

Design Guidelines

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INTRODUCTION

Purpose of Design Guidelines

Design Guidelines provide the framework for improving the aesthetics of new and retrofit highway projects. They are written statements of recommended methods to meet the segment design objectives. Guidelines should not be mistaken as new standards for highway design. They represent recommendations for design solutions.

Guidelines approach corridor aesthetics as a comprehensive effort, intentionally avoiding a project-to-project approach. Guidelines assist in the development of design. Adherence to the guidelines in planning, design, and operations accomplishes the following goals:

- Interpreting the design themes of each landscape design segment
- Creating visual unity among all highway structures and facilities
- Selecting finishes, color palettes, and surface patterns that are compatible with the surrounding landscape
- Incorporating transportation art motifs and media that represent the landscape design segment themes

The guidelines, accompanied by concept diagrams, sketches, or photographs, demonstrate ways in which to achieve the design intent.

NDOT will review each project design for consistency with these guidelines and the overall Landscape and Aesthetics Corridor Plan. The full design team—NDOT staff, communities, engineers, project managers, landscape architects, consultants, contractors, and maintenance crews—is strongly encouraged to:

- 1) Become familiar with design guidelines for the design segment in which a project is located. The guidelines direct the design toward creating aesthetic unity within the design segment
- 2) Understand the site context. The landscape surrounding the proposed project (including predominant materials, colors, and structures, as well as natural and cultural resources and social elements) provides direction for enhancement
- 3) Seek early review of the project. Changes are much easier to make at the beginning of the project than at the end. Involving others early in the planning/design process helps ensure that the project is both economically and aesthetically feasible

How to Use the Design Guidelines

The Design Guidelines are divided into three sections as described below. The full design team as well as potential partnering entities, such as communities and other organizations, should be familiar with each section.

1) Design Process Guidelines:

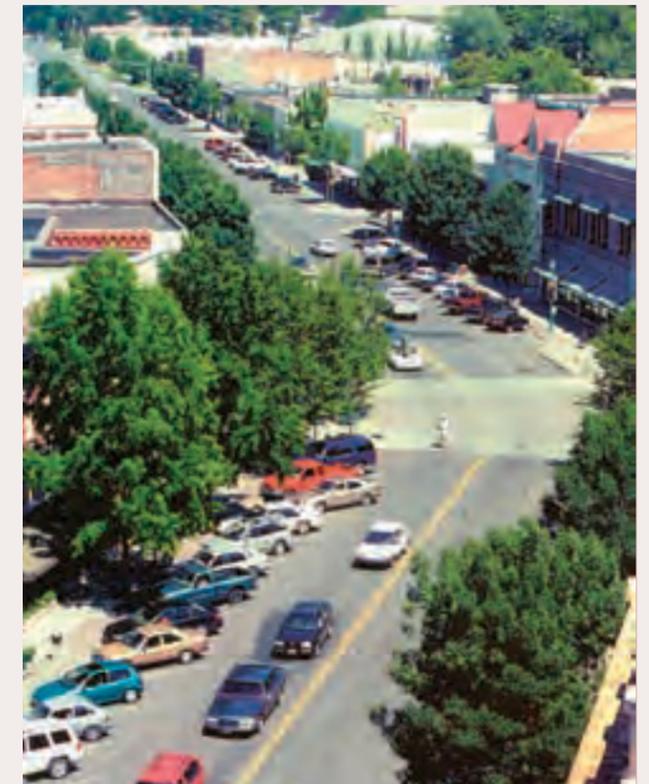
Describe the necessity of integrating landscape and aesthetics at the beginning of every project.

2) Community and Urban Context Guidelines:

Describe guidelines for facilities and amenities that are primarily influenced by local communities, depending on right-of-way extents.

3) Highway Facilities Guidelines:

Describe guidelines that are primarily influenced by NDOT's standards, including structures, grading, roadside services, and construction practices.



(1) The Corridor Plan provides NDOT with the ability to facilitate improvements and to provide highways that support the vision and needs of a community.



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

SECTION ONE: Design Process Guidelines

These guidelines describe the necessity of integrating landscape and aesthetics at the beginning of every project.

1.0 PROJECT DESIGN PROCESS

1.1 Integrate landscape and aesthetics at the onset of the planning, design, and engineering phases of all highway projects.

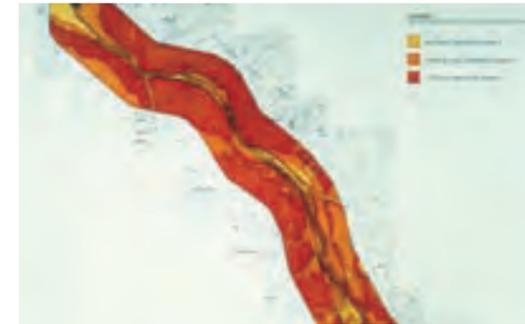
Landscape and aesthetics should not be an afterthought to a highway project.

- Landscape and aesthetics are an integral part of the planning, design, and engineering of all highway projects.
- NDOT's structure inventory report regarding type, size, and location of highway structures should include information on landscape and aesthetics. It should also provide justification for proposed structures that do not meet the design guidelines.
- Engineering design should incorporate landscape and aesthetics to create highway structures and facilities that are effective, safe, and aesthetically appealing.

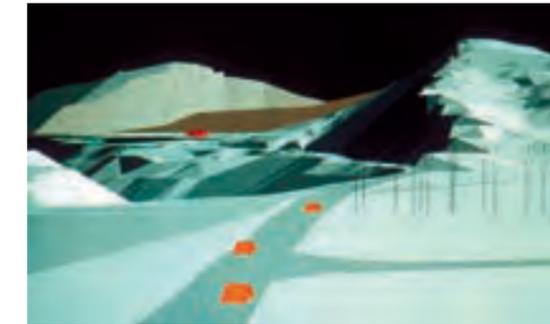
1.2 Understand the design segment theme and select design concepts that interpret the theme.

- Review the vision and objective for the landscape design segment as described in the Corridor Plan and ensure that the theme guides the project design.
- Understand the site context, including the viewshed analysis and landscape design segment objectives described within the Corridor Plan.
- Ensure project design successfully interprets the landscape design segment theme.

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



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



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



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

1.3 Understand the site context, including the surrounding landscape, and conduct a comprehensive analysis.

- Conduct a comprehensive site analysis for each project. The site inventory for each project should extend beyond project boundaries to analyze the site and surrounding landscape. Ensure the planning and design of the highway project responds 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 that are located on, and surrounding, the site. Additionally, cultural context such as archaeological and cultural resources and categories, such as historic settlement, are important.

1.4 Use a variety of sketches, three-dimensional modeling, and other tools to visualize and detail the highway.

As the level of design progresses from general to specific, highway layout and facilities should be visualized through a variety of methods to create a high quality system.

1.5 Visualize design concepts in three dimensions.

Plan view design does not accurately represent the experience of the traveler along the highway or illustrate issues of visual design. Therefore, it is important to understand design concepts in their three-dimensional framework.

- Utilize sketches, models, and digital visualization tools. “Roadway Explorer” is an excellent tool to utilize for this purpose.

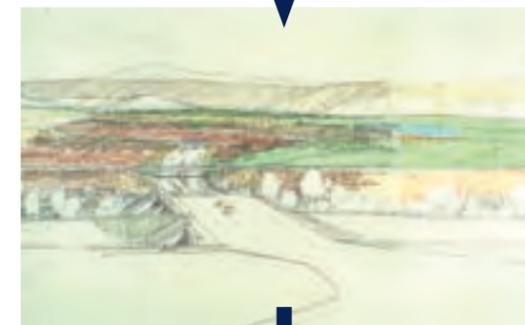
1.6 Consider landscape and aesthetics costs in conjunction with baseline costs.

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.

1.7 Estimate maintenance costs during design to calculate the total life cycle cost for landscape and aesthetic treatments.

Maintenance is a key component to the success of landscape and aesthetic treatments.

- Design new projects that are low maintenance.
- Consider maintenance routines required for the design program, and identify areas that may need additional attention.
- Create maintenance agreements with local agencies as necessary to establish appropriate practices and levels of maintenance over the life of the project.



(4), (5), (6), (7) This series of highway design studies shows the level of design progression from general to specific.

SECTION TWO: Community and Urban Context Guidelines

These guidelines include facilities that are primarily influenced by local community desires but may benefit from NDOT’s support. A community’s highway is important and serves as a primary component of the public realm. Even though NDOT is not responsible for facilities outside of the right-of-way, it recognizes the need to work with local jurisdictions to create context-sensitive solutions.

NDOT understands the need for flexibility, and it functions as a facilitator in supporting a community’s vision and goals for the highway. The guidelines found in this section are meant to enhance established traffic engineering and road design practice. No single solution will transform a community’s highway through downtown. Rather, communities should carefully evaluate and consider several options and thoroughly understand the issues at hand in order to create a highway that fulfills the collective goals of the partnership established between the community and NDOT. Neither NDOT nor the community can accomplish the goals on their own.

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1.0 COMMUNITY GATEWAYS

1.1 Establish gateways that clearly express community identity.

Gateways are highly visible areas specially designed and maintained to make a positive first impression and convey the identity of neighborhoods, communities, towns, cities, and regions.

- Provide an impressive visual aesthetic.
- Utilize appropriate landscape and/or structural techniques to screen unsightly land uses.

1.2 Integrate the gateway into the highway facilities.

Gateways should be part of a larger design intent, coordinate with community facilities, and use materials that are repeated throughout the town. Refer to Softscape and Hardscape Types and Treatments (pages 1.6-1.9) and Softscape Types and Treatments guidelines (pages 3.33-3.43), for more details about the types of features and plants to consider for community gateways.

- Community gateways need to be integrated with highway structures and landscape (see illus. 1).
- Architectural elements may include transportation art, rock walls, accent lighting, and signage.
- Ensure that community gateways are distinctive, memorable, and functional.

1.3 Ensure community gateways contribute to community identity and clearly define community identity points.

Highlight community entrances with clear and attractive signage, using landscape materials that reflect the community character. Execute the design in a clear, consistent, and bold manner. Design repetition reinforces town identity.

- 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 (see illus. 3).
- Landscape plantings should include layers of low water-use plant material arranged to enhance the architectural elements and reinforce the transition into the community.

1.4 Locate gateways at likely future growth boundaries.

Community gateways mark the entrances/exits and designate the transition to increased development. Gateways marking downtowns may be used to improve community identity and draw motorists into the heart of town.

- Downtown gateways should complement the community gateway while reflecting the special character of the city center.

1.5 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.



(1) Integrate community gateways with highway facilities and landforms to help strengthen the relationship between the highway and place.



(2) Replace outdated and faded community entry signs with coordinated signage that conveys a positive town image. Consolidate signage for multiple town service groups into an attractive amenity as shown above.



(3) Gateways create a visitor's first impression of a community and should therefore engage local stakeholders in the planning, design, and implementation of such features to ensure they reflect the community's vision. Signage reinforces the community's sense of place and image.

Drawing by Joyce

2.0 COMMUNITY-BASED STREET SYSTEMS ISSUES

2.1 Consider improvements to the surrounding street system before widening the highway through communities.

Wide streets discourage pedestrian activity and have a negative economic impact. Secondary streets that are not performing well influence the way in which a highway operates as a community main street. Improvements to other major and minor streets impact the functionality of a main street.

- Traffic improvements should be considered in context with surrounding transportation patterns. Improvements to other streets allow potential lane width reductions along the highway and provide additional space for landscape and aesthetics.
- Improvements to surrounding city streets may include utilizing parallel streets, implementing a truck bypass, improving the local street network, and using parallel, one-way streets.

2.2 Shorter blocks encourage pedestrian activity and provide more corner lots, essential for local businesses.

Short blocks with connecting streets characterize traditional main streets.

- Utilize short blocks of up to 400 feet where possible to encourage pedestrian activity in downtowns.

2.3 Consider routing trucks onto a parallel street and encourage vehicular traffic through main street.

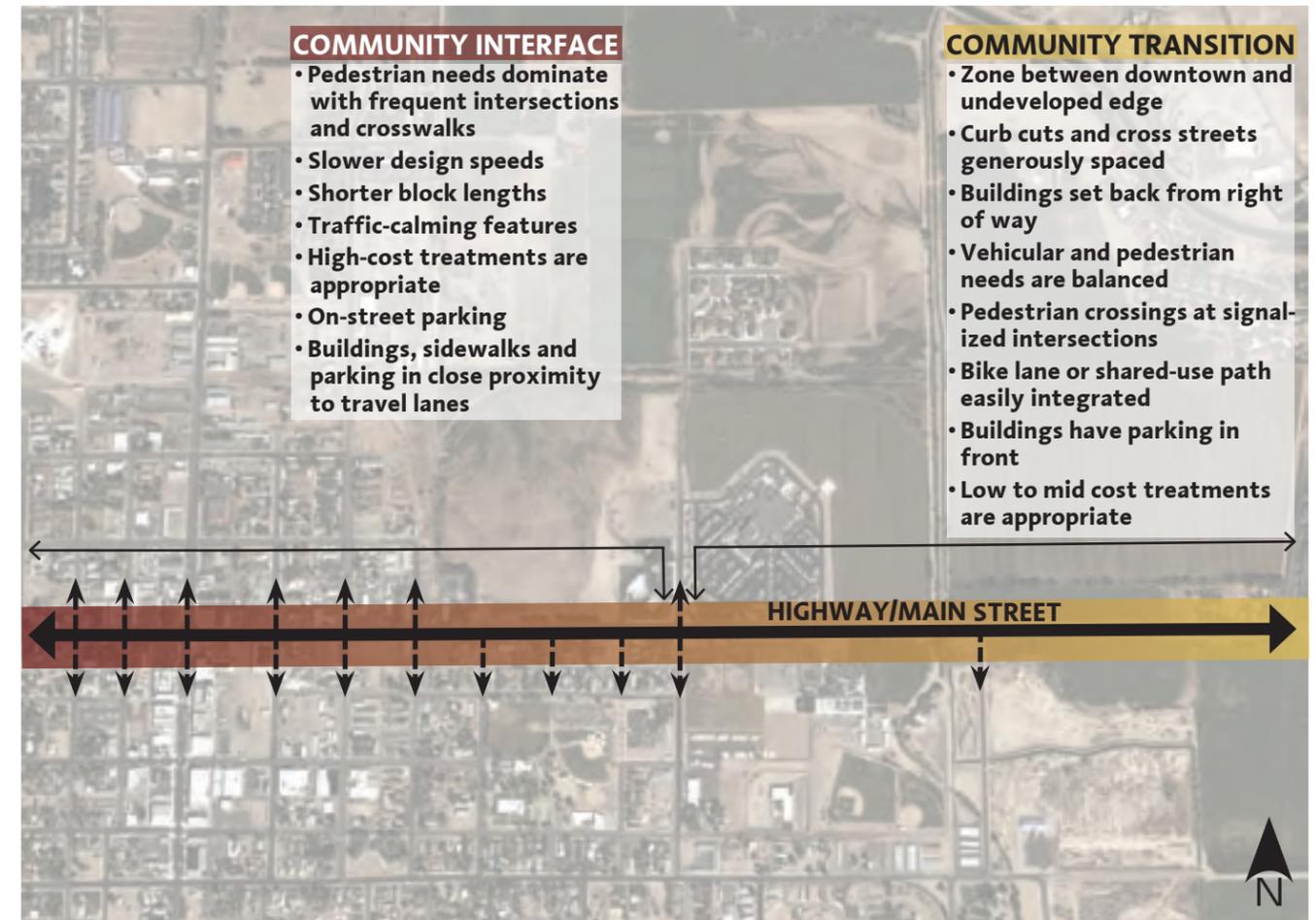
Truck traffic requires more space for turning movements and increases noise levels and fumes within the community. Wide streets discourage pedestrian activity and can harm the town’s economic potential.

- Diverting truck traffic away from the local main street may distribute traffic loads more evenly and improve the function of the main street.
- Vehicular traffic should continue through main street where feasible in order to support community businesses and facilities.
- Parallel streets should have few interruptions and maintain a fairly direct connection that may be improved to accommodate truck traffic.

2.4 Avoid bypasses and only use them in limited applications.

Bypasses are utilized to divert traffic around communities, particularly when heavy traffic conditions obstruct the functionality of main street. However, bypasses reduce the interaction between travelers and communities.

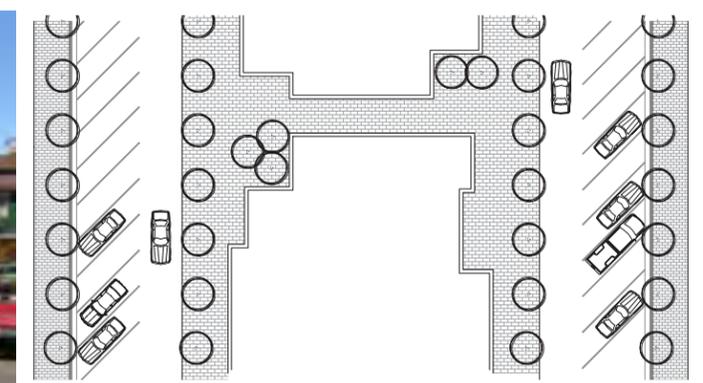
- A bypass may work in certain cases where the highway is designated as part of the freight system or heavy traffic volumes overload a well-designed street system.
- If a bypass is used, maintain connectivity for bicyclists and pedestrians and provide direct connections back to community business districts.



(1) As highways travel through communities, the function of the road changes as development increases at its edges. Improvements to other streets allow the highway to function more smoothly as it incorporates landscape and aesthetic elements.



(2) Truck traffic through communities must be considered as part of street design along rural highways.



(3) Parallel, one-way street systems may be used to improve traffic patterns and provide additional space for landscape, pedestrian improvements, or additional commercial development.

3.0 SIDEWALKS

3.1 Provide a 10 to 15 foot sidewalk width for downtown areas where possible.

A wider sidewalk allows for more pedestrian activities along the street (see illus. 1-4).

- Additional width may be required to accommodate transit shelters, outdoor dining, and retail.
- A sidewalk may be 8 feet wide in constrained circumstances. Minimum sidewalk width is 6 feet.

3.2 Provide continuous sidewalks throughout downtown areas.

The ability of pedestrians to access and move through downtown areas depends on the connectivity of sidewalks and paths, as well as appropriate design and placement of crosswalks.

- Establish connections to other sidewalks or path systems where town centers transition into suburban or rural areas.

3.3 In town centers, provide pedestrian amenities such as benches, drinking fountains, transit shelters, kiosks, trash receptacles, newspaper racks, banners, and decorations.

Streetscapes that appear lively and inviting attract travelers and support local businesses.

- Street furnishings should be consistent with surrounding architectural styles and the overall landscape segment theme.
- Maintain a minimum of 5 feet of clear space around street furniture to accommodate pedestrian movement.
- Provide wide sidewalks and curb extensions as locations for benches.

3.4 Use distinctive paving to highlight sidewalk areas immediately adjacent to the inside face of curb.

Sidewalk areas can be organized into two zones: the amenity zone and the pedestrian zone. The amenity zone is adjacent to the curb and should have a minimum width of 2 feet, but preferably 4 feet or greater, depending on the sidewalk width.

- Distinctive paving treatments may be used in this area to distinguish it from pedestrian movement areas.
- Treatments should be consistent over a block length, but may vary from block to block.
- Street trees, planters, benches, transit shelters, signs, utility poles, and other elements are located in the amenity zone.
- Elements should be grouped together or placed in a way that leaves a minimum open area of 8 feet between them, allowing passage from the sidewalk to the street.

3.5 Provide pleasant seating opportunities along every block in the downtown area.

Seating is essential in a comfortable pedestrian environment.

- Arrange seating to accommodate a variety of views.
- Locate benches and gathering spaces to absorb sun on cold days and provide shade on hot days.
- Ensure that communities commit to maintain and clean street furniture as part of maintenance agreements that are negotiated prior to construction.



(1) 8' sidewalks allow minimal two-way pedestrian traffic and street furnishings.



(2) 10' sidewalks provide enhanced user comfort and space.



(3) 12' sidewalks allow room for outdoor dining and sidewalk displays.



(4) 15' sidewalks create area for high levels of pedestrian activity.



(5) A successful pedestrian experience is created through the appropriate organization of lighting, street furnishings, and planting areas.



(6) Choice of paving reflects local character. In the example above, railroad tracks have been converted to a pedestrian promenade that recalls an aspect of the town's history.

3.6 Consider undergrounding utilities to provide additional space for sidewalk enhancements.

Utilities should be consolidated to minimize poles and other sidewalk obstructions.

- Coordinate signage with utility poles where feasible.
- Avoid placing signs and utilities in pedestrian areas.

3.7 Incorporate transit shelters to promote pedestrian and non-motorized transportation opportunities.

Coordinate transit stops with local transportation agencies.

- Locate bus pull-outs on the far-side location of intersections.
- Minimize conflicts between vehicles, passengers, pedestrians, and cyclists.

3.8 Consider using artistic paving and historical marker insets to accentuate downtown areas.

- Celebrate distinctive areas with accentuated paving materials.
- Consult artists for ideas to improve the community downtown.
- Paving patterns should coordinate with intersection designs and overall community character.



(7) The placement of lighting and other utilities should be considered in conjunction with providing appropriate space for unobstructed pedestrian movement.



(8) Locate transit stops to minimize conflicts between vehicles, pedestrians, and cyclists.

4.0 STREET TREES AND PLANTING STRIPS

4.1 Carefully select plant species.

- Select trees that thrive in the local climate and consider species whose roots, seasonal flowers, or fruit create minimal disruption to sidewalks.
- Evaluate trees based on site-specific characteristics as well as design intent.
- Considerations for physical characteristics include form, height, spread, height to canopy bottom, canopy density, trunk size, root habit, rate of growth, and longevity.
- Consider habitat requirements affecting plant growth, including soil type, compaction tolerance, salt tolerance, irrigation requirements, shade tolerance, heat tolerance, air pollution tolerance, and wind resistance.

