Executive Summary

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The U.S. Court of Appeals for the Tenth Circuit remanded the Legacy Parkway final environmental impact statement (Final EIS) (Federal Highway Administration et al. 2000) for additional consideration of the following five areas.

1. Practicability of a narrower right-of-way.

2. Elimination of the Denver & Rio Grande (D&RG) regional alignment as a feasible alternative based on cost and substantial impacts on existing development.

3. Alternative sequencing of the Shared Solution.

4. Integration of the Legacy Parkway project and mass transit.

5. Impacts on wildlife, including migratory birds.

This technical memorandum addresses the fifth issue identified by the court, impacts on wildlife. The court's remand found that the Federal Highway Administration (FHWA) and the U.S. Army Corps of Engineers (Corps) failed to adequately consider impacts on wildlife, both in the Final EIS and when making the determination to issue the Clean Water Act (CWA) Section 404 individual permit authorizing construction of the Legacy Parkway project. The court found that, by limiting the impact evaluation to habitat structure within a 305-meter (m) (1,000-foot [ft]) area, the federal lead agencies had failed to consider impacts on migratory bird populations that use the larger Great Salt Lake Ecosystem (GSLE). This technical memorandum expands on the Final EIS analysis of impacts on wildlife by considering direct, indirect, and cumulative impacts on wildlife, particularly migratory species, within and beyond a 305-m (1,000-ft) project study area in the GSLE.

ES.1 Approach to Preparing this Memorandum

This technical memorandum was prepared with input from ecologists and biologists from FHWA, the Corps, Utah Department of Transportation (UDOT), and their representative technical consultants, as well as wildlife biologists and technical experts from the U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), and Utah Department of Natural Resources (UDNR). This inclusive approach was intended to ensure that the best available scientific information was acquired and appropriately analyzed. The methods and analyses used to evaluate the potential impacts on wildlife from the Legacy Parkway project are introduced below.

ES.1.1 Methods Used to Acquire Information

- **Habitat Delineation.** Wildlife habitats—specifically open water, riparian, emergent marsh, wet meadow, mudflat/pickleweed, pasture, cropland, salt desert scrub, and developed (urban landscaping)—within the project study area were delineated and mapped.
- **GIS Mapping.** Wildlife habitats around Great Salt Lake for which spatial data were available were mapped using geographic information system (GIS) technology.
- **Species Identification.** Wildlife species that use or could potentially use the delineated habitats were identified, and their ecological status (e.g., seasonal occurrence, breeding and migratory status, habitat requirements) within the project study area and around Great Salt Lake was documented.
- **Habitat Evaluation.** The ecological importance of the different habitats to migratory wildlife within the project study area and around Great Salt Lake was evaluated.
- **Literature Review.** Scientific literature on the potential impacts of highway noise, artificial light, highway mortality, habitat modification, and human disturbance on wildlife was reviewed.

ES.1.2 Analysis

- **GIS Analysis of Habitat Change.** A GIS analysis was conducted to determine how wildlife habitat would change within the project study area with implementation of the Legacy Parkway project. The analysis focused on habitat loss, fragmentation, and degradation, and how these changes could potentially affect species that use the habitats locally and regionally around Great Salt Lake.
- **GIS Analysis of Changes in Lake Level and dynamics of habitat availability and distribution.** A GIS analysis was conducted to characterize how natural changes in the level of Great Salt Lake affect the availability of wildlife habitat in the project study area and around Great Salt Lake combined with the different build alternatives.
- **Bioacoustics Analysis.** A bioacoustics analysis was conducted to determine the biological nature and geographic extent of potential adverse effects of highway noise on migratory birds.
- **Highway Noise Model Analysis.** Highway noise levels for the different project alternatives were modeled to determine the spatial extent of noise effects and how different wildlife habitats would be affected.

ES.2 Results of Technical Analysis

The Great Salt Lake Ecosystem is internationally important to millions of migratory birds as a major stopover, staging, and breeding area. The proposed Legacy Parkway project is located within the GSLE. The analyses conducted for this study evaluated the potential impacts of implementation of the proposed action on wildlife resources within the project study area and around the GSLE. The results of the analyses are briefly summarized in Table ES-1 and discussed in detail in Chapter 3, *Environmental Consequences*.

