
ML-14	Intersection of Mica Lane and Silvercreek Drive, Layton	B	Residential	38	12-12
ML-15	Intersection of 2200 West (Westside Drive) and 1000 South, Layton	B	Residential	56 (planes ×3)	12-13
ML-16	332 South 3200 West, Layton	B	Residential	42 (planes)	12-14
ML-17	South end of Bluff Ridge Blvd., Layton	B	Residential	45 (planes ×2)	12-15
ML-18	Gentile Street adjacent to Still Water Development (under construction), Syracuse	B	Residential	60 (wind picking up)	12-17
ML-19	Intersection of 3000 West and Gentile Street, Syracuse	G	Undeveloped	57 (planes ×2, farm machinery in background)	12-19

(*continued on next page*)

Table 12-3. Measured Noise Levels in the Noise Impact Analysis Area

Monitoring Location[a]	Approximate Address	Activity Category[b]	Land Use	Measured Noise Level in dBA (Noise Sources)	Figure(s)
ML-20	Intersection of 2700 South and Doral Drive (3525 West), Syracuse	B	Residential	52 (plane, birds, dog barking)	12-20
ML-21	Fremont Park (1900 South and 3000 West), Syracuse	C	Active sports area	43	No figure
ML-22	Intersection of 2635 West and 2300 South, Syracuse	B	Residential	44 (planes ×2, nail gun/hammering in background, dog barking in background)	12-31
ML-23	Intersection of Craig Lane and 2015 South/Bluff Road	B	Residential	61 (plane, Hill AFB jets ×3, pass-by traffic on Bluff Road)	12-31
ML-24	Jensen Nature Park (at the bridge), Syracuse	C	Park	45 (Hill AFB jet, Bluff Road traffic in background, ducks, plane ×2, backup alarms from new development)	12-16, 12-28
ML-25	Just south of 3000 West and 1525 South, Syracuse	B	Residential	65 (low-flying plane, meter close to shoulder of 3000 West, pass-by traffic on 3000 West)	12-32
ML-26	3000 West north of 1200 South (by onion field), Syracuse	B	Residential	62 (plane, construction noise, pass-by traffic on 3000 West)	12-32
ML-27	800 South west of 3000 West, Syracuse	B	Residential	49 (construction noise, cement truck, nail guns)	12-32, 12-33
ML-28	Intersection of St. Andrews Drive and 3525 South (just south of 700 South), Syracuse	B	Residential	53 (planes ×3, pass-by traffic on 700 South)	12-33
ML-29	Intersection of 700 South and 4000 West, Syracuse	B	Residential	40	12-22
ML-30	300 North and pedestrian trail, West Point (?) or Syracuse	B	Residential	60 (pass-by traffic on 300 North)	12-23, 12-34
ML-31	1650 North 4700 West, West Point	B	Residential	43	12-24, 12-35
ML-32	4191 West 1425 South, Syracuse	B	Residential	42	12-21
ML-33	5000 West 1800 North, West Point	B	Residential	60	12-24, 12-35
ML-34	1300 North west of 4150 West, West Point	B	Residential	48 (plane ×2)	12-27, 12-36
ML-35	Intersection of 1800 North and 4325 West, West Point	B	Residential	64 (plane ×2, pass-by traffic on 1800 North, meter near shoulder of road on 1800 North)	No figure
ML-36	4750 West 2425 North, Hooper	G	Undeveloped	48	12-25
ML-37	5720 South 5500 West (by the detention pond), Hooper	B	Residential	48 (lawnmower, traffic on 5500 West, plane)	12-26
ML-38	5900 South 5500 West, Hooper	B	Residential	66 (traffic on 5900 South)	12-26

[a] These monitoring locations are shown in Figures 12-1 through 12-36, Noise Receptor Impacts, in Volume IV.

[b] For descriptions of the activity categories, see Table 12-2 above, UDOT's Noise-Abatement Criteria.

Measured noise levels in the impact analysis area were typical of suburban and rural environments and ranged from about 38 dBA to 66 dBA. Higher noise levels were recorded at locations adjacent to high-traffic roads, near locations with ongoing construction, or because of other noise sources such as aircraft overflights during the monitoring period. One monitoring location (ML-38) had a monitored noise level of 66 dBA due to pass-by traffic on 5900 South during the short-term measurement period.