- Minimize maintenance costs by avoiding trees with excessive maintenance requirements including flowers, foliage, fruit, and twigs.
- Consider common insect and disease problems that consistently require maintenance or are life threatening.
- Maintain storefront visibility and reduce pedestrian conflicts by selecting trees whose form remains intact when limbed up to 8 feet.
- Consider tree height over traffic lanes. Canopies should appear natural when trimmed to 14 feet.
- Select plants that will provide a variety of ornamental characteristics, such as seasonal color, fruit, texture, bark, and foliage.
- Plant species according to the softscape type and treatment designated by the design objectives.



(1) Trees should be placed so that they do not block the view of business names and entries.



(2) Choose tree species that are appropriately sized, do not drop fruit or seed pods, and are easy to maintain.

- Avoid planting a single species in suburban areas due to the risk of a pest or disease destroying an entire street tree planting.
- Downtown districts may be highlighted through a formalized street tree pattern.

4.2 Properly place trees in sidewalk conditions.

Maximize the lifespan of trees to reduce the cost of tree replacement.

- Protect trees from damage by car doors. Where on-street parking is provided, allow adequate room between trees and cars (2 feet at minimum, but ideally 3 to 4 feet). Trees may be placed between parking spaces to minimize damage.
- Allow for root aeration and potential water harvesting through the use of tree wells (4 feet by 4 feet at minimum, but ideally 5 feet by 5 feet). Dry-set pavers may also be used, ensuring adequate root aeration.
- Consider light placement as part of tree spacing and placement (typically 25 to 40 feet).
- Place trees so they do not block vehicular site lines or building access ways. Maintain visibility of traffic signals, directional signage, and access to entry drives.

4.3 Street tree plantings may be varied to distinguish downtown areas from transition zones and to accentuate wayfinding.

Small trees in combination with medium and large trees can reinforce wayfinding in towns.

- Distinctive trees may be used within downtown areas to distinguish them from other commercial areas (see illus. 3).

- Key intersections and gateways may be designated by clustering smaller trees or other distinctive groupings.

4.4 Utilize hanging baskets, containers, and other vertical elements where feasible.

In areas of limited rights-of-way, hanging baskets, moveable planters, and other vertical elements may be used to provide structure or to accent street tree plantings.

- Hanging baskets may be incorporated into the street design and attached to light fixtures or buildings to provide visual relief and enhance the aesthetics.
- Baskets may be replaced with wreaths or other seasonal accents during dormant seasons.
- Moveable planters add flexibility to the streetscape design.
- Avoid placing containers within clear zones and immediately adjacent to curbs where high levels of heat and vehicle exhaust are more prevalent.
- No container should be used if planter widths exceed 25% of the entire sidewalk width.
- Select container colors that harmonize with brick pavers, concrete sidewalks, most building facades, and the myriad color combinations produced by annual plantings.
- Container design should be simple and understated (see illus. 6).
- Use a consistent planter type within communities and provide groupings where possible. Containers should be sited near street corners (as long as clear visibility is maintained for drivers), to flank entrances to landmark buildings, or to physically and visually define outdoor café spaces.



(4) Place street trees where they are protected from car door damage and allow a smooth flow of pedestrian movement.



(6) Container color and form should be simple and understated.



(3) Varied street tree types may be used to distinguish key areas and gateways.



(5) Used consistently, street trees help define the extent of downtown districts and neighborhoods. A change in planting type and spacing can be used to signal transition zones between downtown and outlying areas.



(7) Tree grates protect trees from unwanted root compaction along street environments.

- Combined height of containers and plantings should not obstruct the view of either motorists or pedestrians at street intersections and access drives.

4.5 Buffer sidewalk from the roadway through the use of planting strips or raised planters where possible.

Planting strips provide opportunities to absorb runoff water and decrease overall drainage requirements. Additionally, they create areas to store snow during removal periods throughout the winter.

- Where space is not required for widened sidewalks or on-street parking, provide planting strips (ideally a minimum of 5 feet in width) or raised planters.
- Planting strip design should consider the placement of benches, signs, bicycle racks, and other street furniture.
- Raised planters should incorporate seat walls to provide additional pedestrian seating.
- Consider providing 3 feet of hard surface between planting strips and parallel on-street parking to accommodate motorists upon exit from their vehicles.

4.6 Ensure that communities commit to maintain and provide irrigation for streetscape plantings.

The success of a streetscape program within communities requires dedication to maintenance and irrigation of planted areas.

- Streetscape plantings should not be provided without community endorsement and support.
- Minimize the use of irrigation. Where required, do not overspray onto walkways and into gutters.

- Irrigation and maintenance may be funded through community beautification committees and other community organizations.

4.7 Use engineered planting soil for street tree plantings.

Trees planted in urban conditions and as part of street tree programs face unique challenges. The soil under adjacent sidewalks and roadways is typically compacted to support the paving. This compaction inhibits root growth and spread, causing shallow root growth and tree stress. Engineered planting soils (see illus. 10) include mixtures of soil, loam, stone, water, and a moisture-retaining polymer or sand that transfers weight-bearing loads from stone to stone in the gravel, leaving the soil between the stones unaffected by compaction. This type of engineered soil creates a larger rooting volume with increased porosity, nutrient-holding capacity, and drainage for a healthier environment for tree root growth.

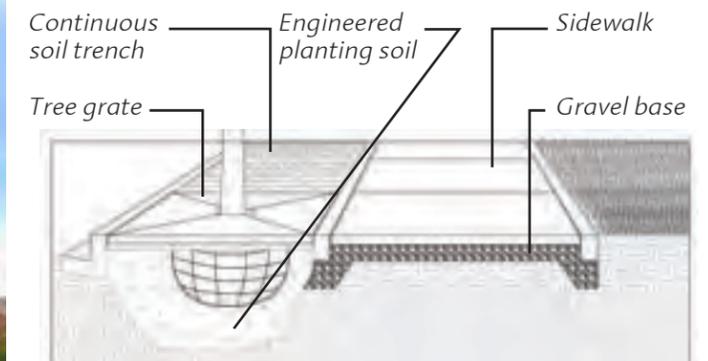
- Engineered planting soils should be used around root balls of street trees.
- Continuous trenches of engineered planting soil are recommended between street trees.
- Locate trenches parallel to curbs and under non-mortared brick pavers. Trenches provide greater volumes of soil for root growth and permit air and water to reach tree zones.



(8) Street trees and planting strips separate sidewalk areas from travel lanes and can provide seating opportunities.



(9) Street trees can be combined with planting strips to buffer pedestrian zones from traffic. Plant height should not block sight distances.



(10) Engineered planting soil can increase the lifespan of street trees by allowing tree roots to grow and expand into areas that otherwise would be inaccessible.

5.0 GRAPHICS AND SIGNAGE

5.1 Create a standard system of signage that aids wayfinding within communities while also providing information about local facilities and organizations.

- Provide a coordinated signage system that reflects the distinctive character of special districts.
- Graphics can take the form of signs, banners, information kiosks, or pavement inscriptions or inlays.
- Materials and designs should be clear and simple, so as to be easily read and quickly understood by pedestrians or motorists, as appropriate.

5.2 Locate and size signage and graphics so that it is easily read and understood by both motorists and pedestrians.

- Pedestrian-scaled signage should be placed at heights that can be easily seen from the sidewalk.
- Signage designed for motorists can be larger and placed at heights and intervals that can be easily seen and understood at higher traveling speeds (see illus. 3).

5.3 Provide community graphics, such as banners, to promote special events and define special districts and neighborhoods.

- Create a coordinated system of signage that describes community events and reinforces community character.
- Banners that span the roadway should be used in distinctive downtown commercial locations. Banners can be installed permanently or as seasonal and temporary forms of signage (see illus. 2).

5.4 Use distinctive signage to direct motorists through the heart of the community.

Truck traffic is often not desired within downtown areas and separate truck routes may be established. Vehicular and tourist traffic, however, is desirable.

- Ensure that signage appropriately directs vehicular traffic to promote tourism and support local businesses.

5.5 Coordinate light fixture design with graphics and signage.

- Banners may be incorporated into light fixtures and should be considered as part of the design. Graphics should be consistently displayed and banners should be placed to avoid conflicts with parked and moving vehicles.
- Customized light fixtures reinforce context-sensitive solutions.

5.6 Utilize a consistent color palette within local communities.

Local jurisdictions may choose a color palette for fixtures and amenities that corresponds with the community's vision. State Historic Preservation Office coordination and approval may be needed for specialized street light and street furniture amenities if federal funds are used.

- Colors should respond to the natural setting and subtly enhance the community without overpowering the streetscape design.
- Color should complement the NDOT color palette for structures within the right-of-way.



(1) Kiosks provide community event information.



(2) Banners may be used in coordination with light standards or over the highway in order to reinforce the sense of scale and community space.



(3)



(4)

(3), (4) Signage provides direction to community resources. Simple materials and designs are easy to understand, and they reflect community character. Scale of signage differs for vehicular traffic versus pedestrian traffic.

SECTION THREE: Highway Facilities Guidelines

These guidelines pertain to highway facilities that are primarily influenced by NDOT's standards, including structures, grading, roadside services, and construction practices. The guidelines found in this section are meant to enhance established traffic engineering and road design practice. No single solution will transform the highway. Partnerships may be created with communities and other agencies and organizations to accomplish landscape and aesthetic treatments. In addition, partnerships can support landscape and aesthetic elements that impact areas outside of the right-of-way. Established partnerships and design teams should thoroughly understand and carefully evaluate several options and related issues in order to create a highway that fulfills their collective goals. Neither NDOT nor communities, other agencies, or organizations can accomplish the goals on their own.

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1.0 NON-INTERSTATE STATEWIDE GATEWAYS

1.1 Provide statewide gateway features crafted from the land where US 50/US 6 and US 93 enter Nevada from Utah and Idaho, respectively.

Identify state entry points to welcome travelers to Nevada.

- Non-interstate gateways should be understated and relate to the scale of the road (see illus. 1-2).
- Include the Nevada name and state seal.
- Utilize vernacular forms and stone material from local sources.
- Use low-maintenance softscape treatment types, such as native revegetation.
- Recognize major regional features through material selection or design harmony.



Drawing by Joyce

(1) The gateway at the Utah-Nevada border along US 50 should be coordinated with signage that identifies Great Basin National Park, as it establishes the traveler's first impression of the State.



Drawing by Joyce

(2) The Idaho-Nevada statewide gateway along US 93 can be sited to take advantage of the surrounding landforms. Grounding the sign into the hillside helps frame the basin view and utilization of local materials and patterns accentuates the connection to place and history.

2.0 REST AREAS, VIEWPOINTS, AND PULL-OFFS

2.1 Provide a comprehensive roadside service program.

Roadside services are key components of the highway corridor, particularly where long distances separate developed areas. The road services matrix on the opposite page describes varying levels of service stops and associated program elements. Refer to the corridor’s Specific Features maps (pages 2.20-2.22, 2.27, 2.33, and 2.41-2.42) for potential road service facility locations.

- Locate rest areas to provide safe stopping points.
- Connect rest areas in highly utilized recreation areas with a shared-use trail.
- Buffer roadside services from the highway, or provide an access road when located off the highway.
- Consider major site resources and features such as topography, views and vistas, unique vegetation, geological features, wetlands, and other qualities native to the site and its surroundings.
- Consider siting activity pull-offs where they provide access to activities located adjacent to the highway.
- Locate truck parking so as to not disrupt views and other features while ensuring safe accessibility to the services provided.

2.2 Ensure rest area design reflects the local setting.

All rest areas, viewpoints, and pull-offs should readily accommodate travel needs and reflect the corridor’s design theme.

- Utilize vernacular forms and local materials to create rest areas that blend seamlessly with the surrounding landscape.
- Avoid using makeshift, adapted site facilities with no distinctive architectural style.
- Concrete barriers and brightly painted pole bollards should not be used for parking delineation or site boundaries at rest areas and pull-offs.
- Aesthetic alternatives should be used in place of bright orange fencing around trash receptacles.
- Sustainable architecture may be appropriate for many highway service areas where water, energy, and landscape resources are difficult to secure and maintain.
- 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.

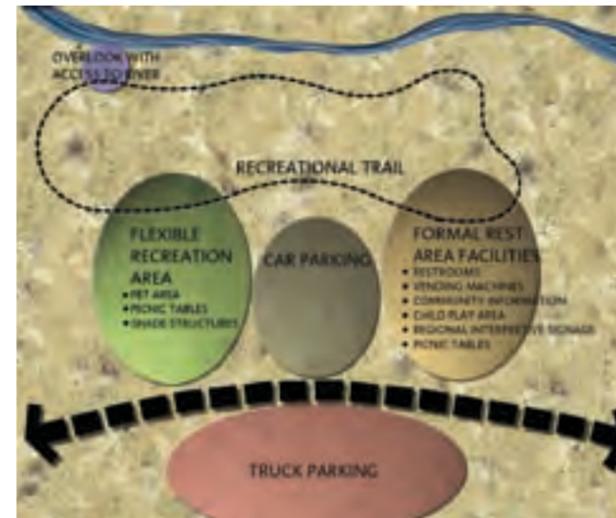
2.3 Retrofit existing rest areas.

Analyze existing rest area structures, buildings, amenities, and layout for their visual interest. Renovate to improve the aesthetics and user comfort of existing road service facilities.

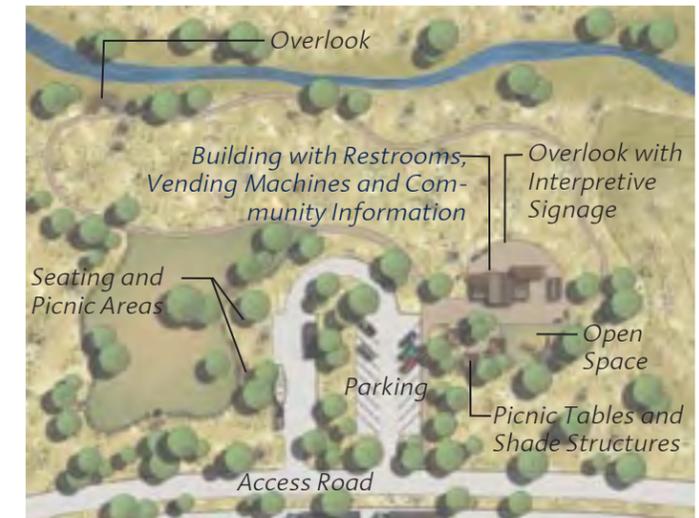
2.4 Locate viewpoints and points of interest to take advantage of visual access to the features of interest.

Give special attention to existing or potential views, vistas, and cultural or historic attractions that are unique to the site or have outstanding resource value, such as Native American heritage and emigrant history.

- Design viewpoints to reflect the surrounding setting and features.



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



(2) 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.



Drawing by Joyce

(3) Community rest areas, such as the one planned for Austin, create valuable opportunities for towns as travelers stop in town to explore the area.



Drawing by Joyce

(4) The design of structures should incorporate plantings and materials that reinforce the corridor’s theme. Adobe-like materials are applicable in southern portions of the corridor.



(5) Viewpoints should be designed to frame views of the landscape and provide shade.



Drawing by Joyce

(6) Rest areas should be situated within the environment to take advantage of impressive views of the surrounding landscape.

ROAD SERVICES MATRIX

Type	Description	Landscape Treatment	Program Elements
ROADSIDE PULL-OFF	Roadside pull-offs provide facilities for drivers to exit the highway for a brief period. Facilities and minimal parking are provided to accommodate the abbreviated stay. (Referred to as “Rest Stop” under former NDOT naming conventions.)	<ul style="list-style-type: none"> • Native plant revegetation to enhanced native landscape types • Standard hardscape type 	<ul style="list-style-type: none"> • Site-specific interpretive signage • No toilets or running water • Trash containers • Limited paved parking for cars and recreational vehicles • Scenic overlooks • Located according to unique or outstanding features • Shade canopy (vegetation or structure)
VIEWPOINTS AND POINTS OF INTEREST	Viewpoints and points of interests present opportunities to view unique vistas, geologic and historic features, or cultural landmarks. Interpretive elements are integrated into the site design, and place name signage and travel information elements are provided to establish the relationship between highway and place. Typically, the length of stay is short and parking is limited.	<ul style="list-style-type: none"> • Native plant revegetation to enhanced native landscape types • Standard to accentuated hardscape types 	<ul style="list-style-type: none"> • Located according to travelers’ needs and unique site features • Site-specific interpretive signage • Toilets/no running water • Handicap accessible • Picnic tables and shade structures • Trash containers • Paved car and recreational vehicle parking • Telescopes/viewfinders • Nature walks or short trails • Seating areas • Shade canopy (vegetation or structure)
BASIC REST AREA AND COMMUNITY REST AREA	Basic rest areas are located throughout the state, offering site-specific interpretive information. They offer limited rest room facilities and may or may not include running water, depending on availability. Typically these rest areas are located adjacent to scenic views or unique historic, cultural, or environmental features. Community rest areas provide facilities within the town’s infrastructure and function as a pocket park or town square.	<ul style="list-style-type: none"> • Enhanced native landscape type • Standard to accentuated hardscape types 	<ul style="list-style-type: none"> • Located according to travelers’ needs and unique site features • Site-specific interpretive signage • Toilets/no running water • Emergency call box • Handicap accessible • Picnic tables and shade structures • Trash containers • Paved car and recreational vehicle parking • Paved truck parking • Nature walks or short trails • Seating areas • Shade canopy (vegetation or structure) • Local community information
COMPLETE REST AREA	Complete rest areas are typically located at 60 mile intervals throughout the state and are usually situated outside of developed areas. They feature fully operable facilities in combination with interpretive information about regionally significant cultural and historic sites. Complete rest areas also provide travelers with picnic facilities and include children’s open play areas and pet areas.	<ul style="list-style-type: none"> • Regionally adapted landscape type • Focal hardscape type 	<ul style="list-style-type: none"> • Regional interpretive signage • Running water and flushing toilets • Emergency call box and telephones • Drinking fountains • Vending machine services (at manned sites) • Handicap accessible • Picnic tables and shade structures • Trash containers • Bicycle storage units • Recreational vehicle dump station • Paved car and recreational vehicle parking • Paved truck parking • Telescopes/viewfinders • Interpretive and overlook features • Children’s open play area (not play equipment) • Pet rest facilities • Shade canopy (vegetation or structure) • Local community information
GATEWAY REST AREA	Gateway facilities convey first impressions and identity. Special features may be incorporated to highlight the area through design interpretation of the place. Gateways may be associated with any level of rest stop in the listing. The incorporation of local community information regarding amenities, events, and interpretive elements improves the interface between the highway and the communities it serves.	<ul style="list-style-type: none"> • Regionally adapted landscape type • Landmark hardscape type 	<p>Program elements are consistent with the type of road service area provided.</p> <p>Specific elements include:</p> <ul style="list-style-type: none"> • Regional services information • Interpretation of regional sites and features • Information on regional recreational attractions
WELCOME CENTER	Welcome centers are located along major entry routes to the state. They offer introductions to the state and help travelers find access to useful travel information. Welcome centers include a staffed information kiosk.	<ul style="list-style-type: none"> • Regionally adapted landscape type • Landmark hardscape type 	<ul style="list-style-type: none"> • Located at major entry routes to state • Informational services • Staffed visitor center • Statewide interpretive signage • Running water and flushing toilets • Emergency call box and telephones • Drinking fountains • Vending machine services • Handicap accessible • Picnic areas and shade structures • Trash containers • Bicycle storage units • Paved car and recreational vehicle parking • Paved truck parking • Improved trails • Children’s play area • Pet rest facilities • Shade canopy (vegetation or structure) • Telescopes/viewfinders

- Coordinate the preservation and management of scenic vistas and 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.
- Limit the construction of outdoor advertising and other elements and structures that detract from the quality of the landscape.
- Ensure maintenance funding is established prior to viewpoint development.

2.5 Coordinate locations of rest areas with recreational access points.

Coordinate locations of rest areas with regional trail systems (see illus. 7).

2.6 Provide community rest areas within designated towns.

Community rest areas have the dual benefit of serving as town parks and engaging travelers with local businesses.

- Coordinate with appropriate agencies to provide informational signage for recreational activities.
- Develop community rest areas through cooperative agreements with local municipalities.
- Provide information about local and regional activities, businesses, and points of interest.
- Encourage community development of community rest areas and visitor services.



(7) Walking trails and interpretive elements promote physical activity to energize weary travelers.



(8) A sheltered structure at a point of interest gives travelers a protected place to learn about the area.



(9,10) A community rest area might include a series of shade structures that entice visitors to stop and take advantage of the town's services.



Drawing by Joyce

(11) Aesthetic improvements can be easily realized through the development of simple shade structures that define and give character to basic rest areas. Features should be sited to take advantage of vistas.



Drawing by Joyce

(12) Historic elements and cultural influences can be reflected through elegant architectural features. Rest areas provide great opportunities to engage travelers with Nevada's rich Native American and settlement history.

3.0 TRANSPORTATION ART

3.1 Engage artists early in the design and development stages of highway projects to ensure an integrated and comprehensive art program.

Transportation art should not be an afterthought or decoration.

- Incorporate art as part of the design process and as a means of interpreting the corridor's theme.
- Integrate art as part of functional aspects of highway facilities.
- Artists should coordinate with community members, landscape architects, and architects throughout the design process.
- Scale artwork based on travel speed, slope, and sight distance.

3.2 Create meaningful, regionally appropriate art.

Art enhances the travel experience and can create the first impression of a place. Transportation art should clearly express a meaning and purpose that relates to the surrounding locale, the unique culture and environment of the area, and the travel experience. Patterns and objects used thoughtfully, and even abstractly, can and should evoke a response that connects travelers to the uniqueness of the site and/or the surrounding landscape.

