



Southern Nevada HOV Plan

Prepared for:



Nevada Department of Transportation

Prepared by:



Jacobs Engineering Group Inc.



July 2015

Appendix B

Traffic Forecasting Memorandum - Addendum - Technical Memorandum



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
1263 S. Stewart Street
Carson City, Nevada 89712

BRIAN SANDOVAL
Governor

January 30, 2015

RUDY MALFABON, P.E., *Director*

In Reply Refer to:

Mr. John Karachepone
Project Manager
Jacobs Engineering Group Inc.
Suite 200
319 E. Warm Springs Road
Las Vegas, Nevada 89119

Dear Mr. Karachepone:

The Nevada Department of Transportation's Traffic Information Section has reviewed the *forecasting methodology and traffic volumes* used in the Southern Nevada HOV Plan Update Traffic Forecasting Memorandum Addendum produced by John Karachepone of Jacobs Engineering Group Inc. dated December 22, 2014. The Traffic Information Section agrees with the forecasting methodology. The current and future traffic volumes seem reasonable for use in the traffic operation analysis. Should you require clarification or additional information please contact myself or Mark Wooster at (775) 888-7156.

Sincerely,

A handwritten signature in blue ink, appearing to read "Randy Travis", written over a horizontal line.

Randy Travis
NDOT Traffic Information Chief

CC: Hoang Hong, Traffic Operations

Technical Memorandum

TO: Randy Travis, NDOT **DATE:** December 22, 2014

FROM: John Karachepone, Jacobs

SUBJECT: Traffic Forecasting Memorandum - Addendum

COPIES: Jeff Lerud, P.E., CPM, NDOT; Mark Wooster, NDOT

The “*Southern Nevada HOV Plan Update Traffic Forecasting Memorandum*” dated December 23, 2013, documented the year 2025 and year 2035 traffic forecasts for the near-term study area (I-15 between St. Rose Parkway and US 95/I-515, and US 95/I-515 between South Rancho Drive and West Charleston Boulevard). The Traffic Forecasting Memorandum documented the review, refinement, and application of the RTC Model for the development of traffic forecasts needed for the Plan Update. It also documented the methodologies and assumptions adopted in the development of year 2025 and year 2035 forecasts from the travel demand model outputs (post-processing). The Traffic Forecasting Memorandum was approved by NDOT on January 8, 2014, and is attached as Appendix A.

The Traffic Forecasting Memorandum described the development of three different year 2035 model scenarios (HOV Scenario 1, HOV Scenario 2 and HOV Scenario 3). These scenarios were modeled to determine the desirability and feasibility of various HOV facilities, including HOV lanes and Direct Access Ramps. One of these three scenarios – the Scenario 2 – was used as the basis for the year 2035 forecast peak hour traffic volumes documented in the Traffic Forecasting Memorandum.

Based on a regional HOV system evaluation process and based on project team meetings and stakeholder comments received since then, a recommended Long-Term (year 2035) HOV system Plan has been established. This currently recommended system includes select elements from the original three scenarios. These changes resulted in a mismatch between the modeled Scenario 2 and the recommended system. Therefore, the recommended system (HOV Scenario 4) was re-modeled to develop the year 2035 forecasts. This Traffic Forecasting Memorandum – Addendum (Addendum) documents the year 2035 forecast peak hour traffic volumes for the near-term study area for HOV Scenario 4.

The HOV Scenario 4, shown in Figure 1, includes the following:

- All year 2025 improvements (see Appendix A)
- HOV lanes on the following facilities:

- I-15 – From St. Rose Parkway to north of the I-15/US 95/I-515 Interchange (Spaghetti Bowl) – two HOV lanes in each direction between I-215 and US 95/I-515
- I-515 – From I-215 to I-15
- US 95 – From I-15 to Elkhorn Road – two HOV lanes in each direction between I-15 and Rainbow Boulevard
- I-215/CC-215 Southern/Western Beltway – From I-515 to Summerlin Parkway – two HOV lanes in each direction between Airport Connector and I-15
- Summerlin Parkway – From US 95 to Rampart Boulevard
- Direct-access local drop ramps at:
 - Blue Diamond Road (to/from the north - from/to the west)
 - Hacienda Avenue (to/from the south), Harmon Avenue (to/from the north)
 - Meade Avenue
 - Maryland Parkway and I-515
 - Smoke Ranch Road
 - I-215 and Airport Connector (to/from the north - from/to the west)
 - Sunset Road and CC-215 Southern/Western Beltway
- Direct-access flyover ramps at:
 - I-215/I-15 Interchange (to/from the north - from/to the east and to/from the north - from/to the west)
 - Project Neon HOV Flyover (each connection two lanes)

Raw model volumes from this HOV Scenario 4 were used to develop AM and PM peak hour volume forecasts by following the same methodology and assumptions¹ documented in the Traffic Forecasting Memorandum. The year 2035 forecast peak hour volumes are shown in Figure 2; these forecast volumes supersede the year 2035 Forecast Traffic Volumes (Figure 9-3) presented in the Traffic Forecasting Memorandum and reflect the current recommended system based on the comments received thus far. The forecasts documented in Figure 2 will be used as the year 2035 forecast for the HOV system for the near-term study area.

Appendix A: Southern Nevada HOV Plan Update Traffic Forecasting Memorandum

¹ Along I-15, north of Sahara Avenue, both in the northbound and southbound direction, access to/from the HOV lane is assumed to be restricted. In other words, along I-15 north of Sahara Avenue, vehicles cannot enter/exit the HOV lanes from/to the GP lanes. In the forecasts presented in the Traffic Forecasting Memorandum, no such assumption was made.

Figure 1 – Year 2035 - HOV Scenario 4

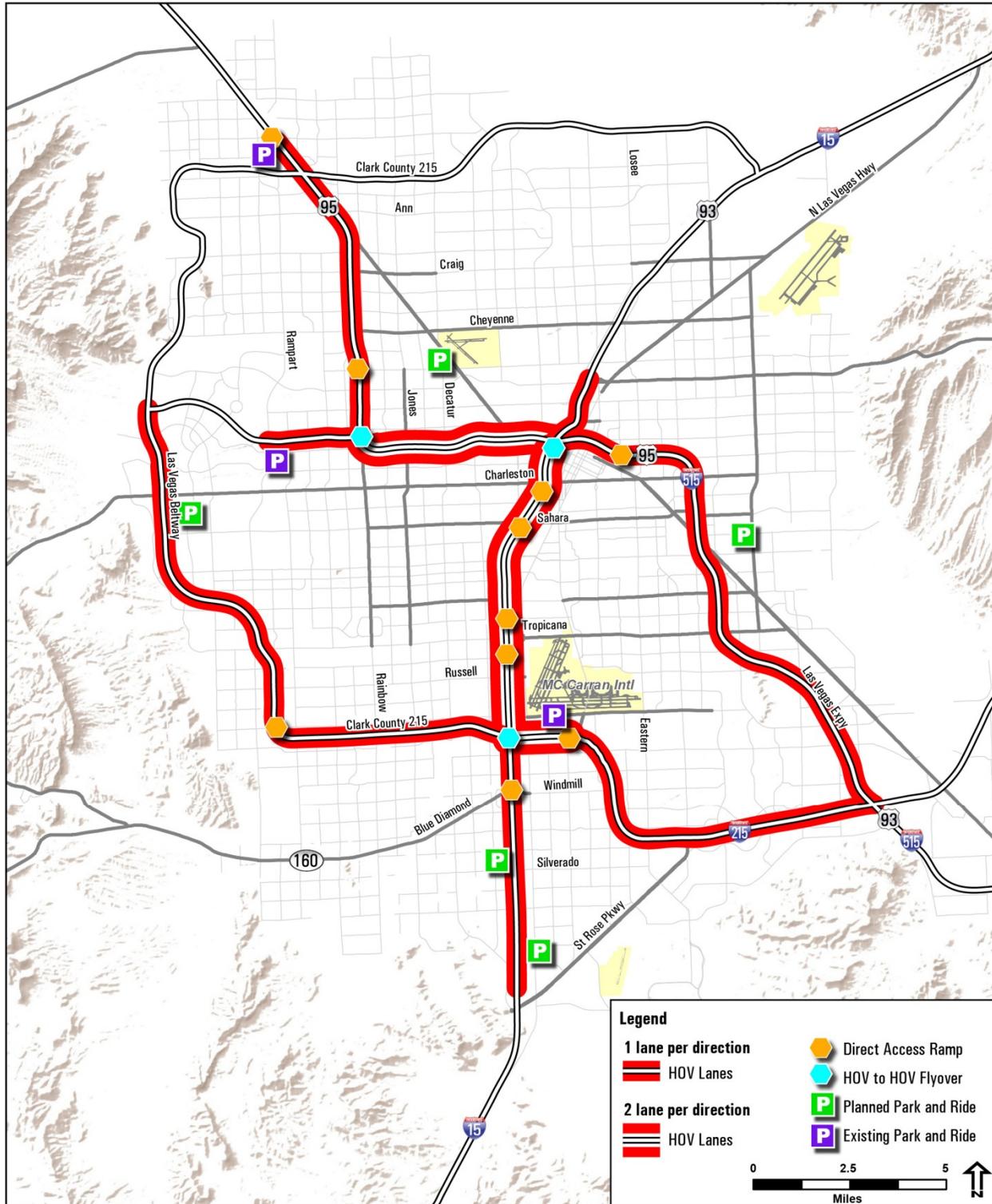
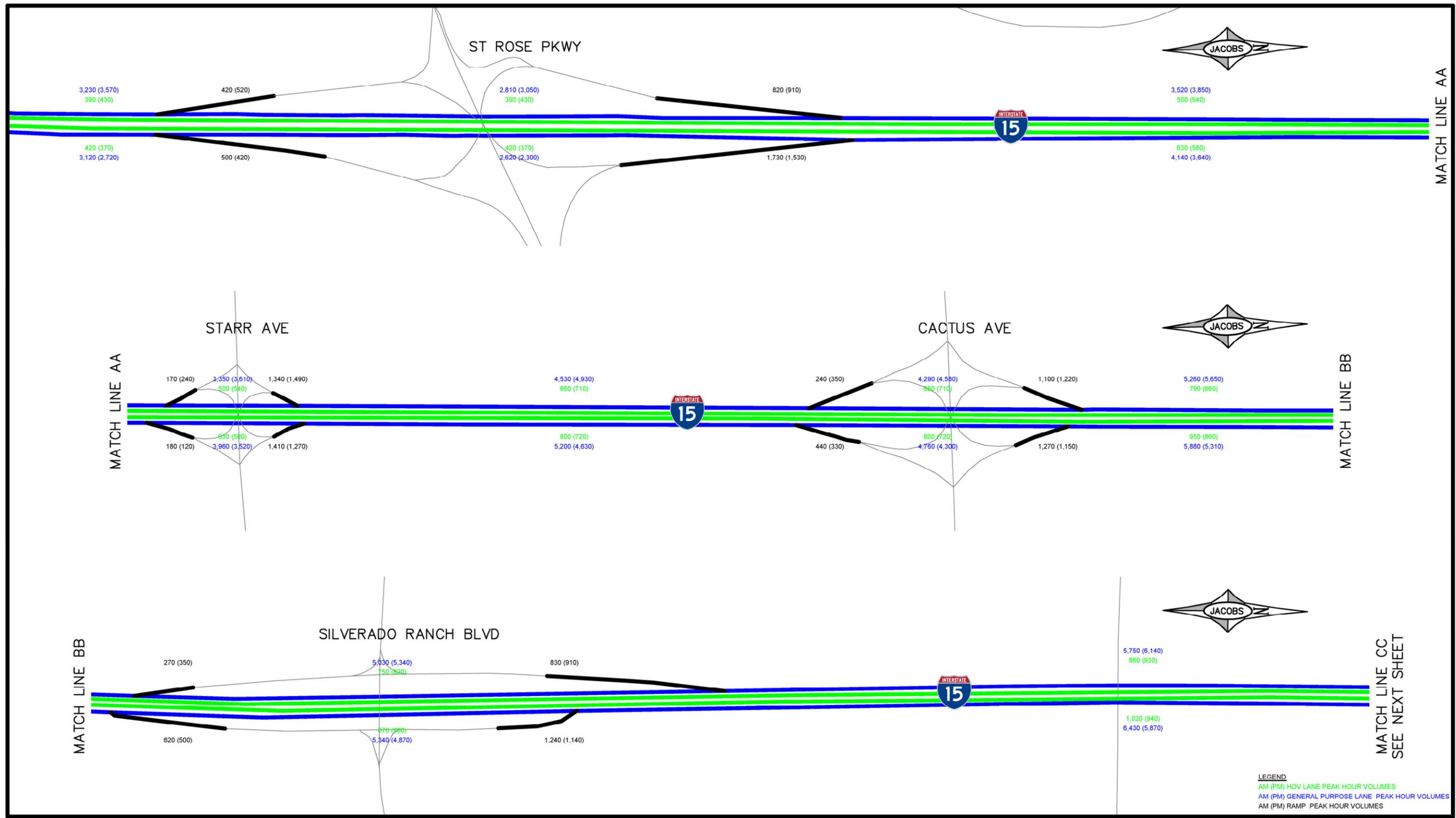
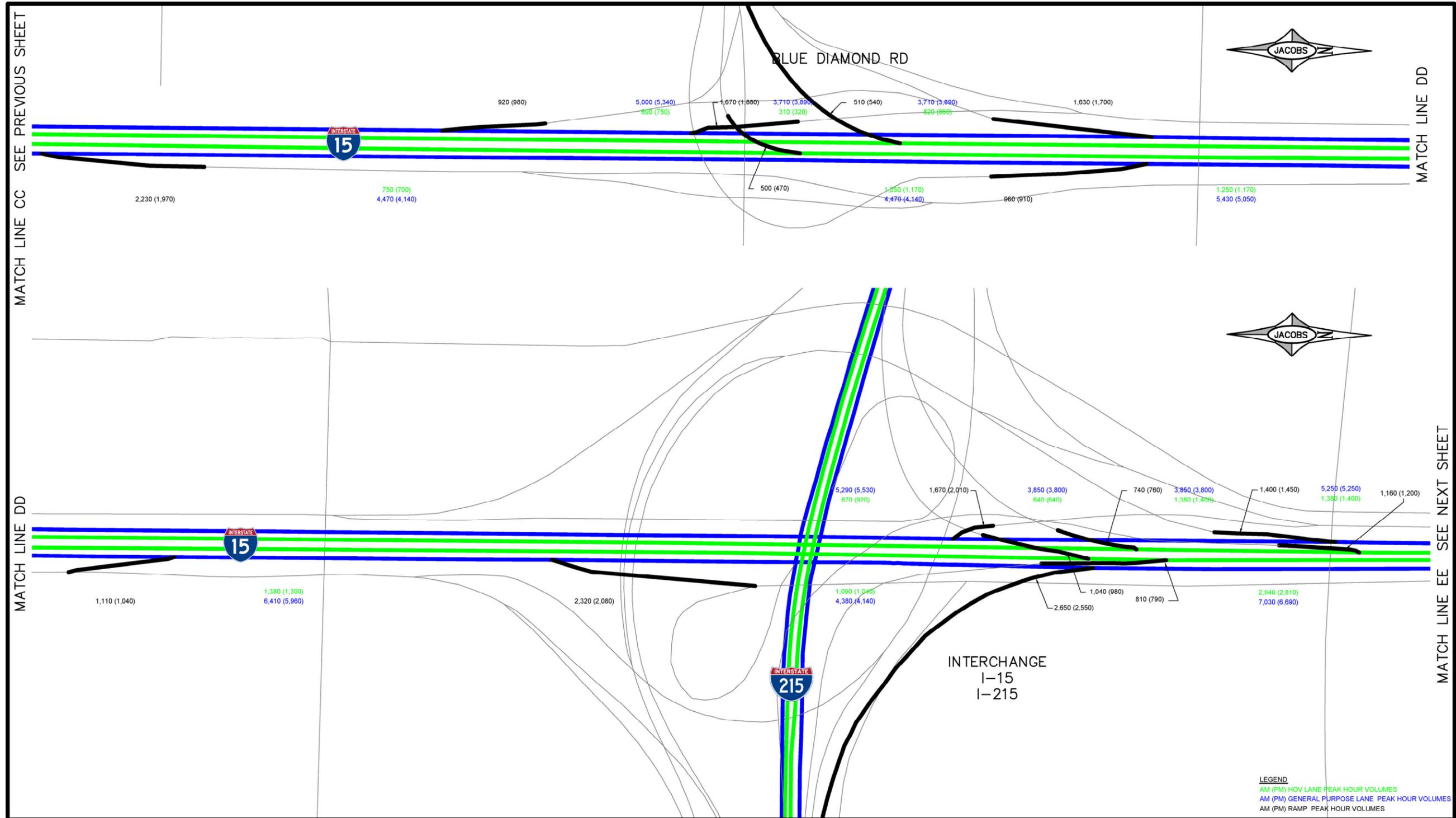


