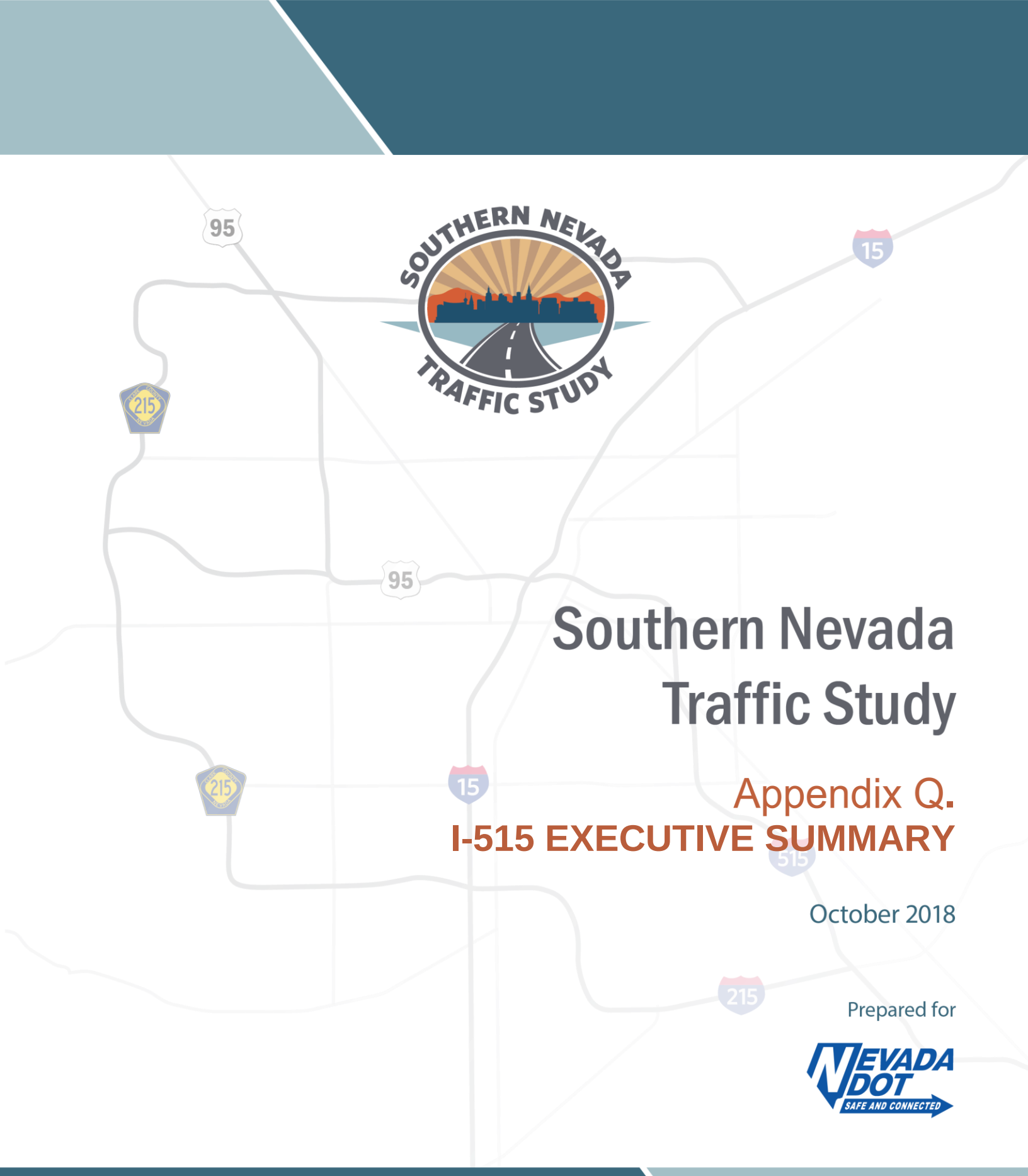


Southern Nevada Traffic Study

Appendix Q.

