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UNION PACIFIC RAILROAD CROSSING STUDY

Final Report



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Executive Summary

The Union Pacific Railroad (UPRR) Crossing Study focused on identifying current and future network deficiencies with respect to the UPRR, developing potential solutions, and prioritizing solutions with regard to the Regional Transportation Commission of Southern Nevada's (RTC) goals.

The study commenced in October 2009 with detailed field review and data collection in the study area—from the Cactus Avenue crossing in the south to Las Vegas Boulevard in the north, along the UPRR mainline.

A technical working group (TWG) was established to guide alternative development and prioritization of UPRR crossings. The TWG included personnel from the RTC, UPRR, Clark County, City of Las Vegas, City of North Las Vegas, Clark County School District (CCSD),

Nevada Department of Transportation (NDOT), and the Federal Highway Administration (FHWA). Through a collaborative meeting process, the TWG provided guidance for identifying mobility and safety issues regarding existing and future UPRR crossings, investigating resolutions for identified issues, and defining the stakeholder and user needs that influence the decision process for prioritizing alternatives and crossing needs.

The UPRR, which runs approximately parallel to I-15 through much of the Las Vegas valley, acts as a mobility impediment in some cases. By identifying locations and potential solutions where mobility is restricted, the RTC can better program and prioritize alternatives and potentially fund projects to increase efficiency and effectiveness of transportation in the valley.

Identifying current network deficiencies and analyzing land use and transportation conditions in the areas surrounding the crossings led to the development of several potential alternative solutions to mitigate deficiencies. Transit connectivity issues were identified at the grade-separated UPRR crossings with Tropicana Avenue, Charleston Boulevard, Bonneville Avenue, and Ogden Avenue due to substandard vertical clearances. At the Charleston Boulevard grade separation, shallow storm drain facilities under the roadway would make re-profiling the underpass extremely difficult and costly. Improvements at this location were therefore not considered. The structures at both Bonneville Avenue and Ogden Avenue and the UPRR are constructed as “box” type structures. Therefore, replacement of these structures at both locations would be costly. This reconstruction would

require the disruption of rail and vehicular traffic for a considerable amount of time.

Potential solutions were developed for two locations: Oakey Boulevard/Wyoming Avenue and Cactus Avenue/Erie Avenue. The mitigation of future crossing deficiencies was captured through the projects included in the *Regional Transportation Plan* (RTP) or other local agency plans.

Criteria were developed based on stakeholder input and a general scan of project selection criteria employed for similar selection processes. The criteria were grouped into seven major categories corresponding to stakeholder needs and addressing RTP’s regional goals and objectives. The prioritization criteria were broad-based and applicable across all major modes of transportation including automobile, transit, bicycle, and pedestrian. The criteria provided an assessment of the impact that the proposed alternative or crossing would have on mobility and circulation, safety, efficiency, and the environment, while maintaining neighborhood and community integrity.

Evaluation results indicated that the criteria equally captured all transportation modes. Projects involving four primary modes (vehicular, transit, bicycle, and pedestrian) were contained in the top five priorities within the short-term category of crossings:

1. Sunset Road (vehicular)
2. Union Park Pedestrian Bridge (pedestrian)
3. Cactus Avenue (vehicular)
4. Erie Avenue/Cactus Avenue
Pedestrian Underpass (pedestrian/bicycle)
5. Discovery Drive/Lewis Avenue (transit)

The Oakey Boulevard/Wyoming Avenue grade separation ranked first in the long-term category of crossing projects. This project assumes that the MLK/Industrial Connector has been already built.

The prioritization criteria intended to capture the importance of a crossing at a specific location. Many of the crossings evaluated through this process were included in major regional projects with more extensive benefits than a particular crossing would provide. These benefits have not been fully captured by this study's criteria, which were focused on localized areas. While they may not rank as high as expected on this specific study, major regional projects can be placed into the perspective of more encompassing, multidisciplinary efforts.

The prioritization process of the UPRR crossings was based on available information, which primarily included existing facilities or near-term plans for specific routes. This lack of information introduced a subjectivity factor into the evaluation of long-term projects, especially those that include a crossing that does not yet exist.

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Appendix A: Technical Memo - Existing Conditions and Future Needs

Appendix B: Technical Memo - Prioritization of Alternatives and Future UPRR Crossings

Appendix C: Prioritization Results

Acknowledgements

This document is the result of more than one year of dedication and effort from a variety of stakeholders. Without their support, this study would not have been possible. The Regional Transportation Commission of Southern Nevada (RTC) is grateful for their participation and would like to take the opportunity to thank those that contributed in developing this study.

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Notes



1 Overview

In this chapter:

- ✓ Project scope
- ✓ Need and purpose
- ✓ Technical working group
- ✓ Report organization

1.1 Study Area

Construction of a railway line between Salt Lake City, Utah, and Los Angeles, California, via Las Vegas, Nevada, began in 1901 with the formation of the San Pedro, Los Angeles, and Salt Lake Railroad Company (LA&SL). The railroad's mainline was completed in 1905, and in 1916, company shareholders adopted the LA&SL name. Today the former LA&SL railroad tracks operate as an integral part of the Union Pacific Railroad (UPRR) system.

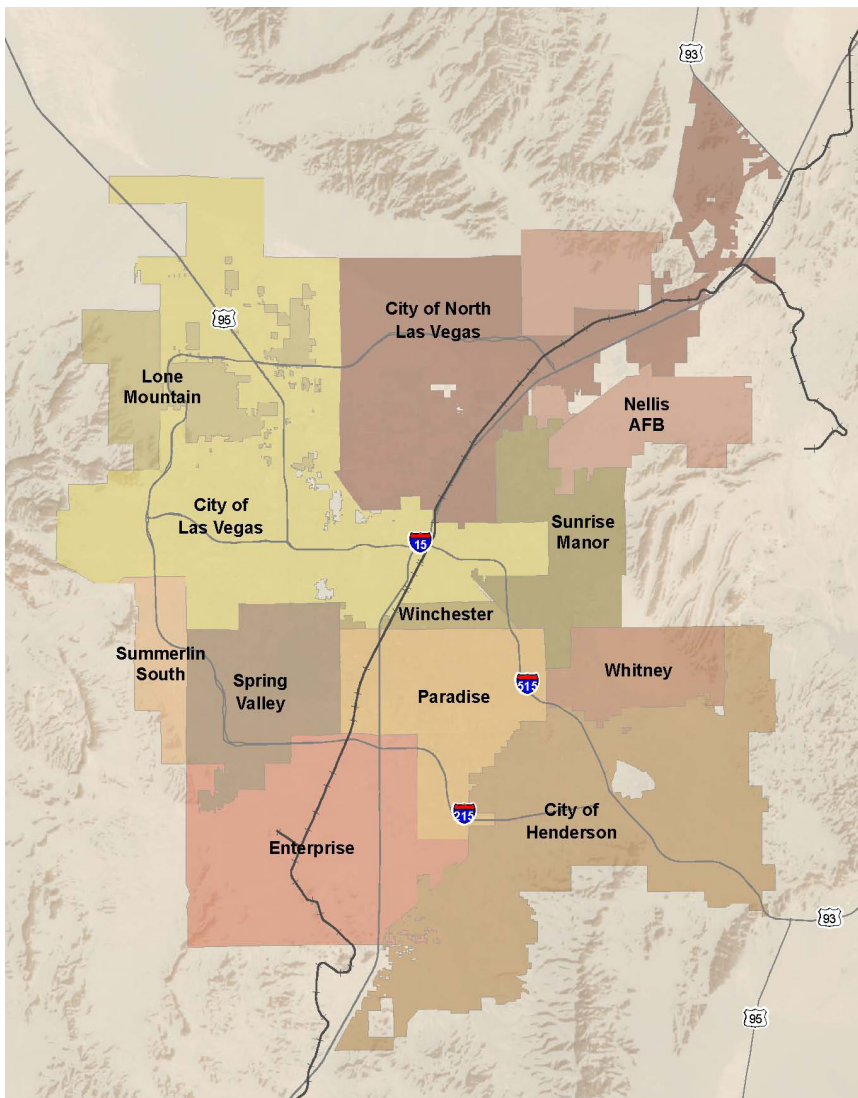


Figure 1. Union Pacific Railroad in Las Vegas, Nevada

The UPRR mainline enters the Las Vegas Valley Urban Area (Las Vegas) just south of Cactus Avenue, west of Interstate 15 (I-15). Las Vegas is the largest urbanized area in Clark County and Nevada with a July 1, 2008, population estimate of 1,936,376. Clark County has been one of the fastest growing areas of the country, with an average population growth of 5.22% from 1990 to 2008. The number of vehicles traveling on the roadways in the Las Vegas urban area also increased substantially.

Although the rate of population growth has been in recent decline, Clark County's population is projected to be 2,715,000 by 2020 and 3,126,000 by 2030.

South of I-215, the UPRR crosses primarily residential areas and vacant land. Many of these residential areas lack connectivity to the rest of the network and employment centers due to the decline in development and plans for infill development that never occurred.



Between I-215 and I-515, the UPRR crosses primarily industrial areas and runs parallel to the resort corridor, where the largest employment centers are located. Several major arterials—including Flamingo Road, Tropicana Avenue, Sahara Avenue, and Charleston Boulevard, all of which serve Annual Average Daily Traffic (AADT) of approximately 50,000 to 80,000 vehicles—cross the UPRR in this area. Several regional transit routes also provide connectivity between the areas east and west of the UPRR and I-15. Significant pedestrian activity is present in the areas near the resort corridor, but long crossing structures do not make these pedestrian trips welcoming.

North of I-515, the UPRR crosses industrial and residential areas on both sides.

Figure 2. Las Vegas Valley Urban Area

1.2 Need and Purpose

Running approximately parallel to I-15 through the entire Las Vegas valley, the UPRR has always been a mobility impediment. Many major arterials crossing the UPRR have provided much-needed connectivity, but in other areas the railroad continues to restrict mobility. Several of these areas have been identified by local agencies, and projects that provide additional connectivity have been included in the *Regional Transportation Plan* (RTP). Additionally, minor deficiencies exist and would provide improved mobility if addressed.

Which UPRR crossings need to be funded first?
That is the question that this study helps
to answer.

Funding for transportation improvements is becoming more and more difficult due to a decline in state and federal revenues, while the need for providing connectivity is increasing.

Under these circumstances, the Regional Transportation Commission of Southern Nevada (RTC) needs a tool to better program and prioritize alternatives and to potentially fund projects that increase the efficiency and effectiveness of transportation in the valley.

The following goals are the foundation for this planning effort:

- Improve safety
- Improve overall system efficiency
- Increase transportation network convenience for all modes
- Update the transportation system to improve air quality

The specific objectives of this project are to:

- Identify current and future network deficiencies with respect to the UPRR
- Develop potential solutions
- Prioritize existing and future potential solutions with regard to the RTC's goals

1.3 Technical Working Group

This study benefited from the active involvement and participation of a broad range of agencies and stakeholders. In an effort to direct the development of this study, a Technical Working Group (TWG) was organized to include representatives from both governmental and private entities. The TWG held meetings throughout the project to discuss the progress of each study task, address issues, provide guidance in developing evaluation criteria, and comment on evaluation results. Table 1 lists the TWG members.

Table 1. TWG Members

Name	Agency
Aziz Aman, PE	UPRR
Lori Campbell	NDOT
Paulette Carolin, FAICP	RTC
Clete Kus, AICP	City of North Las Vegas
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Joanna Wadsworth, PE	Clark County

1.4 Report Organization

This report is organized in the following manner:

- Chapter 1 provides a project overview including study goals, needs, and purpose.
- Chapter 2 provides information on the data collection effort and introduces the future UPRR crossing needs identified by local agencies and included in the RTP.
- Chapter 3 assesses existing crossing deficiencies, identifies the need for future crossings not previously identified by agencies, and explores opportunities for mitigation.
- Chapter 4 focuses on the evaluation and prioritization criteria development process.
- Chapter 5 presents potential solutions to mitigate the deficiencies identified in Chapter 3.
- Chapter 6 presents the prioritization results.
- Chapter 7 summarizes findings and presents conclusions.

2

Data Collection

In this chapter:

- ✓ Data collection
- ✓ Relevant studies and projects
- ✓ Future mobility needs

The data collected for the project study area was used to identify current and future UPRR crossings, existing crossing conditions, and safety issues. It also provided background information for evaluating alternatives and prioritizing projects.

This chapter provides information regarding the data collection effort, introduces the crossing locations studied, and presents the crossing needs identified by local agencies in the RTP.

2.1 Data Collection

The focus of the data collection task was to collect and summarize information relevant to the existing UPRR crossings as well as planned projects within the study area. The data collection process involved the following activities:

- Obtain recently completed and ongoing technical/planning studies from the RTC and other agencies addressing pedestrian mobility within and adjacent to the project study area.
- Obtain U.S. Department of Transportation grade crossing inventory.
- Obtain additional inventory and crash data from NDOT.
- Review the RTP and obtain future traffic projections from the regional travel demand model for 10- and 20-year horizons.

- Obtain and review the Master Plan of Streets and Highways from the City of North Las Vegas and the City of Las Vegas.
- Collect information on the Clark County Trails Program, City of Las Vegas Transportation Trails Element, and the City of North Las Vegas Citywide Trails and Bikeways Master Plan.
- Collect information on planned bus routes and impacts to existing UPRR crossings.
- Develop a preliminary map illustrating existing and planned UPRR crossings.
- Review field conditions at each existing and future UPRR crossing.
- Obtain information regarding ongoing studies and designs that involve new or improved UPRR crossings.
- Meet with City of Las Vegas staff to discuss existing land use, pedestrian, tourist, and employment destinations and planned redevelopment within the downtown area.

2.2 Relevant Studies and Projects

Other documents that provided information applicable to this study were gathered, including the Downtown Pedestrian Circulation Master Plan, the Project Neon Draft Environmental Impact Statement (DEIS), and the draft City of North Las Vegas Citywide Trails and Bikeways Master Plan.

Information was gathered regarding proposed projects that are under design and set to be implemented upon funding availability.

UPRR crossings that are under design include:

- Cactus Avenue UPRR crossing
- Harmon Avenue/Valley View Boulevard UPRR crossing
- Las Vegas Wash pedestrian bridge trail
- Pedestrian bridges at Union Park
- Sunset Road UPRR crossing

Most of these projects have not received funding, except for the Las Vegas Wash pedestrian bridge trail, which is funded by the Southern Nevada Public Land Management Act (SNPLMA).

2.3 Future Mobility Needs

Future mobility needs were identified through a review of the RTP, local agency transportation plans, and concerns raised by staff and TWG members. Table 2 shows information from the RTP and other local agencies regarding planned improvements that involve UPRR crossings.

Table 2. Planned Improvements Involving UPRR Crossings

Crossing	Arterial	Plan	Year
Sunset	Decatur to Valley View	RTP	2009
Lamb	CC-215 – I-15	RTP	2009
Union Park	Union Park to Main Pedestrian Overpass	RTP	2009
Union Park	Pedestrian Overpass	CLV	N/A
Union Park	Pedestrian Overpass	CLV	N/A
Union Park	Symphony/Lewis Overpass	CLV	N/A
LV Wash	Trail – Pedestrian Overpass	CNLV	N/A
Valley View	Tropicana to Flamingo	RTP	2011
Jones	Blue Diamond to Windmill	RTP	2012
Cactus	Ft Apache to Rainbow (UPRR overpass)	RTP	2015
Oakey/ Wyoming	I-15 to Main	RTP	2019
Windmill	Durango to Decatur	RTP	2020
Lake Mead	Losee to Las Vegas Boulevard	RTP	2020
Centennial	Lamb to Range	RTP	2020
Tropicana	Decatur to Polaris	RTP	2024
Robindale	Jones to Valley View	RTP	2025
Washburn	Pecos to Lamb	RTP	2026
Unnamed	Las Vegas Boulevard to Farm	RTP	2030

3

Assessment of Current Deficiencies

In this chapter:

- ✓ Field review
- ✓ Roadway conditions
- ✓ Railroad conditions
- ✓ Transit connectivity
- ✓ Connectivity to community services and facilities

This chapter provides an assessment of existing crossing deficiencies and identifies needs for future crossings not previously identified by agencies. The assessment includes roadway and railroad physical characteristics; safety; vehicular, pedestrian, and transit connectivity to community services and facilities; and context. Potential deficiencies were identified by assessing traffic and safety data and through detailed field review of the features at each crossing. This chapter also explores opportunities to mitigate the identified issues. Detailed information regarding the identified deficiencies can be found in the technical memoranda in the appendices.

3.1 Field Review

Several sources were used to ascertain the information needed to assess the UPRR crossings. The study team conducted several field visits to

observe safety, connectivity, and context and to document geometric characteristics, including signage and marking. Also, field training was organized by the UPRR to observe safety elements of each crossing, including driver behavior.

3.2 Roadway Conditions

There are 28 existing crossings within the study area; the majority are grade-separated.

Grade-Separated Crossings

Field investigations and a review of agency information indicated that transit connectivity issues existed at the grade-separated UPRR crossings with Tropicana Avenue,



Figure 3. Existing UPRR Crossings



Figure 4. UPRR Grade Separation at Charleston Blvd.

Charleston Boulevard, Bonneville Avenue, and Ogden Avenue due to substandard vertical clearances.

Another deficiency was identified at the Las Vegas Boulevard North underpass. The current vertical clearance is 14 feet, which may not be sufficient to accommodate the growing truck traffic in this area. The current span is 32 feet and accommodates two 10-foot travel lanes in each direction with no shoulders.

At-Grade Crossings

There are three at-grade crossings within the study area: Desert Inn Road, Oakey Boulevard/Wyoming Avenue, and Range Road. The Range Road crossing is a private crossing outside the jurisdiction of local agencies and NDOT and is therefore not considered within this study.



Figure 5. UPRR At-Grade Crossing at Desert Inn Road

Several deficiencies critical to safety and pedestrian connectivity are identified at the Oakey Boulevard/Wyoming Avenue at-grade crossing. The crossing is located just east of a residential area; and 330 feet east of the crossing, Wyoming Avenue crosses Industrial Road, which primarily serves the businesses and casinos on the west side of Las Vegas Boulevard.

The automatic gates provide protection for vehicles only. Field observations during a train ride, however, showed that, due to the absence of a median, drivers can maneuver around the gates.



Figure 6. UPRR At-Grade Crossing at Oakey Boulevard/Wyoming Avenue



Pedestrian connectivity is absent. As shown in Figure 7, the sidewalk is not connected to a pedestrian path across the railroad and is not protected with gates. The markings on

Figure 7. Missing sidewalk at Oakey Boulevard/Wyoming Avenue At-Grade Crossing

the roadway appear to be in poor condition. Alternative potential solutions for mitigating the deficiencies at this location are discussed in Chapter 5 of this report.

3.3 Railroad Conditions

The daily train frequency in the rail corridor through the Las Vegas valley is 19 trains per day, with maximum train speeds from 60 to 79 mph. Crossing details for each location are included in Appendix A. Table 3 summarizes existing railroad conditions at both at-grade crossings.

Crash data obtained from the Federal Railroad Administration (FRA) indicate three crashes in the past 10 years, all of which occurred at the Desert Inn Road crossing. The crashes were limited to property damage only. Also, this crossing was upgraded recently.

Table 3. Railroad Conditions

	Desert Inn Road	Oakey Boulevard/Wyoming Avenue
Crossing Protection	Automatic gates	Automatic gates
Sidewalk Crossing Panels	None	N/A
Railroad Track Condition	Not provided	Not provided
Trains per Day	19	19
Number of Tracks	2	2
Train Speed (mph)	60-79	20-79

3.4 Transit Connectivity

RTC has opened a new regional transit center at the corner of Bonneville Avenue and Casino Center Boulevard. The transit center allows passengers to transfer from one route to another or to terminate trips in the downtown area. To improve system efficiency, the RTC is deploying double-deck buses, especially on routes with high ridership volumes. Operating articulated vehicles is more expensive per mile for the agency than a double-deck vehicle, particularly on these routes.

The existing and planned RTC transit routes along Charleston Boulevard and Alta Drive can reach the new transit terminal either through the Charleston Boulevard underpass or the Bonneville Avenue underpass. These two locations are not able to accommodate double-deck buses due to the substandard clearance, as identified in Section 3.2.

The Charleston Boulevard underpass is in a sump condition with the low point occurring directly under the bridge. There are existing inlets at the low point, draining to a 42-inch reinforced concrete pipe (RCP) storm system that runs east beneath Charleston Boulevard. Alternative solutions for this location are extremely limited and costly and were therefore not considered.

The Bonneville Avenue grade separation consists of a single-span concrete bridge structure with center supporting piers on closed abutments. The abutment walls are integral to the deck and the footings, which extend across Bonneville Avenue as part of the roadway surface. The entire bridge structure is essentially a culvert with piers down the center. Replacing the structure is costly and would require the disruption of rail and vehicular traffic for a considerable amount of time.

The study team looked into the transit vehicles using the Ogden Avenue underpass as an alternative. However, the substandard vertical clearance of this underpass and the type of structure, similar to the Bonneville Avenue underpass, makes it a non-viable alternative to the proposed Bonneville route.

The redevelopment plans underway within the downtown Union Park area may include an opportunity to provide transit route connectivity with the new transit center. Constructing a new crossing over UPRR that connects Symphony Parkway with Lewis Avenue is one of the transportation improvement alternatives that the City of Las Vegas is considering in its redevelopment planning.

A similar connectivity issue was identified at Tropicana Avenue in the westbound direction. Tropicana Avenue is a major east-west arterial that connects residential areas on the east and west side of the valley with major resort corridor employment centers and UNLV. With an average daily ridership of 8,700 passengers, a clearance improvement to accommodate double-deck buses on this route is a priority for the RTC.



Figure 8. Tropicana Avenue Grade Separation

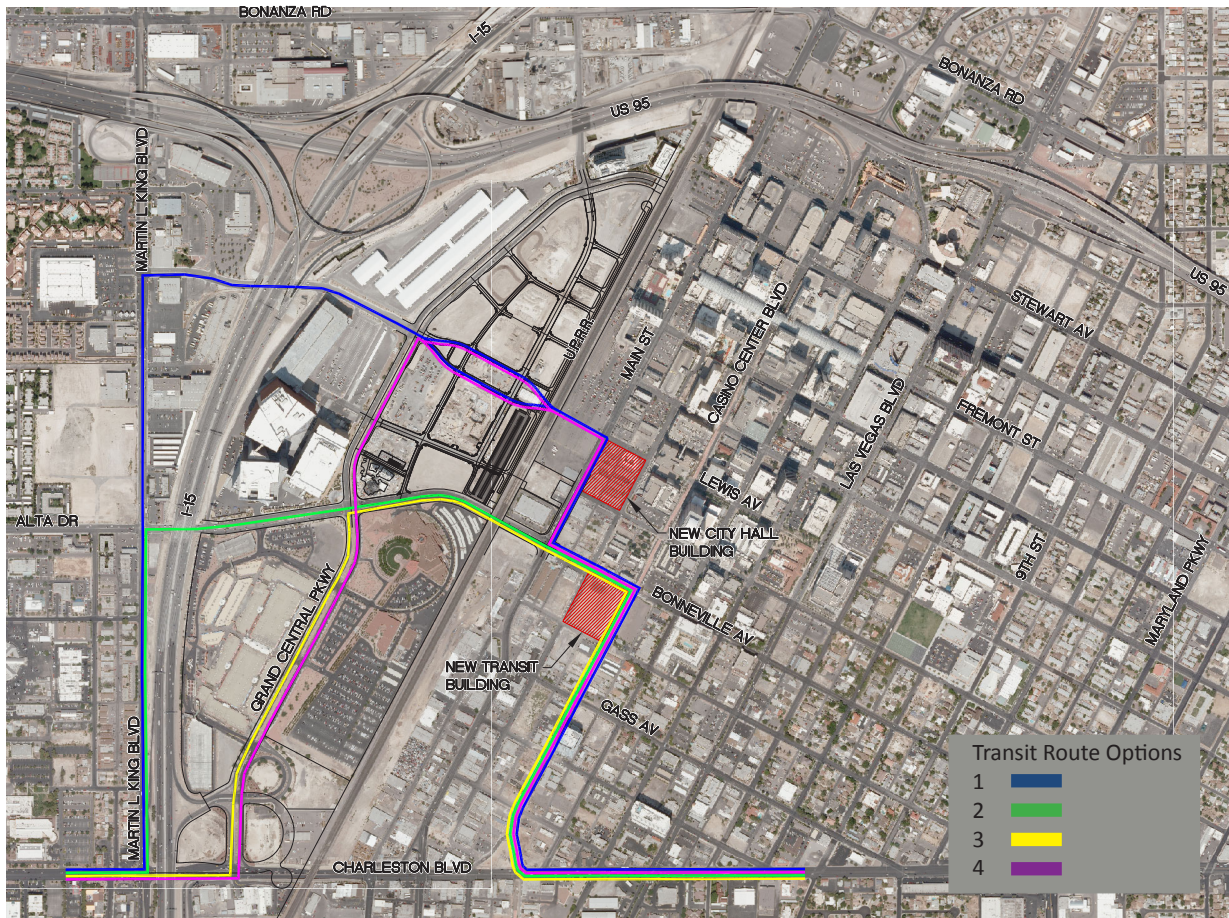


Figure 9. Transit Alternative Route Opportunities

The UPRR bridge structure crossing over Tropicana Avenue is very old and the design plans were not available. Therefore, a specific estimate of the required improvement was not performed. However, widening Tropicana Avenue, with rehabilitation or replacement of the UPRR structure, is included in the RTP as a long-term improvement in year 2024.