- Patterns imprinted on a highway structure should be designed as an artistic composition of objects, imprints, or patterns.
- Patterns should offer a level of complexity and interest appropriate to the place and highway travel speed.
- Avoid the use of repetitive, overused symbols and patterns.
- Consider artwork that utilizes light and shadow to create pattern and images.

- Avoid monotonous applications of repetitive and literal pictorial representations.

3.3 Ensure artwork expresses excellent craftsmanship, quality, truthfulness, and originality.

Transportation art should complement the overall design of highway facilities. Carefully consider materials and forms to ensure the long-term suitability of the project.

- Select a composition of materials that is durable for the anticipated life span of the project.
- Avoid the use of ready-made, randomly placed, stand-alone objects, or imprints that portray little meaning.
- Use evocative artistic expressions that engage observers and complement highway structures and the surrounding landscape.
- Elements of highway art should not be obvious or forged. Rather, transportation art should convey an excellence of craftsmanship, quality, truthfulness, and originality.

3.4 Consider each art piece as part of a larger whole.

Highway art can be carefully crafted, giving the simplest of all elements a very powerful effect. When planning transportation art, the entire design segment and overall corridor should be considered.

- Consider views and vistas to the surrounding landscape.
- Art should be appropriately scaled to the surrounding landscape and highway speed.
- Avoid distracting art pieces. Consider glance recognition and the intensity of surrounding features in order to prevent safety issues.



(1) Transportation art provides deeper meaning and interest to the corridor. Artwork is developed with consideration to the larger landscape and therefore clearly express a meaning and purpose to the landscape.



(2) Light and shadow can be used to create pattern and images.



(3) Materials and architectural design choices dramatically affect the traveler's sense of place. Engaging artists early in the design process is critical to achieving powerful features.

3.5 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 for each landscape design segment theme. Choose art subjects that support the landscape design segments' themes.

3.6 Engage local agencies and organizations in the planning process.

Relationships with local agencies as well as the Nevada Arts Council should be developed to assist in the review and implementation of proposed transportation art projects.

- Consider transportation art at the onset of project development.
- For community matching fund and transportation art programs, refer to the guidelines outlined in the current *Landscape and Aesthetics Community Match Procedures Manual: Guidelines, Applications, Instructions and Forms for the Community Matching Funds and Transportation Art Program*, NDOT.



(4) Murals should thoughtfully celebrate significant historic and cultural events.



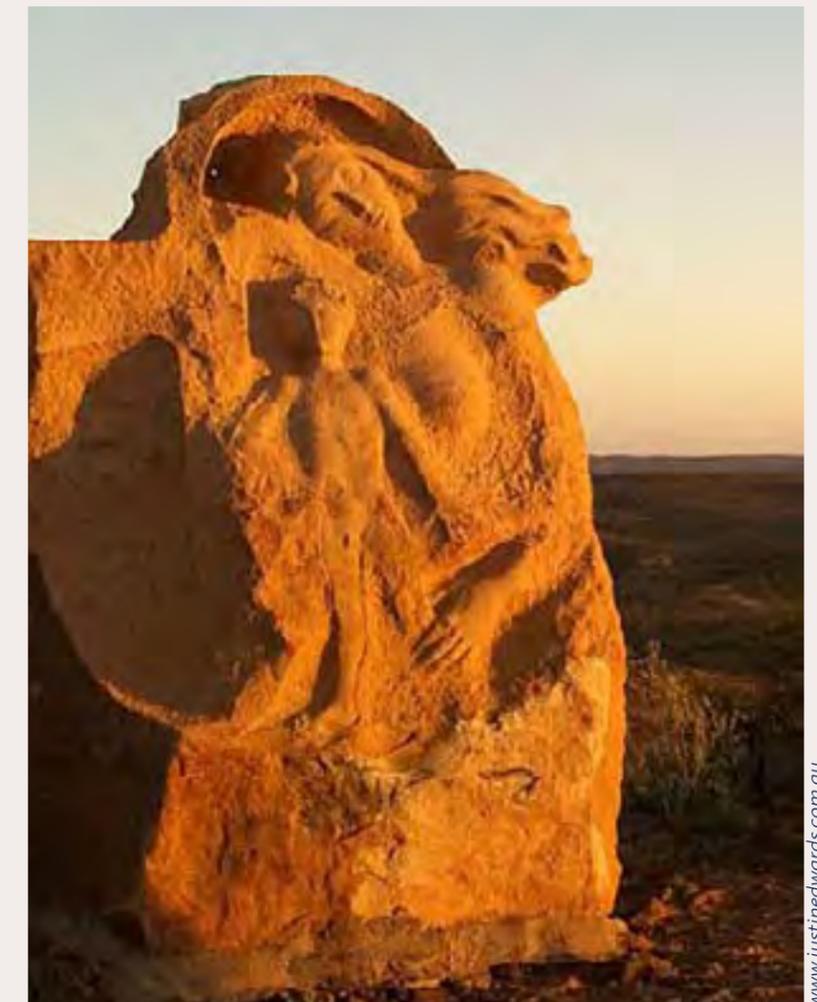
(5) Artwork that utilizes environmental components, such as wind, create unique opportunities for interpretation.



(6) Shadow patterns illuminate simple wall features and add interest to night views.



(7) Art incorporated into bridges and structures subtly invokes special meaning.



(8) Sculptures set in the landscape should evoke meaning and relate to the overall site context.

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4.0 SIGNAGE

4.1 Provide a standard, cohesive system of service signage.

Utilize the Tourist Oriented Directional Sign (TODS) program as a way to provide signage for services located in communities just off the highway. NDOT manages the TODS program, and it is preferred over numerous private individual business signs and billboards. Lamar Advertising, at www.lamar.com, currently operates the program in Nevada. Work with local community agencies and businesses to develop and locate TODS. Refer to the Outdoor Advertising discussion (pages 1.13-1.14) for more information about billboards along the corridor.

- Utilize General Service signs, such as knife and fork for restaurants, along rural highways. Rural towns located just off US 93, such as Panaca and Pioche, provide services that are not frequently found along the corridor. Therefore, use of General Service signage is supported by the MUTCD.
- Reinforce the message of General Service and TODS signage by incorporating business logos, or business placards, on signage where possible. Use of the Logos program in conjunction with TODS has proven to be more successful than TODS alone.

4.2 Implement a Statewide Place Name Sign Program.

A comprehensive place recognition signage program should be implemented through partnership initiatives with local communities and agencies. The program and sign types are described on pages 1.11-1.12.

- Use a consistent color and material for signs.
- Use signs that are high quality and as durable as other standard highway signs.
- Use the MUTCD for signage requirements within the right-of-way.
- Avoid placing too many signs along the highway. Do not provide signage for sensitive environmental or cultural resources.

4.3 Utilize a family of iconic symbols to represent features.

Encourage the recognition of cultural and environmental features through iconic imagery.

- Signage should depict the general physical shape of the point of interest.
- Establish icons to represent general categories of interest within the Nevada landscape. Illustration 1 shows examples of symbols to represent the categories. Unique icons may be created for areas of national significance. Additional symbols should be developed to represent Nevada landmarks/historic points, emigrant trails, scenic byways, and Native American features. Engage Nevada tribes to develop a universal symbol that is both appropriate and simple to represent the state's Native American resources.
- Features and points of interest to be recognized in this program will be coordinated with NDOT, Nevada Division of State Parks, Native American tribes, and the State Historic Preservation Office.
- Name and labels included shall be consistent with Nevada State Library and Archives naming conventions. Consider travel speed when descriptions are used. Lettering less than 6 inches in height can be difficult to read at high speeds.
- Final icon and name approval will rest with NDOT.

EXAMPLES CATEGORIES OF ICONIC SYMBOLS FOR PLACE NAME SIGNS



Landmark Mountain/
Range



Rivers



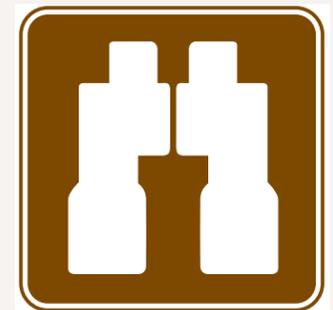
Sand Dunes



Mining



Historic Railroads



Watchable Wildlife



Historic Downtowns



Ghost Towns

(1) Universal symbols represent Nevada's cultural and environmental features as part of the Place Name Sign Program. Additional categories such as Nevada landmarks/historic points and Native American features should be developed to provide straightforward icons that symbolize the resources.



D9-7
Gas

D9-8
Food

D9-9
Lodging

D9-10
Tourist Information

(2) General Service signage includes symbols for typical services found along the highway. In rural towns located just off the main highway, use of such signage is important for businesses to attract patrons.



(3) TODS establishes a program of signage for businesses whose visitors do not typically reside within the immediate area. The signage is intended for cultural, recreational, or historic points of interest.

4.4 Implement an audio interpretation program.

Develop and coordinate an audio/multimedia interpretive program with the Statewide Place Name Sign Program. This program could be implemented via broadcast radio, CD or DVD programs, wireless Internet hotspots, satellite transmission, or other media that allow travelers to access additional information from their car.

- Information may include cultural and natural resources, tourist opportunities, and services along the corridor.
- Link the audio interpretation program to the Statewide Place Name Sign Program, state welcome centers, and local chambers of commerce so that travelers can access specific information.
- Utilize synchronous technologies that allow users to control how and when they access this additional information.
- Coordinate with programs, organizations, agencies, and municipalities along the corridor to explore ways to expand the audio interpretation program.

4.5 Coordinate the Statewide Place Name Sign Program with the national Watchable Wildlife program and with other community-driven programs.

Work with other agencies, civic groups, and municipalities to provide interpretive signage where applicable.

4.6 Highlight scenic byway entrances with signage that is coordinated with the Statewide Place Name Sign Program.

Reflect the place and character of the area with iconographic images incorporated into scenic byway signs (see illus. 5).

4.7 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.
- Along non-interstate roadways, utilize pole signage for anti-littering messages.
- Develop signage that engages Nevada residents and encourages active participation in maintaining clean and beautiful highways.

4.8 Utilize low-profile interpretive signage at rest areas and pull-offs.

- Incorporate and place signage so that it does not block views of scenic resources. Consider signage with a low-profile base and a reading surface placed at a 45-degree angle.
- Provide durable, long-lasting signage. Interpretive signage should be designed to withstand a large range of climatic elements. Consider using Vitratek porcelain enamel or equivalent. Graphics should be produced on a durable medium that produces high-quality graphics.



(4) Simple kiosk signage can provide additional information on the area's resources and opportunities. Coordination with the region's agencies, organizations, and community efforts allows the corridor to better tell the stories of the area in a consistent manner.



(6) Low-profile signage can be incorporated into rest areas without blocking views. Providing travel information and interpretive information at rest areas allows travelers to enrich their experience without cluttering highway with signage.



(5) Scenic byways should include a specific pictorial graphic that is related to the place.



(7) Place-specific interpretive panels highlight important historical, cultural, and environmental information. Panels can be sited along walking paths, allowing travelers to stretch their legs as they become engaged with the state's history.

5.0 COLOR PALETTE APPLICATION

5.1 Use a uniform, consistent color palette for all highway structures.

Standard NDOT practice should utilize a uniform and consistent color palette that complements the surrounding landscape for all new and existing highway structures. Base and accent stain or paint colors for all highway structures along the US 93, East US 6, and East US 50 Corridor have been selected. To ensure accurate color reference, the colors are matched to the Dunn Edwards system (see illus. 1).

- Each highway structure should use a selection of one base color and up to two accent colors, chosen from the palette. No more than two different accent colors should be used per site.
- Ensure roadway structures within a single landscape design segment use the same base color and accent color(s).
- When existing structures require refinishing, they should be stained or repainted to be consistent with the selected color palette.
- Specific town logos and transportation art are exempt (refer to Transportation Art guideline, pages 3.17-3.18).

5.2 Ensure accent colors highlight structural aspects.

Accent colors should highlight structural aspects and/or details of highway structures, such as the beam of a bridge or a bridge railing.

- Ensure that accent color application logically responds to and reinforces structural features or change in materials.

5.3 Blend new rock cuts and/or soil with the surrounding landscape.

Match new rock and soil treatments with existing rock and soil color to blend disturbed areas with the surrounding environment.

- Use this process for any corridor project that includes rock cuts.
- Use the University of Nevada’s *Mapping Ecosystems* (Tueller, et al., 2002) as a guide for soil colors. Soil colors are referenced to the Munsell color guide.
- Blend newly excavated soil and rock with existing weathered rock.
- Where possible, the application of color should occur in a central location and away from sensitive receiving waters.



(2) The landscape inspires the color palette for each landscape design segment. Base colors correspond to the landscape design segment’s environmental features.

BASE COLORS	ACCENT COLORS
 Hidden Gems #DEC 717	 #6224
 Silver State Passage #6215	 #5537
 Pony Express Passage #6223	 #5880
 Cowboy Range #6194	 #5822
	 #5747
	 #6097
	 #6013
	 #5097

Any two accent colors may be chosen from the following 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.



(3) The color palette was field tested in morning, afternoon, and evening conditions.



(4) The practice of staining rock cuts helps to blend exposed rock surfaces with the color of the surrounding ground plane.

6.0 ROADWAY DESIGN

6.1 Reduce the appearance of a wide right-of-way through communities.

Every effort should be made to keep the roadway as narrow as possible. Wide roads allow for faster vehicular travel speeds and therefore negatively impact the safety of pedestrians.

- Consider reducing the number of lanes. Four-lane highways may be retrofitted to two travel lanes or two travel lanes and a turn lane when other street systems are improved and overall traffic patterns move effectively.
- The appearance of a wide roadway may be reduced through the use of vertical elements, curb extensions, and a narrow shy distance (the side clearance from fog line to edge of structure). Utilize a shy distance of 1 to 2 feet from curbs and medians in downtown areas to reduce speed.
- Provide passing lanes outside of rural communities, rather than only within town, to reduce the number of lanes within town and slow travel speeds. Highways that only provide passing lanes within communities encourage higher travel speeds through town because it is the only opportunity to pass slower traffic.

6.2 Consider the use of rumble strips in transition zones to signal a speed reduction.

Changes in paving material and roughened paving provide a visual and audible cue for drivers to slow down.

- Rumble strips may be combined with enhanced roadside treatments such as plantings and gateways to reinforce the entry into pedestrian areas.

6.3 Provide curbs no greater than 6 inches in height in community zones.

Curbs define the edge of the highway and delineate the pedestrian zones within communities. Curbs greater than 6 inches in height may restrict pedestrian movement and create difficult transitions at pedestrian crossings.

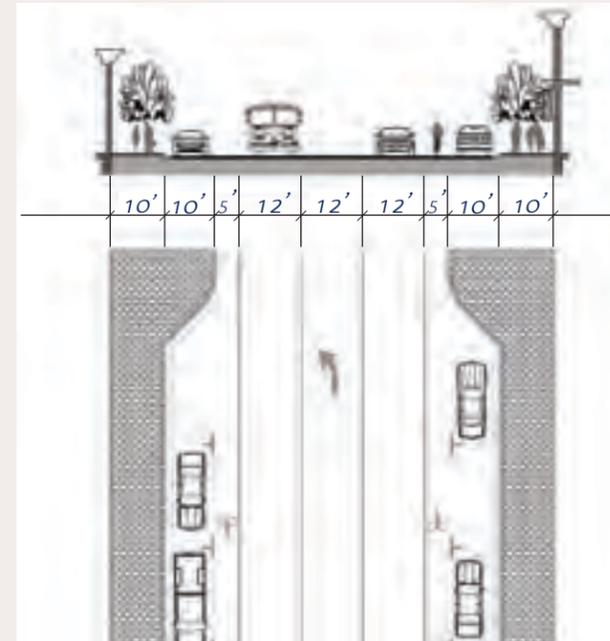
6.4 Utilize on-street parking in community interface zones to buffer the sidewalk from traffic.

On-street parking accommodates access to local businesses and slows traffic (see illus. 1-2).

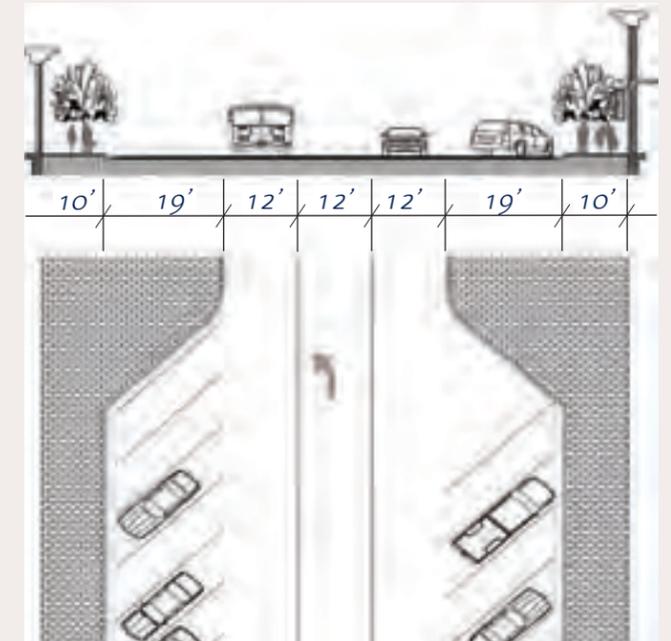
- Use curb extensions to enhance the visibility of pedestrians crossing the street.
- Angled parking should only be used in areas of very low travel speeds.
- Provide a bike lane between parking and travel lanes to create a buffer.
- When bike lanes are not incorporated, consider using a wider outside travel lane or parking area to minimize conflicts between bikes and opening doors.
- For all forms of on-street parking, maintain adequate visibility and buffer zones between travel lanes and parking to prevent conflicts with through traffic.

6.5 Integrate art, softscape, and hardscape as part of a simple landscape treatment for roundabouts.

- Landscape treatments within a roundabout should express the segment theme and community vision.
- Sensitively site transportation art and plantings.
- Treatments should complement and coordinate with the surrounding environment and landscape features and be part of an integrated design approach (see illus. 4).



(1) Parallel parking is best in areas where visibility and traffic flow are concerns.



(2) Where room and travel speeds allow, angled parking creates more parking spaces.



(3) Street systems have a large influence on the social and economic impacts of a community. Reducing the visual width of the street, allowing for on-street parking, and implementing a truck bypass are examples of ways in which communities can greatly reduce the negative impacts of a highway (image above).



(4) Roundabouts can be creatively designed to include low-maintenance hardscape features that add aesthetic value (image to the left).

7.0 MEDIANS

7.1 Revegetate medians along rural highways to integrate the highway with the landscape.

Utilize native plant material to revegetate medians along rural highways to create a more natural and consistent visual experience (see illus. 1).

7.2 Utilize median plantings and treatments to enhance a community's image.

Landscaped medians beautify wide streets by breaking up large expanses of pavement and making the street feel narrower. Medians can include a combination of rock mulch, signage, plantings, and boulders that help to identify the character of the place (see illus. 2-3).

- Avoid using asphalt paving in medians. Stamped, colored concrete or pavers should be used in narrow medians (those less than 5 feet wide). Paving score patterns and texture should be simple and coordinate with surrounding architecture and pedestrian areas. Colored concrete should use the segment's base color (see Color Palette guideline page 3.21) or coordinate with adjacent pedestrian walkways.
- The placement of plantings and treatments should direct pedestrians and facilitate the vehicle operator's view. Selected plant species should also be suitable for the harsh roadway environment.
- Planted medians are generally the width of the center turn lane but can be as narrow as 5 feet. Regardless of width, medians should be designed to allow for safe maintenance as well as for anticipated plant growth.

- Design medians to allow for adequate percolation of water. This practice prevents pavement failure caused by infiltration of irrigation water into the road base/sub-base.

7.3 Utilize medians to reduce potential vehicle-pedestrian conflicts and to enhance pedestrian walkability.

Medians function to improve pedestrian visibility by minimizing turning conflicts and directing and separating traffic. They provide an effective way of reducing conflicts between pedestrians and vehicles because they allow pedestrians to incrementally cross the traffic lanes.

- Medians may be constructed with curbs and combined with pedestrian refuge islands.
- Future development, access management, usage patterns, and changing transportation demands should be examined when determining if raised medians are the appropriate solution for the roadway.

7.4 Direct stormwater to planted medians and landscaped planting strips where feasible.

Utilize drainage swales within medians to handle excess stormwater runoff (see illus. 4-5).

- Carefully design curbs, gutters, catch basins, and drain grates for ease of maintenance.
- Ensure pedestrian movement is not unduly impacted by ponding water.
- In areas where runoff may contain high levels of salt, select salt-tolerant plants.



(1) Native revegetation harmonizes the highway with the surrounding landscape.



(2) Accentuated softscape median treatments combine tree forms with shrub material to give vertical definition to the highway.



(3) Medians provide the opportunity for planting and design details that help define distinct areas within a community. Breaks in the median provide a safe haven, allowing pedestrians to cross lanes incrementally. These refuge islands provide pedestrians with an additional level of security.



(4) Native vegetation and rock-lined medians, alone or in combination with drainage swales, allow for runoff of excess stormwater.



(5) Landscaped medians beautify streets and create context-sensitive solutions.

8.0 PEDESTRIAN CROSSINGS

8.1 Improve pedestrian safety at crossings.

Motorists can see striped crosswalks from a greater distance (see illus. 1).

- Utilize a zebra striping pattern for painted crosswalks.
- Crosswalk striping should correspond to the width and location of sidewalks.

8.2 Use alternative paving type, coloring, or other means to visually highlight pavement in pedestrian crossings.

Crosswalks may be marked with distinctive paving material, colors, and texture.

- Concrete is preferred over brick for its durability. Concrete may be stained, embossed with patterns, or constructed with unit pavers to give crossings a distinctive feel in particular areas.
- Textures and materials should provide a visual contrast with the adjacent road surface, yet they must also provide a smooth travel surface and good traction.

