CORRIDOR DESIGN GUIDELINES FOR I-80

Purpose of Design Guidelines

These landscape and aesthetics guidelines are intended to guide physical changes for existing and new highway projects. The result will be a cohesive highway corridor that is compatible and sensitive to this context. These guidelines will accomplish better design for Nevada's highways.

Design guidelines provide a framework for improving landscape and aesthetics when designing new and retrofit highway projects. The guidelines are written statements of recommended performance that establish qualitative levels of design to meet the objectives of each Landscape Design Segment. Some of the guidelines are accompanied by concept diagrams, sketches, or photographs. These images are illustrative and are intended to demonstrate ways the design intent could be achieved. Ultimately, these design guidelines will assist in successful revitalization and overall landscape and aesthetic improvement of the I-80 highway corridor.

These design guidelines have been prepared to assist in the development of design solutions that:

- Guide the interpretation of the design themes for each landscape design segment.
- Create a visual design unity among all highway structures and facilities.
- Select finish, color, and surface patterns to coordinate structures with the surrounding landscape.
- Apply a consistent color palette for all structures.
- Incorporate transportation art motifs and media that depict the Sierra Nevada Passage, the Sierra Nevada/Great Basin Crossroads, the Truckee River Passage, and the Highway of the West Landscape Design Segment themes.

These guidelines outline ways to achieve the enhancement of the highways' most valuable assets, including scenic views, important cultural and environmental features, and the surrounding Great Basin landscape.

Corridor Plan Guidelines

NDOT, designers, and communities are strongly encouraged to use these guidelines to ensure that individual projects comply with the design spirit and literal intent of the *Corridor Plan*. NDOT will review each project design for consistency with these guidelines and the overall *Landscape and Aesthetics Corridor Plan*. When designing a highway project, the full design team should:

1) Become familiar with design guidelines for the design segment in which a project is located. The guidelines are intended to direct the design toward the objective of aesthetic cohesiveness for the design segment.
2) Understand the context of the project site. The landscape surrounding the proposed project provides directions for enhancement. These include predominant materials, colors, and enhancement to structures, as well as natural and cultural resources and social elements.
3) Seek early review of the project. Making changes at the beginning of the project is far easier than at the end. Involving others early in the planning/design process helps ensure that the project is feasible, both economically and aesthetically.

(1) The purpose of these guidelines is to create a cohesive highway corridor that is compatible with Nevada's existing landscape, communities, and urban areas.

These design guidelines are directed at avoiding project to project design in favor of comprehensive corridor design.

1.0 PROJECT DESIGN PROCESS

1.1 Understand the design segment theme and select design concepts that interpret the theme. Review the vision and objective for the Landscape Design Segment as described in the *Corridor Plan* and ensure the theme guides the project design. Understand the context of the site, including viewshed analysis and Landscape Design Segment objectives as described. Ensure project design successfully interprets the landscape design segment theme.

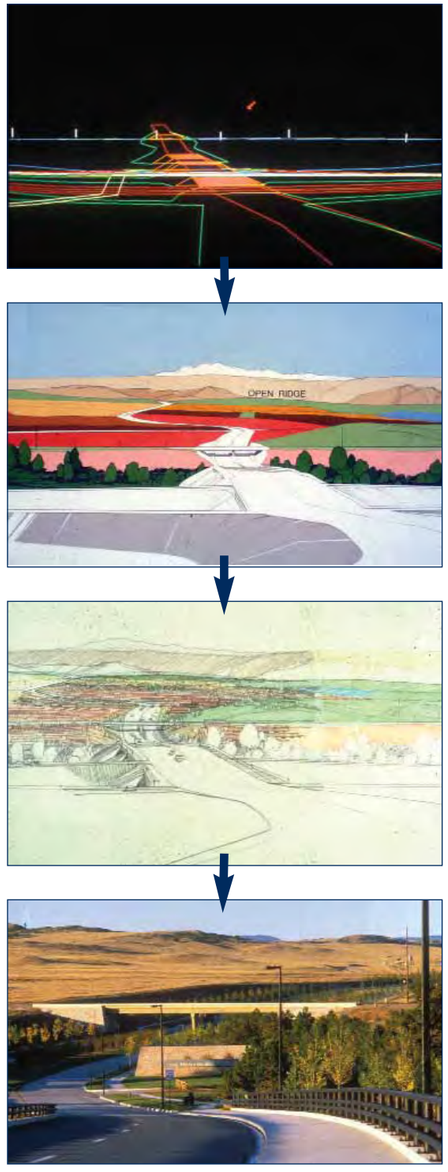
1.2 Understand the site context, including the surrounding landscape, and conduct a comprehensive analysis. Conduct a comprehensive environmental analysis for each project. The site inventory for each project should extend past the project boundaries to analyze the site and surrounding landscape. Ensure the planning and design of the highway project respond to this comprehensive analysis. Consider characteristics such as precipitation, topography, ground cover, size and location of plant material, visual conditions, soils, site drainage, rock outcroppings, and other natural features, both on the site and surrounding the site.

1.3 Visualize design concepts for highway improvements. Utilize sketches, models, and digital visualization tools to understand design concepts from a three-dimensional perspective. Plan view design alone does not accurately represent the experience of the traveler along the highway or illustrate issues of visual design. “Roadway Explorer” is an excellent tool for this purpose.

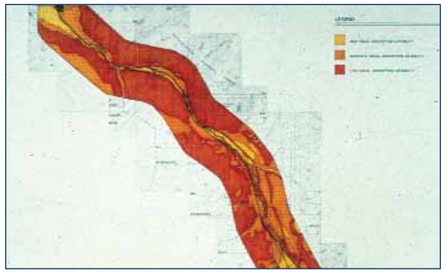
1.4 Integrate landscape and aesthetics at the onset of planning, design, and engineering of all highway projects. Landscape and aesthetics should not be an afterthought to a highway project. Rather, landscape and aesthetics need to be considered at the onset of the planning, design, and engineering of all highway projects. NDOT’s STET report regarding type, size, and location of highway structures should include information on landscape and aesthetics. Engineering design should incorporate landscape and aesthetics to create highway structures and facilities that are effective, safe, and aesthetically appealing. The ability of a roadway and roadway facilities to blend successfully into the surrounding landscape or integrate appropriately with surrounding land uses should be fundamentally addressed at the outset.

1.5 Consider landscape and aesthetics costs alongside baseline costs. Landscape and aesthetics should be considered simultaneously with a project's capital budget and estimates. In addition to determining a project’s baseline construction cost, allocation of budgets and resources for landscape and aesthetics should be clearly outlined at the start of a project.

LANDSCAPE AND AESTHETICS IS NOT AN AFTERTHOUGHT TO ENGINEERING, BUT THE STARTING POINT FOR INTEGRATED, CONTEXT SENSITIVE SOLUTIONS.



(1), (2), (3), (4) This series of highway design studies shows the process of visualization from computer modeling to the built project.



(5) Understanding the corridor conditions and context is a critical part of the design process.

(6) Computer simulation of a planned highway at the conceptualization of the project.

(7) Photo simulation of a highway project allows visualization of physical design.

2.0 WELCOME CENTERS AND STATEWIDE GATEWAYS

2.1 Provide vibrant, visually rich gateway welcome centers. Promote and provide information about statewide travel opportunities and services in a gateway welcome center at the California boundary near Verdi and at the Utah border in West Wendover (pages 4.10-4.12 and 4.41-4.43). Promote the gateway welcome centers as important civic facilities and ensure that these centers have strong visual presence. The gateway welcome centers should convey the identity of Nevada and make the entry into the state a notable and memorable experience. Welcome centers should also signify the departure from Nevada and leave the traveler with a positive memory. Program elements offered at centers include interpretation of time, history, and the Sierra Nevada and Great Basin landscapes. Conduct a feasibility study to determine the appropriate location for the welcome center and potential partnerships for construction, operation, and maintenance.

2.2 Provide statewide gateway features crafted from the land and place. The state gateway at the California border near Verdi (pages 4.10-4.12) should reflect the character of the Sierra Nevadas as shown in sketch 6. The statewide gateway at West Wendover and McDermitt (pages 4.41-4.46) should capture the visual character of sketch 5. Each statewide gateway shall include the Nevada name and State seal, feature stone materials from the local region of the state, and planting type as identified in the landscape design segment. Engage adjacent State agencies and representatives to coordinate implementation of the gateway features where space is constricted due to existing development.

2.3 Coordinate with local agencies to preserve scenic quality from the California/ Nevada state line to Mogul. The I-80 corridor from the California state line to Mogul is currently not highly developed and offers vistas of the Carson Range as it transitions from the Great Basin. As noted in the visual analysis, this portion of the highway provides special scenic features and provides an attractive entrance to the state. Control over the landscape and aesthetics of this section of roadway may require collaboration with federal, state, and local governments and adjacent land managers concerning landscape and aesthetic matters.

(1) Welcome centers provide outdoor space amenities and facilities such as nature trails and viewing areas.

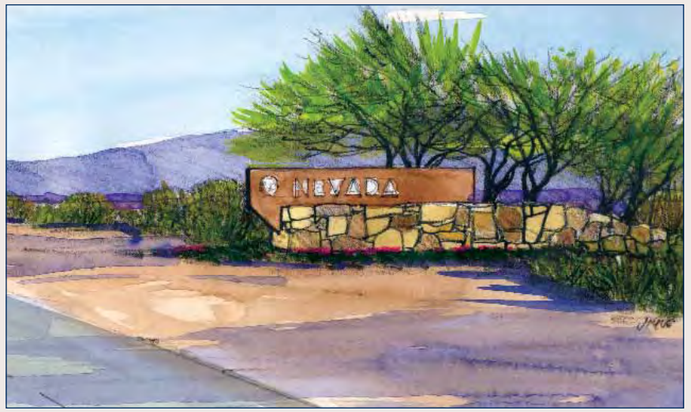
Image courtesy of Elizabeth Murrell, Fabric Structures Inc.

(2) The National Park architecture found in the Sierra Nevadas is reflected in materials.

Image courtesy of Robb Williamson, NREL Center for Buildings

(3) The architectural style strongly reflects the surrounding landscape.

(4) Materials for the Welcome Center at Verdi respond to the Sierra Nevada landscape.



(5) Required design elements illustrated for the West Wendover and McDermitt statewide gateways.

(6) Required design elements illustrated for the statewide gateway at the California border near Verdi.

3.0 COMMUNITY GATEWAYS

3.1 Engage agencies and organizations in the planning and design process. Engage applicable State and local agencies as well as local stakeholders and organizations in the planning, design, and implementation of community gateways. Mark the entrances and exits to communities using enhanced native, regionally adapted, or regional ornamental softscape types, and accentuated, focal or landmark structures and hardscape. Community gateways are intended to be visually impressive. Maintain and enhance important community features through careful gateway planning and design. Use appropriate landscape and/or structural techniques to screen unsightly land uses.

3.2 Locate gateways accordingly. A community gateway for the Sierra Nevada Passage Landscape Design Segment should be located at Verdi (Map 1B, page 4.12). The gateway should be highlighted with enhanced native softscape and accentuated hardscape types.

Community gateways for the Sierra Nevada/Great Basin Crossroads Landscape Design Segment should be located at the west and east McCarran Boulevard interchanges. Visual gateways should be located at Robb Drive and Vista Boulevard. Identification signage should be provided for downtown Reno and Sparks. Section 2 (page 4.19) indicates the types of structure and hardscape features and softscape for each gateway.

Community gateways for the Truckee River Passage Landscape Design Segment should be located at Wadsworth and Fernley. Identification signage should be provided for Lockwood, Mustang, and Clark. Section 3 (page 4.27) indicates the types of gateway features and landscape plantings that should be used to mark these gateways.

Community gateways for the Highway of the West Landscape Design Segment should be located at Lovelock, Winnemucca (both I-80 interchanges and entering from US 95), Battle Mountain, Carlin, Elko, Wells, and Orovada. West Wendover should be highlighted by a gateway welcome center as discussed in Guideline 1.0 (page 5.3). Sections 4, 5, 6, and 7 (pages 4.36, 4.39, 4.42, and 4.45) indicate the types of structure and hardscape features and softscape for each gateway.

3.3 Integrate the gateway into the highway facilities. Free standing signs are not allowed in the right-of-way. Community gateways need to be integrated with highway structures and landscape. Refer to Softscape and Hardscape Types and Treatments (pages 3.2 & 3.7) and Softscape Type Guidelines (pages 5.26-5.32) for more details about the types of features and plants to consider for community gateways.

3.4 Ensure community gateways contribute to community identity and clearly define community identity points. Accentuate community entrances with clear and attractive signage and with a landscape that reflect the community character. Ensure travelers recognize they have entered a special place. Community identification signage should be appropriately sized and incorporated into an architectural or sculptural element consistent with the community's character, the environmental context, and the corridor's theme. Ensure landscape plantings are appropriately designed and include layers of plant material arranged to enhance the architectural elements and develop the transition from the highway into the community. Architectural elements may include transportation art, rock walls, accent lighting, and signage. In areas where pedestrian connections are important, bridges can provide community identity. Ensure community gateways are distinctive, memorable, and functional. Defined levels of softscape treatments and structure and hardscape treatments, along with the suggested community themes, are described as follows:

Image courtesy of Town of Estes and Rotary Club of Estes Park

(1) Community identification signage should be appropriately sized and integrated with other architectural elements.

(2) The incorporation of architectural elements that reflect cultural meaning accentuate the sense of arrival.

(3) Accentuate community entrances with attractive signage and landscape that is integrated into all site features, including bridges and walls.

(4) Community gateway incorporated into retaining wall and bridge structure are appropriate for town entries along the rural study area.

(5) Example of a community gateway incorporated into retaining wall and bridge structure.

3.0 COMMUNITY GATEWAYS CONT.

Verdi: Softscape Treatment: Enhanced Native
Hardscape Treatment: Accentuated

Reno: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Connections to Downtown, Transportation Art

Sparks: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Victorian Square, Spark's Marina

Fernley: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Low Rise Growth Center, Recreation

Lovelock: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Agricultural, Native American Heritage, Emigrant Trail

Winnemucca: Softscape Treatment: Regional Ornamental
Hardscape Treatment: Focal
Character: Mining, Native American Heritage, Ranching, Western Culture, Outdoor Recreation

Battle Mountain: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Mining, Aviation, Native American Heritage

Carlin: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Humboldt River, Gold Mining, Emigrant Trail, Carlin Canyon

Elko: Softscape Treatment: Regional Ornamental
Hardscape Treatment: Focal
Character: Emigrant Trail, Western Culture, Ruby Mountains, Lamoille Canyon, Basque Culture, Wild Horse Reservoir, South Fork State Recreation Area, Native American Heritage

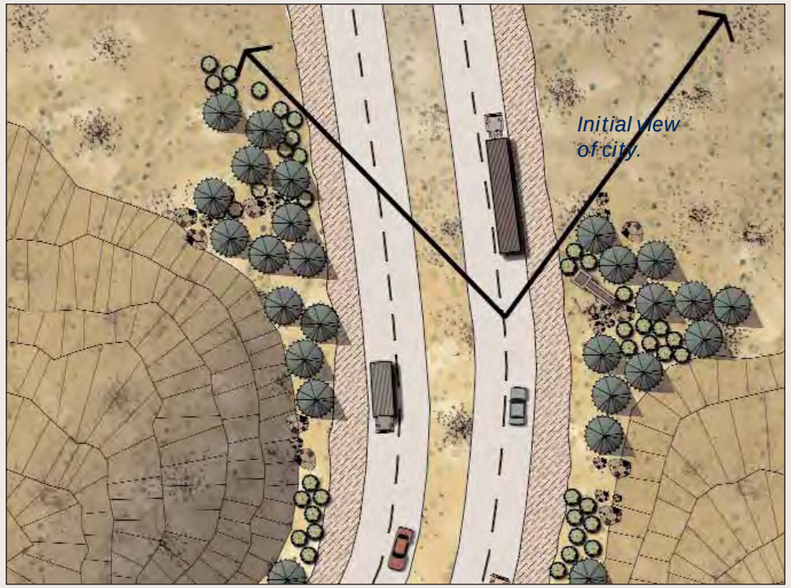
Wells: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character: Angel Lake, Great Basin National Park, Emigrant Trail, Ghost Towns, Native American Heritage

West Wendover: Softscape Treatment: Regionally Adapted
Hardscape Treatment: Focal
Character:: Entertainment, Outdoor Recreation, Air Force Auxiliary Airfield

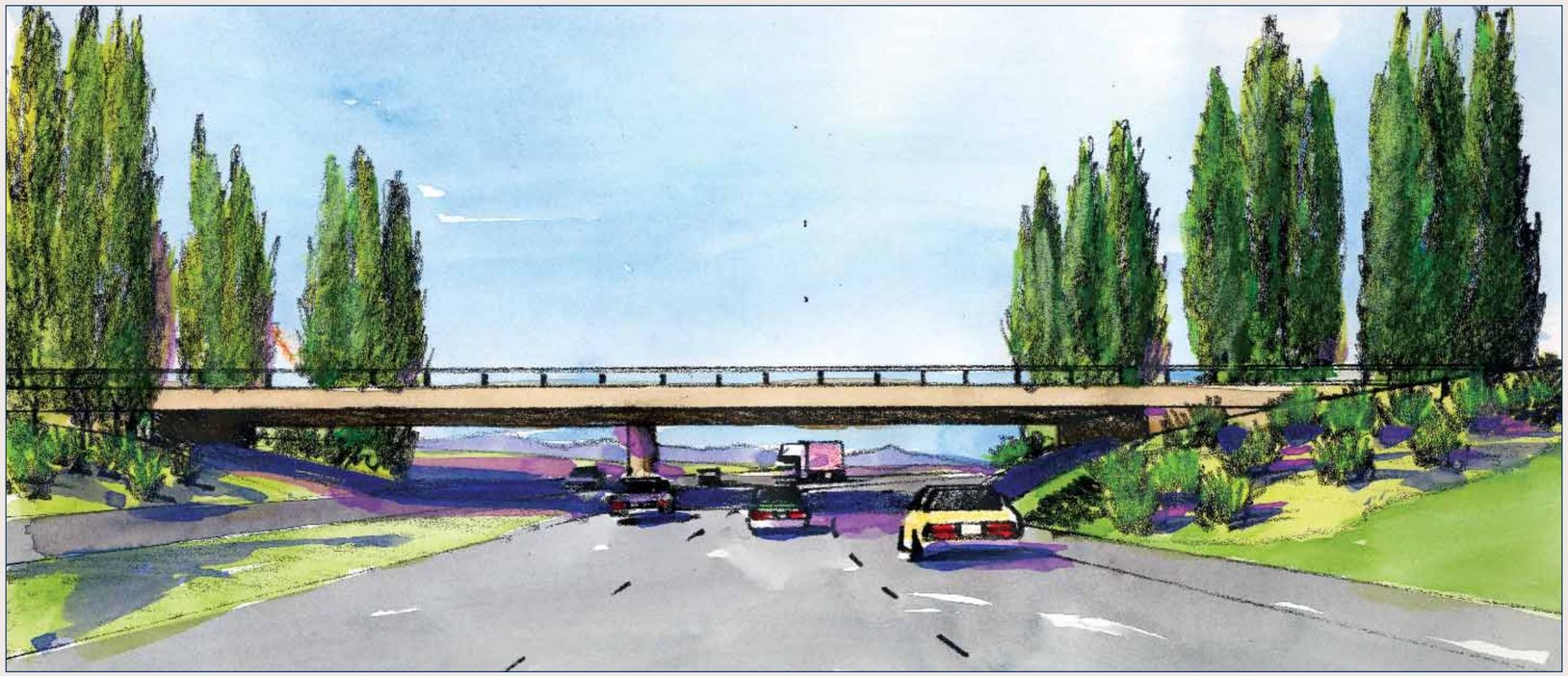
Orovada: Softscape Treatment: Enhanced Native
Hardscape Treatment: Accentuated
Character: Ranching, Recreation, Santa Rosa Range

McDermitt: Softscape Treatment: Enhanced Native
Hardscape Treatment: Accentuated
Character: Native American Heritage, Ranching

3.5 Ensure visual gateways frame the entry view of the community. Emphasize the sequence of arrival into the Reno/Sparks area by extending the sense of entry into the Truckee Meadows. Increase landscape densities along a designated segment of the highway and incorporate sculptural and architectural elements to heighten the expectation of arrival. Accentuate the reveal of the city, and emphasize and clearly mark the transition into the urban environment by using landscape plantings and architectural features to frame and focus views.



