

OVERVIEW

To understand the cost implications of the improvements proposed by this *Corridor Plan*, estimates on a cost per square foot (SF) and per acre basis have been prepared. At the planning budget level, these values can be applied over the Landscape Design Segments to produce a planning level cost for the right-of-way sections and individual interchange improvements. These estimates will inform NDOT in the decision-making process and help influence budget allocations for the landscape and aesthetics highway improvements.

PROCESS

Costs for individual hardscape and softscape treatments, such as concrete form liner imprints, retaining walls, and landscape irrigation, were gathered from several sources, including NDOT, local engineering and landscape architecture firms, contractors, and product manufacturers. This information was analyzed and compiled into a database that could be applied to several prototypical examples of landscape and aesthetic treatment levels. The softscape and hardscape costs presented here represent the capital costs of construction and do not include extended maintenance costs. The treatments correlate to those presented in the NDOT *Landscape and Aesthetics Master Plan*. A separate report prepared by UNLV, entitled *Maintenance Cost Study for Corridor Planning*, examines long-term maintenance costs such as graffiti removal, plant care, and irrigation.

Prototypical designs for each of the five softscape types and four hardscape treatments were developed for two Nevada interchanges. Overall cost estimates

for each level of treatment were developed from these and compared to the costs from actual projects for verification. The project area was then incorporated into the estimate to create a per square foot and per acre cost.

Prototypes were also created for the sections of highway right-of-way that exhibit the various types of treatment. A similar process was applied to these areas to create a per square foot and per acre cost for each hardscape and softscape type.

APPLICATION OF DESIGN GUIDELINES

The Design Guidelines included in this report describe the elements that compose a typical highway interchange and right-of-way section. They also describe a base level of landscape and aesthetic quality that is used to predict costs. The intent of this section is to develop a definition of what is considered a “standard” treatment. The next step following adoption of the *Corridor Plan* is for NDOT to initiate internal review to determine implementation strategies. This review will include cost evaluation, priorities and scheduling, and visual preference evaluations to test each standard proposed by this section.

Funding for the landscape and aesthetics portion of a project will generally not be used to cover the ordinary construction costs. The landscape and aesthetics budget is available for softscape and hardscape treatments that exceed the ordinary construction costs.

The following is a summary description of the components contained within an NDOT standard project that are not generally considered landscape and aesthetic elements:

ROADWAY SERVICE AREAS

- Service area program as defined inclusive of designated services

NON-MOTORIZED TRANSPORTATION SYSTEMS

- Maintain existing sidewalk dimension of intersecting road across bridge overpass
- Maintain existing bike lane dimension of intersecting road across bridge overpass.
- New bicycle paths and walkways that are part of an approved transportation plan

BRIDGE STRUCTURE

- Steel and concrete I-girders or steel and concrete box girder
- Cast-in-place concrete with variable vertical ribbed design
- Two color paint palette—base color with one accent color
- Concrete barrier rail with acrylic stain base color application or steel rail with painted finish
- Bridge/road name identification signs
- Application of a long-term, non-sacrificial anti-graffiti treatment coating to all appropriate structures
- Pedestrian access across bridges

RETAINING WALLS

- Cast-in-place or pre-cast concrete with variable vertical ribbed design
- Acrylic stain base color application
- Application of a long-term, non-sacrificial anti-graffiti treatment coating to all appropriate structures

SOUND WALLS

- Cast-in-place or pre-cast concrete with variable vertical ribbed design
- Acrylic stain base color application
- Application of a long-term, non-sacrificial anti-graffiti treatment coating to all appropriate structures
- Variation in sound wall geometry, material, color, texture, and pattern to eliminate monotonous, linear stretches of wall

CONCRETE BARRIER

- Cast-in-place concrete barrier
- Acrylic stain base color application
- Application of a long-term, non-sacrificial anti-graffiti treatment coating to all appropriate structures

GUARD RAIL

- Galvanized steel triple-corrugated guard rail

FENCING

- Chain link fencing with color application—vinyl clad or painted finish with steel post supports where required (select urban areas)
- Multi-strand wire fencing with painted steel post supports at right-of-way limits (rural areas)
- Fencing required to control access, grading, and drainage

GRADING

- Steepest desired slope of 3H:1V
- Rounded slopes that blend into existing grade
- See Project Design Development Manual (PDDM) 2.2.4.2 side slopes

ROCK CUTS

- Rock cuts that appear natural in form and blend with existing landforms
- Staining of rock cut to provide weathered finish
- Rock fall protection structures if necessary

DRAINAGE

- Basic channel conveyance, culverts, and drainage structures
- Erosion resistant channels
- Water quality basins
- Man-made or constructed wetlands fulfilling mitigation requirements

EROSION CONTROL

- Provision of temporary erosion control during construction
- Permanent erosion control
- Temporary and permanent erosion control best management practices

NATIVE REVEGETATION FOR ALL DISTURBED PORTIONS OF HIGHWAY CONSTRUCTION

- Salvage and storage of topsoil (6" horizon minimum) with native plant fragments
- Respreading of stockpiled topsoil and native plant fragments to minimum 6" depth (amend topsoil when necessary)
- Application of native plant revegetation seed mix in combination with scattered rock mulch
- Supplemental irrigation to establish plantings when necessary (two year minimum by maintenance contract)
- Provide invasive and noxious weed control (two year minimum by maintenance contract)

CONSTRUCTION AND MAINTENANCE MANAGEMENT PRACTICES

- Use of dust control practices
- Construction fencing to preserve sensitive areas
- Traffic control and project site security
- Maintenance period to ensure establishment of native revegetation
- Development of a native revegetation general maintenance program

PROJECT COMPONENTS REQUIRED FOR COMPLIANCE

- All practices must be in compliance with applicable Federal and State regulations

COST ANALYSIS

Softscape Treatments

Using the process described on page 6.1, planning level construction cost estimates for the different softscape treatments were determined in 2004 dollars. They are as follows:

Softscape Type	Cost Estimate (sf & acre)
Ground Treatment / Native Revegetation:	\$1.15 - \$1.35 sf \$50,000 - \$59,000 acre
<i>L & A Cost</i>	<i>\$0.00 sf</i> <i>\$0.00 acre</i>
Enhanced Native:	\$1.40 - \$1.60 sf \$61,000 - \$70,000 acre
<i>L & A Cost</i>	<i>\$0.25 - \$0.45 sf</i> <i>\$11,000 - \$20,000 acre</i>
Regionally Adapted:	\$2.25 - \$2.75 sf \$98,000 - \$120,000 acre
<i>L & A Cost</i>	<i>\$1.10 - \$1.60 sf</i> <i>\$48,000 - \$70,000 acre</i>
Regional Ornamental:	\$3.50 - \$6.00 sf \$152,000 - \$262,000 acre
<i>L & A Cost</i>	<i>\$2.35 - \$4.85 sf</i> <i>\$102,000 - \$212,000 acre</i>

The cost for Ground Treatment/Native Revegetation is covered under the general construction costs as part of the project. The data shown for the different treatment levels represents a total cost. The *L & A Cost* is the portion of the total cost that is above the ordinary construction costs and would be paid for through the Landscape and Aesthetics budget.

For example, a Regionally Adapted softscape costs about \$1.10 sf more than the standard Ground Treatment / Native Revegetation level of treatment, for a total cost of \$2.25 sf (\$1.15 + \$1.10 = \$2.25). The additional \$1.10 sf would be funded through the L & A budget because it is above and beyond the ordi-

nary construction costs. The Regional Ornamental treatment exhibits the widest range of costs due to the highly customized nature of this type.

To place the estimates in the context of a highway corridor, an estimate was calculated for a one-mile section of road. A typical section of highway right-of-way that is 240' wide with two 40' wide paved areas for travel lanes was used to determine this value (Figures 1-4, page 6.4). The approximate softscape costs to develop one mile of corridor right-of-way at each treatment level were calculated to be:

Softscape Type	Cost Estimate (1 mile)
Ground Treatment / Native Revegetation:	~ \$800,000
<i>L & A Cost</i>	<i>\$0.00</i>
Enhanced Native:	~ \$950,000
<i>L & A Cost</i>	<i>~ \$150,000</i>
Regionally Adapted:	~ \$1,600,000
<i>L & A Cost</i>	<i>~ \$800,000</i>
Regional Ornamental:	~ \$2,250,000 - \$3,800,000
<i>L & A Cost</i>	<i>~ \$1,450,000 - \$3,000,000</i>

Structures and Hardscape Treatments

The construction of the bridge at an interchange composes the majority of hardscape costs. For the purposes of cost estimation, a 12,000 square foot (60' x 200') bridge was assumed. The estimate for the various hardscape levels is:

Hardscape Type	Cost Estimate (sf & total)
Standard:	\$110 - \$115 sf \$1,320,000 - \$1,380,000
<i>L & A Cost</i>	<i>\$0.00 sf</i> <i>\$0.00 total</i>
Accentuated:	\$125 - \$135 sf \$1,500,000 - \$1,620,000
<i>L & A Cost</i>	<i>\$15 - \$25 sf</i> <i>\$180,000 - \$300,000</i>

Focal:	\$170 - \$185 sf \$2,040,000 - \$2,220,000
<i>L & A Cost</i>	<i>\$60 - \$75 sf</i> <i>\$720,000 - \$900,000</i>
Landmark:	\$210 - \$250 sf \$2,520,000 - \$3,000,000
<i>L & A Cost</i>	<i>\$100 - \$140 sf</i> <i>\$1,200,000 - \$1,680,000</i>

Again, the overall construction cost is listed as well as the cost specific to landscape and aesthetics enhancements. Similar to the Regional Ornamental softscape, the Landmark level contains many custom elements and the widest range of potential cost.