8.3 Reduce curb-to-curb distances at crosswalks. Incorporate curb extensions as part of the highway system when on-street parking is provided. Provide refuge islands to break up long crosswalks.

Curb extensions reduce the crossing distance for pedestrians, increase visibility for motorists and pedestrians, prevent illegal parking at corners, and provide additional room for people waiting to cross the street.

- Curb extensions should reach into the street no further than the edge of the travel or bike lane.

- They can be used at mid-block crossings and are beneficial when combined with pedestrian refuges.
- Refuge islands are located at crosswalks in the middle of streets to provide a safe waiting area for pedestrians.
- The waiting area in refuge islands should be in line with the crosswalk and as wide as the crosswalk to allow persons with disabilities to cross without obstruction.
- Refuge islands may include additional pedestrian safety features such as bollards and flashing signage to enhance their visibility.

8.4 Alert motorists to pedestrian crossings through the use of signage and flashers.

Pedestrian signals work in conjunction with traffic signals to assign right-of-way at intersections.

- Active signals are preferred over passive signals.
- Pedestrian signals are appropriate at all intersections with traffic signals where crossing is permitted.

8.5 Balance the need for adequate vehicular turning radii with pedestrian needs.

A tighter turn (or shorter radius) forces drivers to slow down, allowing them to see pedestrians and make quick stops. Additionally, shorter turning radii create more sidewalk space for pedestrian amenities.

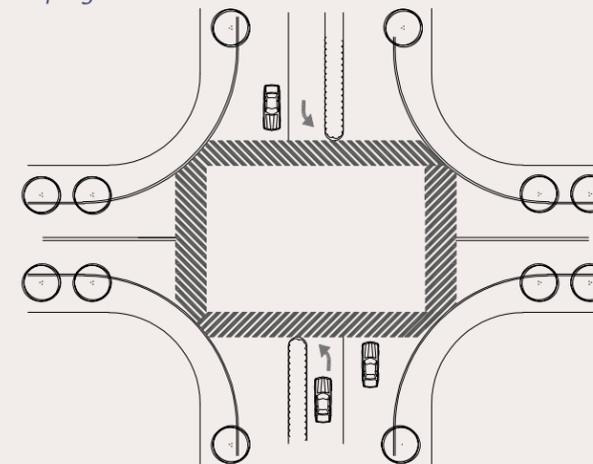
- Reduce corner radii where feasible to shorten and align pedestrian crossings while reducing vehicle turning speed.
- Reduce the use of slip lanes (channelization) where possible to minimize vehicle-pedestrian conflicts.



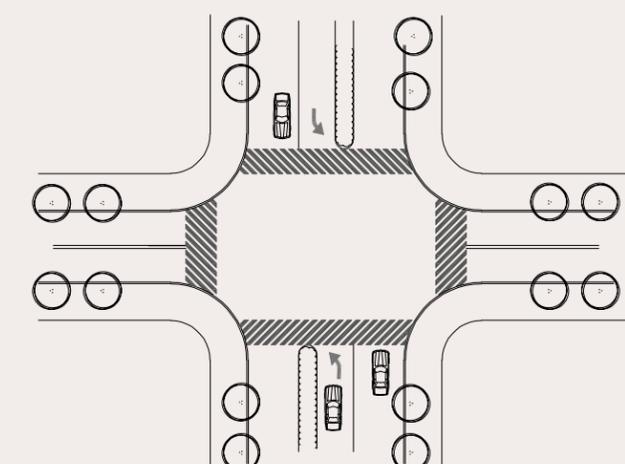
(1) Zebra striped crossings require less maintenance and are more noticeable than standard parallel striping.



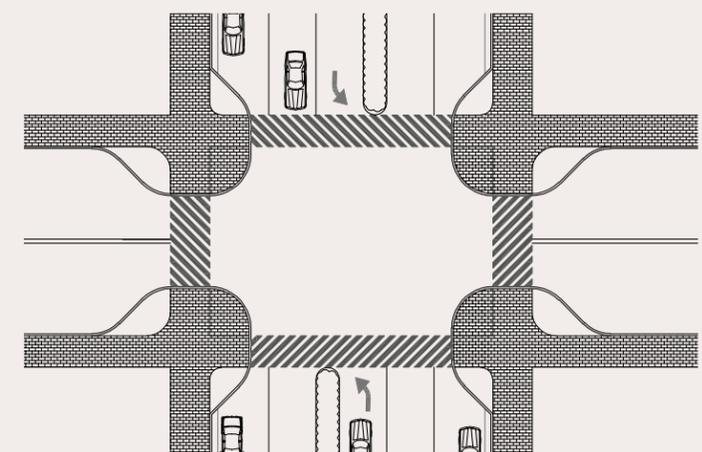
(2) Use of colored paving differentiates pedestrian crossings and elevates the pedestrian's importance.



(3) Pedestrian movement is directly affected by turning radii. Larger radii increase traffic speed and crossing distance for pedestrians, thereby reducing pedestrian comfort.



(4) Tighter, shorter turning radii reduce traffic speed and shorten pedestrian crossing distances. Motorists are better able to see pedestrians and stop quickly.



(5) Curb extensions are easily integrated into roadways with on-street parking. Consider the use of curb extensions in highly utilized pedestrian areas in order to provide pedestrian amenities and reduce crossing distances.

9.0 NON-MOTORIZED TRANSPORTATION SYSTEMS

9.1 Consider aesthetics as part of bicycle facility design.

Users of non-motorized transportation (NMT) systems are more likely to use facilities that include aesthetic treatments and that link to critical destinations.

- Minimize underpass length to allow for natural lighting (see illus. 1).
- Utilize transportation art consistent with the segment theme.

9.2 Engage agencies and organizations in the planning and design process.

Proper planning ensures that NMT facilities are convenient while minimizing adverse safety and environmental impacts.

- Engage federal, state, and local agencies as well as local user groups and organizations in the planning, design, and implementation of NMT facilities.
- Ensure the maintenance of connections to regional trails and pedestrian systems.
- Consult the statewide bicycle and pedestrian plans prepared by NDOT.
- Provide signage to trailheads and regional trails to encourage NMT use.

9.3 Integrate NMT into the right-of-way.

Where topography, site conditions, and land use warrant, separate bicycle paths may be built in the right-of-way.

- Ensure that direct connections are made to existing and future trail systems and shared-use pathways (see illus. 3).

9.4 Incorporate designated bike lanes within the roadway to link regional bike trail systems.

Within developed community areas, bike lanes provide access to regional trail systems and local facilities. Along US 50, bike lanes should be incorporated to safely accommodate the heavy use.

- Stripe and sign designated bike lanes to promote driver awareness and enhance user comfort (see illus. 2).
- Enhanced paving or pavement markings may be used in downtown areas.
- Along rural highways, ensure adequate shoulder width is provided. Rumble strips create an unrideable surface for cyclists. Shoulder design should accommodate both rumble strip and bike lane requirements.

9.5 Consider underpass or specifically designed at-grade crossing for NMT crossings along rural highways.

Outside of developed community areas, shared-use paths may need to cross the highway to provide a direct connection to a recreation destination. In such circumstances, safety is of utmost importance. Design considerations include ADT, type of traffic, speed, sight distance, grade, type of roadway, and number of lanes to be crossed.

- An underpass provides the recommended method for crossing the highway in rural areas. Structures should be wide enough to be visually inviting and allow for natural lighting.
- At-grade crossings should be properly signed and striped. Advance warning measures should be incorporated to notify motorists of the need to slow down and look for crossing cyclists.



(1) The length of underpasses should be minimized where possible in order to allow for natural lighting.



(2) In areas of heavy use, such as US 50, adequate shoulder width should be provided to improve rider safety. Shoulder design should consider bicycle use when incorporating a rumble strip.



(3) Bike lanes can be incorporated adjacent to or separated from rural highways to create links to other recreational opportunities.



(4) Grade-separated crossings should be utilized along high-speed rural highways.

10.0 BRIDGES

10.1 Accentuate locations where bridges cross major water bodies, drainage courses, or canyons.

Utilize landscape treatments in order to highlight crossings and connect motorists to the landscape (see illus. 3).

- Consider the integration of a grade-separated pedestrian crossing into structure when possible.
- Coordinate with local jurisdictions to determine the need for these features.

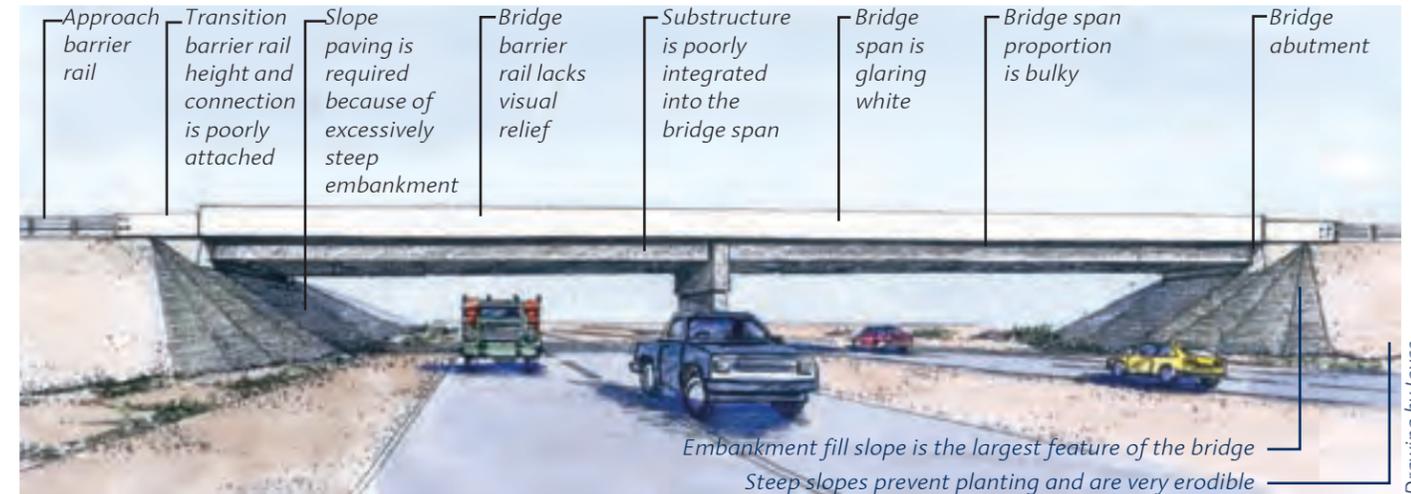
10.2 Use a consistent bridge design.

Bridges are prominent features in the landscape and can significantly affect the visual quality of the environment. NDOT standard bridge design incorporates a concrete and steel I-girder, or concrete and steel box girder bridge structure of similar proportion, finish, and barrier rail design. The major structural elements (piers, girders, and abutments) also serve as the major architectural features.

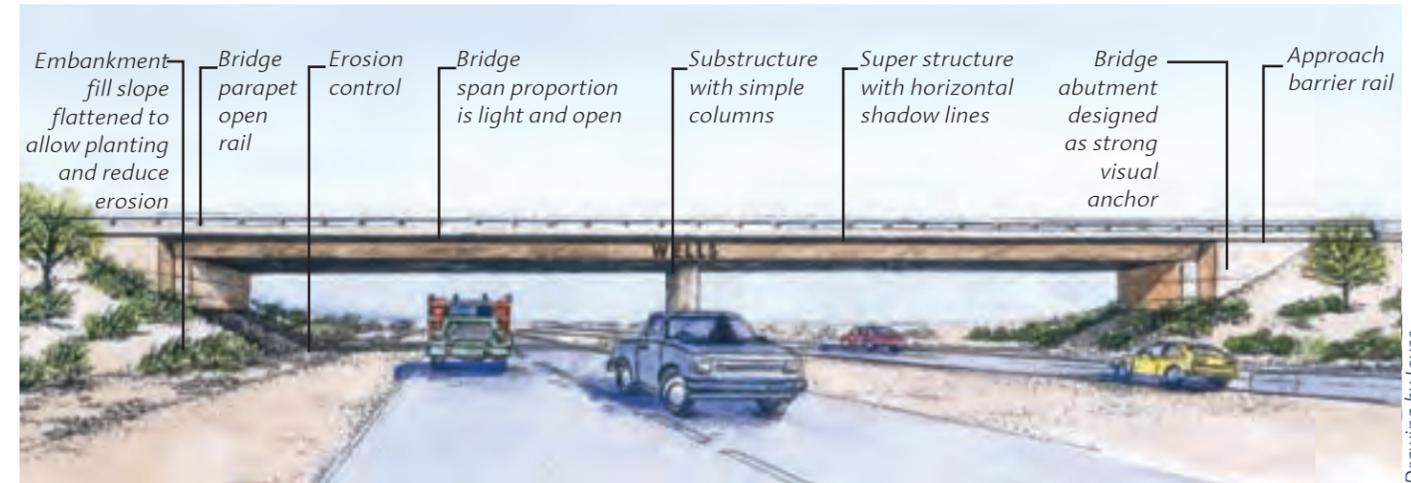
In the event of bridge construction in this corridor, refer to the Central US 95, West US 6, and West US 50 Corridor Plan for additional bridge design guidelines.

- Aesthetic qualities must consider proportion, rhythm, balance, and unity. Refer to the *Aesthetic Guidelines for Bridge Design* (Minnesota Department of Transportation, 1995) for a complete discussion.
- Bridge form should be simple and uncomplicated (see illus. 2).

- Large amounts of slope paving should be avoided. Grade to a slope of 3H:1V to allow for slope revegetation. Use landscape or rock mulch to stabilize embankments.
- Street names should be embossed on the bridge span, providing place identification for the motorist.
- Where special conditions arise and larger or different bridge spans or types are required, ensure landscape and aesthetic aspects are incorporated into the standard design type.
- 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 to avoid joining incompatible materials and creating abrupt vertical changes at connection points.
- Use simple substructure and support features with strong proportional relationships in all standard bridge design.
- Consider open rail design of steel rail or concrete barrier and steel, both to create a more refined bridge with a lighter appearing span, and to maintain scenic views and vistas to the surrounding landscape.



(1) Avoid components and proportions lacking visual appeal.



(2) Preferred landscape and aesthetic treatments improve the appearance of the bridge when applying design guidelines from this section.



(3) Bridge forms should be simple and abutments should visually support the structure.



(4) Bridges should be uncomplicated. Open rails create a more refined appearance and maintain views.

11.0 NOISE REDUCTION AND WALLS

11.1 Minimize the need for noise walls throughout the corridor.

At the planning level, encourage land uses that are compatible with highway noise, such as commercial areas. Noise-sensitive facilities, such as schools and churches, require sound abatement strategies.

- Coordination at the planning stages is critical to avoid conflicts.

11.2 Consider grading to minimize wall height.

Where possible, use an embankment slope with landscape planting to buffer sound (see illus. 1), or use a combination of earth forms and noise walls to achieve structural integrity and buffer sound while limiting actual wall height.

- This guideline does not change or supersede federal noise wall requirements, which specify the location of noise walls according to adjacent land uses and a sound level threshold approaching 67 decibels.
- Noise walls should not be greater than 14 feet in height without a step in the wall plane (see illus. 7).
- Walls used only for visual screening may not be taller than 10 feet.
- Use natural barriers and earth forms when possible.

11.3 Provide landscape planting and setback space between the vehicle recovery zone and the noise wall.

When necessary, work with developers to ensure adequate right-of-way is provided for sound abatement.

- Consider grading to minimize wall height. Landscape plantings in front of walls will soften the appearance of large wall faces (see illus. 1-2).
- Ensure planting and maintenance is provided.

11.4 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 and noise walls. In the event of noise wall construction in this corridor, refer to the Central US 95, West US 6, and West US 50 Corridor Plan for additional design guidelines.

- Maintain consistent use of the selected material, pattern, color, and texture. The required prototypical surface pattern is shown in illustration 3.
- Avoid using multiple materials, such as steel and concrete or CMU, on continuous spans of wall.
- Post and panel systems are not encouraged for noise wall construction and should be used only for temporary applications. If a post and panel system is used it should be constructed with a single material, preferably pre-cast concrete for all components (see illus. 5).
- Use visual design themes and/or pictorial motifs comprised of simple patterns and surface texture, and carefully design the motif's composition (height and position) on the wall.
- Noise walls over 12 feet in height require special graphic or pattern treatment (refer to Transportation Art guideline, page 3.17, for more information about appropriate subject matter).



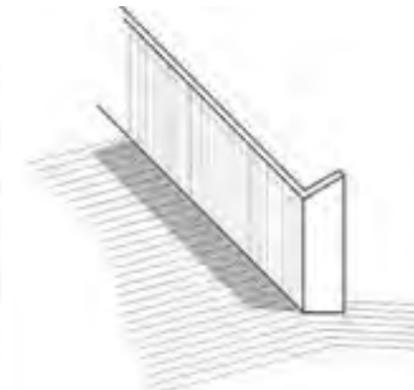
(1) Grading in combination with walls will reduce the height of walls while still meeting federal noise standards.



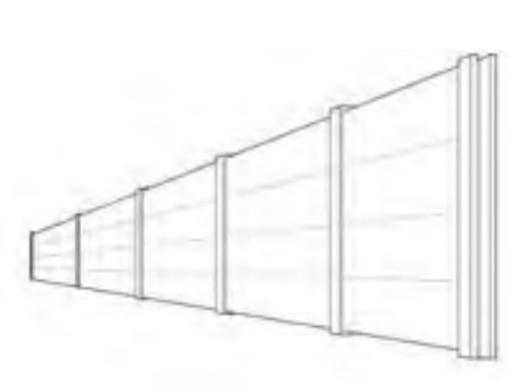
(2) Integrate noise walls into highway right-of-way with landscape planting between wall and roadway. The setback also allows earth contour grading to vary the wall heights and base grade.



(3) Preferred prototypical surface pattern is rusticated variable vertical ribbing. Dimensions vary between 2" to 8" apart.



(4) For noise walls outside the clear zone, a wall return of 3 feet is recommended at the beginning of the wall facing the driver.



(5) Avoid post and panel system for permanent noise wall application.



(6) Focal noise wall imprints add an additional layer of interest to noise walls.



(7) Stepping tall soundwalls expands the corridor view and reduces the canyon-like feeling that can occur with high walls.

12.0 CONCRETE BARRIERS AND GUARD RAILS

12.1 Stain concrete barriers to blend the roadway into the surrounding environment.

- Concrete barriers should be stained to match the segment's base color as shown in illustration 1 (refer to Color Palette guideline, page 3.21, for more information on color selection).

12.2 Avoid bright and shiny guard rails.

Use acid-washed steel guardrails where appropriate (see illus. 2).



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



(2) Acid-washed steel guardrail should be used along the majority of highways.

13.0 LIGHTING

13.1 Avoid overlighting.

Excessive high mast lighting can create light pollution along a corridor and impact views to the surrounding landscape.

- Study current lighting level standards to determine levels needed for safety only. Adjust current standards, if necessary, and apply the minimum height, illumination, and number of light masts required.
- Focus attention on illumination versus luminance (i.e. brightness of pavement versus brightness of light).
- Along all sections of the corridor, use lighting fixtures that minimize light pollution and provide even light dispersion.
- Eliminate lighting where possible.
- Use cobra head or shoebox-type pole and fixture instead of high mast lighting where appropriate.

13.2 Use a consistent lighting fixture and pole.

In central commercial districts and town centers, use light fixtures and lamps that are consistent with surrounding architectural styles.

- Use a durable, powder-coated finish for light poles, matching the color to other structures and the surrounding landscape. Typically use colors that blend with the background and do not visually overwhelm.

- Use poles and fixtures with consistent maintenance requirements and procedures for lighting types used within the same maintenance district.
- Select a sleek and simple pole configuration (see illus. 4).
- Allow for context-sensitive design in fixtures and poles where appropriate, particularly in areas such as historic sites (see illus. 1-2).
- Consider color properties when selecting lamps. Metal halide lamps are preferred in pedestrian areas. Mercury vapor lamps produce favorable lighting for enhanced landscape treatments but should be used sparingly unless energy efficient sources are used. Energy efficient high-pressure sodium lamps are commonly used for large portions of the roadway.

13.3 Lighting height and brightness should be consistent with pedestrian needs in downtown or heavily pedestrian-oriented areas.

Create desirable pedestrian environments by using pedestrian-scaled lighting along sidewalks.

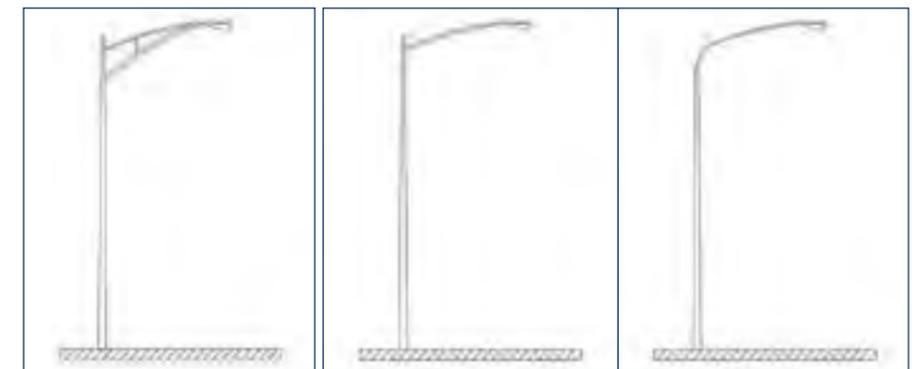
- Fixtures should be more closely spaced than conventional cobra head street lights.
- Lighting height and brightness should provide for clear illumination of walking paths.



(1) A change in lighting height and style emphasizes the transition into a community.



(2) Sculptural lighting reflects community character. Context-sensitive lighting emphasizes placemaking and can define town districts.