3.5 Connectivity to Community Services and Facilities

Identification of locations where mobility is restricted was performed through a review of existing land uses and public facilities and through visual investigation in the field. The analysis focused on restricted or out-of-direction travel of vehicles, pedestrians, and bicycles on

their routes to school, emergency services or other public facilities, and commercial destinations.

In the southern part of the valley, south of I-215, the UPRR alignment is surrounded primarily by undeveloped land. A significant amount of residential development started in this area within the past 10 years. These communities are isolated from each other, however, and in many instances lack connectivity with commercial centers and public facilities.

Desert Oasis High School is located a quarter mile south of Cactus Avenue and approximately 700 feet east of the UPRR. The existing school zone extends west, and residential development exists approximately 700 feet west of the tracks.



Figure 10. Desert Oasis High School

The Cactus Avenue/UPRR overpass project is under design, but it is not planned to be funded through the RTP until 2015. The lack of connectivity between the residential areas and the school at Erie Avenue and opposite the school cause out-of-direction automobile trips that increase the distance from less than a half mile to more than seven miles. This situation reportedly entices students to cross the UPRR tracks and fence at the school.

Site observations indicate that there is one large drainage structure under the tracks at Cactus Road and three small drainage structures in the area between the residential development and the school. A detention basin is being constructed just northwest of the future Cactus Avenue overpass. The flow in the area bounded by Erie Avenue, the UPRR, Rainbow Boulevard, and Star Avenue will continue to use the three existing culverts located between Erie Avenue and Star Avenue. The flow crossing these culverts is significant and does not allow a safe pedestrian crossing. Also, to comply with ADA and UPRR requirements for vertical clearance, the structure may need to be replaced. Drainage issues and cost of replacement make this alternative not feasible.

Once the detention basin is completed, it is understood that the wash, over which the UPRR structure at Cactus exists, will not be needed to convey drainage flows. Using this structure as a pedestrian underpass offers a safer alternative to crossing the tracks and an efficient option for decreasing the walking distance to school. More details on alternative potential solutions for this location are discussed in Chapter 5 of this report.



Figure 11. Cactus Underpass

Connectivity issues also exist at Jones Boulevard near Blue Diamond Road. The recent construction on Blue Diamond Road and the UPRR grade-separated crossing have improved connectivity with areas southeast and northwest of this location. Out-of-direction trips still occur, however, due to the lack of connectivity along Jones Boulevard. The UPRR grade-separated crossing at Jones Boulevard is included in the RTP.

In the central part of the valley, from I-215 to US 95, the UPRR alignment runs in close proximity to I-15 and crosses it near Twain Avenue. The land use surrounding the UPRR is primarily industrial and service commercial, with large-scale buildings adjacent to the resort corridor. Construction of the Sunset Road/UPRR overpass and Harmon Avenue/Valley View Boulevard overpass, which are under design, will improve automobile and transit connectivity with

the resort corridor and contribute to distributing the traffic to less congested arterials, thereby relieving the adjacent arterials. The construction of UPRR grade-separated crossings at these locations is included in the RTP.

In the northern part of the valley, connectivity is also limited to the major east-west arterials, spaced every mile. However, major safety and connectivity issues have not yet been studied. The North 5th project and the Las Vegas Wash Trail, which are under design, will provide additional connectivity for automobiles, transit, and pedestrians in this part of the valley.

Notes



4

Prioritization Criteria

In this chapter:

- ✓ Criteria development process
- ✓ Selected prioritization criteria
- ✓ Application of Prioritization Criteria

The UPRR Crossing Study serves as an unbiased, methodological way of providing RTC direction in determining funding for projects through prioritization. This chapter summarizes the prioritization criteria development process, introduces the selected prioritization criteria, describes what these criteria represent, and provides information on the application and weighting of the criteria.

4.1 Criteria Development Process

Criteria development began with a workshop, with the goal of broadly identifying railroad crossing concepts that could be shaped into meaningful project selection criteria. The stakeholder agencies and organizations that attended the workshop included:

- RTC
- UPRR
- NDOT
- FHWA
- City of Las Vegas
- City of North Las Vegas
- Clark County School District
- Clark County

Through detailed discussions and collaboration, the workshop identified user and stakeholder needs.

The second effort in criteria development was a general scan of project selection criteria employed for similar selection processes, including the goals and objectives driving the criteria. RTC's goals and objectives were included and emphasized. Combining this information with the criteria workshop results generated a comprehensive set of 12 criteria.

An equitable process for applying criteria to multiple project types with differing user groups was then explored. Criteria selection processes inherently contain unfairness, due to issues such as preference, mathematics, linguistics, and decision science. Each element of partiality resulting from criteria application was identified, evaluated, and addressed to the highest degree possible. This effort was undertaken through an iterative revision process by a group of area experts. The result was the project prioritization implementation guide included in Appendix B.

The developed prioritization criteria were broad-based and applicable across all major modes of transportation including automobile, transit, bicycle, and pedestrian.

4.2 Selected Prioritization Criteria

The selected prioritization criteria, listed below, were question-based:

1. *Does the proposed crossing increase accessibility and mobility options?* This criterion rewards projects that improve access to transit, support or provide for development of fully integrated modal options, and provide for connectivity among modes.
2. *Is the crossing regionally important?* This criterion rewards projects that provide more crossing opportunities in terms of AADT.
3. *Does the project enhance safety for all travelers?* This criterion evaluates the safety benefits of the proposed crossing based on the assessment of existing safety conditions.
4. *Does the project preserve and enhance the existing transportation corridors?* This criterion recognizes the importance of preserving and enhancing the existing transportation network and facilities in maintaining mobility and providing reliability to the users.
5. *Does the specific project fit into the planned physical setting?* This criterion measures the relationship between transportation and land use by evaluating whether a specific project fits into the planned physical setting and how it can impact planned land uses.
6. *Does the project improve reliability?* This criterion rewards projects that, through best judgment, improve reliability of travel between areas separated by the UPRR.
7. *Is the project's cost lower than the given thresholds?* This criterion rewards projects that do not have a significant cost impact. The following thresholds are used:
 - \$ Project cost lower than \$5 million
 - \$\$ Project cost between \$5 and \$25 million
 - \$\$\$ Project cost higher than \$25 million
8. *Does the project support more efficient freight movement?* This criterion rewards projects that contribute to safer and more efficient freight movement along and across the UPRR.

9. *Does the project have any projected negative impacts on natural resources, air quality, noise, energy conservation, or disadvantaged areas?* This criterion rewards projects that are considered to have less opportunity for negative impacts on natural resources, air quality, noise, energy conservation, and disadvantaged areas.
10. *Does the project leverage funds?* This criterion recognizes projects that have the opportunity to leverage funds.
11. *Is the project ready for implementation?* Many projects have already been through the design process and are ready for implementation. This criterion recognizes the readiness of projects that could proceed to construction within 6 months.
12. *Does the project have community support?* This criterion rewards the projects that, in best judgment, have community support.

The interrelated nature of the major evaluation categories allowed criteria to be relevant in more than one category. The repetitiveness of a given criteria was therefore an indicator of its weight or significance. The weighting criteria matrix shown in Table 4 was developed to capture the relationships and determine the weight.

At this point in the process, it became apparent that the criteria for selecting the preferred alternative solutions and the criteria for prioritizing the solutions were similar. The same set of criteria was therefore used to select the preferred alternatives to mitigate deficiencies at specific locations and to prioritize and integrate these solutions into projects identified in the RTP.

4.3 Application of Prioritization Criteria

To simplify their application, the evaluation consisted of a set of questions requiring a yes/no answer, equaling 1 or 0 points.

The criteria were grouped into seven major categories corresponding to stakeholder needs and addressing the RTP's regional goals and objectives:

1. Connectivity
2. Safety
3. Defined pathway/context
4. Economic impact
5. Regional priority
6. Preliminary NEPA compliance
7. Project momentum

Table 4. Prioritization Criteria Weighting Matrix

		Evaluation Criteria	Categories						Project Momentum	Multiplier
			Connectivity	Safety	Defined Pathway/Context	Economic Impact	Regional Priority			
No.										
1	Does the proposed crossing increase the accessibility and mobility options? (Y/N)									2
2	Is this crossing regionally important? (Y/N)									1
3	Does this project enhance safety for all travelers? (Y/N)									2
4	Does this project preserve and enhance the existing transportation corridors? (Y/N)									1
5	Does this specific project fits into the planned physical setting? (Y/N)									2
6	Does this project improve reliability? (Y/N)									1
7	Is the cost of this project lower than the given thresholds? (Low/Medium/High)									1
8	Does this project support more efficient freight movement? (Y/N)									1
9	Does this project have projected negative impacts on natural resources, air quality, noise level, energy consumption and disadvantaged areas? (Y/N)									1
10	Does this project leverage funds? (Y/N)									1
11	Is this project ready for implementation? (Y/N)									1
12	Does this project have community support? (Y/N)									1
	Total Score	2	1	2	3	4	3	3	3	15
	Category Weight	13%	7%	13%	20%	27%	20%	20%	20%	100%

5

Alternative Mitigation Measures

In this chapter:

- ✓ Cactus Avenue/Erie Avenue Pedestrian Crossing Alternatives
- ✓ Oakey Boulevard/Wyoming Avenue Improvement Alternatives

This chapter presents potential solutions to mitigate deficiencies identified in Chapter 3. The development of mitigation alternatives focused on pedestrian connectivity in the vicinity of the Cactus Avenue crossing and safety improvements at the Oakey Boulevard/Wyoming Avenue at-grade crossing.

5.1 Cactus Avenue/Erie Avenue Pedestrian Crossing Alternatives

Pedestrian crossing alternatives that facilitate pedestrian movements from the residential communities west of the UPRR to the Desert Oasis High School just south of Cactus crossing include:

- Baseline Alternative
- Alternative A: Trail under existing structure using Rainbow Boulevard

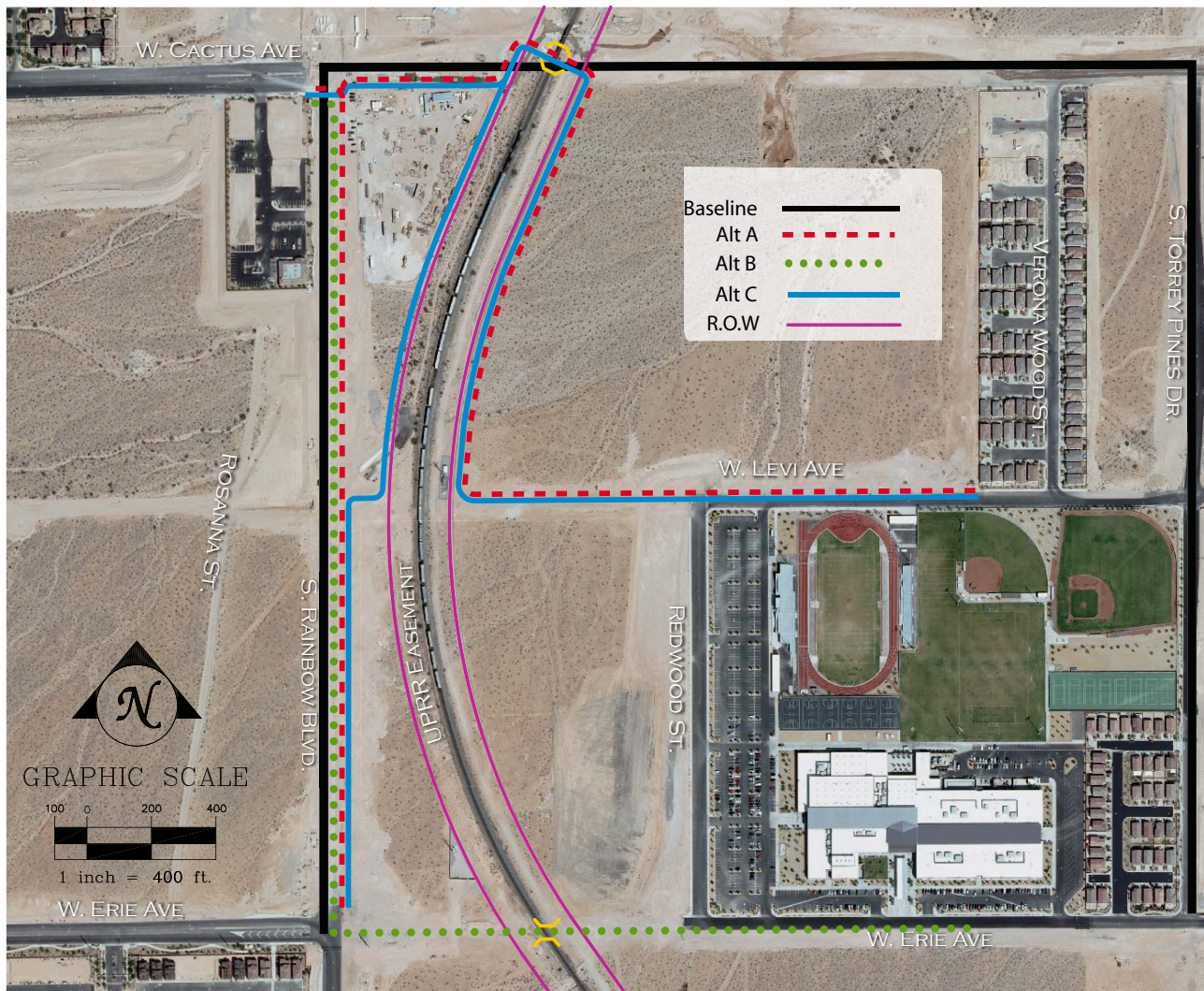


Figure 12. Pedestrian Crossing Alternatives for Desert Oasis High School

- Alternative B: Desert Oasis pedestrian crossing overpass
- Alternative C: Trail under existing structure using trail along UPRR

Figure 12 shows the pedestrian paths for each alternative.

Baseline Alternative

This alternative represents the planned Cactus Avenue overpass. The facility is planned to include three vehicle travel lanes in each direction, shared bicycle routes, and standard

5-foot sidewalks. Pedestrians from communities west of the UPRR will use Rainbow Boulevard, Cactus Avenue, and Torrey Pines Drive to reach the high school. The average travel distance is approximately 1.7 miles.

Alternative A

Under this alternative, the existing UPRR structure would remain partially open to facilitate the movement of pedestrians and bicycles. A trail would be constructed to connect the sidewalk on the west side of the UPRR with the sidewalk or path on the east side.

The average travel distance is approximately 1.3 miles. Figures 13 and 14 show the view and the cross-section of the trail.



Figure 13. Pedestrian Trail Underpass at Cactus UPRR Structure

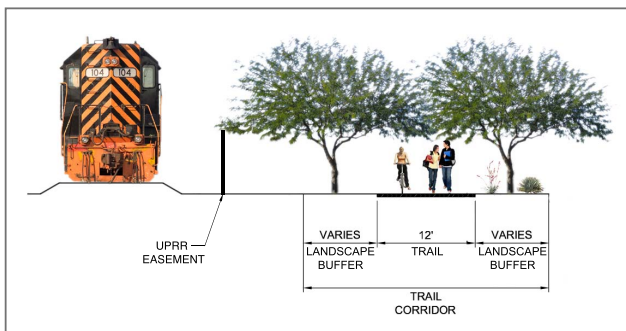


Figure 14. Pedestrian Trail Cross Section

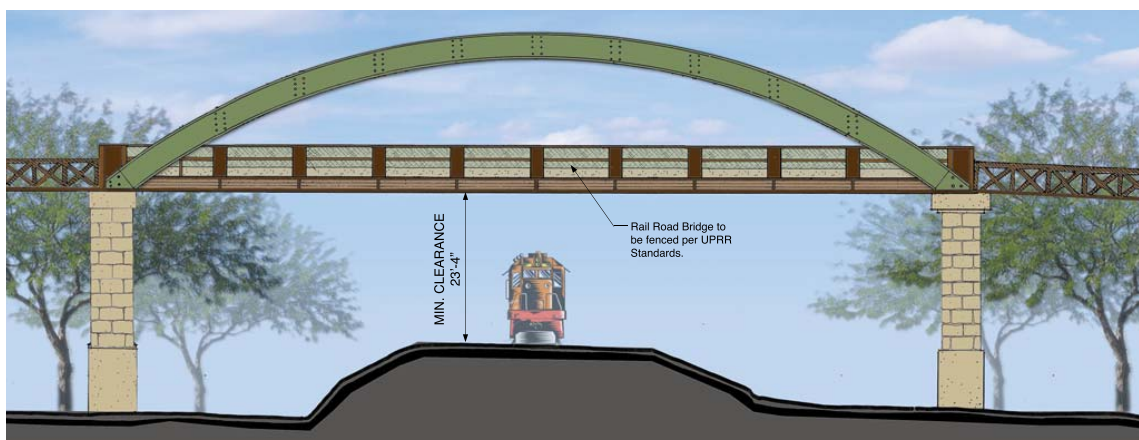


Figure 15. Pedestrian Overpass at Erie Avenue

Alternative B

In this alternative a pedestrian overpass crosses UPRR along the Erie Avenue alignment as illustrated in Figure 15.

Alternative C

This alternative is similar to Alternative A, except the pedestrians on the west side of UPRR would be routed to a trail parallel to UPRR, rather than using Rainbow Boulevard.

5.2 Oakey Boulevard/Wyoming Avenue Improvement Alternatives

Identified deficiencies at this crossing can be mitigated by implementing one of the following alternatives:

- Alternative A: Safety improvements at the existing at-grade crossing.
- Alternative B: Grade separation of Oakey Boulevard/Wyoming Avenue and UPRR.

Alternative A

This alternative provides short-term mitigation measures that target safety and connectivity issues identified during the analysis of the existing conditions.

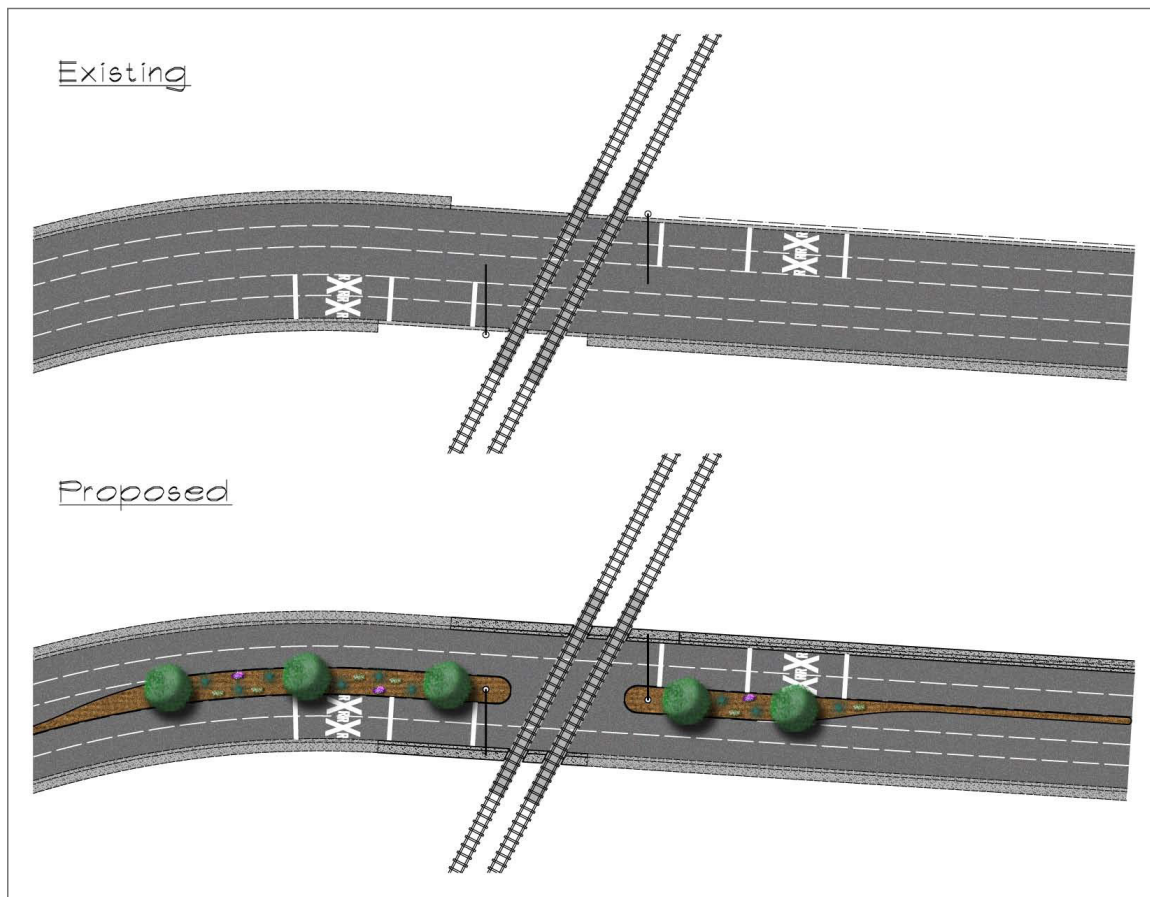


Figure 16. Short-Term Safety Improvements at Oakey Boulevard/Wyoming Avenue At-Grade Crossing

This alternative proposes the following interim improvements:

- Extension of the sidewalks on both sides of the street, based on ADA standards
- A median that separates travel lanes
- Gate relocation to the median
- Restriping

Figure 16 displays the improvements under this alternative.

Alternative B

This alternative provides a long-term solution to the identified safety issues. The construction of a grade separation is included in the RTP as part of Project Neon, with a scope much wider than the construction of an overpass at this location. Project Neon is anticipated to increase accessibility to the area surrounding the existing at-grade crossing and change regional travel patterns. This may increase the issues related to safety at this location. To capture the benefits of a grade-separated crossing here, it is assumed that the grade separation will be constructed with the other components of Project Neon.

6

Prioritization Results

In this chapter:

- ✓ Organization of supporting data
- ✓ Evaluation of Alternatives and Prioritization of Crossings

This chapter summarizes the results of the alternative selection and prioritization of crossings.

6.1 Organization of Supporting Data

To facilitate the evaluation process, the collected data was organized and mapped in a document that includes:

- Existing and future crossings map
- Existing and future crossings geometry and AADT
- Land use maps
- Bicycle routes map
- Environmental resources
- Jobs-housing balance
- Transit routes
- Ridership data
- Project costs
- Project readiness information

The document is provided as an attachment to Technical Memorandum 3 and is included in Appendix B.

6.2 Evaluation of Alternatives and Prioritization of Crossings

Following the results of the existing conditions analysis, identification of future needs, and mitigation of alternatives, a list of crossings that required prioritization was compiled. The majority of the crossings in this list belong to projects included in and prioritized by the RTP.

The prioritization of these projects in the RTP was based on a different scale that may not necessarily have focused on the crossing itself. Additionally, the criteria applied to the RTP used broader sources of information and targeted regional goals and objectives. To honor the project prioritization provided by the RTP, the crossings were separated into two major groups based on the expected implementation timeframe. This allowed a relative prioritization of projects within their own group, given the uncertainty of the information when moving farther into the future.

The list of crossing projects for prioritization—separated into two major groups based on implementation timeframe—is shown in Table 5.

The alternative evaluation results summarized in Table 6 (on page 25) did not differentiate a preferred alternative for the Cactus Avenue crossing. Alternatives A, B, and C served the pedestrian element only, while the baseline alternative (UPRR overpass) was part of a broader project that included vehicular and transit components.

Table 5. List of Crossings by Implementation Timeframe

Short-Term Crossing Projects (2010 - 2015)	Long-Term Crossing Projects (2016 - 2030)
Cactus Avenue	Centennial Parkway
Symphony Parkway/ Lewis Avenue	Lake Mead Boulevard
Erie Avenue/Cactus Avenue Pedestrian Trail	North Farm Road/ Unnamed
Jones Boulevard	Oakey Boulevard/ Wyoming Avenue Grade Separation
Lamb Boulevard	Robindale Road
Las Vegas Boulevard	Tropicana Avenue
Oakey Boulevard/ Wyoming Avenue	Washburn Road
Sunset Road	Windmill Lane
Union Park Pedestrian Bridge	
Valley View Drive/ Harmon Avenue	

The evaluation indicated that an underpass trail would be more cost effective and pedestrian friendly than an overpass.

The Oakey Boulevard/Wyoming Avenue grade separation ranked higher than rehabilitating the current crossing. A direct comparison of these two alternatives, however, may not be reasonable. An evaluation of at-grade crossing improvements considers the current land use and transportation network surrounding the crossing and is an inexpensive short-term safety improvement. The grade separation assumes that the MLK/Industrial Connector, has been built.

Table 6. Ranking of Alternatives

Rank	Crossing	Arterial	Score
Cactus Avenue/Desert Oasis Crossings			
1	Cactus Avenue Baseline	Ft. Apache Road to Rainbow Boulevard (UPRR overpass)	55
1	Alternative A	Trail under existing structure using Rainbow Boulevard	55
2	Alternative B	Desert Oasis pedestrian crossing overpass	54
3	Alternative C	Trail under existing structure using trail	53
Oakey Boulevard/Wyoming Alternative Improvements			
1	Alternative B	I-15 to Main Street grade separation	48
2	Alternative A	Rehabilitation of existing crossing	47

The prioritization ranking summarized in Table 7 indicates that the Sunset Road crossing has the highest priority among the near-term project crossings. This crossing will provide connectivity to the newly developed areas in the

southwest part of the valley, with industrial areas located in the vicinity of the crossing as well as a major commercial center just east of the UPRR and I-15. Appendix C contains additional details on prioritization results.