I-515 EXECUTIVE SUMMARY

October 2018

Prepared for

NEVADA DOT
SAFE AND CONNECTED

Prepared by HDR

EXECUTIVE SUMMARY
I-515 ALTERNATIVES DEVELOPMENT STUDY Concept Report

FIGURES

TABLES

I-515 ALTERNATIVES DEVELOPMENT STUDY
Concept Report

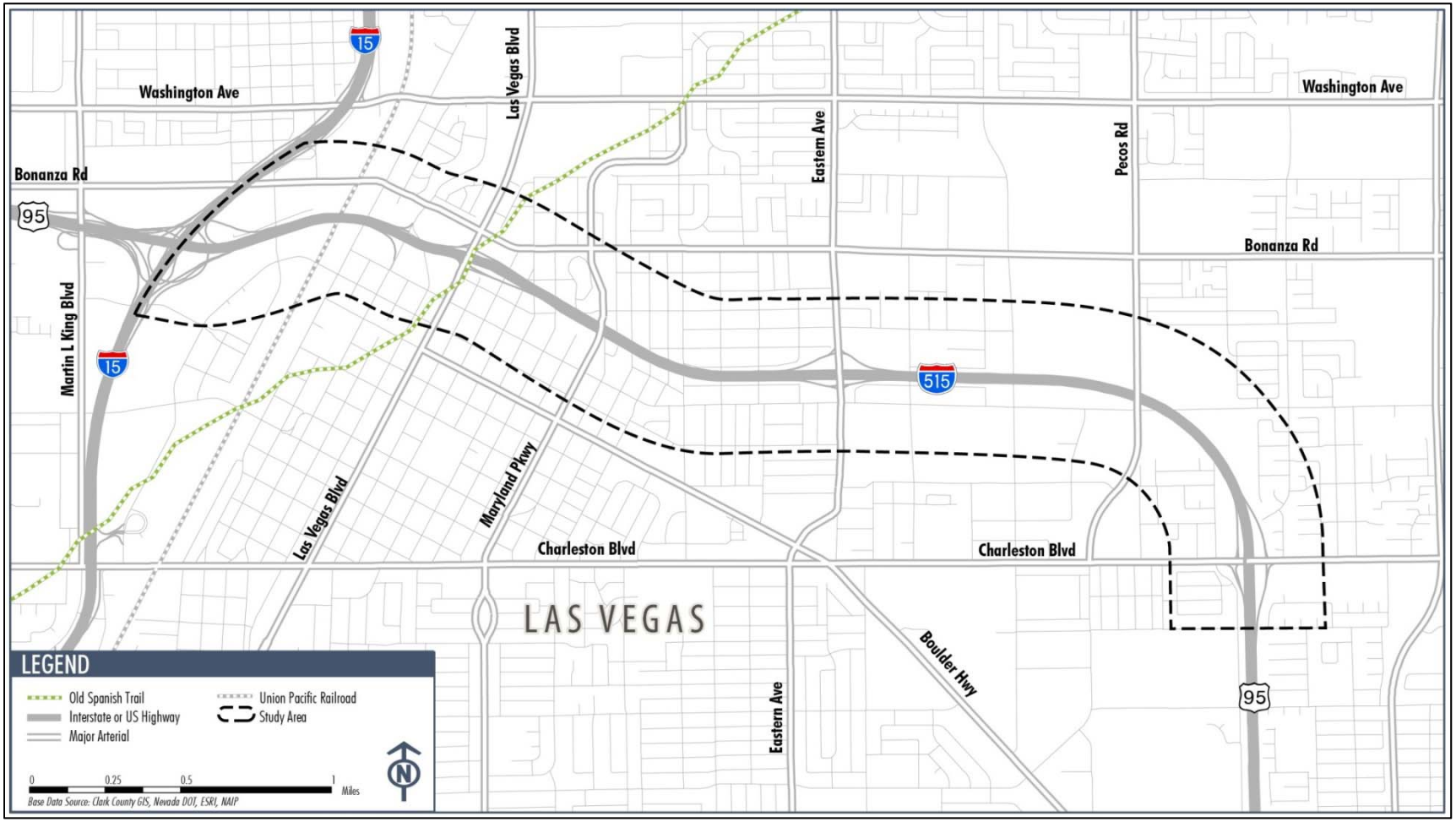
Executive Summary

ES.1 Introduction and Study Background

U.S. Interstate 515 (I-515) is a 20-mile spur between the junction of I-15 and US 95 (known as the Las Vegas Spaghetti Bowl interchange) and Railroad Pass in southeastern Henderson, Nevada. This I-515 Alternatives Development Study was initiated by the Nevada Department of Transportation (NDOT) to identify and evaluate near-term operational and safety improvements along I-515 from the Spaghetti Bowl to Charleston Boulevard in Las Vegas (study area), as shown on Figure ES-1. This study is intended to be a precursor to future NDOT environmental studies to comply with the National Environmental Policy Act (NEPA).

Key stakeholders provided study oversight. They included the City of Las Vegas, Clark County, the Regional Transportation Commission of Southern Nevada, and Federal Highway Administration (FHWA). The study team, which included NDOT and the consultant team of Jacobs, Atkins, and Louis Berger Group, used the Planning and Environmental Linkages (PEL) approach to guide this study. As part of this PEL approach, the study team developed a Purpose and Need statement, evaluated improvements, and recommended potential projects for NDOT to evaluate further. The team also solicited public and agency input on the process and study findings.

Figure ES-1: Study Area



Purpose and Need

The purpose of this study is to improve traffic operations and safety on the I-515 corridor, including ramp terminal intersections, between I-15 (at the Spaghetti Bowl interchange) and Charleston Boulevard by implementing near-term and cost-effective transportation improvements that are compatible with other future improvements.