(1) Visual gateways frame the entry view of the city through the use of vegetation, landform, and architectural elements.



(2) The landmark qualities of this Highway of the West community gateway is an example that represents the highest level of treatment identified within the landscape design segments.

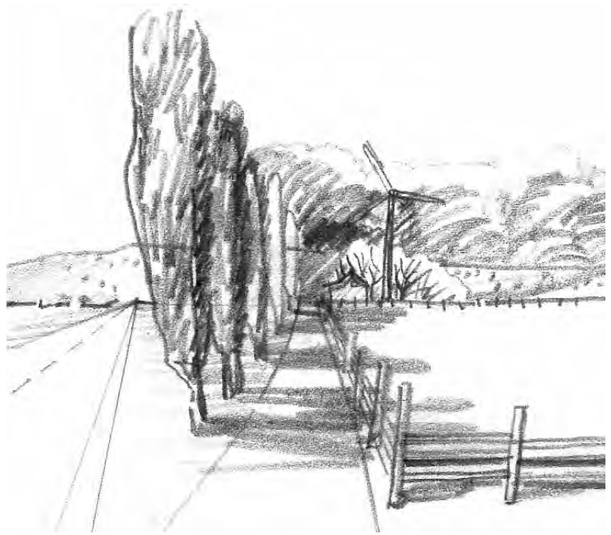
4.0 REST AREAS, VIEWPOINTS, AND PULL-OFFS

4.1 Implement a comprehensive roadside service program. Roadside services are key components of the highway corridor, particularly where long distances separate developed areas. Implement a comprehensive roadside service program throughout the corridor. Refer to Road Services Program for a detailed description of road services (page 3.10). Locations for road service sites are located on the Specific Corridor Features maps (pages 4.12, 4.20, 4.28, 4.37, 4.40, 4.43, and 4.46). All roadside services must be located off the highway or served by acceleration/deceleration lanes or service roads.

4.2 Ensure rest area design reflects the local setting. Ensure highway rest areas and other such facilities reflect the landscape and natural setting of the local area. All rest areas, viewpoints, and pull-offs should readily accommodate travel needs and reflect the corridor's design theme. Avoid using makeshift, adapted site facilities with no distinctive architectural style. Concrete barriers should not be used for parking delineation or site boundaries at rest areas and pull-offs. Ensure all built facilities, such as restrooms, information signs/services, and shade, are rooted in the local landscape. Sustainable architecture or green building design is highly suitable to many highway rest areas and other such facilities where water, energy, and landscape resources are difficult to secure and maintain (refer to Sustainable Highway Environments, page 5.35).

Analyze existing rest area structures, buildings, amenities, and layout in regards to their visual interest. Provide a renovation schedule to improve the aesthetics and user comfort of existing facility structures, amenities, and materials. Provide lighting in scale with the site development. Articulate space, frame views, and provide shade through the use of landscape plantings and/or architectural features.

The layout of rest areas should include major site resources and features such as topography, views and vistas, unique vegetation, geological features, wetlands, and other inherent qualities of the site and its surroundings. The amount of required truck parking should be analyzed and, where possible, should be minimized and/or sited as to not disrupt views and other features.



(1) Elements of rest areas include vegetation and architectural features that reflect the culture of the area.

(2) Shade structures at interpretive rest area with table, benches, and shade structure that frames significant views.

(3) A complete rest area provides facilities that are part of an integrated architectural approach.

(4) Architectural shade structure provides visual interest within the landscape.

(5), (6) Prototypical shade structure for all types of road service areas protects users from the wind and sun.

(7) The design of rest area structures should incorporate plantings, materials, and landscape features that reinforce the corridor's design theme.

4.0 REST AREAS, VIEWPOINTS, AND PULL-OFFS cont.

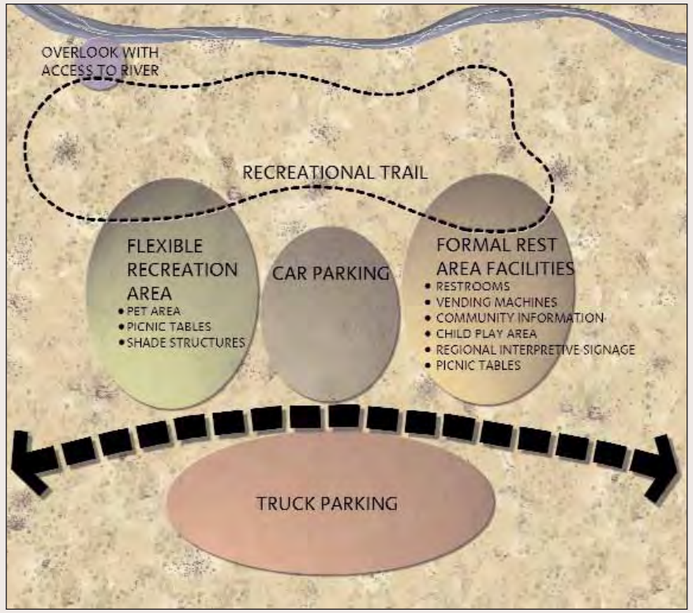
4.3 Locate viewpoints and points of interest accordingly. Special attention should be given to existing or potential views, vistas, and cultural or historical attractions that are unique to the site or have outstanding resource value, such as Native American heritage and emigrant history. Viewpoints should be located at the following locations:

I-80 Urban Study Area
- Renovate existing viewpoint eastbound near mile post 5
- Relocate existing viewpoint near Lockwood

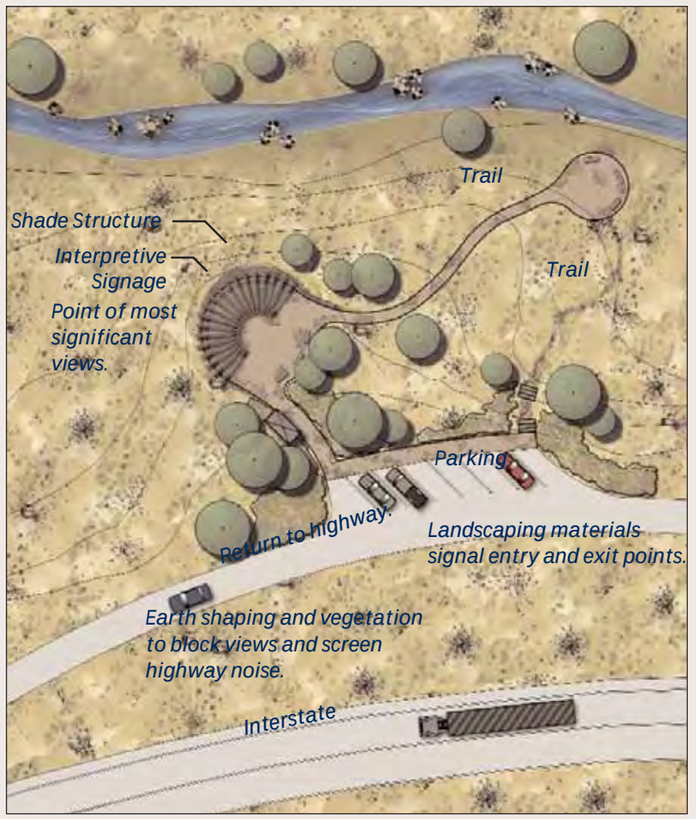
I-80 Rural Study Area
- Brody's Hot Springs
- Emigrant Pass
- Applegate-Lassen Cutoff
- Pequop Summit
- Winnemucca Sand Dunes
- Deeth: Humboldt River

Design the viewpoint to reflect the surrounding setting and unique features. Coordinate the preservation and management of scenic vistas and unique features with the appropriate organizations and groups. Evaluate viewpoints periodically to ensure the integrity of the view. Consider the use of scenic easements to protect views and vistas. Manage the construction of outdoor advertising and other elements and structures that detract from the quality of the landscape. Program elements to be included at viewpoints and the levels of softscape, structures, and hardscape treatments are listed in Road Services Program (page 3.10).

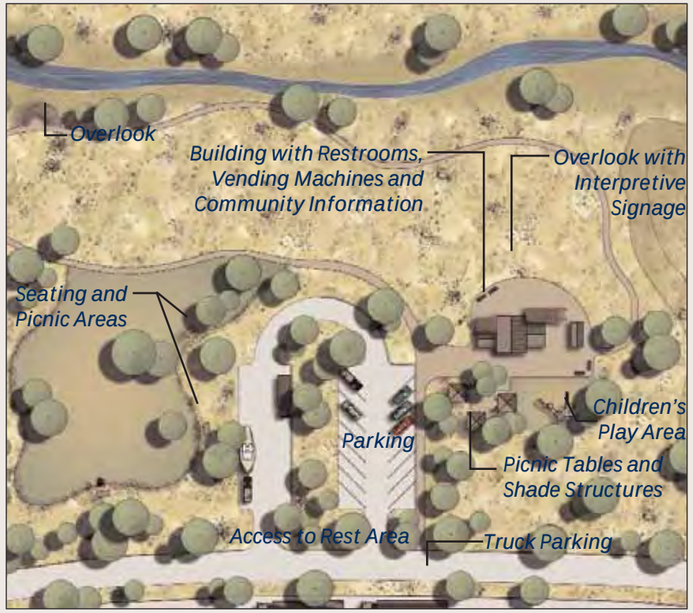
(1) Viewpoints and points-of-interests incorporate interpretive signage.



(2) Conceptual layout of rest area amenities responds to environmental context.



(3) Develop viewpoints that reflect the surrounding setting and unique features. Viewpoints should be separated from the highway and provide amenities for viewing, resting, and accessing natural resources.



(4) Rest areas should include a series of buildings or structures that reflect a homestead arrangement. Outdoor spaces should be considered as part of the building layout.

5.0 SIGNAGE

5.1 Provide a standard, cohesive system of service signage. NDOT will manage the location of Tourist Oriented Directional Signage (TODS) along the highway in a cohesive, understated manner. A cohesive set of standard TODS is encouraged over numerous private individual business signs and billboards. Work with local community agencies and businesses to develop and locate TODS. Refer to Outdoor Advertising Program (page 3.13) for more information about billboards along the corridor.

5.2 Implement a Statewide Place Recognition Sign Program. A comprehensive place recognition signage program should be implemented through partnership initiatives with local communities and agencies.

Areas of interest within the I-80 Urban Study Area's design segments that could be highlighted include:

- **Historic Features:** Derby Dam, historic flumes, railroads, emigrant trails, National Auto Museum, State Railroad Museum, and V&T Railroad (from Virginia City to Carson City and to Reno)
- **Wildlife and Natural Areas:** Fernley Wildlife Management Area and wildlife viewing areas
- **Geographic Features:** Truckee River, Truckee Canyon, Lahontan Reservoir, Pyramid Lake, and Lake Tahoe
- **Cultural/Recreational Resources:** Mount Rose Scenic Byway (SR 431), Pyramid Lake National Scenic Byway (SR 445), Pyramid Lake Indian Reservation, petroglyph site near Vista Boulevard, University of Nevada, Nevada Museum of Art, Tahoe Pyramid Bikeway, and Virginia City National Historic District

Areas of interest within the I-80 Rural Study Area's design segment that could be highlighted include:

- **Historic Features:** Native American history, Toulon Historic Mill, Mill City ruins, Unionville, Emigrant Trail, Hastings Cutoff and California Trail, Applegate-Lassen Cutoff Trail, Winnemucca Historical Museum, springs at Wells, Lovelock Caves, Thunder Mountain, and Veterans Memorial Park
- **Wildlife and Natural Areas:** Humboldt Wildlife Management Area, bioenhancement of Humboldt River, Rye Patch Dam, Pinyon-Juniper forests in the Pequop Range, and wildlife viewing areas
- **Geographic Features:** Fernley Sink, Carson Sink, 40-mile Desert, Lava Rocks, Tufa Rock Formations, Thunder Mountain, Eugene Mountains, Humboldt River, Snake Mountains, Pilot Peak, Sonora Range, Osgood Mountains, Buffalo Mountains, Winnemucca Sand Dunes, and Wild Horse Reservoir
- **Geological Places of Interest:** quarry/mining sites, Brody's Hot Springs, mining restoration sites, Mercury Mine near Cordero, Sleeper Mine near Daveytown, Pequop Caves, Denio Opal Mine, and historic lake levels
- **Cultural/Recreational Resources:** Rye Patch Recreational Area, Mining Center for Copper, Borite, and Gold near Battle Mountain, Lamoille Canyon Scenic Byway (SR 227), Angel Lake Scenic Byway (SR 231), Emigrant Trail Visitor Center, Sand Dune Recreation Area, Ruby Mountains, Bloody Shins Trail, South Fork State Recreation Area, Native American tribes, Native American heritage, Eisenhower Highway (I-80), and Veterans Memorial Highway (US 95)

5.3 Icon Representation. The features and points of interest to be recognized in this program will be approved by the NDOT signage committee. The image icons depicting each feature to be recognized on the sign should be derived from the actual physical shape of the point of interest as shown in illustrations 1, 2, 3 and 4 on this page. Name and labels included shall be consistent with State archives and map naming conventions. Final icon and name approval will rest with NDOT.

5.4 Incorporate the anti-littering campaign. Anti-littering messages located at highway stops that include food and beverage services will provide an immediate reminder to travelers. Work with local vendors to place the anti-littering messages on disposable cups, plates, and other items likely to be tossed out the vehicle window.

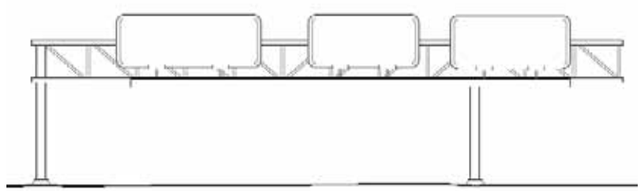
5.5 Implement an Audio Interpretation Program. Develop an audio/multimedia interpretative program that would tie into the Statewide Sign Program. This program could be implemented via broadcast radio, CD or DVD programs, wireless Internet hotspots, satellite transmission, or other media that allows travelers to access additional information about cultural and natural resources, tourist opportunities, and services along the corridor from their car. Link the Audio Interpretation Program to the Statewide Place Recognition Sign Program and state welcome centers so that travelers will be able to access specific information on selected sites. Utilize synchronous technologies that allow the users to control how and when they access this additional information. Incorporate the program into the Intelligent Transportation System Regional informative architecture to allow messages to be updated in real time and be coordinated with AMBER alert and 511 traveler information messages. Partner with other groups, organizations, agencies, and municipalities along the corridor and explore ways to expand the Audio Interpretation Program.

(1) Truckee River

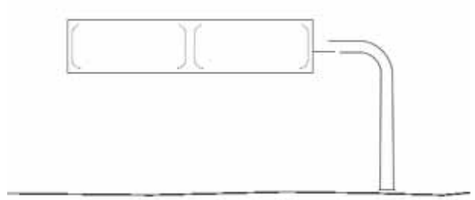
(2) Truckee River depicted on the Nevada sign program.

(3) Pilot Peak

(4) Pilot Peak depicted on the Nevada sign program.



(5) Sign bridge with numerous trusses are visually cluttered.



(6) Single arm monotube with one signage board clarifies appearance of information.

6.0 TRANSPORTATION ART

6.1 Create regionally appropriate, meaningful art. For the roadway user, an artscape enhances the travel experience and the impression of place. Transportation art should be authentic and should evoke clear meaning and purpose that relates to the surrounding place, the unique culture and environment of the area, and the travel experience. Patterns imprinted on a highway structure should be designed with an artistic composition of objects, imprints, or patterns. While complementing other highway structures in form and color, patterns should offer a level of complexity and interest that responds to the unique experience of the place and roadway travel. Artwork should be of a scale appropriate to highway travel speed. Consider artwork that expresses the element of light, involving both sunlight and artificial light. Select sculpture that captures the desert sun as an element of its design. To engage the viewer, patterns and objects should be used thoughtfully. Even abstract elements can and should evoke a response to the physical reality of travel, time, and the uniqueness of the site and surrounding landscape to depict appropriate character and meaning. Avoid monotony in the duplication of repetitive literal pictorial applications, such as profiled mountains rendered in concrete texture.

6.2 Ensure artwork expresses an excellence of craftsmanship, quality, truthfulness, and originality. Elements of highway art should not be obvious nor inauthentic. Avoid the use of ready-made, randomly placed, stand-alone objects or imprints that depict little meaning. Rather, transportation art should have an excellence of craftsmanship, quality, truthfulness, and originality. Use evocative artistic expressions that complement highway structures and the surrounding landscape and that engage observers. Rather than imprints of obvious subject matter, select more complex artistic expressions that encourage viewers to "fill in the blanks" and in so doing evoke a higher level of meaning.

6.3 Consider each art piece as part of a larger whole. Highway art can be carefully crafted, and the simplest of all elements have a very powerful effect. When planning transportation art, the entire length of each design segment and the corridor should be considered. Each design segment is planned around views and vistas to the surrounding landscape to which the art is complementary.

6.4 Ensure transportation art supports the landscape design segment themes. Transportation art is not a typical project, and the choice of appropriate subject matter and media is essential to obtaining the desired expression of each landscape design segment theme. Choose art subjects that support the landscape design segments' themes, such as:

Sierra Nevada Passage:

- Celebration of arrival to and departure from Nevada
- Ranching
- Railroads
- Mining
- Outdoor recreation
- Sierra Nevada landscape and wildlife features

(1) Culturally important mural along roadside created as a tile mosaic.

Image courtesy of Catherine Widgery

(2) Cultural symbols sandblasted into stone mark aspects of the historic emigrant travel.

(3) Towering metal sculpture as part of a bridge is intended to be seen from a distance and is appropriate for the I-80 urban study area.

6.0 TRANSPORTATION ART cont.

Sierra Nevada/Great Basin Crossroads:

- Travel / Tourism
- Entertainment industry and gaming
- History of community and of transportation
- Outdoor recreation
- Railroads
- Virginia City National Historic District
- Truckee River and Pyramid Lake
- Community and cultural events
- Sierra Nevada and Great Basin landscape and wildlife features

Truckee River Passage:

- Outdoor recreation
- Native American heritage
- Riparian system
- Canyon features
- Emigrant trails
- Railroads
- Historical and present-day mining
- Pyramid Lake and Lahontan Reservoir
- Great Basin landscape and wildlife features

Highway of the West:

- Celebration of arrival to and departure from Nevada
- Native American heritage
- Emigrant Trail; pioneer heritage
- Entertainment culture
- Mining
- Railroads
- Basque culture
- Ranching
- Agriculture
- Mountain ranges
- Ghost towns
- Outdoor recreation
- Environmental features
- Great Basin landscape and wildlife features

Enhance bridges, pedestrian structures, sound walls, and retaining walls with appropriate motifs and consider sculptural ornamentation, decoration, and landmark features.