A typical interchange encompasses an area of about 6.5 acres including on/off ramps and infield landscape areas (Figures 5-8, page 6.5). To develop an estimate for an interchange, the softscape data was applied to the infield areas and added to the cost of the bridge deck. Likely softscape and hardscape treatment combinations were used to create the following interchange estimates:

Type	Cost Estimate (total)
Ground Treatment / Native Revegetation & Standard:	~ \$1,700,000
<i>L & A Cost</i>	<i>~ \$0.00</i>
Enhanced Native & Accentuated:	~ \$2,000,000
<i>L & A Cost</i>	<i>~ \$300,000</i>
Regionally Adapted & Focal:	~ \$2,750,000
<i>L & A Cost</i>	<i>~ \$1,050,000</i>
Regional Ornamental & Landmark:	~ \$4,000,000
<i>L & A Cost</i>	<i>~ \$2,300,000</i>

Cost information presented here is provided for the purpose of long range planning and budgeting. It is not intended to substitute for a project-level detailed cost projection.



Figure 1

Structures and hardscape Type - **Standard**
Softscape Type - **Ground Treatment / Native Revegetation**

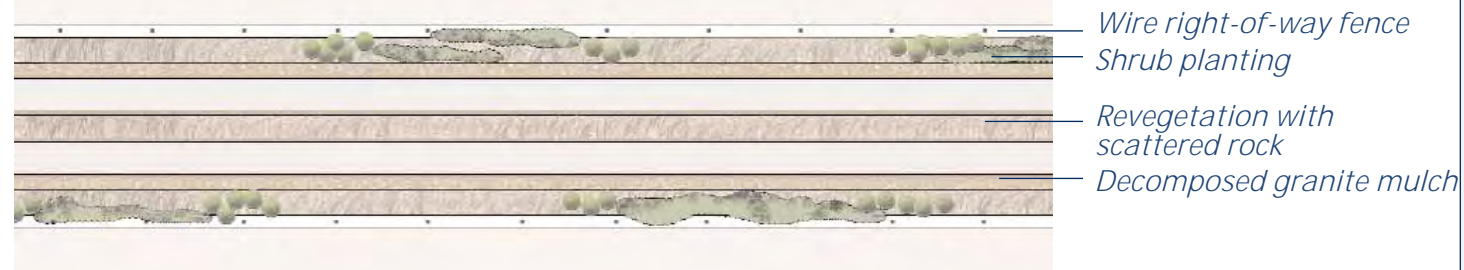


Total Cost: \$50,000 - \$59,000 acre of ROW area

L & A Cost: \$0.00 acre

Figure 2

Structures and hardscape Type - **Accentuated**
Softscape Type - **Enhanced Native**

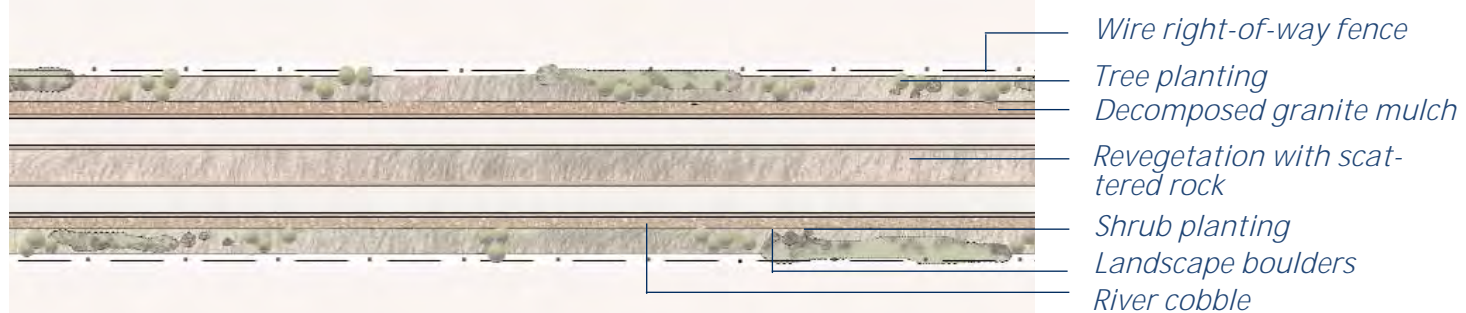


Total Cost: \$61,000 - \$70,000 acre of ROW area

L & A Cost: \$11,000 - \$20,000 acre

Figure 3

Structures and hardscape Type - **Focal**
Softscape Type - **Regionally Adapted**

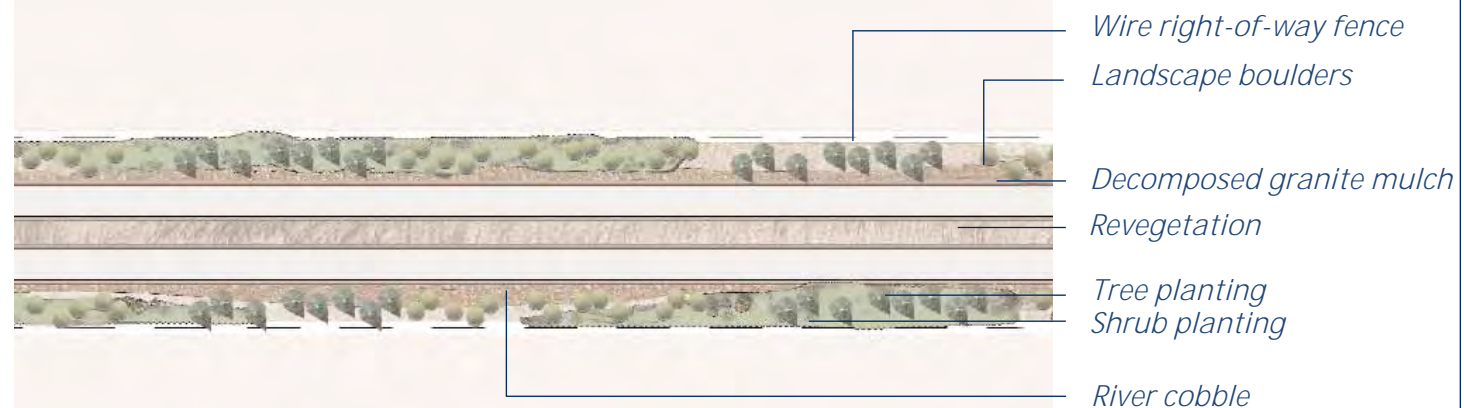


Total Cost: \$98,000 - \$120,000 acre of ROW area

L & A Cost: \$48,000 - \$70,000 acre

Figure 4

Structures and hardscape Type - **Landmark**
Softscape Type - **Regional Ornamental**