The needs to be addressed in the study include:

- Mobility Problem: Impaired traffic flow resulting from high traffic volumes, substandard geometry, and incidents.
- Safety Problem: Higher than expected crashes due to traffic congestion and substandard geometry.

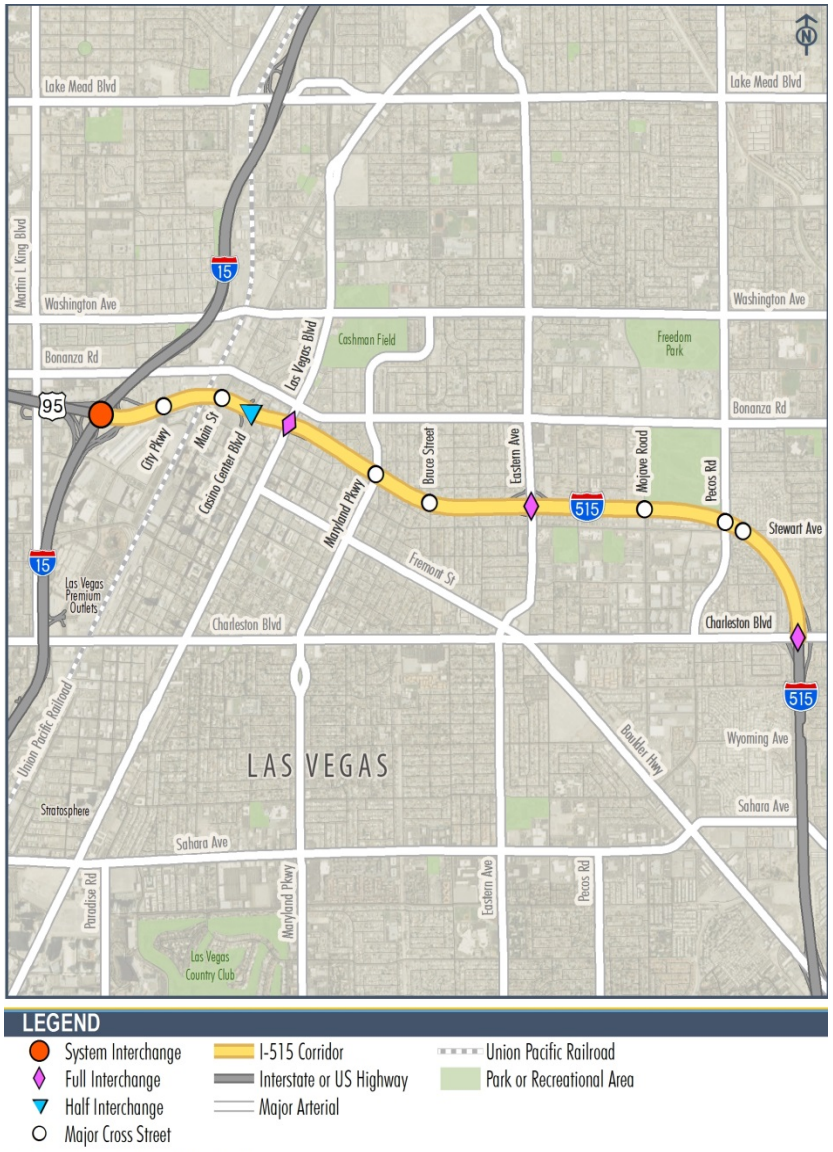
ES.2 Existing Corridor Conditions

The study evaluated and documented the existing corridor conditions, including the roadway network, land use and demographic characteristics, traffic conditions, traffic volumes, traffic operations, utilities, safety performance, transit options, bicycle and pedestrian facilities, major structures, and environmental conditions.

Roadway Network

I-515 extends between the City of Las Vegas and the City of Henderson, with interchanges serving both cities and unincorporated areas of Clark County. Eleven major streets cross beneath I-515 within the study area, providing a network of roads that complement I-515. One system interchange (with I-15) and four service interchanges are located within the study area. Figure ES-2 depicts the road network within the study area.

Figure ES-2: Study Area Road Network



Data Source: Clark County GIS, Nevada DOT, ESRI, NAIP

Land Use and Demographic Characteristics

Between 1990 and 2015, the Las Vegas Valley urban area experienced an average population growth rate of 4.1 percent per year. Demographic information on occupied housing unit density, major trip generators, average population growth (1990 to 2015), population density, employment density, percent of households below the poverty level, and percent of zero-vehicle households is presented in the study. The study area has a mix of land uses that includes residential, commercial, public, parks and recreation, mixed-use, and industrial.

Traffic Conditions

The study team conducted an existing conditions traffic operations analysis using CORSIM microsimulation software and SYNCHRO intersection analysis. Levels of Service (LOS)[1] were calculated in accordance with the *Highway Capacity Manual 2010* (Transportation Research Board, 2010). The operational performance results from CORSIM included:

- Five northbound road segments with LOS E and F in the AM period
- Ten northbound road segments with LOS E and F in the PM period
- Six southbound road segments with LOS E and F in the AM period,
- Six southbound road segments with LOS E and F in the PM period

[1] LOS is a qualitative measure of the quality of traffic service using letters A through F, with A being the best and F being the worst.