Table 7. Crossing Priority by Timeframe

Rank	Short-Term Crossing Projects (2010 - 2015)	Score	Rank	Long-Term Crossing Projects (2016 - 2030)	Score
1	Sunset Road	58	1	Oakey Boulevard/Wyoming Avenue Grade Separation	48
2	Union Park Pedestrian Bridge	56	2	Lake Mead Boulevard	46
3	Cactus Avenue	55	3	Tropicana Avenue	41
4	Erie Avenue/Cactus Avenue Underpass	55	4	Windmill Lane	32
5	Symphony Parkway/Lewis Avenue	54	5	Washburn Road	30
6	Lamb Boulevard	51	6	Robindale Road	29
7	Oakey Boulevard/Wyoming Avenue	47	7	North Farm Road/Unnamed	28
8	Jones Boulevard	45	8	Centennial Parkway	26
9	Valley View Drive/Harmon Avenue	40			
10	Las Vegas Boulevard	31			

Notes



7

Conclusions

In this chapter:

- ✓ Findings summary

This chapter summarizes the findings and highlights key areas of the report:

- Evaluation results indicated that the criteria equally captured all modes of transportation. Four modes (vehicular, transit, bicycle, and pedestrian) were contained in the top five projects.
- Application of several criteria appeared to be subjective when considering scale (regional vs. local) and use of information regarding future transit and bicycle plans.
- The development of prioritization criteria was intended to capture the importance of a UPRR crossing at a specific location. Many of these crossings were included in major regional projects with more extensive benefits than a particular crossing would provide. These benefits have not been fully captured by the criteria, and therefore the evaluation results for projects of a regional scale may be placed into perspective.

- Local agencies are working on finalizing near-term and long-term transit and bicycle plans. The prioritization process of the UPRR crossings was based on available information, which primarily included existing facilities or near-term plans for specific routes, and existing long-term plans. The lack of information on future facilities and routes introduced a subjectivity factor in the evaluation of long-term projects, especially those that include a non-existing crossing.
- Providing transit connectivity for the double-deck buses in the downtown area significantly influenced the ranking of the Symphony Parkway/Lewis Avenue overpass. Although this project may not be pursued by the City of Las Vegas, the ranking is an indication of the regional priority of transit connectivity in this area.
- The Union Park Pedestrian Bridge is perceived as an important project that will provide pedestrian connectivity between downtown Las Vegas and Union Park and contribute to reduced vehicular traffic in this area. However, the prioritization process did not take into consideration the rate of development at Union Park. The RTC may wish to coordinate with the City of Las Vegas in identifying the most likely implementation timeframe of this project, should development plans be postponed. This will allow the RTC to allocate funds for other significant projects.
- The Cactus Avenue grade separation is perceived as more critical in providing connectivity and accessibility to other modes and services than other crossings, including Lamb Boulevard, Valley View Drive, and Jones Boulevard. This project will connect the secluded residential areas west of the UPRR with services and other major arterials on the east.
- Both the Cactus Avenue grade separation and the Cactus trail underpass would provide the needed connectivity and a safe crossing for the Desert Oasis High School. The trail underpass is more convenient for pedestrians, and its construction would be a time- and cost- efficient investment that would address immediate and long-term needs.
- The prioritization results obtained from this study may be used by the RTC to inform the update of the Alternate Mode Plan.



Appendix A - Technical Memo

Existing Conditions and Future Needs



**UPRR Crossing Study
Technical Memorandum:
Existing Conditions and
Future Mobility Needs**
January 25, 2010

1.0 Introduction

Construction of a railway line between Salt Lake City, Utah, and Los Angeles, California, via Las Vegas, Nevada, began in 1901 with the formation of the San Pedro, Los Angeles, and Salt Lake Railroad Company (LA&SL). Construction of the railroad's main line was completed in 1905, and in 1916, company shareholders adopted the LA&SL name. Today the LA&SL railroad tracks operate as an integral part of the Union Pacific Railroad (UPRR) system.

The UPRR runs approximately parallel to I-15 through much of the Las Vegas valley and can be a mobility impediment in addition to I-15 and Las Vegas Boulevard in some areas. By identifying locations and potential solutions where mobility is restricted, the Regional Transportation Commission (RTC) of Southern Nevada can better program and prioritize alternatives and potentially fund projects to increase the efficiency and effectiveness of transportation in the valley.

The following goals are the foundation for this planning effort:

- Improve safety,
- Improve overall efficiency of the system,
- Increase transportation network convenience for all modes, and
- Update the transportation system to improve air quality.

The specific objectives of this project are to:

- Identify current and future network deficiencies with respect to the UPRR,
- Develop potential solutions, and
- Prioritize existing and potential solutions with regard to the RTC's goals.

2.0 Purpose of the Memo

The purpose of this memo is to report on progress made in the data collection process, the evaluation of existing conditions, and to summarize future mobility needs based on the results of the existing conditions analysis, future planned improvements and land uses, field evaluation, and agencies input.

3.0 Data Collection

The focus of the data collection task was to collect and summarize data and information relevant to the existing UPRR crossings as well as planned projects within the study area. The data collection process involved the following activities.

- Obtain recently completed and ongoing technical/planning studies from the RTC and other agencies that address pedestrian mobility within and adjacent to the project study area.
- Obtain U.S. Department of Transportation grade crossing inventory.
- Obtain additional inventory and crash data from the Nevada Department of Transportation (NDOT).
- Review the RTC's Regional Transportation Plan (RTP) and obtain future traffic projections from the regional travel demand model for 10- and 20-year horizons.
- Obtain and review the Master Plan of Streets and Highways from the City of North Las Vegas and the City of Las Vegas.
- Collect information on the Clark County Trails Program, City of Las Vegas Transportation Trails Element, and the City of North Las Vegas Citywide Trails and Bikeways Master Plan.
- Collect information on planned bus routes and impacts to existing UPRR crossings.
- Develop a preliminary map illustrating existing and planned UPRR crossings.
- Review field conditions at each existing and future UPRR crossing.
- Obtain information regarding ongoing studies and designs that involve new or improved UPRR crossings.
- Meet with City of Las Vegas staff to discuss existing land use, pedestrian, tourist, and employment destinations, and planned redevelopment within the downtown area.

The data collected for the project study area were used to identify current and future UPRR crossings, existing crossing conditions, and safety issues and to provide background information for evaluating alternatives and prioritizing projects.

4.0 Proposed Projects

Information was gathered regarding proposed projects that are under design and will be implemented upon funding availability. The UPRR crossings that are under design include:

- Cactus Road UPRR crossing,
- Harmon Avenue/Valley View Boulevard UPRR crossing,
- Las Vegas Wash pedestrian bridge trail,
- Pedestrian bridges at Union Park, and
- Sunset Road UPRR crossing.

5.0 Relevant Studies

Other relevant documents, which provide information applicable to this study, have been gathered, including the Downtown Pedestrian Circulation Master Plan, the Project Neon Draft Environmental Impact Statement (DEIS), and the draft City of North Las Vegas Citywide Trails and Bikeways Master Plan.

6.0 Existing Conditions

There are 28 existing crossings within the study area. During October and November, 2009, detailed field reviews were conducted to collect information and capture the characteristics of each crossing. Signing and striping evaluation at existing at-grade crossings was performed based on the 2003 Manual on Uniform Traffic Control Devices (MUTCD). The updates in recently released 2009 MUTCD, however, may impact the signage at existing crossings.

6.1 Roadway Conditions

A majority of the crossings within the study area are grade separated. Field investigations and a review of agency information indicated that vertical clearances at Tropicana Avenue, Charleston Boulevard, and Bonneville Avenue are not sufficient to accommodate double-deck buses. Operating articulated vehicles is more expensive per mile for the agency than a double-deck vehicle; improving the clearance at these locations may be a priority for the RTC. Although not part of the existing and planned RTC transit routes, the Ogden Avenue underpass has a low vertical clearance and cannot accommodate double-deck buses and therefore is not a viable alternative to the proposed Bonneville route

Another deficiency identified at a grade-separated crossing includes the Las Vegas Boulevard North underpass. The current vertical clearance is 14 feet which may not be sufficient to accommodate the growing truck traffic in this area. The current span is 32 feet and accommodates two 10-foot travel lanes in each direction with no shoulders.

Tables 1 and 2 summarize information regarding the grade-separated crossings where deficiencies were identified, and descriptions follow.

Table 1. Mode Data at Deficient Grade-Separated Crossings

Crossing	Traffic		Transit	Pedestrians	Bicycles
	2008 AADT	Speed	Bus Route/ Dedicated Lane	Sidewalk/ Trail	Bicycle Facilities/ Trail
Tropicana Avenue	56000	45	201	Yes	No
Charleston Boulevard	51000	45	206	Yes	No
Bonneville Avenue	11250	35	207/108/105	Yes	Yes/BL*
Las Vegas Boulevard	2400	55	No	No	No

* BL = bicycle lane

Bonneville Avenue Grade Separation

The existing Bonneville Avenue/UPRR crossing is an underpass. The crossing consists of a cut section with retaining walls along Bonneville Avenue on either side, approaching a single-span concrete bridge structure with center supporting piers on closed abutments. The abutment walls are integral to the deck and the footings, which extend across Bonneville Avenue as part of the

roadway surface. The entire bridge structure is essentially a culvert with piers down the center. The bridge consists of two UPRR tracks and an open drainage channel, along with an 18-inch and 12-inch utility conduits within the bridge deck. The existing clearance is 14 feet, 6 inches. Bonneville Avenue is in a sump condition approximately 50 feet west of the existing bridge and requires a storm water pump station. Pedestrian access is provided on Bonneville Avenue via a sidewalk adjacent to traffic, separated by a handrail.

Charleston Boulevard Grade Separation

The existing Charleston Boulevard/UPRR crossing is an underpass. The crossing consists of a cut section with concrete paved side slopes on either side, approaching a two-span steel bridge structure on closed abutments. The bridge consists of three UPRR tracks, and the clearance is 14 feet, 6 inches. Charleston Boulevard is in a sump condition with the low point occurring directly under the bridge. There are existing inlets at the low point, draining to a 42-inch reinforced concrete pipe (RCP) storm system that runs east beneath Charleston Boulevard. Pedestrians use Charleston Boulevard via an elevated sidewalk adjacent to the roadway under the bridge.

Tropicana Avenue Grade Separation

Design plans of this crossing have not yet been obtained.

Las Vegas Boulevard North Grade Separation

Design plans of this crossing have not yet been obtained.

Table 2. Geometrical Data at Deficient Grade-Separated Crossings

Crossing	Vertical Clearance		Horizontal Clearance		Notes
	Existing	Standard	Existing	Standard	
Tropicana Avenue	14'-6"	16'-6"	86' abutment to abutment w/ center pier.	Current Tropicana lanes and sidewalk are perpetuated through bridge crossing and therefore does not require widening.	Dimensions based on visual inspection.
Charleston Boulevard	14'-0"	16'-6"	70' face of wall to face of wall, including curb, gutter and center pier. 81' abutment wall to abutment wall. Additional 11' includes raised sidewalk on both sides.	Current lane configuration on Charleston is perpetuated through bridge location therefore additional widening is not necessary.	Wall is for elevated 5' sidewalk.
Bonneville Avenue	14'-0"	16'-6"	100' abutment to abutment w / center pier.	Current lane configuration is perpetuated through bridge section therefore additional widening is not necessary.	
Las Vegas Boulevard	14'-0"	16'-6"	32' abutment to abutment, including curb and gutter.	Current lane configuration is perpetuated through the bridge section. There are currently no plans for the widening of Las Vegas Blvd in this area to a standard 100' RTC section.	Dimensions based on visual inspection.

There are three at-grade crossings within the study area: Desert Inn Road, Oakey Boulevard/Wyoming Avenue, and Range Road. The Range Road crossing is a private crossing outside the jurisdiction of local agencies and NDOT; as such, it will not be considered within this study. Table 3 summarizes information regarding the at-grade crossings.

Table 3. Mode Data at At Grade Crossings

Crossing	Traffic		Transit	Pedestrians	Bicycles
	2008 AADT	Speed (mph)	Bus Route/ Dedicated Lane	Sidewalk/ Trail	Bicycle Facilities/ Trail
Desert Inn Road	14000	35	No	Yes	No
Oakey Boulevard/ Wyoming Avenue	15000	35	No	No	No

Desert Inn Road Crossing

Desert Inn Road crosses the mainline UPRR double track at grade. The crossing is located within the Clark County unincorporated area, with Desert Inn Road designated as a collector.

The crossing roadway has four 11-foot lanes and a 16-foot median, with 5-foot sidewalks. The overall crossing width is 100 feet. The roadway does not accommodate bicycles and is not used by transit. The annual average daily traffic (AADT) recorded in 2006 was 14,000 vehicles per day and the posted speed limit is 35 mph. The crossing is located within an industrial/commercial area, which is reflected in the 30 percent truck traffic along the route.

On average, 19 trains per day cross Desert Inn Road, with speeds varying from 60 to 79 mph. Trains operate on a class 4 track with a site distance of 1,921 feet.

The at-grade crossing has active protection including four automatic gates, two electronic bells, and cantilever flashing lights over the travel lanes. The crossing has been signed with W10-1, R15-1, R8-8, R15-2, I-13, High Speed Trains signage, and pavement markings in accordance with MUTCD (2003). The automatic gates provide protection for vehicles and pedestrians. The crossing surfacing material is concrete with rubber flange fillers, and it appears to be in good condition.

Oakey Boulevard/Wyoming Avenue Crossing

Oakey Boulevard/Wyoming Avenue crosses the mainline UPRR double track at grade. The crossing is located within the City of Las Vegas and is designated as collector. Improvements to this at-grade crossing are included in the RTP and are planned as part of Project Neon in 2019.

The crossing roadway has four 12-foot lanes. The roadway cross-section does not include sidewalks or bicycle lanes. The overall crossing width is 100 feet, and the roadway is used by transit route 116 east of the crossing. The AADT, recorded in 2006, was 17,000 vehicles per day, and the posted speed limit is 35 mph.

The crossing is located just east of a residential area; and 330 feet east of the crossing, Wyoming Avenue crosses Industrial Road, which primarily serves the businesses and casinos on the west side of Las Vegas Boulevard.

On average, 19 trains per day cross Wyoming Avenue, with speeds varying from 20 to 79 mph. Trains operate on a class 4 track with a site distance of 1,681 feet.

The at-grade crossing has active protection including two automatic gates, two electronic bells, and cantilever flashing lights over the travel lanes. The crossing has been signed with W10-1, R15-1, R15-2, I-13, and pavement markings in accordance with MUTCD (2003). The automatic gates provide protection for vehicles only. The vehicular crossing surface material is concrete with rubber flange fillers, and it appears to be in good condition. The markings on the roadway appear to be in poor condition. Pedestrian connectivity is absent. The sidewalk is not connected to a pedestrian path across the railroad and is not protected with gates.

6.2 Railroad Conditions

The daily train frequency in the rail corridor through the Las Vegas valley is 19 trains per day, with maximum train speeds from 60 to 79 mph. Table 4 summarizes existing railroad conditions at both at-grade crossings.

Table 4. Railroad Conditions

Crossing	Crossing Protection	Sidewalk Crossing Panels	RR Track Condition	Trains per Day	Number of Tracks	Train Speed (mph)
Desert Inn Road	Automatic gates	None	Not Available	19	2	60-79
Oakey Boulevard/ Wyoming Avenue	Automatic gates	N/A	Not Available	19	2	20-79

Crash data obtained from the Federal Railroad Administration (FRA) indicate three crashes in the past 10 years, all of which occurred at the Desert Inn Road crossing. The crashes were limited to property damage only.

6.3 Connectivity to Community Services and Facilities

Identification of locations where mobility is restricted was performed through a review of existing land uses and public facilities and through visual investigation in the field. The analysis focused on restricted or out-of-direction travel of vehicles, pedestrians, and bicycles on their routes to school, emergency services or other public facilities, and commercial destinations.

In the southern part of the valley, south of I-215, the UPRR alignment is surrounded primarily by undeveloped land. A significant amount of residential development has started in this area within the past 10 years. These communities are isolated from each other, however, and in many instances lack connectivity with commercial centers and public facilities.

Desert Oasis High School is located a quarter mile south of Cactus Avenue and approximately 700 feet east of the UPRR. The existing school zone extends west, and residential development exists approximately 700 feet west of the tracks. The Cactus Avenue/UPRR overpass project is under design, but it is not planned to be funded through the RTP until 2015. The lack of connectivity between the residential areas and the school at Cactus Avenue and opposite the school cause out-of-direction automobile trips that increase the distance from less than a half mile to more than seven miles. This situation may entice students to cross the UPRR fence at the school.

Site observations indicate that there is one large drainage structure under the tracks at Cactus Road and three small drainage structures in the area between the residential development and the school. A detention basin is being constructed just northwest of the future Cactus Avenue overpass. The flow in the area bounded by Erie, UPRR, Rainbow Boulevard and Star Avenue will continue to use the 3 existing culverts located between Erie Avenue and Star Avenue. The flow crossing these culverts is quite significant and does not allow a safe pedestrian crossing.

Also to comply with the ADA and UPRR requirements for vertical clearance the structure may need to be replaced.

Once the detention basin is completed, it is understood that the wash, over which the UPRR structure at Cactus exists, will not be needed to convey drainage flows. Using this structure as a pedestrian underpass offers a safer alternative to crossing the tracks and an efficient option for decreasing the walking distance to school.

A trail project is planned by Clark County, using Southern Nevada Public Lands Management Act (SNPMLA) funds. The trail will run along St. Rose Parkway, turning north on Southern Highland Parkway, and then west on Cactus Avenue. The trail will split from Cactus Avenue just east of the Cactus Avenue overpass and will cross the UPRR north of the overpass using a grade-separated pedestrian structure. A review of crossing alternatives to improve the connectivity and safety in this area will be performed in later stages of this project.

Connectivity issues also exist at Jones Boulevard near Blue Diamond Road. The recent construction on Blue Diamond Road and the UPRR grade-separated crossing has improved connectivity with areas southeast and northwest of this location. Out-of-direction trips still occur, however, due to the lack of connectivity along Jones Boulevard.

In the central part of the valley, from I-215 to US 95, the UPRR alignment runs in close proximity to I-15 and crosses it near Twain Avenue. The land use surrounding the UPRR is primarily industrial and service commercial, with large-scale buildings adjacent to the resort corridor. Construction of the Sunset Road/UPRR overpass and Harmon Avenue/Valley View Boulevard overpass, which are currently under design, will improve automobile and transit connectivity with the resort corridor and contribute to distributing the traffic to less congested arterials, thereby relieving the adjacent arterials.

In the northern part of the valley, connectivity is also limited to the major east-west arterials, spaced every mile. However, major safety and connectivity issues have not yet been studied. The North 5th project and the Las Vegas Wash trail, which are under design, will provide additional connectivity for automobiles, transit, and pedestrians in this part of the valley.

7.0 Conclusions

A review of existing conditions indicates the following.

- The study may further explore improvement alternatives at the Oakey Boulevard/ Wyoming Avenue UPRR crossing to accommodate pedestrian and bicycle movements and provide for their safety.
- The study may further explore improvement alternatives at Tropicana Avenue, Charleston Boulevard, and Bonneville Avenue to accommodate the required clearance for existing and proposed transit routes.
- The study may further explore improvement alternatives at Las Vegas Boulevard crossing the UPRR as the northeast area of the valley develops.

8.0 Future Mobility Needs

Future mobility needs were identified through a review of the RTP, local agency transportation plans, and concerns raised by the staff and members of the working group. Table 5 shows information from the RTP and other local agencies regarding improvements that involve UPRR crossings.

Table 5. Planned Improvements Involving UPRR Crossings

Crossing	Arterial	ROW	2015 AADT	2020 AADT
Sunset	Decatur to Valley View	120'	38000	51000
Lamb	CC-215 – I-15	120'	53000	83000
Union Park	Union Park to Main Pedestrian Overpass	n/a	Pedestrian	Pedestrian
Union Park	Pedestrian Overpass	n/a	Pedestrian	Pedestrian
Union Park	Pedestrian Overpass	n/a	Pedestrian	Pedestrian
Union Park	Lewis /Symphony Overpass	n/a	Not avail	Not avail.
Las Vegas Wash	Trail – Pedestrian Overpass	n/a	Pedestrian	Pedestrian
Decatur	Warm Springs to CC-215 (2 UPRR overpasses)	120'	45000/19000	59000/17000
Valley View	Tropicana to Flamingo	120'	27000	33000
Jones	Blue Diamond to Windmill	100'	18000	26100
North 5th	Owens to Cheyenne	tbd	42700	53200
Cactus	Fort Apache to Rainbow (UPRR overpass)	100'	24000	31500
Oakey/Wyoming	I-15 to Main	80'	16000	18500
Windmill	Durango to Decatur	100'	800	17800
Lake Mead	Losee to Las Vegas Boulevard	tbd	22000	30000
Centennial	Lamb to Range	100'	0	1500
Tropicana	Decatur to Polaris	120'	55000	57000
Robindale	Jones to Valley View	80'	9000	6500
Washburn	Pecos to Lamb	80'	Not avail.	Not avail.
Unnamed	Las Vegas Boulevard to Farm	100'	0	Not avail.
Project Neon	Industrial MLK Connector	80'	0	tbd

Project Neon requires a relatively high financial commitment from the City of Las Vegas, which is currently evaluating additional alternatives to improve downtown connectivity with the area south of Charleston Boulevard. These alternatives may also involve additional UPRR crossings. Details on the outcome of the improvements planning will be provided once the study is completed and approved.

Access from Martin Luther King Boulevard to the industrial/commercial area between I-15 and Dean Martin Drive is available via Wall Street. Should Project Neon be constructed, Wall Street would be closed and a new access for this area would need to be established. The new access may require an at-grade crossing with UPRR at Circus Circus Drive, if this alternative is approved by the City.



Appendix B - Technical Memo

Prioritization of Alternatives and Future UPRR Crossings



an **Atkins** company

**UPRR Crossing Study
Technical Memorandum:
Prioritization of Alternatives and Future
UPRR Crossings
December 08, 2010**

1.0 Introduction

As part of the Regional Transportation Commission of Southern Nevada's (RTC) strategic planning process, a system-wide evaluation of mobility and circulation is necessary to continually improve safety, efficiency, and air quality and to increase mobility while maintaining neighborhood and community integrity. The Union Pacific Railroad (UPRR), which runs approximately parallel to I-15 through much of the Las Vegas valley, acts as a mobility impediment in some cases. Locations have been identified where mobility is restricted, and potential solutions have been developed. Prioritizing the potential solutions will help the RTC plan and program alternatives and potentially fund projects to increase the efficiency and effectiveness of transportation in the valley.

The following goals are the foundation for this planning effort:

- Improve safety
- Improve overall efficiency of the system
- Increase transportation network convenience for all modes
- Update the transportation system to improve air quality

The specific objectives of this project are to:

- Identify current and future network deficiencies with respect to the UPRR
- Develop potential solutions for existing deficiencies
- Prioritize potential solutions for existing and future deficiencies with regard to the RTC's goals

2.0 Purpose of the Memo

Identifying current network deficiencies and analyzing land use and transportation conditions in areas surrounding the crossings led to the development of several alternative potential solutions to mitigate deficiencies. These potential solutions were developed for two locations: Oakey/Wyoming and Cactus/Erie. The mitigation of future deficiencies regarding UPRR crossings has been captured through the projects included in the Regional Transportation Plan (RTP).

The purpose of this document is to prioritize solutions for existing and future deficiencies and to provide stakeholders the prioritization criteria used to select potential solutions.

3.0 Criteria Development Process

Criteria development began with a criteria workshop, with the goal of broadly identifying railroad crossing concepts that could be shaped into meaningful project selection criteria. A series of brainstorming sessions generated extensive lists of ideas. Through detailed discussions and active organization, these lists captured preliminary user and stakeholder needs. The stakeholder agencies and organizations that attended the workshop included:

- RTC
- UPRR
- Nevada Department of Transportation
- Clark County
- City of Las Vegas
- City of North Las Vegas
- Clark County School District

The second effort in criteria development was a general scan of project selection criteria employed for similar selection processes, including the goals and objectives driving the criteria. RTC's goals and objectives were included and emphasized. Combining this information with the criteria workshop results generated a comprehensive set of criteria.

The criteria were grouped into seven major categories corresponding to stakeholder needs and addressing the RTP's regional goals and objectives. The major criteria categories included:

1. Connectivity
2. Safety
3. Defined pathway/context
4. Economic impact
5. Regional priority
6. Preliminary NEPA compliance
7. Project momentum

At this point in the process, it became apparent that the criteria for selecting the preferred alternative solutions and the criteria for prioritizing the solutions were similar. The same set of criteria was therefore used to select the preferred alternatives to mitigate deficiencies at specific locations and to prioritize and integrate these solutions into projects identified in the RTP.

An equitable process for applying criteria to multiple project types with differing user groups was then explored. Criteria selection processes inherently contain unfairness, due to issues such as preference, mathematics, linguistics, and decision science. Each element of partiality resulting from criteria application was identified, evaluated, and addressed to the highest degree possible. This effort was undertaken through an iterative revision process by a group of area experts, resulting in the project prioritization implementation guide in the attachment.

The prioritization criteria were broad-based and applicable to all major modes of transportation, including automobile, transit, bicycle, and pedestrian. To simplify their application, the

evaluation consisted of a set of questions requiring a “yes/no” answer equaling 1 or 0 points. The major evaluation categories were interrelated, so the criteria within a major category could be repeated in other categories. This repetitiveness was an indicator of a specific criteria’s weight or significance. A weighting criteria matrix (included in the attachment) was developed to capture the relationship and determine the weight.