ES.2.1 Direct Habitat Loss from Proposed Action

The Legacy Parkway project would result in the direct loss of from 238 hectares (ha) (588 acres [ac]) to 340 ha (840 ac) of wildlife habitat within the project study area (Table ES-2).

ES.2.2 Change in Level of Great Salt Lake

As the level of Great Salt Lake rises, existing terrestrial habitats are inundated and converted to saline open water habitat. The lake reached a historic high of approximately 1,283.7 m (4,211.5 ft) on April 15, 1987, and a low of 1,277.4 m (4,191 ft) on October 15, 1963. As the lake level rises, the total amount of available terrestrial habitat within the project study area decreases. As the lake level recedes, the former ecological communities regenerate slowly. The combined effects of natural inundation from changes in lake level and implementation of each build alternative were examined to determine how these factors act in concert to affect the temporal pattern of overall availability of wildlife habitats within the project study area. The results of this analysis are summarized below.

- At the regional level, there is relatively little change in upland habitats (pasture, cropland, scrub) as lake level changes rises, but there is a 64 percent reduction at high water of both mudflat/pickleweed and emergent marsh habitats, a 30 percent reduction in wet meadow, and a 15 percent reduction in available riparian habitat. However, the amount of any habitat that would be lost under any build alternative on a regional basis would be proportionally very small both at low lake level (<0.3 percent) and at high lake level (<0.6 percent) because of the very large area of these habitats available regionally.

- At the project study area level, the change in the areas of habitats that would be lost to the Proposed action is proportionally greater than at the regional level, both at low and high lake levels. For example, mudflat/pickleweed habitat lost under Alternative C changes from 5 percent of available habitat in the project study area at low lake level to 27 percent of the habitat in the project study area at high lake level—a difference of 22 percent. Under Alternative B, loss of emergent marsh habitat changes from 9 percent at low lake level to 20 percent at high lake level—a difference of 11 percent. Changes between low and high lake level percentages for all other habitats are smaller. These project study area changes represent the local effects of lake level change on habitat availability.

- The rate of change of availability of each habitat type as inundation occurs varies depending largely on the habitat's distribution within each inundation zone. For example, the extent of available mudflat/pickleweed changes rapidly between 1,281.4 m (4,204 ft) and 1,283.8 m (4,212 ft), the inundation zone in which most of that habitat occurs; this rate surpasses the rates of change of other low-elevation wetland/riparian habitats (emergent marsh, wet meadow, and riparian). Overall, the lower-elevation wetland/riparian habitats become inundated at higher rates than do upland habitats within the same inundation zones.

- Except for open water habitat, the alignments of the different project alternatives are located such that the highest levels of impact from habitat loss occur mostly in the middle elevation zones (1,281.4–1,282.6 m [4,204–4,208 ft] and 1,282.6–1,283.8 m [4,208–4,212 ft]). This is characteristic of both wetland/riparian and upland habitats. Open water habitat (fresh water) is mostly affected in the lower inundation zones.

- The probability of inundation, as estimated from historic conditions (pre-settlement; before 1847) (Figure 2-4), is highest for the two inundation zones below 1,282.6 m (4,208 ft) (24–33 percent for

these zones, contrasted with 1.7–8.3 percent for zones above 1,282.6 m [4,208 ft]). This trend indicates that when assessing the relative level of impacts of each alternative, these impacts should be evaluated relative to the probability of inundation, with emphasis on those zones subject to the greatest potential impact but with low probability of inundation (i.e., zones above 1,282.6 m [4,208 ft]).

- Wetland and riparian habitats are distributed largely at the lower elevations of the project study area, and are therefore inundated at initial increases of lake level. Upland habitats occur primarily at the higher elevations. At the historic high-water level (1,283.8 m [4,212 ft]), 97.2 percent of open water habitat (e.g., freshwater ponds), 73.4 percent of mudflat/pickleweed, 74.9 percent of emergent marsh, 69.6 percent of riparian, and 46.9 percent of wet meadow habitats are converted (i.e., lost) to saline open water. By contrast, only 20.0 percent of cropland, 21.9 percent of pasture, and 38.9 percent of salt desert scrub habitat are converted by the same rise in lake level.