12.4 Environmental Consequences

12.4.1 Methodology

Noise Impacts

According to UDOT Policy 08A2-01, a traffic noise impact occurs when either of the following conditions occurs at a sensitive land use (that is, at a land use defined in activity categories A, B, C, or E):

- The future-year worst-case noise level is greater than or equal to the UDOT NAC in Table 12-2 above, UDOT's Noise-Abatement Criteria, for each corresponding land-use category, or
- The future-year worst-case noise level is greater than or equal to an increase of 10 dBA over the existing noise level (a substantial exceedance). This impact criterion applies regardless of existing noise levels.

The goal of the noise impact analysis for all WDC action alternatives was to determine whether the predicted future-year noise levels associated with the proposed alternatives would approach or exceed the applicable NAC (for example, 66 dBA for residential locations) or result in a 10-dBA increase over existing noise levels (a substantial exceedance according to UDOT's noise policy). If either situation is predicted to occur after modeling, the analysis then considers whether noise mitigation is warranted using evaluation procedures specified in UDOT's noise policy.

The section below describes how the future-year worst-case noise levels were determined for the proposed alternatives.

Future-Year Noise Levels

The WDC team used the following methods to identify future-year worst-case noise levels for the proposed alternatives:

- Existing activities, developed land, and undeveloped land for which development is planned, designed, or programmed and that could be affected by noise from the proposed alternatives were identified from field surveys and aerial photographs. Existing residential developments were determined based on field observations and aerial photographs of the project area.
- As described in Section 12.3.1, Methodology, short-term (10- or 15-minute) sound-level measurements typical of existing conditions were taken throughout the impact analysis area and were used to characterize the existing noise environment. Measured noise levels were used to establish background noise levels in the noise model.
- Future-year worst-case noise levels near the proposed alternatives were predicted using the FHWA Traffic Noise Model, version 2.5 (February 2004).
- Per UDOT Policy 08A2-01, the future-year worst-case noise levels were assumed to occur when traffic is operating at LOS C. On the mainline, WDC traffic was modeled using an LOS C volume of 1,600 vehicles per hour per lane (vphpl) operating at a free-flow speed of 65 miles per hour (mph). The vehicle mix was assumed to be 92% cars or small trucks, 5% medium trucks, and 3% heavy trucks, which is similar to vehicle mixes on other freeways in Utah, such as I-15. Interchange ramps were also modeled at 1,600 vphpl with decreasing speeds approaching the cross streets. Arterials were modeled at a volume of 700 vphpl operating at 45 mph.

What is level of service?

Level of service (LOS) is a measure of the operating conditions on a road or at an intersection. Level of service is represented by a letter "grade" ranging from A (free-flowing traffic and little delay) to F (extremely congested traffic and excessive delay). LOS B through LOS E represent progressively worse operating conditions.

FHWA Traffic Noise Model

Traffic noise levels were modeled using the FHWA Traffic Noise Model, version 2.5. The Traffic Noise Model estimates acoustic intensity at receiver locations based on the level of sound energy generated from a series of straight-line road segments. Where appropriate, the effects of local shielding from existing structures (existing barriers and rows of homes, for example), dense vegetation, terrain, and other adjustment factors were included in the model to provide higher levels of detail and accuracy.

Traffic noise was modeled at representative locations for residential, commercial, and recreational land uses as specified in Table 12-2 above, UDOT's Noise-Abatement Criteria, with special attention given to those areas with substantial residential developments where noise-abatement measures might be warranted.

Mitigation for Noise Impacts

Noise mitigation typically consists of installing a noise wall or other physical barrier that blocks the line of sight from the roadway noise source to nearby receptors. Mitigation measures for reducing noise impacts were evaluated using the UDOT noise policy's guidelines for determining feasibility, reasonableness, and cost-effectiveness. The mitigation evaluation for noise impacts is described in Section 12.4.5, Mitigation Measures.

Construction Noise Impacts

Construction noise impacts are described in Section 20.3.6, Noise and Vibration Construction Impacts.

12.4.2 No-Action Alternative

With the No-Action Alternative, the WDC would not be built, so there would be no project-related noise impacts from the WDC. However, other transportation projects identified in the Wasatch Front Regional Council's Regional Transportation Plan and by the local communities would be constructed whether or not WDC is constructed, and these projects would contribute to local noise impacts throughout the impact analysis area. In addition, as the area changes to a more urban environment over the next 20 years, traffic volumes and traffic-related noise levels would continue to rise.