6.5 Engage local agencies and organizations in the planning process. Significant transportation art opportunities exist in each design segment of the I-80 corridor. Artwork can be included as a component of landscape and aesthetic projects, or as free-standing art installations. A relationship with the Nevada Arts Council should be developed as a statewide contact. Local relationships should be developed with agencies, such as Reno Arts and Culture Commission, the Sierra Arts Foundation, the Churchill Arts Council, and the Western Folklife Center, to assist in the review and implementation of proposed transportation art projects. Consider transportation art at the onset of project development. Engage community members, artists, landscape architects, and architects early in the design and development stages of highway projects to ensure an integrated and comprehensive art program. For Community Matching Fund and Transportation Art programs, refer to NDOT's guidelines outlined in the Landscape and Aesthetics Procedures Manual: Guidelines, Applications, Instructions and Forms for the Community Matching Funds, and Transportation Art Program.

Image courtesy of Scottsdale Public Art and Erik Gonzales, artist.

(1) Art incorporated into pedestrian bridge.

Image courtesy of Scottsdale Public Art and Erik Gonzales, artist.

(2) Art along roadside that reflects the color palette of the surrounding environment.

Image courtesy of PS Engineering and Lee Kelly, artist.

(3) Sculptural art in urban setting stands out as part of a rural community gateway.

Image courtesy of Mick Winter

(4) Iconic sculpture reflects the working nature of the landscape.

Image courtesy of Scottsdale Public Art and Jeff Englemann

(5) Sound wall with decorative imprint motif created with custom form liner. This is both imprint as well as "additive relief" to project beyond the wall surface.

Image courtesy of Miami-Dade County and Ed Carpenter, Mike McCulloch, and John Rogers, artists.

(6) Glowing wall panels reflect light and create a bright, colorful art piece.

7.0 COLOR PALETTE APPLICATION

7.1 Use a uniform, consistent color palette for all highway structures. Standard NDOT practice should use a uniform and consistent color palette for all new and existing highway structures that complements the surrounding landscape. Base and accent stain or paint colors for all highway structures along the I-80 Corridor have been selected. For color reference purposes, the colors have been matched to the Dunn-Edwards system and are shown below.

From the palette below, each highway structure should use a selection of one base color and up to two accent colors. Ensure roadway structures within a single Landscape Design Segment use the same base color and accent color(s). As existing structures require refinishing, they should be stained or repainted to be consistent with the selected color palette. Specific logos and transportation art are exempt (refer to Transportation Art guideline, page 5.9).

7.2 Ensure accent colors highlight structural aspects. Accent colors should be used to highlight structural aspects and/or details of highway structures, such as the beam of a bridge or a bridge railing. Ensure accent color application logically responds to and reinforces structural features or change in materials.

7.3 Blend new rock cuts and/or soil with the surrounding landscape. Match new rock and soil treatments with existing rock and soil color. Where possible, application shall occur in a central location and away from sensitive receiving waters. Treatments should blend newly excavated soil and rock with existing weathered rock. Any corridor project in which rock cuts are included should use this process.

BASE COLORS

Sierra Nevada Passage
#6215

Sierra Nevada/Great Basin Crossroads and Truckee River Passage
#6137

Highway of the West
#6194

ACCENT COLORS

#5264
#6097
#6040
#5936
#6223
#6258

Any two accent colors may be selected from the follow selections. All landscape design segments use this accent color palette.

(1) The proposed color palette refers to the Dunn-Edwards paint system, for reference purposes only.

(2) The landscape inspires the color palette for each landscape design segment. A different base color is used for each segment of the corridor.

(3) Field testing of color palette in different light, orientation, and settings.

(4) The following images demonstrate existing roadway structures before and after color palette application. Color application can be retrofitted to existing-in-place structures.

7.0 COLOR PALETTE APPLICATION cont.

7.5 Use color composition on bridges to visually reinforce structural elements. Use the base and accent colors to reinforce the structural elements and integrity of a bridge. Concrete bridge spans, super-structure support, and slope paving should be selected from the landscape segment base color. Railing and other features incorporating a material change should be accent colors. Steel bridge spans should use an accent color.

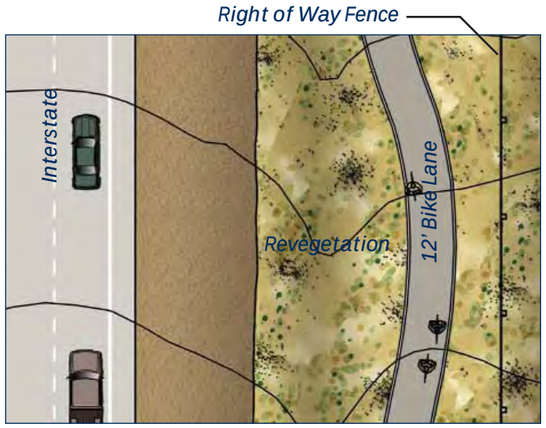
(1), (2) Appropriate coloring of bridge enhances visually quality

8.0 NON-MOTORIZED TRANSPORTATION SYSTEMS (NMT)

8.1 Engage agencies and organizations in the planning and design process. Engage Federal, State and local agencies as well as local user groups and organizations in the planning, design, and implementation of non-motorized transportation facilities. Ensure proper planning conveniently accommodates NMT while minimizing adverse safety and environmental impacts. Consult the statewide bicycle and pedestrian plans prepared by NDOT.

8.2 Integrate NMT into the right-of-way. NMT systems can be accommodated and should be encouraged within some areas of the highway right-of-way. Where right-of-way topography, site conditions, and land use warrant, separate bicycle paths may be built. Where possible, ensure that direct connections are made to existing and future trail systems and multi-use pathways.

(3) An appropriate combination of color treatments, lighting, and scale helps to create a comfortable pedestrian environment.



(5) Coordinate with local agencies to integrate regional trail systems into the highway right-of-way and provide crossing structures that connect to neighborhoods.

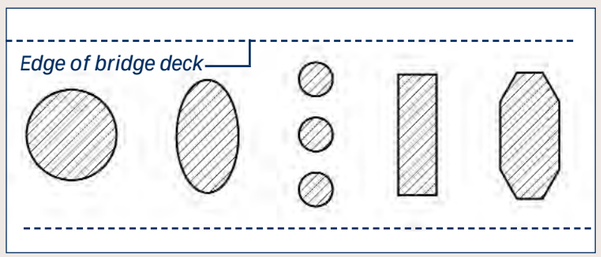
(4) Custom pedestrian bridge rail highlights a crossing point.

(6) Native materials can be used to create unique pedestrian undercrossings. In this example, the height of the opening allows light into underpass.

9.0 BRIDGES

9.1 Use a consistent bridge design. Use bridge structures of similar proportions, finish, and barrier rail design consistently throughout the corridor. In the Sierra Nevada/Great Basin Crossroads segment, street names should be embossed on the bridge span, providing place identification for the motorist. Community names may be embossed in the Highway of the West segment. Where special conditions arise and larger or different bridge spans or types are required, ensure the new bridge is compatible with the type used elsewhere in the corridor.

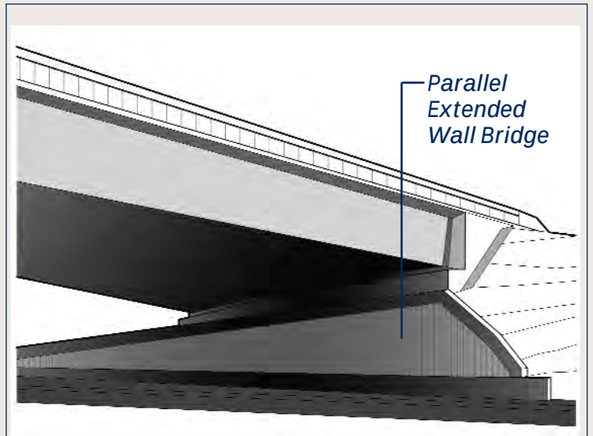
9.2 Use simple sub-structure and support features. where possible, avoid "V," "Y," or flared support shapes in sub-structure and support features. Instead, use simple sub-structure and support features with strong proportional relationships in bridge design. Use simple geometric shapes to minimize support profile as well as the number of supports required. Generally, piers should not be the focal point of a bridge composition. When bridge supports involve stream crossings, column shape must account for bridge scour.



(1) Sample bridge support cross sections.

9.3 Use visually light bridge rail structures. Consider open rail design of steel rail or concrete barrier and steel to create a more refined bridge with a lighter appearing span. Maintain scenic views and views of the surrounding landscape where possible. Where a solid concrete barrier is required for safety consideration, use shadow lines and patterns to avoid blank surfaces.

9.4 Consider fill embankments and approach rails as part of the bridge design. Consider fill embankments and approach rails in concert with the abutment, bridge barrier rail, and superstructure. Materials, height, and attachment details should be carefully considered when connecting guardrails to the bridge. Minimize slope pavement at bridge embankments and consider flattening slopes to 3H:1V. Use rock mulches, stone riprap, or decorative slope paving (minimally) to stabilize steep banks immediately below the bridge.



(2) Avoid bridge structure design that creates walls parallel to the travel lane. Utilize graded slope and abutments.

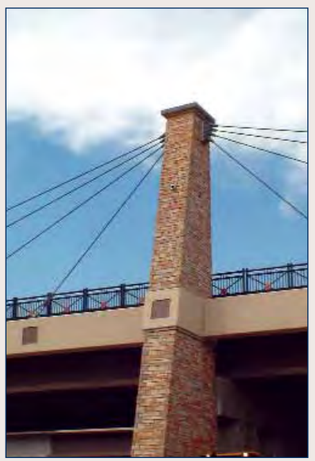
(3) Simple bridge design integrated into embankment with landscape planting.

(4) Bridge design with focal hardscape features in urban setting.

(5) Bridge features reflect local stone materials.

(6) Landmark bridge detail in urban areas.

(7) Emboss names on the bridge span to provide wayfinding for the motorist in the urban Reno/Sparks area.



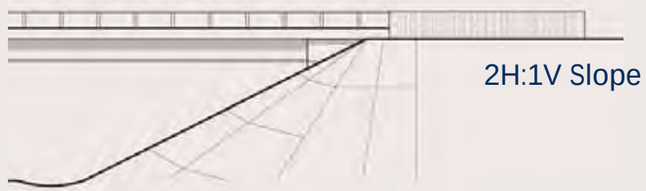
(8) Special bridge design elements to create a focal feature.

(9) Bridge design with simple sub-structure and support feature.

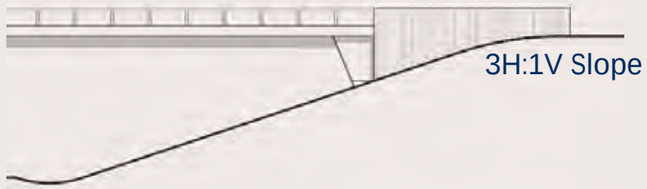
9.0 BRIDGES cont.

9.5 Use landscape or rock mulch to stabilize embankments. Contour grade embankments and use landscape planting to maintain embankment where possible. Use retaining walls to establish suitable flat landscape areas where right-of-way is narrow. Ensure mulch materials match bridge structure color and the surrounding landscape. (see Color Palette guideline for appropriate color selection, page 5.11). Rock mulches, stone riprap, or decorative slope paving (minimally) are appropriate to stabilize abutments below the bridge. When slope pavement is used, include integral color to match base color palette.

9.6 Select vandalism resistant finishes. Finish type, color, and surface patterns are important design elements in coordinating the structure with the surrounding landscape. Select bridge finishes of appropriate color (see Color Palette guideline, page 5.11) and vandalism-resistance. All exposed surfaces should be treated with non-sacrificial anti-graffiti finishes. Color and finish selections will assist in reinforcing the design intent of the bridge structure. Use "fine surface finish" as needed to apply color stains and anti-graffiti coatings.



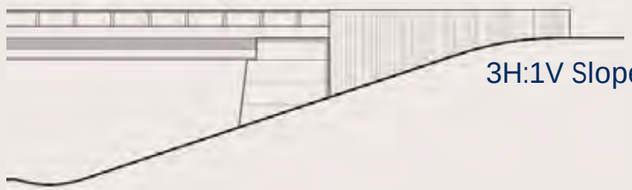
(1) Avoid 2:1 slope as primary bridge abutment and the need for slope pavement to stabilize steep slope.



(2) Avoid weak proportions in bridges with shallow or undersize abutments.

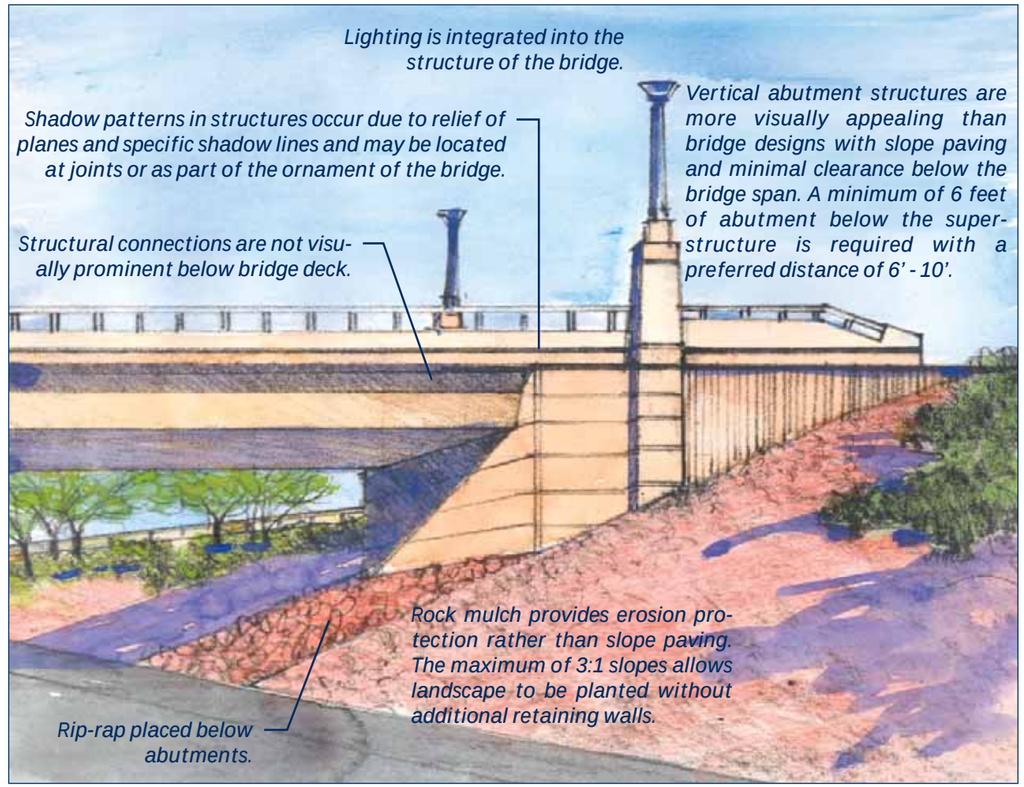
(3) Avoid characteristic shapes that don't allow the structure to be visually supported.

(4) Preferred use of bridges with retaining wall abutment and 3:1 slope is intended for the corridor.



(5) Preferred use of a batter to the abutment is a desirable feature.

(6) Proportions significantly affect the visual appeal of the structure.

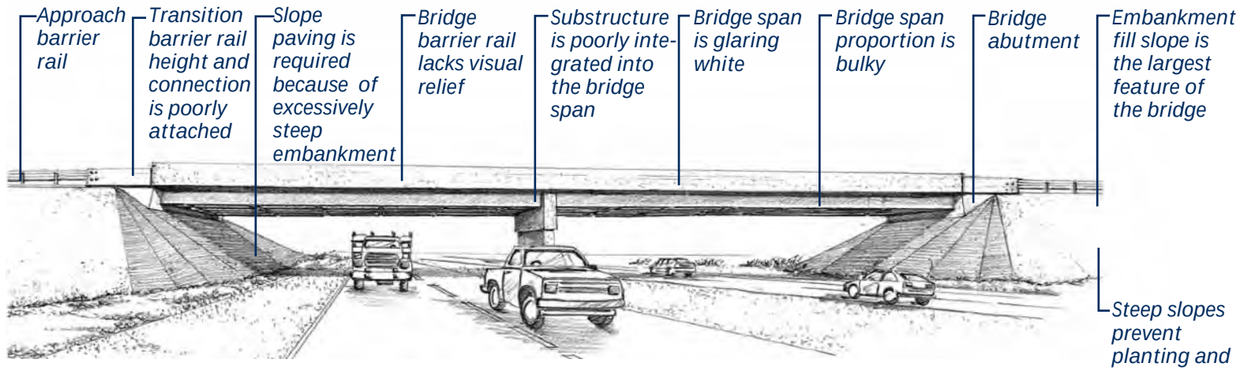


(7) Bridge abutment and barrier rail designed as a composition with jointing and materials consistently applied into a well proportioned bridge

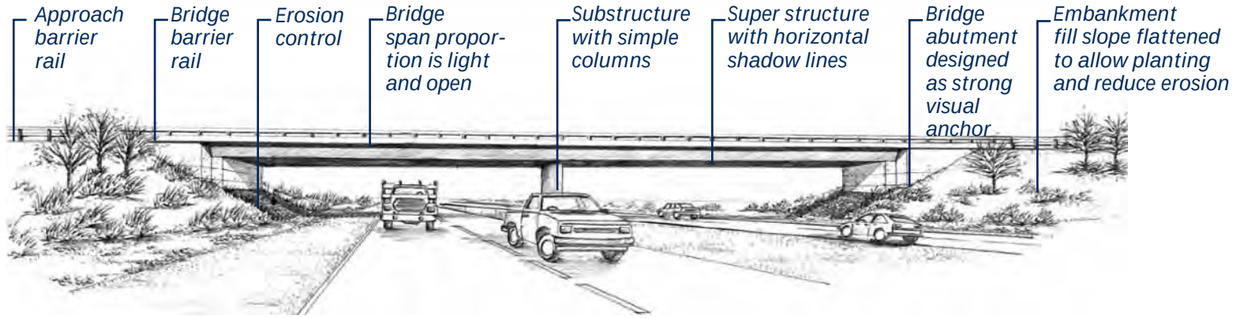
9.0 BRIDGES cont.

9.7 Create a visual design unity among all existing and new structures. Coordinate visual aspects of bridges with sound walls, retaining walls, and other highway structures. Create a visual design relationship that includes coordinating materials, patterns, color, and other design elements of structures. Establish visual design continuity of existing bridges and other structures by implementing a paint/stain retrofit program to unify color schemes where they vary within a corridor.

9.8 Integrate landscape and aesthetics at the onset of project planning. NDOT's initial report on type, size, and location of highway structures should include information regarding landscape and aesthetics elements.