- With rising lake level, inundation combines with direct habitat loss that would result from the build alternatives to reduce the overall availability of habitat to wildlife. Because the portion of the highway footprint that is inundated would not be available whether or not the alternative were constructed, the direct loss of available habitat caused by the build alternatives is lowest at high lake levels and highest at low lake levels. (It should be noted that the highway itself would not be inundated because it would be raised above ground level.)

- In the project study area, the rise in lake level reduces the availability of wetland habitats and progressively forces birds to move inland, closer to the proposed highway alignment. This process could potentially increase the risk of project-related impacts on birds (e.g., collisions with vehicles, noise, human disturbance). Such consequences would pertain especially to wetland species that typically use upland areas for refuge during inclement weather and for roosting. The Proposed action would potentially compound the effects of habitat loss from inundation by reducing the availability of associated upland habitat used by these species. However, these effects would be temporally scaled to the frequency, height, and duration of inundation in the project study area. Inundation at the higher elevations has a much lower probability of occurrence, but would have an increasingly pronounced effect as habitat availability diminishes. With recession of lake levels, these effects decrease as former habitat regenerates.

- If increasing lake level occurs rapidly, some less mobile wildlife (e.g. mice, snakes, frogs, nonflying insects) will perish unless they can move to suitable habitat above the waterline. If the rise is gradual (e.g., over several seasons), local populations will change in size in proportion to the reduced carrying capacity of the remaining habitat.

- The above-described effects of lake level change were determined for existing conditions. Projected future build-out within the project study area would result in a marked reduction in the amount of remaining natural habitat in the project study area. The combined affects of lake level rise, future build-out and the Proposed action would leave little habitat available for wildlife within the project study area at high water. The overall habitat loss/fragmentation effects of the Proposed action on the remaining small amount of natural habitat would be proportionally greater with future build-out.

ES.2.3 Habitat Fragmentation

In addition to direct habitat loss, the Proposed action would result in fragmentation of existing habitats. On the most general level, each of the build alternatives would dissect the matrix of wildlife habitats in

the project study area into east and west areas. The area east of the proposed rights-of-way has been largely modified by development and is currently experiencing continued rapid urban growth. Projected future growth in this area is likely to result in complete build-out. This area does not appear to support any ecologically unique habitats that are not also represented west of the proposed alignments. The area west of the proposed rights-of-way retains a greater proportion of wetlands and wildlife habitats. This primary fragmentation effect of the Proposed action is not expected to reduce the diversity of habitat types within the project study area. In addition to this primary effect, all the build alternatives would result in the finer scale fragmentation of many existing wildlife habitat patches within the project study area. Each build alternative would result in a general decrease in the size of habitat patches available to wildlife in the area and a decrease in the number of larger patches, particularly in upland habitats. There would be a declining trend in the total amount of habitat in most size classes in most habitat types, with the exception of wetland habitats in the <0.4-ha (<1-ac) size class.

The overall effects of construction of the Legacy Parkway project on habitat fragmentation are summarized below.

- Alternatives A and E would have the least impact on fragmentation across the habitat types. Alternative A is located more to the east and would reduce the amount of habitat isolated between the right-of-way and existing development east of the alignment.

- The number of upland patches would increase under all build alternatives. Alternatives A and E would cause the least increase in the number of upland patches. Alternative B would cause the largest increase in the number of upland patches, predominantly in the smaller patch sizes. The changes in mean patch size reflect the same pattern.

- The number of wetland patches would increase under all build alternatives. Alternative E would cause the least increase in the number of wetland/riparian patches. Alternative A would cause the highest increase, but would result in very little change in mean patch size.

- In the area east of the proposed alignments, there are no unique or unusually valuable habitat types, either terrestrial or wetland/riparian, that would not still be represented in the remaining area west of the alignments. This primary fragmentation effect of the project would not therefore reduce the diversity of habitat types in the project study area or in the GSLE in general.