To facilitate the evaluation process, the collected data was organized and mapped into a document that included:

- Existing and future crossings map
- Existing and future crossing geometry and annual average daily traffic (AADT)
- Land use maps
- Bicycle route map
- Environmental resources
- Jobs-housing balance
- Transit routes
- Transit Ridership
- Project cost
- Project readiness information

This document is included in the attachment.

4.0 Evaluation of Alternatives and Prioritization of Crossings

As noted, criteria were similar for project selection and project prioritization. Accordingly, it was determined that all alternatives be included on the project list for evaluation. The final ranking determined preferred alternatives for particular crossing locations. Table 1 indicates the alternatives included in the evaluation process by location.

Table 1: UPRR Crossing Alternatives

Crossing	Arterial	Year Included in the RTP	RTP Project #	Crossing Status	Cost \$
Cactus Avenue/Desert Oasis Crossings					
Cactus Baseline	Fort Apache to Rainbow (UPRR overpass)	2015	898	New/Design Stage	\$\$
Alternative A	Trail Under existing structure using Rainbow	Not Included			\$
Alternative B	Desert Oasis Pedestrian Crossing Overpass	Not Included			\$
Alternative C	Trail Under existing structure using trail	Not Included			\$
Oakey/Wyoming Alternative Improvements					
Alternative A	Rehabilitation of Existing Crossing	Not Included			\$

Crossing	Arterial	Year Included in the RTP	RTP Project #	Crossing Status	Cost \$
Alternative B	I-15 to Main	2019	4249	ROD Obtained/Active/New	\$\$\$

Following the results of the existing conditions analysis and identification of future needs, a list of crossings requiring prioritization was compiled and summarized into Table 2.

Table 2: Crossing Prioritization List

Crossing	Arterial	Year Included in the RTP	RTP Project #	Crossing Status	Cost \$
Cactus ⁽¹⁾	Fort Apache to Rainbow (UPRR overpass)	2015	898	New/Design Stage	\$\$
Centennial	Lamb to Range	2020	805	New	\$\$
Discovery/Lewis	Grand Central to Main	Not Included		New/Design Stage	\$\$
Jones	Blue Diamond to Windmill	2012	568	New	\$\$
Lake Mead	Losee to Las Vegas Boulevard	2020	4146	Active	\$\$
Lamb	CC-215 – I-15	2009	145	New	\$\$
Las Vegas Boulevard	Near Apex	Not Included		Active	\$\$
Oakey/Wyoming ⁽¹⁾	I-15 to Main	2019	4249	EIS Stage/ Active/New	\$\$\$
Robindale	Jones to Valley View	2025	595	New	\$\$
Sunset	Decatur to Valley View	2009	617	New/Design Stage	\$\$
Tropicana	Decatur to Polaris	2024	4247	Active	\$\$\$
Union Park	Union Park to Main Pedestrian Overbridge	2009	1561	New/Design and Construction	\$
North of Farm/Unnamed ⁽²⁾	Las Vegas Blvd to Farm	2030	863	New	\$\$\$
Valley View/Harmon	Tropicana to Flamingo	2011	4262	New/Design Stage	\$\$\$
Washburn	Pecos to Lamb	2026	823	New	\$\$
Windmill	Durango to Decatur	2020	639	New	\$\$
Selected Cactus Avenue/Desert Oasis Alternative Crossings if other than Cactus Crossing					
Selected Oakey/Wyoming Alternative Improvement if other than Oakey/Wyoming Grade Separation					

(1) Although considered as an alternative this project will also be prioritized. As part of Project Neon scheduled in 2019 by the RTP, the evaluation of the grade separation will assume that all the other elements of the Project Neon have been built.

(2) Project included in the RTP does not include a crossing over UPRR.

The majority of the crossings included in Table 2 belong to projects included in the RTP Appendix 1: “List of Projects in the Transportation Capital Program 2009-2030”. The prioritization of the crossings in this study will be performed within two time periods: short term (2010 – 2015) and, long term (2016 – 2030).

The prioritization criteria developed within this study cannot necessarily be used in determining the timeframe in which these identified crossing projects will be implemented. The timeframe determined by the RTP for the implementation of the projects, which include these crossings, is used to identify the projects within each time period.

The List of Crossings grouped based on the expected implementation timeframe (short-term and long-term), is shown in Table 3.

Table 3: List of Crossings by Implementation Timeframe

Short-Term Project Crossings (2010 – 2015)	Long-Term Project Crossings (2016 – 2030)
Cactus	Centennial
Discovery/Lewis	Lake Mead
Jones	Oakey/Wyoming Grade Separation
Lamb	Windmill
Las Vegas Boulevard	Robindale
Sunset	Tropicana
Union Park Pedestrian Bridge	North Farm/Unnamed
Valley View/Harmon	Washburn
Oakey/Wyoming Improvements	
Erie/Cactus Pedestrian Trail	

The independent evaluation results are summarized in Tables 4 and 5. The evaluation matrix is provided electronically attached to this technical memo.

Table 4: Ranking of Alternatives

Rank	Crossing	Arterial	Score
Cactus Avenue/Desert Oasis Crossings			
1	Cactus Baseline	Fort Apache to Rainbow (UPRR overpass)	55
1	Alternative A	Trail Under existing structure using Rainbow	55
2	Alternative B	Desert Oasis Pedestrian Crossing Overpass	54
3	Alternative C	Trail Under existing structure using trail	53
Oakey/Wyoming Alternative Improvements			
1	Alternative B	I-15 to Main Grade Separation	48
2	Alternative A	Rehabilitation of Existing Crossing	47

Table 5: Crossing Priority by Timeframe

Rank	Short-Term Project Crossings (2010 – 2015)	Score	Rank	Long-Term Project Crossings (2016 – 2030)	Score
1	Sunset	58	1	Oakey/Wyoming Grade Separation	48
2	Union Park Pedestrian Bridge	56	2	Lake Mead	46
3	Cactus	55	3	Tropicana	41
4	Erie/Cactus Underpass	55	4	Windmill	32
5	Discovery/Lewis	54	5	Washburn	30
6	Lamb	51	6	Robindale	29
7	Oakey/Wyoming Improvements	47	7	North Farm/Unnamed	28
8	Jones	45	8	Centennial	26
9	Valley View/Harmon	40			
10	Las Vegas Boulevard	31			

5.0 Conclusions

Evaluation results indicated that criteria captured all transportation modes. Projects involving three primary modes (vehicular, transit, and pedestrian) were contained in the top five projects.

The results did not differentiate a preferred alternative for the Cactus crossing. Alternatives A, B and C served the pedestrian element only, while the baseline alternative (UPRR overpass) was part of a broader project that includes vehicular and transit components. The evaluation indicated that an underpass trail would be more cost-effective and pedestrian friendly than an overpass.

The Oakey/Wyoming grade separation ranked higher than rehabilitating the current crossing. A direct comparison of these two alternatives, however, may not be reasonable. An evaluation of at-grade crossing improvements considers the current land use and transportation network surrounding the crossing and is an inexpensive short-term safety improvement. The grade separation assumes that the first phase of Project Neon, which includes the MLK/Industrial Connector, has been already built.

Some criteria appeared to be subjective when considering scale (for example, regional versus local) and future transit and bicycle plan information.

The development of prioritization criteria was intended to capture the importance of the UPRR crossing at specific locations. Many of these crossings were rolled over into major regional projects with more benefits than a particular crossing would provide. These benefits have not been fully captured by the criteria; therefore, the evaluation results for projects of a regional scale may be placed into perspective.

Local agencies are finalizing near-term and long-term transit and bicycle plans. The prioritization process of the UPRR crossings was based on information currently available, which primarily included existing facilities or near-term plans for specific routes. This lack of information introduced a subjectivity factor into the evaluation of long-term projects—especially regarding projects that included a crossing that does not exist.



Union Pacific Railroad Crossing Study Project Prioritization Packet



Evaluation Criteria

1. Does the proposed crossing increase accessibility and mobility options? This criterion rewards projects that improve access to transit, support or provide for development of fully integrated modal options, and provide for connectivity among modes.

Roadway Projects

"Yes" – This project accommodates existing or planned transit routes.

"Yes" – This project accommodates sidewalks and bike routes if previously missing.

Transit Projects

"Yes" – This project accommodates pedestrians and bicycles

"Yes" – This project provides transfer points to other routes or modes.

Pedestrian and Bicycle Projects

"Yes" – This project integrates with other modes.

2. Is this crossing regionally important? This criterion rewards projects that provide more crossing opportunities in terms of AADT. To assist in making a judgment of the regional importance, existing important arterials were selected and their AADT and number of lanes were summarized. Review the information regarding future AADT and number of lanes provided for the projects on the prioritization list and compare them with the existing important arterials to determine the future importance.

All Projects

"Yes" – This project will have higher or comparable AADT and AADT per lane with the following regionally important arterials or provide regional benefit to transit operations and pedestrian movements.

Arterial	Existing AADT	Existing No. of Lanes	AADT/Lane
Tropicana	56,000	6	9,300
Flamingo	80,000	6	13,000
Desert Inn	40,000	6	6,600
Sahara	61,000	6	10,200
Charleston	51,000	6	8,500
Cheyenne	49,000	6	8,200
Craig	53,000	8	6,600

3. Does this project enhance safety for all travelers? This criterion evaluates the safety benefits of the proposed crossing based on the assessment of existing safety conditions.

All Projects

"Yes" – This project provides grade separations or improvements to existing at grade crossings.

Pedestrian and Bicycle Projects

"Yes" – This project includes pedestrian and bicycle facilities that eliminate the conflict between bikes or pedestrians and trains.

4. Does this project preserve and enhance the existing transportation corridors? This criterion recognizes the importance of preserving and enhancing the existing transportation network and facilities in maintaining mobility and providing reliability to the users.

Roadway Projects

"Yes" – This project enhances and improves travel along the major existing facilities through, for example, pavement rehabilitation or construction of crossings that eliminate gap areas.

Transit Projects

"Yes" – Projects that improve the service along existing service routes and increase the efficiency and connectivity of these routes with the existing network or other modes.

Pedestrian and Bicycle Projects

"Yes" – Projects that improve the existing bicycle and pedestrian facilities as well as new projects that support and enhance the existing network based on the area-wide plans.

5. Does this specific project fit into the planned physical setting? This criterion measures the relationship between transportation and land use by evaluating whether a specific project fits into the planned physical setting and how it can impact planned land uses.

Roadway Projects

"Yes" – This project is necessitated by the planned changes in land use and includes alternative modes which support efficient land use patterns.

Transit Projects

"Yes" – Transit projects that provide service to planned high density and transit oriented developments and support efficient land use patterns.

Pedestrian and Bicycle Projects

"Yes" – Bicycle and Pedestrian paths or trails that accommodate user needs as a result of a planned development.

6. Does this project improve reliability? This criterion rewards projects that, through best judgment, improve reliability of travel between areas separated by the UPRR.

Roadway Projects

"Yes" – Grade separations.

Transit Projects

"Yes" – Roadway improvements that improve reliability of transit service, connectivity to intermodal facilities or regional transit centers that accommodate significant transfers.

Pedestrian and Bicycle Projects

"Yes" – Bicycle and pedestrian trails that will primarily serve commuters.

7. Is the cost of this project lower than the given thresholds? This criterion rewards projects that do not have a significant cost impact. The following thresholds are used:

\$ Project cost lower than \$5 million

\$ \$ Project cost between \$5 and \$25 million

\$ \$ \$ Project cost higher than \$25 million

Roadway Projects

"Yes" – Lower than \$ \$

Transit Projects

"Yes" – Lower than \$ \$

Pedestrian and Bicycle Projects

"Yes" – Lower than \$

8. Does this project support more efficient freight movement? This criterion rewards projects that contribute to safer and more efficient freight movement along and across the UPRR.

Roadway Projects

"Yes" – projects that include a grade separation at the UPRR crossing.

Transit Projects

"Yes" – transit projects that include route modification or grade separated structures.

Pedestrian and Bicycle Projects

"Yes" – Pedestrian and Bicycle facilities on grade separated structures.

9. Does this project have any projected negative impacts on natural resources, air quality, noise, energy conservation, and disadvantaged areas? This criterion rewards projects that are considered to have less opportunity for negative impacts on natural resources, air quality, noise, energy conservation, and disadvantaged areas.

Roadway Projects

"No" – This project is located within a previously impacted area and has less opportunity for negative impacts. This project is expected to reduce system-wide auto emissions by improving traffic flow and/or is expected to reduce system-wide VMT. This roadway project provides dedicated transit and bicycle lanes and sidewalks. The roadway project is not expected to increase noise levels. This project is not expected to have a negative impact on the adjacent neighborhoods.

Transit Projects

"No" – This transit project will increase the ridership by inducing mode shift from single occupant vehicles. This transit project improves reliability, enhances service, and is expected to attract more riders. This project enhances service to the adjacent neighborhoods.

Pedestrian and Bicycle Projects

"No" – This type of project will promote walking and biking as an alternative to single occupant vehicles. All projects in this category promote energy conservation and are not perceived to increase noise levels. This project enhances the livability of the adjacent neighborhoods.

10. Does this project leverage funds? This criterion recognizes projects that have the opportunity to leverage funds.

Roadway Projects

Yes – This project relieves bottleneck(s) and/or promotes a shift to alternate modes of transportation.

Transit Projects

Yes – This project introduces a federally funded project, including New Starts, Small Starts, or CMAQ project, and/or supports system enhancement.

Pedestrian and Bicycle Projects

"Yes" – This project is included with roadway and/or transit improvements or contributes to safety and more livable communities.

11. Is this project ready for implementation? Many projects have already been through the design process and are ready for implementation. This criterion recognizes the readiness of projects that could proceed to construction within 6 months.
12. Does this project have community support? This criterion rewards the projects that, in best judgment, have community support.

Proposed Weighting Criteria

No.	Evaluation Criteria	Categories						Multiplier
		Connectivity	Safety	Defined Pathway/Context	Economic Impact	Regional Priority	Project Momentum	
1	Does the proposed crossing increase the accessibility and mobility options? (Y/N)							2
2	Is this crossing regionally important? (Y/N)							1
3	Does this project enhance safety for all travelers? (Y/N)							2
4	Does this project preserve and enhance the existing transportation corridors? (Y/N)							1
5	Does this specific project fits into the planned physical setting? (Y/N)							2
6	Does this project improve reliability? (Y/N)							1
7	Is the cost of this project lower than the given thresholds? (Low/Medium/High) (*)							1
8	Does this project support more efficient freight movement? (Y/N)							1
9	Does this project have projected negative impacts on natural resources, air quality, noise level, energy consumption and disadvantaged areas? (Y/N)							1
10	Does this project leverage funds? (Y/N)							1
11	Is this project ready for implementation? (Y/N)							1
12	Does this project have community support? (Y/N)							1
	Total Score	2	1	2	3	4	3	15
	Category Weight	13%	7%	13%	20%	27%	20%	100%
(*) Cost threshold will be provided with the evaluation matrix and include:								
\$ Project cost lower than 5 million US\$		2						
\$ Project cost between 5 and 25 million US\$		1						
\$ Project cost higher than 25 million US\$		0						



UPRR Crossing Alternatives

Potential Crossing Alternatives

Following the review of existing and future conditions, mitigation alternatives were further explored at the following locations:

- Other crossing alternatives in addition to the proposed Cactus overpass to facilitate the movement of pedestrians to the Desert Oasis High School.
- Improvement alternatives at the Oakey Boulevard/ Wyoming Avenue UPRR crossing to accommodate pedestrian and bicycle movements and provide for their safety.

Crossing	Arterial	Year Included in the RTP	RTP Project #	Crossing Status	Cost \$
Cactus Avenue/Desert Oasis Crossings					
Cactus Baseline	Fort Apache to Rainbow (UPRR overpass)	2015	898	New/Design Stage	\$\$
Alternative A	Trail Under existing structure using Rainbow	Not Included			\$
Alternative B	Desert Oasis Pedestrian Crossing Overpass	Not Included			\$
Alternative C	Trail Under existing structure using trail	Not Included			\$
Oakey/Wyoming Alternative Improvements					
Alternative A	Rehabilitation of Existing Crossing	Not Included			\$
Alternative B	I-15 to Main	2019	4249	EIS Stage/ Active/New	\$\$\$

Cactus Avenue/Desert Oasis UPRR Crossing

Desert Oasis High School is located on Erie Avenue 700 feet east of UPRR. Residential developments are located on the west side of the UPRR and the need for pedestrians (especially students crossing the UPRR to go to school) was identified during the review of the existing conditions. Construction of Cactus Avenue overpass south of the school is planned to occur in 2015 when funds become available. In addition to this base alternative, additional alternatives that would facilitate the pedestrian crossing were considered. The alternatives include:

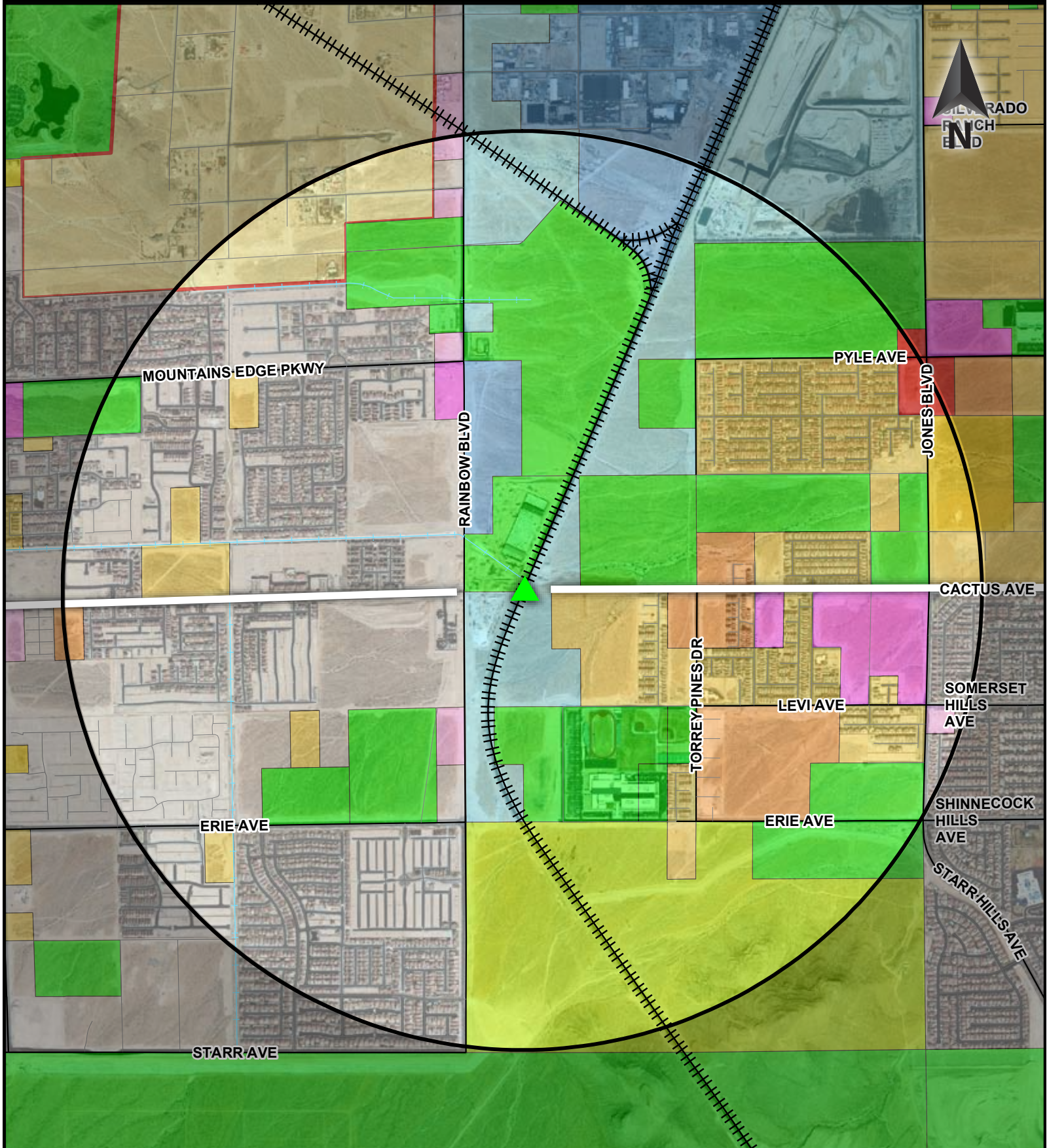
Baseline Alternative – Cactus Avenue Overpass

Alternative A – Cactus Avenue Underpass along Rainbow Boulevard

Alternative B – Erie Avenue Overpass

Alternative C – Cactus Avenue Underpass and trail along UPRR

The following figures provide information regarding the land use surrounding the crossing, location of the alternative routes and typical cross sections of the required improvements.



Source: Clark County, Nevada.