12.4.3 Alternatives A1–A2 and B1–B2

12.4.3.1 Alternatives Description

As described in Chapter 2, Alternatives, Alternative A is the more westerly alternative and consists of two separate alternatives: Alternatives A1 and A2. Alternative B is the more easterly alternative and consists of two separate alternatives: Alternatives B1 and B2. These alternatives are defined in Table 12-4.

Table 12-4. Components of Alternatives A1–A2 and B1–B2

Alternative	I-15 Connection	Four-Lane Highway	Two-Lane Highway	West Point/ Hooper Cities Segment	North Terminus
A1	Glovers Lane	I-15 to 2000 West	2000 West to 1800 North	4100 West	1800 North (West Point)
A2	Glovers Lane	I-15 to 2000 West	2000 West to 5500 South	5400 West	5500 South (Hooper)
Alternative	**I-15 Connection**	**Four-Lane Highway**	**Two-Lane Highway**	**West Point City Segment**	**North Terminus**
B1	Glovers Lane	I-15 to Antelope Drive[a]	Antelope Drive to 1800 North	4100 West	1800 North (West Point)
B2	Glovers Lane	I-15 to Antelope Drive[a]	Antelope Drive to 1800 North	4800 West	1800 North (West Point)

[a] The transition from a four-lane highway to a two-lane highway would occur between Antelope Drive and 700 South.

12.4.3.2 Noise Impacts from Alternatives A1–A2 and Alternatives B1–B2

The locations of the modeled receptors for all of the proposed alternatives are shown in Figures 12-1 through 12-36, Noise Receptor Impacts, in Volume IV. On the figures, a red dot indicates a modeled receptor where the modeled noise level exceeded the residential noise-abatement criterion (66 dBA) or where the modeled noise level substantially exceeded existing noise levels (that is, where there was a 10-dBA increase or more in noise levels).

Table 12-5 summarizes the noise impacts from Alternatives A1–A2 and Alternatives B1–B2.

Table 12-5. Modeled Noise Impacts from Alternatives A1–A2 and Alternatives B1–B2

			Number of Modeled Noise Impacts	
Alternative	Number of Modeled Receptors	Number of Modeled Residences	Residences (Activity Category B)	Non-residential (Activity Category C)
A1	639	1,282	550	9
A2	629	1,221	627	12
B1	837	1,658	879	15
B2	781	1,526	828	15

Modeled receptors can represent more than one residence.

As shown in Table 12-5 above, the proposed alternatives would cause noise impacts at 550 to 879 residences, depending on the alternative. Alternative B1 would have the most residential noise impacts (879), and Alternative A1 would have the fewest residential noise impacts (550).

Alternative A1, which uses the 4100 West alignment in Davis County, would have 77 fewer residential noise impacts and three fewer non-residential impacts than Alternative A2, which uses the 5400 West alignment in Weber County. Alternative B1, which uses the 4100 West alignment in West Point, would have 51 more residential noise impacts than Alternative B2, which uses the 4800 West alignment in West Point. Non-residential impact locations (Activity Category C) are shown in Table 12-6 below.

Interior noise levels at the Syracuse Arts Academy and churches were estimated using FHWA's noise guidelines for masonry structures assuming single- or double-glazed windows. The noise reduction due to these features is 25 dBA (single-glazed windows) to 35 dBA (double-glazed windows). Noise-reduction factors were subtracted from the modeled exterior noise levels shown in Table 12-6 below.

In undeveloped areas around the alignments, future noise levels would range from about 60 dBA at 500 feet from the alignment to about 80 dBA at locations very close to the road (20 feet from the edge of pavement). Increases in noise levels in any areas that are not permitted for development prior to the signing of the Record of Decision would not be considered noise impacts, would not be evaluated for noise mitigation, and would not be eligible for any federal noise-abatement funding.