- The fragmentation effects of the build alternatives on local wildlife populations would be additive to existing levels of fragmentation and all reasonably foreseeable future fragmentation that is likely to occur in the area (see Section 4.13.3.3, *Cumulative Effects*). Physical segregation of upland habitats from wetlands in the project study area could potentially have an adverse regional effect on migratory shorebirds and waterfowl that traditionally use both habitats in the area.

These changes would likely result in a number of effects on wildlife habitat, including reduction in habitat patch size, increase in the perimeter-to-area ratio of patches and associated edge effects, reduced connectivity between habitat patches, and introduction of barriers to dispersal for some species. Reduced habitat patch size can decrease the resources available to wildlife species, in turn reducing the local carrying capacity for those species. Moreover, smaller habitat patches are typically characterized by an increase in the length of the patch edge relative to the patch area, as well as a reduction in the distance from the edge to the center of the patch. These changes can favor a reduction in the ecological buffering capacity of the patch for species sensitive to detrimental factors outside the patch (e.g., microclimate, competition from other species, predation, noise and human disturbance, pollution, highway mortality). Construction of any build alternative could also introduce a physical barrier to movement and dispersal of

some species, especially those with low dispersal capabilities, such as small mammals, reptiles, and amphibians.

However, because the existing habitat in the project study area is already highly fragmented by a diversity of human activities (e.g., agriculture, fences, roads, urban development), the additional fragmentation effects that the build alternatives would have on wildlife would likely be less than, but additive to, the effects of direct habitat loss. The fragmentation metrics of the build alternatives display detectable variation, but the differences are small and biologically indistinguishable at the scale of this analysis. The results of the assessment of the effects of direct habitat loss on special-status species, including area lost as a result of fragmentation, indicate that local populations of some species would be affected by loss of individuals and/or habitat. Analysis of the effects of fragmentation relative to those of direct habitat loss show that in landscapes with loss of more than 30 percent of suitable habitats, changes in patch size and isolation will complement the effects of habitat loss, and the loss of species or declines in population size will be greater than those expected to result from habitat loss alone. The Ogden hydrologic unit, where the majority of the Proposed action would be located, has already lost nearly 70 percent of its estimated historic wetland/wildlife habitats. Under these conditions, there is a potential for a substantial increase in isolation of species populations, leading to declines in species numbers. These losses, however, would occur locally. Because extensive areas of suitable wildlife habitat are still present in the region as a whole, the population declines precipitated by the Proposed action would not result in a notable change in the long-term viability of these species in the GSLE.

ES.2.4 Changes in Habitat Quality

Water Quality

Preliminary hydrological analyses of surface and subsurface water flow in the project study area, conducted since publication of the Final EIS, indicate that, with installation of appropriate drainage structures, the Proposed action would not significantly impede normal water flow among wetland habitats. Implementation of pollutant management BMPs, including the vegetated biofiltration median strip proposed in the Final EIS, would reduce highway-associated pollution and degradation of water quality. Catastrophic spills of ecologically harmful materials are possible, and spilled toxins could be transported over large areas. Such spills could affect numerous individuals of multiple species both directly and through the food chain. Existing hazardous material transportation regulations and spill response contingency programs would minimize the adverse effects of these events to the extent possible. Changes in water quality would be similar under all build alternatives. With minimization of roadside pollutant runoff to adjacent wildlife habitats, the effects of the proposed action on species occurring there would be low and would not likely affect the long-term viability of those species. However, catastrophic spills could have significant adverse effects on species found within a spill area.

Air Quality

Changes in air quality in the project study area would consist primarily of an increase in highway-related pollutants. This change would likely have little effect on migratory species passing through the area. However, resident species could be subjected to increased levels of air pollutants, particularly during temperature inversion periods. Analysis of future (2020) air quality conditions indicate that carbon monoxide and particulate matter will likely be higher along the alignment of the proposed action. Ozone is not expected to cause new exceedances of the National Ambient Air Quality Standards (Utah Department of Environmental Quality, Division of Air Quality 1997), but the potential effects on wildlife

caused by the proposed action are unknown. Similarly, future concentrations of nitrogen dioxide and lead are not expected to change from existing conditions in the project study area, but their effects on wildlife are unknown. Any effect on wildlife and wildlife habitat quality resulting from changes in air quality would be similar for all build alternatives.