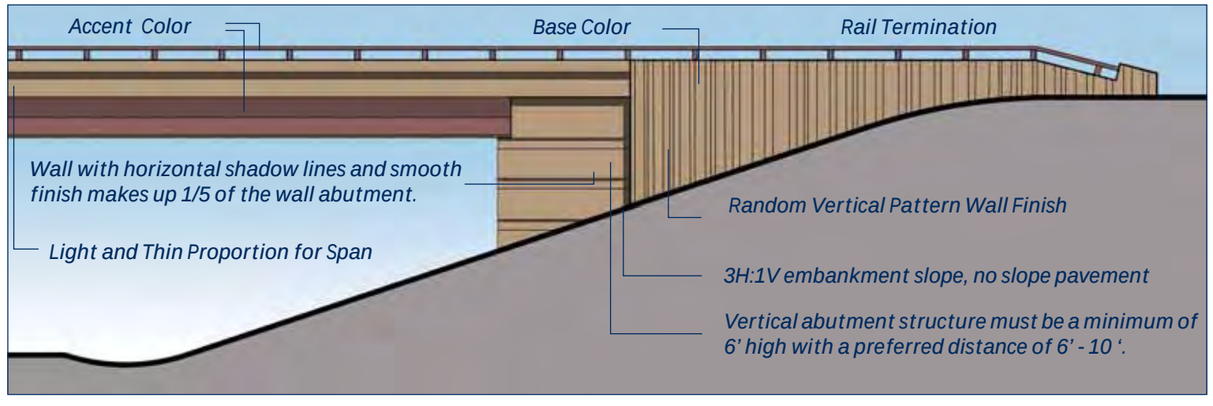


(2) Typical components and proportions lack visual appeal.



(3) Landscape and aesthetic treatments improve the appearance of the bridge when applying design guidelines from this section.

(1) This is an example of a standard bridge in the Highway of the West segment.



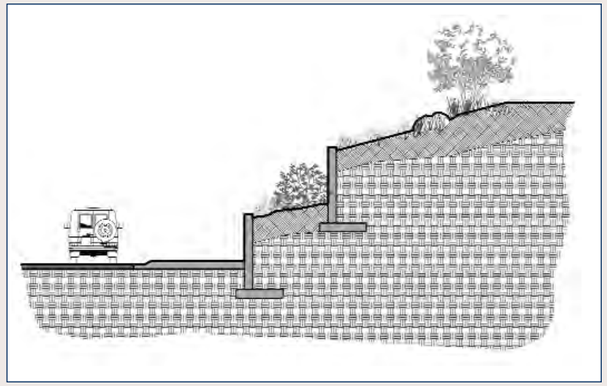
(4) Preferred bridge design elements for I-80 corridor.

10.0 RETAINING WALLS

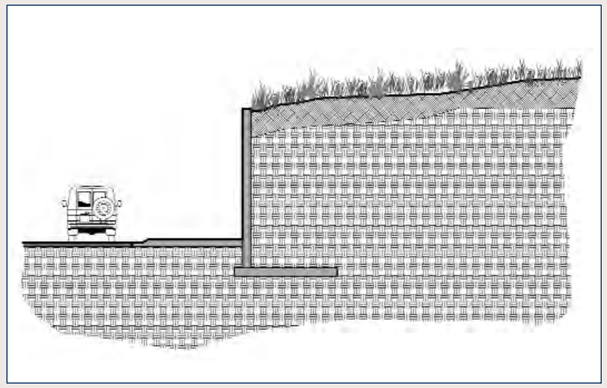
10.1 Consider grading to minimize wall height. Along steep embankments, terraced grades and low retaining walls to avoid the need for high walls and/or expansive facades are recommended. On gradually sloping grades, ensure the top of wall transitions appropriately with the slope. Match the top of wall with the adjacent contour. Use a step or change of plane where walls exceed 14-feet exposed vertical height above finish road surface (illustrations 1 and 4).

10.2 Provide landscape planting. Landscape plantings in front of walls will soften the appearance of large wall faces. When planning and designing retaining walls, landscape planting and maintenance space should be provided. Landscape planting space at the wall base should occur wherever retaining walls are included.

10.3 Anchor retaining walls to the earth. Turn the end portions of retaining walls into cut-slopes to provide greater stability to the wall's surface and to create the positive visual effect that the wall is "anchored" to the earth. Avoid over-steepened slope transition at retaining wall ends or introduction of rip-rap to correct this condition. Extend each wall return to accommodate graded slope (illustrations 7 and 8).



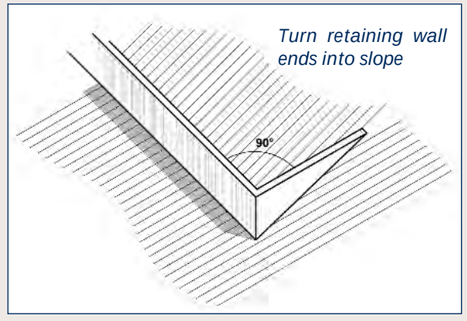
(1) An example of a step or change of plane for a retaining wall greater than 14 vertical feet.



(4) An example of the tunnel effect created by a retaining wall greater than 14 vertical feet.

(2) An example of a cantilevered retaining wall with a simple, consistent use of materials. Vertical joints are most compatible with the finish.

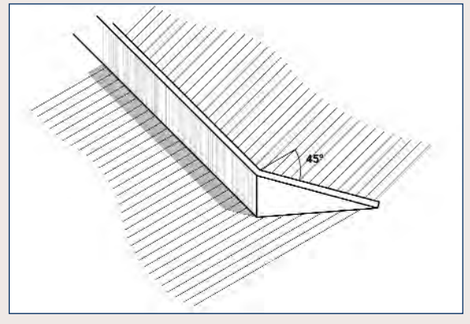
(5) Simple retaining wall patterning, railing design, and landscape palette. The wall is separated from the concrete barrier with the space and planting area.



(7) Turning the ends of retaining walls "anchors" them into the earth and creates a finished end to the retaining wall.

(3) Bridge design integrated into retaining wall with landscape planting creates gentle slopes and area for landscape planting.

(6) Retaining walls provide space for pedestrian walkways.

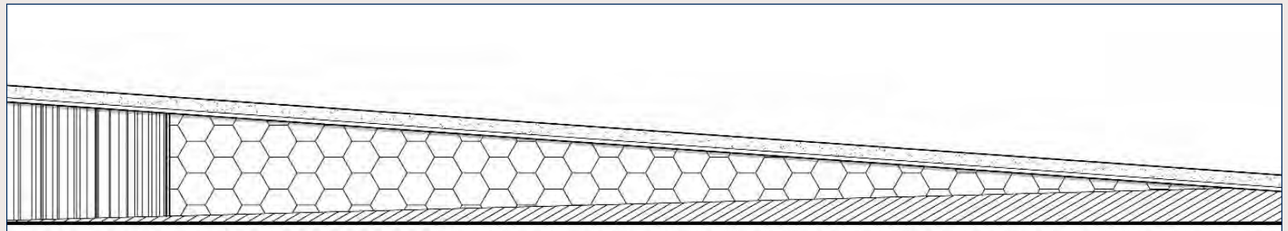


(8) Retained slopes with walls should return to meet uphill grade.

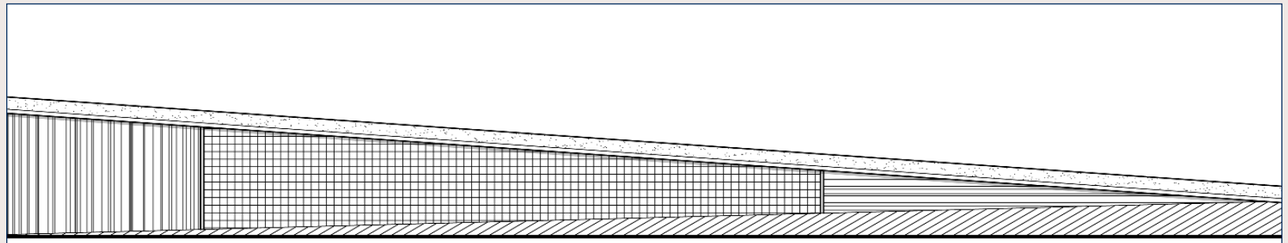
10.0 RETAINING WALLS cont.

10.4 Select a simple design palette. Choose a simple design palette of material, pattern, color, and texture that coordinates with the corridor's Landscape Design Segment theme for retaining walls. Maintain consistent use of the selected material, pattern, color, and texture. Avoid using multiple materials, such as steel, concrete, keystone block, or CMU on walls. (Refer to Color Palette guideline, page 5.11, and Transportation Art guideline, page 5.9, for more information about appropriate patterns). Exterior finish for retaining walls should have the same visual appearance independent of the type of wall. For MSE walls, 50 square foot size panels are preferred with vertical joints and a rectangular shape. All panels should have a rusticated variable vertical pattern that extends across the entire surface. The prototypical surface finish is shown in illustration 3 and is detailed in illustration 6 on page 5.18.

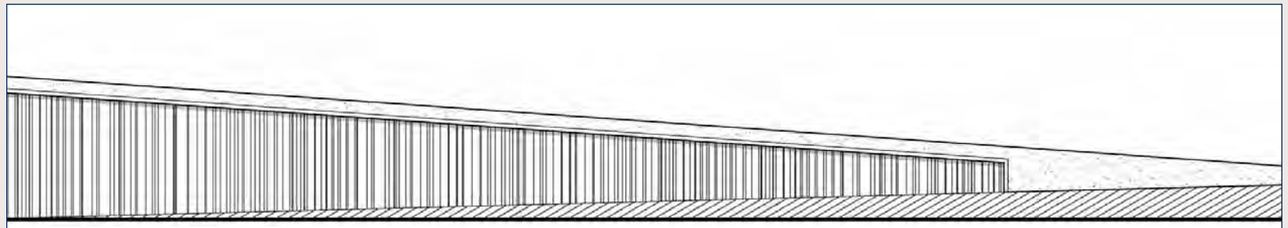
10.5 Choose an appropriate visual design subject. Use visual design themes and/or pictorial motifs comprised of simple patterns and distinct surface texture. Carefully design the compositions of motifs (height and position) on the wall. Ensure that visual design themes and/or pictorial motifs are an appropriate subject and scale for the highway segment in which they are located (refer to Transportation Art guideline, page 5.9, for more information about appropriate subject matter).



*(1) **Avoid** small scale joints, octagon, or cruciform shaped panels. These are only acceptable when textured with a rusticated variable vertical pattern.*



*(2) **Avoid** multiple materials, shapes, and joint patterns.*



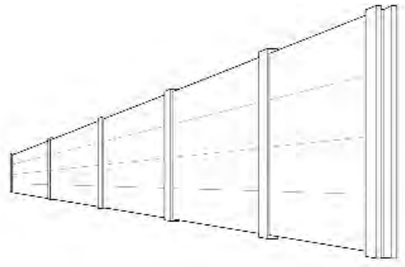
*(3) **Preferred** finish is rusticated variable vertical texture and pattern. Surfaces should have a single finish whether MSE, cast-in-place, or other wall type is used. Consistency with other structures is required.*

11.0 SOUND WALLS AND VISUAL SCREEN WALLS

11.1 Consider grading to minimize wall height. This guideline is not intended to change or supercede federal sound wall requirements. Aesthetic improvements for sound walls should be considered in concert with specific site characteristics, available space, cost, and noise protection procedures. When possible, free-standing sound walls should not exceed 14-feet in height without a step in the wall plane. Where possible, consider an embankment slope to buffer sound, or use a combination of earth berms and sound walls to achieve structural integrity and buffer sound while limiting actual wall height. Walls used only for visual screening should not exceed 10-feet.

11.2 Provide landscape planting and setback space between the vehicle recovery zone and the sound wall. Landscape plantings in front of walls will soften the appearance of large wall faces. Ensure planting and planting maintenance is accommodated both in front of and behind the wall.

11.3 Select a simple design palette. Choose a simple design palette of material, pattern, color, and texture that coordinates with the corridor's Landscape Design Segment theme for retaining walls and sound walls. Maintain consistent use of the selected material, pattern, color, and texture. The required prototypical surface pattern is shown in illustration 6. Avoid using multiple materials, such as steel and concrete or CMU, on continuous spans of wall. Post and panel systems are not recommended for permanent sound wall construction and should be used only for temporary applications. If a post and panel system is used, then it should be constructed of a single material, preferably pre-cast concrete.



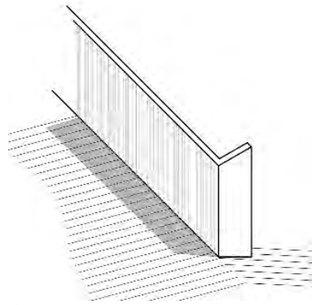
(1) Avoid post and panel system for permanent sound wall application.

(2) The integration of vertical vegetation softens sound walls.

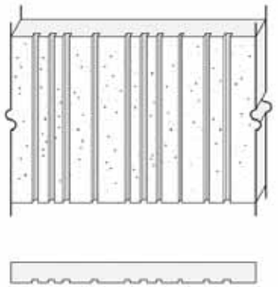
(3) Form liners can produce details in wall patterns.

(4) Focal sound wall imprint adds visual interest.

Image courtesy of Scottsdale Public Art and Jeff Englemann



(5) A wall return of three feet is recommended for sound walls outside the clear zone at the beginning of the wall facing the driver.



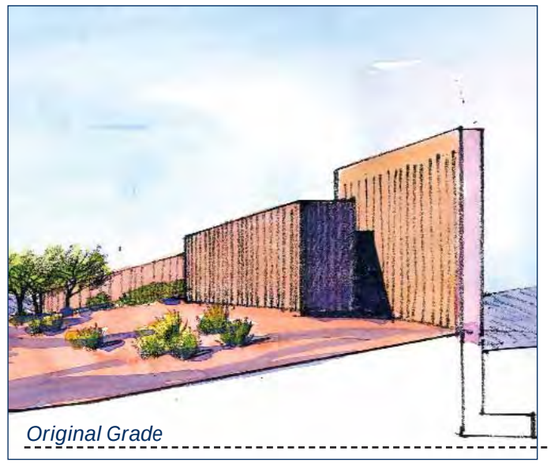
(6) Required prototypical surface pattern is rusticated variable vertical ribbing. Dimensions vary between 2"-8" apart.

(7) Rusticated variable vertical patterning adds visual interest.

(8) Motif patterned retaining wall and sound wall considers the location of the pattern on the wall.

(9) Sound wall materials reflect local materials.

(10) Integrate sound walls into highway right-of-way with landscape planting between wall and roadway. The setback also allows earth contour grading to vary the wall heights and base grade.



(11) Grading in combination with walls will reduce the height of walls while still meeting federal noise standards.

(12) Earth berms or embankment slopes are effective as sound barriers and should be used along or in combination with partially depressed road profiles. This can avoid walls where sound attenuation is required.

11.0 SOUND WALLS AND VISUAL SCREEN WALLS cont.

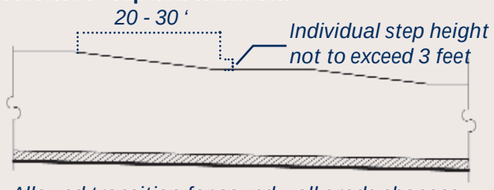
11.4 Choose an appropriate visual design subject. Use visual design themes and/or pictorial motifs comprised of simple patterns and distinct surface texture, and carefully design the compositions of motifs (height and position) on the wall. Ensure that visual design themes and/or pictorial motifs are an appropriate subject and scale for the highway segment in which they are located. Sound walls over 12-feet in height require special graphic or pattern treatment (refer to Transportation Art guideline, page 5.9, for more information about appropriate subject matter).

11.5 Create visual breaks and interruptions to avoid monotony along walls. Use staggered and/or curved walls of varying lengths to provide visual interest where there are extended stretches of sound wall. Prototypical sound wall layout designs are illustrated on page 5.20. Battered walls, which are inclined walls, can provide additional interest. Shadow patterns can be introduced to create visual interest that shifts and changes throughout the day. Configure walls as illustrated in drawings and photos below.

11.6 Separate walls from other highway structures and set back from travel lanes where possible. When practical, avoid attaching walls to concrete barriers and/or retaining structures. When walls are attached to such structures, avoid mixing materials and incompatible forms. Ensure walls are carefully planned for and integrated with the design of the highway and/or bridge. Set walls back a minimum of 30-feet from edge of travel lane where possible. Walls may be placed on top of concrete barriers only when no other practical solution exists.

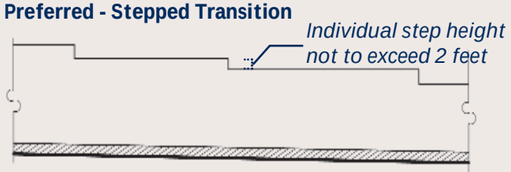
11.7 Encourage noise compatible land uses adjacent to highway corridors. At the planning level, encourage land uses adjacent to highways that are more compatible with highway noise such as commercial and light industrial areas. Noise sensitive receptors, such as residential areas, schools, hospitals, and recreation facilities require sound abatement strategies while other types of uses may not. Coordination at the planning stages is critical to avoid conflicts.

Preferred - Tapered Transition



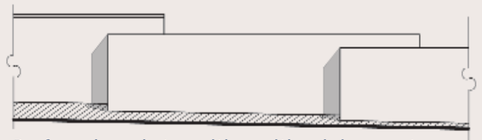
Allowed transition for sound wall grade changes

Preferred - Stepped Transition



Allowed grade transition with steps between 8" and 2'

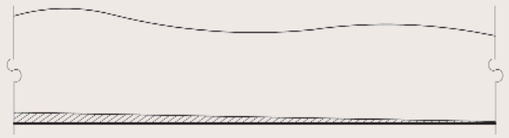
Preferred - Stepped Transition with Staggered Walls



Preferred grade transition with minimum stagger of 24" between wall planes

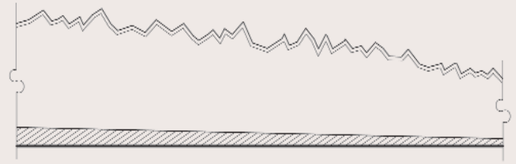
(1)

Preferred - Curved



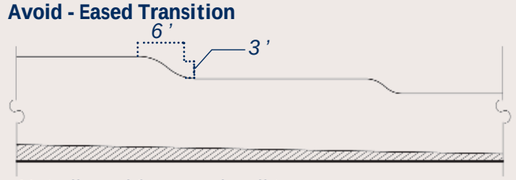
Allowed transition for sound wall top

Avoid - Angular Wall Top



Not allowed for sound wall top

Avoid - Eased Transition



Not allowed for sound wall top

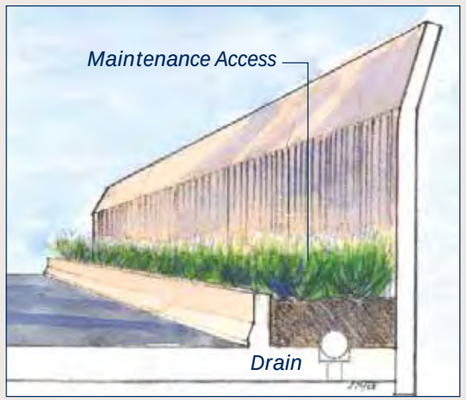
(2)

(3) This sequence of travel over approximately 1000 feet illustrates the sound wall design for the corridor. Characteristics include staggered wall planes, landscape planting in front of the wall face, and patterning on the wall face.

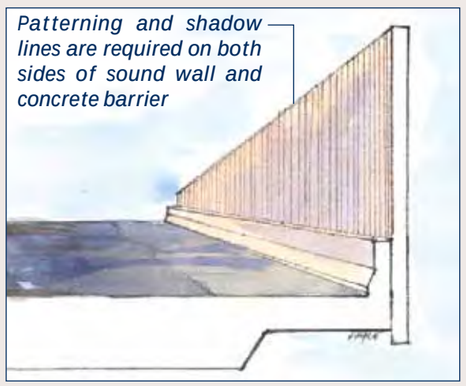
11.0 SOUND WALLS AND VISUAL SCREEN WALLS cont.