Figure 2: Year 2035 Forecast Traffic Volumes



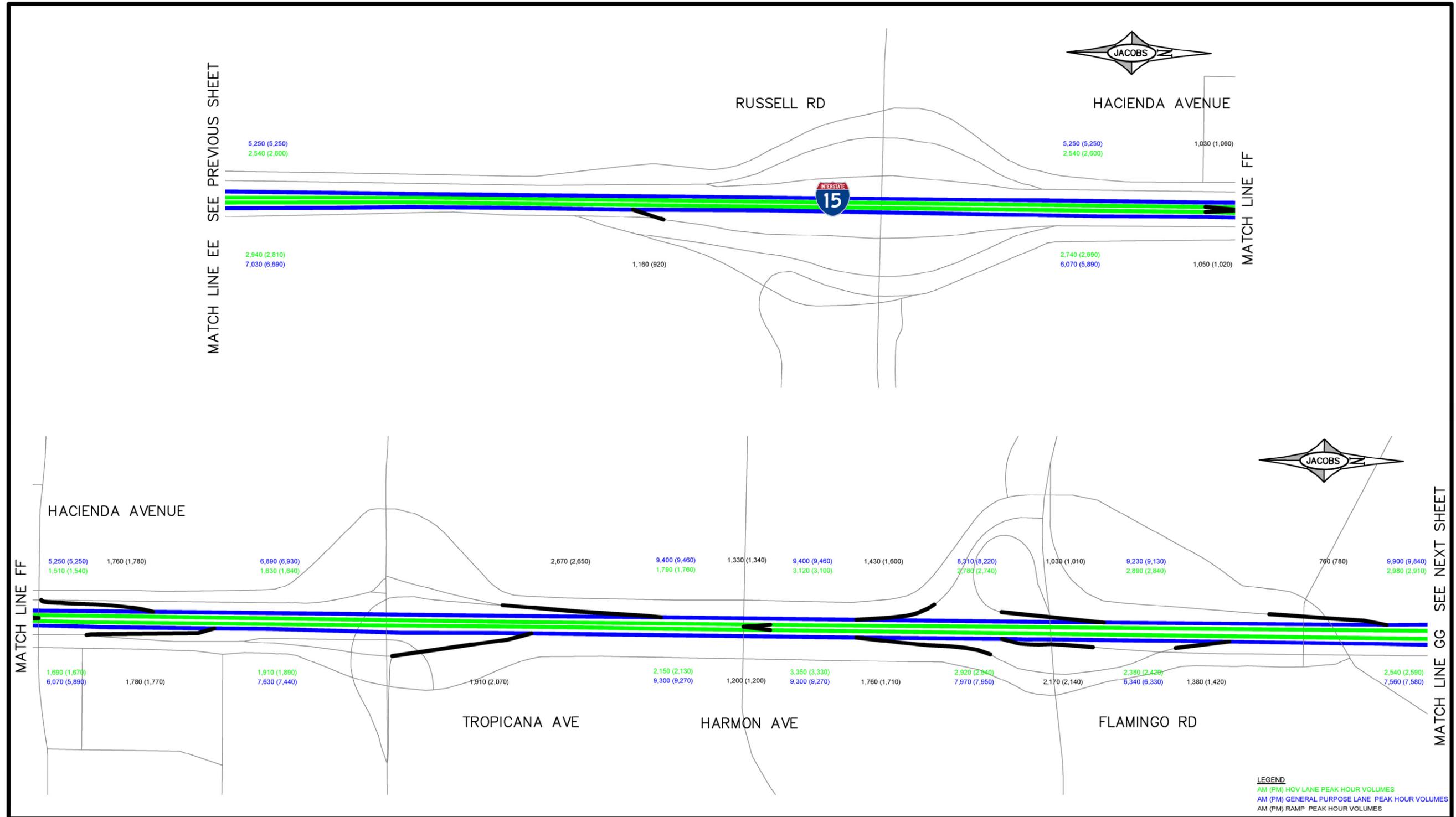
Date Revised: December 22, 2014

Figure 2: Year 2035 Forecast Traffic Volumes



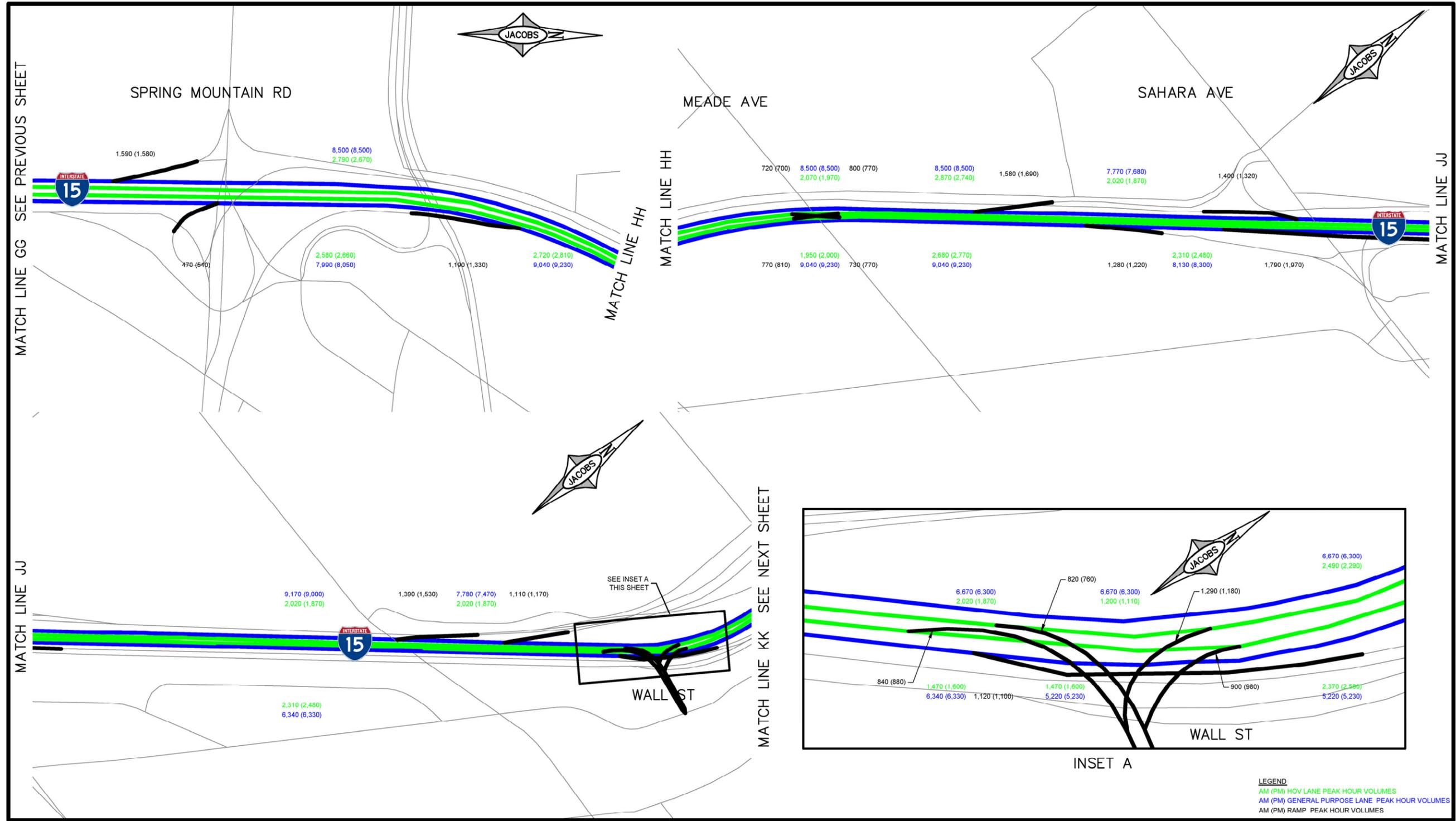
Date Revised: December 22, 2014

Figure 2: Year 2035 Forecast Traffic Volumes



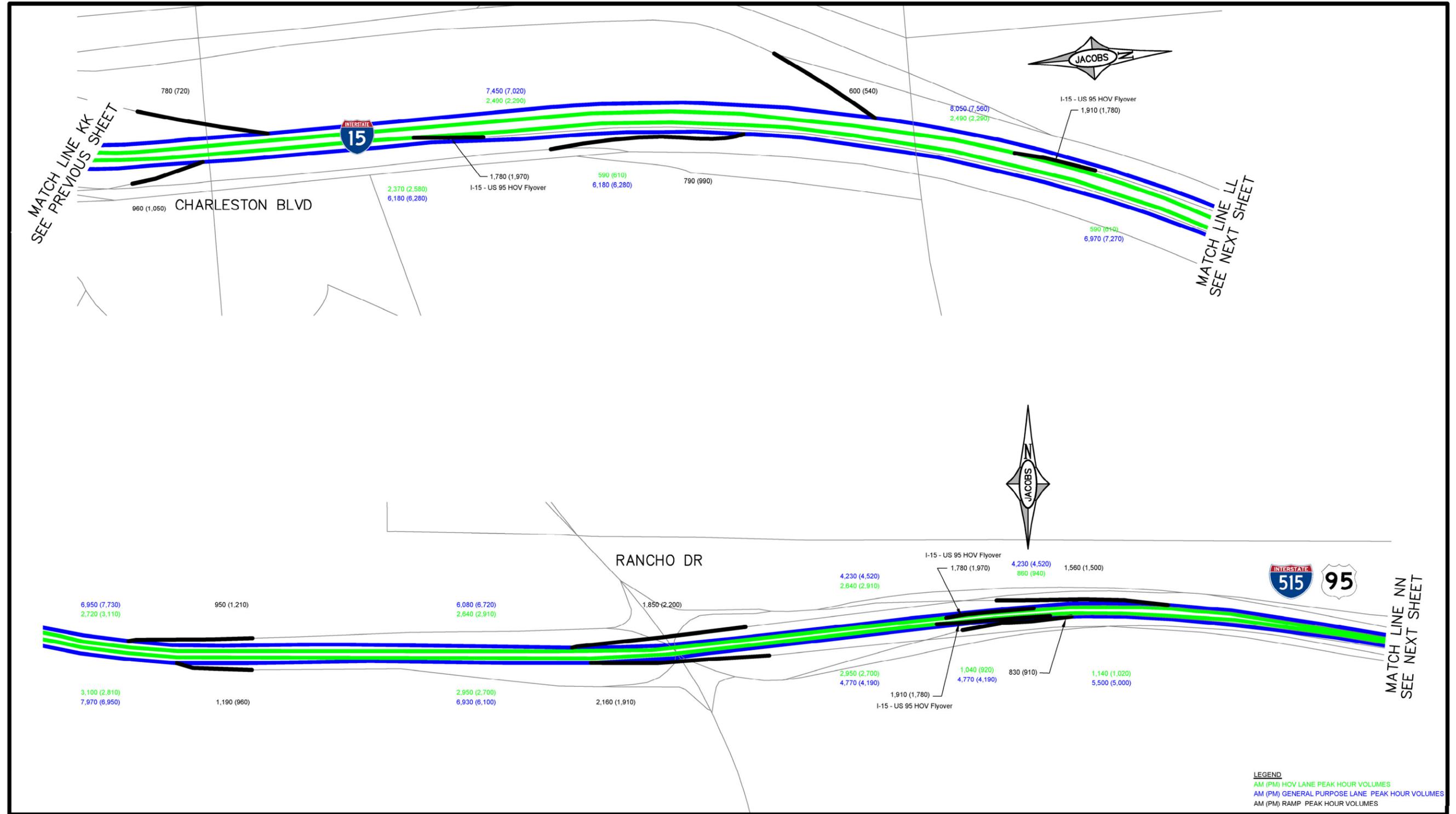
Date Revised: December 22, 2014

Figure 2: Year 2035 Forecast Traffic Volumes



Date Revised: December 22, 2014

Figure 2: Year 2035 Forecast Traffic Volumes



Date Revised: December 22, 2014

Figure 2: Year 2035 Forecast Traffic Volumes

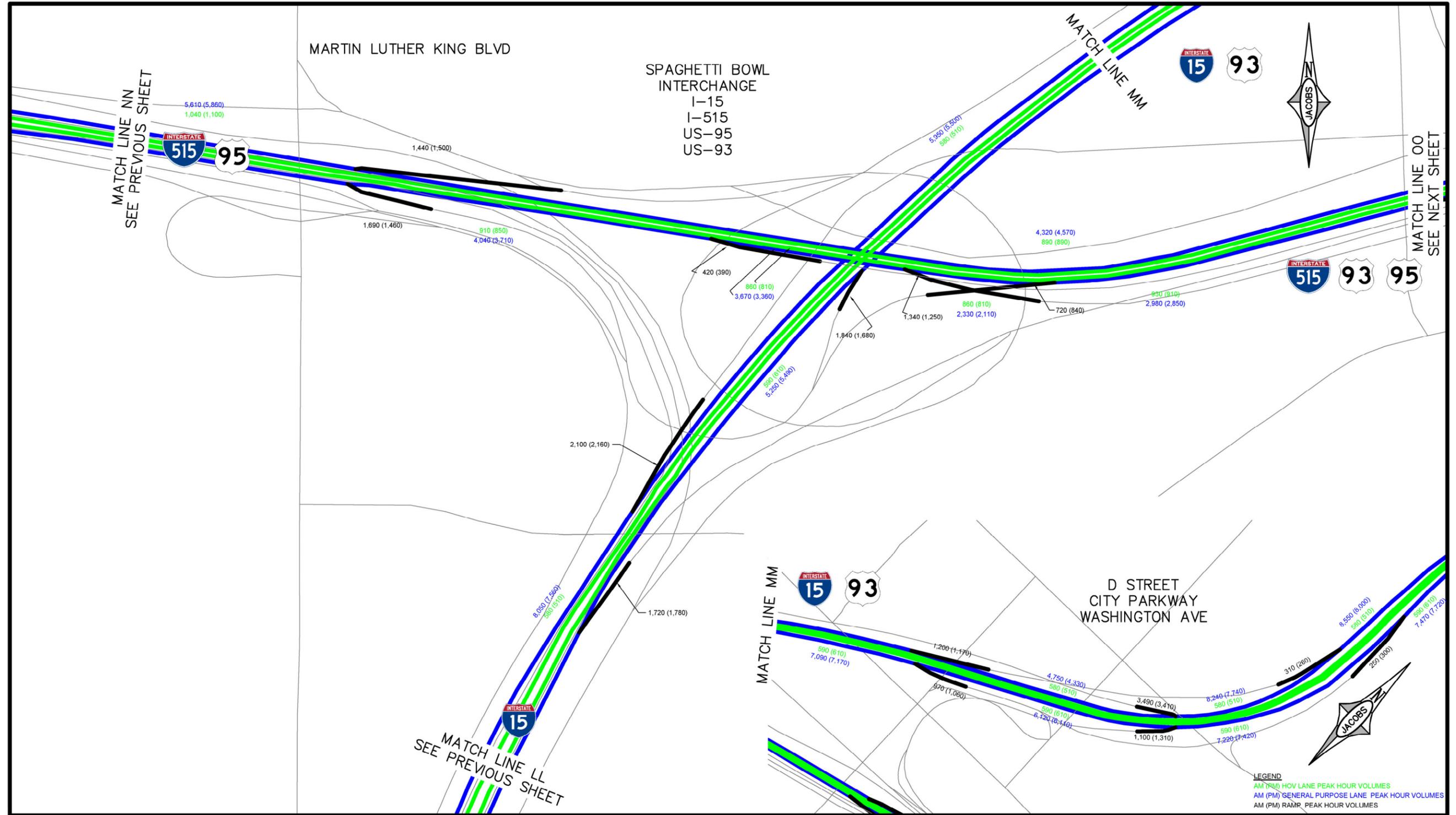
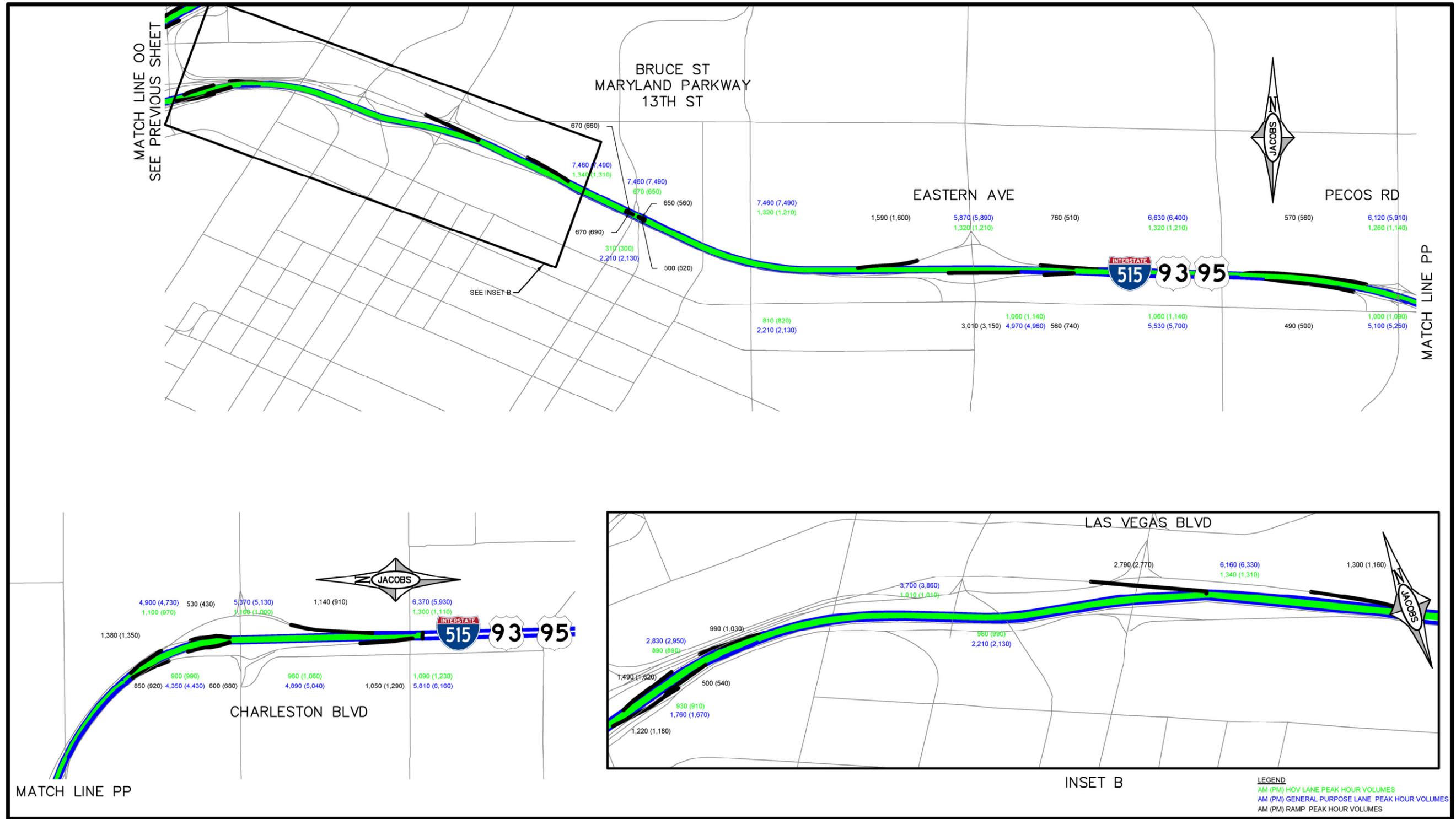


Figure 2: Year 2035 Forecast Traffic Volumes



Date Revised: December 22, 2014

Appendix C

Year 2035 Forecasts along Freeways outside the Priority Area

Year 2035 Forecast Peak Hour Volumes

Freeway	Direction	Link Type	Link	AM Peak Hour Volume	PM Peak Hour Volume
I-15	NB	GP	Between Lake Mead on-ramp and Cheyenne off-ramp	6,740	6,970
I-15	NB	GP	Between Craig on-ramp and Lamb off-ramp	2,850	2,940
I-15	NB	GP	Between HOV Flyover to CC-215 WB and on-ramp from CC215 EB	1,290	850
I-15	SB	GP	Between off-ramp to CC215 WB and HOV flyover from CC215 EB	890	1,230
I-15	SB	GP	Between Lamb on-ramp and Craig off-ramp	2,980	3,030
I-15	SB	GP	Between Cheyenne on-ramp and Lake Mead off-ramp	6,950	7,080
US95	NB	GP	South of Auto show off-ramp	3,120	2,580
US95	NB	HOV	South of Auto show off-ramp	60	50
US95	NB	GP	Between Auto show on-ramp and Sunset off-ramp	4,990	4,370
US95	NB	HOV	Between Auto show on-ramp and Sunset off-ramp	80	70
US95	NB	GP	Between Sunset on-ramp and Galleria on-ramp	4,550	3,970
US95	NB	HOV	Between Sunset on-ramp and Galleria on-ramp	750	650
US95	NB	GP	Between Russell on-ramp and Tropicana off-ramp	5,750	5,310
US95	NB	HOV	Between Russell on-ramp and Tropicana off-ramp	820	760
US95	NB	GP	Between Flamingo on-ramp and Boulder Hwy off-ramp	6,110	6,490
US95	NB	HOV	Between Flamingo on-ramp and Boulder Hwy off-ramp	900	950
US95	NB	GP	Between Decatur on-ramp and Jones off-ramp	7,410	7,870
US95	NB	HOV	Between Decatur on-ramp and Jones off-ramp	2,610	2,770
US95	NB	GP	Between Jones on-ramp and Summerlin off-ramp	5,390	8,800
US95	NB	HOV	Between Jones on-ramp and Summerlin off-ramp	1,580	2,580
US95	NB	GP	Between Rainbow on-ramp and Lake Mead off-ramp	3,840	7,080
US95	NB	HOV	Between Rainbow on-ramp and Lake Mead off-ramp	840	1,560
US95	NB	Ramp	DC to Smoke Ranch	370	700
US95	NB	Ramp	DC from Smoke Ranch	190	330
US95	NB	GP	Between Cheyenne on-ramp and Craig off-ramp	3,030	6,300
US95	NB	HOV	Between Cheyenne on-ramp and Craig off-ramp	650	1,350
US95	NB	GP	Between Ann on-ramp and CC 215 off-ramp	2,120	4,870
US95	NB	HOV	Between Ann on-ramp and CC 215 off-ramp	490	1,120
US95	NB	GP	Between CC 215 on-ramp and DC to Elkhorn	1,490	3,440
US95	NB	HOV	Between CC 215 on-ramp and DC to Elkhorn	400	900
US95	NB	Ramp	DC to Elkhorn	230	540
US95	NB	GP	North of DC to Elkhorn	1,420	3,280

Year 2035 Forecast Peak Hour Volumes

Freeway	Direction	Link Type	Link	AM Peak Hour Volume	PM Peak Hour Volume
US95	NB	HOV	North of DC to Elkhorn	60	140
US95	SB	GP	North of DC from Elkhorn	3,320	2,290
US95	SB	HOV	North of DC from Elkhorn	80	60
US95	SB	Ramp	DC from Elkhorn	720	500
US95	SB	GP	Between DC from Elkhorn and off-ramp to CC 215	3,590	2,480
US95	SB	HOV	Between DC from Elkhorn and off-ramp to CC 215	870	600
US95	SB	GP	Between Craig on-ramp and Cheyenne off-ramp	7,020	4,230
US95	SB	HOV	Between Craig on-ramp and Cheyenne off-ramp	1,490	900
US95	SB	Ramp	DC to Smoke Ranch	340	210
US95	SB	Ramp	DC from Smoke Ranch	730	440
US95	SB	GP	Between Lake Mead on-ramp and Summerlin off-ramp	7,840	5,300
US95	SB	HOV	Between Lake Mead on-ramp and Summerlin off-ramp	1,710	1,160
US95	SB	GP	Between Rainbow on-ramp and Jones off-ramp	9,170	6,390
US95	SB	HOV	Between Rainbow on-ramp and Jones off-ramp	2,900	2,020
US95	SB	GP	Between Jones on-ramp and Decatur off-ramp	9,180	8,650
US95	SB	HOV	Between Jones on-ramp and Decatur off-ramp	2,920	2,750
US95	SB	GP	Between Boulder Hwy on-ramp and Flamingo off-ramp	5,640	6,300
US95	SB	HOV	Between Boulder Hwy on-ramp and Flamingo off-ramp	700	780
US95	SB	GP	Between Tropicana on-ramp and Russell off-ramp	3,770	5,460
US95	SB	HOV	Between Tropicana on-ramp and Russell off-ramp	590	850
US95	SB	GP	Between Galleria off-ramp and Sunset off-ramp	3,070	4,450
US95	SB	HOV	Between Galleria off-ramp and Sunset off-ramp	460	670
US95	SB	GP	Between Sunset on-ramp and Auto show off-ramp	3,700	5,290
US95	SB	HOV	Between Sunset on-ramp and Auto show off-ramp	160	220
US95	SB	GP	South of Auto show on-ramp	3,050	4,600
US95	SB	HOV	South of Auto show on-ramp	150	230
Summerlin	WB	GP	Between US95 SB on-ramp and Buffalo off-ramp	3,920	4,700
Summerlin	WB	HOV	Between US95 SB on-ramp and Buffalo off-ramp	620	740
Summerlin	WB	GP	Between Rampart on-ramp and Town Center off-ramp	3,300	3,590
Summerlin	WB	GP	West of Anasazi on-ramp	3,290	2,530
Summerlin	EB	GP	West of Anasazi off-ramp	2,440	3,490
Summerlin	EB	GP	Between Town Center on-ramp and Rampart off-ramp	3,690	3,350

Year 2035 Forecast Peak Hour Volumes

Freeway	Direction	Link Type	Link	AM Peak Hour Volume	PM Peak Hour Volume
Summerlin	EB	GP	Between Buffalo on-ramp and Rainbow off-ramp	4,190	4,030
Summerlin	EB	HOV	Between Buffalo on-ramp and Rainbow off-ramp	820	780
N. Beltway	WB	GP	Between Range on-ramp and Lamb off-ramp	760	1,160
N. Beltway	WB	GP	West of Pecos on-ramp	1,170	1,790
N. Beltway	EB	GP	West of Pecos off-ramp	1,850	1,220
N. Beltway	EB	GP	Between Lamb on-ramp and Range off-ramp	630	420
W. Beltway	NB	Ramp	DC to Sunset	270	400
W. Beltway	NB	Ramp	DC from Sunset	120	190
W. Beltway	NB	GP	Between Russell on-ramp and Tropicana off-ramp	3,940	6,010
W. Beltway	NB	HOV	Between Russell on-ramp and Tropicana off-ramp	670	1,020
W. Beltway	NB	GP	Between Flamingo on-ramp and Town Center off-ramp	3,420	5,220
W. Beltway	NB	HOV	Between Flamingo on-ramp and Town Center off-ramp	650	1,000
W. Beltway	NB	GP	Between Sahara on-ramp and Charleston off-ramp	5,490	3,600
W. Beltway	NB	HOV	Between Sahara on-ramp and Charleston off-ramp	1,080	710
W. Beltway	NB	GP	North of Summerlin off-ramp	6,500	4,260
W. Beltway	NB	HOV	North of Summerlin off-ramp	1,660	1,080
W. Beltway	SB	GP	North of Far Hill off-ramp	2,630	4,860
W. Beltway	SB	HOV	North of Far Hill off-ramp	1,090	2,030
W. Beltway	SB	GP	Between Charleston on-ramp and Sahara off-ramp	3,250	6,020
W. Beltway	SB	HOV	Between Charleston on-ramp and Sahara off-ramp	990	1,830
W. Beltway	SB	GP	Between Town Center on-ramp and Flamingo off-ramp	5,350	2,890
W. Beltway	SB	HOV	Between Town Center on-ramp and Flamingo off-ramp	1,480	790
W. Beltway	SB	GP	Between Tropicana on-ramp and Russell off-ramp	6,290	3,400
W. Beltway	SB	HOV	Between Tropicana on-ramp and Russell off-ramp	920	500
W. Beltway	SB	Ramp	DC to Sunset	230	120
W. Beltway	SB	Ramp	DC from Sunset	480	260
S. Beltway	WB	GP	East of Stephanie off-ramp	5,950	5,230
S. Beltway	WB	HOV	East of Stephanie off-ramp	700	610
S. Beltway	WB	GP	Between Valle Verde on-ramp and Green Valley off-ramp	6,980	6,130
S. Beltway	WB	HOV	Between Valle Verde on-ramp and Green Valley off-ramp	810	710
S. Beltway	WB	GP	Between Pecos on-ramp and Eastern off-ramp	5,690	4,190
S. Beltway	WB	HOV	Between Pecos on-ramp and Eastern off-ramp	610	450

Year 2035 Forecast Peak Hour Volumes

Freeway	Direction	Link Type	Link	AM Peak Hour Volume	PM Peak Hour Volume
S. Beltway	WB	GP	Between Windmill on-ramp and Warm Springs off-ramp	6,350	4,670
S. Beltway	WB	HOV	Between Windmill on-ramp and Warm Springs off-ramp	240	180
S. Beltway	WB	Ramp	DC from Airport Connector	1,170	1,150
S. Beltway	WB	GP	Between ramp from Airport Connector and Las Vegas off-ramp	7,300	7,140
S. Beltway	WB	HOV	Between ramp from Airport Connector and Las Vegas off-ramp	2,330	2,280
S. Beltway	WB	GP	Between I-15 on-ramp and Decatur off-ramp	7,440	6,740
S. Beltway	WB	HOV	Between I-15 on-ramp and Decatur off-ramp	1,700	1,550
S. Beltway	WB	GP	Between Jones on-ramp and Rainbow off-ramp	6,640	6,010
S. Beltway	WB	HOV	Between Jones on-ramp and Rainbow off-ramp	1,430	1,290
S. Beltway	WB	GP	Between Buffalo on-ramp and Durango off-ramp	4,990	4,510
S. Beltway	WB	HOV	Between Buffalo on-ramp and Durango off-ramp	1,170	1,060
S. Beltway	EB	GP	Between Durango on-ramp and Buffalo off-ramp	5,130	5,930
S. Beltway	EB	HOV	Between Durango on-ramp and Buffalo off-ramp	740	840
S. Beltway	EB	GP	Between Rainbow on-ramp and Jones off-ramp	6,550	7,560
S. Beltway	EB	HOV	Between Rainbow on-ramp and Jones off-ramp	1,230	1,420
S. Beltway	EB	GP	Between Decatur on-ramp and off-ramp to I-15	7,080	8,180
S. Beltway	EB	HOV	Between Decatur on-ramp and off-ramp to I-15	1,240	1,430
S. Beltway	EB	GP	Between Las Vegas on-ramp and ramp to Airport Connector	6,260	6,170
S. Beltway	EB	HOV	Between Las Vegas on-ramp and ramp to Airport Connector	2,030	2,000
S. Beltway	EB	Ramp	DC to Airport Connector	1,050	1,030
S. Beltway	EB	GP	Between Warm Springs on-ramp and Windmill off-ramp	3,860	5,890
S. Beltway	EB	HOV	Between Warm Springs on-ramp and Windmill off-ramp	360	550
S. Beltway	EB	GP	Between Eastern on-ramp and Pecos off-ramp	3,930	6,000
S. Beltway	EB	HOV	Between Eastern on-ramp and Pecos off-ramp	240	370
S. Beltway	EB	GP	Between Green Valley on-ramp and Valle Verde off-ramp	4,900	7,130
S. Beltway	EB	HOV	Between Green Valley on-ramp and Valle Verde off-ramp	450	670
S. Beltway	EB	GP	East of Stephanie on-ramp	4,140	6,020
S. Beltway	EB	HOV	East of Stephanie on-ramp	460	670

Appendix D

HOV System Near-Term Priorities for Project Neon Area - Technical Memorandum

Technical Memorandum

TO: Jeff Lerud, NDOT **DATE:** November 2014
FROM: John Karachepone, Jacobs
SUBJECT: HOV System Near-Term Priorities for Project Neon Area
COPIES:

1.0. INTRODUCTION AND BACKGROUND

This technical memorandum documents the recommendations and implementation plan for HOV improvements within Project Neon limits; and how these improvements would tie into US 95 HOV lanes and to I-15 express lanes. Project Neon extends from the I-15 Sahara Avenue Interchange on the south to the I-15/ US 95/I-515 Interchange (the Spaghetti Bowl) on the north.

Both Project Neon Final Environmental Impact Study (FEIS) and I-15 South Project¹ propose HOV lanes on I-15. Therefore, it is accepted that the existing express lanes on I-15 will eventually be replaced by one or more HOV lanes. The Southern Nevada HOV Plan Update addresses the timing of this express lanes conversion to HOV lanes and the number of HOV lanes after the conversion (one or two). A public information plan for the conversion has been prepared separately.

Project Neon will be built in phases. The first phase, the public-private-partnership (P3) phase, is planned to open in year 2018, while other phases are anticipated to be built between year 2025 and year 2035. As part of the P3 Phase, an HOV direct connector facility (HOV flyover) is proposed that would connect the existing US 95 HOV lanes (which begin/terminate at S. Rancho Drive) and the I-15 express lanes (which begin/terminate at Sahara Avenue). Additionally, HOV drop ramps are proposed to a new local street between Oakey Boulevard and Charleston Boulevard, approximately where Wall Street crosses under I-15 (HOV Gateway). The Southern Nevada HOV Plan Update does not reevaluate the need or location for the HOV flyover and the HOV Gateway.

Using the RTC's Mode Choice Travel Demand Model, the project team developed and validated year 2025 and 2035 model runs specifically for the Southern Nevada HOV Plan Update. As the first priority, traffic volumes for years 2025 and 2035 were estimated for the near-term study area (I-15 between St. Rose Parkway and US 95/I-515, and US 95/I-515 between Rancho Drive and Charleston Boulevard). Findings from these traffic forecasts were used to support the recommendations in this technical memorandum. The HOV demand forecasts are based on limiting access to HOV lanes to vehicles with two or more occupants (HOV 2+).

¹ I-15 South Traffic Re-evaluation of Design Modifications to Implement the Southern Nevada HOV Plan.

2.0. VEHICLE VOLUME THRESHOLDS

The number of required HOV lanes depends on the minimum and maximum vehicle volume thresholds. Since the primary goal of HOV lanes is to provide travel time savings and travel time reliability to HOVs, a maximum “per lane” volume threshold is required so that the lane(s) do not become congested. Conversely, a minimum “per lane” volume threshold should be met on the opening year to justify the restricted use of the facility and ensure public acceptance of the HOV lanes.

Table 1 presents the minimum and maximum volume thresholds from NDOT’s *Managed Lanes and Ramp Metering Manual*. These thresholds were used to determine the appropriate number of HOV lanes needed within Project Neon limits. The thresholds shown for the freeway-to-freeway direct connectors (500/1,650) are applicable to the proposed HOV flyover. The thresholds for the direct access local drop ramps (250/1,400) are applicable to the proposed HOV Gateway.

Table 1: Vehicle Volume Thresholds

Facility	Vehicle Volume Threshold (vehicles/lane/hour)	
	Minimum	Maximum
Mainline	700	1,650
Freeway-to-freeway direct connectors	500	1,650
Direct access local drop ramps	250	1,400

Note: The Manual notes that these thresholds provide general guidance and are flexible.

Source: NDOT Managed Lanes and Ramp Metering Manual, 2013

3.0. YEAR 2025 ANALYSIS

Year 2025 analysis was performed to identify HOV needs for year 2018 (Project Neon Opening) through year 2025. Assumptions and recommendations are described below.

3.1. Continuous versus Limited Access

Access along an HOV lane could be allowed at any point (i.e., continuous access) or be restricted to discrete locations (i.e., limited access). Generally, both scenarios are viable options when planning HOV lanes. For the proposed HOV lanes on I-15, limited access is recommended for 2018 through year 2025 because of following reasons:

- With continuous access, two HOV lanes in each direction would be required in year 2018 for the “Gap” (i.e., the stretch of I-15 between Project Neon and the I-15 South Project, Sahara Ave. to Tropicana Ave.).² I-15 currently has three general-purpose

² The forecasted volumes exceed the single lane HOV volume threshold in the “Gap” for the continuous access scenario. With continuous access, more eligible vehicles use the provided HOV lanes since they can enter and exit at any location.

lanes and two express lanes in each direction within the “Gap.” The requirement for two HOV lanes indicates conversion of both express lanes to HOV lanes in year 2018; and this is not recommended because: 1) Operations of the general-purpose lanes would be impacted by vehicles displaced by the conversion to HOV lanes, resulting in LOS F conditions, and 2) One of the express lanes (in each direction) was originally established by converting a general-purpose lane. Converting that express lane (which was originally a general-purpose lane) to an HOV lane would likely not be acceptable to the public; especially because the remaining three general-purpose lanes are anticipated to operate over capacity. Therefore, with the two-HOV-lane scenario, one of the lanes must be a new add lane; and this is not a practical possibility within the year 2018 or 2025 timeline.

- Limited access discourages short distance/term use of the HOV lanes, hence reducing weaving. The scenario that results in less weaving is especially critical within the “Gap” where weaving issues already exist due to the high frequency of ramps. The existing express lanes have been successful partly because of the limited access and associated reduction of weaving activity between the managed lanes and the general-purpose lanes. With continuous access, short distance trips opportunistically get-in or get-out of the HOV lanes causing turbulence in the traffic stream. This would be avoided by limited access.
- Limited access offers the opportunity to ensure that the lanes do not become overloaded regardless of the level of demand they generate because the limited entry/exit points causes some of the HOV eligible vehicles to stay in the general-purpose lanes. With limited access it is easier to ensure higher travel speeds (tangible time saving) and reliability for the HOV vehicles that travel greater distances.
- Occupancy violation rates are generally lower with limited-access facilities, and enforcement is easier. In early years of HOV operations, it is important to build a culture of compliance to the operational (and occupancy) restrictions of the HOV lane through increased enforcement activity and education. This is easier with limited-access facilities since they are easier to enforce, and educational messages are clearer and more easily understood (e.g., enter/exit only at broken white line marking locations, and do not cross double solid white line markings).

3.1.1. Proposed Ingress/Egress Locations

For the recommended limited-access scenario, proposed ingress/egress locations for the “Gap” and Project Neon are described below.³

Northbound I-15 – Description of Ingress/Egress Locations

- Ingress/egress location near Russell Road:

³ All proposed locations allow the required weaving distance to/from the ramps per *NDOT Managed Lanes and Ramp Metering Manual* (minimum of 800 feet per lane change). These locations should be re-evaluated as part of a more detailed traffic study for the “Gap”.

- This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Blue Diamond Road on-ramps and the I-215 westbound on-ramp.
- This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Flamingo Road off-ramp and the Spring Mountain Road off-ramp.
- Ingress/egress location near the Flamingo Road overpass:
 - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the slip-ramp from the I-15 Collector-Distributor (CD) road (near Tropicana Avenue) and the Tropicana Avenue on-ramp.
 - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Sahara Avenue off-ramp.
- Ingress/egress location near the Sahara Avenue overpass:
 - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Flamingo Road on-ramp and the Spring Mountain Road on-ramps.
 - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Charleston Boulevard off-ramp, the I-15 northbound to MLK Boulevard off-ramp and the I-15 northbound to I-515 southbound off-ramp.

Southbound I-15 – Description of Ingress/Egress Locations

- Ingress/egress location near the Sahara Avenue overpass:
 - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the I-515 northbound to I-15 southbound on-ramp, the Charleston Boulevard on-ramp, and the on-ramp from the CD road (near Oakey Boulevard).
 - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Spring Mountain Road off-ramp and the Flamingo Road off-ramps.
- Ingress/egress location near the Flamingo Road overpass:
 - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Sahara Avenue on-ramp and the Spring Mountain Road on-ramp.
 - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the Tropicana Avenue off-ramp and the slip-ramp to the CD road (south of Tropicana Avenue to Russell Road and CC-215 West).