Catastrophic Hazardous Materials Spills

Hazardous waste or other chemical spills in wetland habitats could potentially have adverse effects on wildlife, particularly when water levels are high. Existing UDOT and FHWA/EPA requirements for safe transport of these materials and emergency spill containment programs would minimize these effects under most conditions. However, unavoidable accidents could occur. Most spills would be localized and would therefore vary in effect between build alternatives, but the effects would be worst in aquatic habitats. Alternative B, which crosses the most wetland habitat, would be most susceptible to adverse effects on wildlife from an accidental hazardous materials spill. Because of their alignment in more upland locations, Alternatives A and E would be less susceptible.

ES.2.5 Habitat Modification

Hydrology

Based on the results of preliminary hydrological investigations, the effects of the proposed action on local habitat are expected to be minimal under all build alternatives, assuming fill heights are minimized and equalization culverts and horizontal strip drains are installed under all build alternatives to equalize surface and groundwater levels.

Highway Landscaping

Highway landscaping could provide both beneficial and negative effects. It could provide some habitat for wildlife, particularly migrating passerine birds and possibly raptors. However, landscaping could also favor conditions for increased highway-related mortality of these species. Use of pesticides and treated sewage water to maintain the landscaping could also add to the highway-associated contaminant load in adjacent wildlife habitats, particularly wetlands. The beneficial and adverse effects of artificial landscaping would be similar under all build alternatives.

ES.2.6 Wildlife Mortality

With increased vehicular traffic in the project study area, road mortality of individuals of some species—particularly birds flying between habitats on different sides of the highway and dispersing amphibians, reptiles, and small mammals—is likely to increase. This would be particularly evident during periods of high lake level, when bird species would be more likely to use upland habitats adjacent to the highway. The three fences proposed to border the highway right-of-way would help minimize these impacts by forcing birds to take higher flight paths and deterring cross-highway movement of all species. Numerous drainage culverts proposed to be installed under the highway would also facilitate wildlife movement without road mortality. The effects of the proposed action on highway-related road mortality of wildlife would be expected to be similar under all build alternatives

ES.2.7 Artificial Light Disturbance

Artificial light from highway lamps could potentially attract migrating birds during foggy/low visibility weather conditions. Some incidental mortality could occur from disoriented birds colliding with vehicles and light standards, but the frequency of these events would likely be low and would not adversely affect the viability of any species. The light could also provide a benefit to bats by attracting insects on which bats forage. The potential effect of additional light on wildlife would be comparable under all build alternatives.

ES.2.8 Highway Noise Disturbance

The modeled areal extent of potential highway noise effects on wildlife habitat shows differences among alternatives in each noise level contour interval relative to the position of the alignment and the spatial distribution of wildlife habitat patches. The total area of wildlife habitat exposed to the different noise levels within the area analyzed is summarized in Table ES-3.

Analysis of the total area of wildlife habitat that would be affected by highway noise in each noise contour interval showed an increase of 42–61 percent in the 60+ dB impact area, depending on the alternative; an increase of 19–58 percent in the 55 to 60 dB area; and an increase of 27–47 percent in the 50 to 55 dB area. The noise level interval of 45–50 dB showed slight decreases in the area affected within the analysis area.

Highway noise is typically neither loud nor startling enough to cause marked stress effects on wildlife (Saigul-Klin et al. 1977). However, highway noise can mask important vocal communication and natural sounds important for mate attraction, social cohesion, predator avoidance, prey detection, navigation, and other basic behaviors. Masking of vocal communication occurs when highway noise interferes with signal transmission by swamping out the signal or parts of the signal (e.g., low-amplitude elements of a song) or degrading the signal to a point at which it is no longer recognizable to other members of a species. When such masking or degradation occurs, the normal communication and associated biological functions of the species can be impaired. Depending on the degree of masking and the particular species' capacity to adapt (e.g., to sing louder), masking can potentially result in abandonment of an area or reduced productivity and survival. Signal masking may result in the inability of males to effectively attract mates and/or repel territorial rivals. Excess energy may be required to physically maintain a territory and to sing louder. Predator warning and parent-offspring signals can be impaired. All these factors could potentially result in reduced survival and reproductive success of affected populations adjacent to the highway.