(3) Avoid this type of pole design in favor of more streamlined attachments. (4) Preferred fixture and pole configurations.

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 and control access.

- Use wire fencing that blends with the landscape and conforms to current NRS code.
- Ensure right-of-way fencing is well maintained.

- Minimize the use of fencing within rights-of-way where possible.
- In urban areas use colored steel fencing such as powder-coated, acid-washed, or stained-galvanized fencing that visually recedes into the urban background.



(1) Simple, multi-strand wire fencing that visually recedes should be used within the rural segments of the corridor.



(2) Chain-link fencing is used in most urban areas.

15.0 GRADING AND RETAINING WALLS

15.1 Avoid creating steep slopes.

Smooth, moderately inclined slopes will blend more readily with the surrounding landscape, are safer to maintain, and are less vulnerable to erosion.

- Flattened fill slopes can assist in decreasing erosion. Flattened slopes also reduce the need for guardrails and provide better accident recovery in the roadside clear zone.
- Acquire adequate right-of-way to provide enough land to construct 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.

- Use finish-grading techniques, such as slope rounding at the top and bottom of cuts, to create smooth landform transitions that blend with the natural terrain (see illus. 1).

- Carefully grade slopes around natural outcrops and abrupt topography to improve aesthetics and allow for easier and more cost-effective maintenance.
- Topographic patterns should be considered with proposed grading. Valleys, high points, and ridges require graded transitions rather than abrupt embankment cuts or fills.
- At minimum, ensure all constructed slopes are revegetated (refer to Native Revegetation Softscape Treatment guideline, page 3.34).

15.3 Create artful earthwork.

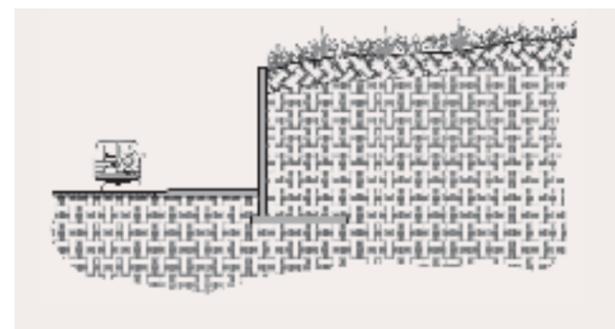
Create landforms that respond to the uniqueness of the site, the surrounding landscape, and the roadway travel experience.

- Contour grade to create effective planting embankments, shadow patterns, and artful earthwork.
- Where feasible, grade slopes to provide for water harvesting (reclaimed surface runoff).

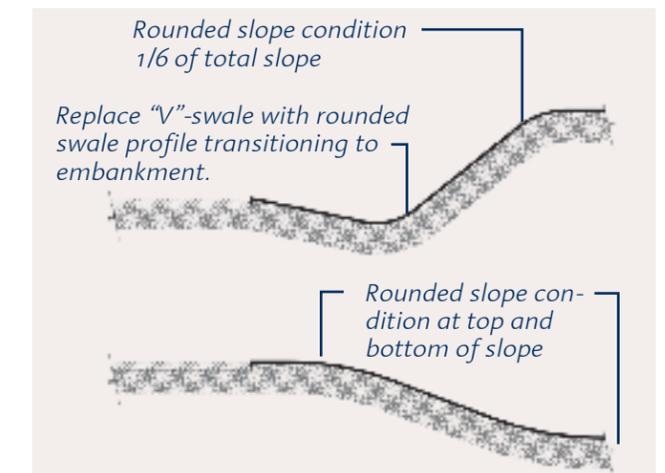
15.4 Utilize retaining walls that reflect surrounding landform and soil colors to minimize large slope cuts.

Staggering, terracing, and progressive offset of retaining walls can stabilize slopes and reduce erosion while blending more smoothly into surrounding landforms than terraced high wall cuts (see illus. 2-3).

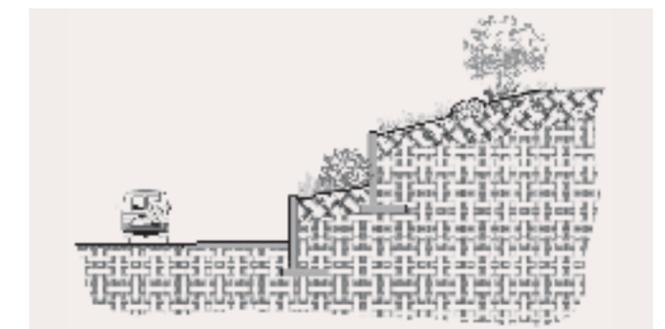
- Select retaining structures or slope stabilization methods that blend with the surrounding landscape and encourage revegetation.
- Provide landscape plantings in front of walls to soften their appearance.
- Provide a minimum of 8 feet between terraces to provide for landscape planting.



(2) Avoid the tunnel effect created by a retaining wall greater than 14 vertical feet.



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

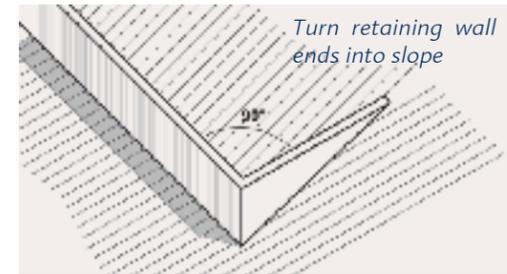


(3) Preferred design incorporates a step or change of plane for a retaining wall greater than 14 vertical feet.

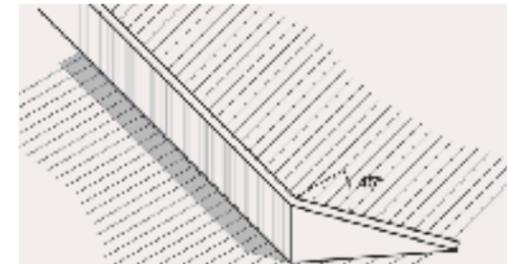
- Carefully design gabion walls. Color should be dark and muted to match soil and surrounding landscape. Wire mesh should match stone color. Plant terraces with native vegetation to break up visual impacts.
- Retaining walls should be consistent within a segment and utilize a simple design palette and anchor to the earth (see illus. 5-6).
- Utilize a simple design palette. Avoid using multiple materials such as steel, concrete, keystone block, or CMU on walls. Exterior finish for retaining walls should have the same visual appearance independent of the type of wall.
- For MSE walls, rectangular shaped panels with vertical joints and a consistent pattern are preferred. Patterns should extend across the entire surface of all panels (see illus. 7).



(4) Preferred gabion systems utilize dark stone in a single plane. Wall does not appear to be an artificial system.



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



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



(7) Standard finish is rusticated vertical texture and pattern. Surfaces should have a single finish whether MSE, cast-in-place, or other wall type is used. Emphasis is placed on minimizing the visual distraction of joints between panels.

16.0 ROCK CUT AND EXCAVATION

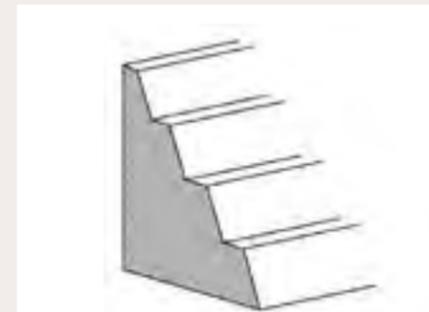
16.1 Analyze rock geology.

Provide a multidisciplinary team of civil engineers, geotechnical engineers, and landscape architects to ensure that the inherent character of a rock's natural bedding planes, fractures, joints, and overall stability is carefully analyzed and informs the design of all rock cuts.

- Conduct careful analysis of rock geology, site, and costs. Design rock cuts to avoid the need for rock fall protection fencing.

16.2 Design rock cuts to be natural in form, texture, and color in relationship to the surrounding landforms.

- Blend rock cuts to match natural rock forms and use naturalized bedding planes to avoid creating an unnatural rock face (see illus. 2).
- Ensure all designed landforms are natural in appearance and blend with the topography and geology of the surrounding landscape (see illus. 5).
- Match new rock and soil excavations with existing rock and soil using rock staining, soil-coloring treatments, and/or accelerated weathering techniques.
- 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.



(1) Avoid artificial-looking straight cuts and benches by using custom naturalized cuts.



(4) Preferred custom benching follows the natural rock form and accomplishes the same elevation change as shown in illustration 1.



(2) Preferred rock cuts in which natural bedding planes were used to excavate naturalized landform.



(3) Avoid securing slopes with concrete facing when possible. When necessary, use colored concrete that resembles natural rock face textures.



(5) Preferred resculpted rock cuts change artificial slope banks into forms that appear natural. Plan cuts that terrace and bench. Use bedding planes found in the natural rock for the final design of any rock slope.

Drawing by Joyce

17.0 DRAINAGE

17.1 Use naturalized channel design and infiltration methods.

Avoid paving drainage ditches or check dams with asphalt or concrete. Where possible, secure check dams with rock and use naturalized channel design and infiltration methods to enhance, both functionally and visually, highway drainage systems (see illus. 1).

- In unique situations, utilize geotextiles, impervious mats, or a stone lining to maintain the appearance of a natural channel.
- Excessive flow velocities and erosion potential may demand paved drainage surfaces. Consider the use of open cell concrete block with native grass or rock mulch. Match colors to the surrounding soil.
- Vary the size of rock treatments. Meander naturalized treatments so that they feather into the landscape (see illus. 3).

17.2 Revegetate drainage infrastructure.

Drainage detention and infiltration areas should be shaped with natural undulating edges and bottoms rather than angular embankment slopes (see illus. 2).

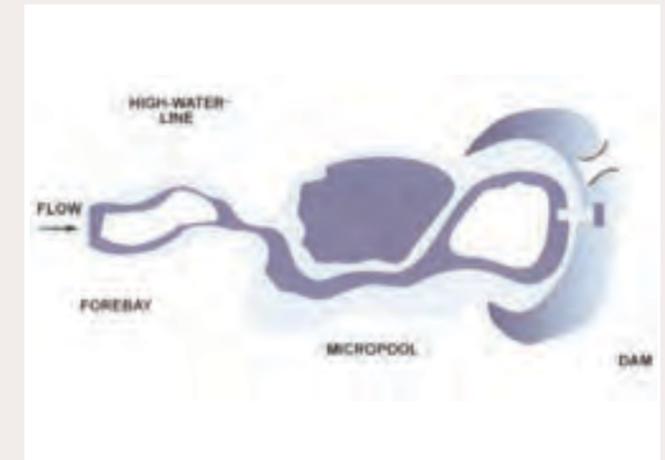
- Upper slopes of drainage detention basins should be revegetated or covered with appropriate ground treatment (refer to Ground Treatment Softscape Treatment guideline and Native Revegetation Softscape Treatment guideline, page 3.34).

17.3 Naturalize culvert ends.

- Use rock to naturalize inlets and outlets.
- Culverts should not be exposed except at the end of headwalls and endwalls or with mitered end sections.
- When it is essential to have portions exposed, they should be stained to blend with the surroundings.
- Consider whether trails or wildlife passages can be coordinated with culverts.



(1) Rock-lined drainage channels are an attractive alternative to concrete or unlined ditches.



(2) Design of detention basin uses naturalized, curvilinear shapes instead of "V" channels.



(3) Feather rock treatments into surrounding landscape so they appear more natural.

18.0 EROSION CONTROL

18.1 Stabilize soils to ensure successful revegetation and to control erosion. Use native materials for stabilization and revegetation to blend with surrounding landscape.

- Use materials such as heavily textured soil and/or gravel mulches to slow water runoff and provide dust control.
- Where water concentrates, riprap material and/or geotextile reinforcement may be used to avoid erosion.

- Permanent revegetation efforts can be improved by providing in situ topsoil, native vegetation fragments, and rocks and by enhancing soil salvage techniques and seed mixes.
- Provide uncompacted topsoil surfaces (approximately 85% compaction) prior to seeding.

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



(1) Native rock and vegetation add aesthetic value while stabilizing slopes.



(2) 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 topsoil, employing effective site surfacing and grading techniques, track walking, applying mulches and tackifiers, sensitively siting features, and using permeable paving or cisterns.

The collection of runoff for use in landscape design is especially important in arid climates. Increase the availability of natural water by directing runoff and precipitation into areas such as planting beds prior to moving it off site into drainage structures. Water harvesting methods also reduce the amount of runoff, thereby reducing non-point source pollution, erosion, and flooding while recharging the groundwater. 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 occur at every site requiring disturbance. This live topsoil contains organisms, seeds, and plant fragments that increase the potential success of revegetation. Incorporation of preserved topsoil increases both the quantity of organic matter and permeability of the soil.

- **Site Surfacing:**

Rock surface composition should simulate the original or adjacent surface cover or be integrated as part of the overall design. Create artful water harvesting features that contribute to the aesthetic quality as well as the functionality of landscape treatments. Placing rocks and shaping landforms to create depressions

increases water retention and provides moisture to the plants (see illus. 1). Rocks create impervious cover, resulting in water harvesting for the remaining soil and seeds. Rocks also create a rough, uneven surface that slows water runoff, allowing water to collect and increasing infiltration. Rock mulches retain moisture and protect plants by reducing evaporation, providing wind protection, and moderating the soil temperature so that it is cool in the summer and warm in the winter, effectively lengthening the growing period.

- **Site Grading:**

Grade surfaces to slow water flow, encouraging absorption. Instead of a continuously angled slope, position breaks or depressed areas around planted areas. Contour slopes so that water slows and infiltrates around vegetation. Prevent erosion by minimizing slope angle and directing water flow.

- **Track Walking:**

Where possible, track walk all slope surfaces to stabilize material and minimize potential erosion. Track walking should be performed perpendicular to the contour.

- **Mulches and Tackifiers:**

Use mulch and tackifiers to hold seed and topsoil cover and assist with moisture retention during germination. Mulches, such as bark or pinned straw, can be used to stabilize seeded areas and assist in moisture retention during plant germination and growth.

- **Siting of Features and Facilities:**

Thoughtful consideration should be given to the siting of features and facilities. Rest areas and other facilities where vegetation is desired should be located where natural surrounding upland topography can provide increased water to the planted areas. Planted areas should

be sited where roadway runoff can be directed to provide water to these areas before it enters structured drainage systems. This method enhances plant growth and supplements the irrigation needed for high water use plants, thereby reducing the cost of irrigation. Features used to direct or store water can be part of the aesthetics of the design.

- **Permeable Pavements:**

Pavements such as flagstone or permeable asphalt should be used where appropriate to aid in the infiltration of precipitation in urban areas.

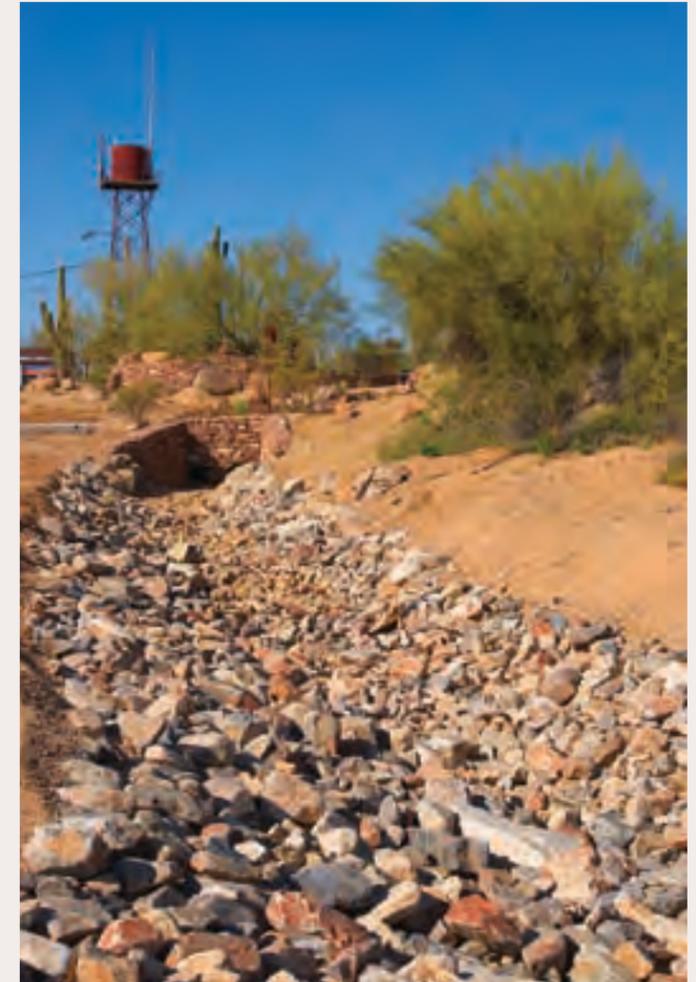
- **Water Storage in Cisterns or Tanks:**

In some cases it may be desirable to store water in a cistern for later use. Storage provides the most control and flexibility in the use of harvested water. Cisterns collect water throughout the year, storing it until it is needed during the height of summer. Consider the need for mosquito abatement during design. Water should not be stored in open systems for long periods of time. Cisterns can be sculptural and incorporated into an aesthetic design, or they can be large but relatively flat and located under parking areas.

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



(1) Rock ground treatments should harmonize with existing soils. Aesthetic placement integrates drainage systems as part of the design. Water can be directed to cisterns for storage and later use.

20.0 IRRIGATION

20.1 Select efficient and effective irrigation systems.

Focus on minimizing irrigation needs. Where required, select efficient and easily maintained systems with a central controller.

- Consider the use of reclaimed water, including fully treated effluent and harvested water, as a supplement to irrigation.
- If a non-domestic water source is used, include a filter system to prevent clogging of emitters.
- Consider threaded emitters, as opposed to punch-in types, to minimize vandalism.

20.2 Provide appropriate irrigation for each softscape type.

The early stage of revegetation growth demands the most water use and is most critical to the establishment of young plants in an arid climate. As revegetation becomes more established and mature, the demand for water will lessen to the point of complete removal.

- Temporary watering is required for containerized native plants for a period of approximately one to two years, depending on the success rate of revegetation.
- Permanent irrigation to individual plants is required for enhanced native, regionally adapted, and regional ornamental softscape types.
- When a water source is not available, consider water harvesting methods or the use of vertical elements and structures.

20.3 Manage the high concentration of salts.

Nevada's desert soils often concentrate salts at the outer edge of the wetted soil volume, including near the soil surface, particularly in drip irrigation situations.

- Salt management techniques include flushing the soil periodically with heavy watering and/or planting salt-tolerant materials.



(1) Where irrigation is required, use low-flow systems to distribute water directly to the plant. Avoid overwatering or using inefficient irrigation systems.



(2), (3) Certain plant species, such as Ephedra and Rabbitbrush, are adapted to survival in saline soils.

21.0 SOFTSCAPE TYPES AND TREATMENTS GENERAL GUIDELINES

21.1 Consider aesthetics and maintenance of selected softscape treatment.

In all non-paved areas, select ground treatments that meet both aesthetic and maintenance requirements.

21.2 Select appropriate plant sizes.

The minimum plant size used should consider plant survival and the visual effect of the material.

- Consider sunlight, water requirements, and wind exposure when placing plant material.

21.3 Preserve healthy trees and vegetation.

Mature vegetation is an integral part of community identity and an important public resource that enhances the quality of life.

- Preserve areas that have been previously landscaped with ornamental plant material that is in good condition, form, and health.
- Include a tree inventory listing all protected trees and other landscape materials within the right-of-way.
- Include a listing of species, size, and condition of each tree, an index of trees to remove or preserve, and specifications for tree maintenance during construction.



(1) Softscape treatments within the right-of-way should be adapted to the specific environmental conditions of the region.

GROUND TREATMENT SOFTSCAPE TREATMENT**21.4 Implement appropriate ground treatment and softscape type.**

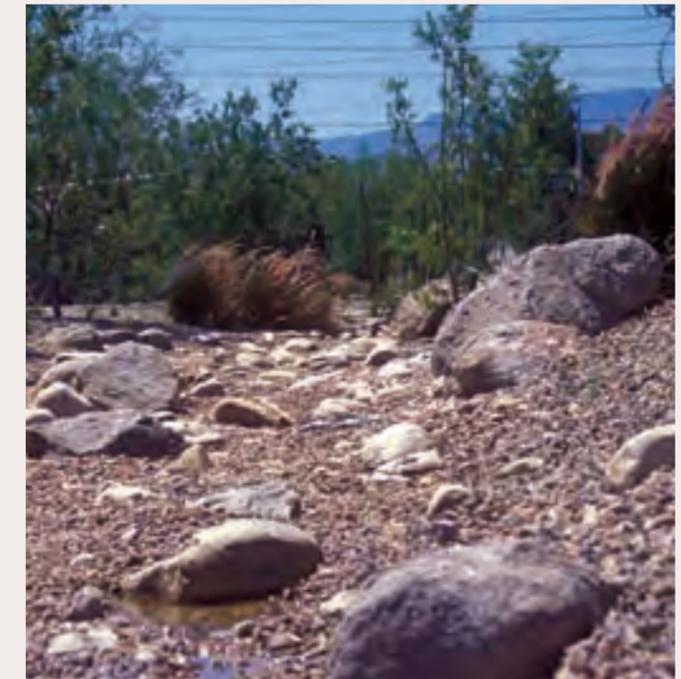
Use recommended softscape and ground treatment types to assist with erosion and dust control, consistent with NDOT specifications.

- Rock mulch, where used, should complement and/or match the surrounding natural environment.
- For rural areas, ground treatment should be derived from natural patterns found in playas, foothills, or ephemeral drainages.
- For landscaped areas in urban settings, use rock mulches to create patterned and textured ground treatments.
- Implement a ground treatment retrofit program to treat areas of bare soil.

21.5 Coordinate ground treatment with surrounding landscape.

Ground treatment should coordinate in size, texture, color, and aggregate mix with the surrounding landscape.

- Mulches composed of variable-sized rock resemble natural patterns of surrounding soils; their use should be considered as a matching technique.