11.8 Utilize berming and landscape plantings to reduce the need for sound walls. The rural corridor of I-80 is characterized by open vistas. As such, sound walls appear out of context in many applications. Where noise abatement is required, analyze the necessity for sound walls. Utilize a combination of earthwork and layered landscape plantings prior to constructing a sound wall where possible.

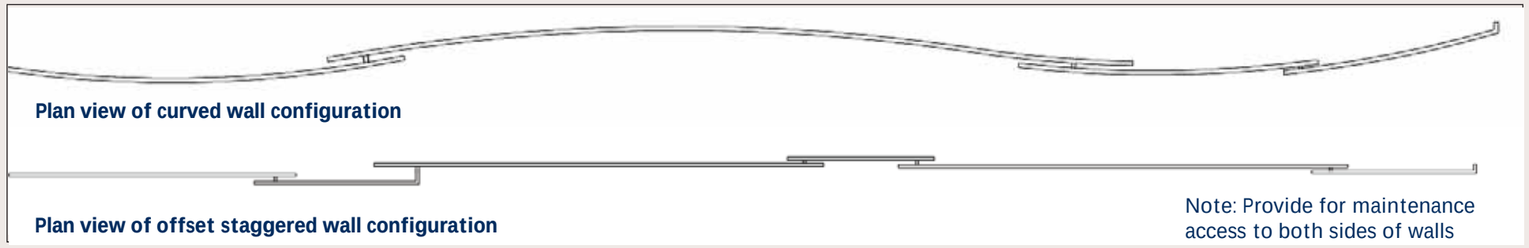
11.9 Establish a retrofit program for existing walls in the I-80 Urban study area. Existing walls that do not meet the aesthetic requirements of these guidelines should be analyzed for possible retrofit. Design solutions should not impact the quality of the wall's structural integrity or noise abatement. Retrofitted walls should respond to the corridor's environmental and cultural context. Consider the use of texture finishes, the integration of transportation art, and the use of landscape planting, such as vines. Patterns and wall height should be of appropriate scale and in accordance with the guidelines.



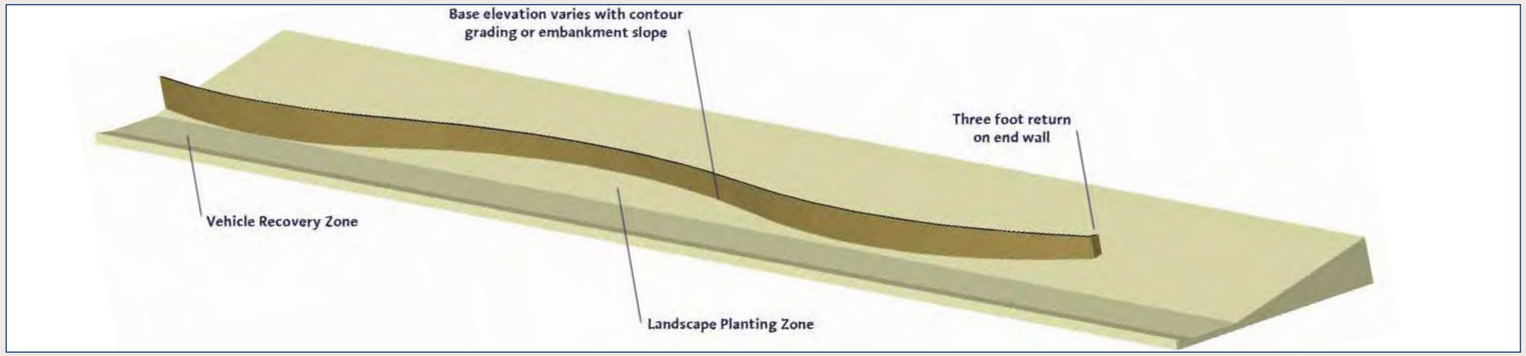
(1) Walls approaching bridges can be adapted with a setback and planting strip. A flare of the upper one-fourth of the wall further prevents an enclosed, narrow passage.



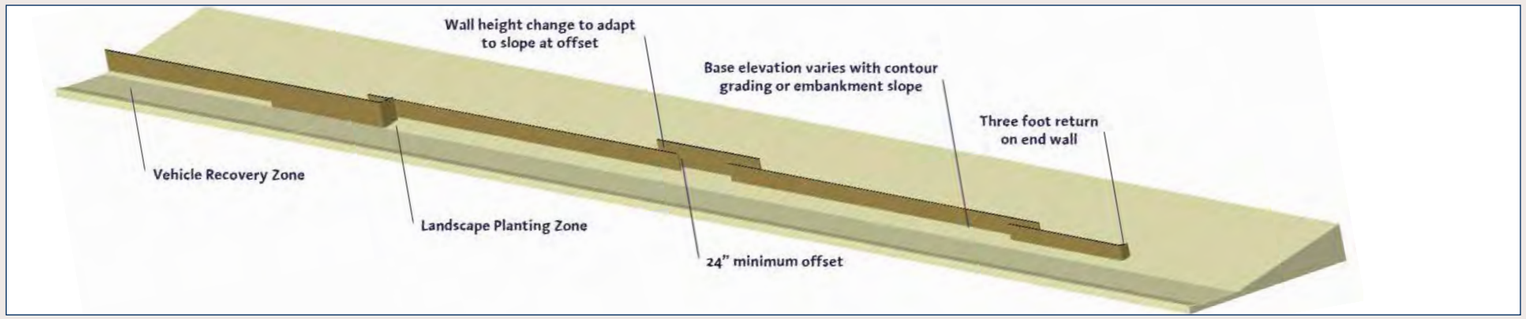
(2) When concrete barrier and sound walls co-exist without buffer space, wall is integrated into concrete barrier rail.



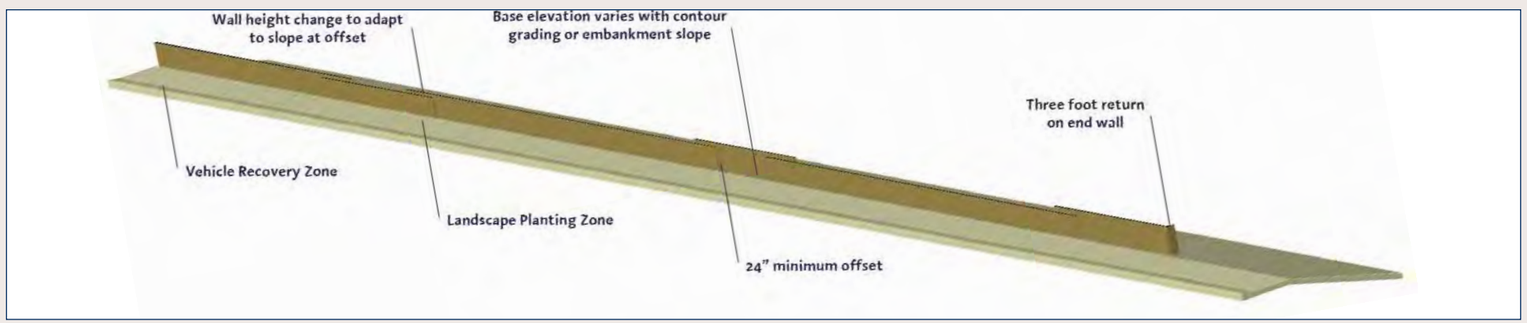
(3) Using curved and/or staggered sound walls creates visual interest and reduces the impact of a monolithic structure.



(4) Uphill Condition



(5) Uphill Condition



(6) Downhill Condition

12.0 CONCRETE BARRIERS AND GUARD RAILS

12.1 Stain concrete barriers. Concrete barriers should be stained to match the segment's base color (refer to Color Palette guideline, page 5.11, for more information on color selection).

12.2 Avoid bright, shiny steel appearance in visually sensitive areas. Use acid washed steel guardrails where appropriate to reduce gloss.

(1) Acid washed steel guardrail should be used in remote locations.

(2) Stained concrete barriers should use colors from the design segment's color palette.

13.0 LIGHTING

13.1 Analyze lighting requirements. Excessive high mast lighting can create light pollution along a corridor, and excessive height masts can impact the view of surrounding vistas. Avoid overlighting facilities. Study lighting level standards currently in place and determine levels needed for safety only. Adjust current standards, if necessary, and use a minimum height, illumination, and number of light masts required. Focus attention on luminance vs. illumination (i.e. how bright is the pavement vs. how bright is the light).

13.2 Avoid high-mast lighting. Along all sections of the corridor, use lighting fixtures that minimize light pollution and provide even light dispersion. Eliminate lighting where not necessary. High mast lighting should be avoided in favor of cobra head or shoe box type pole and fixtures.

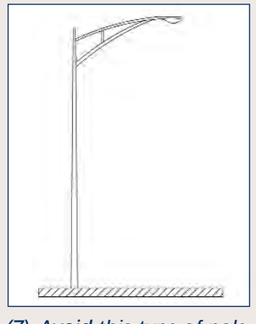
13.3 Use a consistent lighting fixture and pole. In urban areas, use a durable, powder-coated finish for light poles of a color that matches other structures and the surrounding landscape. Use accent color palette for poles (refer to Color Palette guideline, page 5.11, for more information). The desired pole configurations are shown at right. Allow for context sensitive design in fixtures and poles where appropriate in areas such as historic sites.

(3) Lights are incorporated in bridge design as a feature of the approach.

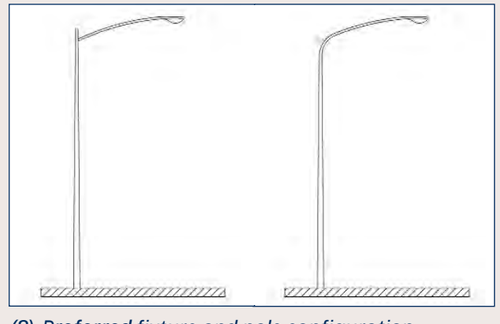
(4) Powder coat coloring blends into surrounding environment.

(5) This is an example of a monumental light incorporated into road design.

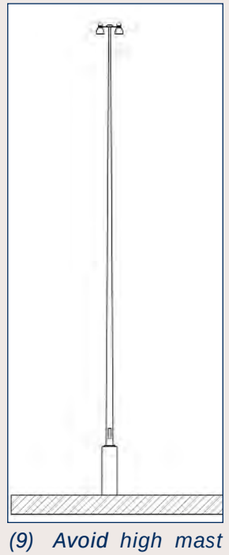
(6) This is an example of a shoebox style fixture on a steel pole.



(7) Avoid this type of pole design in favor of more streamlined attachments.



(8) Preferred fixture and pole configuration.



(9) Avoid high mast lighting.

14.0 FENCING

14.1 Ensure right-of-way fencing blends with the landscape. Fencing can be used in non-urban areas to delineate the highway right-of-way. Where appropriate use three-strand wire fencing. Ensure right-of-way fencing is well maintained. Where fencing is required in urban areas, use powder coated or stained colored powder coated or stained galvanized fencing.

(1) Three-strand fencing should be used within the rural segments of the corridor.

15.0 GRADING

15.1 Avoid creating steep slopes. Smooth, moderate ly inclined slopes will blend more readily with the surrounding arid landscape, are safer to maintain, and are less vulnerable to erosion. Place top soil salvaged from construction site on cut/fill slopes. Flattened fill slopes can assist in slowing down the erosion process. Grade slopes to provide for water harvesting (reclaimed surface runoff) wherever feasible. In addition, flatter slopes reduce the need for guardrails and provide better accident recovery in the roadside clear zone. Where site conditions and cost analysis permit, acquire adequate right-of-way to provide enough land to design and build the desired slope and grade. In some locations, steeper slopes may be unavoidable to protect important natural or cultural resources adjacent to the highway.

15.2 Create smooth landform transitions and revegetate slopes. Finish-grading techniques such as slope rounding at the top and bottom of cuts should be used to create smooth landform transitions that blend with the natural terrain. Carefully grade slopes around natural outcrops and abrupt topography to improve aesthetics and allow for easier and more cost-effective maintenance. Ensure all constructed slopes are revegetated (refer to Native Plant Revegetation Softscape Type guideline, page 5.27). Use fill material to reduce the visual rigidity of the constructed slope geometry. In addition, soil-coloring treatments that blend newly cut or filled soil with existing soils should be implemented.

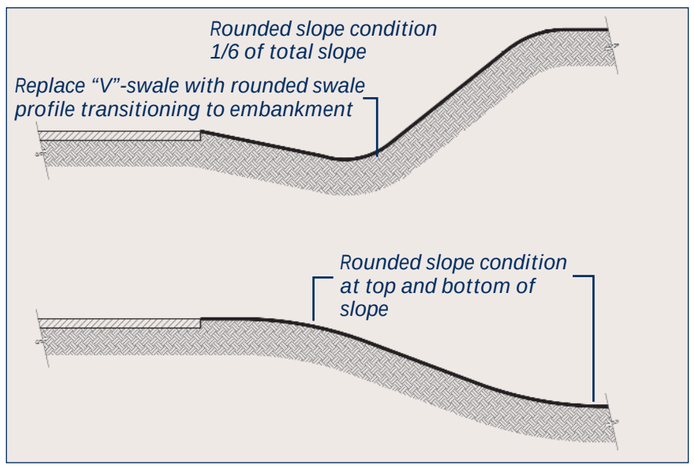
15.3 Create artful earthwork. Grading is the foundation of all aspects of the corridor. In addition to grading for effective roadway alignment, carefully consider contour grading. Create landforms that respond to the uniqueness of the site, the surrounding landscape, and the roadway travel experience. Contour grade to create effective planting embankments, shadow patterns, and artful earthwork.

15.4 Blend earthwork with existing slope conditions. Patterns of topography should be considered with proposed grading. Valleys, high points, and ridges require graded transitions, rather than abrupt embankment cuts or fills.

(2) A model shows an example of naturalized contour grading.

(3) The travel route sequence is defined by earthwork which defines space.

(4) Artful earthwork and contour grading will create landscapes that integrate with Nevada's existing topography.

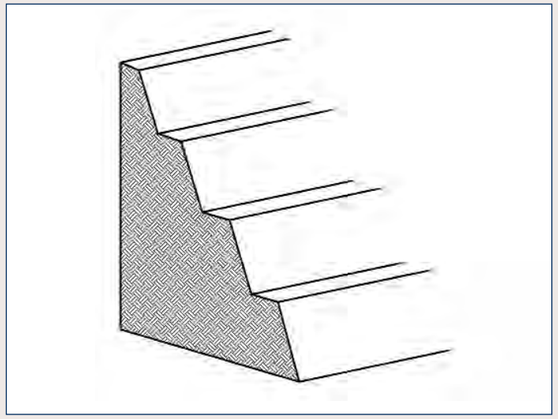


(5) Smooth transitions between cut and fill slopes and existing conditions can be accomplished by rounding the slopes.

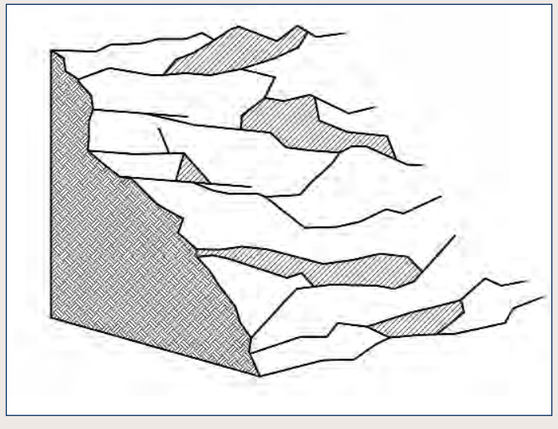
16.0 ROCK CUT AND EXCAVATION

16.1 Analyze rock geology. Work with a multi-disciplinary team of civil engineers, geotechnical engineers, and landscape architects whose job it is to ensure that the inherent character of a rock's natural bedding planes, fractures, joints, and overall stability. Conduct careful geological, site, and cost analysis, and design rock cuts to minimize the need for rock fall protection fencing.

16.2 Design rock cuts to be natural in form. Ensure rock cuts are designed to look natural in form, texture, and color in relationship to the surrounding landforms. Customize fracture rock cuts to match natural rock form and use naturalized bedding planes to avoid creating a sheer, unnatural rock face. Ensure all designed landforms are natural in appearance and blend with the topography and geology of the surrounding landscape. Match new rock and soil excavations with existing rock and soil using rock staining, soil-coloring treatments, and/or accelerated weathering techniques. Such treatments will successfully blend newly cut or filled soil and rock with existing weathered rock. Where site conditions and cost analysis permit, acquire adequate right-of-way to provide enough land to design and build the desired rock cut slope and grade.

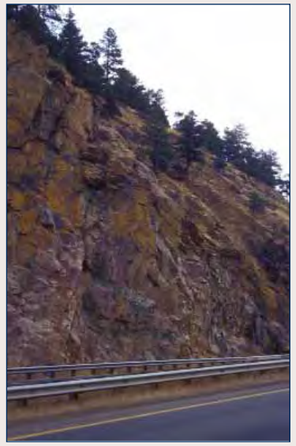


(3) Replace artificially appearing straight cuts and benches with custom naturalized cuts.

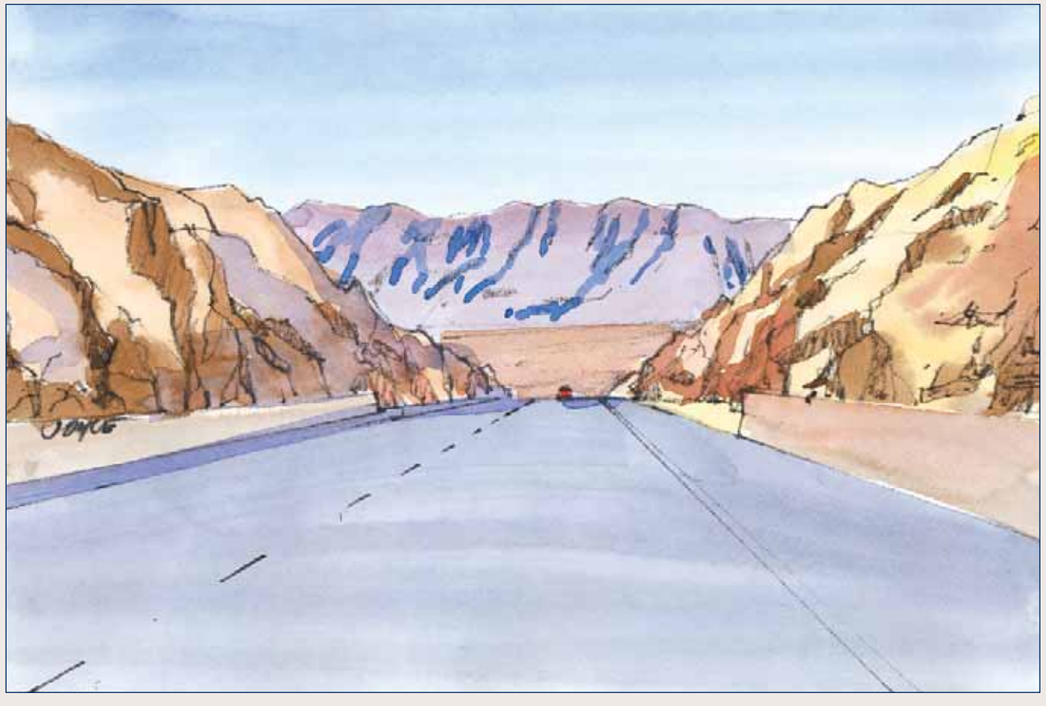


(4) An example of custom benching, following the natural formation of the rock and accomplishing the same elevation change as shown in illustration 1.