- Ingress/egress location near Russell Road:
 - This location is the first ingress point into the HOV lane for the vehicles that entered the system through the Flamingo Road on-ramp.
 - This location is the last egress point out of the HOV lane for the vehicles that exit the system through the I-15 southbound to I-215 eastbound off-ramp.

3.2. Demand Forecasts and HOV Lane Requirements

Based on the limited-access scenario, Table 2 shows year 2025 peak hour HOV demand forecasts within Project Neon limits, and where Project Neon ties into I-15 on the south and US 95 on the west.

Table 2: Year 2025 HOV Demand Forecasts

Location	Peak Hour HOV Demand Forecast ¹	
	Northbound	Southbound
HOV flyover	1,080	1,040
I-15 south of the HOV flyover	1,500	1,430
HOV Gateway	880	910
I-15 south of Sahara Avenue ²	1,290	1,050
US 95 west of flyover ramps ³	1,290	1,340

¹Demand for the highest peak hour is shown.
²This is where Project Neon ties into I-15 on the south. This location also represents the volumes for the “Gap”.
³This is where Project Neon ties into US 95 on the west.

Year 2025 forecasts in Table 2 were compared with the vehicle volume thresholds shown in Table 1. Based on the comparison, year 2025 HOV lane requirements are shown in Table 3.

Table 3: Year 2025 Number of HOV Lane Requirements

Location	Required Number of HOV Lanes	
	Northbound	Southbound
HOV flyover	1	1
I-15 south of the HOV flyover	1	1
HOV Gateway	1	1
I-15 south of Sahara Avenue ¹	1	1
US 95 west of flyover ramps ²	1	1

¹This is where Project Neon ties into I-15 on the south. This location also represents the volumes for the “Gap”.
²This is where Project Neon ties into US 95 on the west.

One HOV lane in each direction is proposed within the “Gap” at the time of Project Neon Opening (2018). The I-15 express lane closest to the median would be converted to an HOV lane at that time (see Section 5.0 for further information on express lanes conversion). The remaining express lane would become a general-purpose lane.

4.0. YEAR 2035 ANALYSIS

Table 4 shows year 2035 peak hour HOV demand forecasts for the same locations presented in Table 2 for year 2025. These demand forecasts for year 2035 assumed continuous access for the HOV lanes to better capture the demand for the facility over this longer time frame (beyond 2025). NDOT has the flexibility to implement the best operational policy (i.e., continuous access vs. limited access) in response to future conditions. However, similar to near-term recommendation, limited-access is recommended for the long-term system as well.

Table 4: Year 2035 HOV Demand Forecasts

Location	Peak Hour HOV Demand Forecasts ¹	
	Northbound	Southbound
HOV flyover	1,980	1,910
I-15 south of the HOV flyover	2,800	2,970
HOV Gateway	1,090	1,300
I-15 south of Sahara Avenue ²	2,590	2,560
US 95 west of flyover ramps ³	2,820	2,710

¹Demand for the highest peak hour is shown.
²This is where Project Neon ties into I-15 on the south. This location also represents the volumes for the “Gap”.
³This is where Project Neon ties into US 95 on the west.

Year 2035 forecasts in Table 4 were compared with the vehicle volume thresholds shown in Table 1. Based on the comparison, year 2035 HOV lane requirements are shown in Table 5. By year 2035, the “Gap”, the HOV flyover, and US 95 west of flyover ramps all require two HOV lanes in each direction. Project Neon P3 design should be forward compatible with this future configuration.

Table 5: Year 2035 Number of HOV Lane Requirements

Location	Required Number of HOV Lanes	
	Northbound	Southbound
HOV flyover	2	2
HOV Gateway	1	1
I-15 south of the HOV flyover	2	2
I-15 south of Sahara Avenue ¹	2	2
US 95 west of flyover ramps ²	2	2
¹ This is where Project Neon ties into I-15 on the south. This location also represents the volumes for the “Gap”. ² This is where Project Neon ties into US 95 on the west.		

It should be noted that HOV lanes on I-15 are anticipated to continue north of Project Neon by year 2035. Additionally, HOV lanes are planned east of Project Neon on US 95/I-515 (possibly to Charleston Boulevard) in year 2035. Both are to be one-lane facilities. The proposed improvements for Project Neon should be forward compatible with these components of the ultimate HOV system.

5.0. I-15 EXPRESS LANES TO HOV CONVERSION

As discussed in Section 3.0, it is proposed that one of the I-15 express lanes in each direction is converted to an HOV lane at the time of Project Neon Opening (i.e., a 4 general-purpose+1 HOV [4+1] configuration). To identify the potential impact of this conversion on the general-purpose lanes, a volume to capacity (V/C) analysis of the general-purpose lanes (after the conversion) was performed. Table 6 shows the results of this analysis.⁴

⁴ These V/Cs are planning-level estimates; actual operating conditions would be better defined through a detailed traffic operational analysis.

Table 6: Year 2025 General-Purpose Lane V/Cs within the "Gap"

Segment	General-Purpose Lane Volumes		Number of General-Purpose Lanes		V/C	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
Sahara Avenue to Spring Mountain Road	8,780	9,170	4+1 aux	4+1 aux	0.93	0.97
Spring Mountain Road to Flamingo Road	7,100	9,490	4	4+1 aux	0.85	1.00
Flamingo Road to Tropicana Avenue	8,970	8,620	4+2 aux	4+1 aux	0.88	0.91

Notes:

1. Volumes shown are for highest peak hour volume.
2. Capacity of general-purpose lanes are assumed to be 2,100 vehicles per hour (vph).
3. Auxiliary lanes are assumed to have approximately half the capacity of a general-purpose lane. A lower capacity (750 vph) is assumed for the second northbound auxiliary lane between Flamingo Road and Tropicana Avenue.

The results indicate that by year 2025 the general-purpose lane volumes would approach or reach capacity. These V/C values generally indicate unstable conditions that could result in LOS F in the southbound direction; therefore, mitigation is necessary.

A potential mitigation is to add a second HOV lane (i.e., a 4GP+2HOV configuration) by or in year 2025. The travel demand model indicates that there are adequate HOV-eligible vehicles to support a second HOV lane by year 2025.⁵ If a second HOV lane is added, then more eligible vehicles would move to the HOV lanes providing relief to the general-purpose lanes. Actions to promote high occupant vehicle use are recommended in advance of the addition, to better utilize the new second HOV lane. It should be noted that adding a general-purpose lane (instead of adding a second HOV lane) is specifically not recommended because the advantage of HOV lanes would be negated since HOV and general-purpose lanes would then operate at the same speed and quality of service (and remove any incentive for mode shift to HOV).

⁵ The forecasts shown in Section 3.0 indicate only one HOV lane because year 2025 traffic forecast assumed limited access to HOV lanes. That assumption resulted in lower volumes in the HOV lane since HOV eligible vehicles that could not enter or exit the HOV lane (due to the limited-access locations) stayed in the general-purpose lanes.

Because the express lane conversion is proposed at the time of Project Neon Opening, a year 2018 V/C analysis is also conducted (Table 7) to examine conditions projected for the opening year.⁶ Results show that the general-purpose lanes would operate under capacity in year 2018; V/C values indicate LOS E or better conditions. Therefore, a 4+1 configuration in the opening year is projected to be successful.

Table 7: Year 2018 General-Purpose Lane V/Cs within the “Gap”

Segment	General-Purpose Lane Volumes		Number of General-Purpose Lanes		V/C	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
Sahara Avenue to Spring Mountain Road	8,189	8,553	4+1 aux	4+1 aux	0.87	0.91
Spring Mountain Road to Flamingo Road	6,622	8,851	4	4+1 aux	0.79	0.94
Flamingo Road to Tropicana Avenue	8,366	8,040	4+2 aux	4+1 aux	0.82	0.85

Notes:

1. Volumes shown are for highest peak hour volume.
2. Capacity of general-purpose lanes are assumed to be 2,100 vehicles per hour (vph).
3. Auxiliary lanes are assumed to have approximately half the capacity of a general-purpose lane. A lower capacity (750 vph) is assumed for the second northbound auxiliary lane between Flamingo Road and Tropicana Avenue.

6.0. PROPOSED IMPROVEMENTS AND IMPLEMENTATION PLAN

Based on the analyses discussed in the preceding sections, Table 8 presents a timeline of proposed HOV improvements for Project Neon and I-15 express lanes conversion. The improvements are listed incrementally.

Table 8: Proposed Implementation Plan

Implementation Year	HOV Improvement
Neon Opening (2018)	<ul style="list-style-type: none"> • HOV flyover (one lane in each direction); design for two lanes. • HOV Gateway (one-lane ramps). • Convert one of the I-15 express lanes in each direction to HOV lanes within the “Gap”; convert the other lane to general purpose. • Provide one or more HOV lanes in each direction within Project Neon. • Design all HOV with limited access per recommendations.

⁶ A year 2018 travel demand model is not available; therefore, year 2018 forecasts were estimated from year 2025 forecasts using an annual growth of approximately 1.0 percent. The 1.0 percent growth factor was calculated based on model to model volume comparison.

Implementation Year	HOV Improvement
2025	<ul style="list-style-type: none"> • Add a second HOV lane within the “Gap” (i.e., 4+2 configuration). • Extend the second HOV lane to the HOV flyover.
2030 ²	<ul style="list-style-type: none"> • Improve the HOV flyover to accommodate two lanes in each direction. Alternately, this could be done with the improvements listed for year 2025.
2035	<ul style="list-style-type: none"> • Extend HOV lanes north of Spaghetti Bowl (one-lane in each direction).¹ • Extend US 95 HOV lanes east of Spaghetti Bowl (one-lane in each direction).¹
<p>¹The limits of the extension will be determined as part of the overall system plan evaluation. They are listed here to ensure that Project Neon design is forward compatible with these improvements.</p> <p>²By year 2035, the HOV flyover requires two lanes in each direction; while one lane in each direction is adequate in year 2025. Year 2025 and 2035 demand forecasts were interpolated to estimate the year in which the demand would exceed the one-lane threshold, i.e., the year in which the facility would need to be improved to two lanes in each direction. The result was year 2030.</p>	

6.1. Operational Recommendations

6.1.1. Minimum Occupancy

It is recommended that the minimum occupancy requirement on the proposed HOV facilities be HOV 2+. The HOV 2+ requirement allows the widest rideshare market to benefit from the HOV lanes. The demand forecasts, analysis results, and number of lane recommendations in this memorandum are based on the HOV 2+ eligibility requirement. Nevertheless, in the event that HOV 2+ demand grows beyond the facility’s maximum operational threshold after the HOV lanes are implemented, a more restrictive access (HOV 3+) could be considered. The travel demand model does not indicate sufficient HOV 3+ demand; therefore, HOV 3+ is not recommended for the proposed 4+1 configuration for the “Gap” for year 2018 and year 2025.

6.1.2. Hours of Operation

HOV lanes can operate full time (24-hour) or part time (peak period or extended peak period). Full-time operation provides travel time and reliability benefits for users at all times during recurring and non-recurring congestion. It is easier to sign, mark, and enforce since there are no changes by time of day. Additionally, full-time operation may promote wider acceptance of the facility. The down side is that the HOV lanes may appear empty during off-peak periods when traffic in the general-purpose lanes also flows freely, and there is no apparent advantage for any traffic to use the HOV lanes. This may create a negative public perception of the HOV lanes.

Using the travel demand model data, two representative locations on I-15 were investigated for shared ride potential beyond the peak periods. Shared ride potential is the total of shared ride

demand across all lanes. The two locations were 1) between Flamingo Road and Tropicana Avenue, and 2) between Sahara Avenue and Charleston Boulevard. The results indicate that at both locations, shared ride demand for each hour between 7 AM and 8 PM is similar (Table 9).⁷

Table 9: Shared Ride Demand from the Travel Demand Model

Model Time Period	Between Flamingo Road and Tropicana Avenue		Between Sahara Avenue and Charleston Boulevard	
	Total Shared Ride Demand	Total Shared Ride Demand per Hour	Total Shared Ride Demand	Total Shared Ride Demand per Hour
12 AM to 7 AM	8,780	1,254	8,642	1,235
7 AM to 9 AM	11,115	5,558	10,878	5,439
9 AM to 2 PM	36,451	7,290	37,070	7,414
2 PM to 4 PM	14,781	7,391	15,307	7,654
4 PM to 6 PM	14,462	7,231	14,726	7,363
6 PM to 8 PM	15,042	7,521	15,368	7,684
8 PM to 12 AM	16,980	4,245	16,248	4,062

Notes:

- The shared ride demand volumes are year 2025 raw model volumes for combined northbound and southbound directions. They are used for comparison purposes only.
- The shared ride demand volumes are not the HOV lane volumes. They are the shared ride model volumes across all lanes.

 Peak commute periods.

 Outside of peak commute periods excluding night hours.

Total demand (i.e., shared ride plus single occupant) for all time periods were also reviewed for the same two locations on I-15. The goal was to find out if there would be adequate demand on the general-purpose lanes to justify operating the HOV lanes outside of the peak periods (i.e., if the HOV lanes would be beneficial outside of the peak periods). The model indicates that the hourly demand is similar throughout the day from 7 AM to 8 PM, meaning there would be some congestion on general-purpose lanes, thereby justifying the use of HOV lanes. Existing traffic volumes on I-15 also were investigated for the same objective using data from NDOT’s permanent count station on I-15 between Sahara Avenue and Charleston Boulevard. The data (Table 10) shows the volumes are fairly flat from 6 AM to 7 PM.

⁷ The same result, however, is not true for the HOV flyover. Although there would be demand to meet the minimum threshold, the demand outside of the peak commute periods is lower. With reduced congestion on the general-purpose lanes, fewer shared ride vehicles would elect to use the HOV flyover.

Table 10: 24-Hour Volume Data on I-15 between Sahara Ave and Charleston Blvd

Start Time	Volume		Hourly to Daily Ratio	
	Southbound	Northbound	Southbound	Northbound
0:00	2,378	4,172	1.8%	3.3%
1:00	1,712	2,847	1.3%	2.3%
2:00	1,519	2,325	1.1%	1.8%
3:00	2,081	1,988	1.6%	1.6%
4:00	2,828	2,175	2.1%	1.7%
5:00	5,110	2,868	3.8%	2.3%
6:00	6,743	4,425	5.0%	3.5%
7:00	8,012	5,940	6.0%	4.7%
8:00	7,799	5,687	5.8%	4.5%
9:00	6,892	5,547	5.1%	4.4%
10:00	6,942	5,885	5.2%	4.7%
11:00	7,368	6,144	5.5%	4.9%
12:00	7,001	6,568	5.2%	5.2%
13:00	7,523	6,922	5.6%	5.5%
14:00	8,037	7,054	6.0%	5.6%
15:00	8,030	7,635	6.0%	6.1%
16:00	7,847	7,758	5.8%	6.2%
17:00	7,216	7,585	5.4%	6.0%
18:00	6,312	6,650	4.7%	5.3%
19:00	5,726	5,624	4.3%	4.5%
20:00	4,915	5,188	3.7%	4.1%
21:00	4,718	4,955	3.5%	3.9%
22:00	4,137	4,863	3.1%	3.9%
23:00	3,360	4,860	2.5%	3.9%
Daily Total	134,206	125,663	100.0%	100.0%

Note: Peak hour is shown in bold.

Source: NDOT Count Station # 0031210 on I-15 0.2 mile north of Sahara Avenue Interchange.

The shared ride and total demand analyses indicate that demand supports an HOV lane operation period that extends well beyond the peak periods. Today, US 95 HOV lanes operate two extended peak periods (6 to 10 AM and 2 to 7 PM). Based on the analyses, demand supports continuous operation from 6 AM to 7 PM. A 24-hour operation, however, has many advantages as discussed earlier. Since the total traffic is minimal during the night, empty HOV lanes would not create the negative public perception they would during the day. Additionally, because there

are many HOV drop ramps planned, a 24-hour operation would be the better option and, therefore recommended.

6.1.3. Vehicle Type Eligibility

Trucks

NDOT policy states that trucks with more than two axles (or vehicle-trailer combinations) are not allowed on HOV lanes. This means that after conversion of the I-15 express lanes to HOV lanes, these vehicles will no longer be able use the median lanes during HOV operating hours. Truck data on the I-15 express lanes was investigated to estimate the potential impact of this policy.

On the I-15 express lanes, one NDOT count station, located just south of Blue Diamond Road (ATR # 0035340), has detailed truck counts available by lane. Year 2013 weekday truck counts at this station were analyzed. The data indicates that trucks with more than two axles comprise approximately 6 percent of all vehicles; and among this 6 percent, approximately 30 percent use the express lanes, and 70 percent use the general-purpose lanes. Moving the 30 percent of trucks from the express lanes to the general-purpose lanes, which amounts to less than 2 percent of all vehicles, is not anticipated to significantly impact the operation of the general-purpose lanes. There is no detailed by-lane truck data available within the “Gap”; however, the overall daily truck percentage, based on NDOT’s Vehicle Class Distribution Report (2012), is approximately 4 percent as shown in Table 11.

Table 11: Truck Percentage within the “Gap”

Freeway	From	To	Heavy Vehicles AADT	Total Average AADT	Daily Heavy Vehicles Percent
I-15	Spring Mountain Road	Sahara Avenue	10,525	257,000	4.1%

Allowing trucks on the HOV lanes would have adverse impacts on speeds, safety, and reliability; and is not consistent with the HOV goal of moving people. Furthermore, allowing trucks on one-lane facilities (such as the HOV flyover) would have significant adverse impacts on speeds due to their slower acceleration during climbing. Additionally, Project Neon and the I-15 South Project FEIS documents do not have an objective related to freight vehicles. Therefore, trucks with more than two axles are not recommended on the proposed HOV facilities.

It should be noted that even with a policy that allows trucks on HOV lanes, a portion of the trucks would still use general-purpose lanes because they would not meet the minimum occupancy requirements.

Occupancy-Exempt Vehicles

According to NDOT policy, emergency vehicles responding to an incident and dead-heading public transit buses are allowed on HOV lanes regardless of their occupancy level. Motorcycles are also allowed unless a safety study determines otherwise.

NDOT does not have a policy for low-emission and energy-efficient vehicles on HOV lanes. State law (NRS 484A) and federal law (23 U.S.C. 166) give NDOT the authority to allow low-emission and energy-efficient vehicles that meet specific performance requirements on HOV lanes (defined in U.S.C.166 (f) (3)). The HOV demand forecasts used in this memorandum did not include these types of vehicles, so it is recommended that they not be allowed on the HOV lanes when they first open. After the HOV lanes are operational for a few years, the Department may want to reevaluate the volumes and then decide if they should be allowed.

6.1.4. Summary of Operational Recommendations

Table 12 is a summary of the operational recommendations.

Table 12: Operational Recommendations

Component	Operational Plan
Minimum occupancy	2+
Hours of operation	24-hours, 7 days of the week
Trucks	Vehicles with more than two axles (or vehicle-trailer combinations) are not eligible
Motorcycles	Eligible
Emergency vehicles	Those responding to an emergency are eligible
Public transit buses	Eligible (including dead-heading buses)
Single-occupant low-emission and energy-efficient vehicles	To be studied
Access Type	Limited Access

6.2. Design Recommendations

Design of the proposed improvements will be completed as part of the Project Neon P3 Phase and subsequent phases and projects. The following are the recommendations for design:

- Design criteria should conform to the NDOT *Managed Lanes and Ramp Metering Manual*.
- Design should be forward compatible with the incremental improvements shown in Table 8

- If the access is limited (as proposed for year 2018 to 2025), there are two separation treatment options for HOV lanes: barrier separation or double white lane lines (i.e., contiguous). Both options should be evaluated during design, and the most appropriate option implemented.
- Design should not allow permanent barrier separation for those segments where a future year requires a higher number of HOV lanes than the opening year configuration.
- Ingress/egress locations to the HOV lane should be designed such that weaving issues are minimized. A minimum of 800 feet per lane change should be provided for weaving. A weaving analysis is required to determine the specific distance. Ingress/egress locations proposed in Section 3.1.1 should be re-evaluated as part of a more detailed traffic study.
- Design should allow vehicles from the HOV Gateway to continue northbound on I-15 north of the Spaghetti Bowl. Similarly, HOVs traveling southbound on I-15 north of the Spaghetti Bowl should be able enter the HOV lane north of the HOV Flyover and therefore have the potential to use the HOV Gateway.
- Design should ensure that vehicles on the Charleston Boulevard northbound on-ramp cannot enter the HOV flyover; and vehicles from southbound HOV flyover cannot exit at Charleston Boulevard. This is recommended to avoid weaving issues along the short distance between these ramps.
- Design should ensure that vehicles on the Sahara Avenue northbound on-ramp cannot enter the HOV flyover; and vehicles from southbound HOV flyover cannot exit at Sahara Avenue. These restrictions are primarily to avoid weaving issues.
- No HOV openings are to be provided between the HOV Flyover and the HOV Gateway.
- Design should be forward compatible with the ultimate HOV lane system, which includes HOV lanes north and east of the Spaghetti Bowl.

Appendix E

Preliminary Design Plans for Direct-Access Ramps

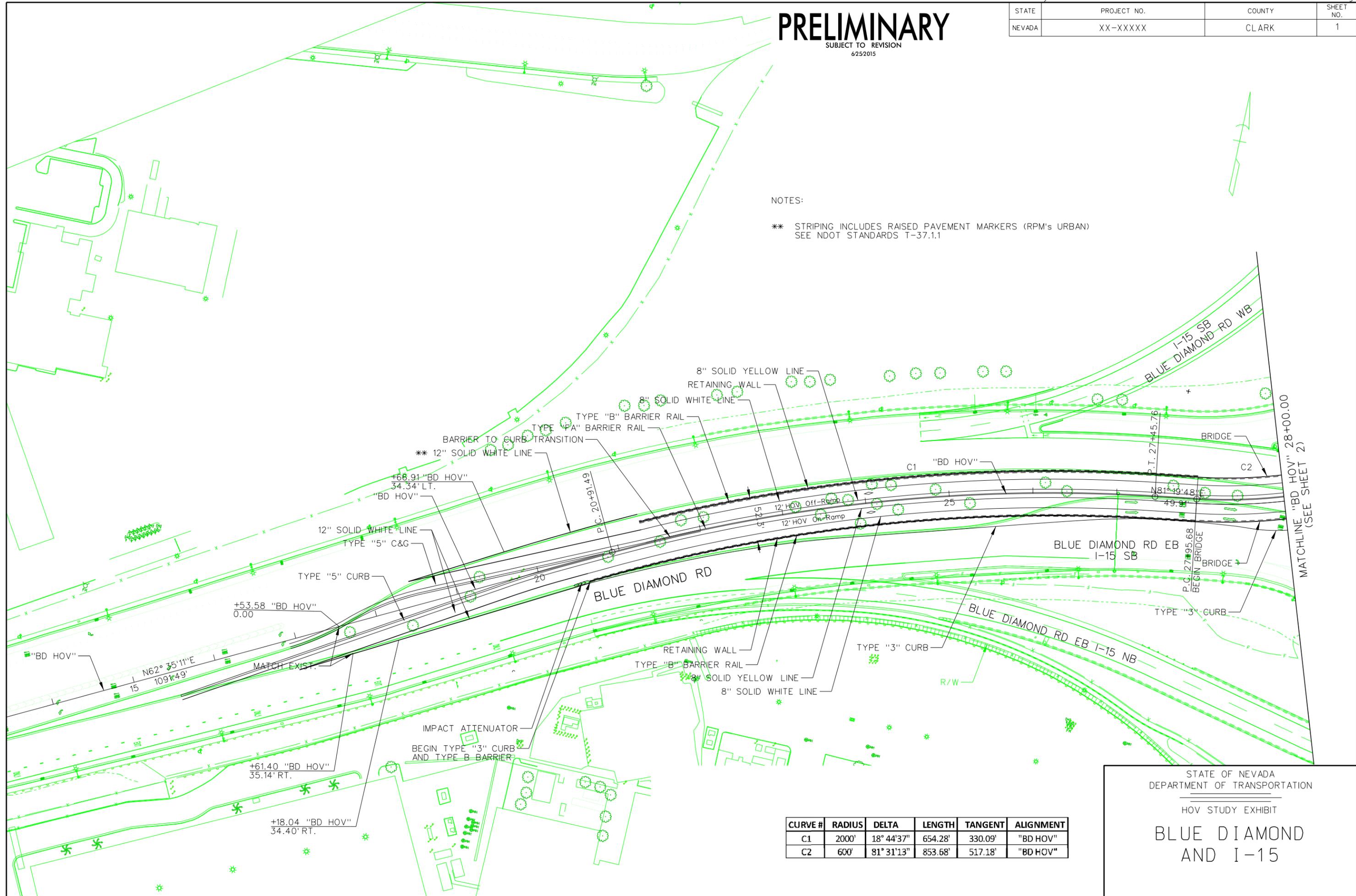
PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1

NOTES:

** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1



CURVE #	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C1	2000'	18° 44'37"	654.28'	330.09'	"BD HOV"
C2	600'	81° 31'13"	853.68'	517.18'	"BD HOV"

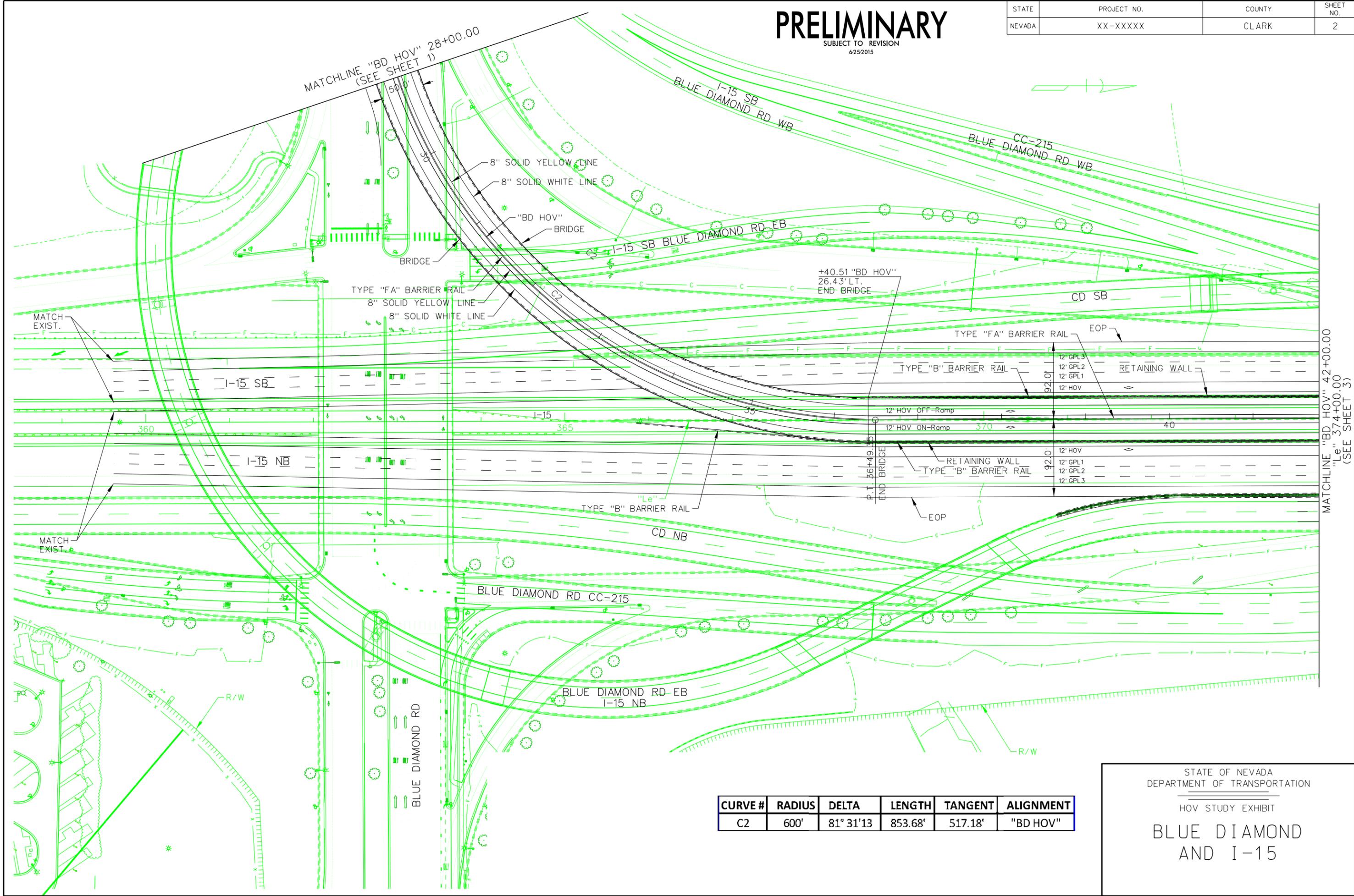
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