(1) Mulches that mimic natural features help to blend disturbed areas with their natural surroundings.

NATIVE REVEGETATION SOFTSCAPE TREATMENT**21.6 Apply native revegetation softscape along open, rural highways.**

Re-establish native conditions using the native revegetation softscape treatment type. The native revegetation softscape type is the background planting for the majority of the corridor and should be implemented as indicated in the landscape design segment sections.

- Roadsides should be revegetated after a fire to reduce erosion and snow drift.
- Plant density and spacing should mimic surrounding conditions, incorporating scattered rock mulch to reduce erosion and improve revegetation success.
- Distribute scattered rock mulch in a pattern similar to that found in the surrounding landscape instead of a thick, even spread of rock mulch.

- Select an appropriate native plant palette. Sites should be evaluated for elevation, soil conditions, and ecosystem type (for example, riparian, playa, or salt flat).

21.7 Carefully select native plant species.

In addition to plant species identified in *Mapping Ecosystems* (Tueller, et al., 2002), use the provided native plant species list (see Figure 11) for revegetation efforts. Plant palettes are not restrictive. They provide a starting point for plant selection.

- Ensure the plant palette selected for the site complements existing desirable vegetation in the surrounding landscape.
- Use native plant species to create plant communities with variations in plant height, size, and width.
- Additional plants not included in the adjacent list can be included upon review and approval.



(1) Plant material native to eastern Nevada includes species adapted to the Mojave Desert and the Great Basin.

21.8 Utilize revegetation best practices.

- Re-establish native conditions using the native plant revegetation softscape type. Select perennial grasses, forbs, and shrubs that can be established with little or no maintenance over the long term. Incorporate the Native Wildflower Program in revegetation efforts. 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* (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.
- Salvage existing native plants and topsoil prior to construction. Species salvageability depends on size, location, soils, and analysis of plant value, including the potential survival rate. Salvaged plants can be utilized at revegetation sites to improve roadside aesthetics and to provide mature plants that would otherwise take years to establish. Where existing native plants can not be reused, chip salvaged plants and incorporate into the topsoil. In addition, ensure native topsoil is collected and stored for re-use. Native topsoil provides a seed source and important bacteria for salvaged plant establishment and growth. Carefully remove, stockpile, and store the native topsoil 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. Organic mulches may be used to improve soil quality. Firmly anchor mulches to the site. Carefully analyze the site to determine the need for fertilizers and pH amendments.

- Salvage and stockpile native rock mulch. Existing rock naturally blends with the landscape. Reuse of existing materials should be considered as part of site design.
- Apply a prescribed soil treatment such as plowing, disking, harrowing, furrowing, hydroseeding, applying mulches (such as straw), and using tackifiers (such as dark colored netting). 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 can reduce potential dust problems. On some sites, deep ripping can loosen hardpan and improve seeding success. In conditions of steep cuts and slopes greater than 40%, slope disking may create seed pockets. Use scattered rock mulch in coordination with revegetation. This mulch provides seed pockets and protects plant establishment.
- 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 or BLM nurseries.

Figure 11 - Native Revegetation Plant Palette

PLANT PALETTE - GREAT BASIN AREAS

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Upper Elevations				
Big Sagebrush Sites				
Shrubs:				
<i>Artemisia tridentata</i> - Big Sagebrush	1.5' to 6' x 10'	Full sun	minimal	Aromatic
<i>Chrysothamnus viscidiflorus</i> - Green Rabbitbrush	2' x 3'	Full sun	minimal	Yellow flowers
<i>Eriogonum ovalifolium</i> - Cushion Buckwheat	1' x 1'	Full sun	minimal	Yellow flowers
<i>Ephedra viridis</i> - Green Ephedra	3' x 3'	Full sun	minimal	Evergreen
<i>Purshia tridentata</i> - Antelope Bitterbrush	6' x 6'	Full sun	minimal	Yellowish spring color
<i>Salvia dorrii</i> - Purple Sage	2' x 2'	Full sun	moderate	Blue flowers
Grasses:				
<i>Achnatherum thurberianum</i> - Thurber's needlegrass	24" x 24"	Full sun	minimal	Grass
<i>Pseudoroegneria spicata</i> - Bluebunch Wheatgrass	18" x 12"	Full sun	Full sun	moderate Grass
<i>Thinopyrum intermedium</i> - Pubescent Wheatgrass	18" x 12"	Full sun	moderate	Grass
<i>Bromus inermis</i> - Smooth Brome	12" x 12"	Full sun	moderate	Grass
<i>Festuca idahoensis</i> - Idaho Fescue	12" x 12"	Full sun	moderate	Grass
<i>Leymus triticoides</i> - Creeping Wildrye	24" x 24"	Full sun	moderate	Grass
<i>Poa ampla</i> - Big Bluegrass	up to 4' tall x 1'	Full sun	moderate	Grass
Forbs:				
<i>Argemone munita</i> - Flatbud Prickly poppy	36" x 36"	Full sun	minimal	Large white flowers
<i>Castilleja spp.</i> - Indian Paintbrush	12" x 8"	Full sun	moderate	Brilliant flowering color
<i>Helianthus annuus</i> - Sunflower	8' x 2'	Full sun	moderate	Large yellow flower
<i>Linum lewisii</i> - Prairie Flax	24" x 24"	Full sun	minimal	Delicate blue flowers
<i>Lupinus spp.</i> - Lupine	12" x 12"	Full sun	minimal	Brilliant flowering color
<i>Penstemon palmeri</i> - Palmer's penstemon	36" x 24"	Full sun	minimal	Large fragrant flowers
<i>Lana Vicia Villosa</i> - Woollypod Vetch	18" x 12"	Full sun	moderate	Purpleish flowers
Pine and Juniper Woodland Sites				
Trees:				
<i>Amelanchier alnifolia</i> - Saskatoon Serviceberry	12' x 6'	Full sun	minimal	Bluish-purple fruit
<i>Juniperus osteosperma</i> - Utah Juniper	shrubby to 20-30'	Full sun	minimal	Yellowish green foliage
<i>Pinus monophylla</i> - Single-leaf Pinyon Pine	20' x 15'	Full sun	minimal	Evergreen
<i>Pinus ponderosa</i> - Ponderosa Pine	100' x 30'	Full sun	minimal	Evergreen
Shrubs:				
<i>Artemisia nova</i> - Black Sagebrush				
<i>Artemisia tridentata</i> - Big Sagebrush	1.5' to 6' x 10'	Full sun	minimal	Aromatic
<i>Cercocarpus ledifolius</i> - Curl-leaf Mountain Mahogany	15' x 10'	Sun to light shade	minimal	Narrow green leaves
<i>Chrysothamnus spp.</i> - Rabbitbrush	5' x 5'	Full sun	minimal	Golden flowers
<i>Ephedra viridis spp.</i> - Mormon Tea	3' x 3'	Full sun	minimal	Evergreen
<i>Kochia prostrata</i> - Prostrate summercypress	3' x 3'	Sun to light shade	minimal	Gray-green foliage
<i>Purshia tridentata</i> - Antelope Bitterbrush	6' x 6'	Full sun	minimal	Yellowish spring color
<i>Rhus trilobata</i> - Skunkbush Sumac	5' x 15'	Full sun	minimal	Yellow to red fall color
Grasses:				
<i>Bromus inermis</i> - Smooth Brome	12" x 12"	Full sun	minimal	Grass
<i>Elymus glaucus</i> - Blue Wild Rye	36" x 24"	Sun to light shade	minimal	Grass
<i>Poa secunda</i> - Sandberg Bluegrass	12" x 12"	Full sun	minimal	Grass
<i>Pseudoroegneria spicata</i> - Bluebunch Wheatgrass	36" x 24"	Full sun	minimal	Grass
Forbs:				
<i>Castilleja spp.</i> - Indian Paintbrush	12" x 8"	Full sun	moderate	Brilliant flowering color
<i>Geranium viscosissimum</i> - Sticky Purple Geranium	24" x 12"	Sun to light shade	minimal	Purple flowers
<i>Linum lewisii</i> - Prairie Flax	12" x 12"	Full sun	minimal	Delicate blue flowers
<i>Lupinus spp.</i> - Lupine	12" x 12"	Full sun	minimal	Brilliant flowering color
<i>Penstemon palmeri</i> - Palmer's penstemon	36" x 24"	Full sun	minimal	Large fragrant flowers
<i>Sanguisorba minor</i> - Small Burnet	12" x 24"	Sun to light shade	moderate	Unique foliage

- Monitor revegetation during construction to ensure the specified materials and installation methods have been used. Plan and budget for maintenance of revegetation and weed control areas until the desired species are established. 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 for NDOT staff who oversee revegetation administration. Failures in revegetation can often be attributed to poor installation and maintenance practices.

- Develop a program to control noxious weeds and invasive plant species. In areas requiring revegetation, quickly establishing native species is the most effective method of controlling invasive species. In much of the corridor, however, re-establishing native plant communities may take many years. Use biotic or organic forms of control, such as temporary mulches, to prevent invasive species from establishing. Provide regular and frequent monitoring of new plantings to identify when additional forms of control may be needed.

Figure 11 - Native Revegetation Plant Palette (cont.)

PLANT PALETTE - GREAT BASIN AREAS (CONT.)

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Lower Elevations				
Big Sagebrush Sites				
Shrubs:				
<i>Artemisia tridentata</i> - Big Sagebrush	1.5 to 6' x 10'	Full sun	minimal	Aromatic
<i>Atriplex canescens</i> - Fourwing Saltbush	5' x 7'	Full sun	minimal	Narrow gray leaves
<i>Ericameria teretifolia</i> - Green Rabbitbrush	2' x 3'	Full sun	minimal	Yellow flowers
<i>Ephedra viridis</i> - Green Ephedra	3' x 3'	Full sun	minimal	Evergreen
<i>Krascheninnikovia lanata</i> - Winterfat	3' x 3'	Full sun	minimal	Yellowish flower clusters
<i>Prunus andersonii</i> - Desert Peach	5' x 5'	Full sun	minimal	Pinkish flowers
<i>Purshia tridentata</i> - Antelope Bitterbrush	6' x 6'	Full sun	minimal	Yellowish spring color
<i>Rhus trilobata</i> - Skunkbush Sumac	5' x 15'	Full sun	minimal	Yellow to red fall color
Grasses:				
<i>Achnatherum hymenoides</i> - Indian Ricegrass	24" x 24"	Full sun	minimal	Grass
<i>Achnatherum speciosum</i> - Desert Needlegrass	24" x 24"	Full sun	minimal	Grass
<i>Leymus cinereus</i> - Basin Wildrye	36" x 24"	Full sun	moderate	Grass
<i>Leymus triticoides</i> - Creeping wildrye	24" x 24"	Full sun	moderate	Grass
<i>Poa ampla</i> - Big Bluegrass	36" x 24"	Sun to light shade	moderate	Grass
<i>Poa secunda</i> - Sandberg Bluegrass	36" x 24"	Sun to light shade	moderate	Grass
<i>Pseudoroegneria spicata</i> - Bluebunch Wheat Grass	36" x 24"	Full sun	minimal	Grass
Forbs:				
<i>Ipomopsis aggregata</i> - Scarlet Gilia	3' x 1'	Full sun	minimal	Delicate red flowers
<i>Linum lewisii</i> - Prairie Flax	12" x 12"	Full sun	minimal	Delicate blue flowers
<i>Lupinus spp.</i> - Lupine	36" x 36"	Full sun	minimal	Blue flowers
<i>Medicago sativa</i> - Alfalfa	36" x 12"	Full sun	moderate	Pinkish flowers
<i>Melilotus officinalis</i> - Yellow Sweetclover	48" x 24"	Full sun	moderate	Small yellow flowers
<i>Penstemon eatonii</i> - Firecracker Penstemon	36" x 24"	Full sun	minimal	Red flower spike
<i>Penstemon palmeri</i> - Palmer Penstemon	36" x 24"	Full sun	minimal	Large fragrant flowers
<i>Camissonia tanacetifolia</i> - Tansyleaf evening primrose	6" x 12"	Full sun	moderate	Bright yellow flowers
<i>Sanguisorba minor</i> - Small Burnet	12" x 24"	Sun to light shade	moderate	Unique foliage
<i>Solidago spectabilis</i> - Nevada Goldenrod	18" x 12"	Sun to light shade	moderate	Yellow flowers
<i>Sphaeralcea coccinea</i> - Globemallow	12" x 12"	Full sun	minimal	Orange flowers
<i>Vicia spp.</i> - Vetch	36" x 12"	Full sun	moderate	Pinkish flowers
Salt Desert Shrub - Shadscale and Bailey's Greasewood Sites				
Shrubs:				
<i>Atriplex canescens</i> - Fourwing Saltbush	5' x 5'	Sun to light shade	minimal	Yellow flowers
<i>Atriplex confertifolia</i> - Shadscale	3' x 3'	Full sun	moderate	Flowering spikes
<i>Atriplex gardneri</i> - Gardner Saltbush	1.5' x 3'	Full sun	minimal	Evergreen
<i>Grayia spinosa</i> - Spiny Hopsage	3' x 3'	Full sun	minimal	Evergreen
<i>Kochia prostrata</i> - Prostrate Summercypress	3' x 3'	Sun to light shade	minimal	Gray-green foliage
Grasses:				
<i>Achnatherum hymenoides</i> - Indian Ricegrass	12" x 6"	Full sun	minimal	Grass
<i>Agropyron fragile</i> - Siberian Wheatgrass	24" x 12"	Full sun	moderate	Grass
<i>Distichlis spicata</i> - Saltgrass	6" x 6"	Full sun	minimal	Grass
<i>Elymus elymoides</i> - Squirreltail	18" x 12"	Full sun	minimal	Grass
<i>Pleuraphis jamesii</i> - James' galleta	6" x 6"	Full sun	minimal	Grass
<i>Leymus triticoides</i> - Creeping Wildrye	24" x 24"	Full sun	moderate	Grass
<i>Sporobolus airoides</i> - Alkali Sacaton	36" x 18"	Full sun	minimal	Grass
Forbs:				
<i>Oenothera spp.</i> - Evening Primrose	48" x 24"	Full sun	moderate	Small yellow flowers
<i>Melilotis officinalis</i> - Yellow Sweetclover	48" x 24"	Full sun	moderate	Small yellow flowers
<i>Sphaeralcea coccinea</i> - Scarlet Globemallow	12" x 12"	Full sun	minimal	Orange flowers

Figure 11 - Native Revegetation Plant Palette (cont.)

PLANT PALETTE - GREAT BASIN AREAS (CONT.)

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Salt Desert Shrub-Black Greasewood Sites				
Shrubs:				
<i>Atriplex canescens</i> - Fourwing Saltbush	5' x 5'	Sun to light shade	minimal	Yellow flowers
<i>Atriplex lentiformis</i> - Quailbush	5' x 5'	Full sun	minimal	Yellow flowers
<i>Chrysothamnus nauseosus</i> - Rabbitbrush	2' x 3'	Full sun	minimal	Yellow flowers
<i>Kochia prostrata</i> - Prostrate Summercypress	3' x 3'	Sun to light shade	minimal	Gray-green foliage
<i>Sarcobatus vermiculatus</i> - Greasewood	3' x 3'	Full sun	minimal	Bright green foliage
Grasses:				
<i>Agropyron elongatum</i> - Tall Wheatgrass	36" x 18"	Full sun	minimal	Grass
<i>Distichlis spicata</i> - Salt Grass	6" x 6"	Full sun	minimal	Grass
<i>Elymus elymoides</i> - Squirreltail	18" x 12"	Full sun	minimal	Grass
<i>Leymus cinereus</i> - Great Basin Wildrye	36" x 24"	Full sun	moderate	Grass
<i>Sporobolus airoides</i> - Alkali Sacaton	36" x 18"	Full sun	minimal	Grass
Forbs:				
<i>Melilotus officinalis</i> - Yellow Sweetclover	48" x 24"	Full sun	moderate	Small yellow flowers
<i>Oenothera pallida</i> - Pale Evening Primrose	48" x 24"	Full sun	moderate	Small white flowers
<i>Sphaeralcea ambigua</i> - Desert Globe Mallow	36" x 36"	Full sun	moderate	Orange flower color
Streamside Sites (use only in streamside conditions)				
Trees and Shrubs:				
<i>Alnus rhombifolia</i> - White Alder	25' x 12'	Full sun to shade	moderate	Bright green
<i>Alnus viridis</i> - Mountain Alder	25' x 15'	Full sun to shade	high	Greenish yellow catkins
<i>Baccharis salicifolia</i> - Seep Willow	6' x 6'	Full sun	high	White flowers
<i>Betula occidentalis</i> - Water Birch	40' x 25x	Full sun	moderate	Copper bark
<i>Cornus sericea</i> - Red-Twigged Dogwood	15' x 15'	Full sun to shade	moderate	Red fall color
<i>Populus fremontii</i> - Fremont Cottonwood	60' x 30'	Full sun	moderate	Bright lemon yellow in fall
<i>Populus tremuloides</i> - Quaking Aspen	50' x 25'	Full sun	moderate	Golden yellow in fall
<i>Populus trichocarpa</i> - Black Cottonwood	75' x 30'	Full to part sun	moderate	Yellow fall color
<i>Salix boothii</i> - Booth's Willow	15' x 10'	Full sun	high	Narrow green leaves
<i>Salix lasiolepis</i> - Arroyo Willow	8' x 6'	Full sun	high	Narrow green leaves
<i>Salix lasiandra</i> - Pacific Willow	40' x 25'	Full sun	high	Narrow green leaves
<i>Sambucus cerulea</i> - Blue Elderberry	7' x 10'	Sun to light shade	moderate	Creamy white flowers
<i>Spiraea densiflora</i> - Mountain Spiraea	2' x 3'	Sun to light shade	moderate	Pink flowers
Grasses:				
<i>Elymus lanceolatus</i> - Thickspike Wheatgrass	36" x 24"	Full sun	moderate	Grass
<i>Carex nebrascensis</i> - Nebraska sedge	24" x 12"	Full sun	high	Grass
<i>Poa palustris</i> - Fowl Bluegrass	48" x 24"	Sun to light shade	moderate	Grass
<i>Hordeum brachyantherum</i> - Meadow Barley	24" x 12"	Full sun	moderate	Grass
<i>Juncus balticus</i> - Baltic Rush	48" x 24"	Full sun	high	Grass
Forbs:				
<i>Aconitum columbianum</i> - Columbian monkshood	5' x 3'	Sun to light shade	high	Bright blue flowers
<i>Agastache urticifolia</i> - Nettleleaf Giant Hyssop	18" x 6"	Sun to light shade	moderate	Blue Flowers
<i>Geranium viscosissimum</i> - Sticky Purple Geranium	24" x 12"	Sun to light shade	minimal	Small pinkish flowers
<i>Mertensia longiflora</i> - Small Bluebells	6" x 6"	Sun to light shade	moderate	Small purple flowers
<i>Veratrum californicum</i> - California False Hellebore	6' x 2'	Sun to light shade	high	Large flower spike
<i>Wyethia mollis</i> - Woolly Mule's Ear	2.5' x 2.5'	Sun to light shade	minimal	Orange flowers

Figure 11 - Native Revegetation Plant Palette (cont.)

PLANT PALETTE - MOJAVE DESERT AREAS

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Acacia greggii</i> - Catclaw Acacia	15-25' x 15'	Full sun	Low	Sp/ Fall
<i>Chilopsis linearis</i> - Desert Willow	20' x 15'	Full sun	Med-low	Sp/ Fall
<i>Prosopis glandulosa</i> - Honey Mesquite	25' x 35'	Full sun	Med-low	Summer
<i>Yucca brevifolia</i> - Joshua Tree	30' x 15'	Full sun	Low	Spring
Shrubs:				
<i>Ambrosia dumosa</i> - White Bursage	2' x 3'	Full sun	Low	Fall/Sp
<i>Atriplex canescens</i> - Four Wing Saltbush	5' x 8'	Full sun	Low	Year round
<i>Baccharis</i> spp. - Baccharis ***note: plant male species only	9' x 9'	Full-partial sun	Low	Spring
<i>Coleogyne ramosissima</i> - Blackbrush	5'x6'	Full sun	Low	Spring
<i>Ephedra nevadensis</i> - Mormon Tea	3' x 3'	Full sun	Low	Year round
<i>Larrea tridentata</i> - Creosote Bush	10' x 10'	Full sun	Low	Spring
<i>Erigonum wrightii</i> - Wright's buckwheat	1.5' x 1.5'	Full sun	Low	Sp/Sum
<i>Erigonum fasciculatum</i> v. <i>poliofolium</i> - Flattop buckwheat	1.5' x 1.5'	Full sun	Low	Sp/Sum
<i>Fallugia paradoxa</i> - Apache Plume	5' x 4'	Full sun	Minimal	Feathery plumes
<i>Psoralea fremontii</i> - Indigobush	2.5' x 3'	Full sun	Low	Spring
<i>Salvia mojavnensis</i> - Mojave sage	1.5' x 2'	Full sun	Low	Sp/Sum
Cacti, Perennials, Grasses and Accents:				
<i>Baileya multiradiata</i> - Desert Marigold	1' x 1'	Full-partial sun	Low	Sp/Sum/Fall
<i>Echinocereus engelmannii</i> - Hedge Hog Cactus	.4' x 1.25'	Full sun	Low	Year round
<i>Encelia farinosa</i> - Brittlebush	3' x 4'	Full sun	Low	Spring
<i>Erioneuron pulchellum</i> - Fluffgrass	2" x 6"	Full sun	Low	Sp/Sum
<i>Ferocactus acanthodes</i> - Barrel Cactus	3-5' x 1.5'	Full sun	Low	Sp/Sum
<i>Opuntia bigelovia</i> - Teddy Bear Cholla	4' x 2'	Full sun	Low	Spring
<i>Sphaeralcea ambigua</i> - Desert Globemallow	3' x 3'	Full sun	Low	Spring
<i>Yucca schidigera</i> - Mojave Yucca	12' x 6'	Full sun	Low	Spring
<i>Yucca baccata</i> - Banana yucca	4' x 6'	Full sun	Low	Spring
<i>Agave utahensis</i> - Utah agave	1' x 2'	Full sun	Low-mod	Sum/Fall
<i>Achnatherum hymenoides</i> - Indian ricegrass	2' x 1'	Full sun	Low	Grass
<i>Achnatherum speciosum</i> - Desert Needlegrass	2' x 1'	Full sun	Low	Grass
<i>Hilaria rigida</i> - Big Galleta	3' x 2'	Full sun	Low	Grass

For additional plants appropriate to the different plant communities, refer to *Mapping Ecosystems* (Tueller, et al., 2002).