Cactus Ave Crossing

Cactus Ave 1 mile buffer

Church

Hospital

School

Planned Land Use Classification

Open Lands

Rural Neighborhood Preservation

Residential Suburban

Residential Medium

Residential High

Office Professional

Commercial Neighborhood

Commercial General

Business and Design Research Park

Industrial

Public Facilities

Major Development Project

Union Pacific Railroad Crossing at Cactus Avenue

Planned Land Use

1,500

750

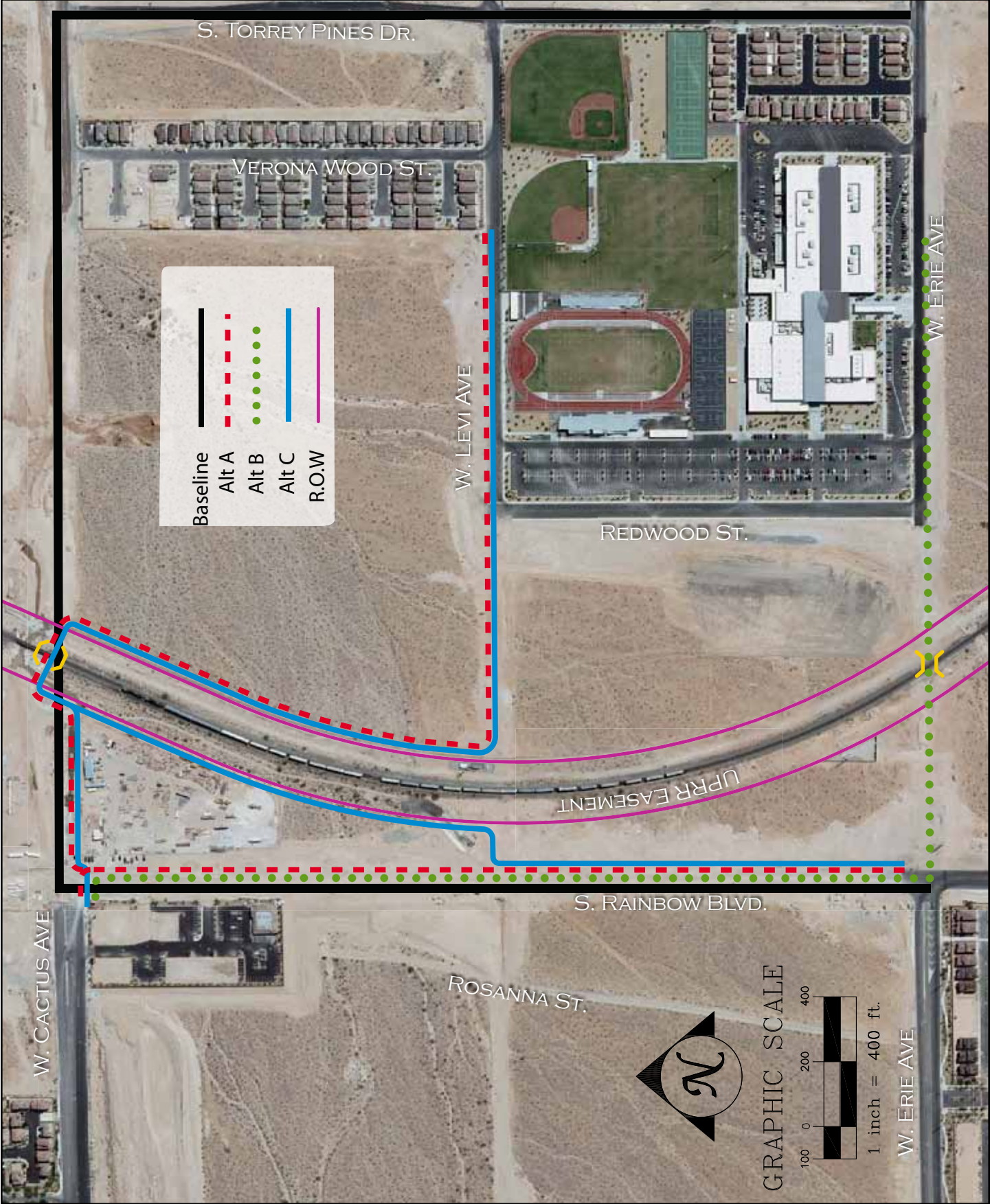
0

1,500

Feet

1 inch = 1,500 feet

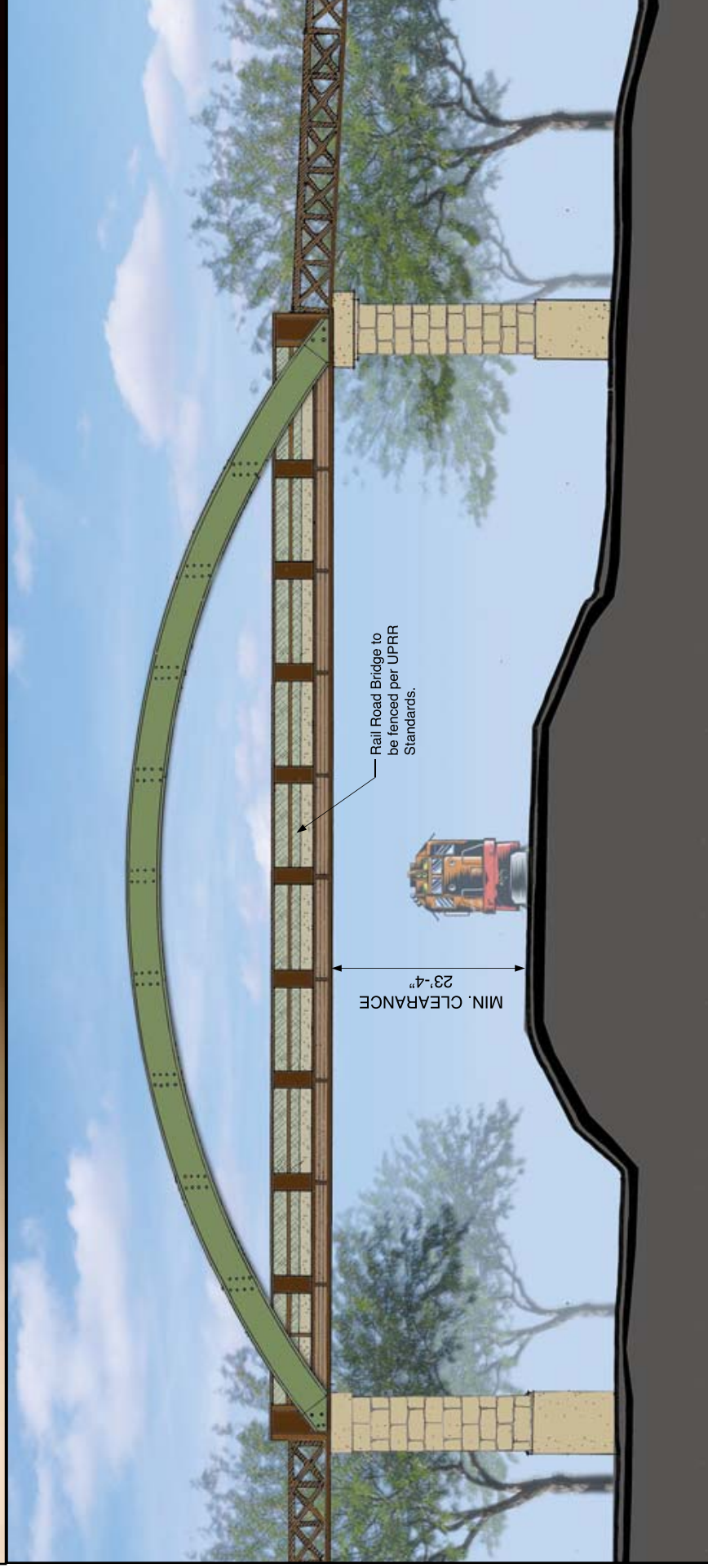
Cactus Erie Crossing Alternatives





Cactus Erie Crossing Alternatives

Alternative B Crossing





UPRR
EASEMENT



VARIES
LANDSCAPE
BUFFER

12'
TRAIL

VARIES
LANDSCAPE
BUFFER

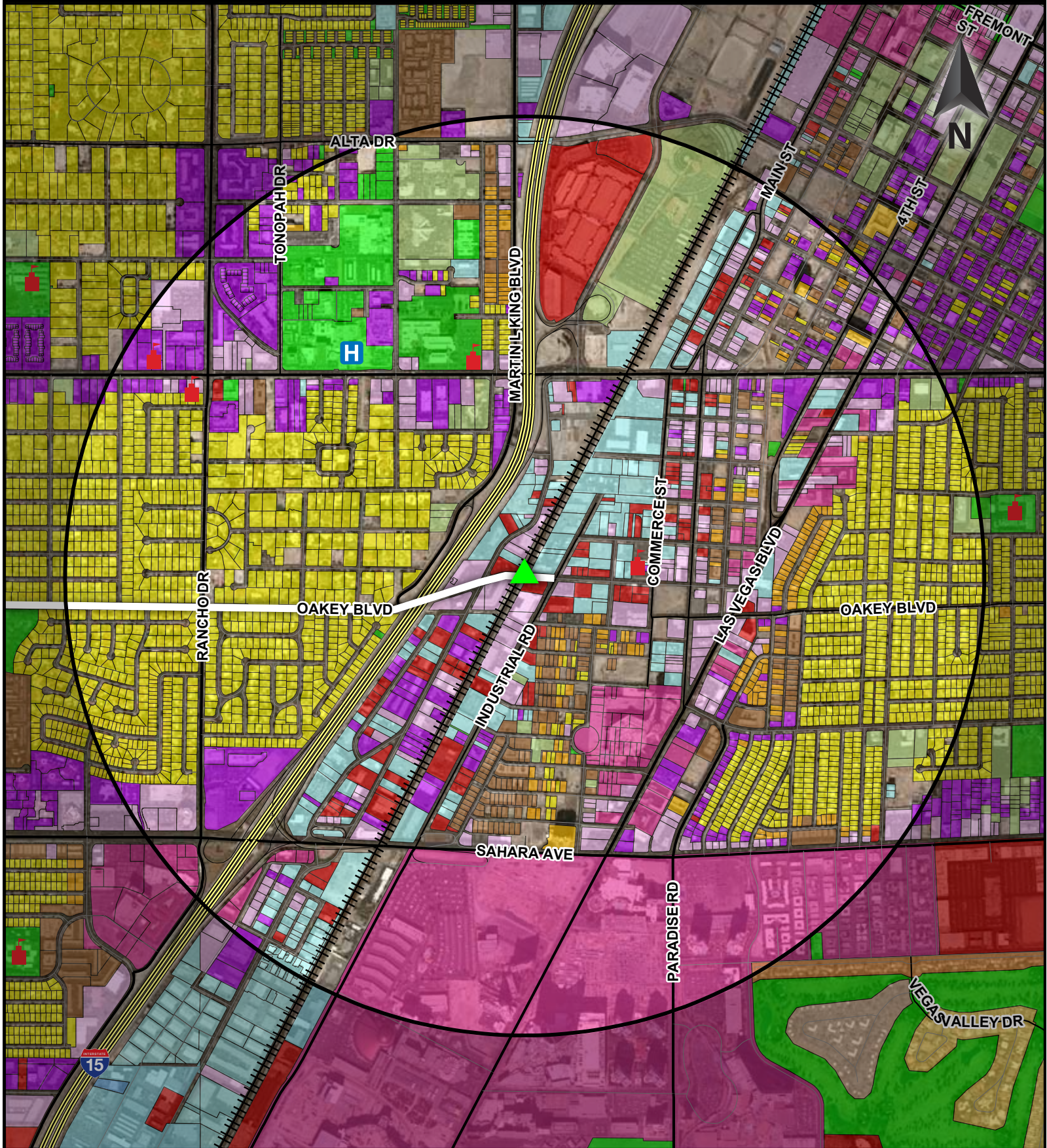
TRAIL
CORRIDOR

Oakey/Wyoming Avenue UPRR Crossing

The grade separation of Oakey/Wyoming and UPRR is planned within the Project Neon. The implementation of this project is scheduled in 2018 based on the RTP. Field investigations indicated that several safety deficiencies exist at this crossing. To provide mitigation for these deficiencies until the project Neon is funded and implemented, the following interim improvements are proposed:

- extension of the sidewalks based on the ADA standards,
- median that separates travel lanes,
- relocation of gates, and
- restriping.

The following figures provide information on the land use surrounding the crossing and the layout of the proposed alternative improvements.



Source: Clark County, Nevada.

Oakey/Wyoming Crossing

Oakey/Wyoming 1 mi buffer

Church

Hospital

School

Planned Land Use Classification

Single Family

Plexes

Condominiums

Apartments

Group Quarters

Non-Profit Organizations

Government & Religious

Residential High

Tourist Commercial

Office

Service Commercial

General Commercial

Ind/Comm/Trans/Utilities

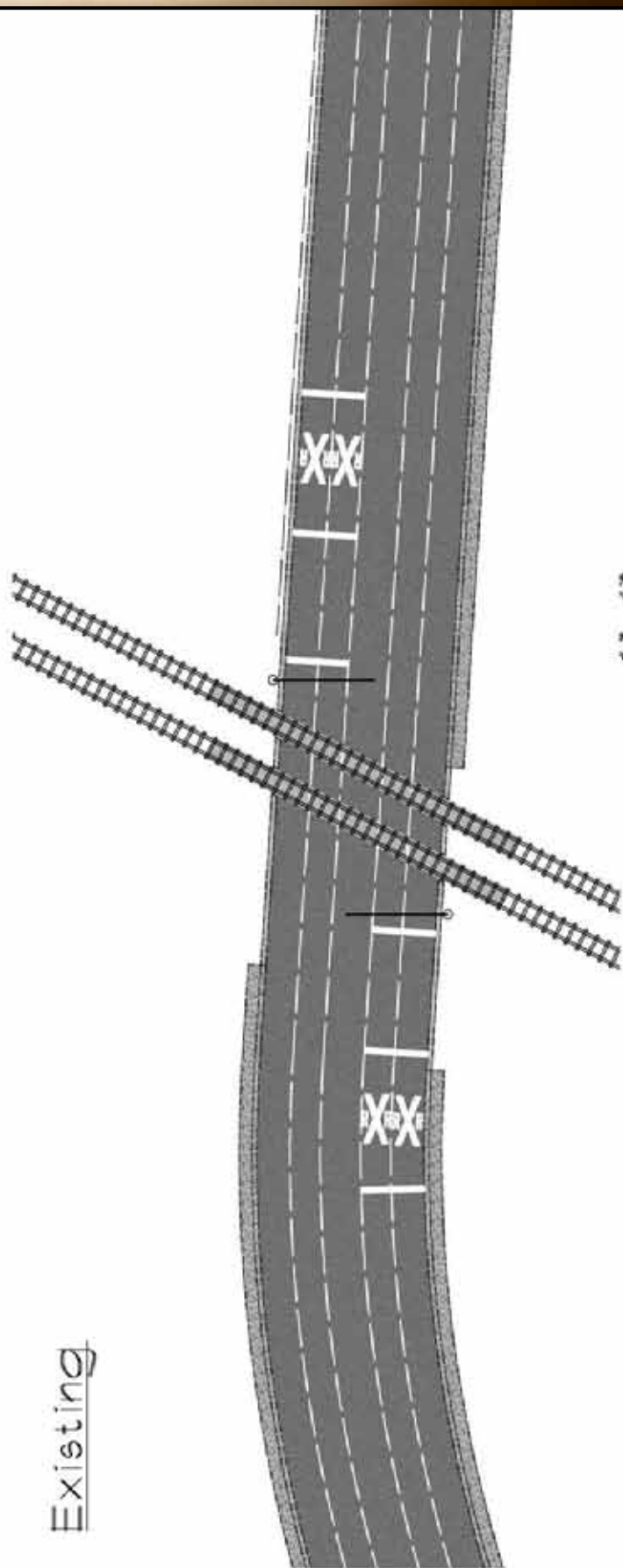
Union Pacific Railroad Crossing at Oakey/Wyoming

Planned Land Use

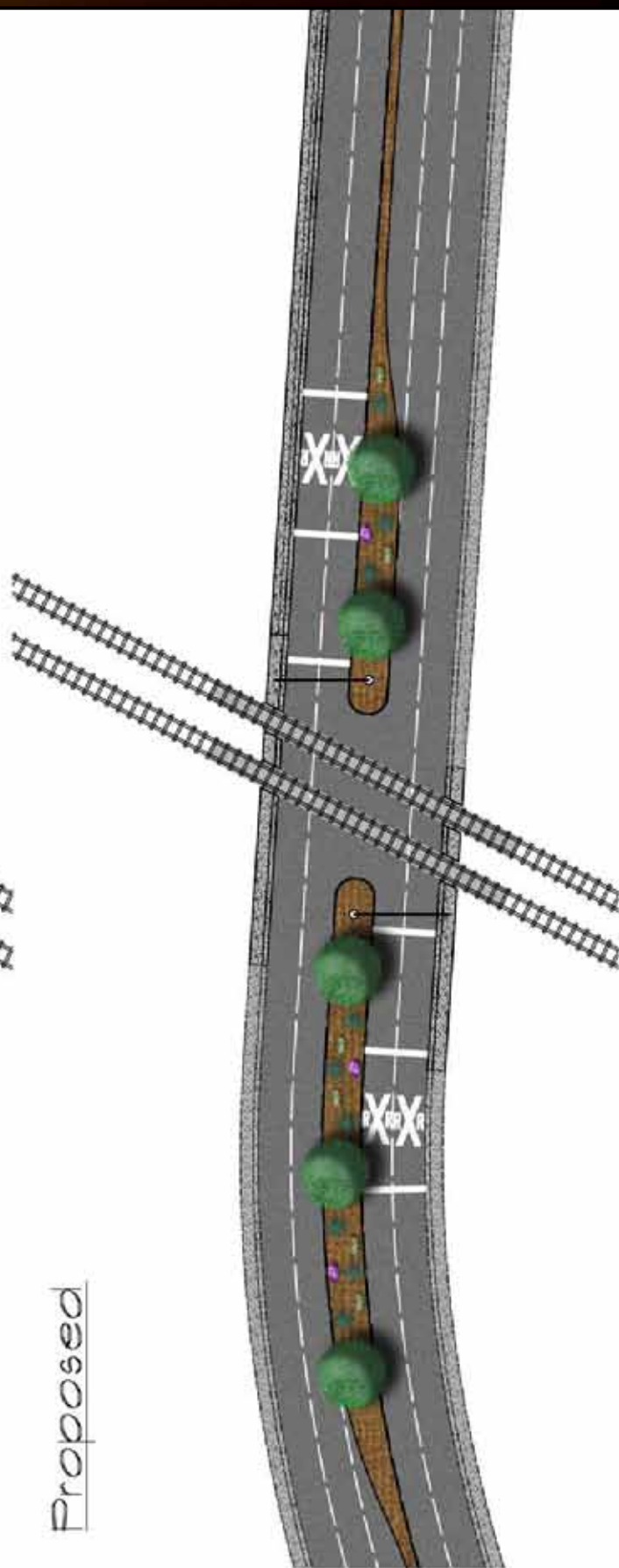
1 inch = 1,500 feet

Oakey/Wyoming Alternative Improvements

Existing



Proposed





Project Prioritization Supporting Information

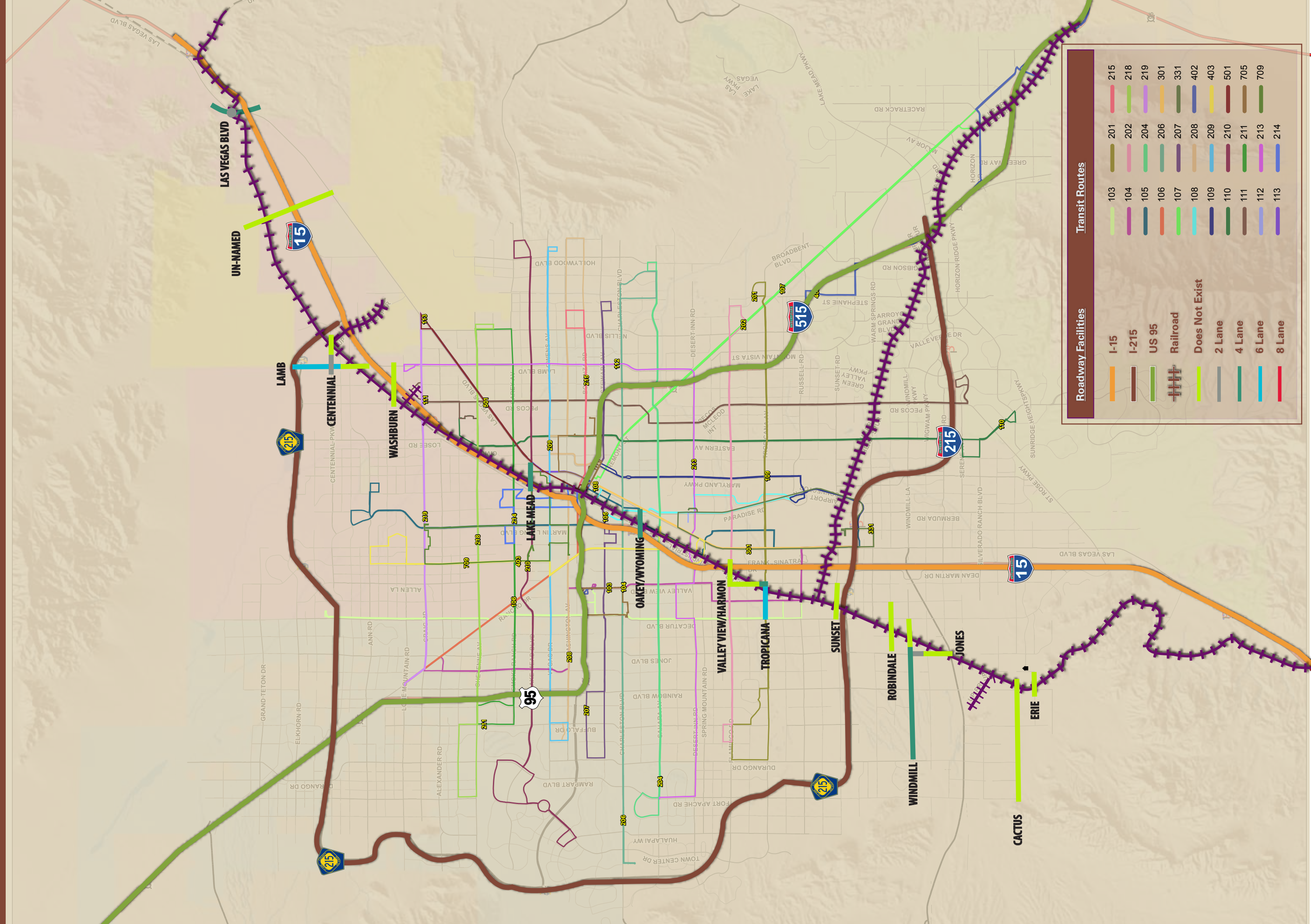
Project Prioritization List

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Windmill	Durango to Decatur	2020	639	New	\$\$
Selected Cactus Avenue/Desert Oasis Alternative Crossings if other than Cactus Crossing					
Selected Oakey/Wyoming Alternative Improvement if other than Project Neon					

(1) Although considered as an alternative this project will also be prioritized

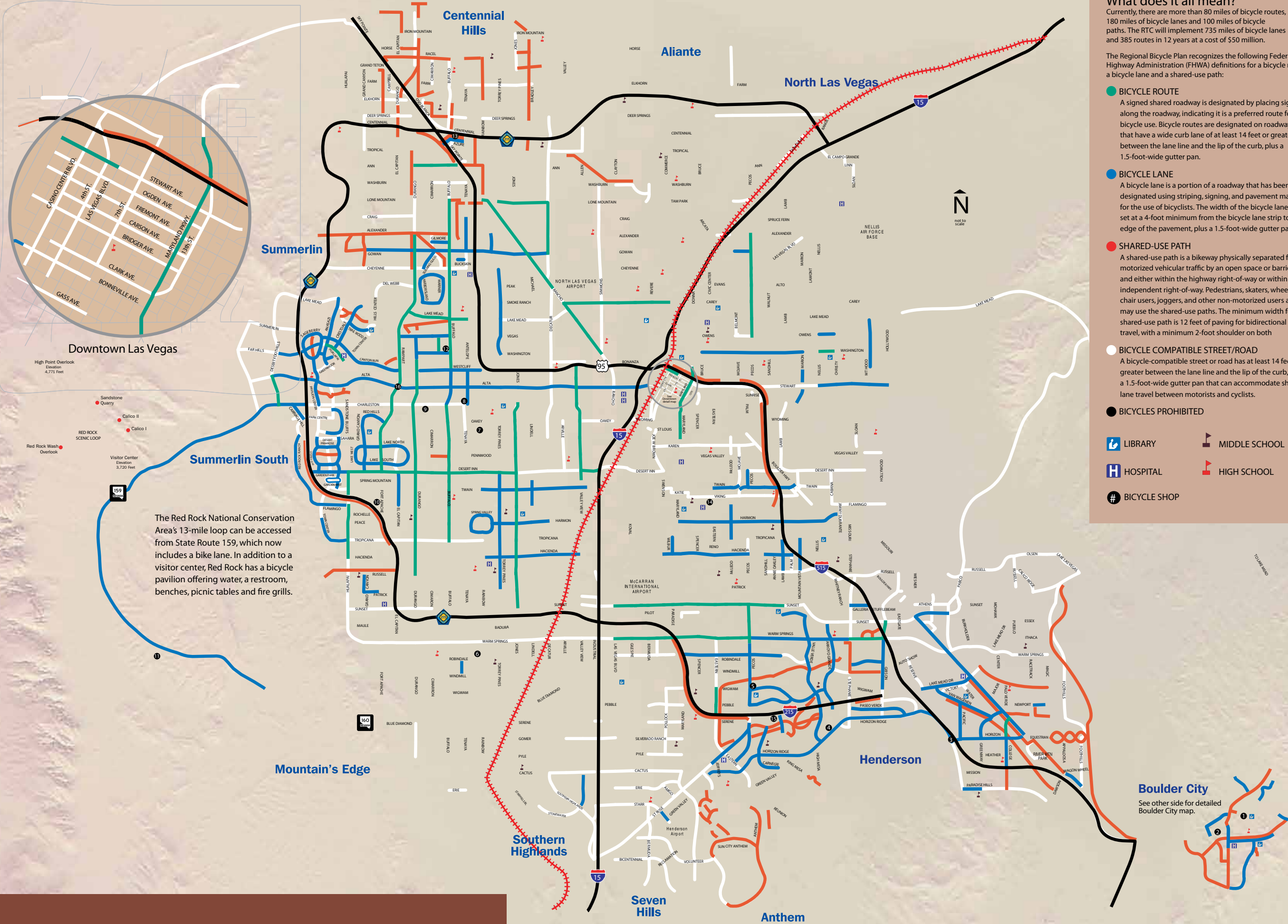
(2) Project included in the RTP does not include a crossing over UPRR.

Existing Facilities in the Vicinity of the Future Crossings



Future UPRR Crossing Project Locations





What does it all mean?

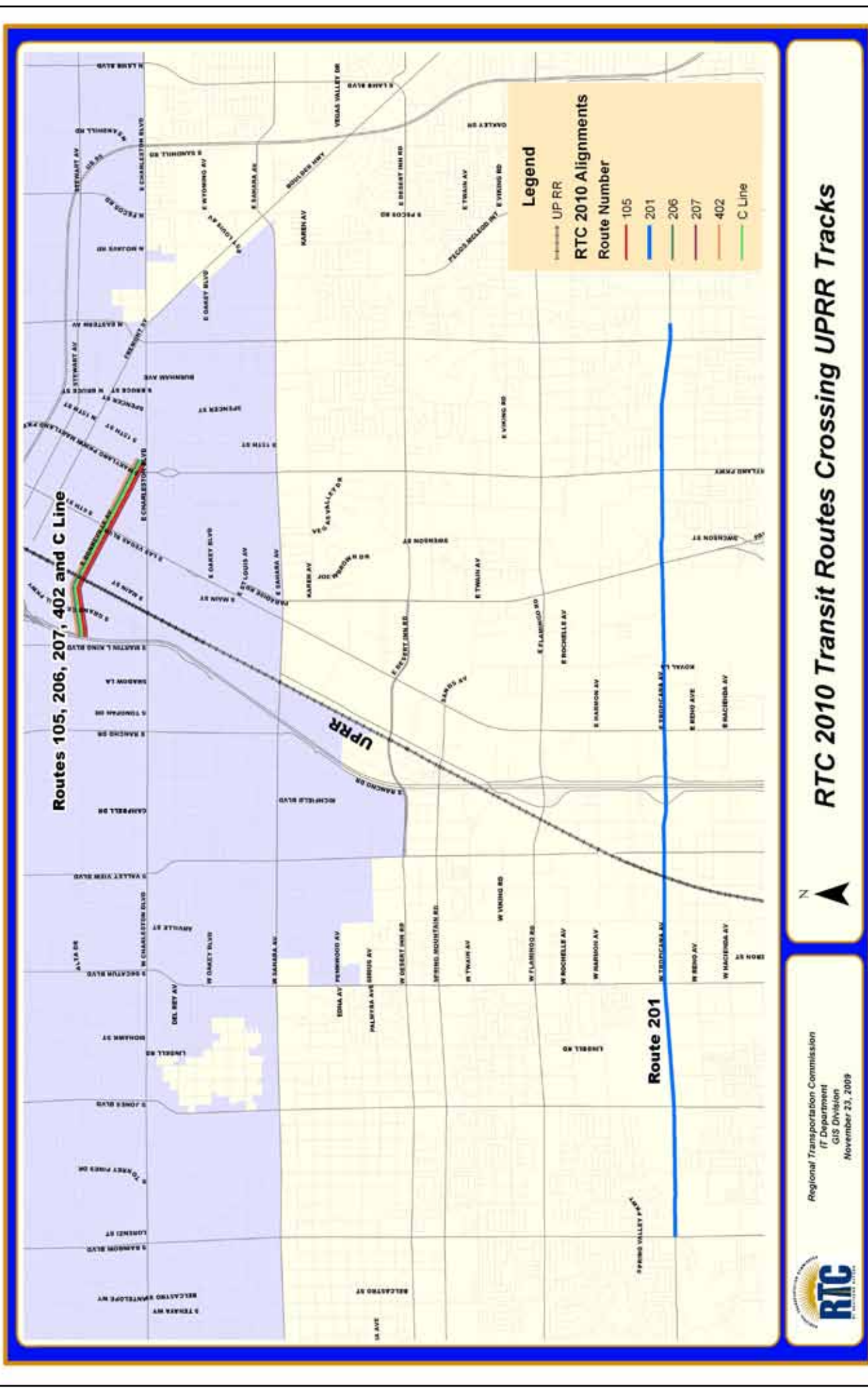
Currently, there are more than 80 miles of bicycle routes, 180 miles of bicycle lanes and 100 miles of bicycle paths. The RTC will implement 735 miles of bicycle lanes and 385 routes in 12 years at a cost of \$50 million.