Traffic noise associated with all the build alternatives could potentially mask vocal communication among some birds. These masking effects are highly species-specific and depend largely on the unique bioacoustics characteristics of each species' vocal signals. The potential impact on American Bitterns (*Botaurus lentiginosus*) represents the greatest distance for possible masking effects (4.8 km [3 mi]; see Appendix E), but this species is only a rare summer visitant to the GSLE that has not been observed in the project study area. Other species such as Black-necked Stilts (*Himantopus mexicanus*), which are common breeders within the project study area, would only be minimally affected by traffic noise close to the highway (76 m [250 ft]; see Appendix E). For territorial songbirds such as Brewer's Sparrows (*Spizella breweri*), noise would have a potential masking effect at intermediate distances.

Potential Effects of Highway Noise on Special-Status Species

Nine special-status bird species (Bald Eagle [*Haliaeetus leucocephalus*], Swainson's Hawk [*Buteo swainsoni*], Peregrine Falcon [*Falco peregrinus*], Prairie Falcon [*Falco mexicanus*], Burrowing Owl [*Athene cunicularia*], Short-eared Owl [*Asio flammeus*], Wilson's Phalarope [*Phalaropus tricolor*], Bobolink [*Dolichonyx oryzivorus*], and American Avocet [*Recurvirostra americana*]) are known to breed in or near the project study area. The potential effects on these species of highway noise that would result from the build alternatives are described in detail in Chapter 3, *Environmental Consequences*, and Appendix E , *Bioacoustics Analysis of Potential Effects of Highway Noise on Wildlife of Great Salt Lake*. Based on an analysis of minimum-amplitude vocal signals, the potential effects distance of highway noise for bird species of concern could extend from less than 38 m (125 ft) to much more than 610 m (2,000 ft) from the highway. For example, Wilson's Phalaropes would have to be more than 610 m (2,000 ft) from the highway to transmit minimum-amplitude signals. Burrowing Owls would need to be 305 m (1000 ft) or more from the highway to avoid noise masking of inter-territorial communication.

It is not known exactly how highway noise would affect the local density and reproductive capacity of individual special-status species currently using habitats in the project study area. Highly noise-sensitive species may leave the affected areas; others may experience reduced reproductive success due to poor communication or reduced ability to detect predators and potential prey. Published research on highway noise impacts on grassland bird species in acoustic habitat similar to that found in the project study area shows reduced bird densities in response to traffic noise levels higher than 45 dB(A). Using 45-dB(A) as an outward-limit benchmark of effects, the area potentially affected by noise from the proposed action could extend on average 4 km (2.5 mi) from the highway.

ES.2.9 Human Disturbance

Access of humans and domestic pets (especially cats) to wildlife habitats adjacent to the highway could result in some level of habitat degradation and wildlife mortality. The existing design for the Legacy Parkway project includes three fences that would restrict access to sensitive wildlife areas; this design component is expected to minimize these effects. Localized disturbance from human use of the proposed trail corridor is also possible, but such adverse effects would likely be secondary to traffic noise effects. Alternative B, which crosses the largest extent of wetland habitats, would probably cause the greatest wildlife disturbance, particularly when the lake level is high. Because Alternatives A and E are located in more upland alignments than Alternatives B and C, they would probably disturb wildlife to a lesser extent. However, many wildlife species, particularly shorebirds, use these upland areas. Fencing of the highway right-of-way and protection of the Legacy Nature Preserve would reduce human impacts under all build alternatives.

ES.2.10 Effects on Special-Status Wildlife

The principal potential effects of the proposed action on special-status wildlife would be direct loss of foraging habitat, disturbance of nesting sites, and masking of communication near the highway. The magnitude of these effects would be proportional to the level that individual species use each habitat. The effects of the proposed action on special-status wildlife are directly related to the amount of direct habitat loss. The project would result in a reduction in population of some special-status species within the project study area, but the overall impact of these losses alone would not affect the long-term viability of any of these species in the GSLE.