(1) Rock cuts and excavation should be natural in form, shape, and texture. Rock formations, such as this rhyolite outcrop, have an inherent visual form that can be duplicated in custom rock excavations.



(2) Example of a rock cut in which natural bedding planes were used to excavate naturalized landform. Weathering techniques blend this rock cut.



(5) Re-sculpted rock cut changes artificial slope banks into naturally occurring landforms. Plan cuts that terrace, bench, and use bedding planes found in rock formations are the final design of any rock slope.

17.0 DRAINAGE

17.1 Use naturalized channel design and infiltration methods. Where possible avoid paving drainage ditches or check dams with asphalt or concrete. Secure check dams with rock and use naturalized channel design and infiltration methods to functionally and visually enhance highway drainage systems. On a case by case situation, utilize geotextiles, impervious mats, or stone lining to maintain a natural channel appearance. When excessive flow velocities or soil conditions must be accommodated, paved drainage surfaces may be used.

17.2 Revegetate drainage infrastructure. Drainage detention and infiltration areas should be shaped with natural, undulating edges and bottoms rather than angular embankment slopes. Upper slopes of drainage detention basins should be revegetated or covered with appropriate ground treatment (refer to Ground Treatment Softscape Type guideline, page 5.26, and Native Plant Revegetation Softscape Type guideline, page 5.27).

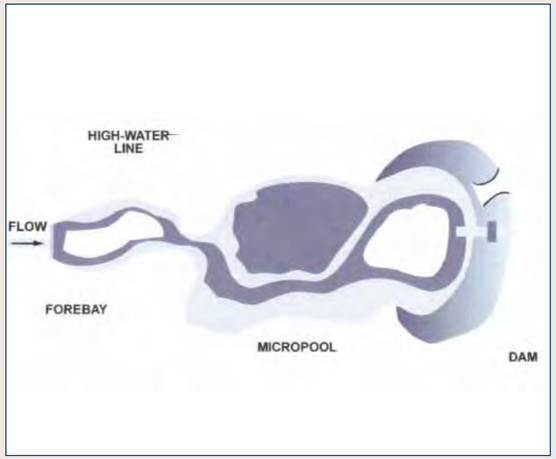


Image courtesy NDOT Stormwater Quality Manuals

(1) Design of detention basin avoids engineered flow patterns.

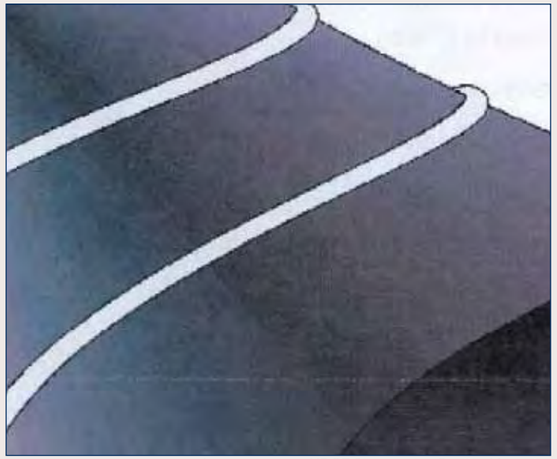


Image courtesy NDOT Stormwater Quality Manuals

(2) Fiber rolls reduce sediment migration.

(3) Rock bed drainage allows water to infiltrate and provide water for adjacent plant materials.

18.0 EROSION CONTROL

18.1 Stabilize soils and ensure successful revegetation to control erosion. Stabilize soils and control erosion using techniques such as heavy textured soil and/or gravel mulches to slow water run-off and provide dust control. Where water concentrates, riprap material and/or geotextile reinforcement may be used to avoid erosion. The success of permanent revegetation efforts can be improved by providing in situ topsoil, native vegetation fragments, and rocks and improving soil salvage techniques and seed mixes.

18.2 Refer to temporary and permanent erosion control best management practices as prepared and documented by NDOT.

(4) Water basins blend into their natural surroundings.

(5) Application of soil stabilizer aids in dust and erosion control.

19.0 WATER HARVESTING

19.1 Maintain soil moisture and improve water retention by preserving top soil, site surfacing, track walking, and applying mulches and tackifiers. Soil moisture and water retention can be maintained and enhanced in several ways, including:

- Topsoil Preservation: Stripping and salvaging the existing topsoil, vegetation seeds and plant fragments for later reapplication should be done to increase both the quantity of organic matter and water holding capacity of the soil.
- Site Surfacing: Rock surface composition should simulate the original or adjacent surface cover. Placing rocks and shaping landforms to create depressions will increase water retention, providing needed moisture to the plants. Rocks create impervious cover, resulting in water harvesting for the remaining soil and seeds. Rocks also create a rough, uneven surface, thereby slowing water runoff, and allowing water to collect.
- Track Walking: Where possible, track walk all slope surfaces to stabilize material and minimize potential erosion.
- Mulches and Tackifiers: Use mulch and tackifiers to keep seeds and topsoil cover in place and to assist with moisture retention during germination.

19.2 Use natural and/or artificial products to collect, store, and release water for plant use. Use products such as:

- Pumice wicks
- Polymer products
- Diatomaceous earth
- Wattles

20.0 IRRIGATION

20.1 Select efficient and effective irrigation systems. Select efficient drip irrigation systems that have a central controller and that can be easily maintained. Consider the use of reclaimed water, including fully treated effluent and water harvesting techniques, as a supplement to irrigation.

20.2 Provide appropriate supplemental irrigation for each softscape type. Temporary irrigation may be provided for establishment of Native Plant Revegetation softscape plantings. This may include using drip irrigation and/or water applied by truck. The early stage of revegetation growth demands the most water use and is the critical period when young plants are starting to establish themselves in the arid climate. As revegetation becomes more established and mature, the demand for water will lessen to the point of being removed. Temporary watering may be required for containerized native plants. Permanent irrigation to individual plants is usually required for all Regionally Adapted and Regional Ornamental softscape types.

20.3 Manage the high concentration of salts. In Nevada's desert soils, in drip irrigation situations, salts often concentrate at the outer edge of the wetted soil volume, including near the soil surface. Salt management techniques include flushing the soil periodically with heavy watering and/or planting salt tolerant materials.

20.4 Use natural and/or artificial products to collect, store, and release water for plant use. Use products such as:

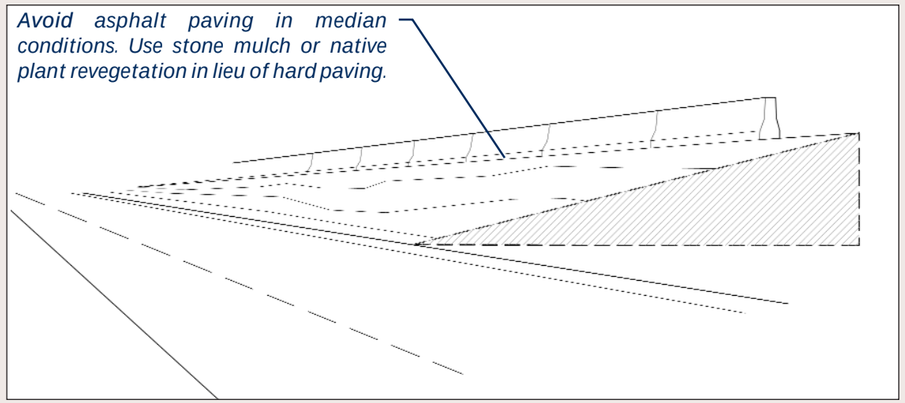
- Pumice wicks
- Polymer products
- Diatomaceous earth
- Wattles

21.0 GROUND TREATMENT SOFTSCAPE TYPE

21.1 Implement appropriate "Ground Treatment" softscape type. Use revegetation softscape type and an appropriate ground treatment to assist with erosion and dust control (refer to Native Plant Revegetation Softscape Type guideline, page 5.27, for more information about revegetation practices). Where used, rock mulch should complement and/or match the surrounding natural environment. For rural areas, ground treatment plant palettes should be derived from natural patterns found in playas, foothills, or ephemeral drainages. For areas within urban settings, use rock mulches to create patterned and textured ground treatments that are aesthetically rich. Implement a ground treatment retrofit program to treat areas which are bare soil.

21.2 Consider aesthetics and maintenance. Select ground treatment in all non-paved areas that meets both aesthetics and maintenance requirements.

21.3 Coordinate ground treatment with the surrounding landscape. Ground treatment should coordinate in size, texture, color, and aggregate mix with the surrounding landscape. Mulches composed of multi-sized rock that resemble natural patterns of surrounding soils should be considered as a matching technique. Where ornamental plantings are used, the ground should be treated with combinations of rock mulches, colored soil, and/or boulders to break up expansive ground planes and provide visual interest.



(1) Match texture and variety of size of stone found in the surrounding landscape.

(2) Large-scale ground cover stone placement of various sizes may be utilized for slope stabilization..

(3), (4) A mix of aggregate size and color re-establishes the graded slope to a naturalized condition.

22.0 NATIVE PLANT REVEGETATION SOFTSCAPE TYPE

22.1 Reestablish the native desert condition using the native plant revegetation softscape type. The native plant revegetation softscape type is the background planting for the majority of the corridor and should be implemented as shown in the landscape design segments. Ensure all roadway construction in these areas re-establishes native desert conditions. Roadsides should also be revegetated after a fire to reduce erosion and snow drifts.

The Great Basin is comprised of a variety of plant communities dependent upon elevation, precipitation, temperatures, and specific soil characteristics. All revegetative projects should follow native plant spatial and frequency patterns and incorporate scattered rock mulch to reduce erosion and improve success of revegetation efforts. In addition, native plant revegetation projects should be evaluated in terms of elevation, site, soil conditions, and ecosystem type (for example, riparian, playa, or salt barren) when selecting an appropriate native plant revegetation palette.

22.2 Select perennial grasses, herbs, and shrubs that can be established with little or no maintenance over the long term. Select plants that have been evaluated for drought tolerance, salt and alkali tolerance, seedling vigor, fire retardant characteristics, growth habit, suitable soil groups, seeding rates, Pure Live Seed (PLS), availability, and general costs of native seed sources. Ecosystem categories and suitable plant species have been identified for revegetation specifications along Nevada's highways in *Mapping Ecosystems Along Nevada Highways and the Development of Specifications for Vegetation Remediation* (Tueller et al, 2002). Tueller's report offers a complete description of suitable plant species and plant communities, soil classification units, and best management practices for vegetation remediation and should be used as a guide for revegetation. For excerpts regarding plant communities appropriate to the I-80 corridor, refer to Appendix A of this plan.

22.3 Salvage native plants and topsoil prior to construction. Salvage existing native plant material prior to construction. The species to be salvaged depends on location, soils, and analysis of plant value, including the potential survival rate. Salvaged plants can readily improve the roadside aesthetic by providing mature plants that would normally take many years to establish. In addition, ensure native topsoil is collected and stored for reuse. Native topsoil provides a seed source and important bacteria for salvaged plant establishment and growth. Carefully remove, stockpile, and store the native top soil of new construction projects to be used as final bedding material. Ensure native soil stockpiles are protected from the wind to avoid erosion and the creation of a dust hazard.

Plant Palette

Upper Elevations (Range Sub-segments)	*Height x Width*	*Exposure to Sun*	*Water Requirement*	*Seasonal Interest*
Big Sagebrush Sites				
Shrubs:				
Artemisia tridentata - Big Sagebrush	*1.5' to 6' x 10'*	*Full sun*	*minimal*	*Aromatic*
Chrysothamnus viscidiflorus - Douglas Rabbitbrush	*2' x 3'*	*Full sun*	*minimal*	*Yellow flowers*
Ephedra viridis - Green Ephedra	*3' x 3'*	*Full sun*	*minimal*	*Evergreen*
Purshia tridentata - Bitterbrush	*6' x 6'*	*Full sun*	*minimal*	*Yellowish spring color*
Salvia dorrii - Purple Sage	*2'x 2'*	*Full sun*	*moderate*	*Blue flowers*
Grasses:				
Achnatherum thurberianum - Thurber's needlegrass	*24" x 24"*	*Full sun*	*minimal*	*Grass*
Agropyron spicatum - Bluebuch Wheatgrass	*18" x 12"*	*Full sun*	*moderate*	*Grass*
Agropyron trichophorum - Pubescen Wheatgrass	*18" x 12"*	*Full sun*	*moderate*	*Grass*
Bromus inermis - Smooth Brome	*12" x 12"*	*Full sun*	*moderate*	*Grass*
Festuca idahoensis - Idaho Fescue	*12" x 12"*	*Full sun*	*moderate*	*Grass*
Leymus triticoides - Creeping Wildrye	*24" x 24"*	*Full sun*	*moderate*	*Grass*
Poa ampla - Big Bluegrass	*up to 4' tall x 1'*	*Full sun*	*moderate*	*Grass*
Forbs:				
Argemone munita - Prickly Poppy	*36" x 36"*	*Full sun*	*minimal*	*Large white flowers*
Castilleja sp. - Indian Paintbrush	*12" x 8"*	*Full sun*	*moderate*	*Brilliant flowering color*
Helianthus annuus - Sunflower	*8' x 2'*	*Full sun*	*moderate*	*Large yellow flower*
Linum lewisii - Prairie Flax	*24" x 24"*	*Full sun*	*minimal*	*Delicate blue flowers*
Lupinus sp. - Lupine	*12" x 12"*	*Full sun*	*minimal*	*Brilliant flowering color*
Penstemon palmerii - Palmer's penstemon	*36" x 24"*	*Full sun*	*minimal*	*Large fragrant flowers*
Vicia dasycarpa - Woolypod Vetch	*18" x 12"*	*Full sun*	*moderate*	*Purpleish flowers*
Pine and Juniper Woodland Sites				
Trees:				
Amelanchier alnifolia - Serviceberry	*12' x 6'*	*Full sun*	*minimal*	*Bluish-purple fruit*
Juniperus osteosperma - Utah Juniper	*shrubby to 20-30'*	*Full sun*	*minimal*	*Yellowish green foliage*
Pinus monophylla - Single-leaf Pinyon Pine	*20' x 15'*	*Full sun*	*minimal*	*Evergreen*
Pinus ponderosa - Ponderosa Pine	*100' x 30'*	*Full sun*	*minimal*	*Evergreen*
Populus tremuloides - Aspen	*50' x 25'*	*Full sun*	*moderate*	*Golden yellow in fall*
Shrubs:				
Artemisia nova - Black Sagebrush				
Artemisia tridentata - Big Sagebrush	*1.5' to 6' x 10'*	*Full sun*	*minimal*	*Aromatic*
Cercocarpus ledifolius - Curl-leaf Mountain Mahogany	*15' x 10'*	*Sun to light shade*	*minimal*	*Narrow green leaves*
Chrysothamnus sp. - Rabbitbrush	*5' x 5'*	*Full sun*	*minimal*	*Golden flowers*
Ephedra sp. - Mormon Tea	*3' x 3'*	*Full sun*	*minimal*	*Evergreen*
Kochia prostrata - Summercypress	*3' x 3'*	*Sun to light shade*	*minimal*	*Gray-green foliage*
Purshia tridentata - Bitterbrush	*6' x 6'*	*Full sun*	*minimal*	*Yellowish spring color*
Rhus trilobata - Skunkbush Sumac	*5' x 15'*	*Full sun*	*minimal*	*Yellow to red fall color*
Grasses:				
Bromus inermis - Smooth Brome	*12" x 12"*	*Full sun*	*minimal*	*Grass*
Leymus glaucus - Blue Wild Rye	*36" x 24"*	*Sun to light shade*	*minimal*	*Grass*
Poa sandbergii - Sandberg's Bluegrass	*12" x 12"*	*Full sun*	*minimal*	*Grass*
Pseudoroegneria spicata - Bluebunch Wheatgrass	*36" x 24"*	*Full sun*	*minimal*	*Grass*
Forbs:				
Castilleya sp. - Indian Paintbrush	*12" x 8"*	*Full sun*	*moderate*	*Brilliant flowering color*
Geranium viscosissimum - Sticky Purple Geranium	*24" x 12"*	*Sun to light shade*	*minimal*	*Purple flowers*
Linium lewisii - Prarie Flax	*12" x 12"*	*Full sun*	*minimal*	*Delicate blue flowers*
Lupinus sp. - Lupine	*12" x 12"*	*Full sun*	*minimal*	*Brilliant flowering color*
Penstemon palmerii - Palmer's penstemon	*36" x 24"*	*Full sun*	*minimal*	*Large fragrant flowers*
Sanguisorba minor - Small Burnet	*12" x 24"*	*Sun to light shade*	*moderate*	*Unique foliage*

22.0 NATIVE PLANT REVEGETATION SOFTSCAPE TYPE cont.

22.4 Apply a prescribed soil treatment and conduct effective site preparation. Every revegetation project requires a prescribed soil treatment. Soil treatments include plowing, disking, harrowing, furrowing, hydroseeding, applying mulches (such as straw), and using tackifiers (such as dark colored netting) to firmly anchor the mulches to the site. Soils should be roughened before and after planting to create favorable seed sites, particularly for grass and forb seeds. In silty conditions, a soil stabilizer, such as a hydromulch, or a matting material should be applied to reduce potential dust problems. Some sites require deep ripping in order to loosen hardpan and improve seeding success. In conditions of steep cut and slopes greater than 40%, slope disking is required to create seed pockets.

In most cases, organic materials will need to be added to the site to improve soil quality. Each site should be carefully analyzed to determine the type of fertilizer application. On sites with hardpan and salts near the surface, an amendment to control or ameliorate pH should be applied. Scattered rock mulch is to be used with this softscape type as groundcover. This mulch will provide seed pockets and protection that will assist in the establishment of seed.

22.5 Collect native seed. Initiate a process for native seed collection at the start of each project where revegetation is designated. Native seed should be collected from a site in close proximity to the revegetation area. Because unpredictable weather patterns can affect seed availability, plan ahead to ensure usable seed. Native seed can also be purchased through seed companies.

22.6 Monitor revegetation construction. Carefully monitor revegetation to ensure the specified materials and installation methods have been used in applying treatments. In addition, continue to monitor revegetation plantings for up to five years after construction to ensure successful establishment. Include temporary irrigation if needed. Provide training to NDOT staff who oversee revegetation administration. Failures in revegetation can often be attributed to poor installation and maintenance.

22.7 Consider the use of living snow fences to control drifting snow. Living snow fences can be up to 90% less expensive than slatted snow fences, capture up to 12 times more snow, reduce maintenance costs, and have the additional benefits of being aesthetically appealing and providing wildlife habitat. Identify locations where the placement of living snow fences will help reduce the effects of blowing snow along the right-of-way. Coordinate with local landowners, natural resource agencies, and soil and water conservation agencies to plan, fund, and maintain snow fences.

22.8 General plant section. Carefully select native plant species. In addition to plant species identified in *Mapping Ecosystems Along Nevada Highways and the Development of Specifications for Vegetation Remediation*, refer to the list of native plant species provided for revegetation efforts. Ensure the plant palette selected for the site complements existing vegetation in the surrounding landscape. Use native plant species to create plant communities with variations in plant height and width. Additional plants not included in the adjacent list can be included upon review and approval. Consider sunlight, water and wind exposure when placing plant material.