The Regional Bicycle Plan recognizes the following Federal Highway Administration (FHWA) definitions for a bicycle route, a bicycle lane and a shared-use path:

- BICYCLE ROUTE**
A signed shared roadway is designated by placing signs along the roadway, indicating it is a preferred route for bicycle use. Bicycle routes are designated on roadways that have a wide curb lane of at least 14 feet or greater between the lane line and the lip of the curb, plus a 1.5-foot-wide gutter pan.
- BICYCLE LANE**
A bicycle lane is a portion of a roadway that has been designated using striping, signing, and pavement markings for the use of bicyclists. The width of the bicycle lane is set at a 4-foot minimum from the bicycle lane strip to the edge of the pavement, plus a 1.5-foot-wide gutter pan.
- SHARED-USE PATH**
A shared-use path is a bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Pedestrians, skaters, wheel-chair users, joggers, and other non-motorized users also may use the shared-use paths. The minimum width for a shared-use path is 12 feet of paving for bidirectional travel, with a minimum 2-foot shoulder on both
- BICYCLE COMPATIBLE STREET/ROAD**
A bicycle-compatible street or road has at least 14 feet or greater between the lane line and the lip of the curb, plus a 1.5-foot-wide gutter pan that can accommodate shared lane travel between motorists and cyclists.
- BICYCLES PROHIBITED**
- LIBRARY**
- MIDDLE SCHOOL**
- HOSPITAL**
- HIGH SCHOOL**
- BICYCLE SHOP**

The Red Rock National Conservation Area's 13-mile loop can be accessed from State Route 159, which now includes a bike lane. In addition to a visitor center, Red Rock has a bicycle pavilion offering water, a restroom, benches, picnic tables and fire grills.

Boulder City
See other side for detailed Boulder City map.

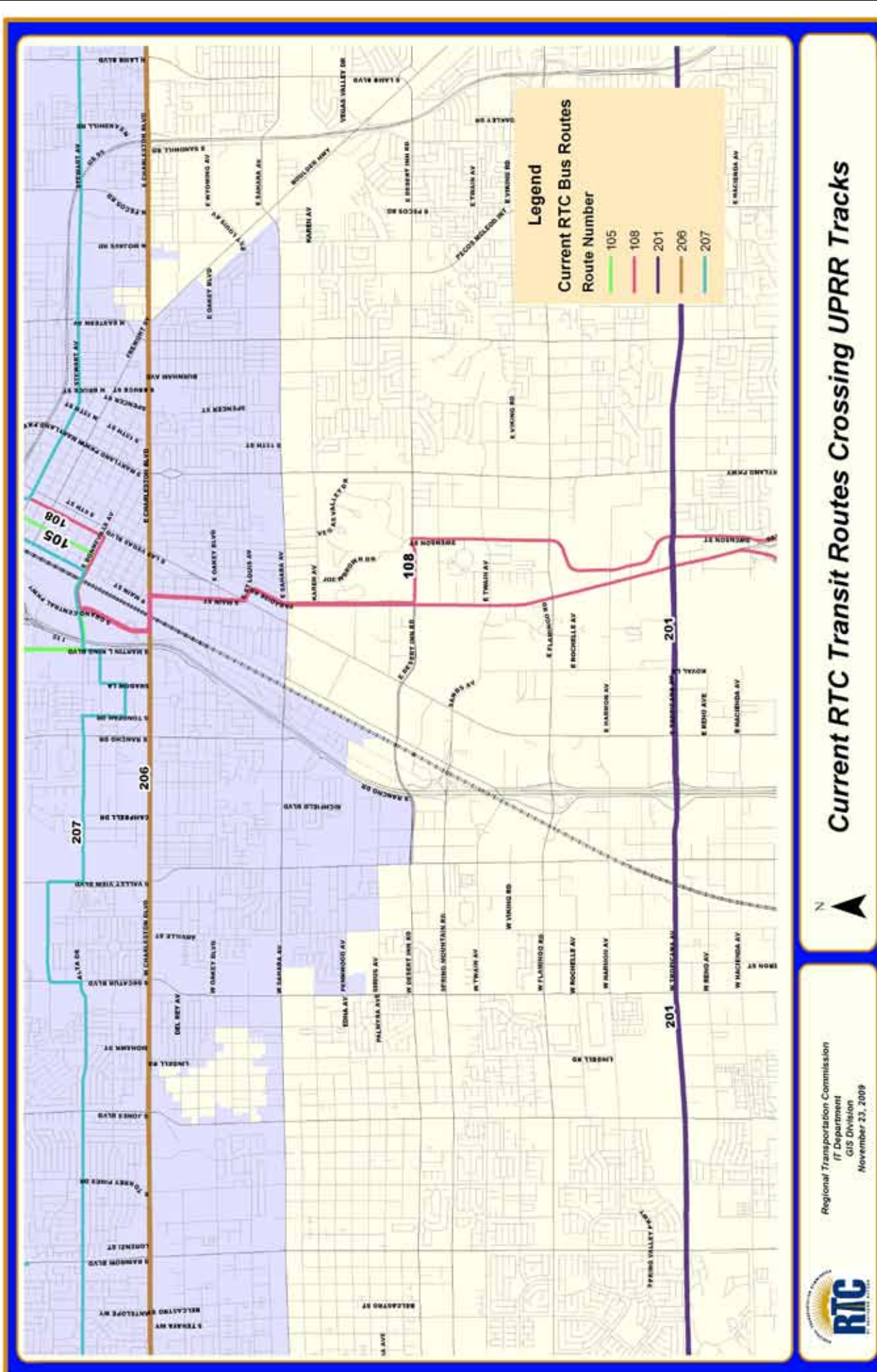


RTC 2010 Transit Routes Crossing UPRR Tracks



Regional Transportation Commission
IT Department
GIS Division
November 23, 2009





Current RTC Transit Routes Crossing UPRR Tracks



Regional Transportation Commission
 IT Department
 GIS Division
 November 23, 2009



SUMMARY OF DATA FOR THE TRANSIT ROUTES CURRENTLY CROSSING UPRR

Bonneville

Route 105-Base service is every 30 minutes, seven days a week with later evening service operating hourly. Avg. daily ridership is 2,100 per day

Route 207-Base service is every 30 minutes Mondays through Fridays and hourly on weekends and late evening. Avg. daily ridership is 2,000 per day

Route 108 (uses both the Charleston and Bonneville underpasses)-Base service is currently every 20-25 minutes and every hour in the very late evening, seven days a week. Average daily ridership is 3,900 (This route will be reconfigured in March 2010 and will not use this crossing)

Charleston

Route 206-Base service every 18 minutes, seven days a week with service operating every 30 minutes in the evening. This is a 24-hour route. Avg. daily ridership is 9,900. In September 2010 after the Bonneville Transit Center opens, this route is proposed to no longer utilize the Charleston underpass but rather use Bonneville. However, the route could be structured in some fashion in the future where one branch may use the Charleston underpass and the other uses Bonneville.

Tropicana

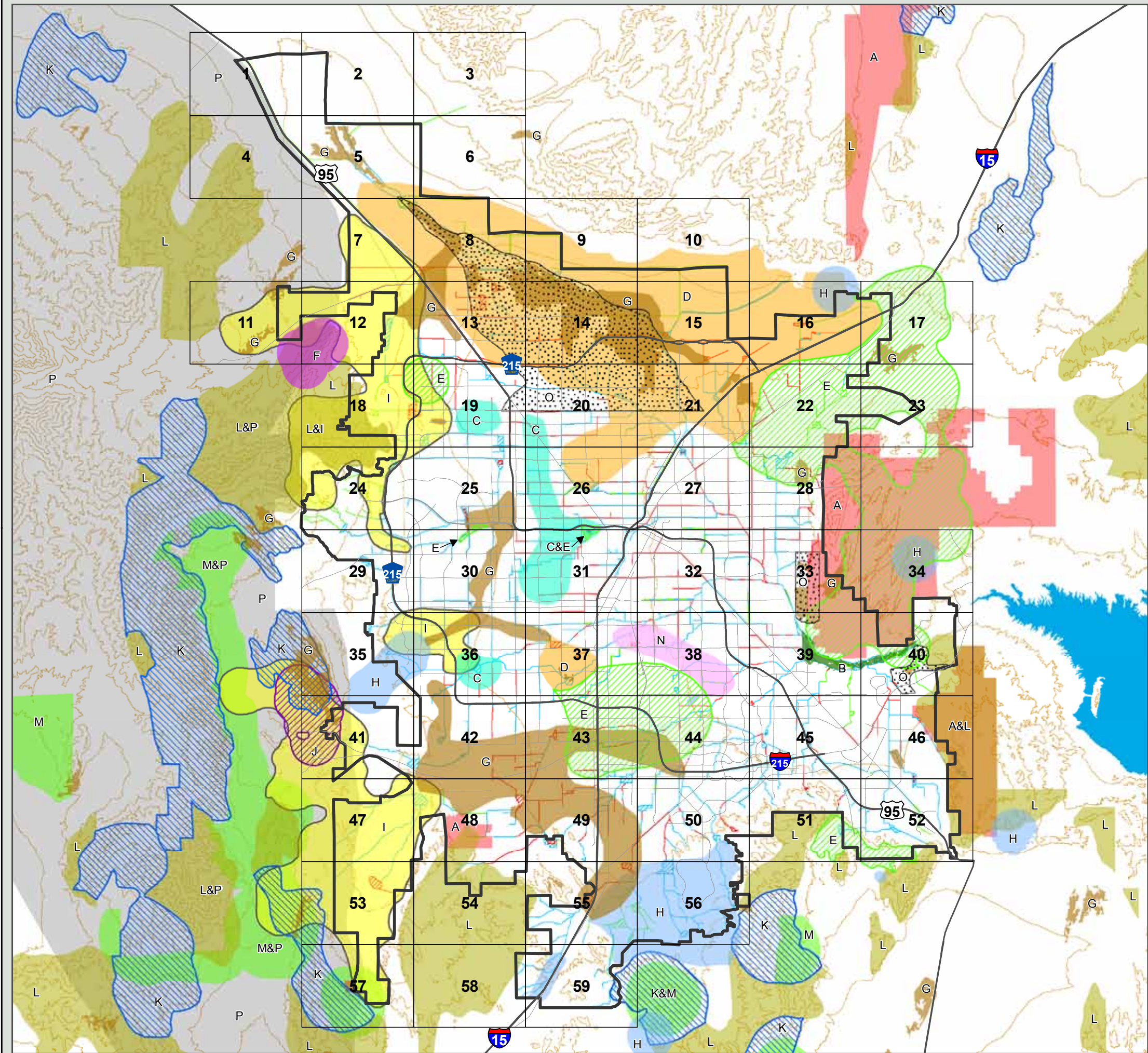
Route 201-Base service every 15 minutes with late evening service operating every 30 and overnight every hour. This is a 24-hour route. Avg. daily ridership is 8,700.

In March 2010, a new commuter route, called the ACExpress C line will operate from Centennial Hills to downtown Las Vegas, then to the LV Premium Outlets, Government Center, the Strip and UNLV utilizing the Bonneville UPRR underpass. At this time, it is estimated to have a daily ridership of 1,800.

In September 2010, Route 402 which currently operates from Meadows Mall to Boulder City via downtown Las Vegas is being proposed for a reroute to use Bonneville from the new transit center under the UPRR tracks, past the Government Center and the UMC hospital area then onto 95. The current avg. daily ridership is 750, but is expected to increase tremendously when we reroute through downtown and extend to a new park and ride lot near the Summerlin Parkway.

The Bonneville underpass will become more and more important for the RTC and as more routes are expanded and rerouted, we have to be careful of what equipment to deploy. Once Symphony Park fully develops near the World Market Center, we would like to operate circulator bus service as well but will be unable to utilize double deck vehicles due to the low railroad bridge.

While we don't have the exact number of passengers that are on the buses as it goes under, the routes themselves are very busy and we are limited to the fleet deployment. Route 201 and 206 are prime examples of high capacity routes that are constrained to utilizing only articulated coaches when a double deck would do just fine.



ENVIRONMENTALLY SENSITIVE AREAS

LEGEND

- Ultimate Development Boundary
- Sheet Index
- Areas of Critical Environmental Concern
- Wetland
- White Bearpoppy
- Las Vegas Buckwheat and Las Vegas Bearpoppy
- Las Vegas Bearpoppy
- Mojave Milkvetch
- Mesquite/Acacia
- Rosy Twotone Beardtongue
- Yellow Twotone Beardtongue
- Bluediamond Cholla
- BLM Crucial Bighorn Habitat
- BLM Bighorn Winter Range
- BLM_Quail_Habitat
- Las Vegas Buckwheat
- Paleontological Sensitive Area
- BLM Horse and Burro Management Area
- Lake Las Vegas
- Lake Mead
- Main Highways
- Major Streets
- 500 ft Contours (USGS)

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/Parallel Facilities
- Category B Remove & Replace/Parallel Facilities

NOTES:

Information displayed on this map is for general reference only. The environmentally sensitive areas presented on this figure are conservative and do not account for areas that are urbanized. These areas are meant to show only where there is a "potential" for sensitive resources to occur and are not meant to define exact locations. The Bureau of Land Management, U.S. Fish and Wildlife Service, Nevada Department of Wildlife, and the Nevada Natural Heritage Program should be consulted for site specific information. Site-specific investigations and species-specific surveys must be conducted for each project to determine whether sensitive environmental resources occur in a specific project area.

*Potential habitat exists for the Mojave desert tortoise, western chuckwalla, banded Gila monster, migratory birds, protected bat species, and desert kit fox on undeveloped land throughout the study area.

*Potential habitat for Gambel's Quail occurs in washes and wetland areas throughout the entire study area.

*Rosy Twotone Beardtongue habitat also exists southwest of the Ultimate Development Boundary.

*Cacti and yucca species occur on undeveloped land throughout the study area.

*Wetlands are known to occur adjacent to the Las Vegas Wash in the eastern portion of the study area.

*Dry ephemeral washes occur throughout the study area.

*Sensitive cultural resources may occur throughout the study area.

*Areas of Critical Environmental Concern (ACEC) are designated by the BLM "to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards". (Reference: Federal Land Policy And Management Act of 1976, 43 USC Sec. 1702).

SOURCES:

*Bureau of Land Management (BLM). 1998. Proposed Las Vegas Resource Management Plan and Environmental Impact Statement. Vol II May.

*BLM. 2002. Personal communication between Gayle Marrs-Smith, Vegetation Specialist and Billye Breckenridge (PBS&J). May 8.

*BLM. 2004. Las Vegas Valley Disposal Boundary Environmental Impact Statement. Prepared by PBS&J. December.

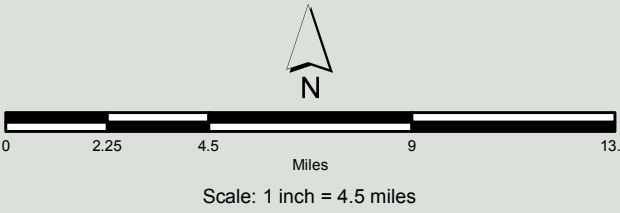
*BLM. 2008. Online Geospatial data. UTM: http://www.blm.gov/nv/st/en/prog/more_programs/geographic_sciences/gis/geospatial_data.3.html. Accessed March.

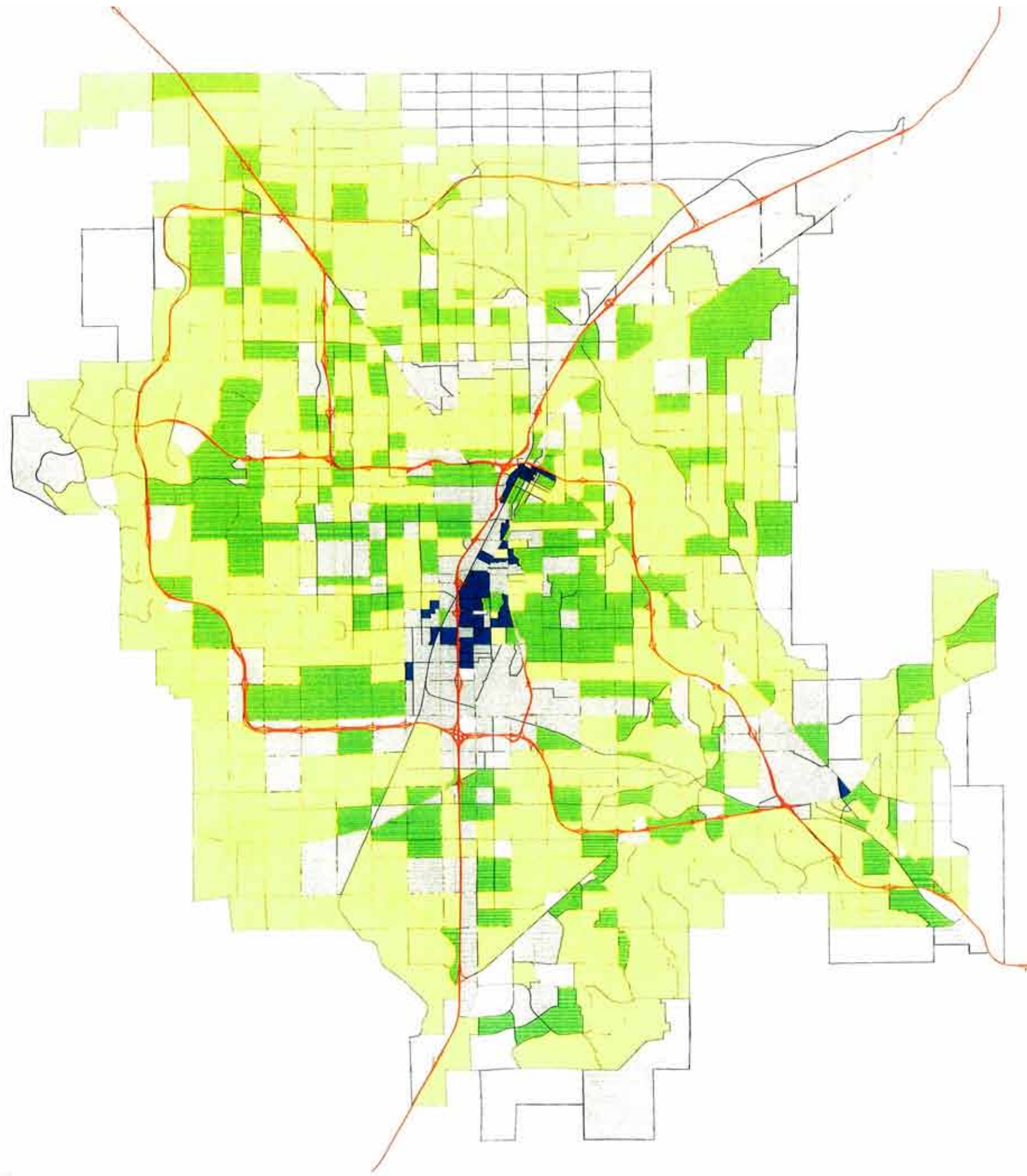
*BLM and U.S. Army Corps of Engineers. 2004. Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District, 2002 Master Plan Update, Final. Prepared by SWCA Environmental Consultants. September.

*Clark County. 2000. The Multiple Species Habitat Conservation Plan and Environmental Impact Statement for Issuance of Permit to Allow Incidental Take of 79 Species in Clark County, Nevada. June.

*Nevada Natural Heritage Program (NNHP). 2008. Data request received April 3.

*PBS&J. 2002. Clark County Regional Flood Control District 2002 Las Vegas Valley Flood Control Master Plan Update. September.





Jobs Housing Balance

Major Streets

Freeways

Jobs/Housing Balance

Vacant

Excess Housing

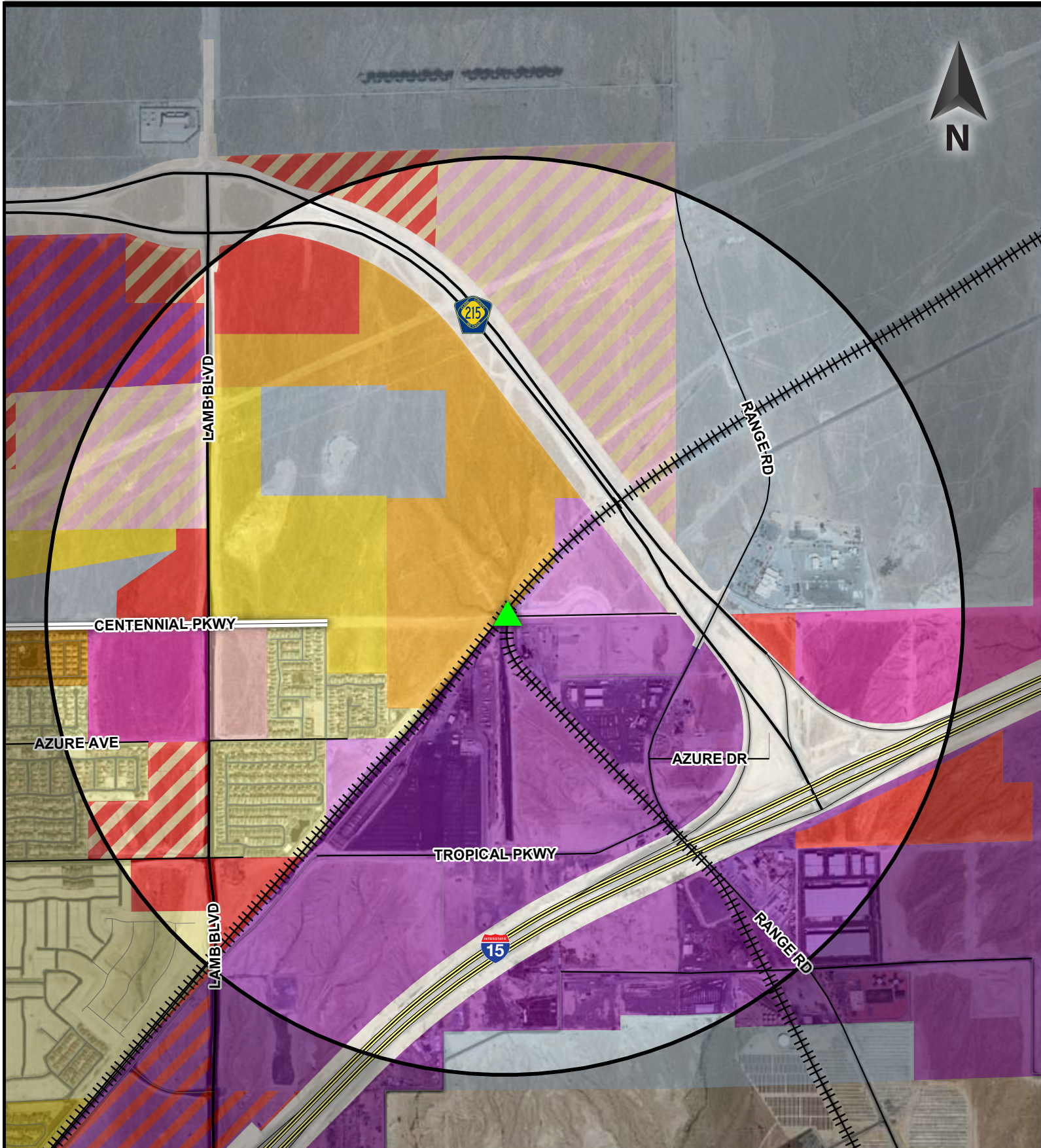
Balanced

Excess Jobs

>50 Jobs/Acre



Exhibit 2



Source: Clark County, Nevada.