The Synchro existing intersection analysis showed the Eastern Avenue and Stewart Avenue intersection operating at LOS F in the PM peak hour, and the southbound ramp intersection at Charleston Boulevard and the southbound ramp intersection at Las Vegas Boulevard operating at LOS E in the AM peak hour.

Utilities

Utility relocations can greatly add to construction costs for highway improvements. This study identified nine specific utility owners with facilities in the study area.

Safety Performance

From July 1, 2011, to July 1, 2014, a total of 1,377 crashes occurred in the 5.5 miles of I-515 evaluated in the *Road Safety Assessment Report for I-515/US 93/US 95 from Rancho Drive to Wyoming Avenue Grade Separation* (NDOT, 2015a). This section of the I-515 corridor experienced higher overall crashes, injury crashes, and property damage crashes than the state average. The study summarized corridor crash severity by roadway segment and crashes at the I-515 interchanges.

Transit Options

Transit routes on the freeways within the study area are primarily express services. The arterials serve as the main transit routes, with several stops strategically placed to provide connectivity. The study shows the average monthly ridership for each route servicing the study area for the three-year period between July 1, 2011, and July 1, 2014. The express routes (SDX and BHX) and Route 206 experience the highest ridership.

Bicycle and Pedestrian Facilities

The study area has a network of bicycle routes/lanes and multi-use paths. A shared-use path runs along I-515. However, the existing trail is discontinuous; missing trail segments are planned to be built in the future.

Major Structures

The Downtown Las Vegas Viaduct consists of two multi-span bridges that carry northbound and southbound I-515 over multiple roads and the Union Pacific Railroad tracks.

The first bridge segment (G-947) between 4th Street and Mesquite Avenue was built in the 1960s, and the second bridge segment (I-947) between 21st Street and 4th Street was built in the early- to mid-1980s. The G-947 structure has reached 50 years of service life; it is in poor overall condition and is functionally obsolete. The I-947 structure and two associated ramp bridges are considered to be in generally good condition. However, as expected for a 35-year-old structure, various elements are reaching the point where either major maintenance or minor rehabilitation are needed to repair existing deficiencies and ensure structure longevity. Additionally, an assessment of the structure's seismic performance identified the need for retrofitting several columns and in-span hinges. The I-947 structure is also functionally obsolete.

Environmental Conditions

The environmental conditions section in the study summarizes existing data collected for the environmental resources identified within the study area. Data is presented for land use and zoning, parks, recreation, bicycle/pedestrian facilities, community facilities, environmental justice (EJ) populations, air quality, traffic noise, cultural resources, hazardous materials, floodplains, and visual conditions. This information helped inform the evaluation of the alternatives as discussed below. Environmental resources most prevalent in the study area include EJ populations, community facilities, historic properties, and hazardous material sites.

ES.3 Alternatives Development and Screening Process

To identify and evaluate near-term operational and safety improvements within the study area, the study team considered a range of reasonable improvements to meet this study's Purpose and Need. The improvements that were carried forward through the screening process generally fell into the following categories:

- Interchange and ramp improvements, including new interchanges
- Collector-distributor roads
- Auxiliary lanes
- Congestion management improvements
- Travel Demand Management (e.g. high-occupancy vehicle lane) improvements
- Transportation System Management improvements, including:
  - Traffic signal optimization
  - Ramp metering

- Active Transportation and Demand Management strategies, such as variable speed control
- Additional turn bays

Thirty-five Conceptual Build Alternatives were developed and evaluated in this study. The screening process was designed to:

- Assess potential improvements along I-515 within the study area, in relation to the study's Purpose and Need.
- Group improvements based on compatibility, proximity, and logical termini into consolidated project alternatives where appropriate.
- Evaluate the benefits and costs of selected project alternatives.

Figure ES-3 illustrates the multilevel screening and prioritization process.

No-Action Alternative

The No-Action Alternative was fully evaluated and serves as a baseline comparison for operational, safety, benefit to cost, and environmental analysis purposes. It assumes completion of ongoing or reasonably foreseeable transportation, development, and infrastructure projects. Figure ES-4shows the locations of these planned improvements.

Fatal Flaw Screening Process and Results

The first level of screening was the most basic, and evaluated whether the proposed improvements met the following criteria:

- Does the improvement meet this study's Purpose and Need?
- Does the improvement serve a study goal?
- Does the improvement have irresolvable environmental impacts?
- Is the improvement widely opposed by stakeholders and/or the public?

All improvements were evaluated against the No-Action Alternative. If an improvement did not meet the criteria listed above, it was screened out and did not continue in the evaluation process. Of the 35 preliminary improvements evaluated in this study, eight were deemed fatally flawed and eliminated.