Table 12-6. Modeled Non-residential (Activity Category C) Noise Impacts

Activity C Modeled Impact Locations	Alternatives	Modeled Exterior Noise (dBA)	Interior Noise for Buildings[a] (dBA)
South Park	A1, A2, B1, B2	71 to 72	—
Bus Park	A1, A2, B1, B2	72	—
Canyon Creek Elementary School	A1, A2, B1, B2	69	34 to 44
Jefferson Academy	A1, A2, B1, B2	52	17 to 27
Kays Creek Elementary School	A1, A2, B1, B2	65	30 to 40
Old Emigration Trail	A1, A2, B1, B2	55 to 62	—
LDS church – 549 S. 1525 W., Farmington	A1, A2, B1, B2	53	17 to 27
LDS church – 905 N. Foxhunter Dr., Farmington	A1, A2, B1, B2	55	30 to 40
LDS church – 2500 S. Bluff Rd., Syracuse	B1, B2	57	22 to 32
LDS church – 3065 S. Bluff Rd., Syracuse	A1, A2, B1, B2,	51	16 to 26
LDS church – 3267 W. 700 S., Syracuse	B1, B2	58	23 to 33
LDS church – 4383 W. 300 N., West Point	A1, A2	60	25 to 35
Jensen Nature Park	A1, A2, B1, B2	59 to 62	—
Syracuse Arts Academy	B1, B2	68	33 to 43
Fremont Park	B1, B2	55	—
Rock Creek Park	B1, B2	57	—
Glen Eagle Golf Course	B1, B2	58	—
Schneiter's Bluff Golf Course	B1, B2	59	—

[a] Source: FHWA 2011, 30–31

LDS = Church of Jesus Christ of Latter-day Saints

Figures 12-37 and 12-38, Four-Lane Noise Contours and Two-Lane Noise Contours, in Volume IV show where the 66-dBA contour line is expected for an area with the four-lane typical section and an area with the two-lane typical section using the worst-case noise scenarios of LOS C traffic. The 66-dBA contour line with the four-lane typical section is expected to be about 247 to 255 feet from the centerline of the travel lanes in each direction (northbound and southbound). The 66-dBA contour line with the two-lane typical section is expected to be about 218 to 231 feet from the centerline of the travel lanes. The 66-dBA contour line represents the areas that would have residential noise impacts under UDOT's current noise policy.

As previously described in Section 12.4.1, Methodology, it is important to note that these noise levels are based on an LOS C volume of 1,600 vphpl operating at a free-flow speed of 65 mph. This is consistent with the UDOT noise policy but is substantially greater than the predicted WDC traffic in 2040, which would likely have volumes averaging about 294 vphpl and peak-hour volumes about 867 vphpl. Therefore, the traffic modeling suggests that the noise from the WDC in 2040 is likely to be less than what is shown in the figures and described in the analysis in this chapter. Modeling using predicted WDC 2040 traffic volumes estimated that noise levels would be about 50 dBA at 300 feet from the WDC right-of-way and 47 dBA at 600 feet from the WDC right-of-way.

Noise Levels and Land-Use Considerations

The federal government has no authority to regulate land-use planning on non-federal land but encourages state and local governments to practice land-use planning and control near highways to prevent incompatible development adjacent to highways.

To assist with this effort, the WDC team developed noise contour information to show the distance where the 66-dBA residential NAC would be exceeded (see Figures 12-37 and 12-38, Four-Lane Noise Contours and Two-Lane Noise Contours, in Volume IV). The WDC team encourages local governments to use this information in future planning efforts. Mitigation measures for reducing noise impacts from Alternatives A1–A2 and Alternatives B1–B2 were evaluated using the UDOT noise policy's guidelines for determining feasibility, reasonableness, and cost-effectiveness. The mitigation evaluation for noise impacts is described in Section 12.4.5, Mitigation Measures.

12.4.4 Wetland Avoidance Options

Two wetland avoidance options are being evaluated in this Final EIS, as shown in Table 12-7. The purpose of these options is to avoid wetland impacts per guidance from the U.S. Army Corps of Engineers on wetland avoidance. Either wetland avoidance option could be implemented with any of the A or B Alternatives.

In this section, the impact information for the wetland avoidance options provides only the differences in impacts for the A and B Alternatives as a result of using the wetland avoidance options. The differences in impacts would apply to any of the A and B Alternatives if they were to use the wetland avoidance options.

Table 12-7. Components of the Wetland Avoidance Options

Option	Location	City	Description
Farmington	Prairie View Drive and West Ranches Road	Farmington	Shift the A and B Alternatives in Farmington about 150 feet east to the southwest side of the intersection of Prairie View Drive and West Ranches Road.
Layton	2200 West and 1000 South	Layton	Shift the A and B Alternatives in Layton about 500 feet east to the northeast side of the intersection of 2200 West and 1000 South.