Centennial Pkwy Crossing

Centennial Pkwy 1 Mile Buffer

Planned Land Use Classification

Single Family Low (up to 6 du / ac)

Single Family Medium (up to 13 du / ac)

Multi-Family (up to 25 du / ac)

Neighborhood Commercial

Resort Commercial

Community Commercial

Public / Semi - Public

Employment

Heavy Industrial

Mixed - Use Employment

Mixed - Use Commercial

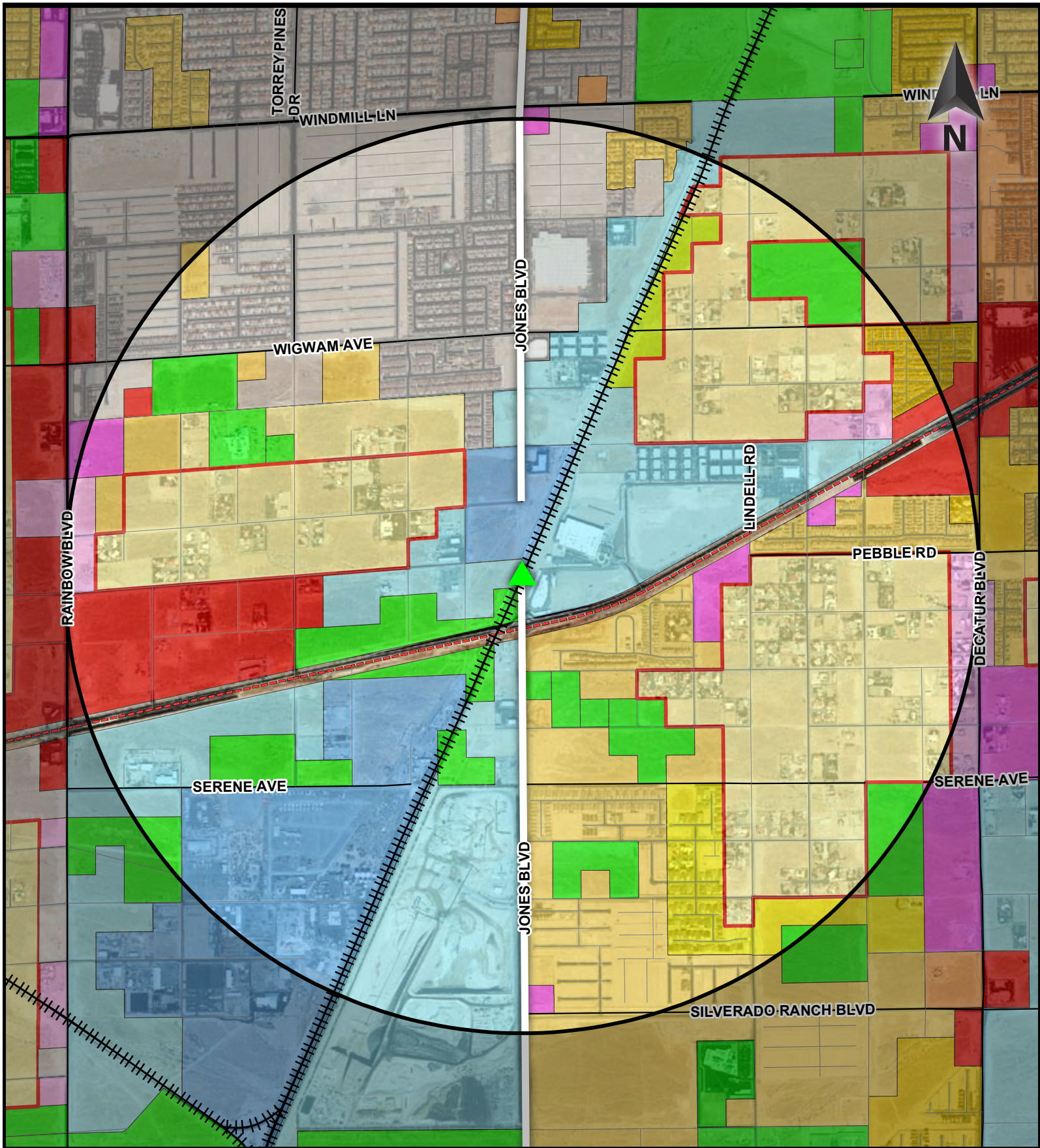
Mixed - Use Neighborhood

ROW

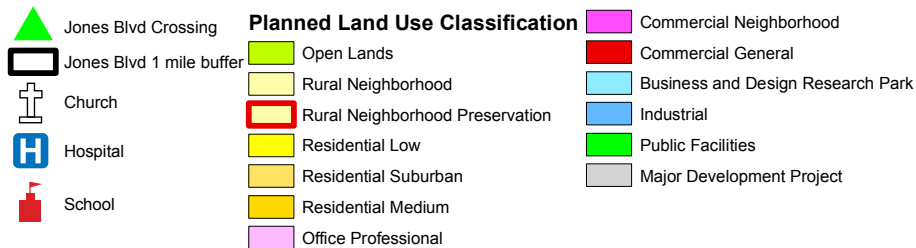
**Union Pacific Railroad Crossing
at Centennial Parkway**

Planned Land Use

1 inch = 1,500 feet

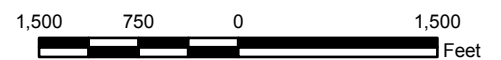


Source: Clark County, Nevada.

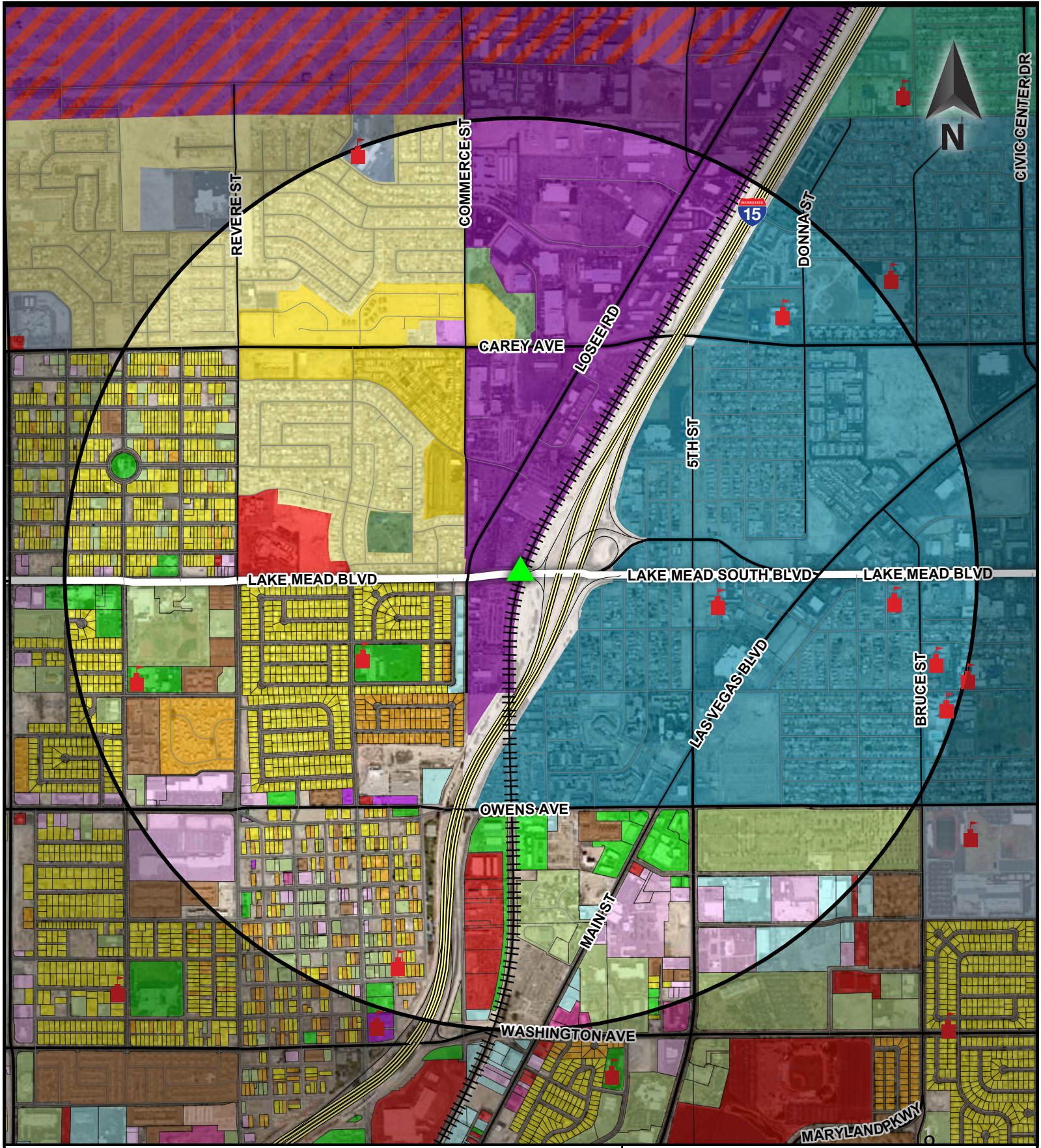


Union Pacific Railroad Crossing at Jones Boulevard

Planned Land Use



1 inch = 1,500 feet



Source: Clark County, Nevada.

Lake Mead Crossing

Lake Mead 1 mile buffer

Church

Hospital

School

City of Las Vegas Planned Land Use

- Single Family
- Plexes
- Apartments
- Group Quarters
- Non-Profit Organizations

North Las Vegas Planned Land Use

RESIDENTIAL

- Single Family Low (up to 6 du / ac)
- Single Family Medium (up to 13 du / ac)

NON - RESIDENTIAL

- Government and Religious
- Tourist Commercial
- Office
- Service Commercial
- General Commercial
- Ind/Comm/Trans/Utilities
- Open Space
- Community Commercial
- Public / Semi - Public
- Downtown Business District
- Employment
- Heavy Industrial

OTHER

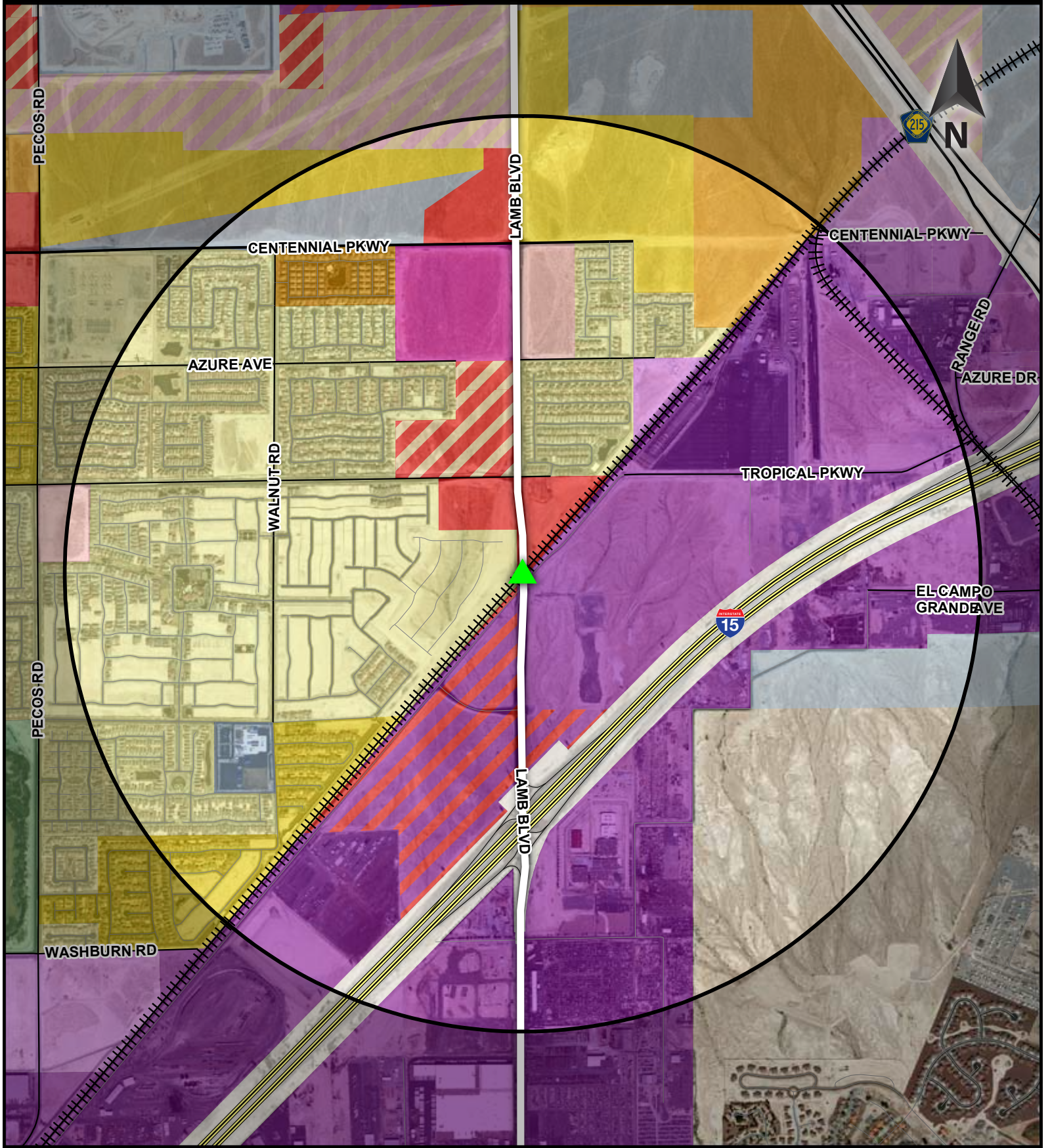
- ROW

Union Pacific Railroad Crossing at Lake Mead Boulevard






Planned Land Use

1,500 750 0 1,500
Feet

1 inch = 1,500 feet






Source: Clark County, Nevada.

-  Church
-  Hospital
-  School
-  Lamb Blvd Crossing
-  Lamb Blvd 1 mile buffer

Planned Land Use Categories






RESIDENTIAL

-  Single Family Low (up to 6 du / ac)
-  Single Family Medium (up to 13 du / ac)
-  Multi-Family (up to 25 du / ac)

NON - RESIDENTIAL

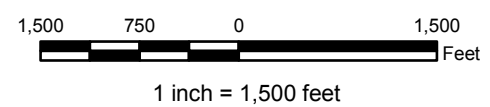
-  Open Space

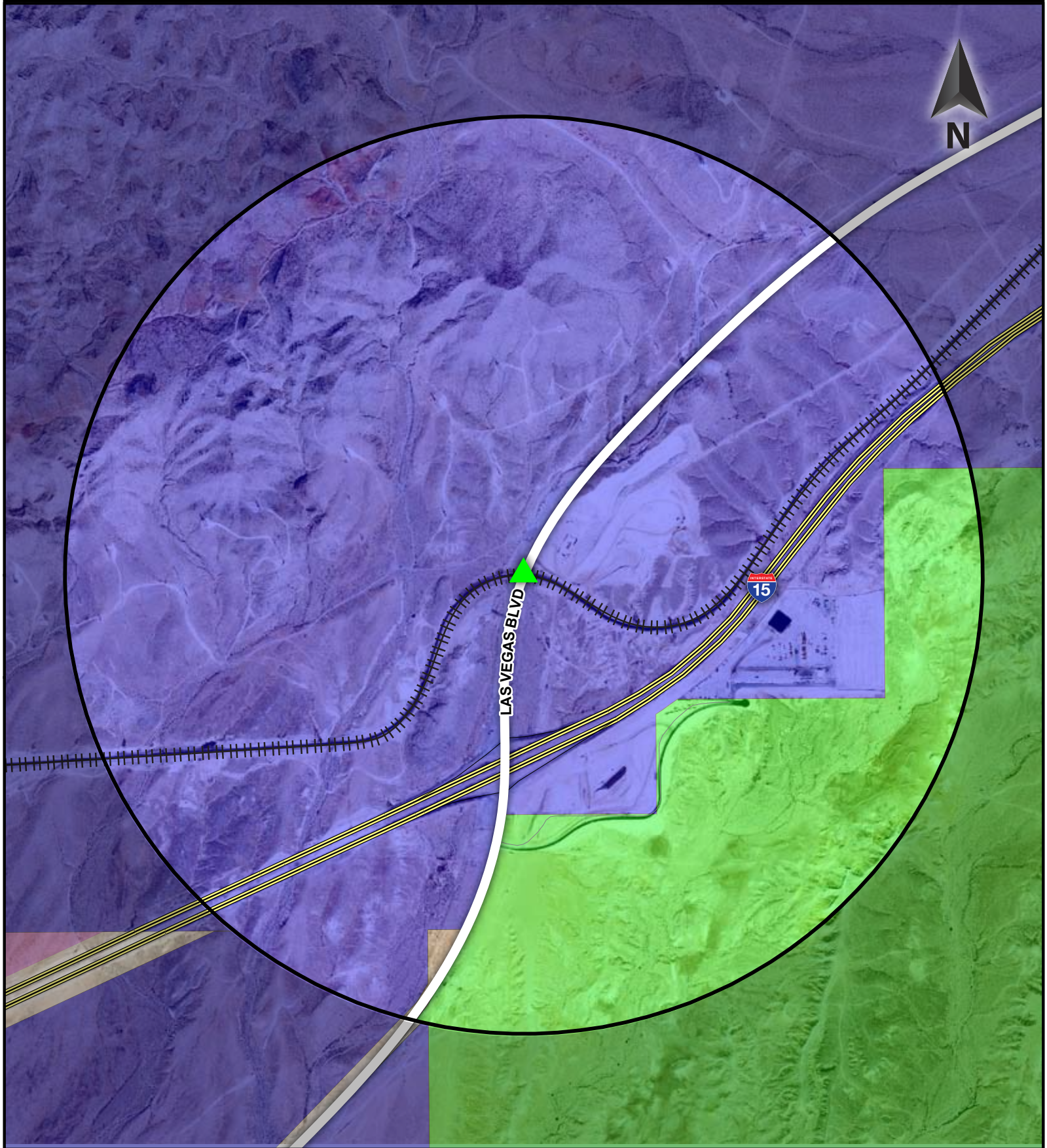
-  Neighborhood Commercial
-  Resort Commercial
-  Community Commercial
-  Public / Semi - Public
-  Downtown Business District
-  Downtown Area of Influence
-  Employment

-  Heavy Industrial
- MIXED - USE**
-  Mixed - Use Employment
-  Mixed - Use Commercial
-  Mixed - Use Neighborhood
- OTHER**
-  ROW






Union Pacific Railroad Crossing at Lamb Boulevard

Planned Land Use



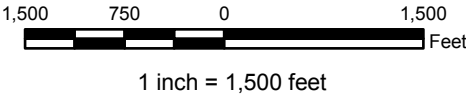


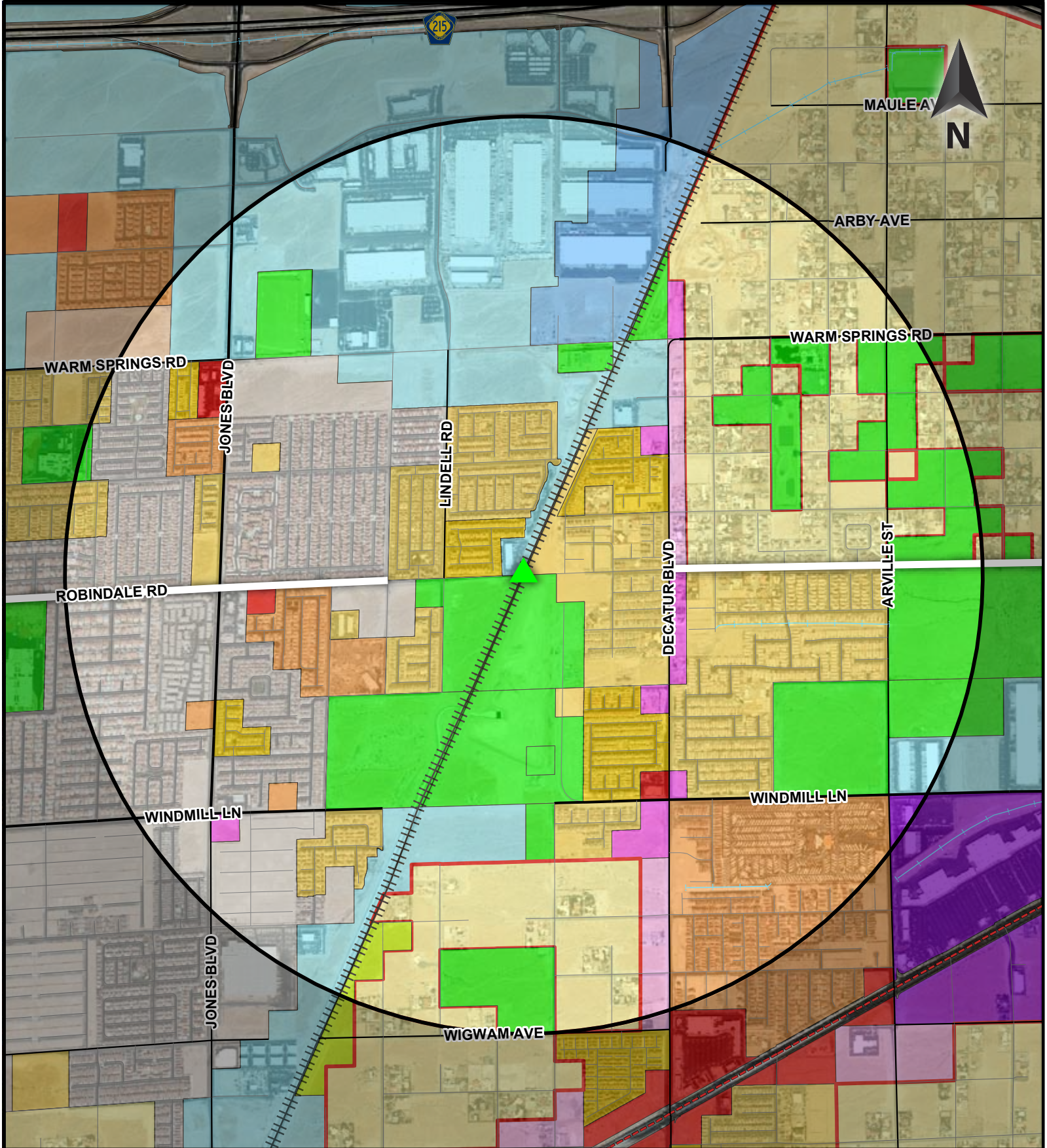
Source: Clark County, Nevada.

-  Las Vegas Blvd Crossing Point
-  Las Vegas Blvd 1 mile buffer
-  Church
-  Hospital
-  School

- Planned Land Use Classification**
-  Heavy Industrial
 -  Public Facilities
 -  ROW

**Union Pacific Railroad Crossing
at Las Vegas Boulevard**
Planned Land Use





Source: Clark County, Nevada.

- Robindale Rd Crossing
- Robindale Rd 1 mi buffer
- Church
- Hospital
- School

Planned Land Use Classification

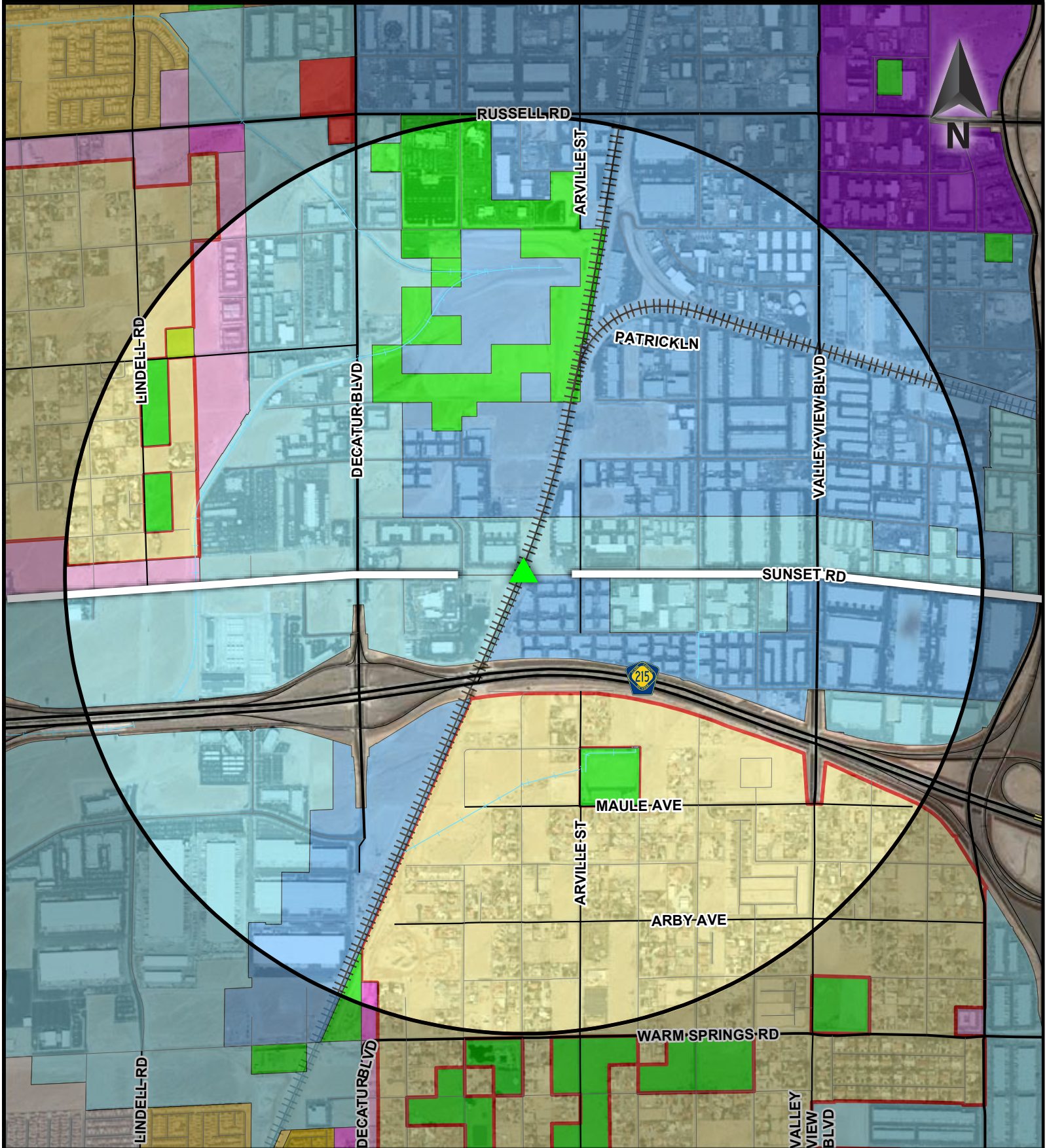
- Open Lands
- Rural Neighborhood Preservation
- Residential Suburban
- Residential Medium
- Residential High
- Residential Urban Center
- Office Professional

- Commercial Neighborhood
- Commercial General
- Commercial Tourist
- Business and Design Research Park
- Industrial
- Public Facilities
- Major Development Project


Union Pacific Railroad Crossing at Robindale Road


Planned Land Use


1 inch = 1,500 feet





Source: Clark County, Nevada.