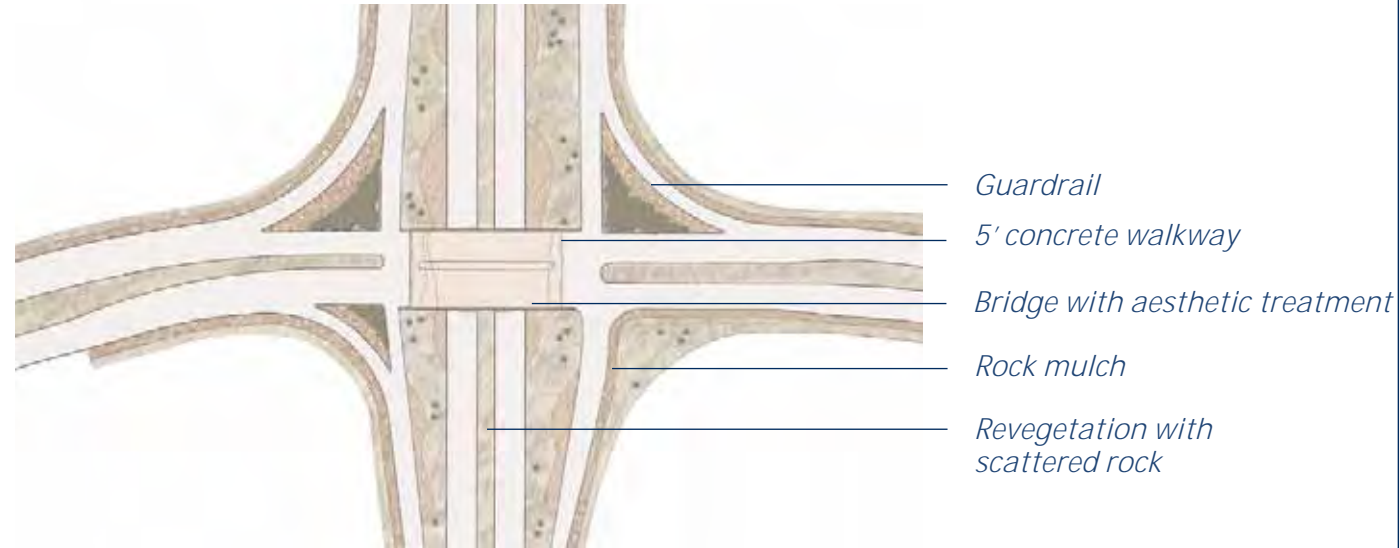
Total Cost: \$152,000 - \$262,000 acre of ROW area

L & A Cost: \$102,000 - \$212,000 acre



Figure 5

Structures and hardscape Types - **Standard**
Softscape Type - **Ground Treatment / Native Revegetation**

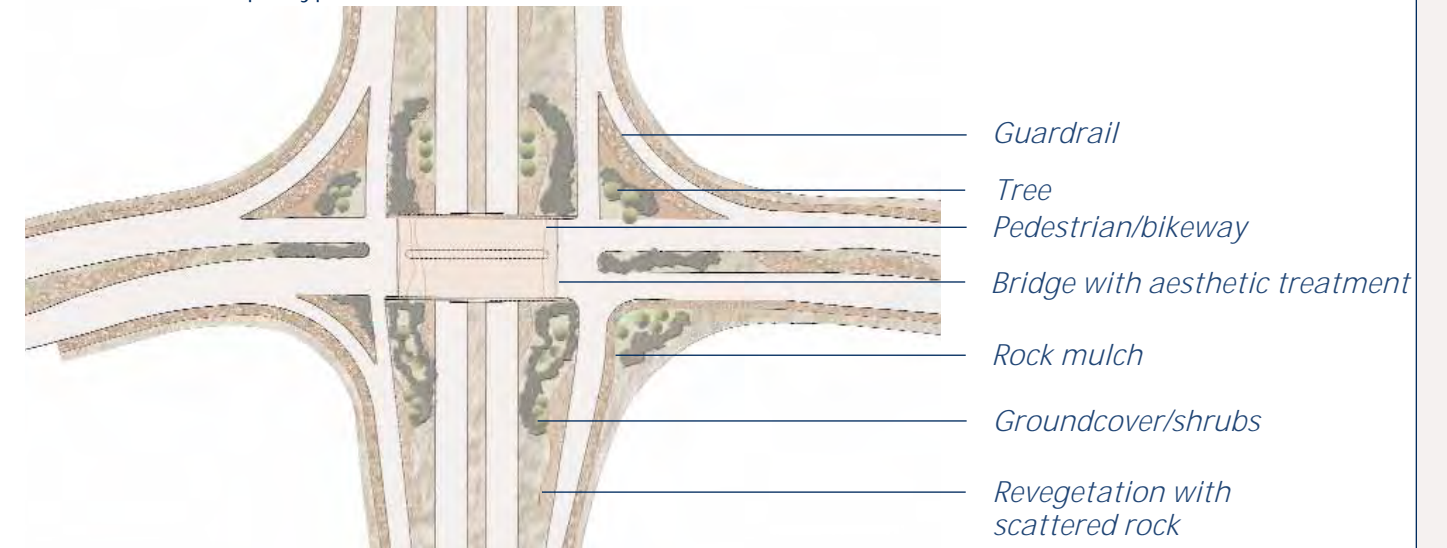


Total Cost: \$1,700,000 (infield landscape and bridge deck)

L & A Cost: \$0.00

Figure 6

Structures and hardscape Types - **Accentuated**
Softscape Type - **Enhanced Native**

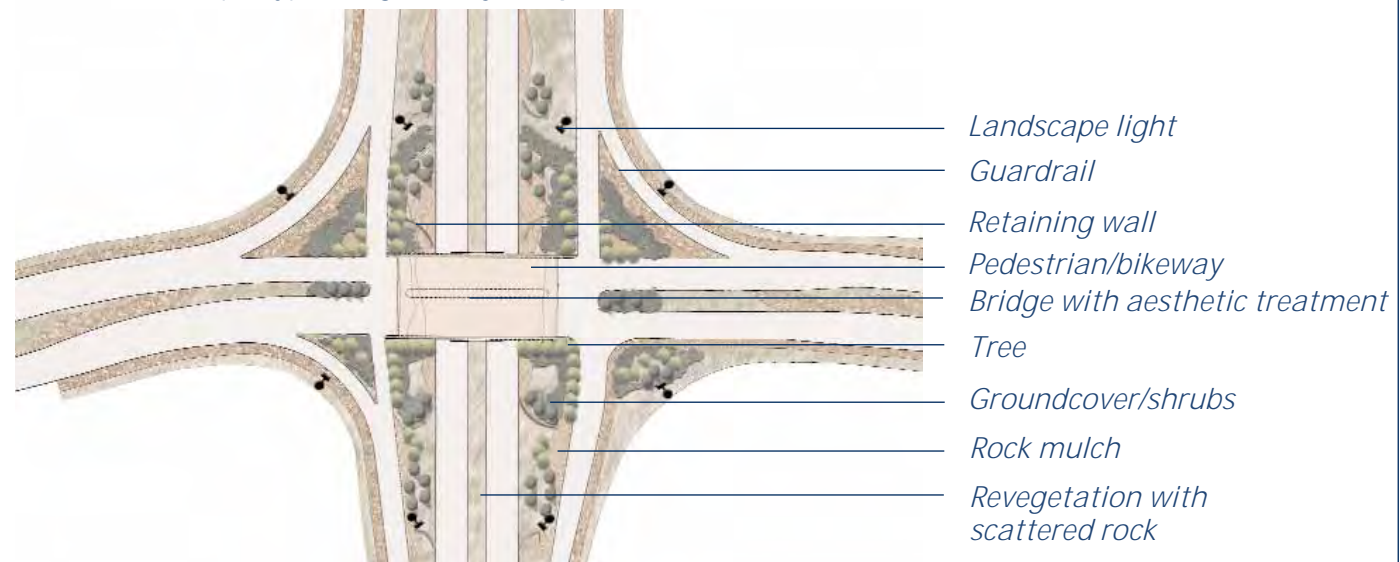


Total Cost: \$2,000,000 (infield landscape and bridge deck)

L & A Cost: \$300,000

Figure 7

Structures and hardscape Types - **Focal**
Softscape Type - **Regionally Adapted**

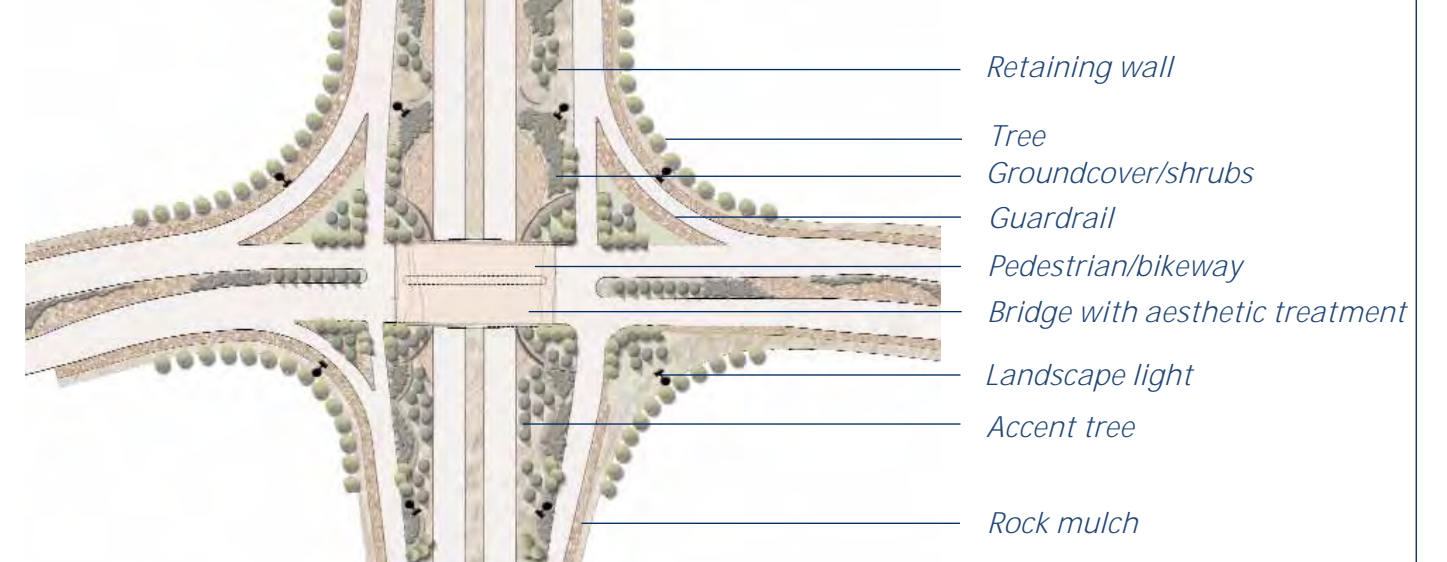


Total Cost: \$2,750,000 (infield landscape and bridge deck)