ES.2.11 Cumulative Impacts: Historic, Foreseeable Future, and Proposed Action

Historic Conditions: Cumulative Habitat Loss

Historic land use changes within the GSLE have significantly reduced available wildlife habitat for migratory birds and other species, both around Great Salt Lake and within the project study area, as summarized below.

- An estimated 58 percent of historic wetland/wildlife habitat in the GSLE (159,439 ha [393,980 ac] of 274,633 ha [678,630 ac]) has been lost to past activities, primarily due to agriculture and urban development.
- In the Ogden and Jordan River hydrologic units, where the proposed action is located, approximately 66 percent of historic wetland/wildlife habitat has been lost.

Foreseeable Future Conditions

Reasonably foreseeable future land use changes would add to the large historic loss of habitat. Approximately 47 percent (55,002 ha [135,915 ac]) of the remaining wetland/wildlife habitat in the regional study area (117,027 ha [289,181 ac]) is on private lands, which are subject to reasonably foreseeable future land use changes.

Foreseeable future cumulative effects estimated by potential habitat loss from build-out vary by alternative. Two categories of development were identified in the potential future development dataset: areas developed since 1997 (developed), and areas potentially developable in the future (developable). Table ES-4 summarizes the potential loss of wetland and upland habitats in the project study area from both development categories under each alternative.

Proposed Action Proportion of Available Habitat

As summarized above, the Legacy Parkway project would contribute a direct loss of between 234 ha (588 ac) and 341 ha (842 ac) to the cumulative loss of wildlife habitat within the project and regional study areas. The local effect of this loss would be highest during high lake levels when much of the project study area is converted to open saline water habitat. Disturbances from noise, light, and human activity would proportionally affect potentially large areas adjacent to the proposed highway, depending on the bioacoustic and other disturbance sensitivities of wildlife currently using those areas.

The project study area does not contain unique wildlife habitats not found in other areas of the GSLE, but it is located within a system of extensive wetlands that includes the Farmington Bay Waterfowl Management Area, which is used by many thousands of migratory birds each year. The loss of habitat resulting from the proposed action would contribute proportionally to the combined historic and estimated future cumulative impacts in the project study area and the GSLE.

Less than 0.1 percent of regionally available wildlife habitat around Great Salt Lake that is used by migratory species would be directly lost because of implementation of the Legacy Parkway project. The percentage lost for each build alternative is summarized in Table ES-5.

A natural rise in lake level from existing conditions (approximately 1,278 m [4,194 ft]) to its historic high (1,283 m [4,212 ft]) would result in conversion of approximately 47–99 percent of existing wetland/riparian habitat to saline open water habitat. A total of approximately 813.6 ha (2,010.4 ac) of wetland/riparian habitats would be affected. The amount of publicly owned wetland/wildlife habitat in the Ogden hydrologic unit would drop from 55 percent to 5 percent with inundation. This conversion would make the habitat unsuitable for traditional habitat-specific use by many migratory species. Future global climate change could potentially result in higher lake levels.

ES.3 Conclusion

In conclusion, all the build alternatives of the Legacy Parkway project would have adverse direct and indirect effects and would contribute to cumulative effects on local wildlife populations, including migratory birds. These adverse effects would contribute to declines in the local density of affected species. In addition, traffic noise could potentially affect the behavior and reproductive capacity of various migratory bird species within the project study area and vicinity.

The area of wildlife habitat affected by direct habitat loss would be small—approximately 0.1 percent of the total amount of wildlife habitat available throughout the regional study area. Highway noise effects would affect a larger area—approximately 1.3 percent of existing wildlife habitat in the regional study area. Loss or degradation of these areas and biological functions (reproductive capacity of birds affected by noise) would add to the cumulative historic and foreseeable future habitat loss and associated impacts on wildlife in the GSLE. The impacts resulting from the proposed action alone, however, would not likely affect the long-term viability of any wildlife species in the GSLE.