The wetland avoidance options, which use the two eastern shifts described in Table 12-7 above, would have four fewer residential noise impacts than the alternatives that do not use the wetland avoidance options.

12.4.5 Mitigation Measures

This section discusses UDOT's methodology for evaluating noise-abatement mitigation measures for the traffic noise impacts identified in Section 12.4.3, Alternatives A1–A2 and B1–B2. As stated in Section 12.4.1, Methodology, noise mitigation typically consists of installing a noise wall or other physical barrier that blocks the line of sight from the roadway noise source to nearby receptors.

According to the UDOT Policy 08A2-01, noise abatement will be considered for new highway construction where noise impacts are identified. The goal of noise abatement is to substantially reduce noise, which might or might not result in noise levels below the NAC.

The two primary criteria to consider when evaluating noise-abatement measures are feasibility and reasonableness. Noise abatement will be provided by UDOT only if UDOT determines that noise-abatement measures are *both* feasible and reasonable.

12.4.5.1 Feasibility Factors

The feasibility of noise-abatement measures deals primarily with construction and engineering considerations such as safety, presence of cross streets, sight distance, and access to adjacent properties, among others. Under UDOT's policy, a noise barrier must also be considered "acoustically feasible" (that is, the barrier must reduce noise by at least 5 dBA for at least 50% of front-row receptors). A 5-dBA change in noise would be perceptible by most people under normal listening conditions.

What is a front-row receptor?

A front-row receptor is a noise-sensitive receptor that is adjacent or nearest to a WDC alternative.

If a noise-abatement measure is determined to be feasible, then the abatement measure will be evaluated to determine whether its construction is reasonable. If a noise-abatement measure is determined to be not feasible, it will not be considered any further.

12.4.5.2 Reasonableness Factors

Under UDOT's noise-abatement policy, reasonableness factors must be collectively achieved in order for a noise-abatement measure to be considered "reasonable." If any of the three reasonableness factors (noise-abatement design goal, cost-effectiveness, and viewpoints of property owners and residents) specified in the policy are not achieved, the noise-abatement measure will be considered not reasonable and therefore not included in the project.

- **Noise-Abatement Design Goal.** UDOT defines the minimum noise reduction (design goal) from proposed abatement measures to be 7 dBA or greater for at least 35% of front-row receptors. As a result, no abatement measure will be considered reasonable if the noise-abatement design goal cannot be achieved.
- **Cost-Effectiveness.** The cost of a noise-abatement measure must be considered reasonable for it to be included in the project. Noise-abatement costs are determined by multiplying a fixed unit cost per square foot by the height and length of the barrier.

  For residential receptors (Activity Category B in Table 12-2 above, UDOT's Noise-Abatement Criteria), cost-effectiveness is based on the cost of the abatement measure (for example, a noise wall) divided by the number benefited receptors (dwelling units at which noise is reduced by a minimum of 5 dBA as a result of the abatement measure). Currently, the maximum cost used to determine the reasonableness of a noise-abatement measure is $30,000 per benefiting receptor based on a unit barrier cost of $20 per square foot of barrier.
- **Viewpoints of Property Owners and Residents.** If a noise-abatement measure is both feasible and cost-effective, the viewpoints of property owners and residents (non-owners) must be solicited to determine whether noise abatement is desired. Balloting will be conducted for those noise-abatement measures that both meet the noise-abatement design goal and are cost-effective.

12.4.5.3 Noise-Abatement Evaluation for the Proposed Alternatives

The effectiveness of noise barriers is generally limited to areas within about 300 feet of the proposed right-of-way. Beyond this distance, noise barriers do not effectively reduce noise levels at individual residences. In addition, differences in terrain and elevation between the roadway and the nearby residences can reduce the effectiveness of noise barriers.

The noise-abatement analysis discussed below was applied to those areas adjacent to each WDC action alternative where there were clustered residences that would potentially benefit from a noise barrier. As described in Section 12.4.5.2, Reasonableness Factors, in order to be considered a reasonable noise-abatement measure, a noise barrier had to reduce project-related noise levels by at least 5 dBA for 50% of front-row receptors, reduce project-related noise levels by 7 dBA for at least 35% of front-row receptors, and meet UDOT's cost-effectiveness criterion of costing $30,000 or less per benefiting residence.