L & A Cost: \$1,050,000

Figure 8

Structures and hardscape Types - **Landmark**
Softscape Type - **Regional Ornamental**

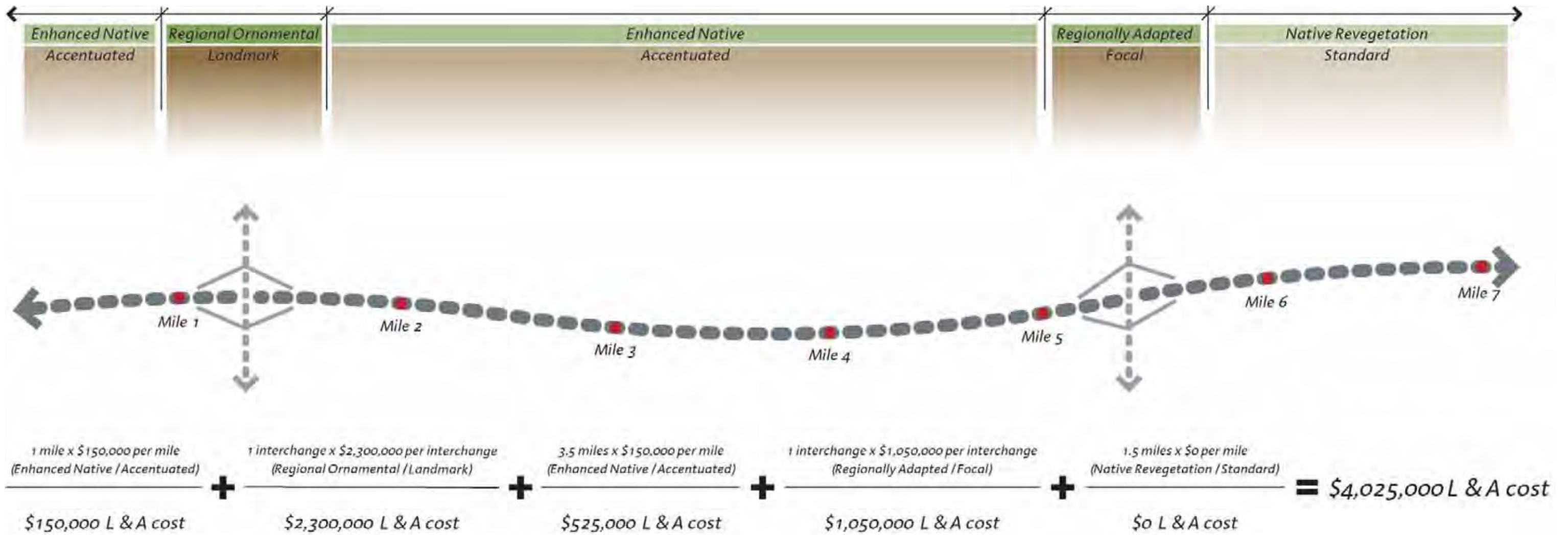


Total Cost: \$4,000,000 (infield landscape and bridge deck)

L & A Cost: \$2,300,000

The diagram below (figure 9) shows how the cost estimate information can be used to determine a planning level estimate of the landscape and aesthetics costs for this hypothetical seven mile section of highway corridor. The costs shown are for landscape and aesthetic enhancements that are above the ordinary construction costs.

Figure 9



MAINTENANCE COSTS

The *Corridor Plan* identifies the level of landscape and aesthetic treatment, and consequently, the maintenance investment. Therefore, it is important that maintenance cost data be incorporated in the *Corridor Plan*. Furthermore, local public agencies and others will be interested in maintenance expenses to help them fully understand the long-term maintenance implications of retrofit projects.

In collaboration with the *Corridor Plan*, long-term maintenance costs have been researched by the University of Nevada, Las Vegas (UNLV) and compiled as the *Maintenance Cost Study for Corridor Planning*. Figure 10 diagrams how total life cycle maintenance costs were developed for the different landscape and aesthetic treatments. Figure 11 shows the maintenance costs that were determined for the various combinations of softscape and hardscape types.

Current estimates exhibit relatively wide variations in cost due to the limited amount of data available. However, further research and tracking of projects will result in more clearly defined maintenance cost estimates.

Figure 10

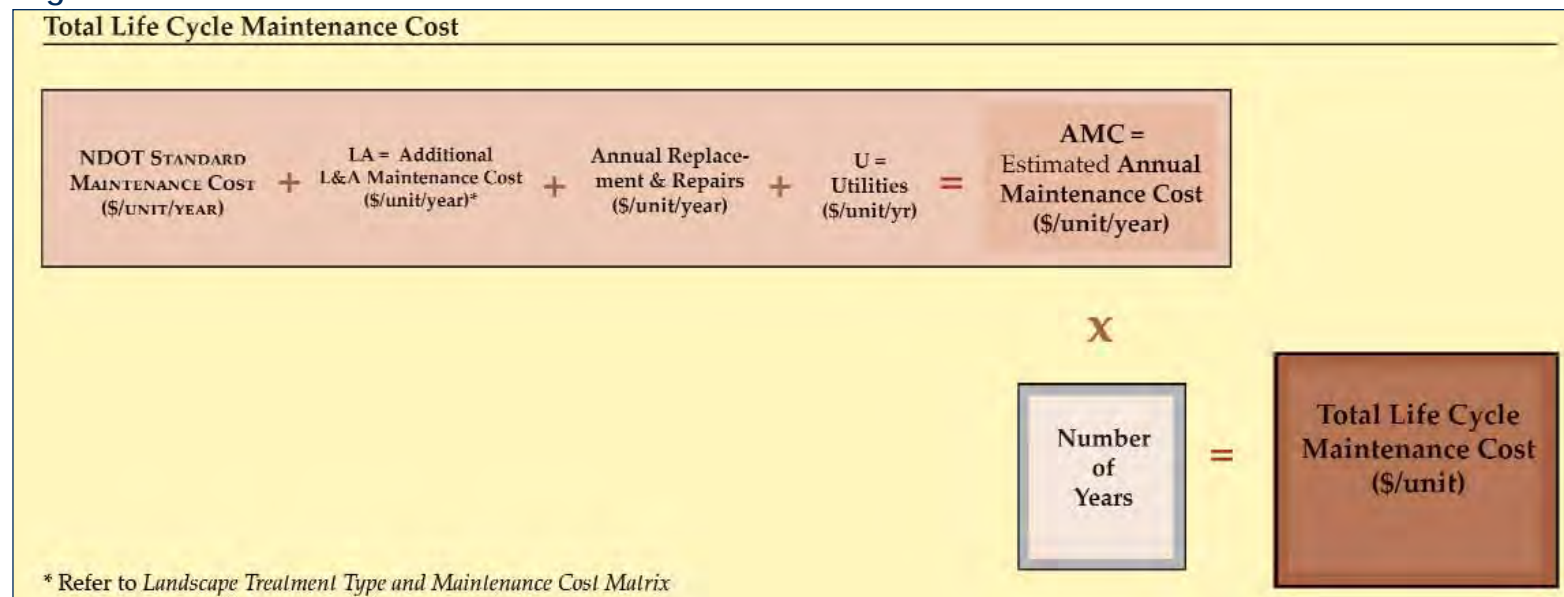


Figure 11

Treatment Type	Hardscape				
	Standard	Accentuated	Focal	Landmark	
Softscape	Ground Treatment	High: \$4,655.11 Median: \$655.70 Low: \$520.00	High: \$2,383.19 Low: \$1,524.00	\$588.00 (based on one project, Cedar City)	Not Available
	Native Plant Revegetation	\$720.00*	\$1,676.40*	\$650.00*	Not Available*
	Enhanced Native	\$1,201.12 (based on one project only)	\$1,089.87 (based on one project only)	Entire Rest Area: High: \$549,200.00 Low: \$29,374.00	Welcome Center Memorial Pt. Cost not available
	Regionally Adapted	High: \$15,840.00 Median: \$3,116.88 Low: \$673.02	High: \$15,242.45 Median: \$5,445.00 Low: \$1,448.67	\$3,054.55 (based on one project only)	Not Available
	Regional Ornamental	High: \$11,775.11 Median: \$7,200.00 Low: \$433.33	High: \$8,500.00 Median: \$3,425.74 Low: \$2,279.59	\$3,005.00 (based on one project only)	\$197,846.36 (based on one project only)
	Turf	High: \$12,325.46 Median: \$6,057.00 Low: \$1,529.79	\$13,178.57 (based on one project only)	High: \$10,363.13 Low: \$3,135.00 (based on two projects, only)	High: \$9,214.70 Median: \$8,391.49 Low: \$3,325.82

High: Single project with highest cost
Median: Distribution of projects between high and low cost.
Low: Single project with lowest cost.