Note: Several of the plants listed above and within *Mapping Ecosystems* will require establishment from seed since they are not available in containers.



(2) Native revegetation softscape types should be used to repair and restore roadsides along the majority of the highway.

ENHANCED NATIVE SOFTSCAPE TREATMENT

21.9 Apply enhanced native softscape along transition zones and as part of simple gateway treatments.

Enrich the native softscape palette with the enhanced native softscape type. The enhanced native softscape type is the second most commonly used plant palette throughout the corridor and should be utilized as shown in the landscape design segments. The enhanced native softscape type enriches the Great Basin and Mojave Desert plant palettes with a mix of heights and densities.

- Typical applications are specified for community zones as well as simple gateway and rest area treatments.
- A variety of native species are planted in moderately dense patterns to create this landscape.
- Enhanced native softscapes use the plant material of the native revegetation palette as a base and add a limited number



(1) The enhanced native softscape type is used at rest areas and viewpoints.

of regionally adapted trees, shrubs, and other materials for diversity in form.

- Plants are placed in massings and in closer proximity to one another than in the surrounding native landscape.

21.10 Carefully select enhanced native plant species.

In addition to the plants listed in the native revegetation softscape type, the following list of plants comprises 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.
- Use existing vegetation as a cue to selecting appropriate plant species.
- Additional plants not listed in Figures 11 and 12 may be included upon review and approval.

Figure 12 - Enhanced Native Plant Palette

PLANT PALETTE - GREAT BASIN AREAS				
	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Acer ginnala</i> - Amur Maple	15' x 12'	Sun to light shade	moderate	Bright red fall color
<i>Acer glabrum v. torreyi</i> - Rocky Mountain Maple	15' x 15'	Light shade	moderate	Orange-red fall color
<i>Acer grandidentatum</i> - Bigtooth Maple	30' x 30'	Full sun	moderate	Red/gold fall color
<i>Celtis reticulata</i> - Nettleleaf hackberry	30' x 30'	Full sun	low	n/a
<i>Cupressus arizonica</i> - Arizona Cypress	60' x 25'	Sun to light shade	moderate	Evergreen
<i>Elaeagnus umbellata</i> - Autumn Olive	14' x 14'	Full sun	moderate	Red globose fruits
<i>Juniperus osteosperma</i> - Utah Juniper	Shrub to 20'-30'	Full sun	minimal	Yellowish green foliage
* <i>Pinus aristata</i> - Bristlecone Pine	20' x 15'	Full sun	minimal	Evergreen
<i>Pinus edulis</i> - Two-needle Pinyon	20' x 15'	Full sun	minimal	Evergreen
<i>Pinus monophylla</i> - Single-leaf Pinyon	50' x 25'	Full sun	minimal	Evergreen
<i>Quercus gambelii</i> - Gambel Oak	25' x 25'	Full sun	minimal	Red fall color
<i>Rhus spp.</i> - Sumac	15' x 15'	Full sun	minimal	Yellow to red fall color
Shrubs:				
<i>Atriplex canescens</i> - Fourwing Saltbush	6' x 6'	Sun to light shade	minimal	Narrow green leaves
<i>Buddleja davidii</i> - Orange-Eye Butterfly Bush	10' x 8'	Full sun	moderate	Colorful flowers
<i>Caragana pygmaea</i> - Pygmy Peashrub	3' x 5'	Sun to light shade	moderate	Yellow flowers
<i>Cytisus spp.</i> - Broom	7' x 6'	Full sun	minimal	Bright yellow flower
<i>Forestiera neomexicana</i> - Desert Olive	8' x 12'	Full sun	minimal	Narrow green leaves
<i>Kochia spp.</i> - Smotherweed	6' x 6'	Full sun	minimal	Narrow green leaves
<i>Perovskia atriplicifolia</i> - Russian Sage	3' x 1.5'	Full sun	moderate	Lavendar spike flowers
<i>Potentilla spp.</i> - Cinquefoil	1.5' x 2'	Sun to light shade	minimal	Yellow flower
<i>Rosa woodsii</i> - Woods' rose	3' x 5'	Sun to light shade	moderate	Light pink flower sp/sum
<i>Rhus spp.</i> - Skunkbush and Aromatic Sumac	6' x 8'	Sun to light shade	minimal	Yellow to red fall color
<i>Sambucus spp.</i> - Elderberry	7' x 10'	Sun to light shade	moderate	Creamy white flowers
<i>Shepherdia argentea</i> - Silver Buffaloberry	10' x 10'	Sun to light shade	moderate	Red fruit in winter
<i>Shepherdia rotundifolia</i> - Roundleaf Buffaloberry	15' x 10'	Sun to light shade	low	Evergreen
<i>Spiraea spp.</i> - Spiraea	varies	Sun to light shade	moderate	Pink flower
Forbs and Grasses:				
<i>Achillea millefolium</i> - Common Yarrow	3' x 2'	Sun to light shade	moderate	White flowers
<i>Artemisia schmidtiana</i> - Silver Mound Artemisia	18" x 24"	Full sun	moderate	Silver-green foliage
<i>Aster spp.</i> - Aster	18" x 24"	Full sun	moderate	Large colorful flowers
<i>Coreopsis verticillata</i> - Threadleaf Coreopsis	18" x 24"	Full sun	moderate	Yellow flower
<i>Echinacea purpurea</i> - Eastern Purple Coneflower	18" x 12"	Full sun	moderate	Large purple flowers
<i>Eriogonum umbellatum</i> - Sulphur Flower	12" x 36"	Full sun	minimal	Bright yellow flowers
<i>Gaillardia grandiflora</i> - Blanket Flower	24" x 12"	Full sun	moderate	Red and yellow flowers
<i>Hesperaloe parviflora</i> - Redflower False Yucca	3' x 4'	Full sun	minimal	Pinkish-red flowers
<i>Linum lewisii</i> - Prairie Flax	12" x 12"	Full sun	minimal	Delicate blue flowers
<i>Lupinus spp.</i> - Lupine	12" x 12"	Full sun	minimal	Brilliant flowering
<i>Penstemon strictus</i> - Rocky Mountain Penstemon	28" x 18"	Sun to light shade	moderate	Small purplish flowers
<i>Rudbeckia fulgida</i> - Orange Coneflower	18" x 24"	Full sun	moderate	Brilliant flowering color
<i>Sedum spectabile</i> 'Autumn Joy'				
<i>Sedum Autumn Joy</i>	24" x 24"	Full sun	moderate	Pink flowers
<i>Elymus cinereus</i> - Great Basin wildrye	24" x 18"	Full sun	low	Grass
<i>Miscanthus sacchariflorus</i> - Amur Silvergrass	6' x 4'	Full sun	moderate	Grass
<i>Miscanthus sinensis</i> - Chinese Silvergrass	3' x 4'	Full sun	moderate	Grass

* Note: *Pinus aristata* to be used only on forested pine or fir sites.

Figure 12 - Enhanced Native Plant Palette (cont.)

PLANT PALETTE - MOJAVE DESERT AREAS

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Acacia farnesiana</i> - Sweet Acacia	10-35' X 15-25'	Full sun	Low	Spring
<i>Acacia schaffneri</i> - Twisted Acacia	18' x 20'	Full sun	Low	Spring
<i>Cercidium microphyllum</i> - Yellow Palo Verde	20' x 20'	Full sun	Low	Spring
<i>Cercis occidentalis</i> - Western redbud	20' x 15'	Sun-part shade	Low-mod	Spring
<i>Chitalpa tashkentensis</i> - Chitalpa	30' x 30'	Full sun	Moderate	Fall
<i>Cordia parvifolia</i> - Small-Leaf Geigertree	4' x 8'	Full sun	Low	Summer
<i>Parkinsonia aculeata</i> - Mexican Palo Verde	30' x 30'	Full sun	Low	Spring
<i>Prosopis alba</i> - Argentine Mesquite	30' x 30'	Full-partial sun	Moderate	Summer
<i>Prosopis chilensis</i> - Chilean Mesquite	25' x 40'	Full sun	Moderate	Summer
<i>Prosopis velutina</i> - Velvet Mesquite	25' x 30'	Full sun	Moderate	Spring
<i>Rhus lancea</i> - African Sumac	20' x 30'	Full-partial sun	Low-mod	Spring
<i>Vitex agnus-castus</i> - Lilac Chaste Tree	25' x 25'	Full sun	Moderate	Summer
Shrubs:				
<i>Acacia cultriformis</i> - Knife Acacia	10-15' x 10-15'	Full sun	Low	Spring
<i>Cassia artemisioides</i> - Feathery Cassia	6' x 6'	Full sun	Low	Spring
<i>Cassia nemophila</i> - Desert Cassia	6' x 6'	Full sun	Low	Spring
<i>Chrysothamnus nauseosus</i> - Rubber Rabbitbrush	4' x 4'	Full-partial sun	Low	Low Fall
<i>Ephedra viridis</i> - Mormon Tea	3' x 3'	Full sun	Low	Year Round
<i>Eremophila spp.</i> - Valentine (TM)	4' x 4'	Full sun	Low-mod	Winter
<i>Ericameria laricifolia</i> - Turpentine Bush	2' x 3'	Full sun	Low	Fall
<i>Garrya flavescens</i> - Ashy Silktassel bush	12' x 8'	Sun-part shade	Low	Sp/Sum
<i>Justicia californica</i> - Chuparosa	3' x 4'	Full sun	Low	Spring - Fall
<i>Leucophyllum frutescens</i> - Texas Ranger	5' x 5'	Full sun	Low	Summer
<i>Santolina rosmarinifolia</i> - Green Santolina	2' x 3'	Full sun	Low	Summer
<i>Simmondsia chinensis</i> - Jojoba	6' x 6'	Full sun	Low	Spring
<i>Vauquelinia californica</i> - Arizona Rosewood	14' x 10'	Full sun	Moderate	Spring
Cacti, Accents, Grasses, Groundcovers, and Perennials:				
<i>Berlandiera lyrata</i> - Chocolate Flower	1.5' x 1.5'	Full-partial sun	Moderate	Sp/Sum
<i>Datura wrightii</i> - Sacred Datura	3' x 6'	Full-partial sun	Moderate	Summer
<i>Erigeron divergens</i> - Spreading Fleabane	1.5' x 1'	Full sun	Low	Summer
<i>Euphorbia rigida</i> - Upright Myrtle Spurge	3' x 4'	Full-partial sun	Moderate	Win/Sp
<i>Ferocactus wislizenii</i> - Fishhook Barrel Cactus	5' x 2'	Full sun	Low	Summer
<i>Gaillardia grandiflora</i> - Blanket Flower	1' x 1.5'	Full sun	Moderate	Summer
<i>Machaeranthera tortifolia</i> - Mojave aster	1.5' x 1'	Full sun	Low	Summer/Fall
<i>Oenothera berlandieri</i> - Mexican Evening Primrose	1' X 3'	Full-partial sun	Moderate	Sp/Sum
<i>Oenothera deltooides</i> - Birdcage Evening primrose	6" x 9"	Full sun	Low	Low Sp/Sum
<i>Opuntia microdasys</i> - Polka Dot Cactus	3' x 3'	Full sun	Low	Summer
<i>Penstemon eatonii</i> - Firecracker penstemon	1.5' x 1'	Full sun	Low	Sp/Sum
<i>Penstemon palmeri</i> - Palmer's penstemon	2.5' x 1.5'	Full sun	Low	Sp/Sum
<i>Penstemon parryi</i> - Parry's Beardtongue	3' x 2'	Full sun	Low	Sp/Sum
<i>Penstemon utahensis</i> - Utah penstemon	2' x 1'	Full sun	Low	Sp/Sum
<i>Psilostrophe cooperi</i> - Paper Flower	1' x 1.5'	Full-partial sun	Low-mod	Sp/Sum/Fall
<i>Santolina chamaecyparissus</i> - Lavender Cotton	1.5' x 3'	Full sun	Low	Spring
<i>Tetranneuris acaulis</i> - Angelita Daisy	1' x 1.5'	Full-partial sun	Moderate	Sp/Sum/Fall
<i>Yucca spp.</i> - Yucca	10' x 6'	Full sun	Low	Summer



(2) The enhanced native softscape type adds verticality and density to create a planting arrangement with varying heights and widths.

REGIONALLY ADAPTED SOFTSCAPE TREATMENT

21.11 Apply regionally adapted softscape in urban areas and locations of high visibility.

Use the regionally adapted softscape type where identified in each landscape design segment (refer to Chapter Two, Sections Two - Five). This softscape type utilizes the Great Basin and Mojave Desert plant palettes along with other low-water use plants that are well adapted to local conditions.

- Typical applications include welcome centers, urban areas, and other high visibility locations.
- Plants are arranged in greater densities, forming overstory and understory layers to create a richness of color, texture, form, and seasonal change, enhancing the desert garden.



(1) Regionally adapted softscape types are used along most city streets and rest areas.

21.12 Carefully select regionally adapted plant species.

Use regionally adapted plant species. In addition to the plants listed in the native revegetation softscape type and the enhanced native softscape type, the list of plants in Figure 13 should be used 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 in Figures 11-13 may be included upon review and approval.

Figure 13 - Regionally Adapted Plant Palette

PLANT PALETTE - GREAT BASIN AREAS				
	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Acer freemanii</i> - Autumn Blaze Maple	40' x 30'	Sun to part shade	moderate	Grown for foliage
<i>Acer ginnala</i> - Amur Maple	15' x 12'	Sun to part shade	moderate	Red fall color
<i>Cedrus atlantica 'Glauca'</i> - Blue Atlas Cedar	40' x 40'	Full sun	minimal	Evergreen
<i>Cedrus deodara</i> - Deodar Cedar	70' x 30'	Sun to part shade	minimal	Evergreen
<i>Celtis occidentalis</i> - Common Hackberry	50' x 25'	Sun to part shade	minimal	Green foliage
<i>Fraxinus pennsylvanica 'Urbanite'</i> - Green Urbanite Ash	70' x 35'	Sun to part shade	Sun to part shade	moderate
Yellow green				
<i>Koelreuteria paniculata</i> - Golden Rain Tree	45' x 25'	Full sun	moderate	Yellow flowers
<i>Picea pungens</i> - Blue Spruce	75' x 30'	Sun to part shade	moderate	Evergreen
<i>Pinus nigra</i> - Austrian Pine	120' x 40'	Full sun	moderate	Evergreen
<i>Pyrus calleryana</i> - Callery Pear	50' x 25'	Full sun	moderate	White flowers
<i>Quercus macrocarpa</i> - Bur Oak	100' x 60'	Sun to part shade	moderate	Fall color
<i>Quercus rubra</i> - Northern Red Oak	100' x 60'	Sun to part shade	moderate	Fall color
Shrubs:				
<i>Aronia melanocarpa</i> - Black Chokeberry	4' x 4'	Full sun	minimal	Pink flowers
<i>Buddleja davidii</i> - Orange Eye Butterfly Bush	7' x 7'	Full sun	moderate	Purple flower
<i>Caryopteris spp.</i> - Blue Mist Spirea	48" x 36"	Full sun	moderate	Purple flowers
<i>Ceanothus cuneatus</i> - Buckbrush	6' x 6'	Full sun	low	White flowers
<i>Chamaebatiaria millefolium</i> - Desert Sweet Fernbush	5' x 5'	Full sun	minimal	Unique foliage
<i>Cotinus coggygria</i> - European Smoke Tree	12' x 10'	Full sun	moderate	Pink flowers
<i>Cotoneaster spp.</i> - Cotoneaster	4' x 4'	Sun to light shade	moderate	White-pink flower
<i>Cytisus spp.</i> - Broom	7' x 6'	Full sun	minimal	Yellow flowers
<i>Eriodictyon californica</i> - Yerba Santa	4' x 5'	Full sun	minimal	White flowers
<i>Forestiera neomexicana</i> - Desert Olive	8' x 12'	Full sun	minimal	Green foliage
<i>Genista lydia</i> - Lydia Broom	36" x 36"	Full sun	moderate	Bright Yellow
<i>Juniperus spp.</i> - Juniper	6' x 3'	Full sun	minimal	Evergreen
<i>Mahonia aquifolium</i> - Oregon Grape	8' x 4'	Sun to light shade	minimal	Green foliage
<i>Mahonia repens</i> - Creeping Barberry	1' x 4'	Full sun	low	Evergreen
<i>Potentilla spp.</i> - Cinquefoil	2.5' x 2.5'	Sun to light shade	minimal	Yellow flowers
<i>Prunus besseyi</i> - Western Sand Cherry	3' x 3'	Full sun	moderate	White flowers
<i>Prunus glandulosa</i> - Pink Flowering Almond	3' x 3'	Sun to light shade	minimal	Green foliage
<i>Spirea spp.</i> - Spirea	4' x 4'	Sun to light shade	moderate	Showy flowers
<i>Perovskia spp.</i> - Russian Sage	6' x 6'	Full sun	moderate	Lavendar flowers
<i>Shepherdia argentea</i> - Silver Buffaloberry	15' x 12'	Sun to light shade	moderate	Silver foliage
<i>Rhus spp.</i> - Sumac	6' x 4'	Full sun	minimal	Red fall foliage
Forbs:				
<i>Aurinia saxatilis</i> - Basket of Gold	12" x 24"	Full sun	minimal	Groundcover
<i>Cerastium tomentosum</i> - Snow-In-Summer	6" x 12"	Full sun	minimal	White/near white
<i>Coreopsis spp.</i> - Tickseed	24" x 24"	Full sun	moderate	Yellow
<i>Echinacea purpurea</i> - Eastern Purple Coneflower	18" x 18"	Full sun	moderate	Pinkish flowers
<i>Hemerocallis spp.</i> - Daylily	18" x 24"	Full sun	moderate	Various color
<i>Kniphofia spp.</i> - Red Hot Poker	24" x 24"	Full sun	minimal	Poker like flowers
<i>Lavandula spp.</i> - Lavender	18" x 18"	Full sun	moderate	Purple flower
<i>Phlox subulata</i> - Creeping Moss Phlox	6" x 18"	Sun to light shade	moderate	Nice pink flowers
<i>Zauschneria californica</i> - California Fuchsia	12" x 20"	Full sun	minimal	Red blooms
<i>Campsis radicans</i> - Trumpet Vine	24" x 24"	Full sun	minimal	Red blooms
<i>Parthenocissus quinquefolia</i> - Virginia Creeper	12" x 48"	Full sun	minimal	Fall color
Grasses:				
<i>Calamagrostis acutiflora 'Karl Foerster'</i> - Foerster's Feather Reed Grass	4' x 5'	Full sun	moderate	Grass
<i>Erianthus ravennae</i> - Ravenna Grass	7' x 4'	Full sun	moderate	Grass
<i>Festuca spp.</i> - Blue Fescue	12" x 12"	Full sun	moderate	Grass
<i>Helictotrichon sempervirens</i> - Blue Oat Grass	24" x 24"	Full sun	moderate	Grass
<i>Panicum virgatum</i> - Switch Grass	6' x 6'	Full sun	moderate	Grass
<i>Stipa gigantea</i> - Giant Feather Grass	7' x 6'	Sun to light shade	moderate	Grass



(2) Regionally adapted softscape types should be used in areas where a highly visible landscape is desired.

Figure 13 - Regionally Adapted Plant Palette (cont.)