Figure ES-3: Alternatives Screening Process

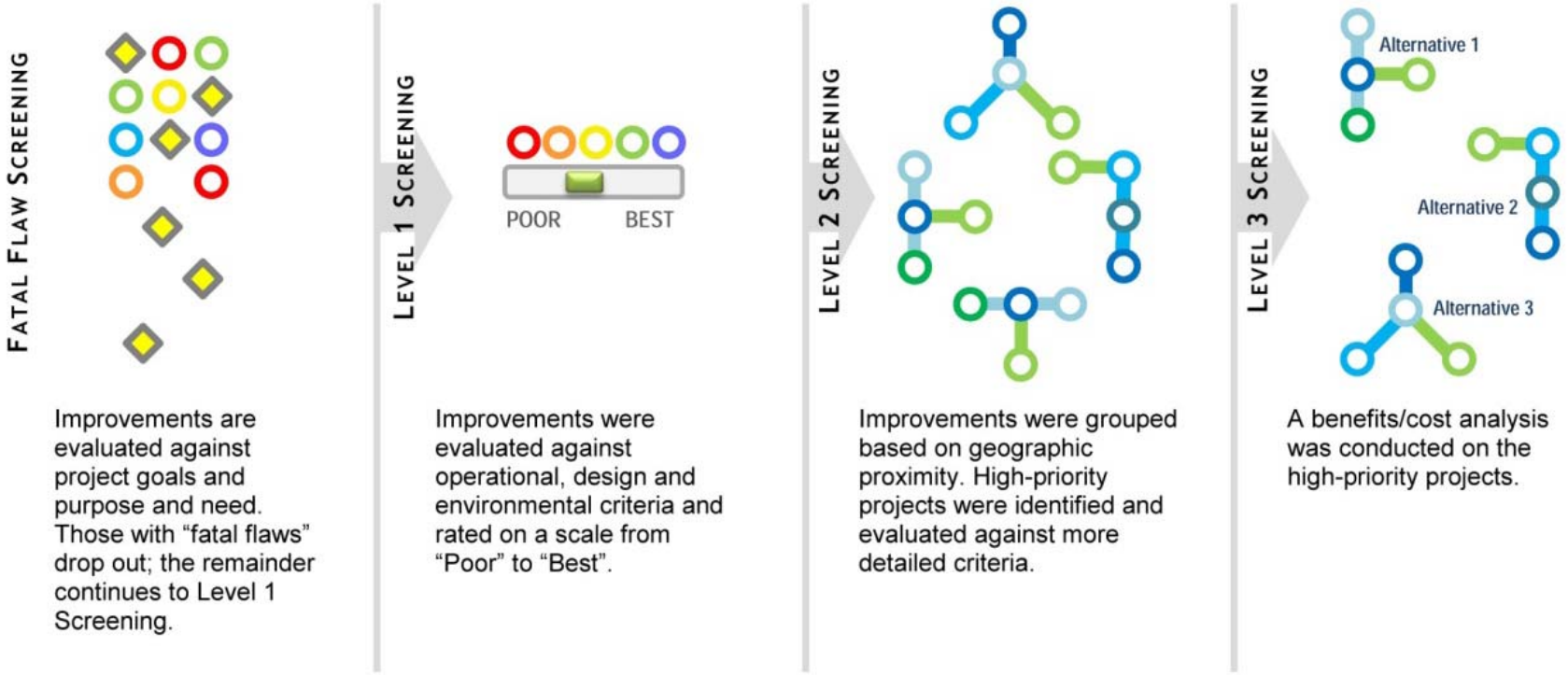


Figure ES-4: Planned Projects Included in the No-Action Alternative

Level 1 Screening – Comparative Screening Process

The Level 1 screening process provided a qualitative evaluation of the individual concepts. More thorough than the preceding fatal flaw screening, this step rated each improvement based on design, operations and safety, and environmental evaluation criteria. The evaluation criteria were developed for this study's Purpose and Need and pre-established goals.

Based on the results of the Level 1 Screening, the improvements were then divided into three tiers:

- Tier 1 – concepts with the highest potential for meeting the Purpose and Need and project goals
- Tier 2 – concepts with a medium potential for meeting the Purpose and Need and project goals
- Tier 3 – concepts with a low potential for meeting the Purpose and Need and project goals

Tier 1 and Tier 2 concepts were advanced to Level 2 Screening. Tier 3 concepts were not carried forward to Level 2 Screening but were held in reserve for consideration if the more detailed analysis in Level 2 screening indicates a Tier 1 or a Tier 2 concept performed poorer than expected.

Level 2 Screening – Quantitative Screening Process

The Level 2 Screening included grouping Tier 1 and Tier 2 concepts from Level 1 into projects based on compatibility and proximity. Six projects were identified for further evaluation and refinement. The six projects identified for further advancement in this study are listed in Table ES-1and shown in Figure ES-5.