BLUE DIAMOND AND I-15

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2



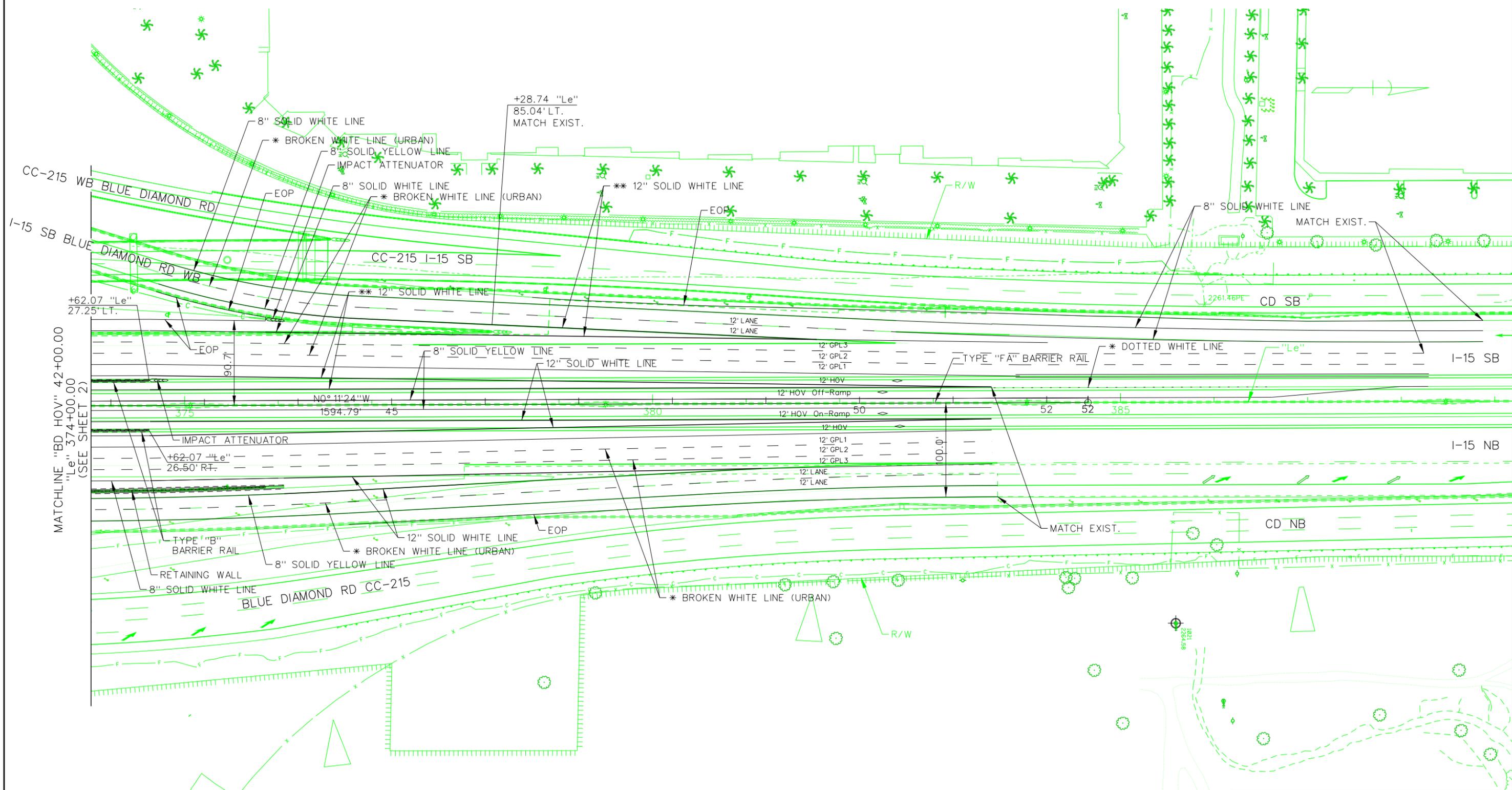
CURVE #	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C2	600'	81° 31'13"	853.68'	517.18'	"BD HOV"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**BLUE DIAMOND
AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3



MATCHLINE "BD_HOV" 42+00.00
"Le" 374+00.00
(SEE SHEET 2)

- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

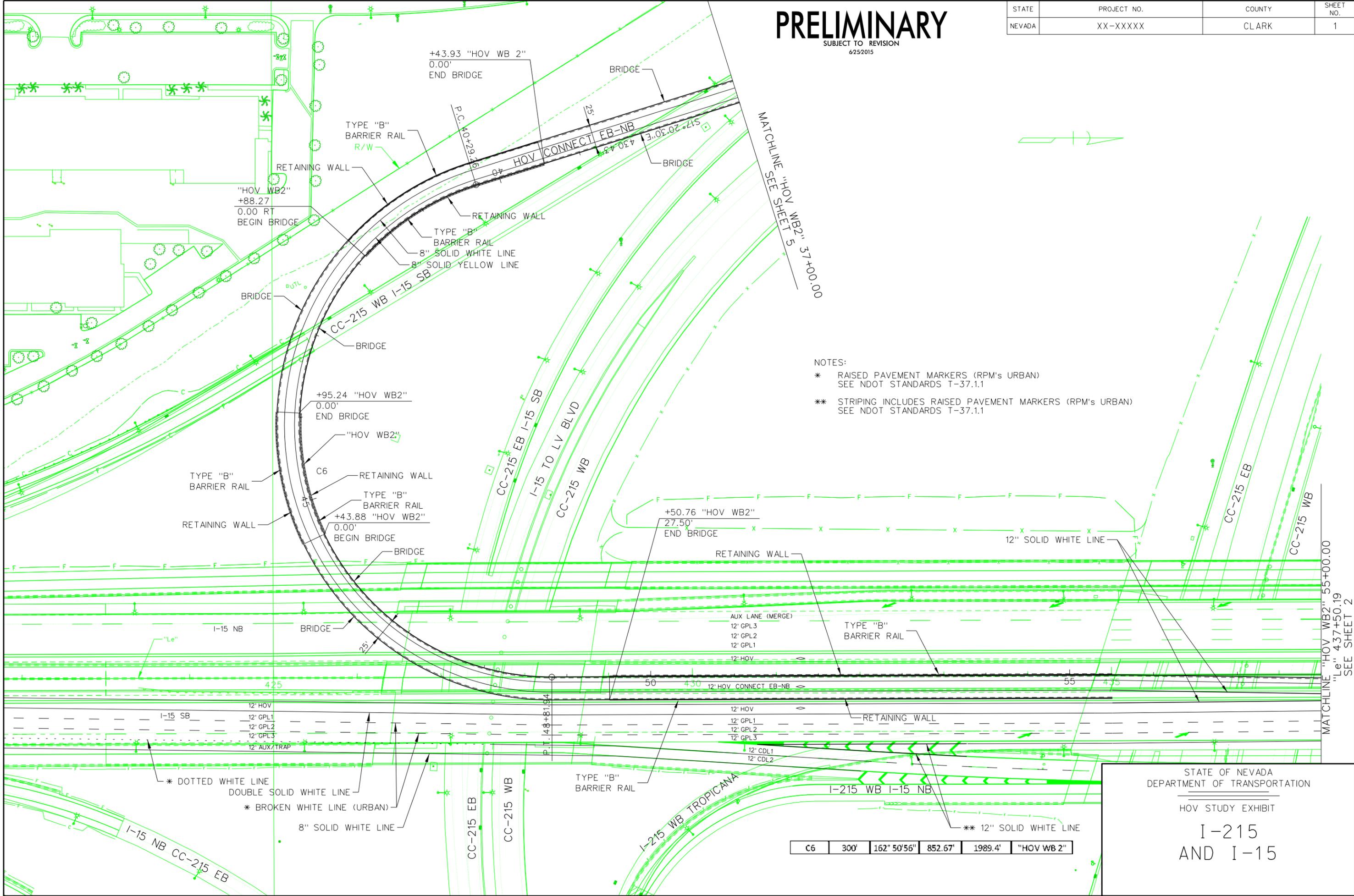
BLUE DIAMOND AND I-15

1:100 PLOT SCALE

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1

- * DOTTED WHITE LINE
- DOUBLE SOLID WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- 8" SOLID WHITE LINE

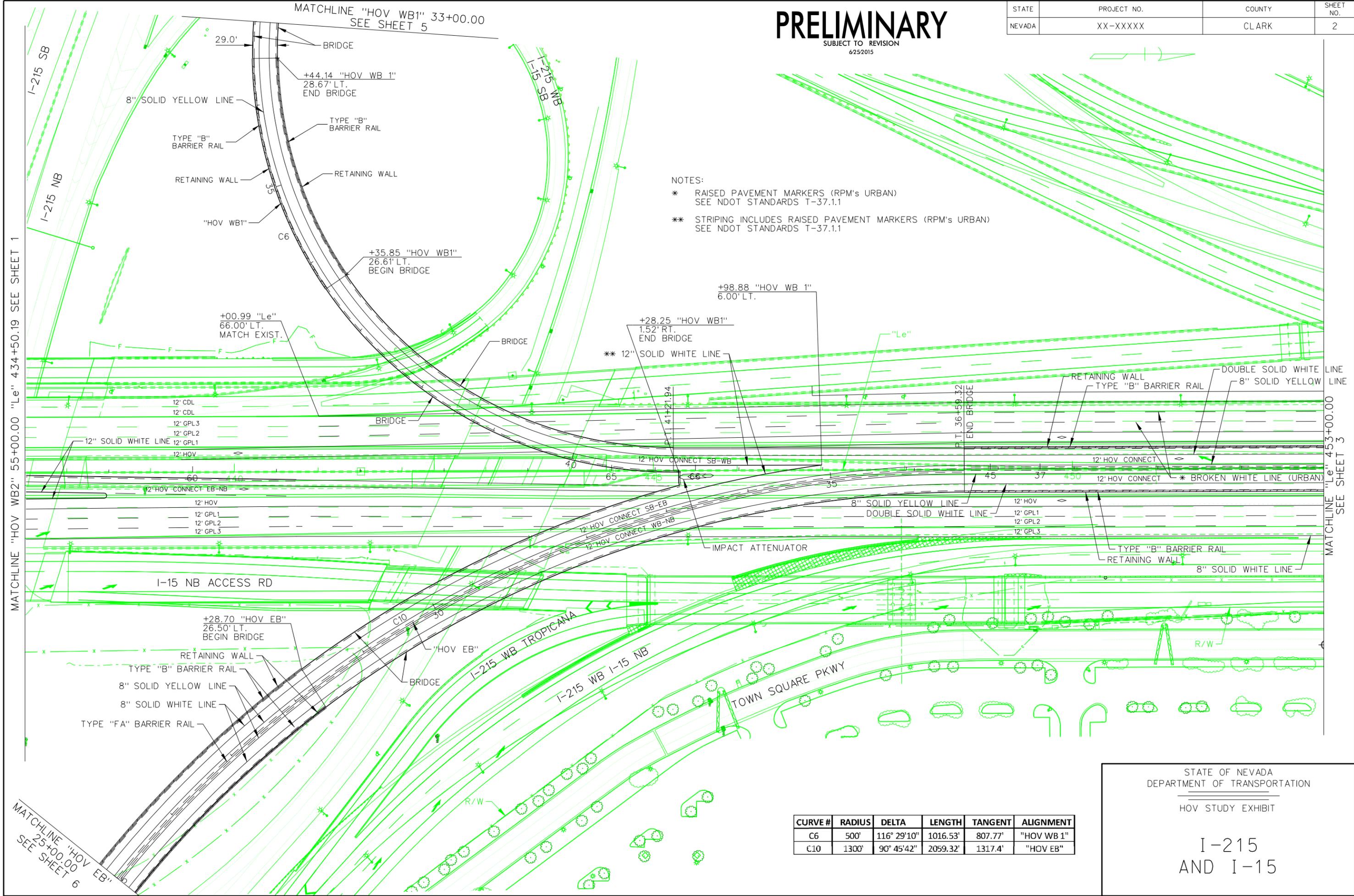
C6	300'	162' 50' 56"	852.67'	1989.4'	"HOV WB 2"
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STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**I-215
AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2



- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

CURVE #	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C6	500'	116° 29'10"	1016.53'	807.77'	"HOV WB 1"
C10	1300'	90° 45'42"	2059.32'	1317.4'	"HOV EB"

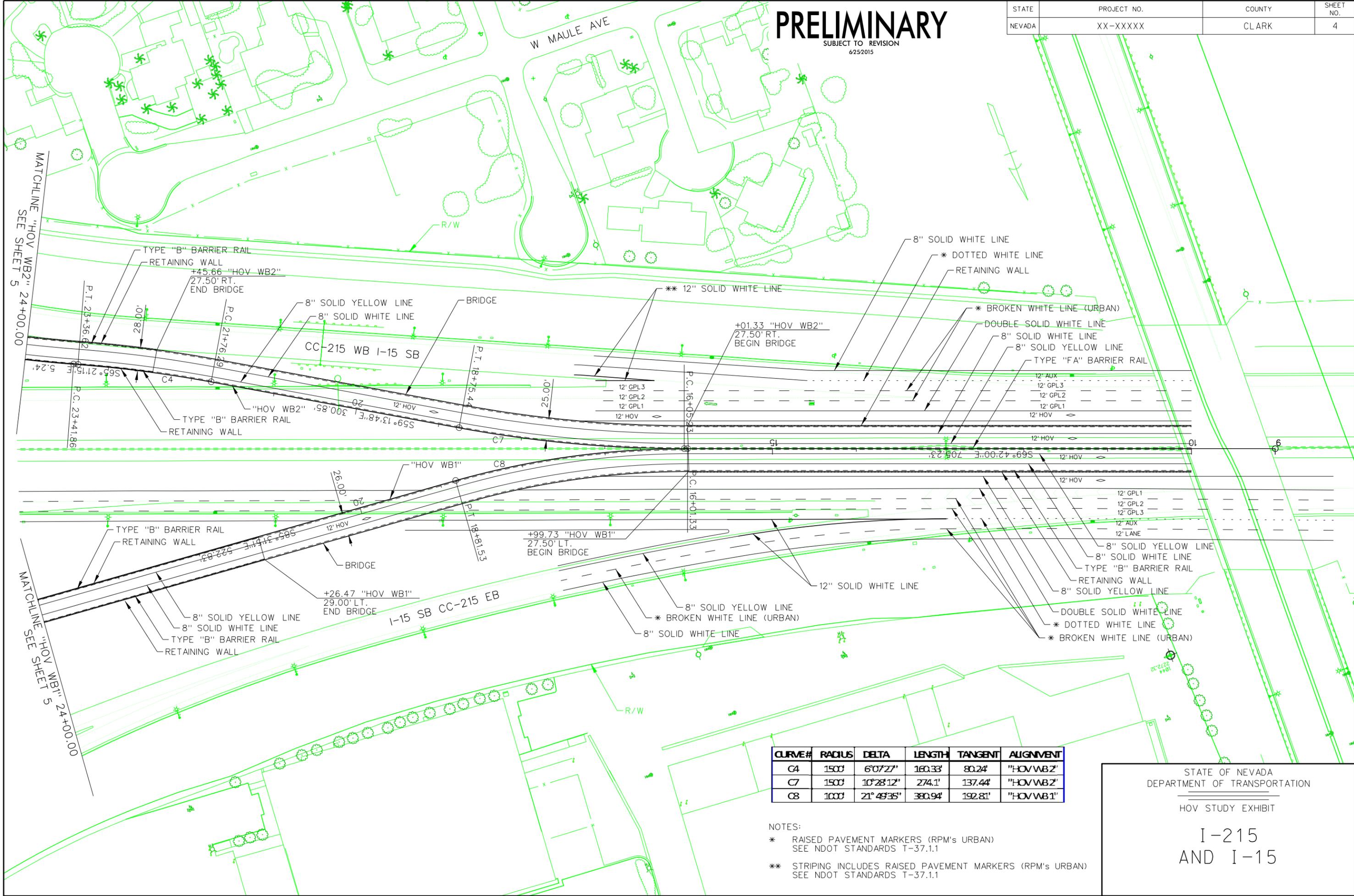
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

I-215 AND I-15

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	4

PRELIMINARY

SUBJECT TO REVISION
6/25/2015



CURVE#	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C4	1500'	6°07'27"	180.33'	80.24'	"HOV WB2"
C7	1500'	10°28'12"	274.1'	137.44'	"HOV WB2"
C8	1000'	21°49'35"	380.94'	192.81'	"HOV WB1"

- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HOV STUDY EXHIBIT

I-215 AND I-15

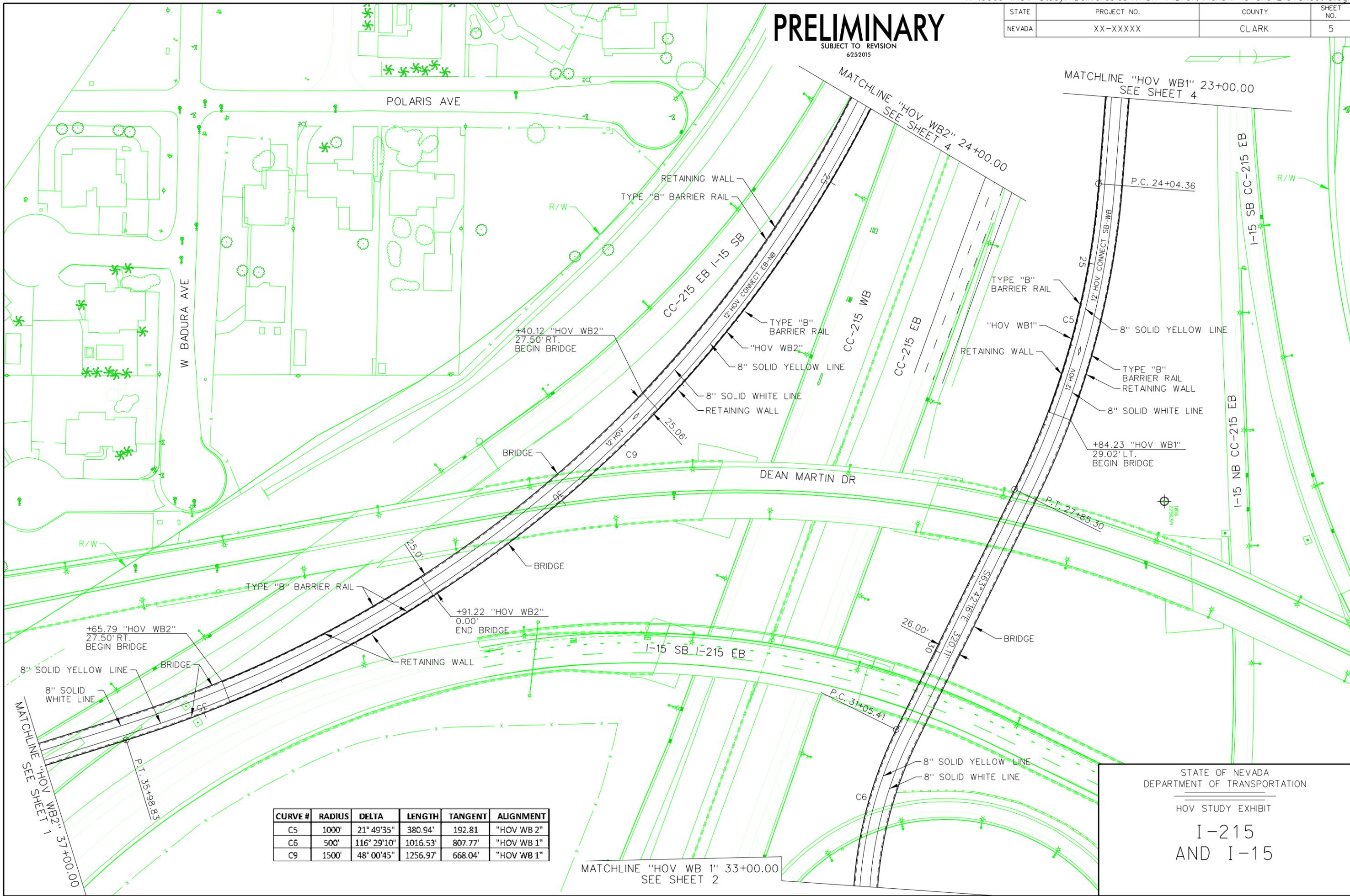
1:100 PLOT SCALE

anitar

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	5



CURVE #	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C5	1000'	21° 49'35"	380.94'	192.81	"HOV WB 2"
C6	500'	116° 29'10"	1016.53'	807.77'	"HOV WB 1"
C9	1500'	48° 00'45"	1256.97'	668.04'	"HOV WB 1"

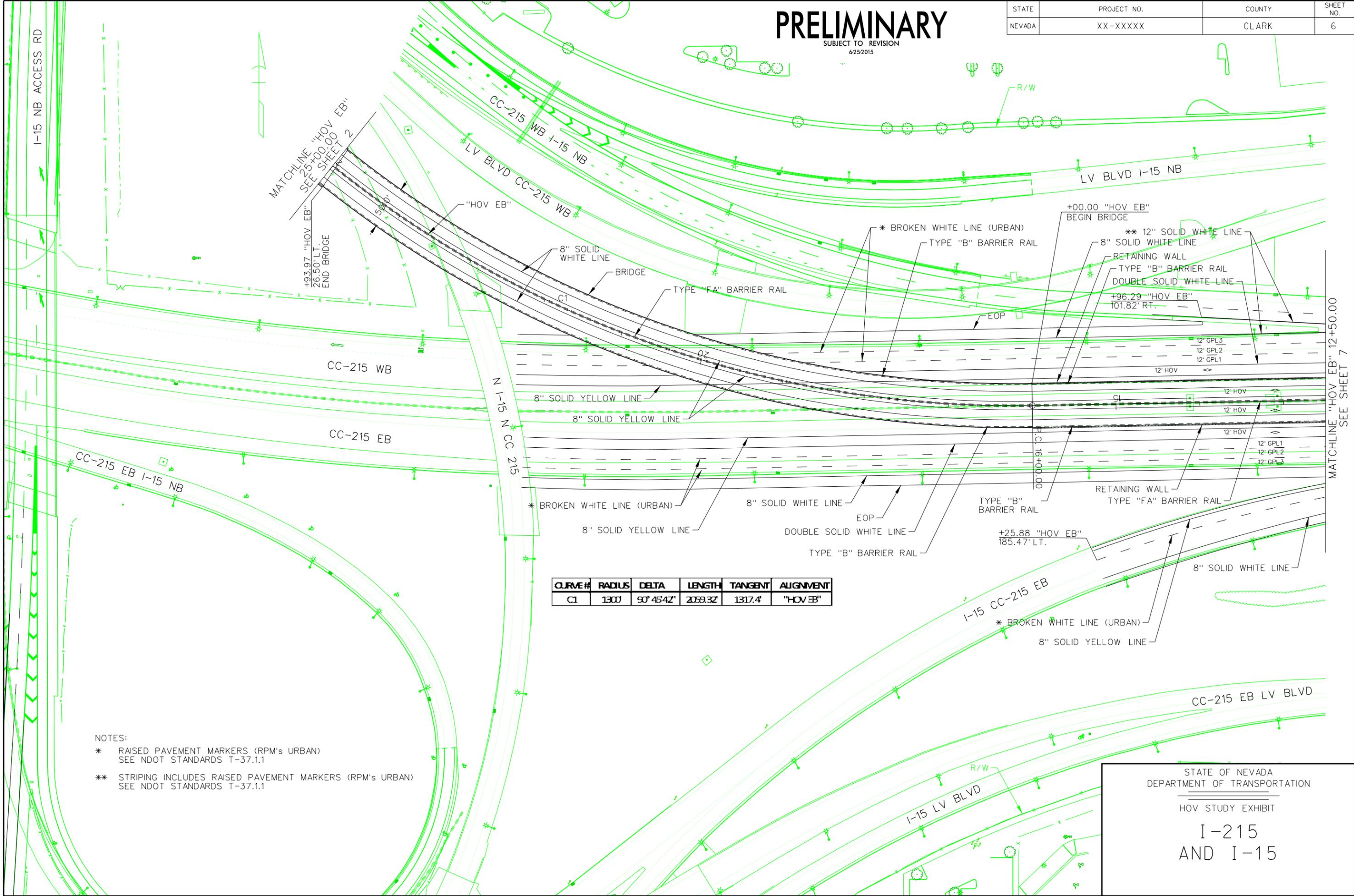
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

I-215 AND I-15

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	6



CURVE#	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C1	1300	90° 45' 42"	2059.32'	1317.4'	"HOV EB"

- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HOV STUDY EXHIBIT

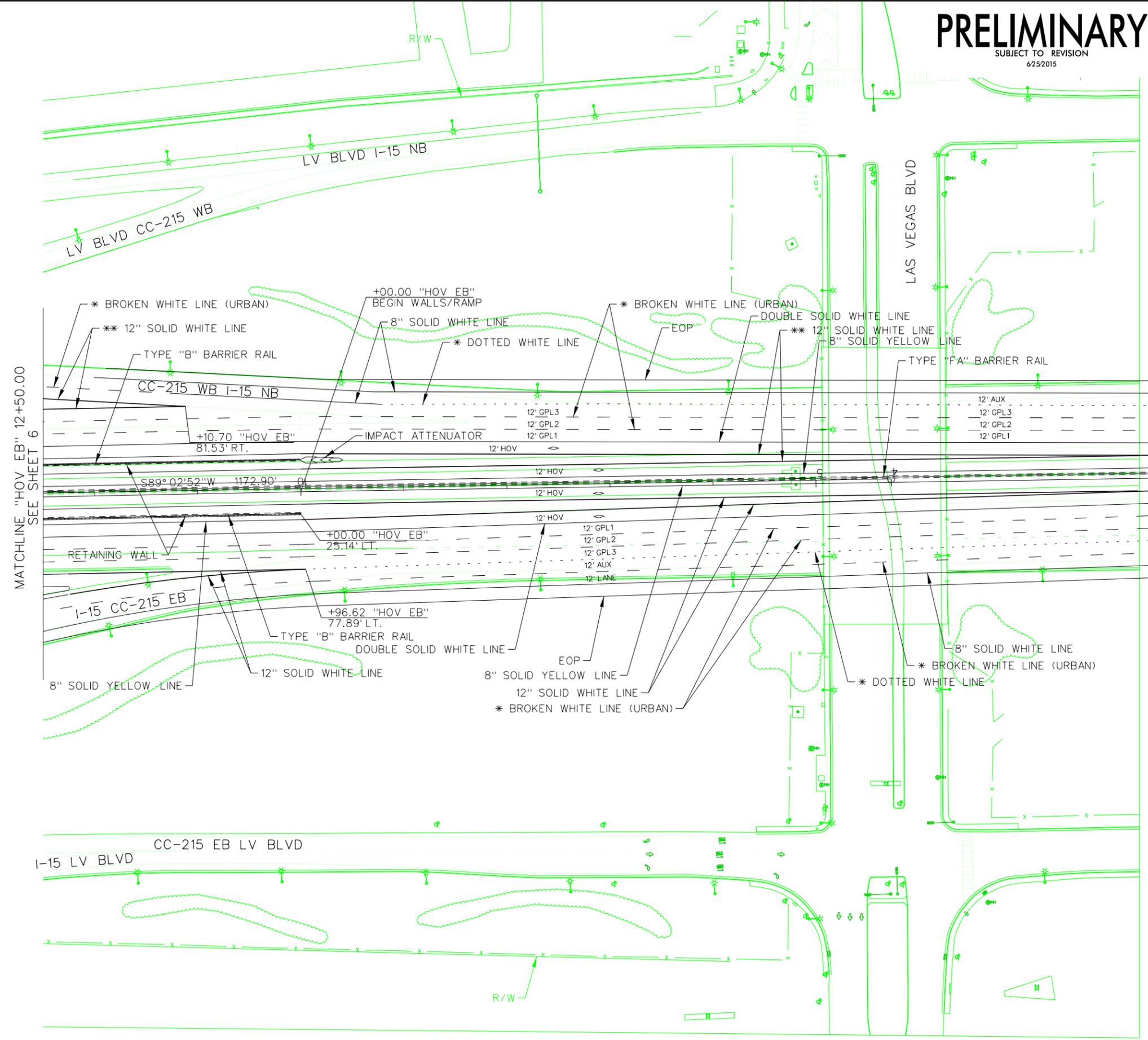
I-215 AND I-15

1:100 PLOT SCALE

MATCHLINE "HOV EB" 12+50.00
SEE SHEET 7

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	7

PRELIMINARY
 SUBJECT TO REVISION
 6/25/2015



NOTES:

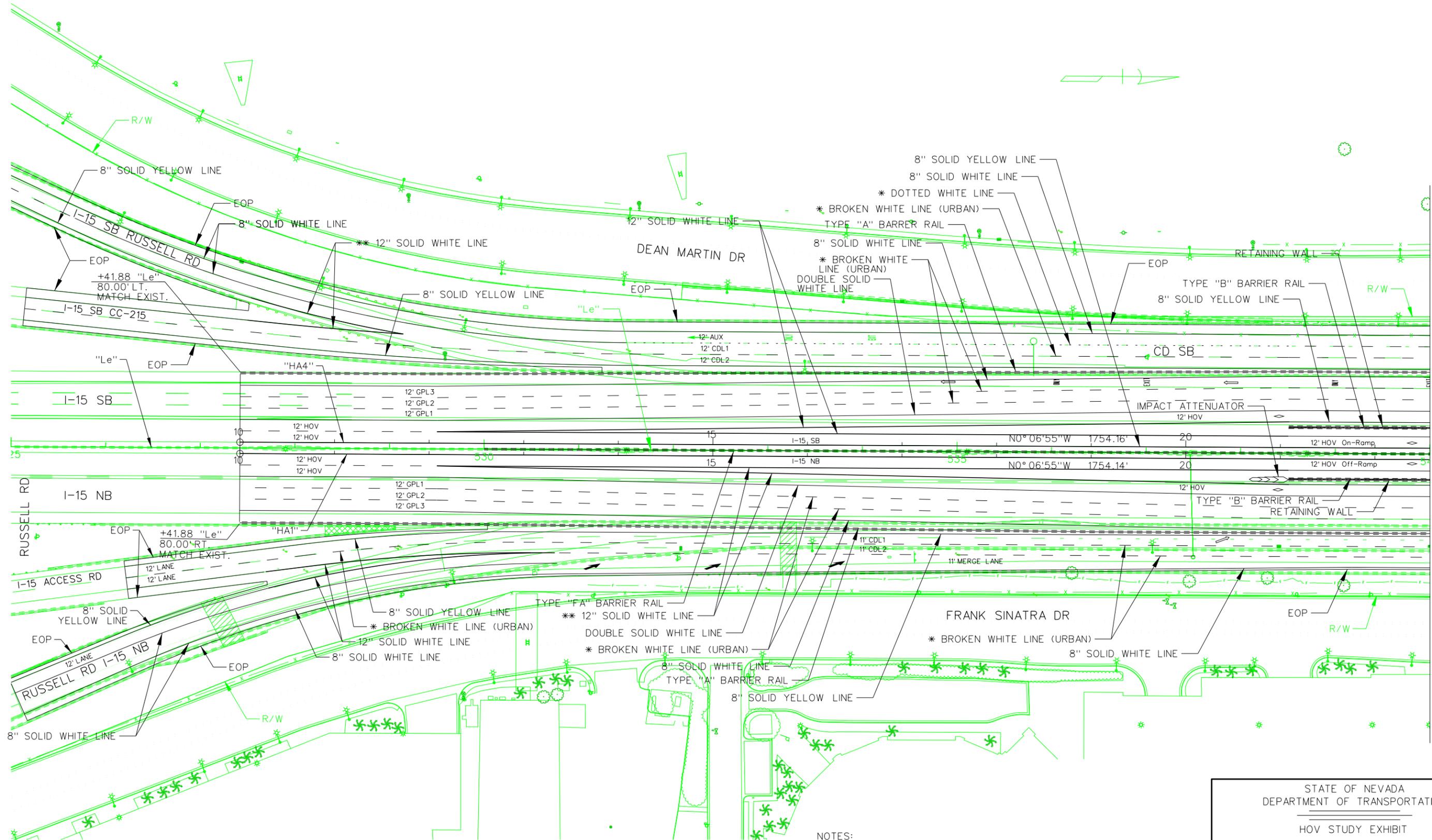
- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
- ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
 DEPARTMENT OF TRANSPORTATION
 HOV STUDY EXHIBIT
**I-215
 AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

HACIENDA HARMON AND I-15

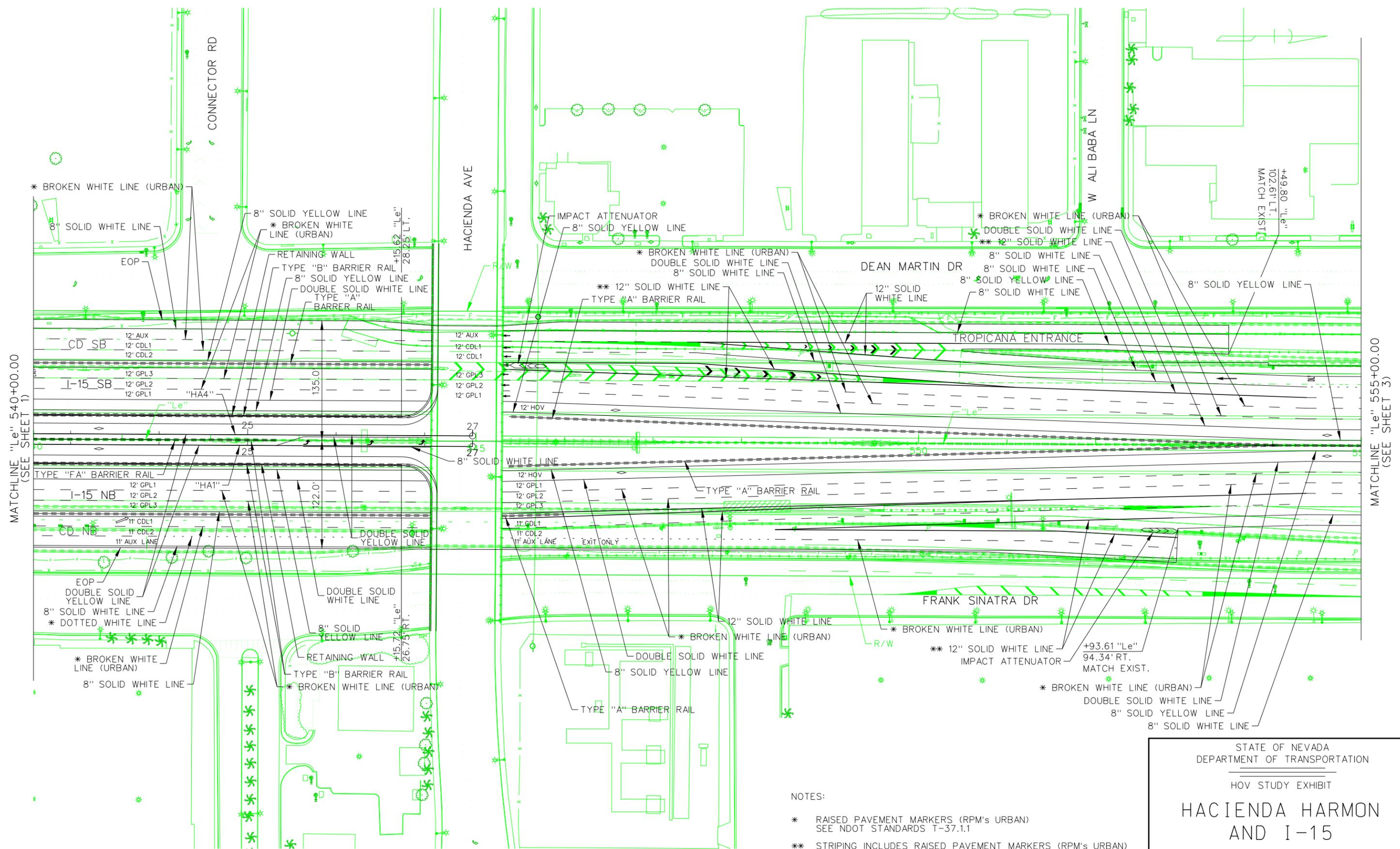
1:100 PLOT SCALE

MATCHLINE "Le" 540+00.00
(SEE SHEET 2)

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2



MATCHLINE "Le" 540+00.00
(SEE SHEET 1)

MATCHLINE "Le" 555+00.00
(SEE SHEET 3)

NOTES:

- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
- ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

HACIENDA HARMON AND I-15

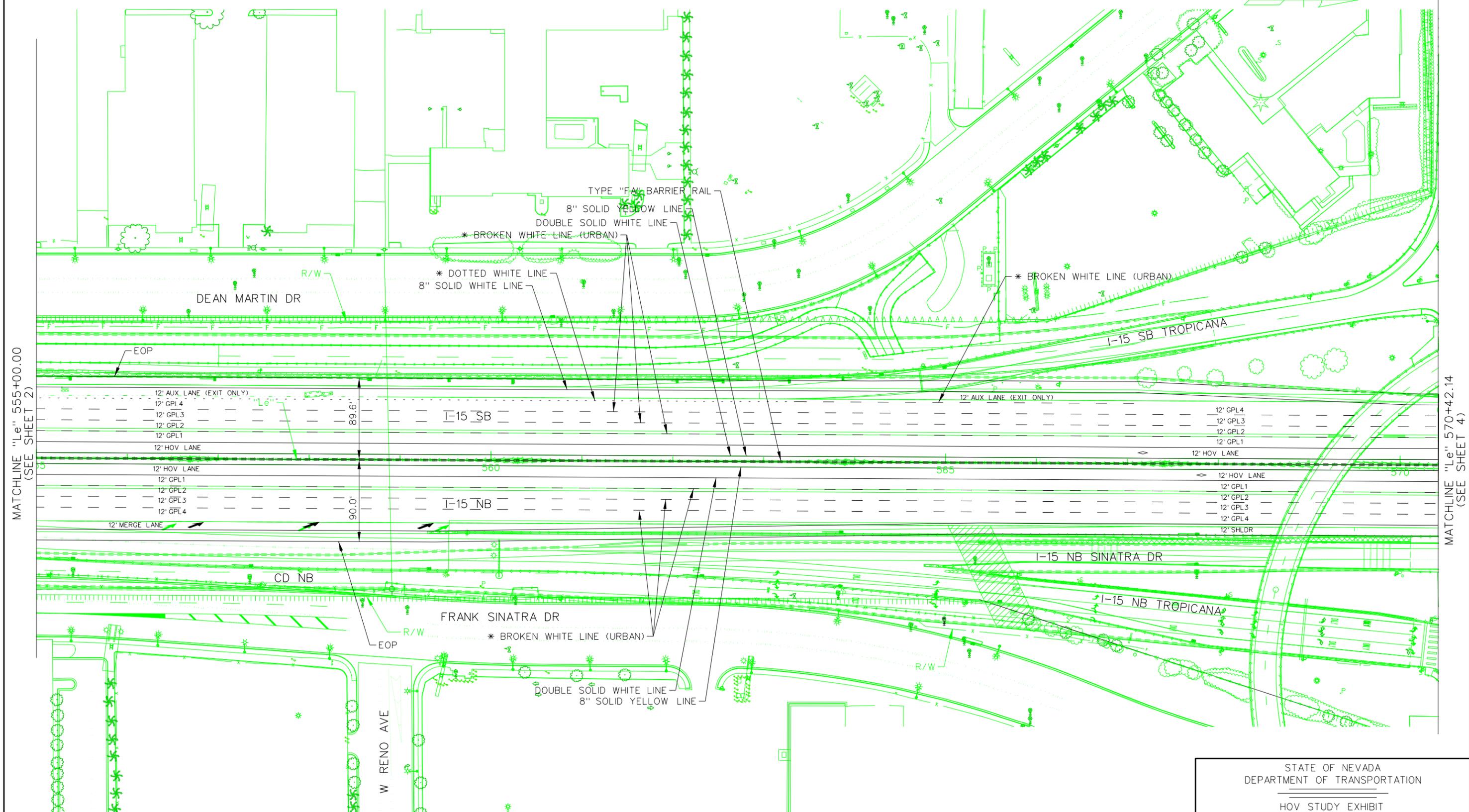
1:100 PLOT SCALE

anitar

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3



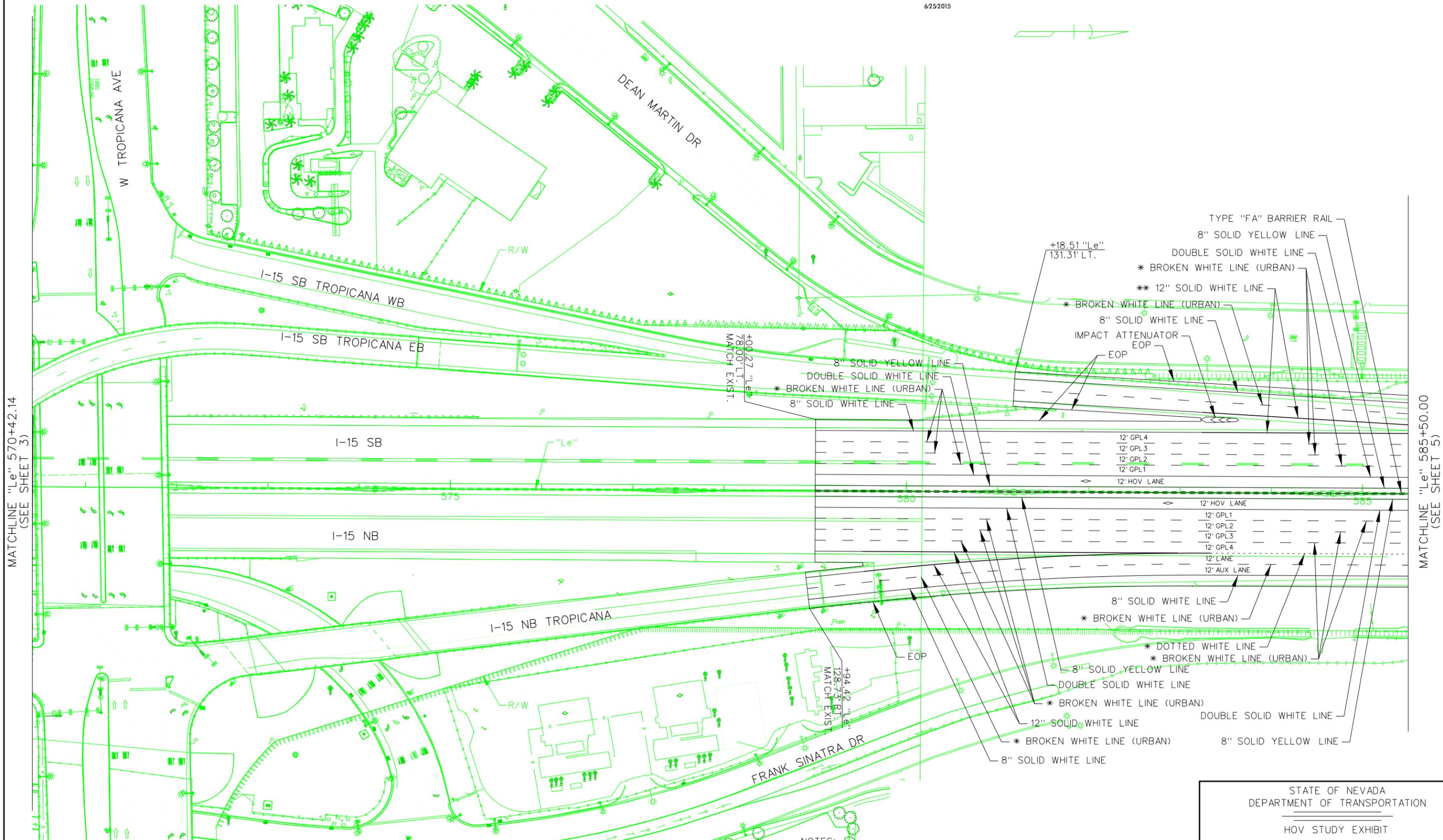
NOTES:
 * RAISED PAVEMENT MARKERS (RPM's URBAN)
 SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
 DEPARTMENT OF TRANSPORTATION
 HOV STUDY EXHIBIT
**HACIENDA HARMON
 AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	4



- TYPE "FA" BARRIER RAIL
- 8" SOLID YELLOW LINE
- DOUBLE SOLID WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- ** 12" SOLID WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- 8" SOLID WHITE LINE
- IMPACT ATTENUATOR
- EOP
- EOP
- 12' GPL4
- 12' GPL3
- 12' GPL2
- 12' GPL1
- 12' HOV LANE
- 12' HOV LANE
- 12' GPL1
- 12' GPL2
- 12' GPL3
- 12' GPL4
- 12' LANE
- 12' AUX LANE
- 8" SOLID WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- * DOTTED WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- 8" SOLID YELLOW LINE
- DOUBLE SOLID WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- 12" SOLID WHITE LINE
- * BROKEN WHITE LINE (URBAN)
- 8" SOLID WHITE LINE
- 8" SOLID YELLOW LINE

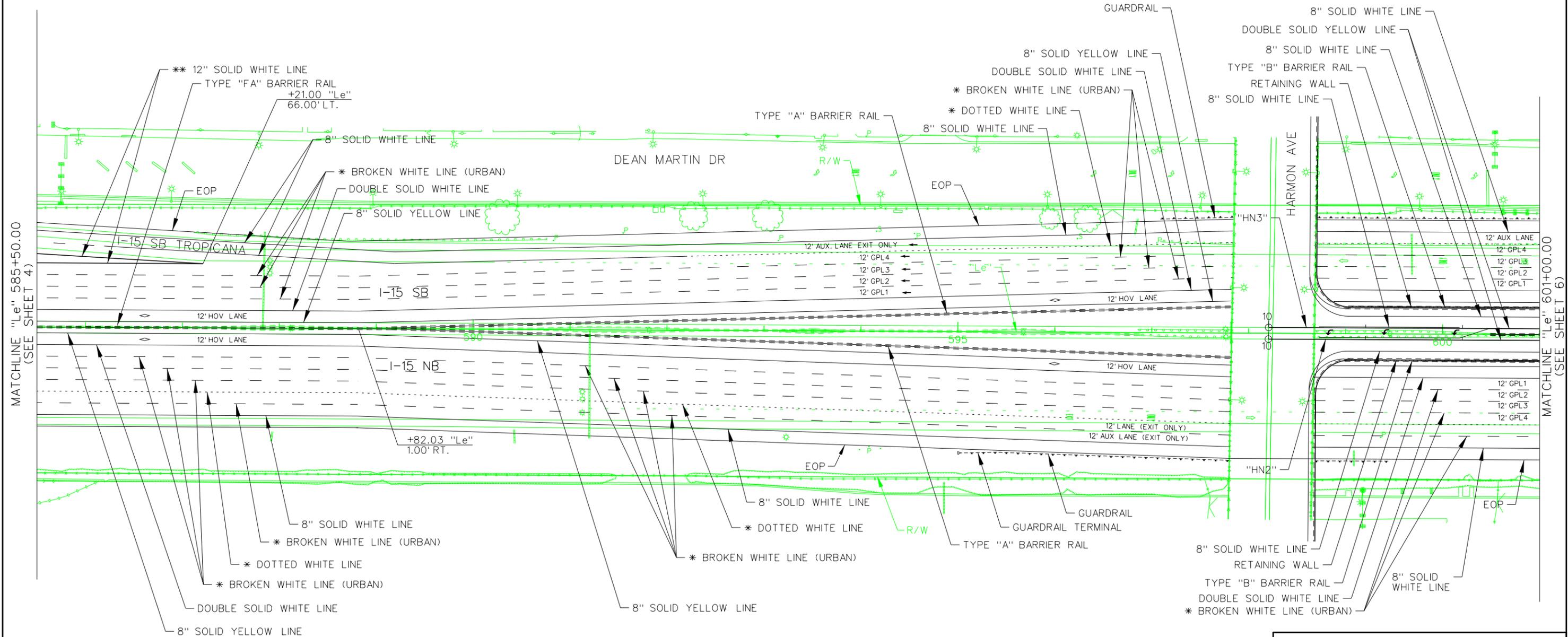
- NOTES:
- * RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1
 - ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**HACIENDA HARMON
AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/27/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	5



NOTES:

- * RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1
- ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN) SEE NDOT STANDARDS T-37.1.1

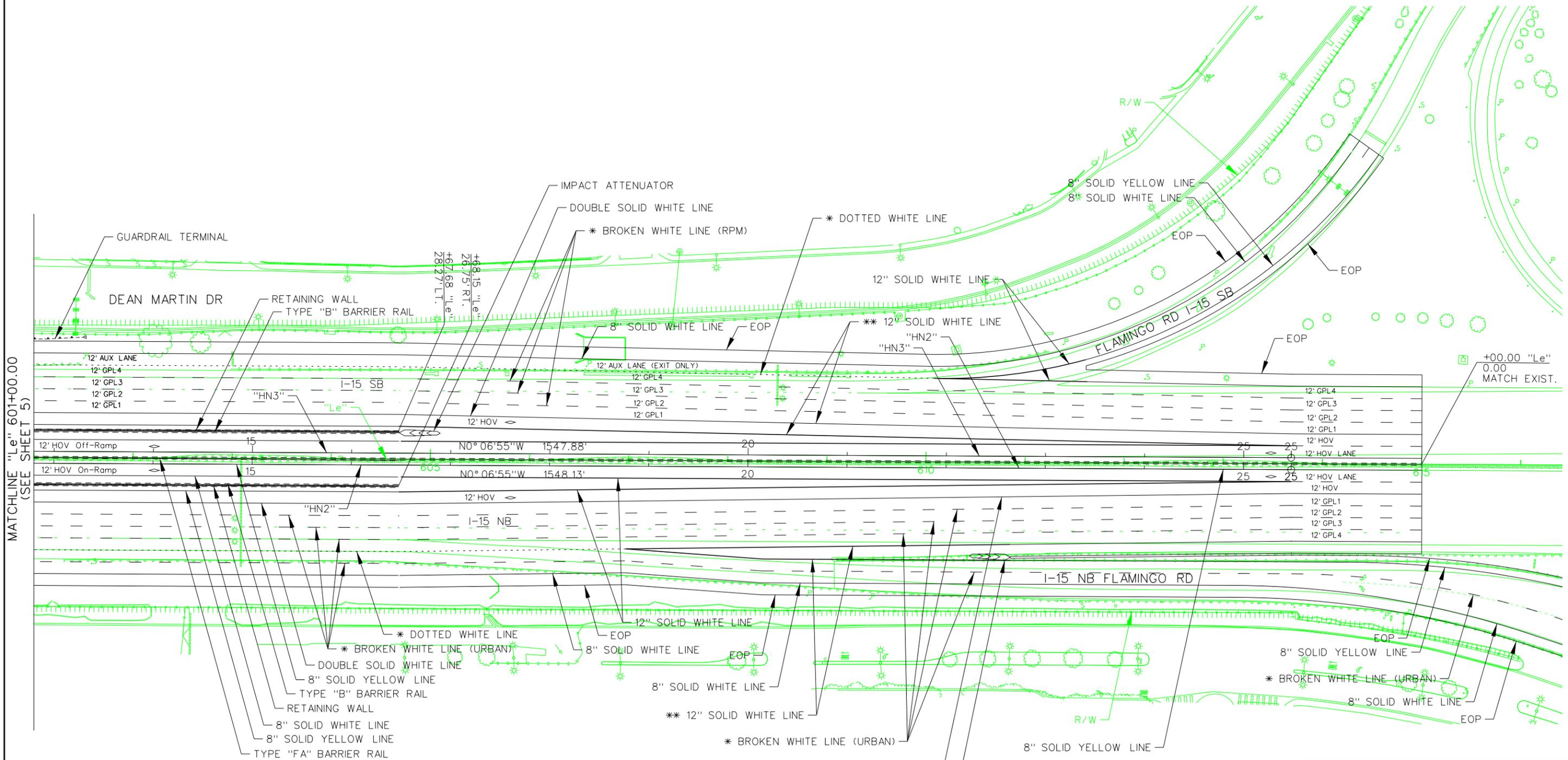
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

HACIENDA HARMON AND I-15

PRELIMINARY

SUBJECT TO REVISION
6/27/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	6



MATCHLINE "Le" 601+00.00
(SEE SHEET 5)

+00.00 "Le"
0.00
MATCH EXIST.