PLANT PALETTE - MOJAVE DESERT AREAS

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Acacia constricta</i> - Whitethorn Acacia	10' x 15'	Full sun	Low	Sp/Sum
<i>Acacia stenophylla</i> - Shoestring Acacia	40' x 30'	Full sun	Low	Spring
<i>Celtis pallida</i> - Spiny Hackberry	8' x 10'	Full sun	Low	Semi-evergreen
<i>Cercidium Hybrid</i> - Desert Museum Palo Verde	25' x 25'	Full sun	Low	Spring
<i>Cordia boissieri</i> - Texas Olive	10' x 10'	Full-partial sun	Low	Summer
<i>Cupressus arizonica</i> - Arizona cypress	40' x 20'	Full sun	Low	Evergreen
<i>Eucalyptus microtheca</i> - Coolabah Tree	30' x 30'	Full sun	Low	Evergreen
<i>Eysenhardtia orthocarpa</i> - Tahitian Kidneywood	18' x 15'	Full sun	Low	Summer
<i>Fraxinus oxycarpa</i> - Raywood Ash	35' x 25'	Full sun	Moderate	Spring
<i>Fraxinus velutina Rio Grande</i> - Fan-tex Ash	50' x 30'	Full sun	Moderate	Spring
<i>Gleditsia triacanthos inermis</i> - Thornless Honey Locust	35' x 25'	Full sun	Moderate	n/a
<i>Parkinsonia floridum</i> - Blue Palo Verde	20' x 25'	Full sun	Low	Spring
<i>Pistacia chinensis</i> - Chinese Pistache	40' x 20'	Full sun	Moderate	Fall
<i>Populus spp.</i> - Cottonwood				
***note: plant where ground water access is available				
<i>Quercus spp.</i> - Oak Tree	40-70' x 20-50'	Full-partial sun	Moderate	Sp/Fall
<i>Rhus lanceolata</i> - Prairie Sumac	12' x 18'	Full sun	Low	Spring
<i>Robinia spp.</i> - Locust	40-50' x 20-40'	Full sun	Moderate	Sp/Sum
<i>Ulmus parvifolia</i> - Chinese Elm	60' x 70'	Full sun	Moderate	Fall
<i>Ungnadia speciosa</i> - Mexican Buckeye	15' x 15'	Full sun	Low	Spring
<i>Vauquelinia californica</i> - Arizona Rosewood	14' x 10'	Full sun	Moderate	Spring
Shrubs:				
<i>Anisacanthus quadrifidus</i> - Mountain Flame	3' x 3'	Full-partial sun	Low	Fall/Sum
<i>Buddleia davidii</i> - Orange Eye Butterfly Bush	8' x 6'	Full-partial sun	Low	Spring
<i>Buddleia marrubifolia</i> - Woolly Butterfly Bush	6' x 6'	Full-partial sun	Moderate	Summer
<i>Cassia phyllodenia</i> - Silver Leaf Senna	6' x 6'	Full sun	Low	Spring
<i>Chrysactinia mexicana</i> - Gray Damianita	2' x 2'	Full sun	Low	Summer
<i>Convolvulus cneorum</i> - Bush Morning Glory	2' x 3'	Full sun	Low	Sp/Fall
<i>Dalea spp.</i> - Prairie Clover	4' x 5'	Full sun	Low	Fall
<i>Dodonaea viscosa</i> - Florida Hopbush	10' x 6'	Full sun	Low	Year Round
<i>Justicia candicans</i> - Arizona Water Willow	3' x 3'	Full-partial sun	Moderate	Summer
<i>Justicia spicigera</i> - Mexican Honeysuckle	3'x3'	Part/filtered sun	Moderate	Spring-Fall
<i>Leucophyllum spp.</i> - Texas Ranger	4' x 4'	Full sun	Low	Summer
<i>Phlomis fruticosa</i> - Jerusalem sage	3'x4'	Full sun	Low-mod	Summer
<i>Rhamnus californica</i> - Coffeeberry	8' x 8'	Full-part sun	Low	Evergreen
<i>Rhus ovata</i> - Sugar Bush	10' x 10'	Full-partial sun	Low	Spring
<i>Salvia clevelandii</i> - Fragrant Sage	4' x 6'	Full sun	Low	Spring
<i>Sophora arizonica</i> - Arizona Necklacepod	3-10'x10'	Full sun	Low	Spring
<i>Tecoma x 'Gold Star'</i> - Texas Yellow Bells	20' x 8'	Full sun	Moderate	Summer
Cacti, Accents, Grasses, Groundcovers, and Perennials:				
<i>Agave spp.</i> - Agave				
***note: plant apart from one another to prevent sisal weevil				
<i>Artemisia frigida</i> - Wormwood	1' x 1'	Full sun	Low	Spring
<i>Convolvulus mauritanicus</i> - Ground Morning Glory	1' x 3'	Full-partial sun	Low	Sp/Sum
<i>Coreopsis lanceolata</i> - Lanceleaf Tickseed	1.5' x 1'	Full sun	Moderate	Sp/Sum
<i>Hemerocallis spp.</i> - Daylily	2' x 2'	Full-partial sun	Low	Spring
<i>Lantana spp.</i> - Lantana	4' x 4'	Full sun	Moderate	Summer
<i>Muhlenbergia rigens</i> - Deer Grass	3' x 4'	Full sun	Low	Summer
<i>Nolina erumpens</i> - Foothill Beargrass	4' x 6'	Full sun	Low	Spring
<i>Salvia leucantha</i> - Mexican Bush Sage	3' x 3'	Full-partial sun	Moderate	Sp/Fall/Win
<i>Tulbaghia violacea</i> - Society Garlic	3' x 3'	Full sun	Low	Sp/Sum

REGIONAL ORNAMENTAL SOFTSCAPE TREATMENT

21.13 Apply regional ornamental softscape type in areas of extremely high importance.

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 is not designated for use in the Eastern Corridors.

- It is typically used to denote an area of the utmost importance.
- This softscape type emphasizes the unique cultural elements of a particular urban environment.
- The use of non-native, ornamental plant species in this softscape type accentuates areas through composition possibilities inherent in form and color.
- Dynamic ornamental forms, colors, and textures enhance the native Great Basin or Mojave Desert landscape in complementary patterns.

21.14 Carefully select regional ornamental plant species.

In addition to the plants listed in the native revegetation, enhanced native, and regionally adapted softscape type, the list of plants in Figure 14 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.
- Additional plants not listed in Figures 11-14 may be included upon review and approval.



(1) The regional ornamental softscape type requires permanent irrigation and is used to highlight points of significant interest and landmark quality.

Figure 14 - Regional Ornamental Plant Palette

PLANT PALETTE - GREAT BASIN AREAS

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Crataegus douglasii</i> - Douglas hawthorn	25' x 12'	Full sun	moderate	Large thorns
<i>Gleditsia triacanthos inermis</i> - Thornless Honey Locust	28' x 16'	Full sun	Moderate	Summer
<i>Picea pungens 'Glauca'</i> - Colorado Blue Spruce	60' x 20'	Sun to light shade	moderate	Evergreen
<i>Rhus spp.</i> - Sumac	15' x 15'	Full sun	minimal	Bright red fall foliage
<i>Robinia spp.</i> - Locust	50' x 25'	Full sun	moderate	Yellowish-green
<i>Sequoia gigantea</i> - Giant Redwood	80' x 35'	Full sun	moderate	Evergreen
<i>Sorbus aucuparia</i> - European Mountain Ash	30' x 25'	Sun to light shade	moderate	Bright red fall color
<i>Tilia tomentosa</i> - Silver Linden	45' x 20'	Full sun	low	White flower
Shrubs:				
<i>Forsythia spp.</i> - Forsythia	6' x 4'	Full sun	moderate	Bright yellow flower
<i>Hibiscus syriacus</i> - Rose of Sharon	10' x 6'	Sun to light shade	moderate	Large flowers
<i>Lonicera spp.</i> - Honeysuckle	6' x 6'	Sun to light shade	moderate	Small flowers
<i>Rosa spp.</i> - Rose (native yellow climbing rose)	Varies	Full sun	moderate	Bright yellow flowers
<i>Syringa spp.</i> - Lilac	15' x 15'	Sun to light shade	moderate	Pink flowers
<i>Viburnum spp.</i> - Viburnum	8' x 8'	Sun to light shade	moderate	Bright red berries
Grasses, Forbs, and Perennials:				
<i>Aster novi-belgii</i> - Michaelmas Daisy	12" x 12"	Full sun	moderate	Long bloom time
<i>Festuca spp.</i> - Blue Fescue	12" x 12"	Full sun	moderate	Grass
<i>Hemerocallis spp.</i> - Daylily	24" x 18"	Full sun	moderate	Yellow flowers
<i>Iris spp.</i> - Iris, Tall Bearded	36" x 10"	Full sun	moderate	Large purple flowers
<i>Leucanthemum x superbum</i> - Shasta Daisy	24" x 12"	Sun to light shade	moderate	Long bloom time
<i>Saccharum ravennae</i> - Plume Grass	10' x 6'	Full sun	moderate	Grass



(2) The regional ornamental softscape type adds to the identity and placemaking of areas of high importance.

Figure 14 - Regional Ornamental Plant Palette (cont.)

PLANT PALETTE - MOJAVE DESERT AREAS

	Height x Width	Exposure to Sun	Water Requirement	Seasonal Interest
Trees:				
<i>Ebenopsis ebano</i> - Texas Ebony	20' x 20'	Full	Low-mod	Summer/Fall
<i>Gleditsia triacanthos inermis</i> - Thornless Honey Locust	28' x 16'	Full sun	Moderate	Summer
<i>Koelreuteria paniculata</i> - Goldenrain Tree	35 x 40'	Full-partial sun	Moderate	Summer
<i>Olea europaea</i> 'Swan Hill' - Olive Tree	30' x 30'	Full sun	Moderate	Summer
<i>Pinus eldarica</i> - Mondell Pine	50' x 30'	Full sun	Moderate	Fall
<i>Pinus halepensis</i> - Aleppo Pine	60' x 40'	Full sun	Moderate	Fall
<i>Pinus pinea</i> - Italian Stone Pine	80' x 40'	Full sun	Moderate	Year Round
<i>Pinus roxburghii</i> - Chir Pine	80' x 40'	Full sun	Moderate	Fall
<i>Pistacia chinensis</i> - Chinese Pistache	40' x 20'	Full sun	Moderate Water Use	Fall
<i>Sophora secundiflora</i> - Mescal Bean	15' x 10'	Full sun	Moderate	Spring
Shrubs:				
<i>Acacia redolens</i> 'Desert Carpet' - Prostrate Acacia	5' x 10'	Full sun	Low	Late Winter
<i>Aloysia virgata</i> - Sweet Almond Bush	15' x 5'	Full sun-part sh	Low	Sp/Sum
<i>Caesalpinia mexicana</i> - Mexican Bird of Paradise	10' x 6'	Full sun	Moderate	Summer
<i>Caesalpinia pulcherrima</i> - Red Bird of Paradise	12' x 12'	Full-partial sun	Low-mod	Summer/Fall
<i>Caryopteris x clandonensis</i> 'Dark Knight' - Blue Mist Spirea	3'x4'	Full sun-part sh	Moderate	Sp/Sum
<i>Calliandra eriophylla</i> - Fairy Duster	4' x 4'	Full-partial sun	Low	Sp/Sum/Fall
<i>Cotoneaster congestus</i> - Rockspray	2' x 6'	Full-partial sun	Low-mod	Spring
<i>Cotoneaster x Lowfast</i> - Lowfast Bearberry	2' x 10'	Full-partial sun	Moderate	Spring
<i>Elaeagnus x Ebbingei</i> - Ebbing's Silverberry	9' x 9'	Full sun	Moderate	Summer
<i>Lagerstroemia indica</i> - Crape Myrtle	20' x 12'	Full-partial sun	Moderate	Summer
<i>Rosmarinus officinalis</i> 'Huntington Carpet' - Spreading Rosemary	2' x 8'	Full sun	Low	Sp/Sum
<i>Rosmarinus officinalis</i> 'Tuscan Blue' - Upright Rosemary	6' x 4'	Full sun	Low	Sp/Sum
Accents Cacti and Grasses:				
<i>Agave spp.</i> - Agave	3' x 2'	Full-partial sun	Low	Summer
***note: plant apart from one another, prone to sisal weevil				
<i>Dasyliirion acrotriche</i> - Green Desert Spoon	4' x 6'	Full sun	Low	Sum/Fall
<i>Dasyliirion wheeleri</i> - Grey Desert Spoon	4' x 6'	Full sun	Low	Sum/Fall
<i>Drosanthemum hispidum</i> - Ice Plant	2' x 3'	Full sun	Low-mod	Spring
<i>Echinocactus grusonii</i> - Golden Barrel Cactus	2' x 3'	Full-partial sun	Low	Spring
<i>Euphorbia characias</i> - Shrubby Spurge	3' x 2'	Full-partial sun	Moderate	Win/Sp
<i>Fouquieria splendens</i> - Ocotillo	18' x 10'	Full sun	Low	Spring
<i>Hesperaloe spp.</i> - False Yucca	4' x 4'	Full sun	Low	Sp/Sum/Fall
<i>Muhlenbergia capillaris</i> - Regal Mist Grass	3' x 6'	Full-partial sun	Moderate	Spring
<i>Nassella tenuissima</i> - Mexican Feather grass	2' x 2'	Full sun	Low	Grass
<i>Opuntia santa-rita</i> - Purple Prickly-Pear	2' x 3'	Full sun	Low	Spring
<i>Phormium tenax</i> - New Zealand Flax	15' x 4'	Partial Sun	Low-mod	Sp/Sum



(3) Regional ornamental softscape types are used sparingly along the corridor and are designated for areas of highest visual impact.

22.0 WILDLIFE CROSSINGS AND PROTECTION

22.1 Engage appropriate agencies in the planning and design of wildlife crossings.

Engage federal, state, and local agencies and wildlife professionals in the planning and design of wildlife crossings from the initial planning stages through implementation.

- Coordinate information on historic migratory routes and daily wildlife movements to situate crossing structures in appropriate locations.
- Track locations of wildlife-related automobile accidents and explore designs to minimize these collisions.

22.2 Use ecologically-appropriate wildlife crossing structures that meet the needs of specific wildlife species in order to improve movement and safety along the corridor.

Analyze wildlife behavioral traits to design effective crossing structures that meet the needs of all species that will use a structure.

- Specific design criteria varies with each species. Consider larger species, such as deer, and smaller species, such as coyotes.
- Ensure structures complement the primary defense strategy for each wildlife species. For instance, animals such as deer, elk, pronghorn, and bighorn sheep depend on good visibility as a key defense mechanism.

- Use open-span bridges and culverts that are oriented perpendicular to the road in order to reduce the overall crossing length and improve visibility. Proportionately increase the size of the underpass as the length increases.
- Restore vegetation leading up to wildlife crossings and provide cover to shield each crossing entrance from the road while maintaining clear visibility through the crossing.
- Within underpasses, incorporate naturally occurring materials that exist in adjacent areas.
- Wildlife underpasses or overpasses combined with fencing have the highest documented rates of success for large and small animals. Most successful crossing structures are open-span bridges with sloping sidewalls.
- Road underpasses may be constructed of concrete boxes, elliptical metal culverts, or open-span bridges. Increased width and height of structures usually correlate with increased use by large mammals. Culvert sizes range from 6.5 feet by 6.5 feet for small animals, to an opening width of 40 feet by a height of 16 feet for larger animals. Where possible, use natural bottoms for underpasses. Determine the actual size, location, and type of structure on a site by site basis.
- Placement of underpasses in relation to an animal's habitat is crucial. The habitat within the crossing structure should also be enhanced to encourage use by wildlife.
- Limit human use of the underpass structures when possible.

22.3 Use different types of fencing as appropriate for different animals.

- Recommended fencing for deer is an 8 foot high, variable-expanded metal mesh fence. Metal mesh fencing should be fastened to metal wire. Barbed wire is unacceptable. Fencing should occur on both sides of the road, and should extend to the underpass or overpass entrance.
- Incorporate breaks, known as jump-outs, in areas with continuous fencing to enable wildlife trapped within the road corridor to escape and return to habitat areas.

22.4 Develop a monitoring system for all major wildlife crossings to document crossing use and to collect data for similar projects.

Several studies in other states indicate that significant movement and migratory disruptions have occurred due to highway construction. Movement and behavior at crossings and other highway locations should be monitored to help increase the success of these facilities as part of ongoing interagency cooperative research.

22.5 The design of crossings may create opportunities to observe animal movements.

Consideration should only be given when observation points are designed so as not to interfere with wildlife movement.

22.6 Design wildlife crossing structures to blend with surrounding landscape.

Visually screened bridges and culverts recede into the landscape. Combine recreational trails and wildlife crossings as part of bridge and culvert crossings where feasible.



Image courtesy of Tony Clevenger

(1) Wildlife crossing signs help preserve critical habitat corridors.



(2) Naturalized wildlife overpasses have been highly successful for many large animal crossings. Incorporation of such features into the highway reinforces the importance of wildlife to the corridor and the need to minimize barriers to their movement.

23.0 CONSTRUCTION PRACTICES

23.1 Clear the site only within the limits of construction.

Avoid the visual scars and plant disturbance from excessive site disturbance.

23.2 Protect important environmental, landscape, and cultural features.

Identify and protect all areas to be preserved prior to construction. These include trees, shrubs, landscape and cultural features, and environmentally sensitive areas.

- Fence areas where vegetation is to remain. Avoid disturbance and compaction of the ground.
- Maintain and enhance existing groundcover to ensure that the area is left in a condition consistent with the natural surroundings.

23.3 Utilize Best Management Practices (BMPs) and appropriate short term stabilization measures to prevent erosion and sedimentation during construction.

Perform a site risk assessment prior to construction to determine the threat of introducing sediments and pollutants into nearby surface waters and drainage systems.

- Utilize short term BMPs to reduce sedimentation and pollutant runoff during construction.
- Consider site specificity, timing of execution, and application of man-made devices and/or vegetative or organic cover to stabilize banks during construction.
- Research alternatives to hard surface paving.

- Give preference to alternative sediment control devices, including sediment basins, diversion berms, vegetative buffer areas, channel linings, energy dissipaters, seeding, and mulching.

23.4 Carefully manage and dispose of waste material.

Asphalt millings inhibit slope revegetation, contaminate adjacent soils, and create a cluttered, unfinished appearance.

- Avoid placing disposed milled asphalt on highway shoulders.

23.5 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 re-use.

- Salvage areas should be designated on plans and staked on the site.
- Salvaged plant materials should be stored and maintained during construction, prior to replanting.
- Stripped topsoil in excess of the quantity required for the project should be stored at specified locations for future use.
- Topsoil of lesser quality can be blended with soil amendments to improve condition for final bedding.

23.6 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 that is equal to or better than original, and consistent with the Corridor Plan design guidelines.



(1) Milled asphalt on highway shoulders detracts from the overall visual quality of the landscape.

24.0 MAINTENANCE FACILITIES AND PRACTICES

24.1 Locate and screen maintenance staging areas in visually unobtrusive areas.

Maintenance staging areas should be adequately set back from the highway. Where possible, site facilities so they are screened from the highway by existing landforms.

- Screen maintenance areas, particularly stockpiles, borrow pits, and equipment from the highway and adjacent developed property.
- Consider security fencing, landscape, and architectural solutions.

Grading and drainage is the most important consideration in site planning and design of a maintenance area in order to prevent any environmental damage that could result from leachates in salt and gravel stockpiles. The *NDOT Best Management Practices Manual* outlines additional points for consideration when planning for maintenance staging areas, including the following:

- Cover salt and sand piles to avoid watercourse and groundwater degradation.
- Provide space for equipment storage, vehicles, and supplies, as well as employee or visitor parking.
- Consider future expansion needs.

24.2 Coordinate with maintenance personnel when planning and designing maintenance areas.

Planning and design of maintenance areas requires close cooperation between designers and the personnel directly responsible for their use.

24.3 Consult BMPs and provide for efficient and effective maintenance of landscape and aesthetic treatments.

With few exceptions, new landscape and aesthetics projects are designed to be low maintenance. Refer to the *NDOT Landscape and Aesthetics Maintenance Manual*. 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, and graffiti removal).
- Grading and earthwork.
- Ground treatment (raking, replacing mulch or decorative rock, and reconfiguring drainage structures).
- Weed control.
- Plantings (interim, temporary, and permanent irrigation; trimming; pruning of

shrubs and trees; manual weed control; and fertilizing).

- Disease and pest management (including invasive species control).
- Repair and replacement of structural and electrical components, irrigation, signage, and lighting.

24.4 Create a visual design unity among all existing and new structures based on the design theme.

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, make sure repairs cover the entire surface and extend to joints and logical edges.
- Use anti-graffiti treatment on detailed sculptural elements.
- District level maintenance teams should use the same color palette for all maintenance and repairs (refer to Color Palette guideline, page 3.21, for more information).
- If no logical edge or joint exists, feather edges of paint.

24.5 Avoid pruning or shearing plant material except as required to remove dead, damaged, or diseased plant part or to provide clear visibility for traffic conditions.

25.0 RECOMMENDATIONS FOR SUSTAINABLE HIGHWAY ENVIRONMENTS

25.1 Use three key principles in highway construction and natural resource management to create sustainable highway environments—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.

25.2 Techniques for creating sustainable highway environments.

- Develop systems to encourage sustainable highways. Develop performance standards, monitoring procedures, and promote coordination between environmental and transportation agencies. Promote environmental education for project staff and the public.
- 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, re-use

of organic materials from cleaning and grubbing operations, deconstruction of removed buildings, water conservation, and selection of long-lived materials.

25.3 Utilize sustainable development principles in the design and construction of the highway corridor.

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, and habitat enhancement and protection.

- Consider sustainability in both the design and construction of highway systems.
- Prepare whole life costing studies in the planning stages of highway projects. Whole life costing is a process that evaluates every cost incurred in respect of a facility or product from inception to disposal.
- Restore disturbed man-made and natural habitats as an important component in achieving a sustainable highway related landscape.

25.4 Use recycled materials for construction.

Asphalt pavements, concrete, base courses, and embankments increasingly have incorporated 'waste' resources instead of raw materials. Reclaimed concrete and asphalt, scrap tires, plastics, steel slag, roofing shingles, coal fly ash, and composted municipal organic wastes are proven, cost effective, and high-efficiency materials with broad applicability in roadway construction. The Recycled Materials Resource Center at the



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



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



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

University of New Hampshire was established by Congress to research and encourage recycling in the highway environment.

- Apply recycled materials like reclaimed asphalt paving (RAP), coal fly ash, and blast furnace slag. Use other materials (e.g. foundry sands, steel slags), when available locally, in response to specific market forces.
- Consider several methods of sustainable asphalt pavement construction and reuse. Asphalt may be stripped from a road surface, crushed, and used as granular or hot mix on the same or future road construction projects, reducing the amount of virgin aggregate and oil used. On-site surface recycling involves removing and replacing the top layers of a pavement structure for the purpose of repairing a wide range of pavement distress (surface

cracking, raveling, and rutting). Advanced pavement recycling equipment can be used to recycle the bottom lift and place virgin hot mix for the final lift.

- Crushed glass and crushed brick should be used as substitute for aggregates in pavement.
- Where possible, use fly ash in concrete and soil stabilization.
- Consider the use of recycled materials for road base, road surface, sound walls, and ground surfacing/mulch.
- Incorporate recycled materials in guardrails. For example, use cross rails constructed of recycled plastic.
- Identify the state's recycled products manufacturers and the products' potential for use in road construction.
- Identify material suppliers capable of producing recyclable materials.