Plant Palette

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Lower Elevations (Basin Sub-segments)				
Big Sagebrush Sites				
Shrubs:				
Artemisia tridentata - Big Sagebrush	*1.5 to 6' x 10'*	*Full sun*	*minimal*	*Aromatic*
Atriplex canescens - Fourwing Saltbush	*5' x 7'*	*Full sun*	*minimal*	*Narrow gray leaves*
Chrysothamnus viscidiflorus - Green Rabbitbrush	*2' x 3'*	*Full sun*	*minimal*	*Yellow flowers*
Ephedra viridis - Green Ephedra	*3' x 3'*	*Full sun*	*minimal*	*Evergreen*
Krascheninnikouia lanata - Winterfat	*3' x 3'*	*Full sun*	*minimal*	*Yellowish flower clusters*
Prunus andersonii - Desert Peach	*5' x 5'*	*Full sun*	*minimal*	*Pinkish flowers*
Purshia tridentata - Bitterbrush	*6' x 6'*	*Full sun*	*minimal*	*Yellowish spring color*
Rhus trilobata - Skunkbush Sumac	*5' x 15'*	*Full sun*	*minimal*	*Yellow to red fall color*
Grasses:				
Achnatherum hymenoide - Indian Ricegrass	*24" x 24"*	*Full sun*	*minimal*	*Grass*
Achnatherum speciosum - Desert Needlegrass	*24" x 24"*	*Full sun*	*minimal*	*Grass*
Leymus cinereus - Basin Wildrye	*36" x 24"*	*Full sun*	*moderate*	*Grass*
Leymus triticoides - Creeping wildrye	*24" x 24"*	*Full sun*	*moderate*	*Grass*
Poa ampla - Big Bluegrass	*36" x 24"*	*Sun to light shade*	*moderate*	*Grass*
Poa secunda - Sandberg Bluegrass	*36" x 24"*	*Sun to light shade*	*moderate*	*Grass*
Pseudoroegneria spicata - Blue Bunch Wheat Grass	*36" x 24"*	*Full sun*	*minimal*	*Grass*
Forbs:				
Ipomopsis aggregata - Scarlet Gilia	*3' x 1'*	*Full sun*	*minimal*	*Delicate red flowers*
Linum lewisii - Prairie Flax	*12" x 12"*	*Full sun*	*minimal*	*Delicate blue flowers*
Lupinus sp. - Lupine	*36" x 36"*	*Full sun*	*minimal*	*Blue flowers*
Medicago sativa - Alfalfa	*36" x 12"*	*Full sun*	*moderate*	*Pinkish flowers*
Melilotus officinalis - Yellow Sweet Clover	*48" x 24"*	*Full sun*	*moderate*	*Small yellow flowers*
Penstemon eatonii - Firemaker Penstemon	*36" x 24"*	*Full sun*	*minimal*	*Red flower spike*
Penstemon palmeri - Palmer's Penstemon	*36" x 24"*	*Full sun*	*minimal*	*Large fragrant flowers*
Oenothera tanacetifolia - Tansy-Leafed	*6" x 12"*	*Full sun*	*moderate*	*Bright yellow flowers*
Sanguisorba minor - Small Burnet	*12" x 24"*	*Sun to light shade*	*moderate*	*Unique foliage*
Solidago spectabilis - Goldenrod	*18" x 12"*	*Sun to light shade*	*moderate*	*Yellow flowers*
Sphaeralcea coccinea - Globe Mallow	*12" x 12"*	*Full sun*	*minimal*	*Orange flowers*
Vicia sp. - Vetch	*36" x 12"*	*Full sun*	*moderate*	*Pinkish flowers*
Salt Desert Shrub - Shadscale and Bailey's Greasewood Sites				
Shrubs:				
Atriplex canescens - Fourwing Saltbush	*5' x 5'*	*Sun to light shade*	*minimal*	*Yellow flowers*
Atriplex confertifolia - Shadscale	*3' x 3'*	*Full sun*	*moderate*	*Flowering spikes*
Atriplex gardneri - Gardner Saltbush	*1.5' x 3'*	*Full sun*	*minimal*	*Evergreen*
Grayia spinosa - Spiny Hopsage	*3' x 3'*	*Full sun*	*minimal*	*Evergreen*
Kochia prostrata - Prostrate Summer Cypress	*3' x 3'*	*Sun to light shade*	*minimal*	*Gray-green foliage*
Grasses:				
Achnatherum hymnenoids - Indian Ricegrass	*12" x 6"*	*Full sun*	*minimal*	*Grass*
Agropyron sibericum - Siberian Wheatgrass	*24" x 12"*	*Full sun*	*moderate*	*Grass*
Distichlis spicata - Saltgrass	*6" x 6"*	*Full sun*	*minimal*	*Grass*
Elymus elymoides - Squirreltail	*18" x 12"*	*Full sun*	*minimal*	*Grass*
Hilaria jamesii - Galeta Grass	*6" x 6"*	*Full sun*	*minimal*	*Grass*
Leymus triticoides - Creeping Wildrye	*24" x 24"*	*Full sun*	*moderate*	*Grass*
Sporobolus airoides - Alkali Scaton	*36" x 18"*	*Full sun*	*minimal*	*Grass*
Forbs:				
Oenothera sp. - Evening Primrose	*48" x 24"*	*Full sun*	*moderate*	*Small yellow flowers*
Melilotis officinalis - Yellow Sweet Clover	*48" x 24"*	*Full sun*	*moderate*	*Small yellow flowers*
Sphaeralcea coccinea - Globe Mallow	*12" x 12"*	*Full sun*	*minimal*	*Orange flowers*

22.0 NATIVE PLANT REVEGETATION SOFTSCAPE TYPE cont.

22.9 Preserve healthy, mature trees and/or vegetation within the right-of-way. Mature vegetation is an integral part of community life and an important public resource that enhances the quality of life. All previously landscaped areas with ornamental plant materials measuring 4' above the ground and trees with greater than 3" caliper in good condition, form, and health shall be preserved. All softscape treatment projects should be initiated by a tree inventory plan listing all protected trees and other landscape materials within the right-of-way which includes: a listing of species, size and condition of each tree, index of trees to be removed and trees to preserve, and an outline of specifications for tree maintenance during construction.

(1) Native plant materials of northern Nevada including: Sagebrush, Bitterbrush, and Rabbitbrush.

Plant Palette

	Height x Width	*Exposure to Sun*	*Water Requirement*	*Seasonal Interest*
Salt Desert Shrub-Black Greasewood Sites				
Shrubs:				
Atriplex canescens - Fourwing Saltbush	*5' x 5'*	*Sun to light shade*	*minimal*	*Yellow flowers*
Atriplex lentiformis - Quail Bush	*5' x 5'*	*Full sun*	*minimal*	*Yellow flowers*
Chrysothamnus nauseosus - Rabbitbrush	*2' x 3'*	*Full sun*	*minimal*	*Yellow flowers*
Kochia prostrata - Kochia	*3' x 3'*	*Sun to light shade*	*minimal*	*Gray-green foliage*
Sarcobatus vermiculatus - Greasewood	*3' x 3'*	*Full sun*	*minimal*	*Bright green foliage*
Grasses:				
Agropyron elongatum - Tall Wheatgrass	*36" x 18"*	*Full sun*	*minimal*	*Grass*
Distichlis spicata - Salt Grass	*6" x 6"*	*Full sun*	*minimal*	*Grass*
Elymus elymoides - Squirreltail	*18" x 12"*	*Full sun*	*minimal*	*Grass*
Leymus cinereus - Great Basin Wildrye	*36" x 24"*	*Full sun*	*moderate*	*Grass*
Sporobolus airoides - Alkali Sacaton	*36" x 18"*	*Full sun*	*minimal*	*Grass*
Forbs:				
Melilotus officinalis - Yellow Sweet Clover	*48" x 24"*	*Full sun*	*moderate*	*Small yellow flowers*
Oenothera pallida - White Evening Primrose	*48" x 24"*	*Full sun*	*moderate*	*Small white flowers*
Sphaeralcea ambigua - Desert Globe Mallow	*36" x 36"*	*Full sun*	*moderate*	*Orange flower color*
Streamside Sites (Riparian Sub-segments) (use only in streamside conditions)				
Trees and Shrubs:				
Alnus incana - White Alder	*25' x 12'*	*Full sun to shade*	*moderate*	*Bright green*
Alnus tenuifolia - Mountain Alder	*25' x 15'*	*Full sun to shade*	*high*	*Greenish yellow catkins*
Baccharis glutinosa - Water Willow	*6'x 6'*	*Full sun*	*high*	*White flowers*
Betula occidentalis - Water Birch	*40' x 25x*	*Full sun*	*moderate*	*Copper bark*
Clematis ligusticifolia - Virgin's Bower	*25' x 1'*	*Sun to light shade*	*high*	*White flowers*
Cornus sericea - Red-Twigged Dogwood	*15' x 15'*	*Full sun to shade*	*moderate*	*Red fall color*
Populus freemontii - Fremont Cottonwood	*60' x 30'*	*Full sun*	*moderate*	*Bright lemon yellow in fall*
Populus tremuloides - Quaking Aspen	*50' x 25'*	*Full sun*	*moderate*	*Golden yellow in fall*
Salix boothii - Willow	*15' x 10'*	*Full sun*	*high*	*Narrow green leaves*
Salix lasiolepsis - Lance-leaf Willow	*8' x 6'*	*Full sun*	*high*	*Narrow green leaves*
Salix lasiandra - Pacific Willow	*40' x 25'*	*Full sun*	*high*	*Narrow green leaves*
Sambucus coerulea - Blue Elderberry	*7' x 10'*	*Sun to light shade*	*moderate*	*Creamy white flowers*
Spirea densiflora - Spirea	*2' x 3'*	*Sun to light shade*	*moderate*	*Pink flowers*
Grasses:				
Agropyron riparium - Streambank Wheatgrass	*36" x 24"*	*Full sun*	*moderate*	*Grass*
Carex nebraskensis - Nebraska sedge	*24" x 12"*	*Full sun*	*high*	*Grass*
Poa palustris - Fowl Bluegrass	*48" x 24"*	*Sun to light shade*	*moderate*	*Grass*
Hordeum brachyantherum - Meadow Barley	*24" x 12"*	*Full sun*	*moderate*	*Grass*
Juncus balticus - Baltic Rush	*48" x 24"*	*Full sun*	*high*	*Grass*
Forbs:				
Aconitum columbianum - Columbian monkshood	*5' x 3'*	*Sun to light shade*	*high*	*Bright blue flowers*
Agastache urticifolia - Nettleleaf Giant Hyssop	*18" x 6"*	*Sun to light shade*	*moderate*	*Blue Flowers*
Geranium viscosissimum - Sticky Purple Geranium	*24" x 12"*	*Sun to light shade*	*minimal*	*Small pinkish flowers*
Mertensia longiflora - Small Bluebells	*6" x 6"*	*Sun to light shade*	*moderate*	*Small purple flowers*
Veratrum californicum - California Falsehellebore	*6' x 2'*	*Sun to light shade*	*high*	*Large flower spike*
Wyethia mollis - Mule's Ear	*2.5' x 2.5'*	*Sun to light shade*	*minimal*	*Orange flowers*

23.0 ENHANCED NATIVE SOFTSCAPE TYPE

23.1 Enrich the native softscape palette with the enhanced native softscape type. The enhanced native softscape type is the second most commonly used plant palette along the I-80 corridor and should be utilized as shown in the landscape design segments (pages 4.10-4.46). The enhanced native softscape type enriches the Great Basin and Sierra Nevada plant palettes with a mix of vertical heights and densities. A variety of native species are planted in moderately dense patterns to create this landscape. The enhanced native softscape type uses the plant material of the native revegetation palette as a base and adds regionally adapted trees, shrubs, and other materials for diversity in form. Plants are placed in closer proximity to one another so that planting is seen as a mass.

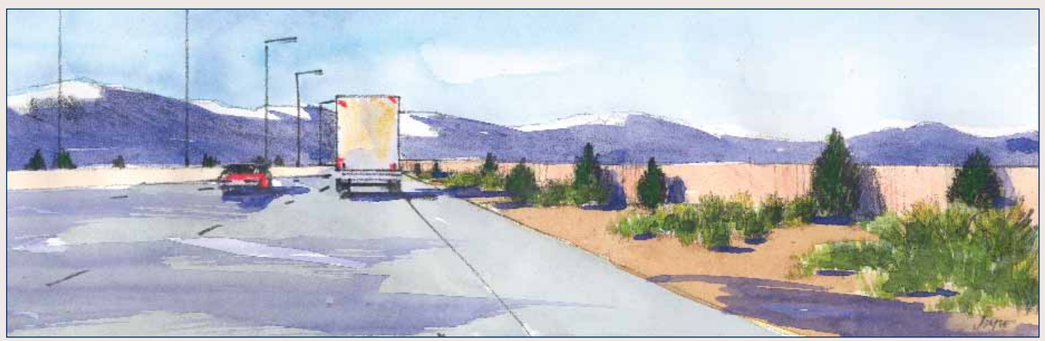
23.2 General plant selection. Use regionally adapted and native plant species. In addition to the plants listed in the Native Plant Revegetation softscape type, the following list of plants should be consulted to comprise the Enhanced Native softscape type. Use these species to create plant communities with variations in plant height and width. Ensure the plant palette selected for the site complements existing vegetation in the surrounding landscape. Additional plants not listed in the adjacent list can be included upon review and approval. Consider sunlight, water, and wind exposure when placing plant material.

23.3 Preserve healthy, mature trees and/or vegetation within the right-of-way. Mature vegetation is an integral part of community life and an important public resource that enhances the quality of life. All previously landscaped areas with ornamental plant materials measuring 4' above the ground and trees with greater than 3" caliper in good condition, form, and health shall be preserved. All softscape treatment projects should be initiated by a tree inventory plan listing all protected trees and other landscape materials within the right-of-way which includes: a listing of species, size and condition of each tree, index of trees to be removed and trees to preserve, and a outline of specifications for tree maintenance during construction.

Plant Palette

	Height x Width	*Exposure to Sun*	*Water Requirement*	*Seasonal Interest*
Trees:				
Acer ginnala - Amur Maple	*15' x 12'*	*Sun to light shade*	*moderate*	*Bright red fall color*
Cupressus arizonica - Arizona Cypress	*60' x 25'*	*Sun to light shade*	*moderate*	*Evergreen*
Elaeagnus umbellate - Autumn Olive	*14' x 14'*	*Full sun*	*moderate*	*Red globose fruits*
Juniperus osteosperma - Utah Juniper	*Shrub to 20'-30' ft*	*Full sun*	*minimal*	*Yellowish green foliage*
Pinus edulis - Pinyon Pine	*20' x 15'*	*Full sun*	*minimal*	*Evergreen*
Pinus monophylla - Single-leaf Pinyon	*50' x 25'*	*Full sun*	*minimal*	*Evergreen*
Populus fremontii - Fremont Cottonwood	*60' x 30'*	*Full sun*	*moderate*	*Bright yellow in fall*
Populus tremuloides - Aspen	*50' x 25'*	*Full sun*	*moderate*	*Golden yellow in fall*
Rhus spp. - Sumac	*15' x 15'*	*Full sun*	*minimal*	*Yellow to red fall color*
Shrubs:				
Atriplex canescens - Fourwing Saltbush	*6' x 6'*	*Sun to light shade*	*minimal*	*Narrow green leaves*
Buddleia davidii - Butterfly Bush	*10' x 8'*	*Full sun*	*moderate*	*Colorful flowers*
Caragana pygmaea - Dwarf Peashrub	*3' x 5'*	*Sun to light shade*	*moderate*	*Yellow flowers*
Cytisus spp. - Broom	*7' x 6'*	*Full sun*	*minimal*	*Bright yellow flower*
Foresteria neomexicana - Desert Olive	*8' x 12'*	*Full sun*	*minimal*	*Narrow green leaves*
Kochia spp. - Kochia	*6' x 6'*	*Full sun*	*minimal*	*Narrow green leaves*
Perovskia spp. - Russian Sage	*3' x 1.5'*	*Full sun*	*moderate*	*Lavendar spike flowers*
Potentilla spp. - Cinquefoil	*1.5' x 2'*	*Sun to light shade*	*minimal*	*Yellow flower*
Rhus spp. - Skunkbush and Aromatic Sumac	*6' x 8'*	*Sun to light shade*	*minimal*	*Yellow to red fall color*
Sambucus spp. - Elderberry	*7' x 10'*	*Sun to light shade*	*moderate*	*Creamy white flowers*
Shepherdia argentea - Silver Buffaloberry	*10' x 10'*	*Sun to light shade*	*moderate*	*Red fruit in winter*
Spirea spp. - Spirea	*varies*	*Sun to light shade*	*moderate*	*Pink flower*
Forbs and Grasses:				
Achillea millefolium - Yarrow	*3' x 2'*	*Sun to light shade*	*moderate*	*White flowers*
Artemisia - Silver Mound	*18" x 24"*	*Full sun*	*moderate*	*Silver-green foliage*
Aster spp. - Daisy	*18" x 24"*	*Full sun*	*moderate*	*Large colorful flowers*
Coreopsis verticulata - Cut-Leaf Coreopsis	*18" x 24"*	*Full sun*	*moderate*	*Yellow flower*
Echinacea purpurea - Purple Coneflower	*18" x 12"*	*Full sun*	*moderate*	*Large purple flowers*
Eriogonum spp. - Sulphur Flower	*12" x 36"*	*Full sun*	*minimal*	*Bright yellow flowers*
Gaillardia grandiflora - Blanket Flower	*24" x 12"*	*Full sun*	*moderate*	*Red and yellow flowers*
Hesperaloe parviflora - Red Yucca	*3' x 4'*	*Full sun*	*minimal*	*Pinkish-red flowers*
Linum lewisii - Prairie Flax	*12" x 12"*	*Full sun*	*minimal*	*Delicate blue flowers*
Lupinus - Lupine	*12" x 12"*	*Full sun*	*minimal*	*Brilliant flowering*
Penstemon strictus - Strictus Bandera	*28" x 18"*	*Sun to light shade*	*moderate*	*Small purplish flowers*
Rudbeckia fulgida - Goldsturm Blackeyed Susan	*18" x 24"*	*Full sun*	*moderate*	*Brilliant flowering color*
Sedum spectibile 'Autumn Joy' - Sedum Autumn Joy	*24" x 24"*	*Full sun*	*moderate*	*Pink flowers*
Miscanthus sacchariflorus- Silver Banner Grass	*6' x 4'*	*Full sun*	*moderate*	*Grass*
Miscanthus sinensis - Japanese Silver Grass	*3' x 4'*	*Full sun*	*moderate*	*Grass*

For additional plants appropriate to the different plant communities, refer to the Technical Appendix



(1) This is an example of enhanced native landscape type planting in front of a highway sound wall .

24.0 REGIONALLY ADAPTED SOFTSCAPE TYPE

24.1 Enhance welcome centers, gateways, rest areas, and urban areas using the regionally adapted softscape type. Use the regionally adapted softscape type where identified in each landscape design segment (see Sections 1-7, pages 4.11-4.45). This softscape type is utilized in urban areas and locations of high visibility. For this softscape type, the Great Basin and Sierra Nevada plant palettes and other low-water use plants are planted in greater densities, forming over-story and under-story layers. Plant palettes create a richness of color, seasonal change, texture, and form to enhance the desert garden. This softscape type integrates Great Basin and Sierra Nevada plants with a variety of plants from other arid environments that have similar climatic conditions.