All entries are per acre annual costs unless otherwise noted.
* Natural Revegetation costs are assumed to be 10% more than Ground Treatment categories costs.

All entries are planning level estimates based on limited available data. NOTE: Utilities and Repair & Replacement are not included in numbers



PROJECT FUNDING

Funding for the implementation of the projects that are included in the corridor may occur through several programs. Funding for new landscape and aesthetic projects associated with the state's highway program could come from both State and Federal sources. Up to three percent (3%) of the total project construction cost may be allocated for landscape and aesthetic improvements.

When a landscape and aesthetics project can significantly influence an adjacent community or area, the community may choose to be involved in the process and participate in a matching funds program. This program assists with the funding of projects initiated independent of the statewide capital plan and annually funds specific projects based on applications received from local public agencies. Additionally, communities and developers can determine enhanced levels of landscape and aesthetics through long-term capital and maintenance cost sharing agreements with NDOT.

The landscape and aesthetic project funds may be banked to allow for better project distribution of capital funds. This would provide the mechanism for NDOT to shift landscape and aesthetics money to areas that have been identified to receive enhanced levels of treatment. The capacity to allocate funds will allow NDOT to broadly manage the landscape and aesthetics budget on a corridor-wide basis.



OVERVIEW

This section describes priority levels for projects within the landscape design segments. First priority was given to sections of road with a high degree of visibility or identity, areas that can contribute significant quality immediately, and projects that are currently in progress. Second priority applies to projects that will provide additional benefits and aesthetics as part of the long range plan. Third priority was given to areas that currently display a reasonable level of aesthetic quality and, upon enhancement, will complete the landscape and aesthetics program for that particular Landscape Design Segment.

It is important to note that corridor-wide roadside trash clean-up has been identified as the top priority for all four Landscape Design Segments. A color retrofit for all existing structures and hardscape elements is recommended as the first priority after the trash clean-up. Establishment of community gateways is also noted as a first priority within the rural study area. These three activities have been selected

because of the immediate and significant impact they will have on the overall aesthetics of the entire I-80 corridor.

Wildlife movement corridors are an important component of the I-80 corridor environment. Recommendations to analyze wildlife corridor movement and provide improved crossing structures are listed as medium priority due to the large capital cost. However, specific crossing areas are designated as first priority due to current crossing use and their importance for connectivity of wildlife habitat.

The priority levels are based on current capital improvements and landscape and aesthetics planning. They are intended to act as a guide and represent those projects the *Corridor Plan* recommends as having the greatest potential impact on the aesthetics of the entire corridor.

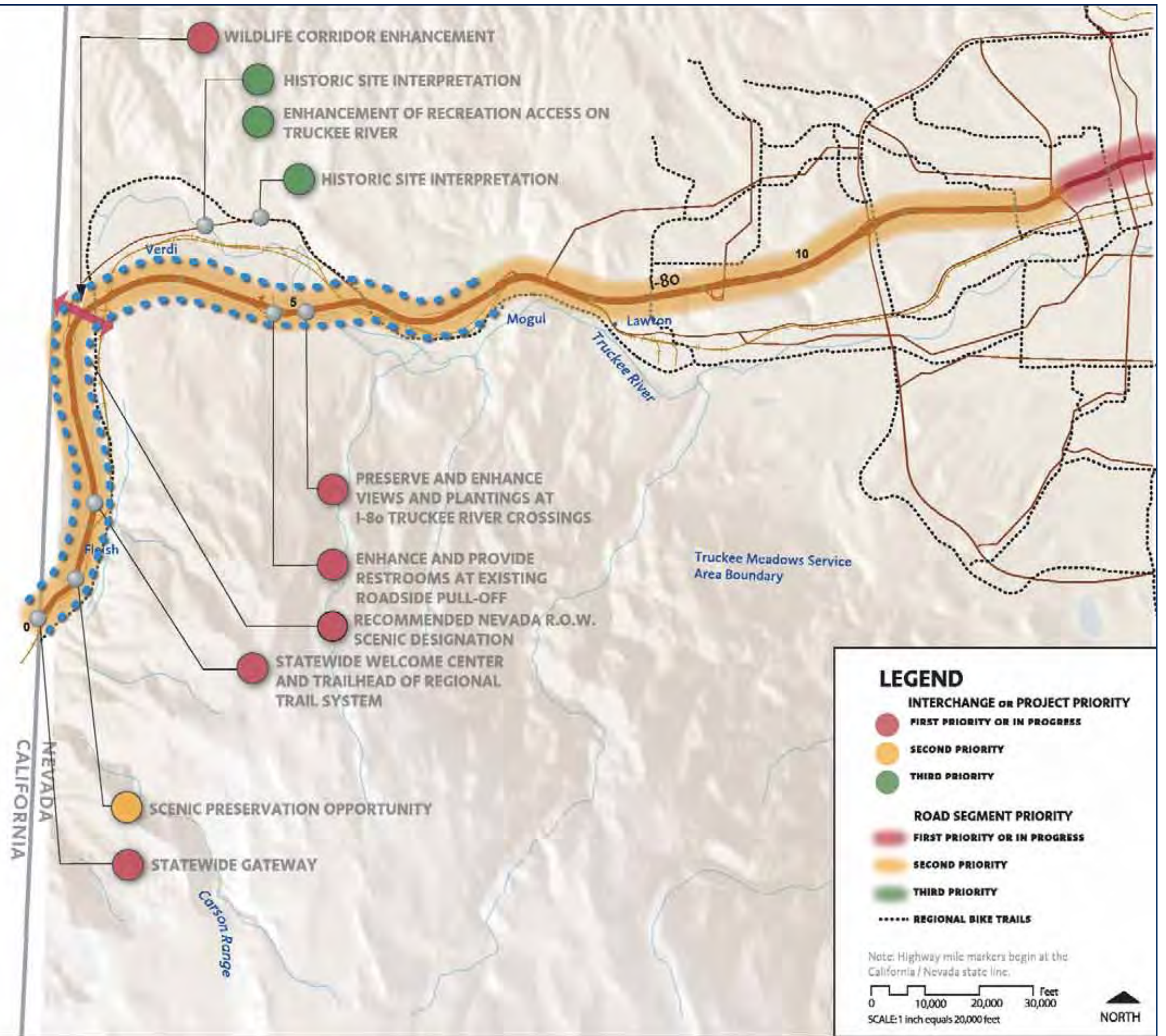
The priorities identified in this chapter are subject to change according to the availability of funds for individual project improvements. Capital projects are significantly influenced by the availability of funding.