The six projects identified for further advancement were subjected to a quantitative screening process. Similar to the qualitative Level 1 screening, this process assessed the six selected projects in three categories — design, operations and safety, and environmental. These categories included evaluation of the following criteria: cost, right-of-way, traffic operations, safety, and environmental impacts. Level 2 findings are summarized below.

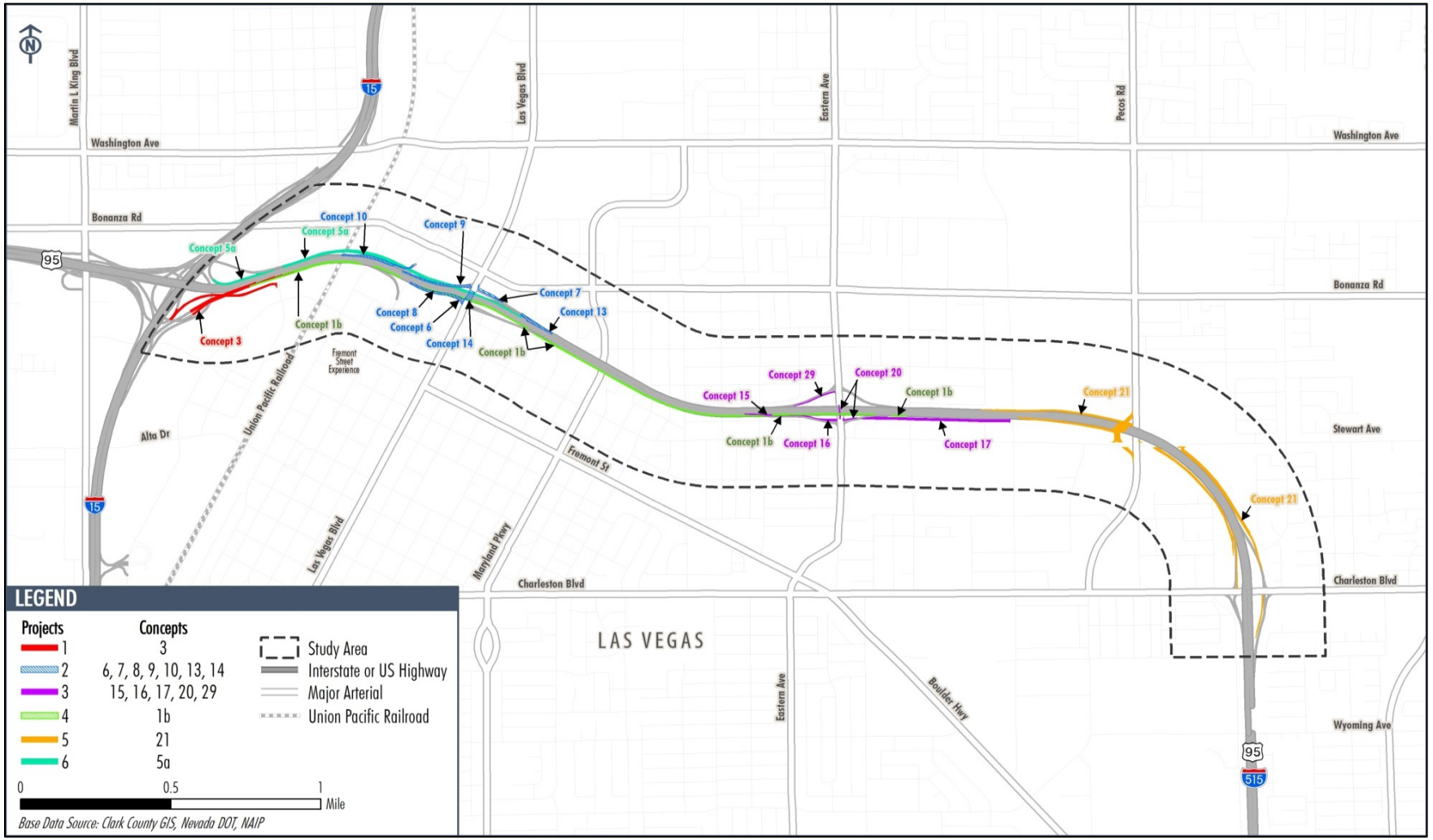
COST

Cost estimates for the projects identified for further advancement included two cost components: 1) capital costs and 2) operating, maintenance, and rehabilitation costs. All cost estimates were developed from preliminary conceptual drawings and are considered appropriate for planning level project programming purposes.