NOTES:

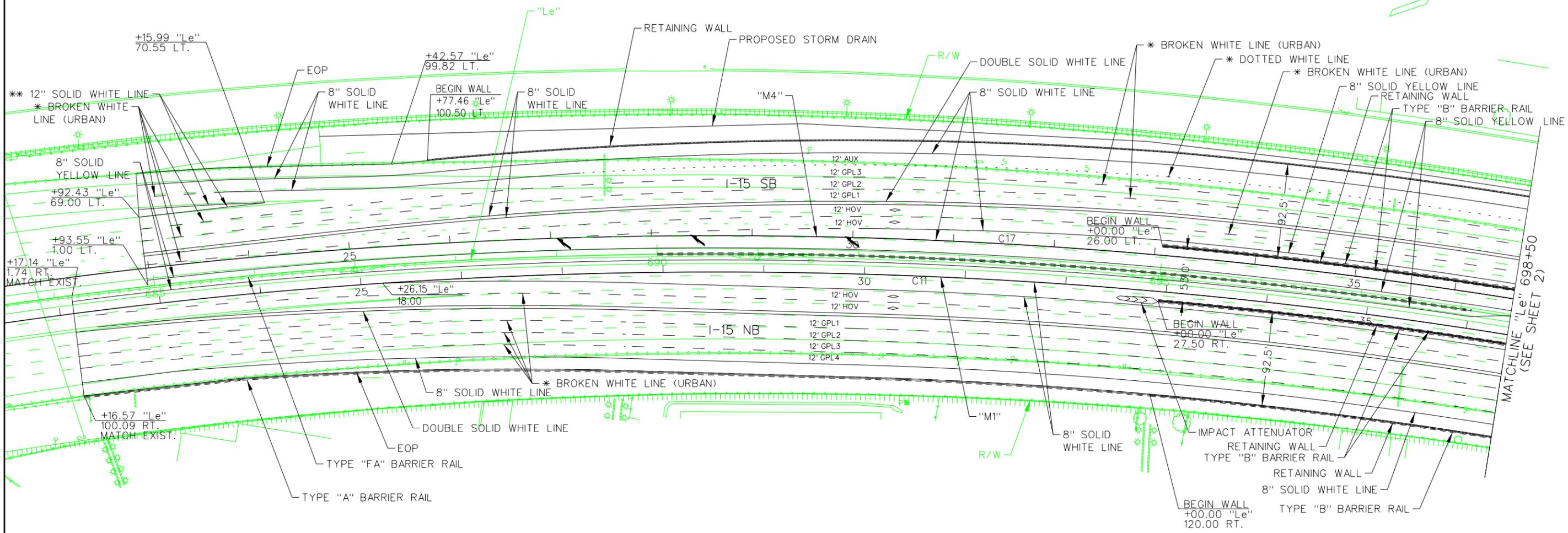
- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
- ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**HACIENDA HARMON
AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



NOTES:

- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1
- ** STRIPING INCLUDES RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

CURVE #	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C11	4982'	29° 53'10"	2598.67'	1329.62'	"M1"
C17	5018'	29° 54'01"	2618.68'	1339.89'	"M4"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**MEADE AVE
AND I-15**

PRELIMINARY

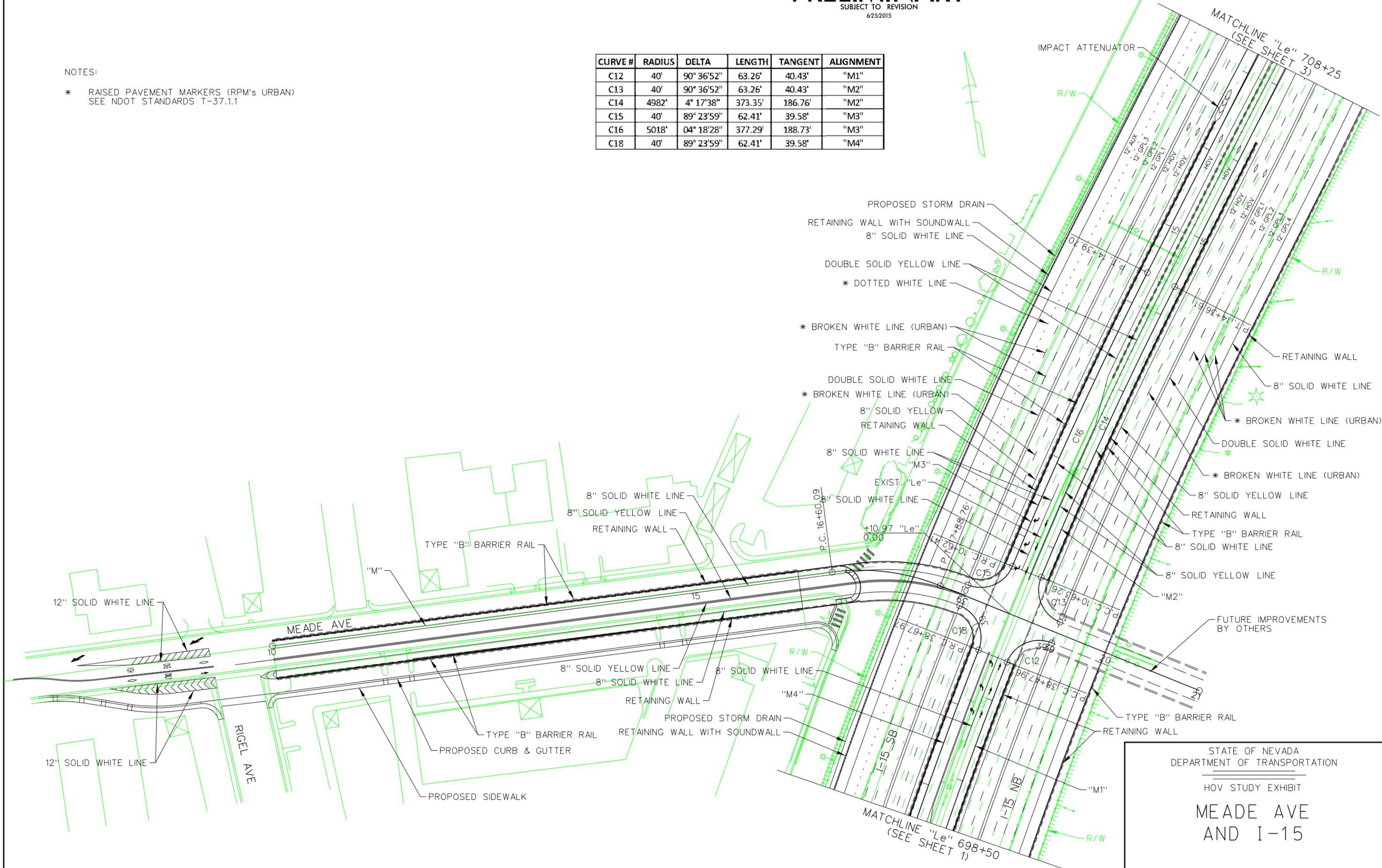
SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2

CURVE #	RADIUS	DELTA	LENGTH	TANGENT	ALIGNMENT
C12	40'	90° 36'52"	63.26'	40.43'	"M1"
C13	40'	90° 36'52"	63.26'	40.43'	"M2"
C14	4982'	4° 17'38"	373.35'	186.76'	"M2"
C15	40'	89° 23'59"	62.41'	39.58'	"M3"
C16	5018'	04° 18'28"	377.29'	188.73'	"M3"
C18	40'	89° 23'59"	62.41'	39.58'	"M4"

NOTES:

* RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

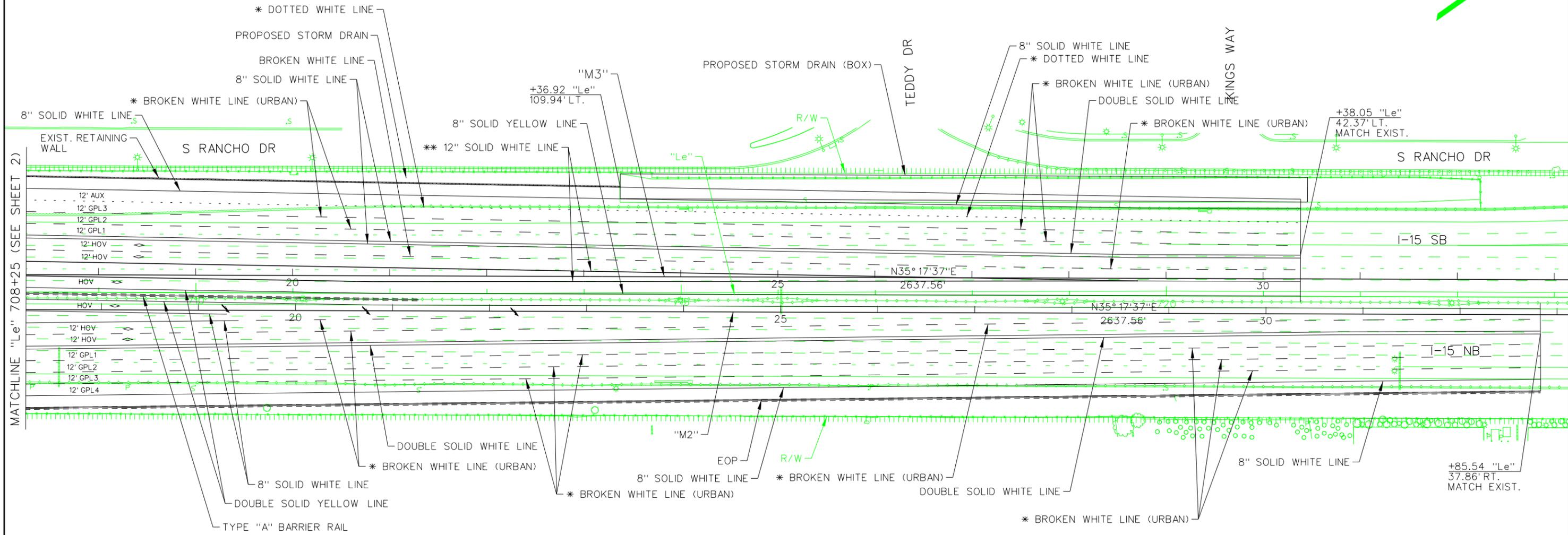
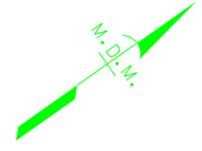


STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**MEADE AVE
AND I-15**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3



MATCHLINE "Le" 708+25 (SEE SHEET 2)

NOTES:

- * RAISED PAVEMENT MARKERS (RPM's URBAN)
SEE NDOT STANDARDS T-37.1.1

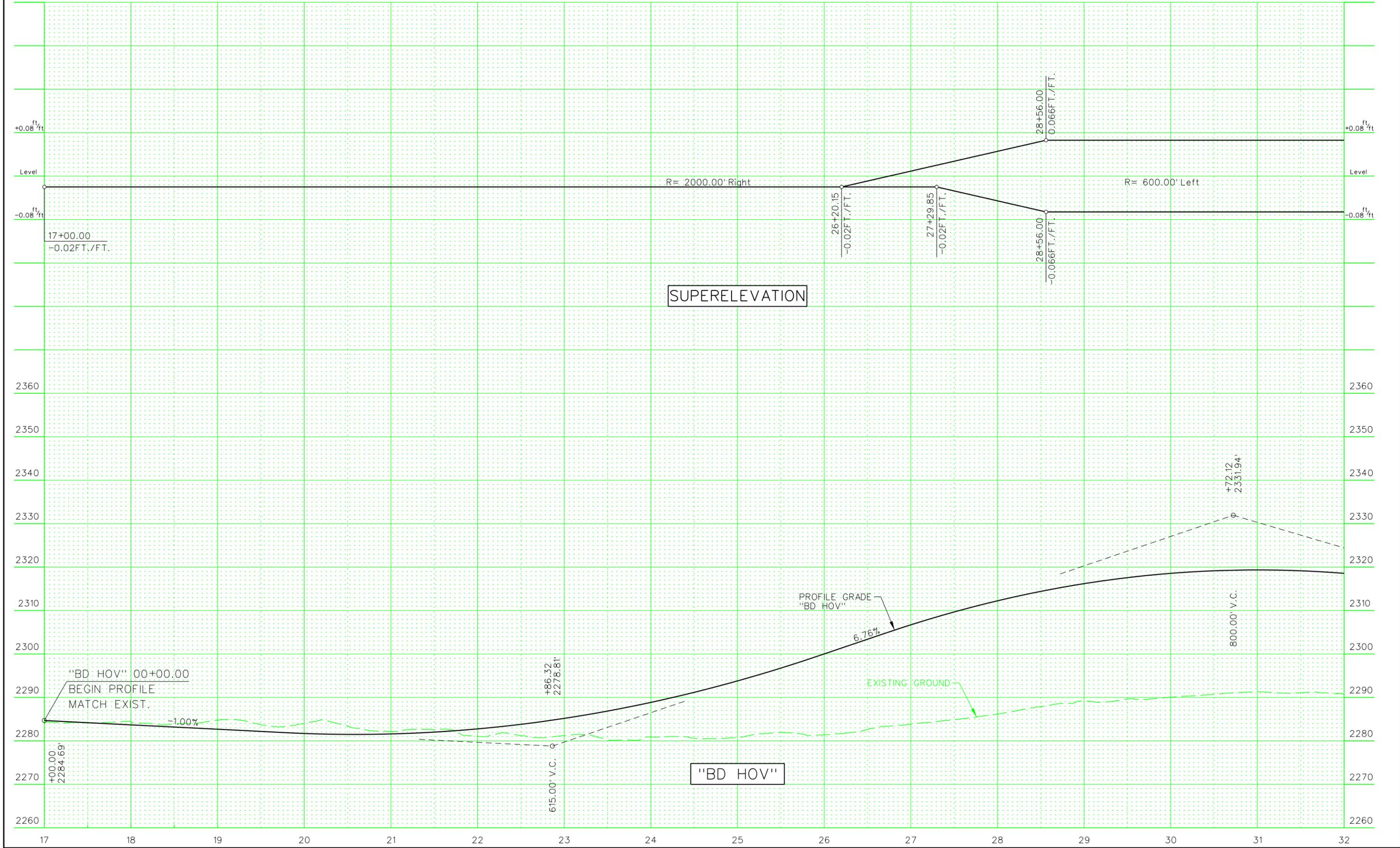
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

MEADE AVE
AND I-15

PRELIMINARY

SUBJECT TO REVISION
6/26/2015

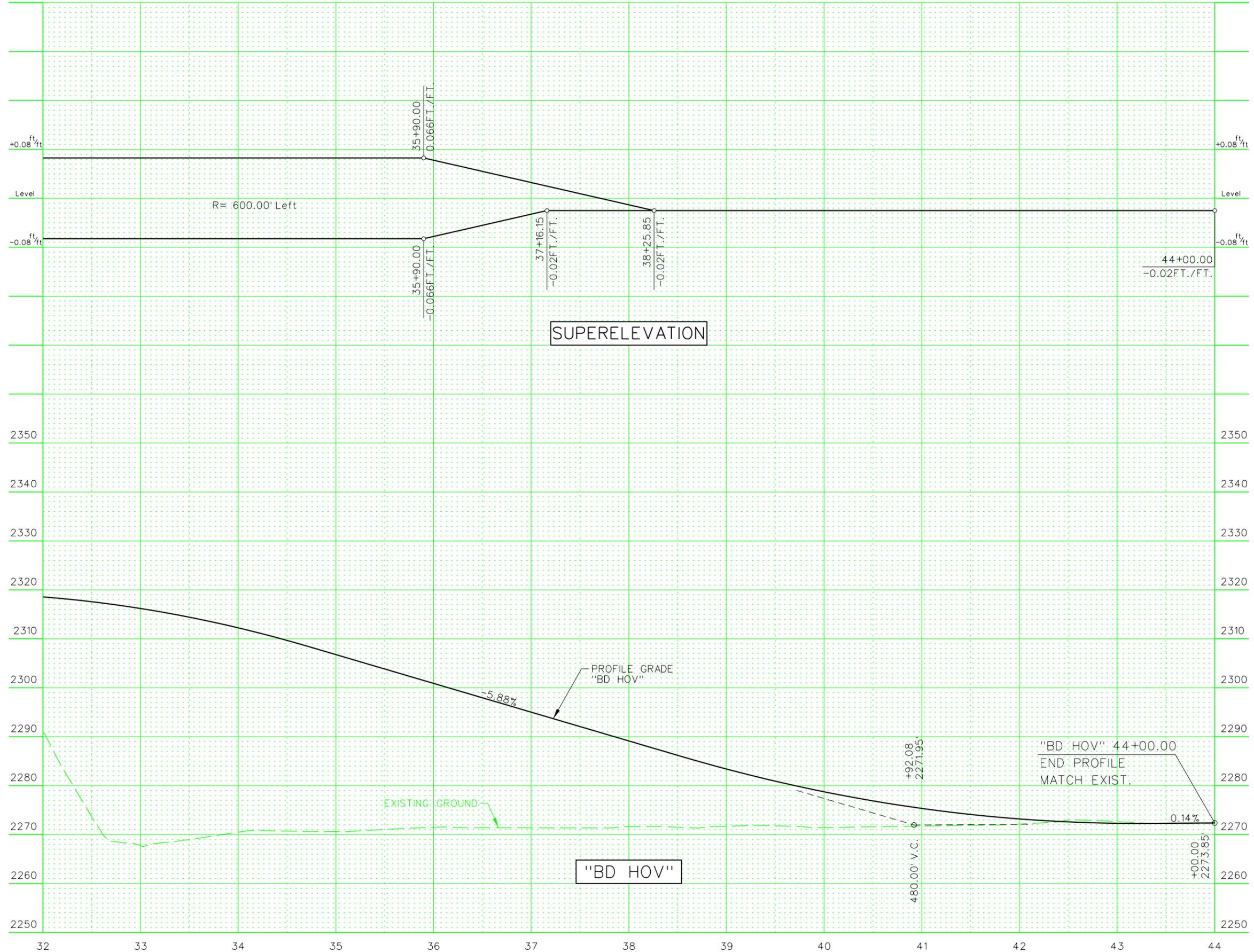
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

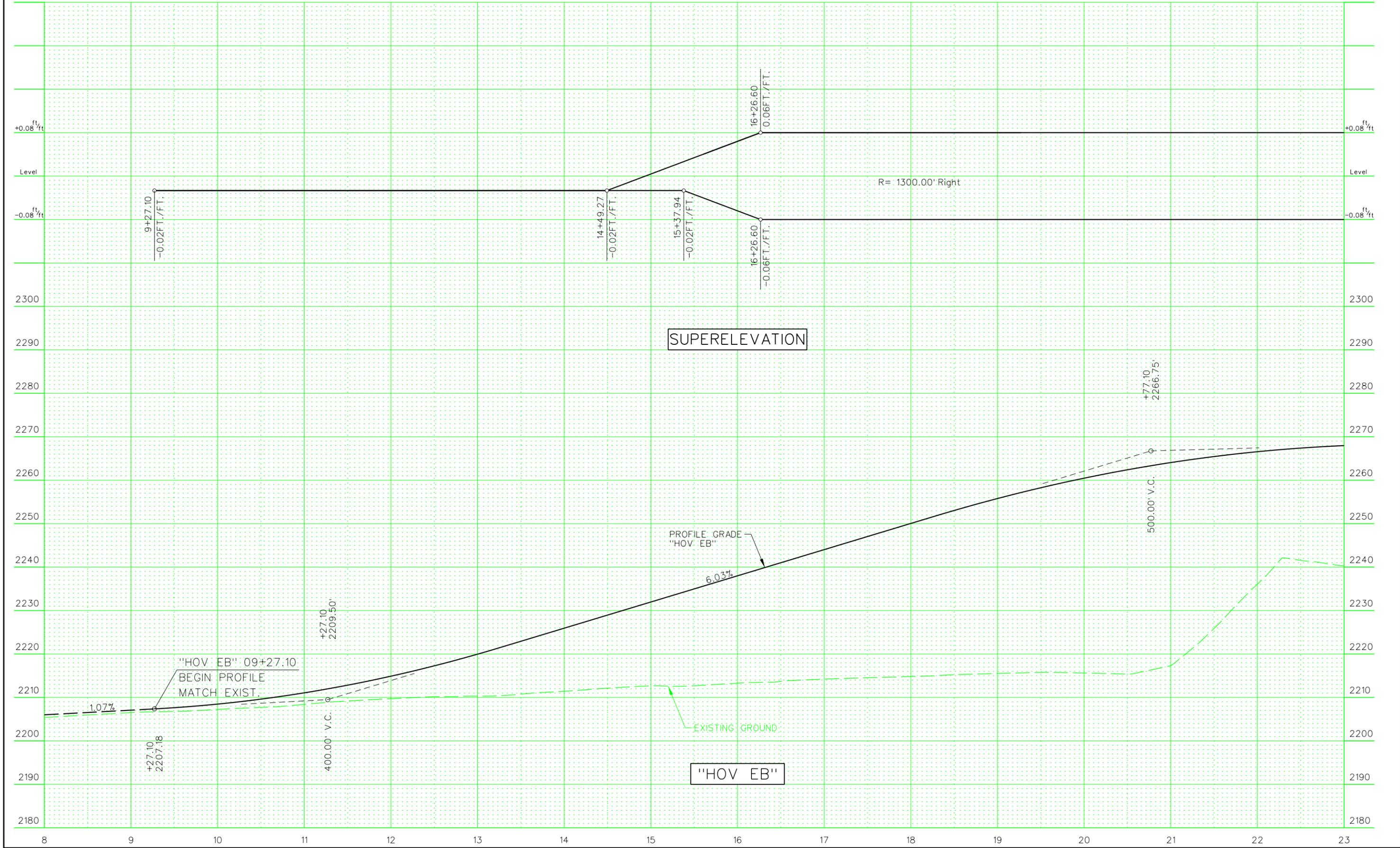
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	XX



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

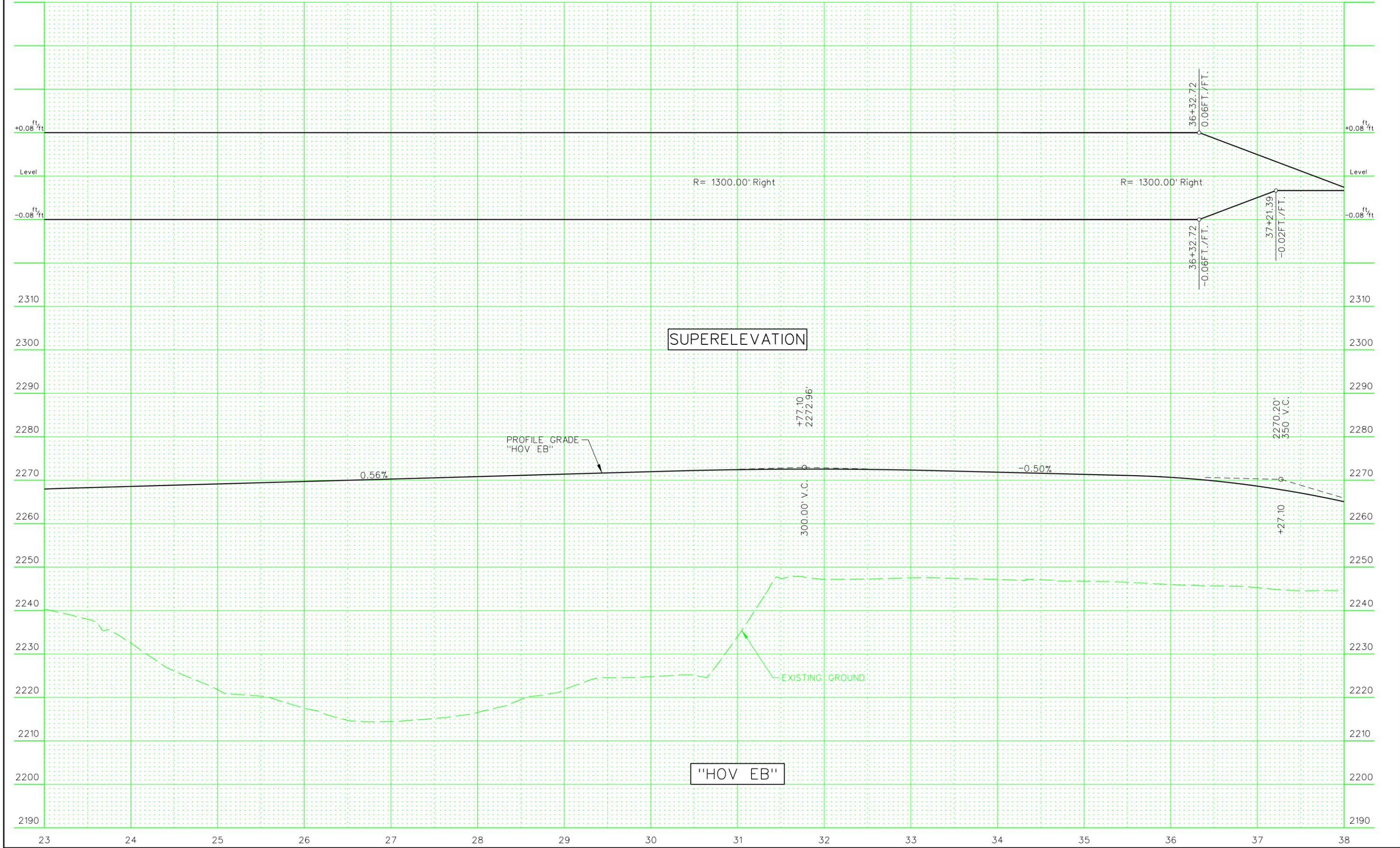
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	7



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

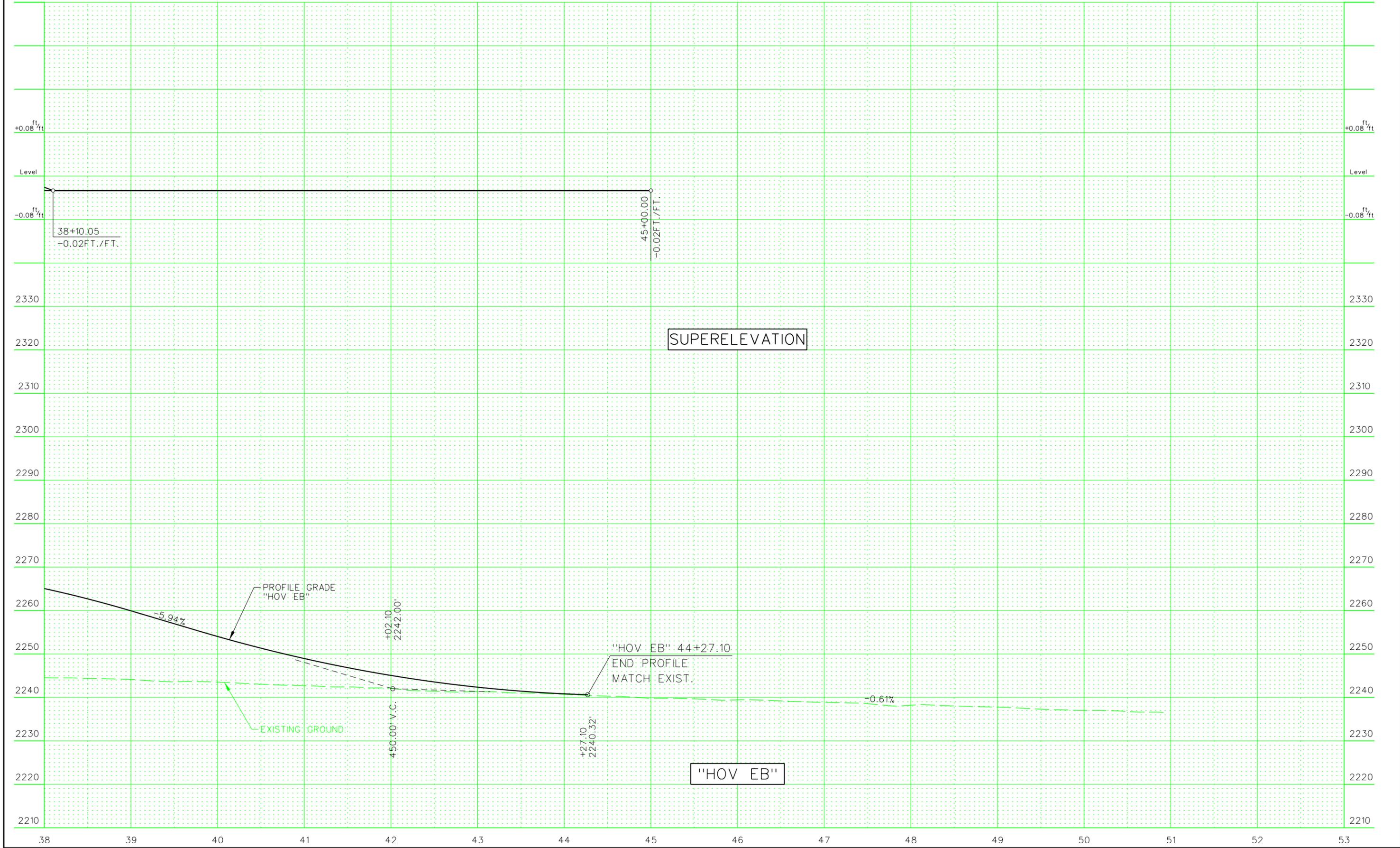
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	8



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

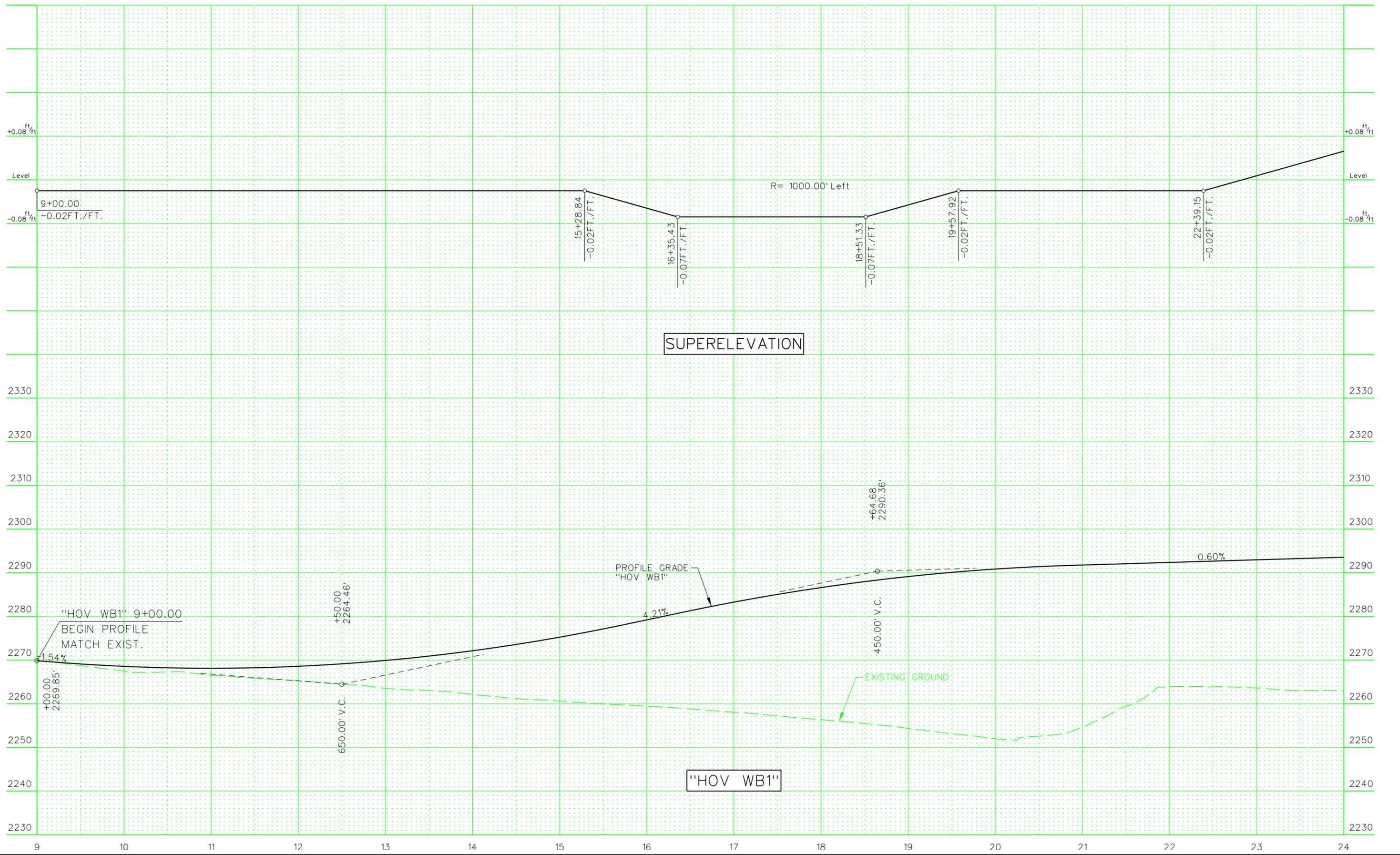
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	9