FEATURES ALONG ENTIRE CORRIDOR

- ROAD CORRIDOR TRASH CLEAN-UP
- PAINT/STAIN RETROFIT OF BRIDGES AND STRUCTURES
- ANALYZE WILDLIFE MOVEMENTS AND PROVIDE APPROPRIATE CROSSING STRUCTURES
- STATEWIDE PLACE NAME SIGNAGE

FEATURES ALONG THE SIERRA NEVADA LANDSCAPE DESIGN SEGMENT

- TAHOE PYRAMID BIKEWAY
- PRESERVE SCENIC QUALITY THROUGH COORDINATION WITH APPROPRIATE AGENCIES AND ORGANIZATIONS
- SCREEN INDUSTRIAL USES WHERE FEASIBLE



LEGEND

INTERCHANGE OR PROJECT PRIORITY

- FIRST PRIORITY OR IN PROGRESS
- SECOND PRIORITY
- THIRD PRIORITY

ROAD SEGMENT PRIORITY

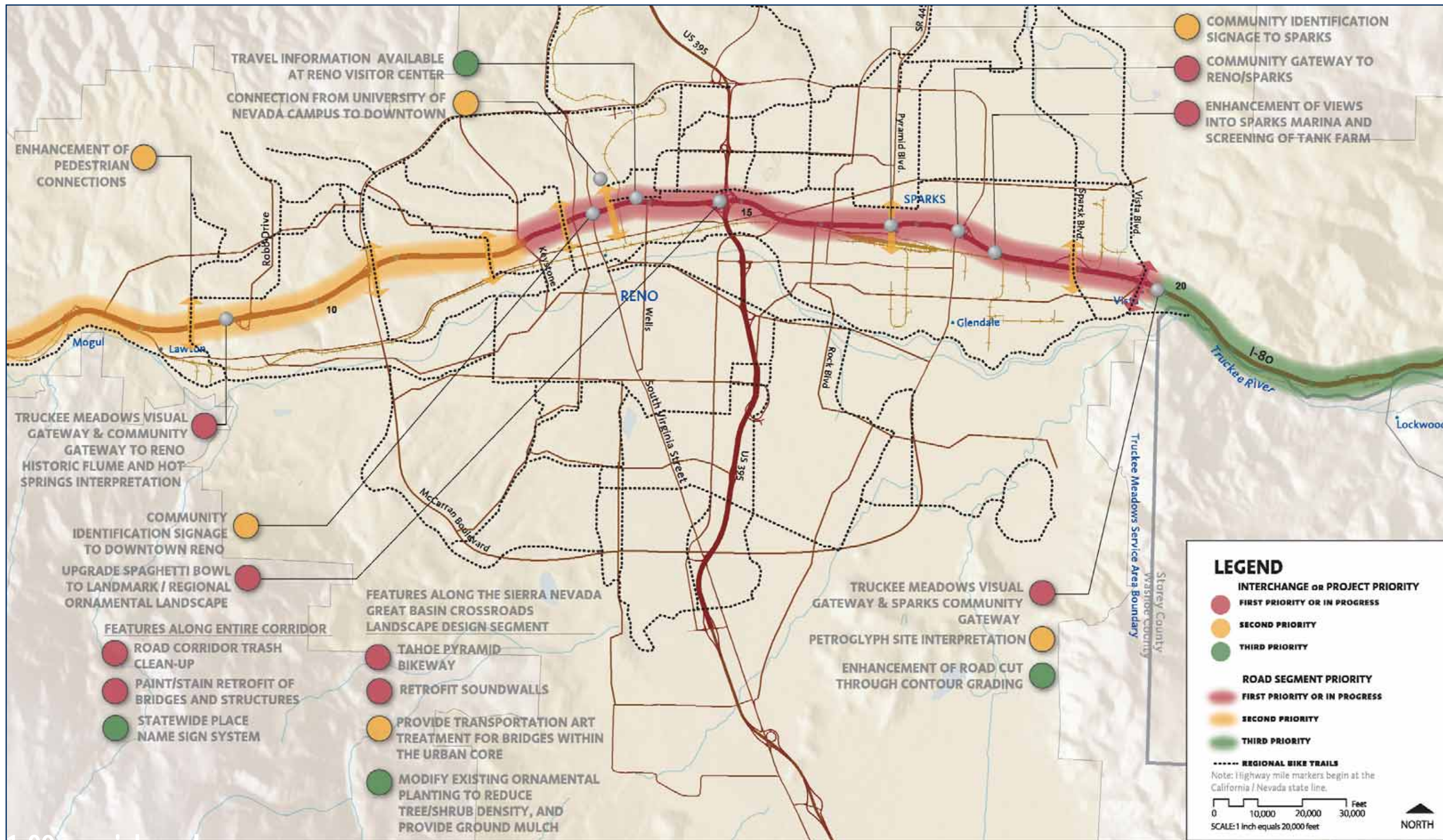
- FIRST PRIORITY OR IN PROGRESS
- SECOND PRIORITY
- THIRD PRIORITY

- - - - REGIONAL BIKE TRAILS

Note: Highway mile markers begin at the California / Nevada state line.