Noise barriers were evaluated at 31 locations. The locations of the 31 noise barriers are shown and labeled in Figures 12-1 through 12-36, Noise Receptor Impacts, in Volume IV.

For each noise barrier location, the feasibility and reasonableness of various barrier heights were evaluated to determine the following:

- The number of benefiting residences (those at which noise would be reduced by at least 5 dBA, regardless of whether they met or exceeded the residential NAC)
- Whether at least 50% of front-row residences would meet the noise-abatement feasibility goal of a 5-dBA reduction from the barrier
- Whether at least 35% of front-row residences would meet the noise-abatement design goal of a 7-dBA reduction from the barrier
- The cost-effectiveness of the barrier (cost per benefiting residence)
- Whether the barrier is overall both feasible and reasonable (cost-effective)

The results of the barrier evaluation are summarized in Appendix 12A, Barrier Mitigation Tables. Appendix 12A shows the abatement evaluation for each noise barrier that was considered. As shown in Appendix 12A, 4 of the 31 modeled noise barriers met UDOT's feasibility and reasonableness criteria.

The four modeled noise barriers that met UDOT's feasibility and reasonableness criteria are Barriers 4, 12, 14, and 25. These noise barriers are shown in Figures 12-7, 12-29, 12-31, and 12-21, Noise Receptor Impacts, in Volume IV.

Noise-Abatement Consideration during Final Design. If an action alternative is selected, the noise impact analysis will be revised during the final design phase of the project to more accurately reflect the alternative's proposed vertical and horizontal alignment. In addition, any new residential developments that receive a final building permit before the Record of Decision for the project is approved by FHWA will be accounted for in this noise impact analysis. For these reasons, the final recommendations concerning noise-abatement measures will be determined during the final design of the selected alternative, and the results discussed above in Section 12.4.5.3 could change based on a revised analysis.

12.4.6 Cumulative Impacts

There are no anticipated cumulative impacts from noise generated by traffic on the WDC. Cumulative impacts were analyzed for local and regionally important issues (ecosystem resources, air quality, water quality, floodplains, farmland, economics, and community impacts). The list of resources analyzed for cumulative impacts was developed with input from resource agencies and the public during scoping. For a more detailed discussion of cumulative impacts, see Chapter 24, Cumulative Impacts.

What are cumulative impacts?

Cumulative impacts are the resulting impacts from the proposed action combined with impacts from other past, present, and reasonably foreseeable future actions.

12.4.7 Summary of Impacts

Table 12-8 summarizes the noise impacts from Alternatives A1–A2 and Alternatives B1–B2.

Table 12-8. Modeled Noise Impacts from Alternatives A1–A2 and B1–B2

	Number of Modeled Noise Impacts	
Alternative	**Residences (Activity Category B)**	**Non-Residential (Activity Category C)**
A1	550	9
A1 with wetland avoidance options	546	9
A2	627	12
A2 with wetland avoidance options	623	12
B1	879	15
B1 with wetland avoidance options	875	15
B2	828	15
B2 with wetland avoidance options	824	15

As shown in Table 12-8 above, the proposed alternatives would cause noise impacts at 546 to 879 residences, depending on the alternative. Alternative B1 without the wetland avoidance options would have the most residential noise impacts (879), and Alternative A1 with the wetland avoidance options would have the fewest residential noise impacts (546).

Alternative A1, which uses the 5100 West alignment in Davis County, would have 77 fewer noise impacts than Alternative A2, which uses the 5400 West alignment in Weber County. Alternative B1, which uses the 4100 West alignment in West Point, would have 51 more noise impacts than Alternative B2, which uses the 4800 West alignment in West Point.

The wetland avoidance options, which use the two eastern shifts described in Table 12-7 above, Components of the Wetland Avoidance Options, would have four fewer residential noise impacts than the alternatives that do not use the wetland avoidance options. As shown in Appendix 12A, Barrier Mitigation Tables, 4 of the 31 modeled noise barriers met UDOT's feasibility and reasonableness criteria. The results of the barrier evaluation are summarized in Appendix 12A.

12.5 References

[CEQ] Council on Environmental Quality

1970 Environmental Quality: The First Annual Report of the Council on Environmental Quality.

[FHWA] Federal Highway Administration

2011 Highway Traffic Noise: Analysis and Abatement Guidance. December.

[UDOT] Utah Department of Transportation

2017 UDOT Policy 08A2-01, Noise Abatement. Revised March 22, 2017.