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

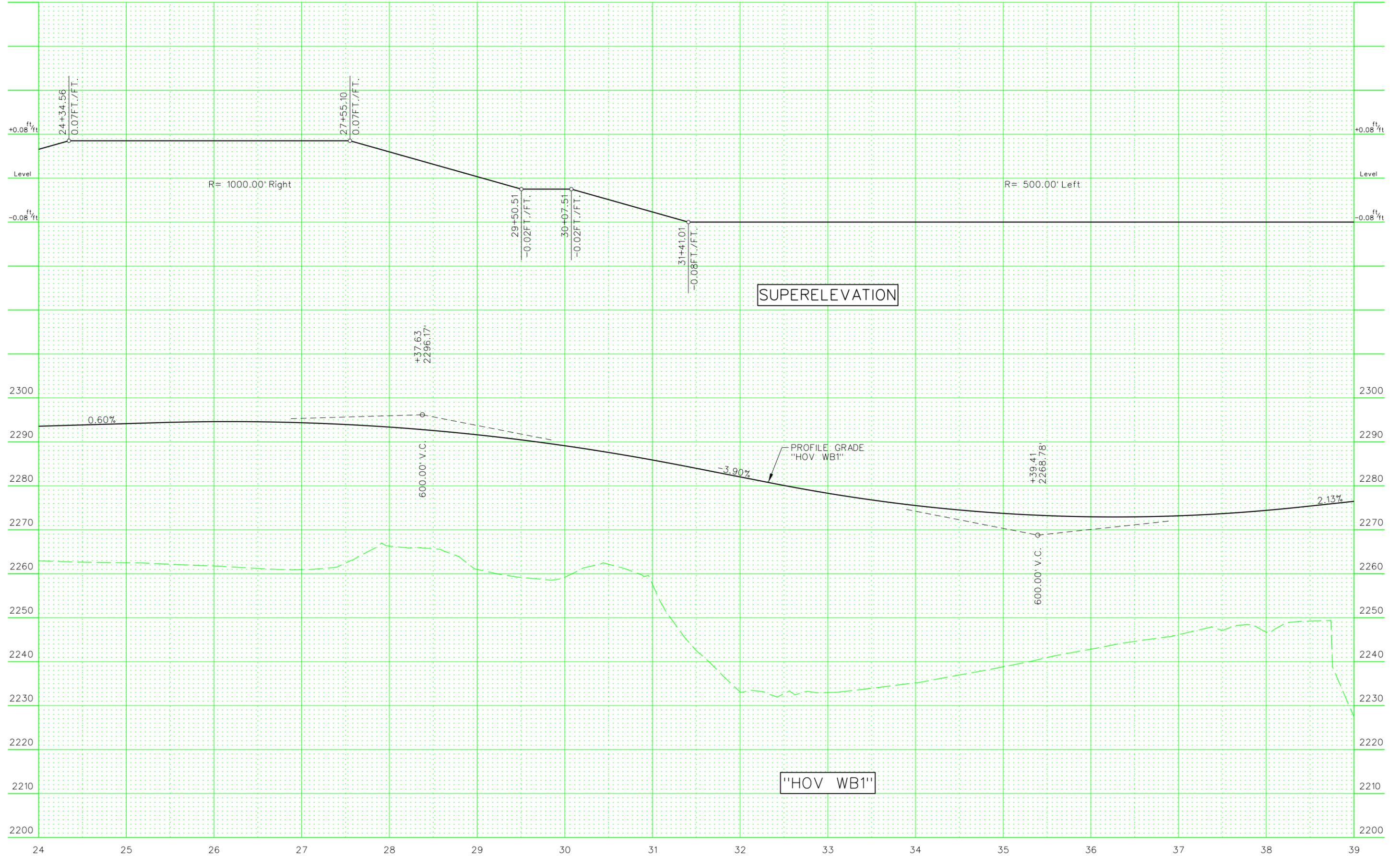
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	10



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

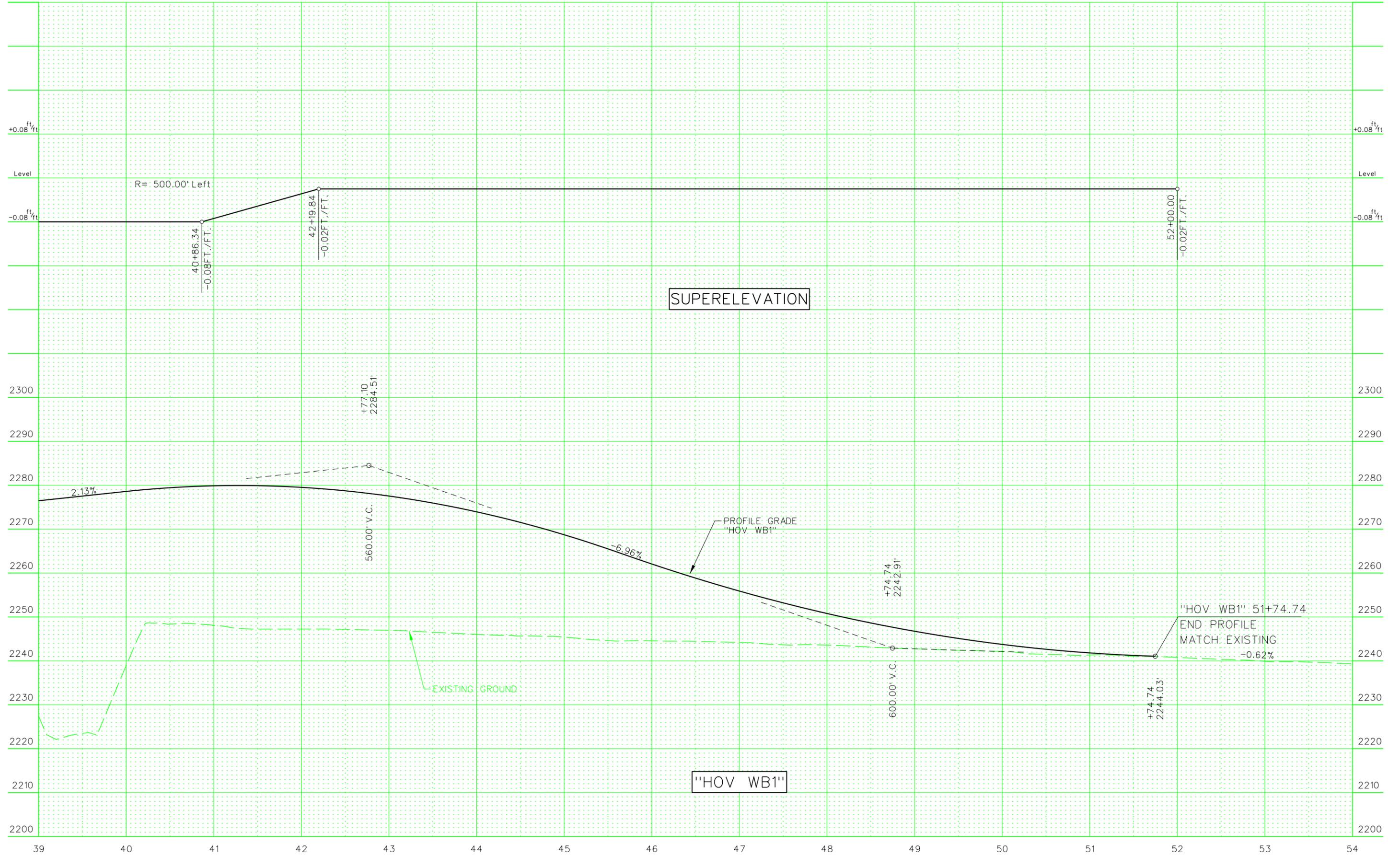
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	11



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

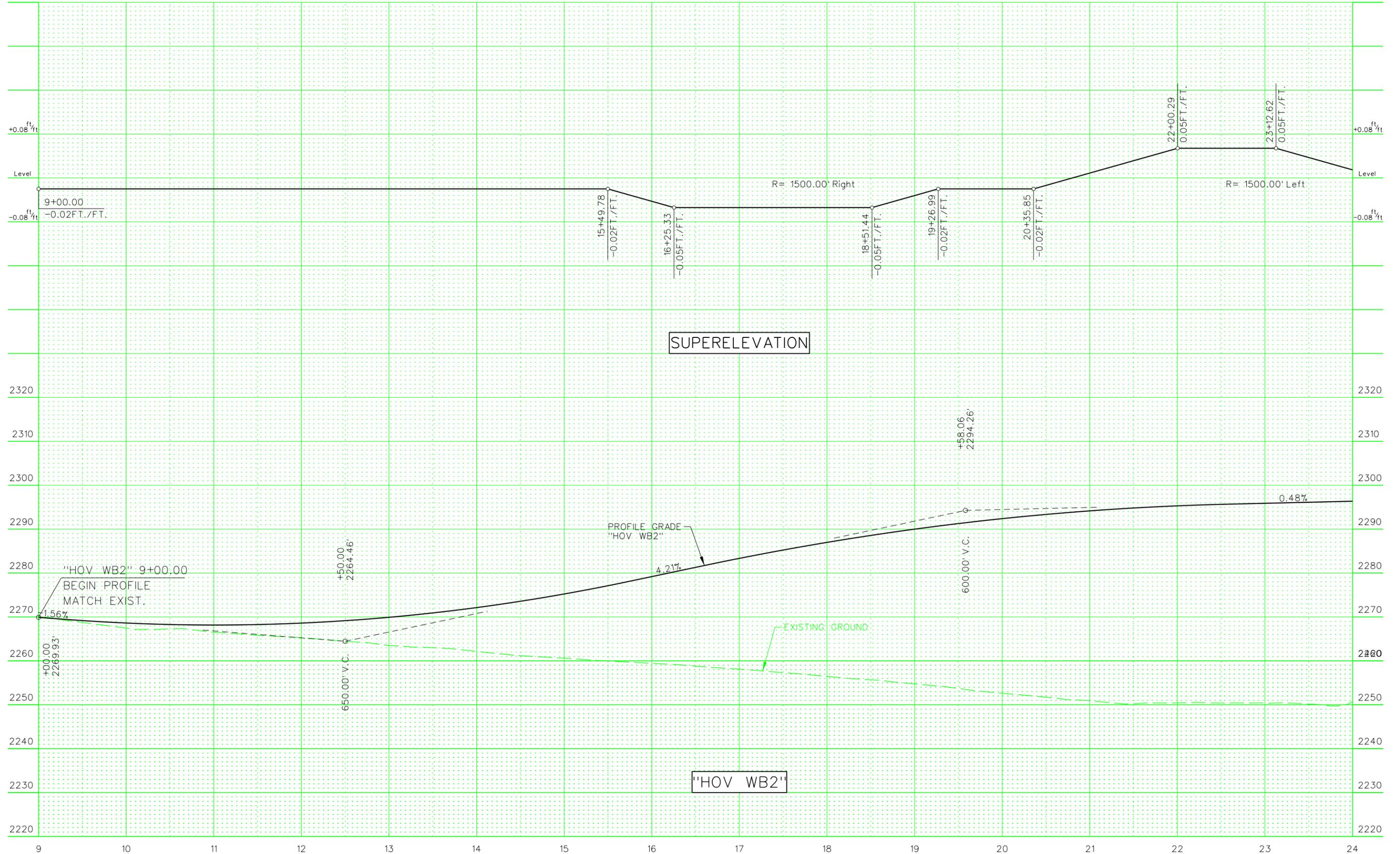
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	12



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

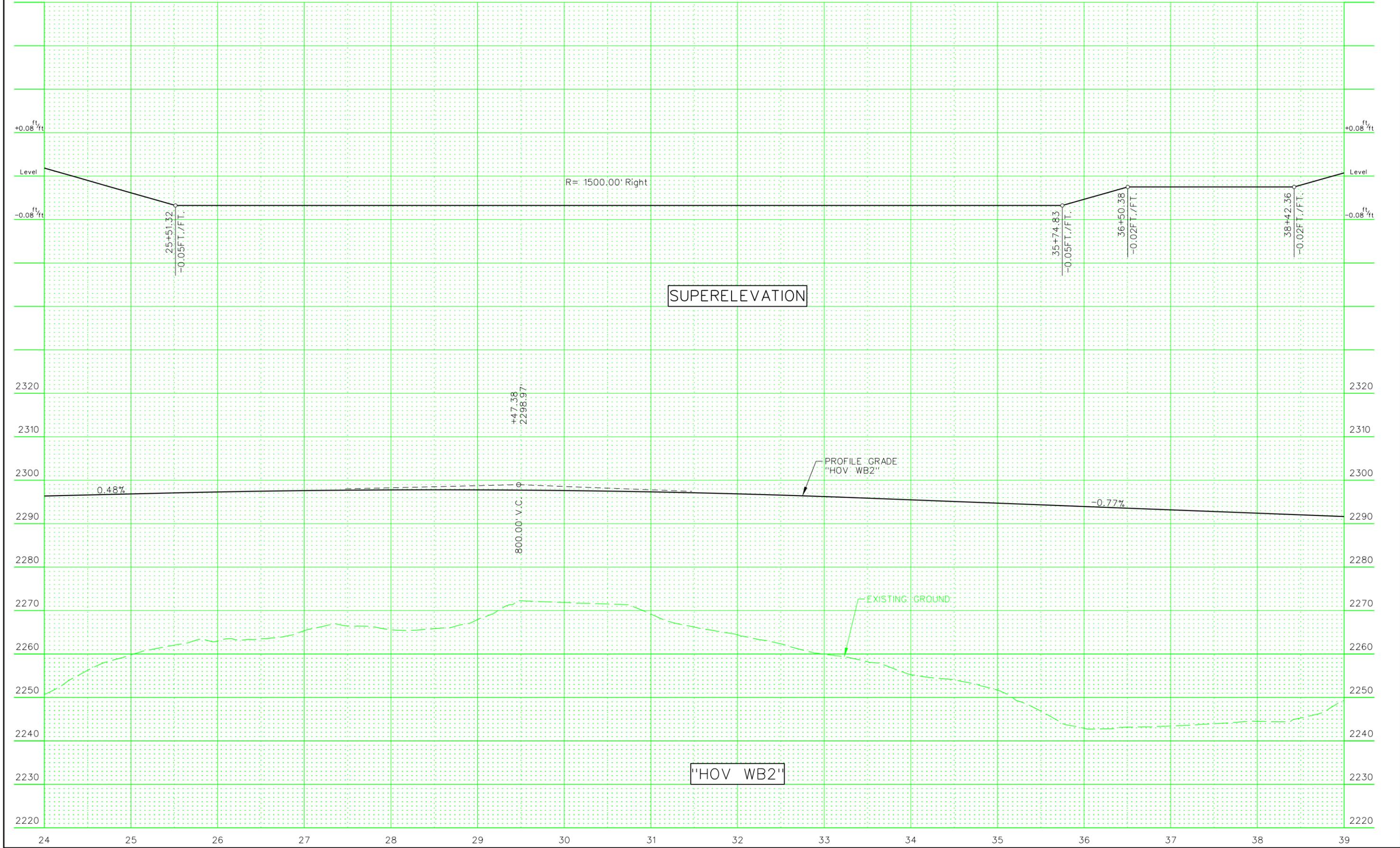
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	13



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	14



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

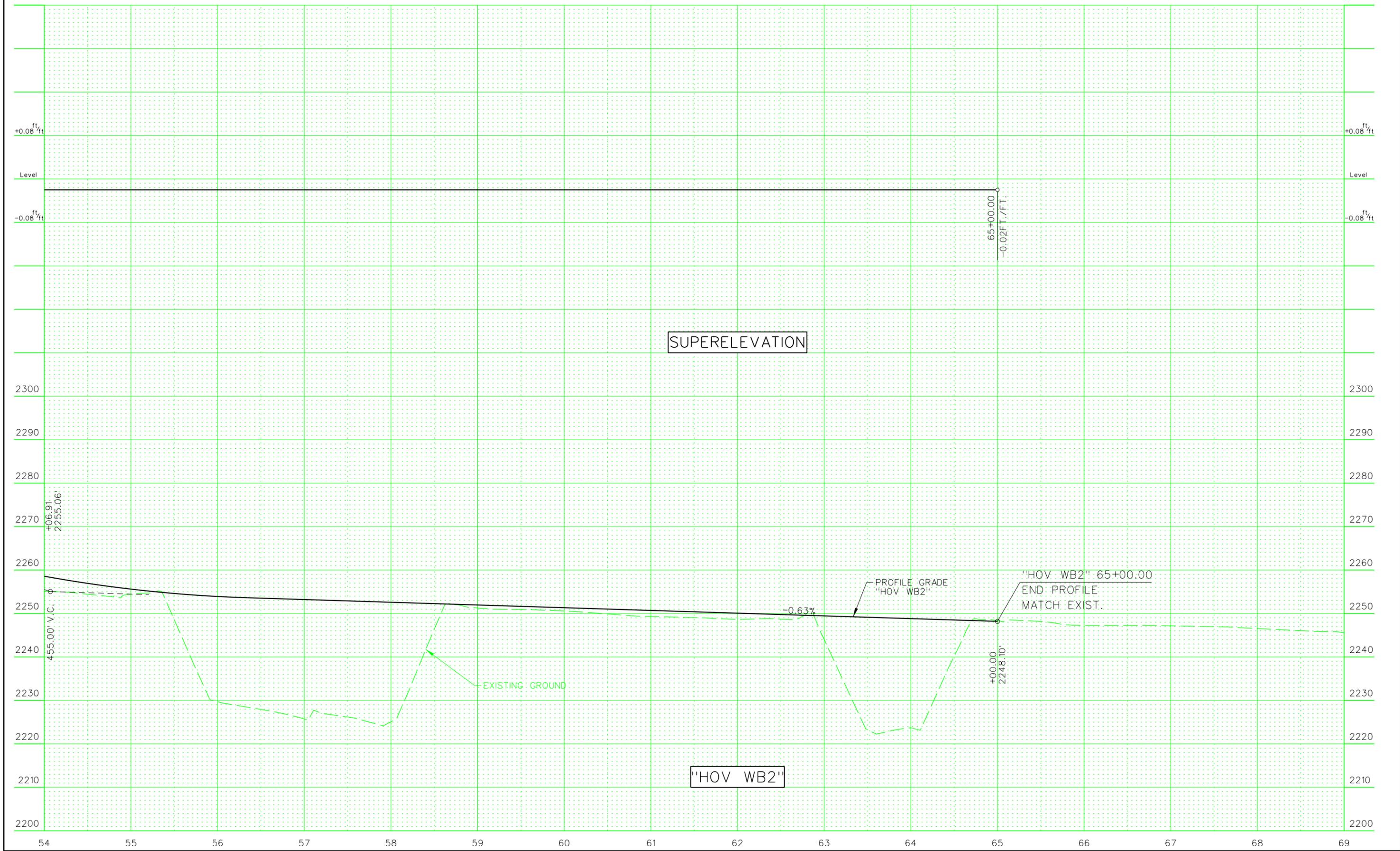
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	15



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	16

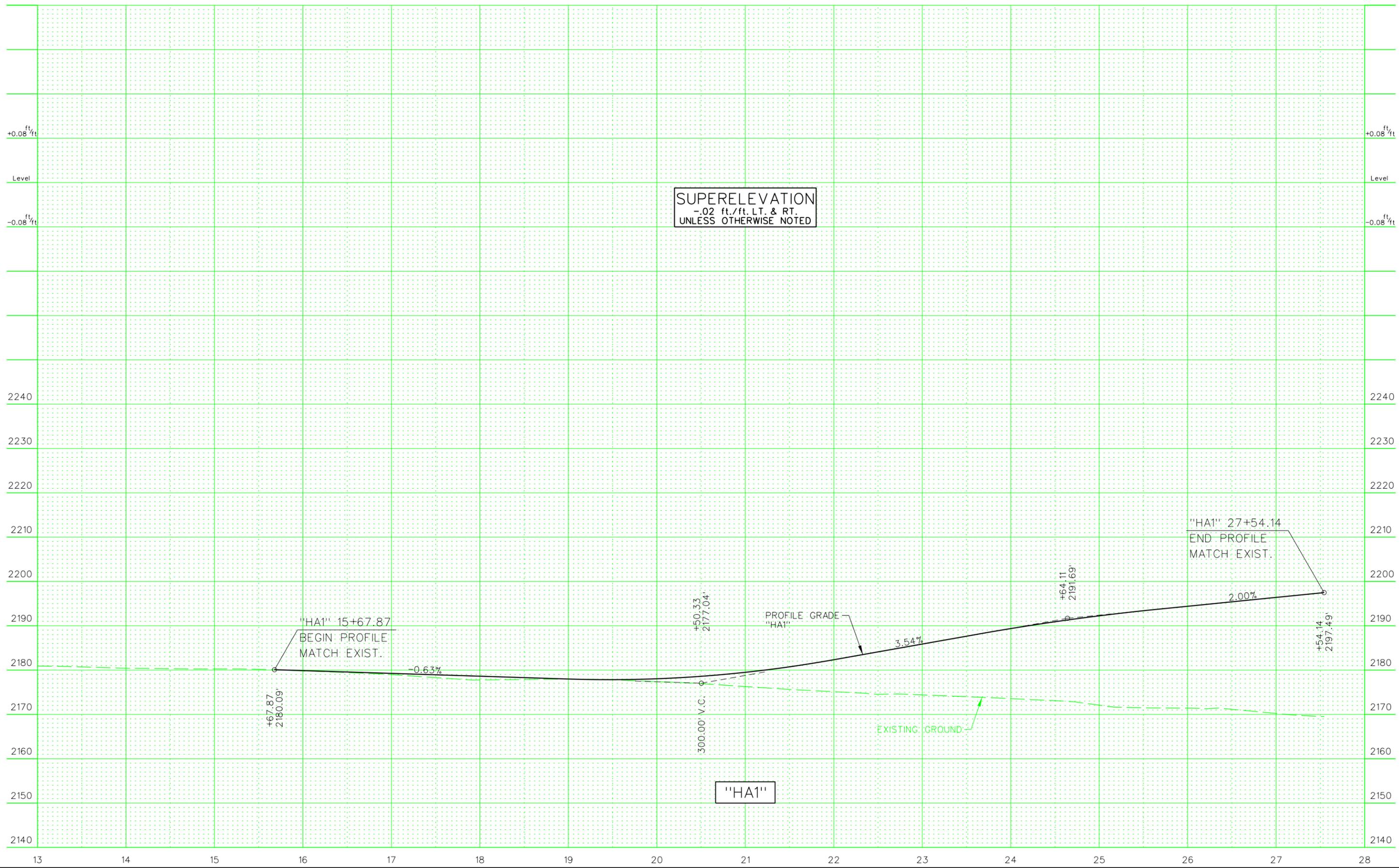


PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3

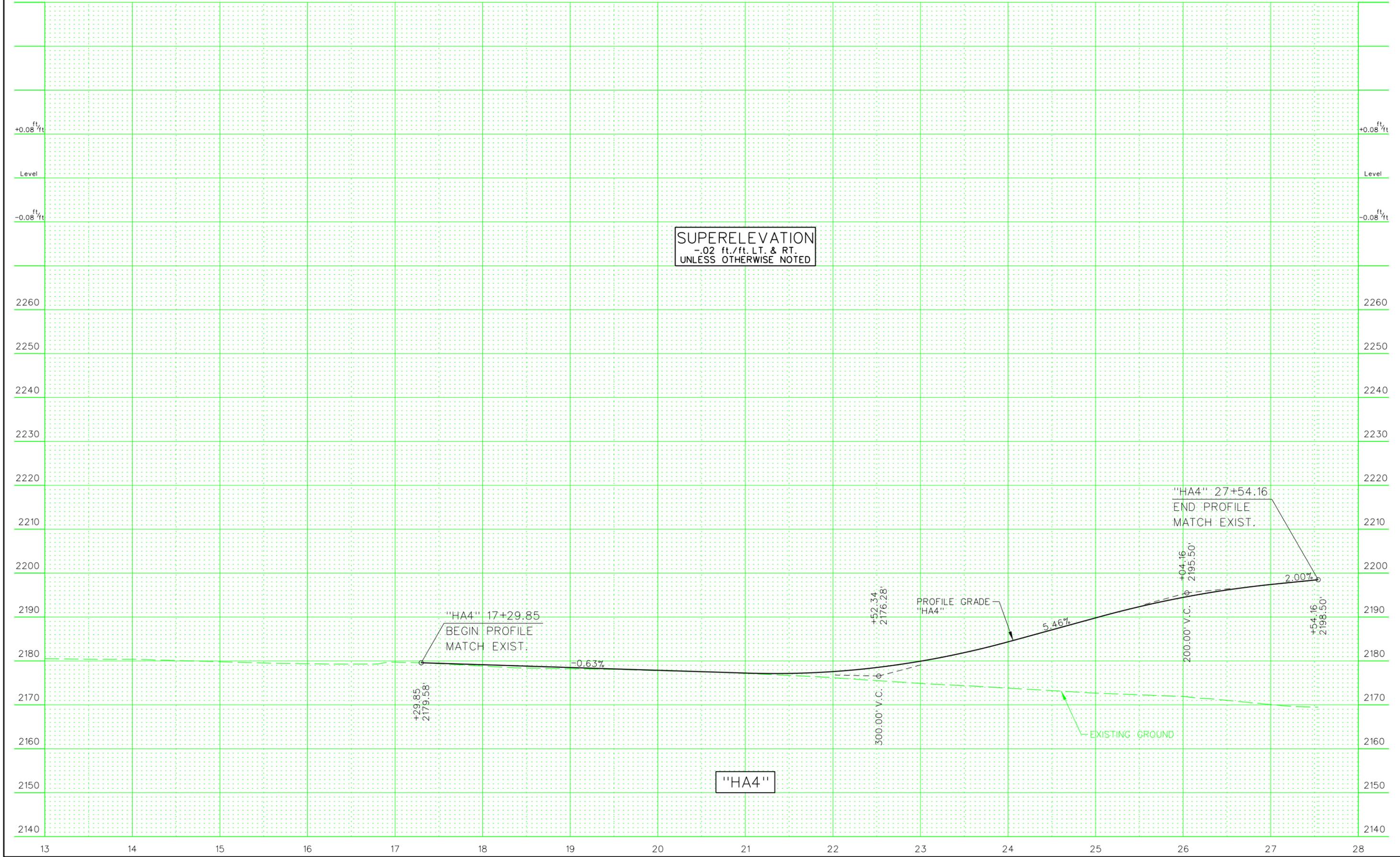
SUPERELEVATION
 -.02 ft./ft. LT. & RT.
 UNLESS OTHERWISE NOTED



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	4



SUPERELEVATION
 -02 ft./ft. LT. & RT.
 UNLESS OTHERWISE NOTED

"HA4" 17+29.85
 BEGIN PROFILE
 MATCH EXIST.

PROFILE GRADE
 "HA4"

"HA4" 27+54.16
 END PROFILE
 MATCH EXIST.