0 10,000 20,000 30,000 Feet
SCALE: 1 inch equals 20,000 feet

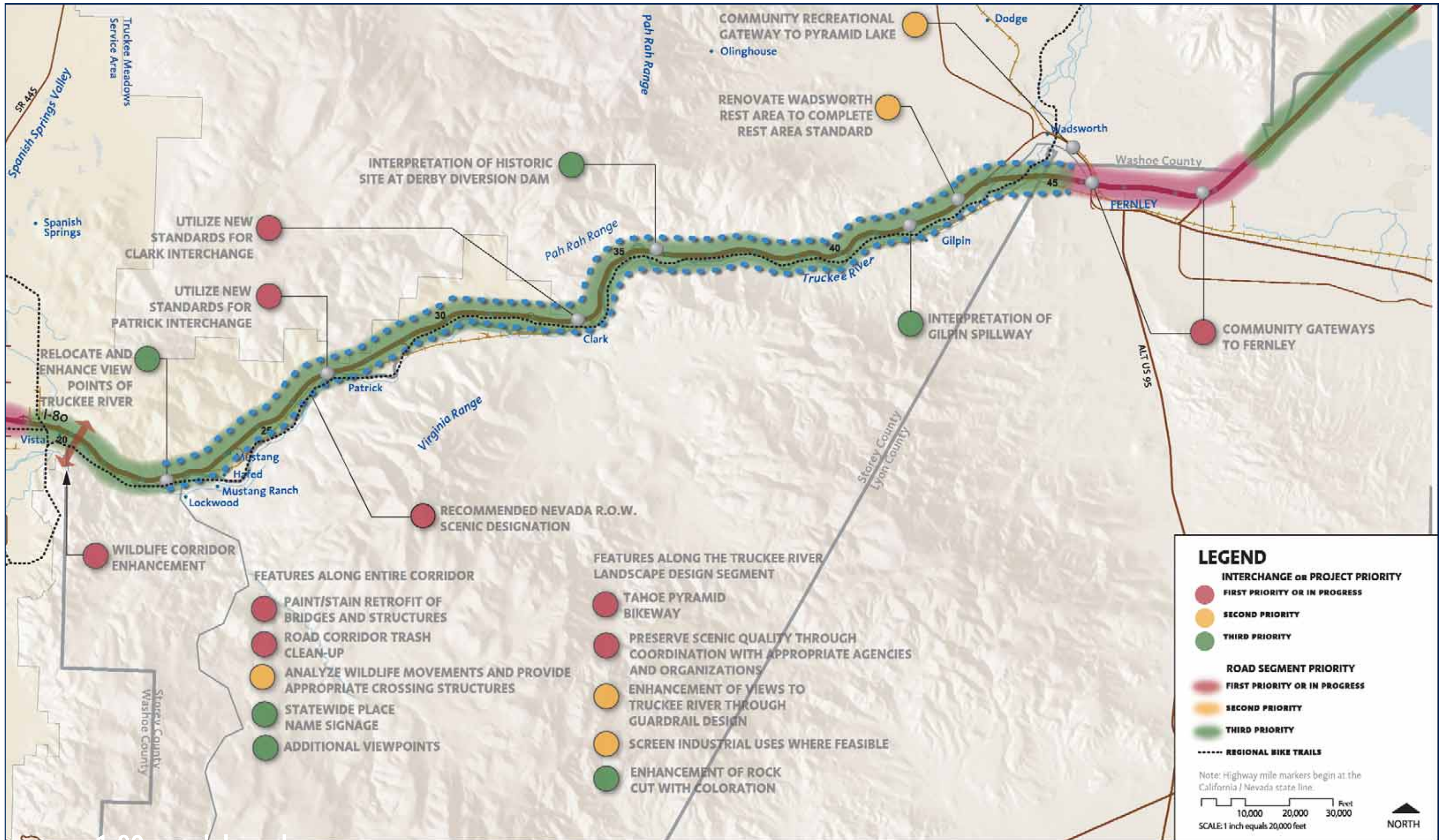
NORTH



I-80 corridor plan

SIERRA NEVADA GREAT BASIN CROSSROADS LANDSCAPE DESIGN SEGMENT

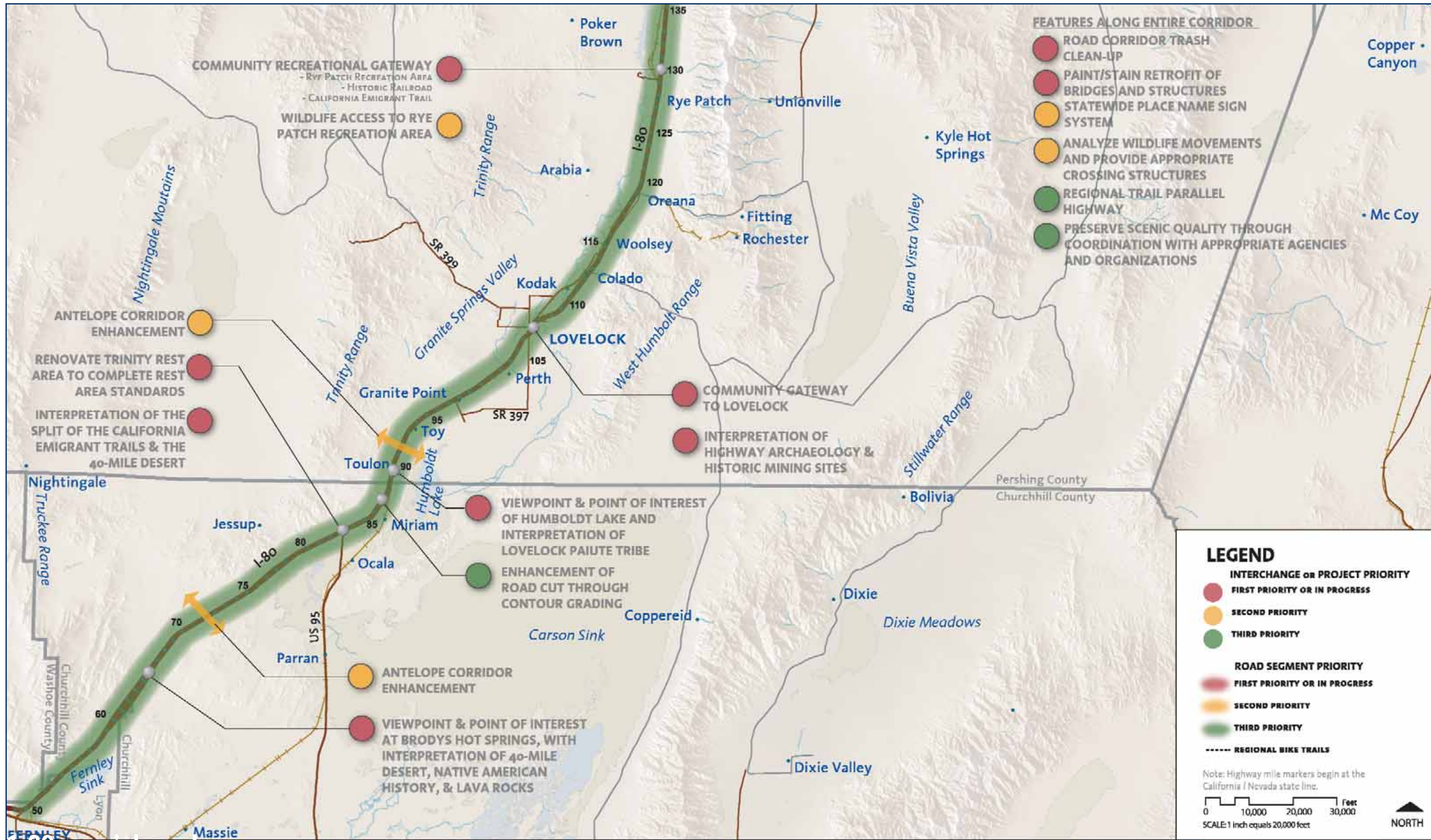
I-80: MOGUL TO VISTA - PRIORITY PROJECTS



1-80 corridor plan

TRUCKEE RIVER PASSAGE LANDSCAPE DESIGN SEGMENT

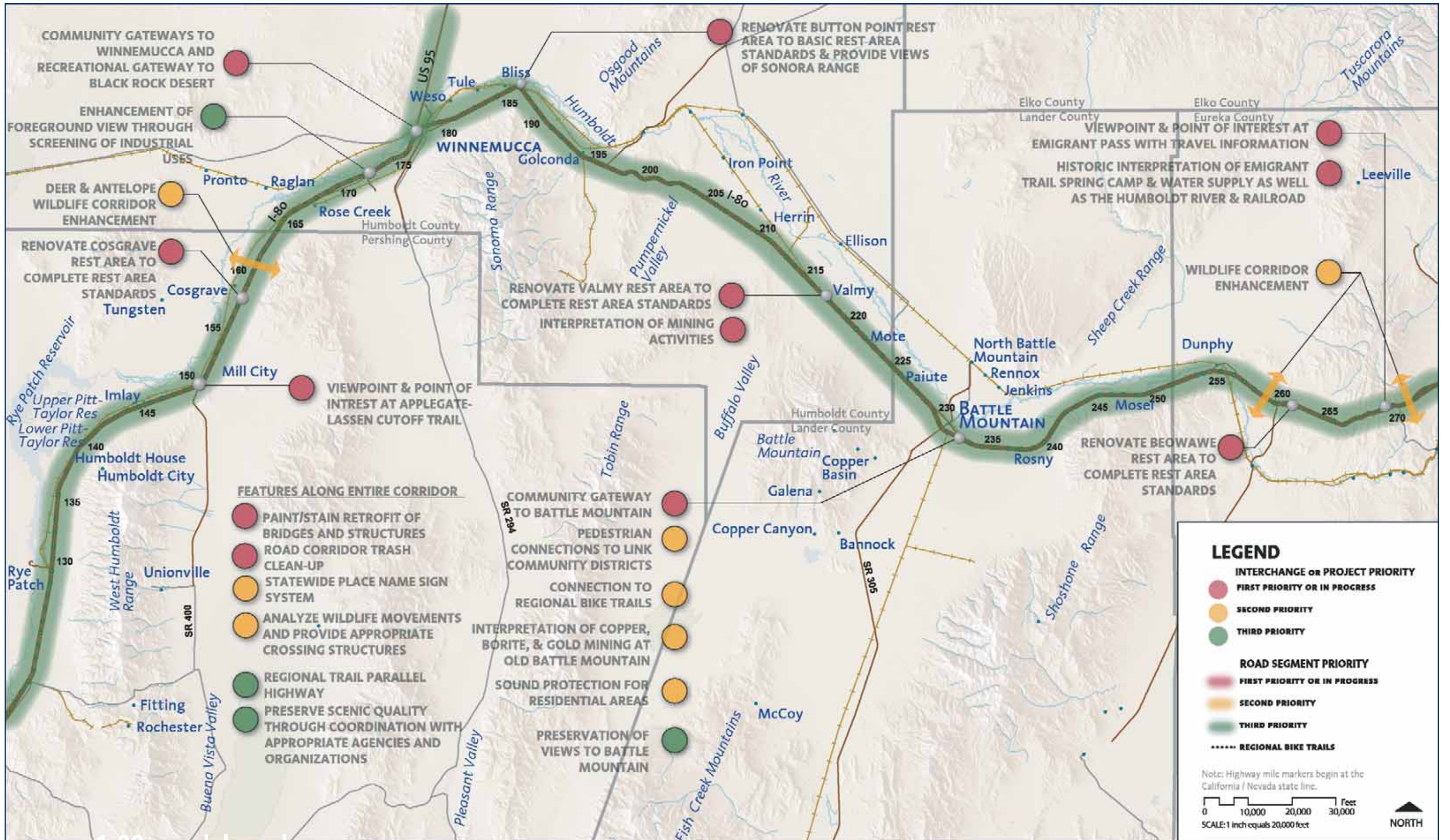
I-80: VISTA TO FERNLEY - PRIORITY PROJECTS