24.2 General plant selection. Use regionally adapted plant species. In addition to the plants listed in the Native Plant Revegetation softscape type and the Enhanced Native softscape type, refer to the following list of plants to comprise the Regionally Adapted softscape type. Use plant species to create plant communities with variations in plant height and spread. Additional plants not listed may be included upon review and approval. Consider sunlight, water, and wind exposure when placing plant material.

24.3 Preserve healthy, mature trees and/or vegetation within the right-of-way. Mature vegetation is an integral part of community life and an important public resource that enhances the quality of life. All previously landscaped areas with ornamental plant materials measuring 4' above the ground and trees with greater than 3" caliper in good condition, form, and health shall be preserved. All softscape treatment projects should be initiated by a tree inventory plan listing all protected trees and other landscape materials within the right-of-way which includes: a listing of species, size and condition of each tree, index of trees to be removed and trees to preserve, and a outline of specifications for tree maintenance during construction.

(1) This is an example of regionally adapted softscape type planting at the embankment of a highway bridge using the plant list above.

Plant Palette

	Height x Width	*Exposure to Sun*	*Water Requirement*	*Seasonal Interest*
Trees:				
Acer freemanii - Autumn Blaze Maple	*40' x 30*	*Sun to part Shade*	*moderate*	*Grown for foliage*
Acer ginnala - Amur Maple	*15' x 12'*	*Sun to part shade*	*moderate*	*Red fall color*
Cedrus atlantica 'Glauca' - Blue Atlas Cedar	*40' x 40'*	*Full Sun*	*minimal*	*Evergreen*
Cedrus deodara - Deodor Cedar	*70' x 30'*	*Sun to part shade*	*minimal*	*Evergreen*
Celtis occidentalis - Hackberry	*50'x 25*	*Sun to part shade*	*minimal*	*Green foliage*
Fraxinus pennsylvanica 'Urbanite' - Urbanite Ash	*70' x 35'*	*Sun to part shade*	*moderate*	*Yellow green*
Koelreuteria paniculata - Golden Rain Tree	*45' x 25'*	*Full sun*	*moderate*	*Yellow flowers*
Picea pungens - Colorado Spruce	*75' x 30*	*Sun to part shade*	*moderate*	*Evergreen*
Pinus nigra - Austrian Pine	*120' x 40'*	*Full sun*	*moderate*	*Evergreen*
Pyrus calleryana - Ornamental Pear	*50' x 25*	*Full sun*	*moderate*	*White flowers*
Quercus macrocarpa - Bur Oak	*100' x 60'*	*Sun to part shade*	*moderate*	*Fall color*
Quercus rubra - Red Oak	*100' x 60'*	*Sun to part shade*	*moderate*	*Fall color*
Shrubs:				
Aronia melanocarpa- Chokeberry	*4' x 4'*	*Full sun*	*minimal*	*Pink flowers*
Buddleia daviddii - Butterfly Bush	*7' x 7'*	*Full sun*	*moderate*	*Purple flower*
Caryopteris spp. - Blue Mist Spirea	*48" x 36"*	*Full sun*	*moderate*	*Purple flowers*
Chamaebatiaria millefolium - Fernbush	*5' x 5'*	*Full sun*	*minimal*	*Unique foliage*
Cotinus coggygria - Smoke Tree	*12' x 10'*	*Full sun*	*moderate*	*Pink flowers*
Cotoneaster spp. - Cotoneaster	*4' x 4'*	*Sun to light shade*	*moderate*	*White-pink flower*
Cytisus spp. - Broom	*7' x 6'*	*Full sun*	*minimal*	*Yellow flowers*
Fallugia paradoxa - Apache Plume	*5' x 4'*	*Full sun*	*minimal*	*Feathery plumes*
Foresteria neomexicana - Desert Olive	*8' x 12'*	*Full sun*	*minimal*	*Green foliage*
Genista lydia - Lydia Broom	*36"x 36"*	*Full sun*	*moderate*	*Bright Yellow*
Juniperus spp. - Juniper	*6' x 3'*	*Full sun*	*minimal*	*Evergreen*
Mahonia aquifolium - Oregon Grape	*8' x 4'*	*Sun to light shade*	*minimal*	*Green foliage*
Potentilla spp. - Cinquefoil	*2.5' x 2.5'*	*Sun to light shade*	*minimal*	*Yellow flowers*
Prunus besseyi - Western Sand Cherry	*3' x 3'*	*Full sun*	*moderate*	*White flowers*
Prunus glandulosa - Pink Flowering Almond	*3' x 3'*	*Sun to light shade*	*minimal*	*Green foliage*
Spirea spp. - Spirea	*4' x 4'*	*Sun to light shade*	*moderate*	*Showy flowers*
Perovskia spp. - Russian Sage	*6' x 6'*	*Full sun*	*moderate*	*Lavendar flowers*
Shepherdia argentea - Silver Buffaloberry	*15' x 12'*	*Sun to light shade*	*moderate*	*Silver foliage*
Sumac spp. - Rhus	*6' x 4'*	*Full sun*	*minimal*	*Red fall foliage*
Forbs:				
Aurinia saxatilis - Basket of Gold	*12" x 24"*	*Full sun*	*minimal*	*Groundcover*
Cerastium tomentosum - Snow-In-Summer	*6" x 12"*	*Full sun*	*minimal*	*White/near white*
Coreopsis spp. - Coreopsis	*24" x 24"*	*Full sun*	*moderate*	*Yellow*
Echinacea purpurea - Purple Coneflower	*18" x 18"*	*Full sun*	*moderate*	*Pinkish flowers*
Hemerocallis spp. - Daylily	*18 x 24"*	*Full sun*	*moderate*	*Various color*
Knipfolia spp. - Red Hot Poker	*24" x 24"*	*Full sun*	*minimal*	*Poker like flowers*
Lavandula spp. - Lavender	*18" x 18"*	*Full sun*	*moderate*	*Purple flower*
Phlox subulata - Creeping Phlox	*6" x 18"*	*Sun to light shade*	*moderate*	*Nice pink flowers*
Zauschneria californica - California Fuchia	*12" x 20"*	*Full sun*	*minimal*	*Red blooms*
Campsis radicans - Trumpet Vine	*24" x 24"*	*Full sun*	*minimal*	*Red blooms*
Parthenocissus quinquefolia - Virginia Creeper	*12" x 48"*	*Full sun*	*minimal*	*Fall color*
Grasses:				
Calamagrostis acutiflora 'Karl Foerster' - Foerster's Feather Reed Grass	*4' x 5'*	*Full sun*	*moderate*	*Grass*
Erianthus ravennae - Ravenna Grass	*7' x 4'*	*Full sun*	*moderate*	*Grass*
Festuca spp. - Blue Fescue	*12" x 12"*	*Full sun*	*moderate*	*Grass*
Helictotrichon sempervirens - Blue Oat Grass	*24" x 24"*	*Full sun*	*moderate*	*Grass*
Panicum virgatum - Switch Grass	*6' x 6'*	*Full sun*	*moderate*	*Grass*
Stipa gigantea - Giant Feather Grass	*7' x 6'*	*Sun to light shade*	*moderate*	*Grass*

25.0 REGIONAL ORNAMENTAL SOFTSCAPE TYPE

25.1 Use the regional ornamental softscape type to create cultural meaning, enhance a landmark feature, or both. The regional ornamental softscape type is the rarest treatment and should be used where identified in the landscape design segments (see Sections 1-7, pages 4.11-4.45). This softscape type is meant to emphasize the unique cultural elements of these particular urban environments. The use of non-native, ornamental plant species in this softscape type accentuates the composition possibilities inherent in form and color. Dynamic ornamental forms, colors, and textures enhance the native Great Basin and Sierra Nevada landscape in complementary patterns.

25.2 General plant selection. Use regional ornamental plant species. In addition to the plants listed in the native revegetation, enhanced native, and regionally adapted softscape types, the following list of plants should be used to comprise the regional ornamental softscape type. The species listed represent those plants with significant cultural value. Alternative plants that have the same form and characteristics (thereby evoking a similar cultural meaning) may be more desirable if the alternative plant is better suited to the environmental conditions, requires less maintenance, and is more drought tolerant. Use one-gallon containers for groundcovers and perennials, a minimum container size of five-gallons for all shrubs, and a minimum box size of 24-inches for trees. Additional plants not listed in the plant palette may be included upon review and approval by NDOT. Consider sunlight, water, and wind exposure when placing plant material.

25.3 Preserve healthy, mature trees and/or vegetation within the right-of-way. Mature vegetation is an integral part of community life and an important public resource that enhances the quality of life. All previously landscaped areas with ornamental plant materials measuring 4' above the ground and trees with greater than 3" caliper in good condition, form, and health shall be preserved. All softscape treatment projects shall be initiated by a tree inventory plan listing all protected trees and other landscape materials within the right-of-way. This inventory plan includes a listing of species, size and condition of each tree, index of trees to remove and preserve, and an outline of specifications for tree maintenance during construction.

Plant Palette

	Height x Width	*Exposure to Sun*	*Water Requirement*	*Seasonal Interest*
Trees:				
Alnus glutinusosa 'Fastigiata' - European Alder	*60' x 15'*	*Full sun*	*high*	*Bright green*
Alnus spp. - Alder	*25' x 12'*	*Full sun*	*moderate*	*Bright green*
Crataegus spp. - Hawthorn	*25' x 12'*	*Full sun*	*moderate*	*Large thorns*
Gleditsia triacanthos inermis - Honeylocust	*60' x 40'*	*Sun to light shade*	*moderate*	*Unique branching*
Picea pungens 'Glauca' - Colorado Blue Spruce	*60' x 20'*	*Sun to light shade*	*moderate*	*Evergreen*
Populus alba - White Popular	*70' x 30'*	*Full sun*	*high*	*Fast growing*
Populus fremontii - Fremont Cottonwood	*60' x 30'*	*Full sun*	*moderate*	*Bright yellow*
Populus tremuloides - Aspen	*50' x 25'*	*Full sun*	*moderate*	*Golden yellow*
Rhus spp. - Sumac	*15' x 15'*	*Full sun*	*minimal*	*Bright red foliage*
Robinia spp. - Locust	*50' x 25'*	*Full sun*	*moderate*	*Yellowish-green*
Sequoia gigantea - Giant Redwood	*80'x 35'*	*Full sun*	*moderate*	*Evergreen*
Shrubs:				
Forsythia spp. - Forsythia	*6' x 4'*	*Full sun*	*moderate*	*Bright yellow flower*
Hibiscus syriacus - Rose of Sharon	*10' x 6'*	*Sun to light shade*	*moderate*	*Large flowers*
Lonicera spp. - Honeysuckle	*6' x 6'*	*Sun to light shade*	*moderate*	*Small flowers*
Rhus spp. - Sumac	*15' x 15'*	*Full sun*	*minimal*	*Bright red foliage*
Rosa spp. - Rose (native yellow climbing rose)	*Varies*	*Full sun*	*moderate*	*Bright yellow flowers*
Syringa spp. - Lilac	*15' x 15'*	*Sun to light shade*	*moderate*	*Pink flowers*
Viburnum spp. - Viburnum	*8' x 8'*	*Sun to light shade*	*moderate*	*Bright red berries*
Grasses, Forbs, and Perennials:				
Aster - Michaelmas Daisy	*12" x 12"*	*Full sun*	*moderate*	*Long bloom time*
Festuca spp. - Blue Fescue	*12" x 12"*	*Full sun*	*moderate*	*Grass*
Hemerocallis spp. - Daylily	*24" x 18"*	*Full sun*	*moderate*	*Yellow flowers*
Iris spp. - Iris, Tall Bearded	*36" x 10"*	*Full sun*	*moderate*	*Large purple flowers*
Leucanthemum x superbum - Shasta Daisy	*24" x 12"*	*Sun to light shade*	*moderate*	*Long bloom time*
Saccarum ravennae -Plume Grass	*10' x 6'*	*Full sun*	*moderate*	*Grass*

(1) This is an example of regional ornamental softscape type planting highway intersection using the same plants listed in the plant palette above.

26.0 WILDLIFE CROSSINGS AND PROTECTION

26.1 Engage appropriate agencies in planning and designing wildlife crossings. Engage Federal, State and local agencies, and wildlife professionals in the initial stages of planning and design through implementation of wildlife crossings. Incorporate wildlife professionals as members of the design team in all non-urban areas. Locate crossing structures to correspond with landscape patterns and to provide landscape connectivity.

26.2 Observation points and watchable wildlife opportunities to observe animal movement may be possible in the design of crossings. Provide appropriate viewing areas, where possible, that do not negatively affect wildlife movement and/or behavior.

Image courtesy of Tony Clevenger

(1) Wildlife undercrossing provides visibility to bisected habitat.

27.0 CONSTRUCTION PRACTICES

27.1 Clear the site only within the limits of construction. Ensure the project site is cleared only within the limits of construction to avoid excessive site disturbance.

27.2 Protect important environmental, landscape and cultural features. Ensure trees, shrubs, landscape and cultural features, and environmentally sensitive areas to be preserved are identified and protected during construction. In areas where vegetation is to remain, avoid disturbance and compaction of the ground. Maintain and enhance existing groundcover to ensure the area is left in a condition consistent with the surroundings.

27.3 Coordinate with construction personnel when planning and designing projects. Implementation of project design requires close cooperation with the personnel directly responsible for its construction. Involve construction personnel early on in the design stage through to the development of final specifications. Maintain effective communication with construction personnel through the construction process.

27.4 Ensure erosion and sedimentation is controlled during construction. Ensure sediments are controlled through the timely control of soil erosion. Consider site specificity, timing of execution, and application of man-made devices and/or vegetative cover to stabilize banks during construction. Consider alternatives to hard surface paving. Give preference to other sediment control devices including sediment basins, diversion berms, vegetative buffer areas, channel linings, energy dissipators, seeding, and mulching. Build permanent erosion controls into structural earthwork design through terracing, flattening slopes, stone and durable synthetic blankets, retaining walls, rip-rap, and/or native revegetation. Maintain compliance with necessary permits throughout construction.

27.5 Carefully manage and dispose of waste material. Avoid disposing of milled asphalt by placing it as a cover on highway shoulders. This can inhibit revegetation on slopes and create a cluttered, unfinished appearance to the corridor.

27.6 Salvage and store topsoil and native plant materials. After soil erosion and sediment control measures have been implemented and before grading work begins, remove and store topsoil for project reuse. Salvage areas should be designated on plans and laid out on the site. Salvaged plant materials shall be stored and maintained during the period prior to planting. Stripped topsoil in excess of the quantity required for the project should be stored at specified locations. Topsoil of lesser quality can be blended with soil amendments to improve condition for final bedding.

27.7 Carefully consider location/reclamation of construction areas. Construction staging areas, borrow pits, and other construction areas must be carefully located and returned to a condition as good or better than original, and consistent with the *Corridor Plan* design guidelines.

28.0 MAINTENANCE PRACTICES

28.1 Consult Best Management Practices and provide for efficient and effective maintenance. Design new projects that are low maintenance. Provide areas where maintenance equipment can be conveniently located. Consider maintenance routines required for the design program, and identify areas that may need additional care or attention initially and/or as the project matures. NDOT maintenance practices include:

- Trash and debris removal
- Surface finish maintenance (painting, patching, graffiti removal)
- Grading, and earthwork
- Ground treatment (raking, replacing mulch or decorative rock, reconfiguring drainage structures)
- Weed control
- Plantings (interim, temporary, and permanent irrigation, trimming, pruning of shrubs and trees, manual weed control, fertilizing)
- Disease and pest management (including invasive species control)
- Repair and replacement of structural and electrical components, irrigation, signage, and lighting

28.2 Create a visual design unity among all existing and new structures. Ensure a visual design relationship exists among all highway structures. This includes coordinating materials, patterns, and color. Ensure structures can be readily patched or painted with matching colors. When paint or stain repair is made, complete repairs, joints, or logical edge point. Use anti-graffitti treatment on all accessible structures. District level maintenance teams should use the same color palette for all maintenance and repairs (refer to Color Palette guideline, page 5.9, for more information).

28.3 Locate and screen maintenance staging areas appropriately. Maintenance staging areas need to be adequately set back from the highway, situated at or near an interchange, located to be visually unobtrusive from the highway, and safe for ingress and egress by maintenance workers. Drainage is an important aspect in the design and location of a maintenance area in order to prevent any environmental damage that results from leachates in salt and gravel stockpiles. Salt and sand piles should be covered to avoid watercourse and groundwater degradation according to the NDOT Best Management Practices Manual. Provide space for equipment storage, vehicles, and supplies as well as employee or visitor parking. Consider, future expansion needs. Architectural or landscape architectural screening of maintenance areas, particularly stockpiles and equipment, should be provided if a maintenance area is visible from the highway or from adjacent developed property. Security fencing may be appropriate in some locations.

28.4 Coordinate with personnel when planning and designing maintenance areas. Planning and design of maintenance area requires close cooperation between designers and the personnel directly responsible for its use.

20.0 RECOMMENDATIONS FOR SUSTAINABLE HIGHWAY ENVIRONMENTS

29.1 Sustainable development is defined as achieving stability of both physical and social systems by meeting the needs of current generations without compromising the ability of future generations to meet their needs. Sustainable design is a holistic philosophy that includes all aspects of function and construction operations, including but not limited to: energy use, air quality, material selection, energy generation, water conservation, heat and solid waste, habitat enhancement, and protection. In this document, the focus is on sustainability for design and construction of the elements that comprise the physical highway system. Restoration of disturbed man-made and natural habitat is an important component in achieving a sustainable highway related landscape.

29.2 Three key principles in highway construction and natural resource management include Avoid, Minimize, and Mitigate. Concepts central to these principles include:

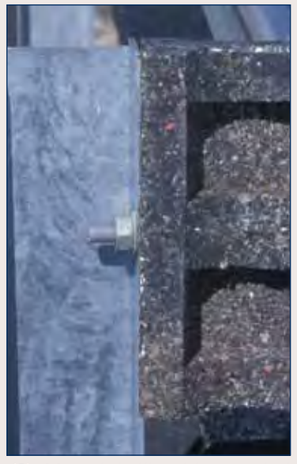
- Water conservation: efficiency, protection and reuse.
- Construction materials selection: reduce, reuse and recycle.
- Air quality protection.
- Energy efficiency: use renewable energy.
- Design innovation.

29.3 Techniques for creating sustainable highway environments.

- Develop systems that encourage sustainable highways. Develop performance standards, monitoring procedures, and promote coordination between environmental and transportation agencies.
- Preserve air quality. Use construction mitigation techniques to minimize dust from construction sites.
- Minimize energy consumption and incorporate alternative energy sources. Where possible use solar powered electronic signs, low energy use lights (such as LED), and passive solar design.
- Use recycled materials for construction. When applicable use reclaimed concrete and asphalt, scrap tires, plastics, steel slag, roofing shingles, coal fly ash, and composted municipal organic wastes.
- Reduce waste. Waste reduction concepts include right-of-way management, reuse of organic materials, water conservation, and selection of long-lived materials.

(1) Solar power provides a sustainable, renewable energy in remote locations.

(2) Wind power generates a clean renewable energy source.



(3) Materials like this recycled plastic modular unit can be used in roadway construction.

(4) Existing condition of asphalt millings being placed along shoulder should be reused in repaving projects.