Table ES-1: Level 2 Screening – Projects Identified for Further Advancement in this Study

Project	Description of Project Elements	Benefits to Cost
Project 1: City Parkway Southbound Ramp	Construct a southbound directional ramp to City Parkway from the US 95/northbound I-15 ramp.	Project 1 Benefit/Cost Ratio 2.9
Project 2: Las Vegas Boulevard and Casino Center Boulevard Interchange Improvements	Add two right-turn lanes and two left-turn lanes on the southbound I-515 Las Vegas Boulevard off-ramp.	Project 2 Benefit/Cost Ratio 0.4
	Widen the I-515 northbound Las Vegas Boulevard off-ramp to provide two right-turn lanes.	
	Restripe the I-515 southbound Las Vegas Boulevard off-ramp to add one lane.	
	Widen the I-515 northbound Las Vegas Boulevard metered on-ramp to add one lane.	
	Widen the I-515 northbound Casino Center Boulevard on-ramp to three lanes.	
	Restripe the I-515 northbound Las Vegas Boulevard off-ramp to add a choice exit lane to the off-ramp.	
	Add one left-turn lane to the I-515 northbound Las Vegas Boulevard on-ramp interchange.	
Project 3: Eastern Avenue Interchange Improvements	Add one lane to the I-515 southbound Eastern Avenue off-ramp.	Project 3 Benefit/Cost Ratio 2.8
	Add one right-turn lane at the I-515 southbound Eastern Avenue off-ramp.	
	Construct a one-way frontage road between the I-515 southbound Eastern Avenue on-ramp and Mojave Road.	
	Add one left-turn lane on Eastern Avenue at the I-515 southbound Eastern Avenue Interchange.	
	Add one lane to the I-515 northbound Eastern Avenue on-ramp.	
Project 4: Southbound Auxiliary Lane from I-15 Underpass to Charleston Boulevard	Eliminate the southbound lane reduction at the I-15 underpass, and construct a full southbound auxiliary lane connecting to the proposed auxiliary lane between Eastern Avenue and Charleston Boulevard exit (partial widening of I-515 to the south).	Project 4 Benefit/Cost Ratio 6.8. Expected to have the greatest benefit/cost ratio because of the expected significant corridor-wide benefits.
Project 5: Pecos Road Interchange	Construct a split diamond interchange at I-515 and Pecos Road.	Project 5 Benefit/Cost Ratio 0.3. If completed together with other capacity improvement projects, it is likely that greater benefits would be realized.
Project 6: Collector-Distributor Road from Las Vegas Boulevard to I-15	Construct a collector-distributor road to allow ramp braiding on northbound I-515 between I-15 and Las Vegas Boulevard.	Project 6 Benefit/Cost Ratio 1.2. Expected to produce significant corridor-wide benefits greater than reflected in ratio. See Report.

Figure ES-5: Level 2 Screening – Projects Identified for Further Advancement in this Study



TRAFFIC OPERATIONS

Traffic operation analyses showed that each of the six projects identified for further advancement in this study would result in higher speeds and lower delays compared to the No-Action Alternative. Traffic operation results are summarized below.

- Project 1 is expected to impact traffic operations in three key segments of the I-515 study area. Both positive and negative impacts are expected if Project 1 is implemented as a stand-alone project.
- For Projects 2 and 3, operational impacts would be mostly localized.
- Project 4, which includes a third southbound lane under the Spaghetti Bowl, would eliminate a severe bottleneck, resulting in significant congestion reduction and improvements in corridor-wide operations.
- Minimal changes in operations are expected under Project 5 within the study area due to congestion and bottlenecks upstream and downstream along the I-515 corridor.
- Project 6 would result in significant congestion reduction and improvement in corridor-wide operations. Project 6 would also result in fewer vehicles entering I-515 because traffic from Las Vegas Boulevard and Casino Center Boulevard could access I-15 directly.

SAFETY

The study presents the safety performance of the six projects when compared to the No-Action Alternative. Project 6 provided the greatest improvement regarding crash frequency, with a reduction of 60 crashes per year per lane mile.

ENVIRONMENTAL

The Level 2 environmental screening refined the Level 1 environmental resource evaluations for each project, which included EJ populations, community facilities, recreational, cultural, and Section 4(f) resources, and hazardous material sites. The results of the environmental screening analysis are summarized in Table ES-2.

Table ES-2: Level 2 Environmental Screening Results

Project Number	EJ & Community Impacts Rating	Recreation Impacts Rating	Cultural Impacts Rating	Hazardous Materials Impacts Rating	Overall Rating
Project 1					
Project 2					
Project 3					
Project 4					
Project 5					
Project 6					

Level 3 Screening – Benefit/Cost Analysis

Level 3 involved benefit/cost analyses to evaluate the six projects identified for further advancement in this study. Benefits quantified in the analysis corresponded to:

- Reduced Travel Time
- Reduced Vehicle Operations Costs
- Reduced Crashes (Improved Safety)
- Reduced Emissions

Costs quantified in the analysis included:

- Capital Costs
- Operation, Maintenance, and Rehabilitation Costs

Results

Benefits and costs calculated for each project were discounted to determine common equivalent year 2016 benefits and costs. These discounted benefits and costs were used to determine the final benefit/cost ratios. The study presents the total cumulative benefits, costs, and benefit/cost ratios for all six projects. Some key observations from the benefit/cost analyses were:

- Project 1, Project 3, Project 4, and Project 6 are expected to provide benefit/cost ratios greater than 1.0. This implies that the total cumulative benefits produced would be greater than the total cumulative implementation costs for these projects.
- Project 4 is expected to have the greatest benefit/cost ratio (greater than 6.0) because of the significant corridor-wide benefits expected.
- Project 2 and Project 5 are expected to have a benefit/cost ratio below 1.0. This implies that the total cumulative benefits produced would be lower than the total cumulative cost of implementation.
- The true benefits of Project 6 will likely be greater than those represented by the benefit/cost ratio presented in the report. Reasons for this conclusion are explained in the Key Observations Regarding the Estimated Benefits section of the report.