I-80 corridor plan

HIGHWAY OF THE WEST LANDSCAPE DESIGN SEGMENT

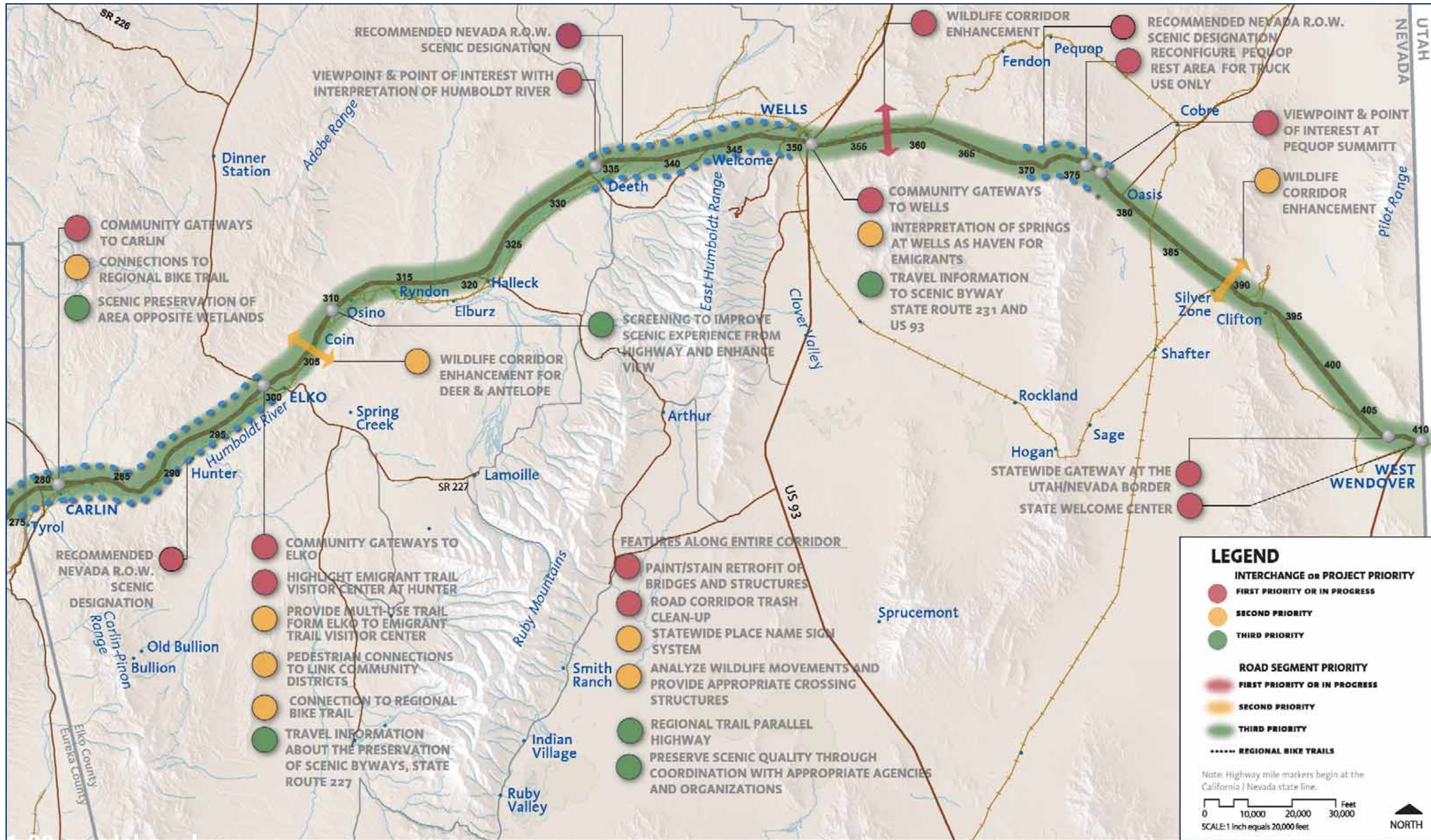
I-80: FERNLEY TO RYE PATCH - PRIORITY PROJECTS



I-80 corridor plan

MAP
5C
7.6

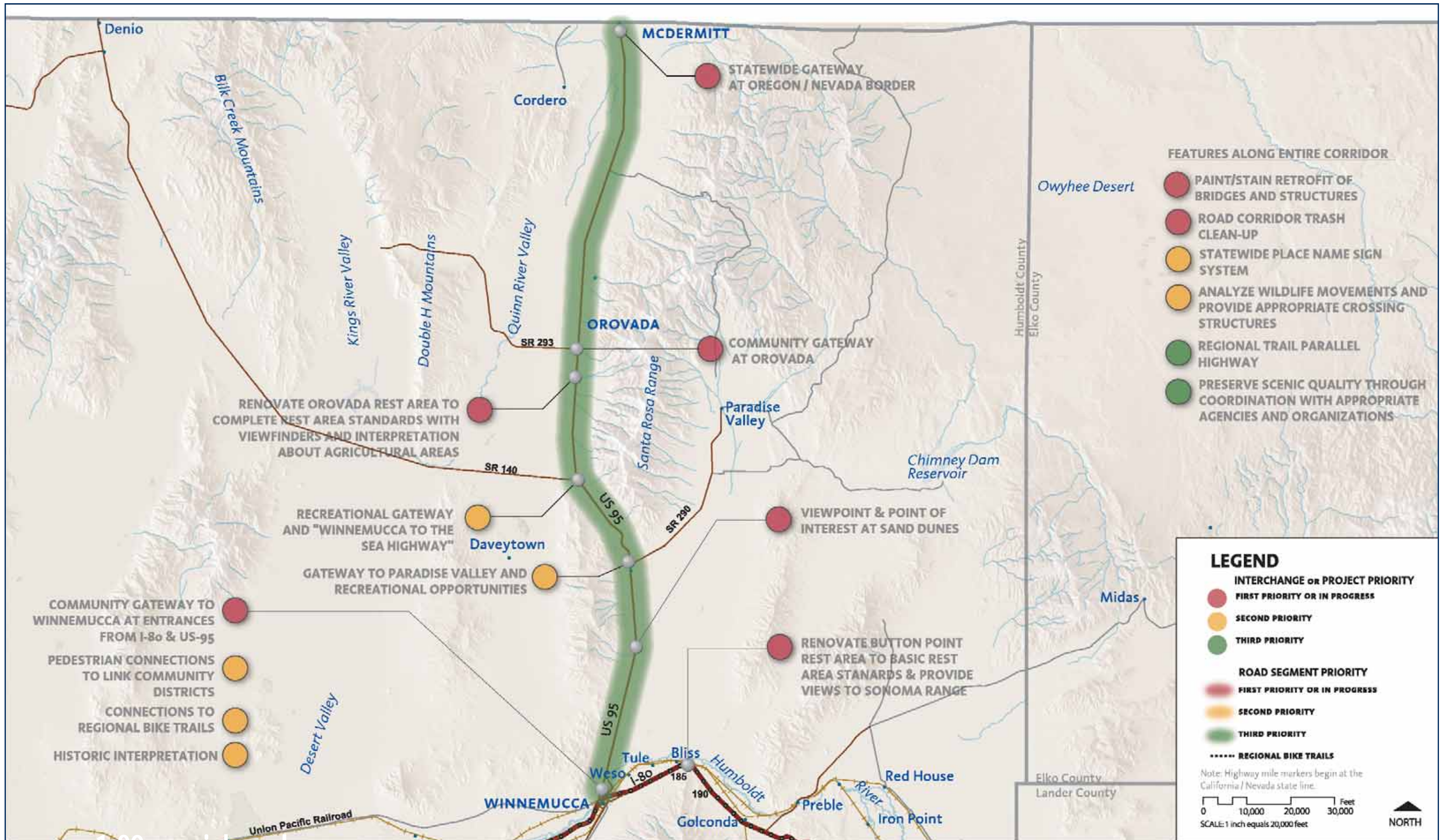
HIGHWAY OF THE WEST LANDSCAPE DESIGN SEGMENT I-80: RYE PATCH TO TYROL - PRIORITY PROJECTS



I-80 corridor plan

HIGHWAY OF THE WEST LANDSCAPE DESIGN SEGMENT

I-80: TYROL TO WEST WENDOVER - PRIORITY PROJECTS



I-80 corridor plan

HIGHWAY OF THE WEST LANDSCAPE DESIGN SEGMENT

US 95: WINNEMUCCA TO McDERMIT - PRIORITY PROJECTS

CONCLUSION

The *I-80 Landscape and Aesthetics Corridor Plan* represents a significant step in Nevada's renewed commitment to landscape and aesthetics as integral elements of the state's highways. This document is designed to guide decisions and policies that will affect the aesthetic quality of Nevada's highways on a corridor-wide basis down to the level of individual projects. It presents extensive research and analysis of the existing conditions of Nevada, its highway corridors, and its scenic natural landscapes. The *Corridor Plan* describes the composition of elements and programs that will be used to enhance the level of landscape and aesthetics across the state. Perhaps most importantly, the Corridor Plan sets the stage for discussion of:

- Implementation strategies
- Cost evaluation/strategies
- Priorities and scheduling
- Visual preference evaluation

To accomplish an increased level of landscape and aesthetics for Nevada's highways, the *Corridor Plan* has detailed a new NDOT standard level of treatment for capital projects. The new standard will raise the basic level of aesthetics on all future projects significantly.

The *I-80 Landscape and Aesthetics Corridor Plan* is a public/private partnership initiative. The *Plan* provides a foundation for this unique initiative to build a comprehensive vision for the landscape and aesthetics of the I-80 corridor. The partnership policy, outlined in the *NDOT Landscape and Aesthetics Master Plan*, clearly states the unique and exciting result of this process.

Highways can be perceived as edges or boundaries that separate city or landscape. Interchanges are seen as intersections, nodes, and gateways. These perceptions argue strongly for a design approach that recognizes cultural boundaries and deals with the landscape and aesthetic design of the highway as a corridor segment, rather than on an individual project basis.