 Sunset Rd Crossing


 Sunset Rd 1 mile buffer


 Church


 Hospital

 School


Planned Land Use Classification


 Open Lands


 Rural Neighborhood Preservation


 Office Professional


 Commercial Neighborhood

 Commercial Tourist

 Business and Design Research Park

 Industrial


 Public Facilities

 ROW

Union Pacific Railroad Crossing at Sunset Road

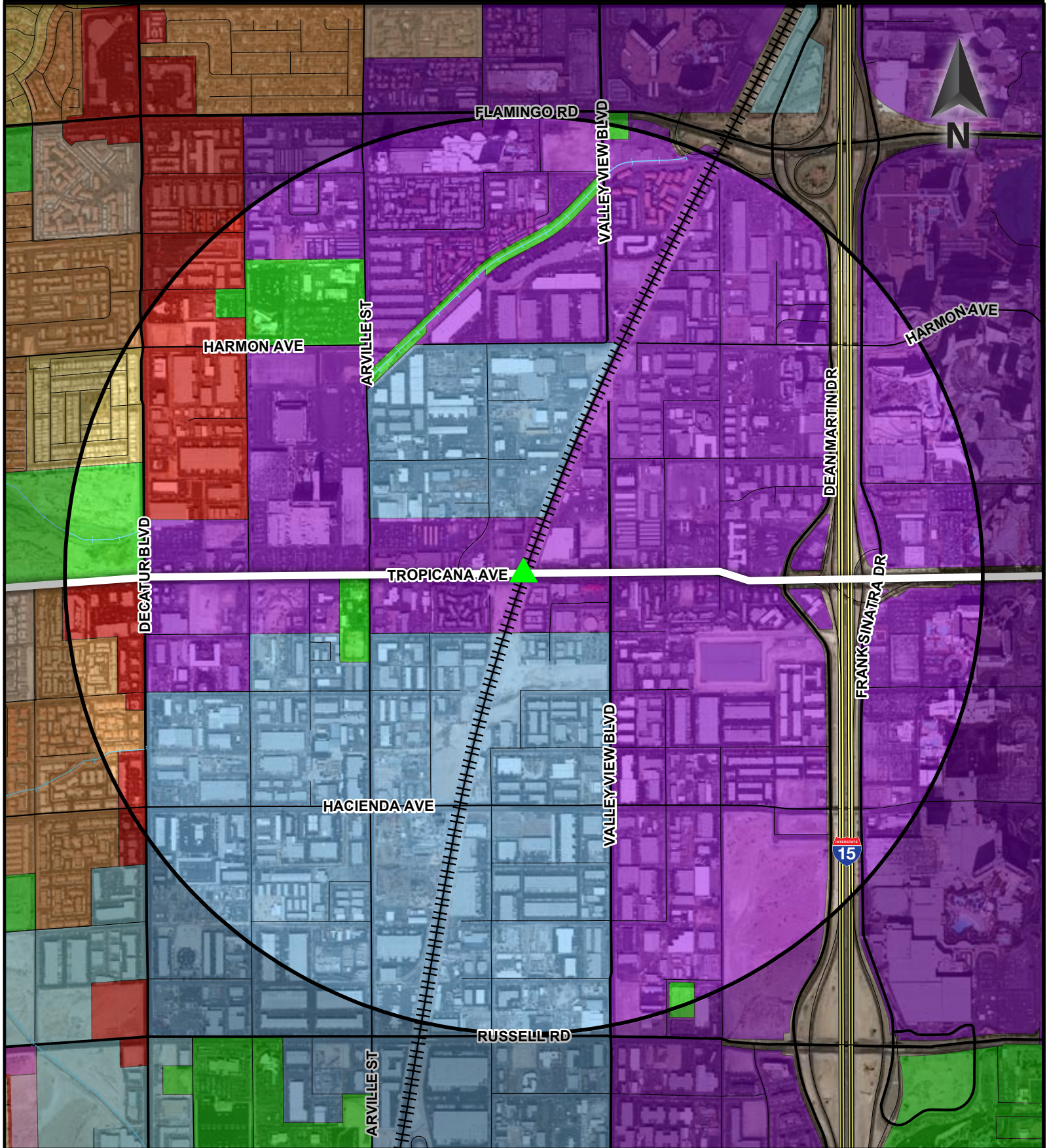
Planned Land Use

1,50075001,500




Feet


1 inch = 1,500 feet





Source: Clark County, Nevada.

 Tropicana Ave Crossing

 Tropicana Ave 1 mi buffer

 Church


 Hospital


 School


Planned Land Use Classification

 Residential Suburban

 Residential High

 Commercial General

 Commercial Tourist


 Industrial

 Public Facilities

Union Pacific Railroad Crossing at Tropicana Avenue

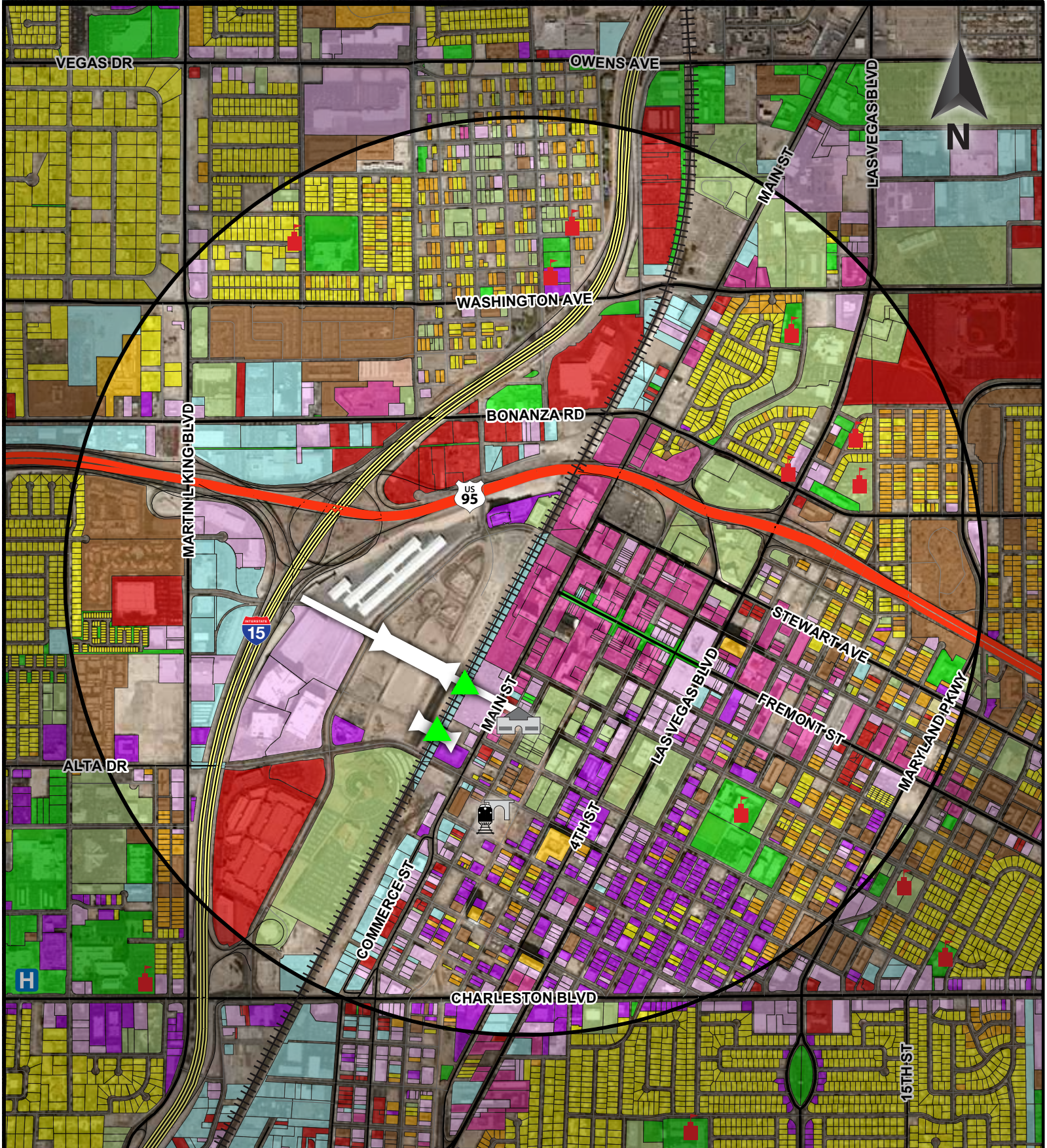
Planned Land Use

1,500 750 0 1,500
























Feet

1 inch = 1,500 feet

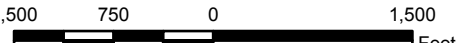


Source: Clark County, Nevada.

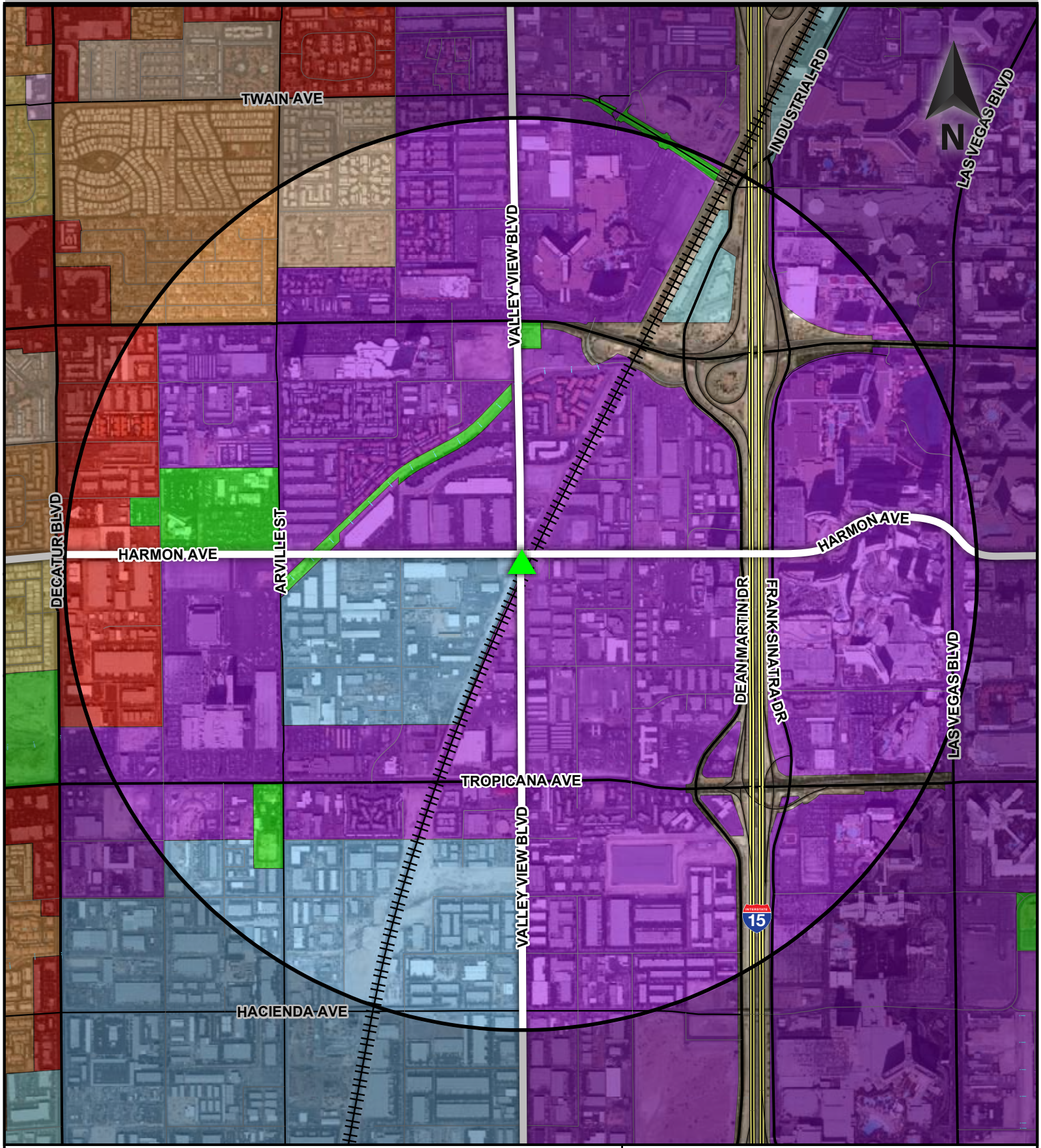
 Union Park Pedestrian Overbridge Crossing  One Mile Radius Buffer  Church  Hospital  School  New Transit Bldg  New City Hall Bldg	Planned Land Use Classification  Single Family  Mobile Homes  Plexes  Townhouses  Condominiums  Apartments  Group Quarters	 Non-Profit Organizations  Government & Religious  Tourist Commercial  Office  Service Commercial  General Commercial  Ind/Comm/Trans/Utilities
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Union Pacific Railroad Crossing at Union Park Pedestrian Overbridge

Planned Land Use



1 inch = 1,500 feet



Source: Clark County, Nevada.

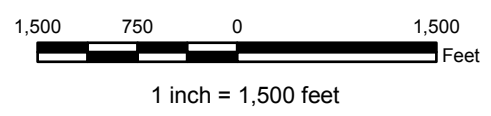
- Valley View Blvd Cross
- Valley View Blvd Cross
- Church
- Hospital
- School

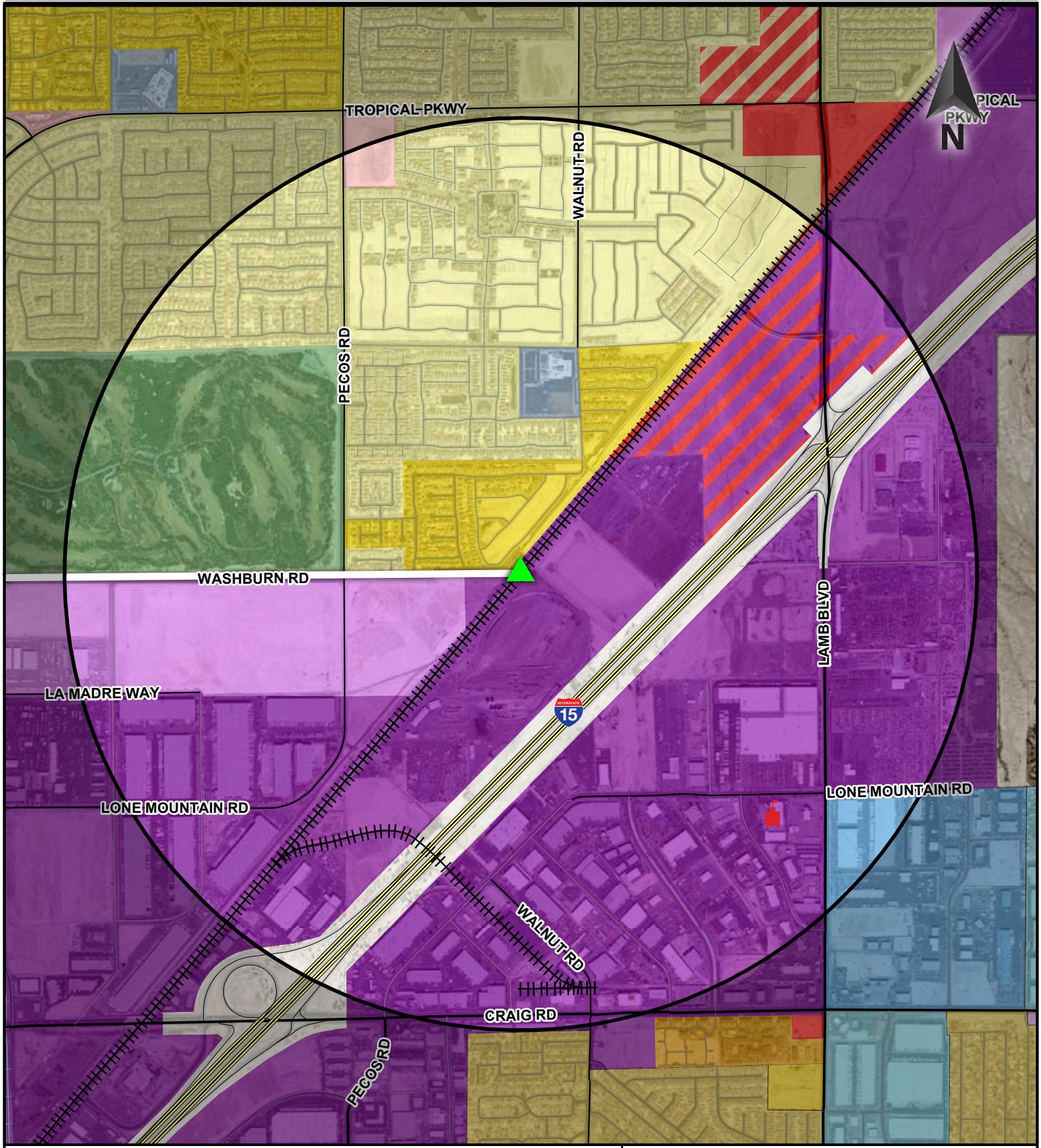
Planned Land Use Classification

- Residential High
- Residential Urban Center
- Commercial General
- Commercial Tourist

- Business and Design Research Park
- Industrial
- Public Facilities
- ROW

**Union Pacific Railroad Crossing
at Valley View/Harmon Boulevard**
Planned Land Use





Source: Clark County, Nevada.

- Washburn Rd Crossing
- Washburn Rd 1 mile buffer
- Church
- Hospital
- School

Planned Land Use Classification

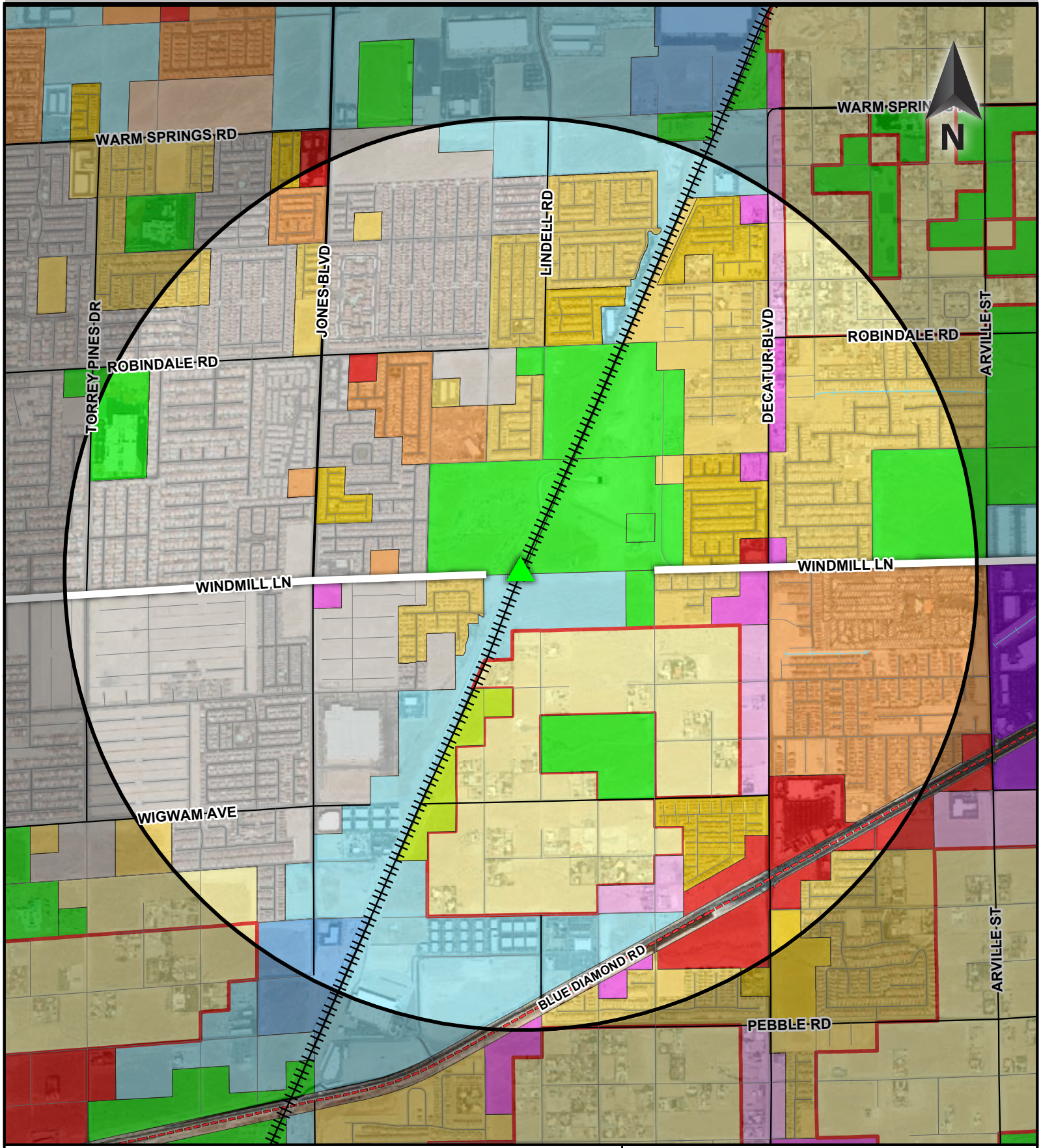
- Single Family Low (up to 6 du / ac)
- Single Family Medium (up to 13 du / ac)
- Open Space
- Neighborhood Commercial
- Public / Semi - Public

- Employment
- Industrial
- Heavy Industrial
- Mixed - Use Employment
- ROW

Union Pacific Railroad Crossing at Las Vegas Boulevard

Planned Land Use

1 inch = 1,500 feet



Source: Clark County, Nevada.

- Windmill Ln Cross Point
- Windmill Ln 1 mile buffer
- Church
- Hospital
- School

Planned Land Use Classification

- Open Lands
- Rural Neighborhood
- Rural Neighborhood Preservation
- Residential Suburban
- Residential Medium
- Residential High
- Office Professional

- Commercial Neighborhood
- Commercial General
- Business and Design Research Park
- Industrial
- Public Facilities
- Major Development Project
- ROW

Union Pacific Railroad Crossing at Windmill Lane

Planned Land Use

1 inch = 1,500 feet





Appendix C

Prioritization Results

Summary of Prioritization Results

		Near Term Crossings (Year 2010 - 2015)												Long Term Crossings (Year 2016 - 2030)							
No.	Criteria	Cactus	Symphony/Lewis	Jones	Lamb	Las Vegas Boulevard	Sunset	Union Park Ped Bridge	Valley View/Harmon	Erie/Cactus Underpass	Erie Overpass	Erie/Cactus trail	Oakey/Wyoming Improvements	Centennial	Lake Mead	Windmill	Robindale	Tropicana	North of Farm/Unnamed	Washburn	Oakey Wyoming Grade Separation
1	Does the proposed crossing increase the accessibility and mobility options? (Y/N)	8	8	8	6	0	8	8	6	8	8	8	4	2	4	4	2	8	6	2	6
2	Is this crossing regionally important? (Y/N)	2	3	1	3	0	3	1	0	0	0	1	2	0	4	1	0	4	0	0	3
3	Does this project enhance safety for all travelers? (Y/N)	8	8	6	8	8	8	8	8	8	8	8	6	6	6	8	8	4	8	8	8
4	Does this project preserve and enhance the existing transportation corridors? (Y/N)	4	2	4	4	3	4	4	4	3	3	3	4	1	4	3	3	4	1	1	4
5	Does this specific project fits into the planned physical setting? (Y/N)	8	8	6	8	6	8	8	6	8	8	8	8	2	8	2	2	6	4	4	8
6	Does this project improve reliability? (Y/N)	4	3	4	4	1	4	3	2	4	4	4	1	3	3	3	3	3	2	2	4
7	Is the cost of this project lower than the given thresholds? (Y/N)(*)	4	4	4	4	4	4	8	0	8	8	8	8	4	4	4	4	0	0	4	1
8	Does this project support more efficient freight movement? (Y/N)	3	4	4	4	4	4	1	4	3	3	2	2	3	2	3	3	2	3	4	4
9	Does this project have projected negative impacts on natural resources, air quality, noise level, energy consumption and disadvantaged areas? (Y/N)	4	4	3	4	4	4	4	4	4	4	4	4	4	4	3	3	4	3	4	4
10	Does this project leverage funds? (Y/N)	3	3	1	2	1	3	3	0	4	3	4	3	0	3	0	0	3	0	0	2
11	Is this project ready for implementation? (Y/N)	3	3	1	2	0	4	4	3	1	0	0	1	0	0	0	0	0	1	0	0
12	Does this project have community support? (Y/N)	4	4	3	2	0	4	4	3	4	4	4	4	1	4	1	1	3	0	1	4
	Total Score	55	54	45	51	31	58	56	40	55	53	54	47	26	46	32	29	41	28	30	48
	Rank	3	5	10	8	12	1	2	11	3	7	5	9	8	2	4	6	3	7	5	1

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