ES.4 Outreach Conducted

NDOT conducted an extensive agency, stakeholder, and public outreach program throughout this study. A Public Information Plan was established at the onset of the study, with the goal to engage agencies, stakeholders, and members of the public in a meaningful way while reestablishing connections with stakeholders that were involved in the *I-515 Preliminary Draft Environmental Impact Statement* process.

Stakeholder Outreach

NDOT solicited stakeholder involvement throughout this study to achieve the following objectives:

- Proactively identify project and corridor issues, concerns, and needs
- Build valuable relationships

- Establish and strengthen public trust and support

NDOT involved stakeholders throughout the course of this study through the following:

- Project Kick-off Meeting and Site Visit
- Individual Stakeholder Interviews/Meetings
- Stakeholder Workshops and Field Trips

Public Outreach

Members of the public were provided the following opportunities to offer comments about this study:

- Send comments directly by email or U.S. mail
- Call NDOT project manager by telephone
- Send email using email link on project website
- Submit contact request form provided on project website
- Complete comment form provided at public meeting
- Provide verbal comments to stenographer at public meeting

A public meeting was held on March 31, 2016, at the East Las Vegas Community Center, which provided an opportunity for members of the public to express their concerns and have their questions answered. The meeting was conducted in an open house format with exhibit reviews from 4:00 PM to 7:00 PM, and a short presentation at 5:30 PM, followed by a question-and-answer session.

A project website (http://nevadadot.com/i-515study/) was established early and regularly updated to keep agencies and members of the public informed and up-to-date.

Over the course of the study, study team members were available for interaction with the public via phone, fax, email, and in person. The study team reached out to minority and low-income groups and organizations in the study area before and after the public meeting to advertise the meeting, provide general project information, and answer questions.

Significant public comments received are summarized below:

- Funding: Questions raised about how much the projects will cost and how they will be funded.
- Purpose and Need: Support voiced for improving the I–515 corridor.
- Alternatives/Design: Suggestions received about various design elements, such as bridge construction, ramp configurations, and additional lanes. Both support and opposition were voiced for the improvements, as recorded in letters and comments from the various meetings.

Agency coordination included meetings between FHWA and NDOT to discuss project status, public and agency involvement activities, work products, and improvement concepts.

In February and March 2016, NDOT sent 47 Intent to Study letters to local, state, and federal agencies; government bodies; companies; and organizations to identify concerns and potential issues related to the project. Comments received were considered during execution of the study.

ES.5 Implementation

This study identified six projects for further advancement, designed to address the traffic operational and safety needs along the I-515 corridor. These projects must compete for limited funding resources in order to be implemented. NDOT project priorities are reflected in its long-range transportation plan, *Connecting Nevada* (NDOT 2013), and its near-term Statewide Transportation Improvement Program (STIP) (NDOT 2016b). NDOT intends to evaluate, compare, and prioritize the projects from this study in relation to other transportation needs in the state to determine which projects will be added to the STIP and eventually constructed.

In cooperation with the City of Las Vegas, NDOT plans to advance Project 1 (City Parkway Southbound Ramp) and begin the environmental analysis in early 2017. Project 1 has received extensive support from stakeholders since its inception.

NDOT plans to seek funding for other high-value projects from this study. As funding is identified, projects will advance through project development, including the environmental, design, right-of-way, and construction phases.

Viaduct Structures: Project 7 and Project 8

Assessment of the two structures that comprise the Downtown Las Vegas Viaduct (G-947 and I-947) concluded that each structure would need to be replaced or rehabilitated, and this work would be best achieved in coordination with the implementation of adjacent projects. The G-947 viaduct structure (referred to as Project 7 in this study) is not a candidate for major rehabilitation investment and should be programmed for replacement. The I-947 viaduct structure (referred to as Project 8) could potentially be rehabilitated and widened; determination of a final replacement vs. rehabilitation course of action would require more detailed study.

National Environmental Policy Act Process

As NDOT identifies projects for implementation, it will coordinate with FHWA to outline environmental clearance requirements under NEPA. Because this study adopted a PEL approach, an environmental analysis was conducted at the planning level based on existing mapping and environmental resource data. Future NEPA studies will require more detailed analyses of the environmental resources that could be impacted by the projects as they are implemented.