Table ES-1. Summary of Impacts of the Legacy Parkway Project

Project Effect	Impacts
Direct Habitat Loss	238 ha (588 ac) to 340 ha (840 ac).
Habitat Fragmentation	Legacy Parkway would transect the matrix of wildlife habitats in a study area where existing fragmentation is generally considered extensive.
Habitat Quality	Without mitigation measures, Legacy Parkway would cause increases in highway runoff contaminants; no significant air quality impacts on wildlife were identified.
Habitat Modification	No adverse impacts on hydrology were identified; highway landscaping could result in both beneficial and negative effects on wildlife.
Wildlife Mortality	Road mortality of individuals of some species is likely to increase.
Artificial Light Disturbance	Effects would likely be minimal.
Highway Noise Disturbance	Potential masking effects from highway noise are highly variable and species-specific; modeled distances range from less than 100 feet to nearly 3 miles. Noise-sensitive species adjacent to the highway would likely either move away from the disturbance area or remain and adapt to the extent they are able, with some reductions in local population densities and species diversity.
Human Disturbance	Increased access for humans and domestic pets could result in habitat degradation and wildlife mortality.
Special-Status Wildlife	Several protected species occur in the study area and could be affected by Legacy Parkway.
Cumulative Impacts	Legacy Parkway would contribute to large historic cumulative effects on wildlife habitat loss, but the effects of the proposed action alone would not likely affect the long-term viability of any wildlife species.

Table ES-2. Direct Habitat Loss

Alternative	Wetland/Riparian Habitats	Upland Habitats	Total Habitat Loss
No Build	0 ha (0 ac)	0 ha (0 ac)	0 ha (0 ac)
Alternative A	46.6 ha (115.1 ac)	195.3 ha (482.5 ac)	241.9 ha (597.6 ac)
Alternative B	78.8 ha (194.6 ac)	261.9 ha (647.1 ac)	340.6 ha (841.7 ac)
Alternative C	63.3 ha (156.5 ac)	188.7 ha (466.2 ac)	252.0 ha (622.7 ac)
Alternative E	52.4 ha (129.5 ac)	185.5 ha (458.3 ac)	237.9 ha (587.8 ac)

Note: See Section 3.1.2 for a discussion of differences between wetland/riparian habitats and jurisdictional wetlands.

Table ES-3. Acres of Wildlife Habitat Exposed to Noise under Build Alternatives[1]

Alternative	Noise Level Interval (acres exposed to noise level)			
	>/= 60 dB	>/= 55 < 60 dB	>/= 50 < 55 dB	>/= 45 < 50 dB
No-Build (Existing Conditions)	6,908	5,632	8,438	26,551
Alternative A	10,501	7,848	10,726	25,333
Alternative B	11,124	8,884	12,462	25,582
Alternative C	9,814	8,041	11,669	25,298
Alternative E	10,670	6,686	11,985	25,057

[1] These estimates are for reference comparison of alternatives only. The noise level contours generated by the FHWA TNM have not been tested for accuracy beyond 396 m (1,300 ft). The locations of contours beyond this distance are projected estimates only and could vary significantly depending on existing background noise, atmospheric conditions, and substrate type. The noise levels shown within each contour interval, particularly those farthest from the proposed highway alignments, are likely to have only minimal, if any, effect on birds if background wind noise is prevalent (Jones & Stokes 2004).

Table ES-4. Summary of Direct Habitat Loss (acres) of Wetland/Riparian and Upland Wildlife Habitats in Conjunction with Full Build-Out

Habitat	Total Project Study Area	Build-Out		Alternative A and Build-Out		Alternative B and Build-Out		Alternative C and Build-Out		Alternative E and Build-Out	
		Developed	Developable	Developed	Developable	Developed	Developable	Developed	Developable	Developed	Developable
Wetland/Riparian	2,310.7	163.6	28.7	243.7	27.2	294.5	26.1	299.5	24.8	259.6	22.6
Upland	5,894.5	1,123.0	2,935.8	1,518.2	2,625.0	1,638.2	2,621.7	1,535.9	2,657.9	1,530.5	2,628.9

Table ES-5. Percentage of Available Wildlife Habitat Loss by Alternative

Alternative	Wetland/Riparian Habitats	Upland Habitats
No Build	0 ha (0 ac)	0 ha (0 ac)
Alternative A	0.022%	0.019%
Alternative B	0.059%	0.021%
Alternative C	0.049%	0.017%
Alternative E	0.032%	0.019%