"HA4"

EXISTING GROUND

PRELIMINARY

SUBJECT TO REVISION
6/26/2015

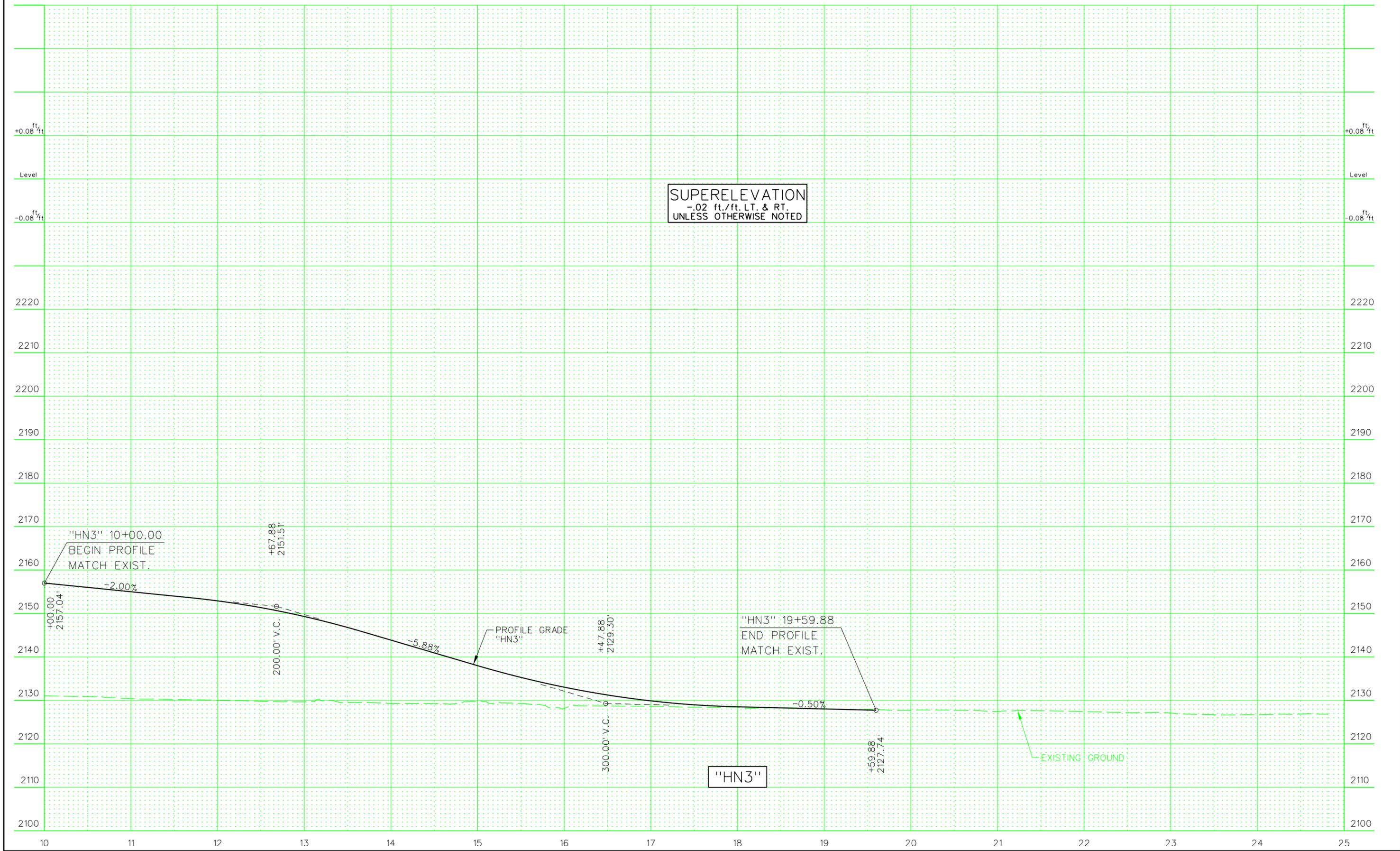
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	5



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

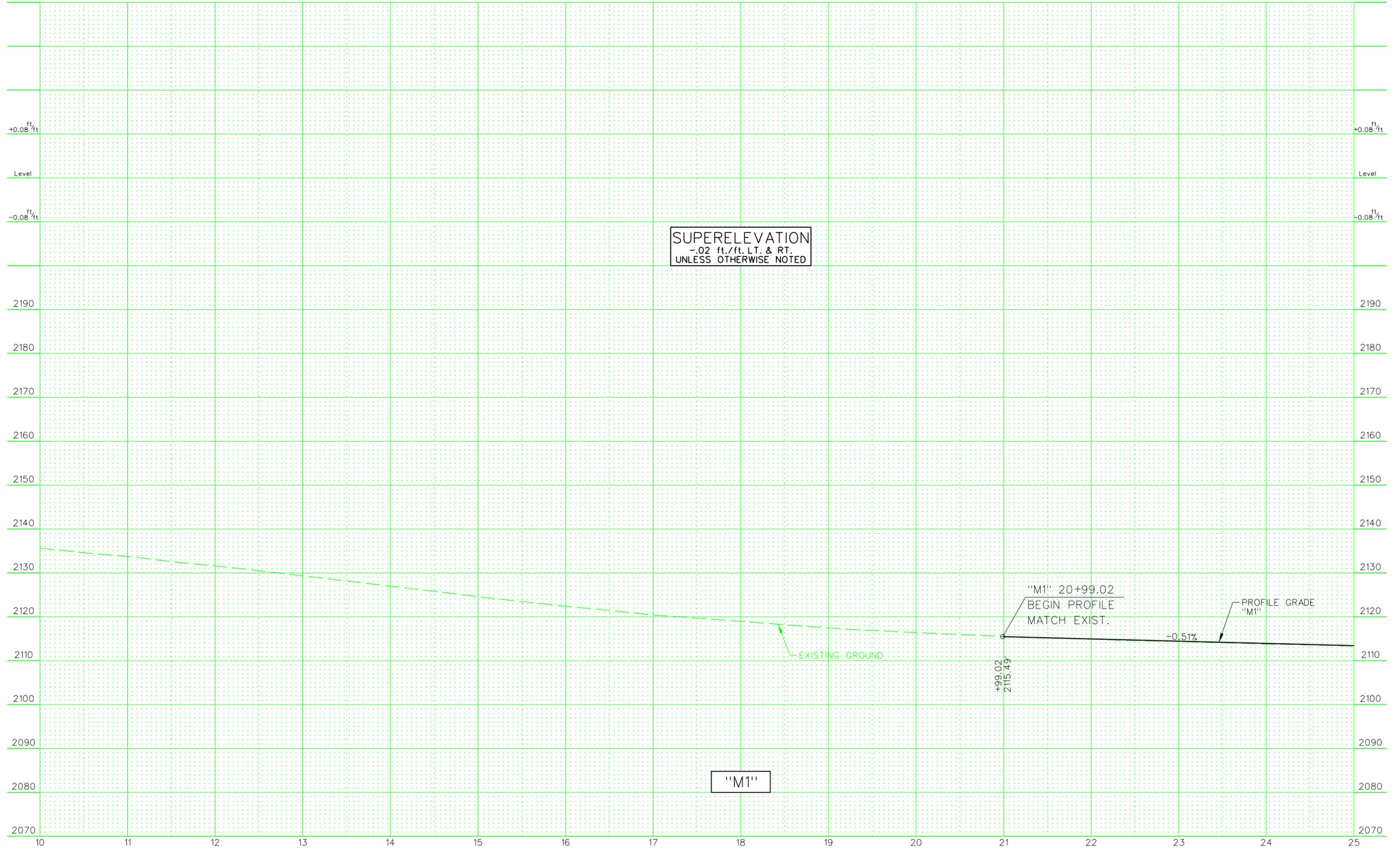
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	6



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

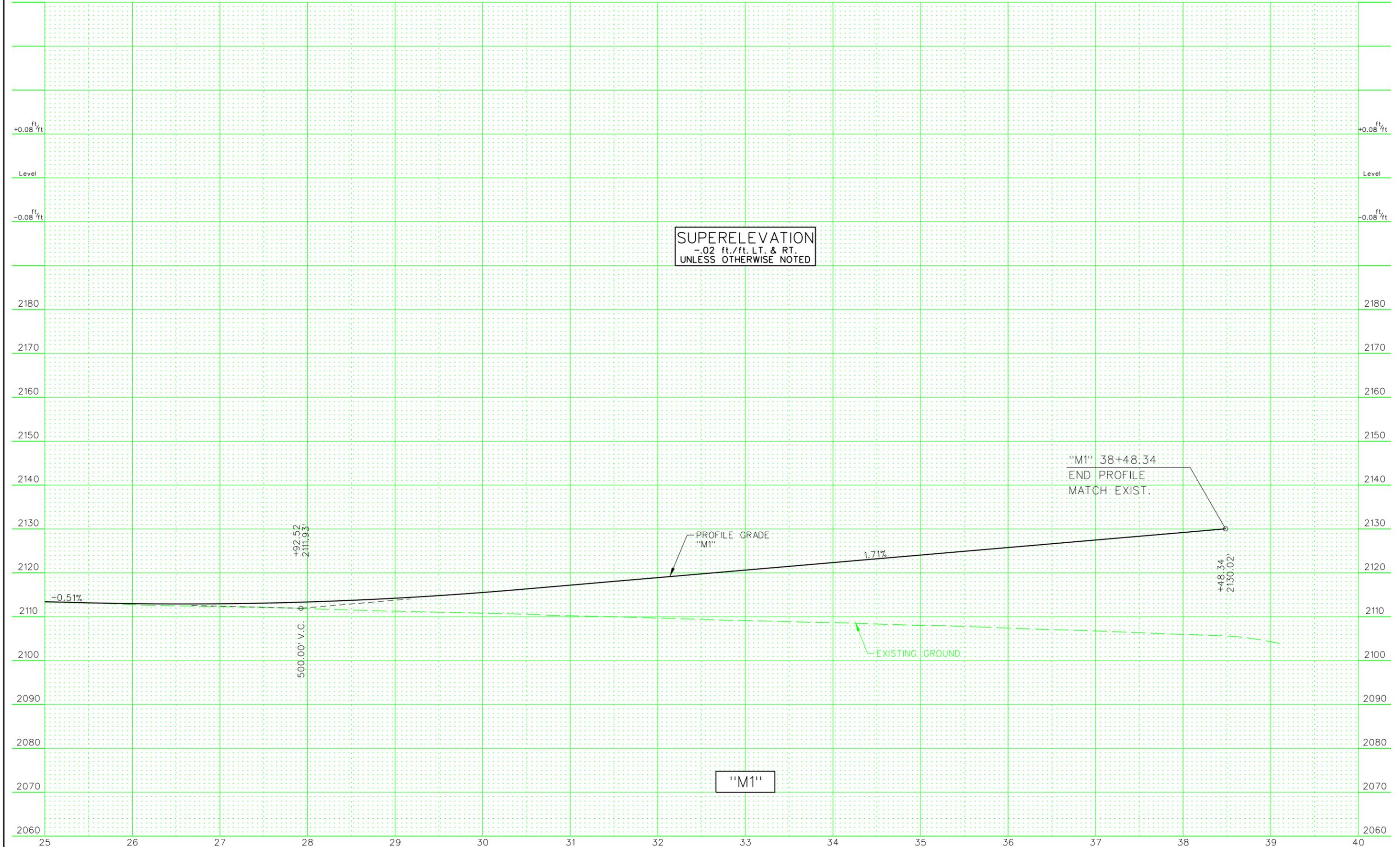
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	17



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

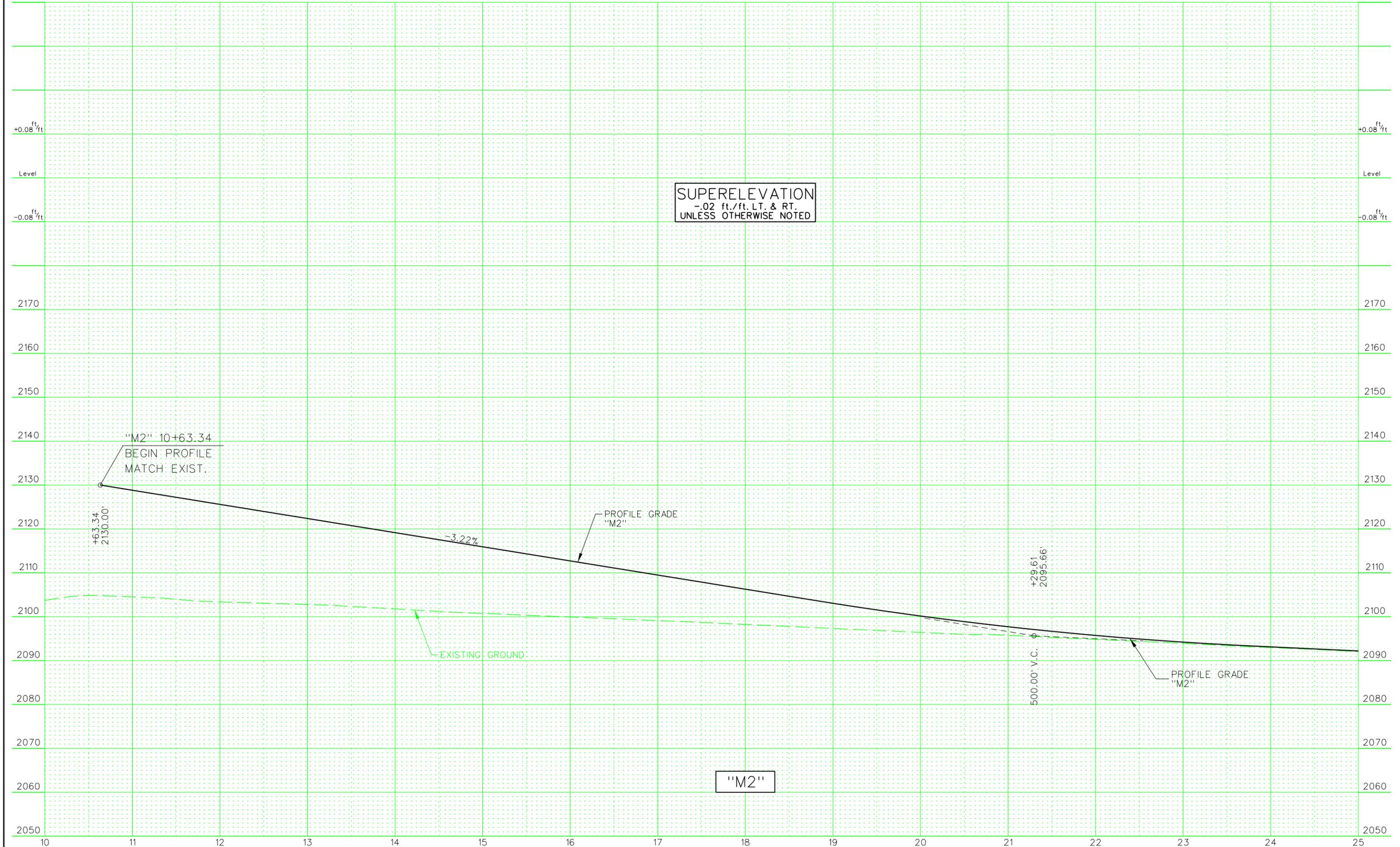
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	18



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	19



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	20



SUPERELEVATION
 -.02 ft./ft. LT. & RT.
 UNLESS OTHERWISE NOTED

PROFILE GRADE
 "M2"

"M2" 35+00.00
 END PROFILE
 MATCH EXIST.

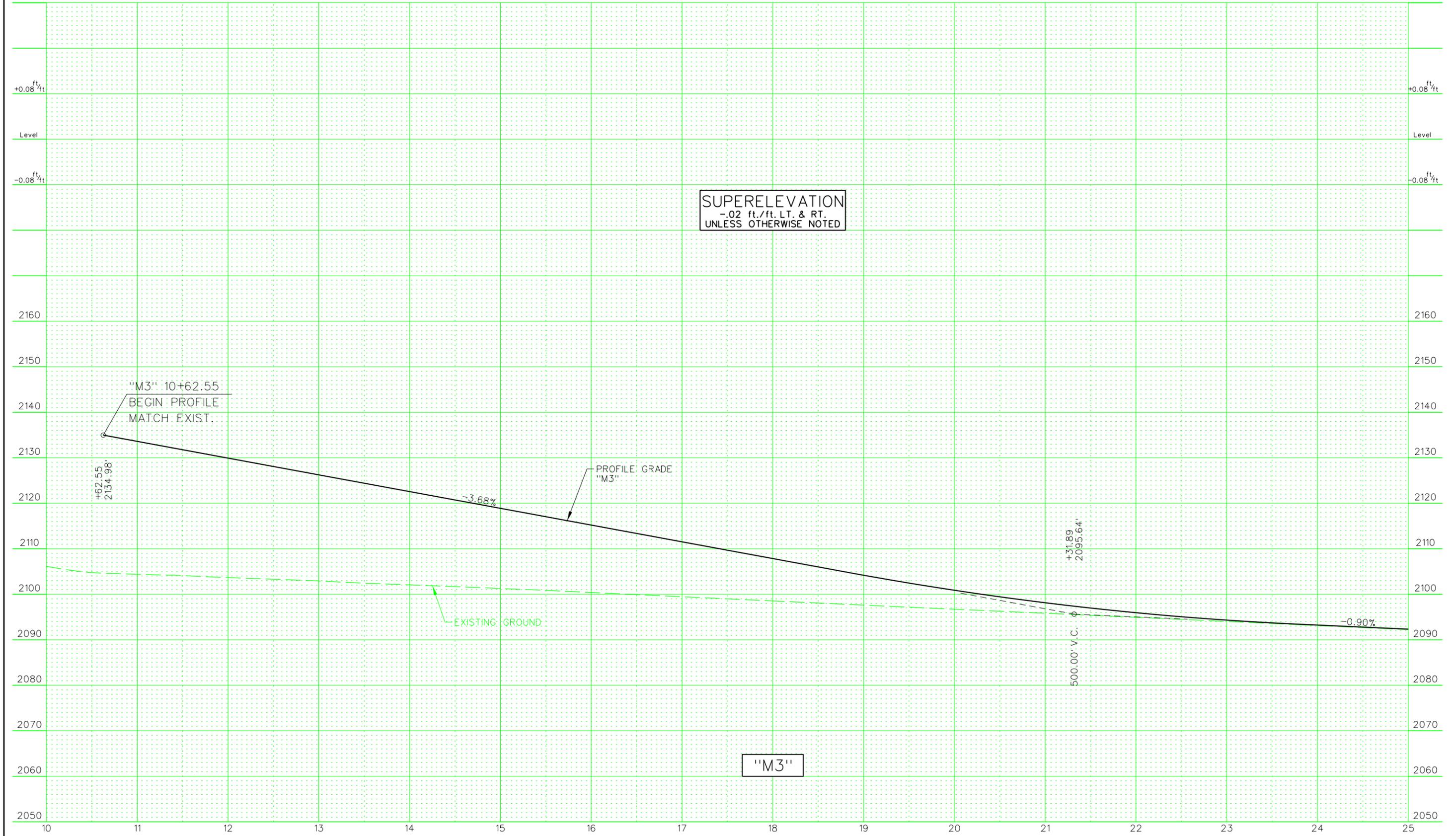
EXISTING GROUND

"M2"

PRELIMINARY

SUBJECT TO REVISION
6/26/2015

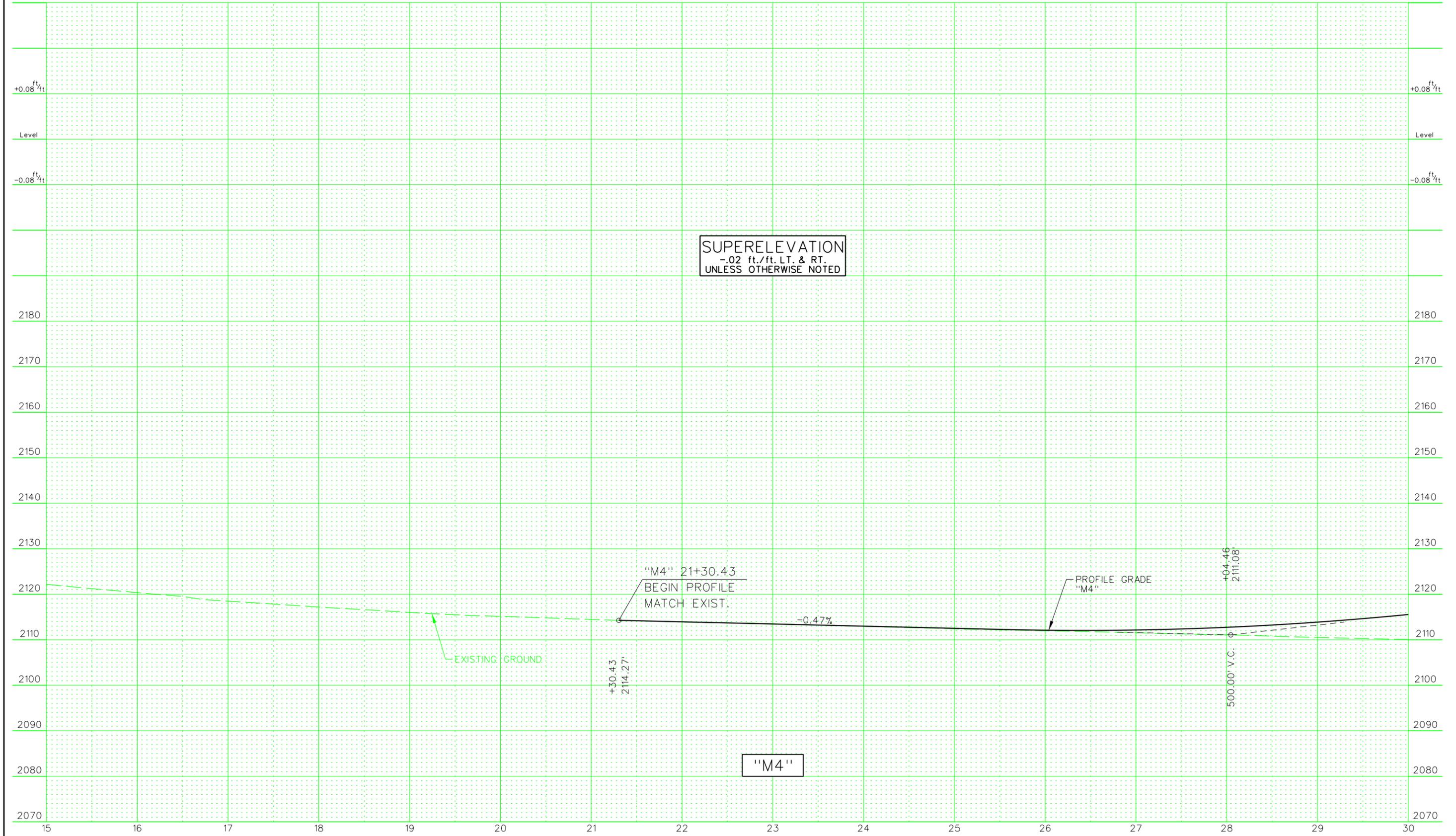
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	21



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

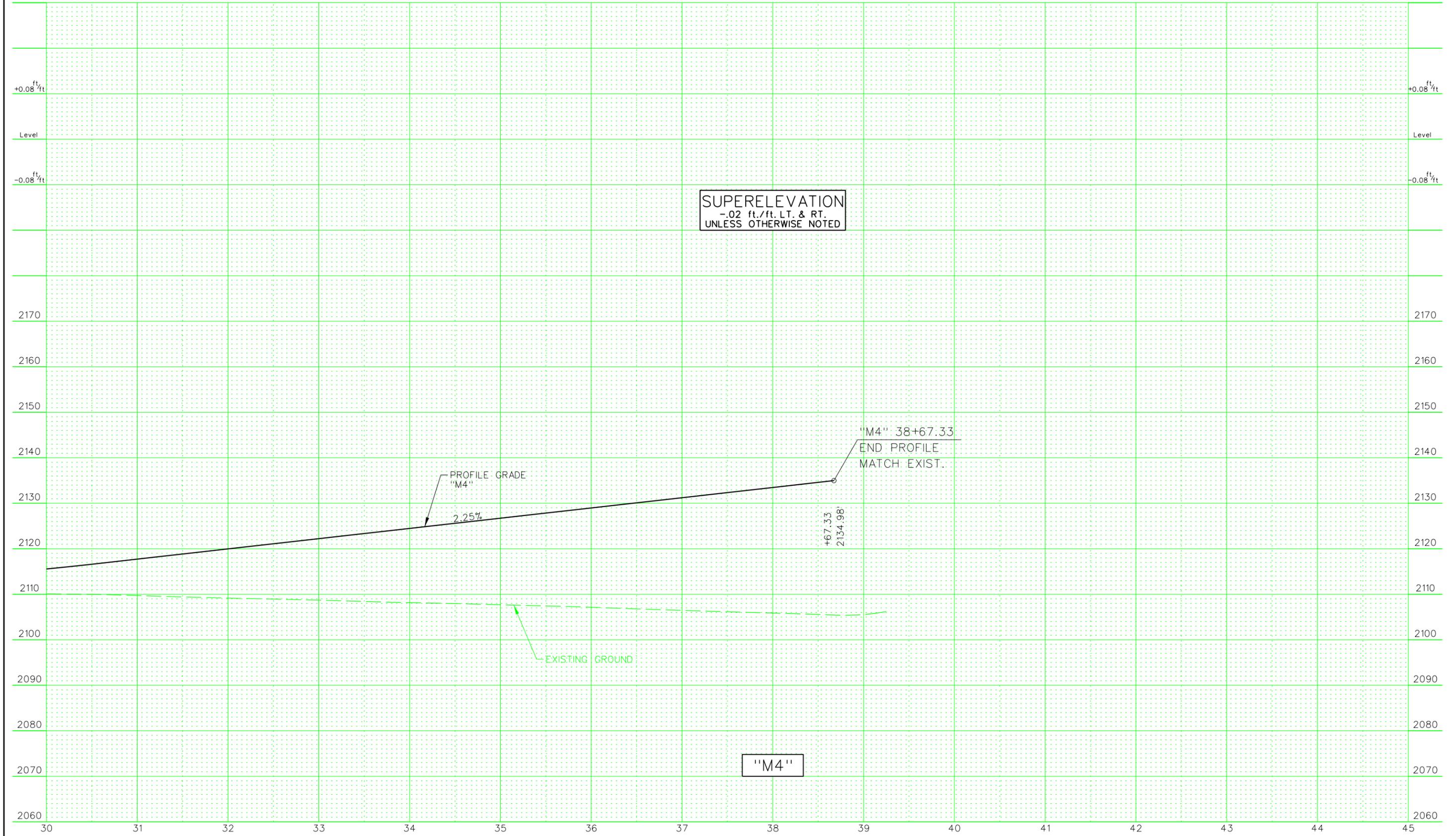
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	23



PRELIMINARY

SUBJECT TO REVISION
6/26/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	24



SUPERELEVATION
 -0.02 ft./ft. LT. & RT.
 UNLESS OTHERWISE NOTED

"M4" 38+67.33
 END PROFILE
 MATCH: EXIST..

PROFILE GRADE
 "M4"

2.25%

+67.33
 2134.98

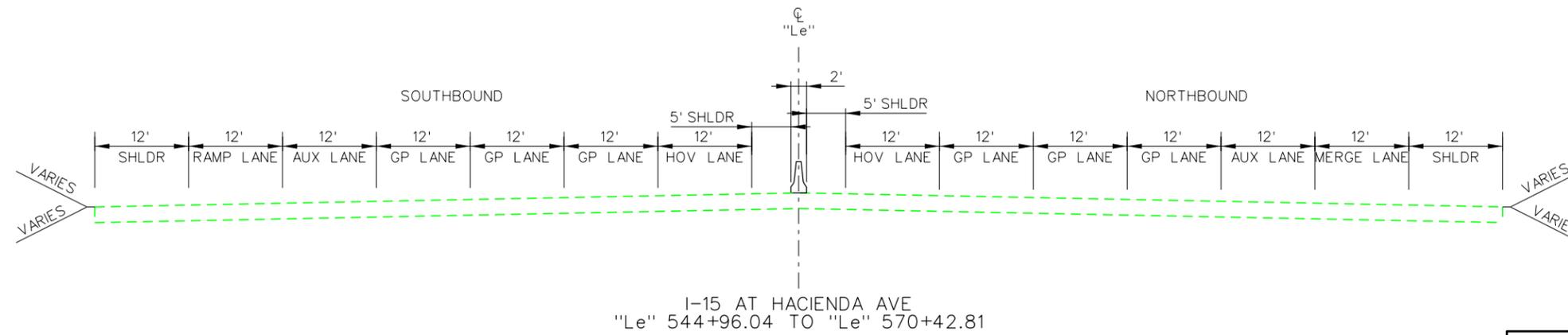
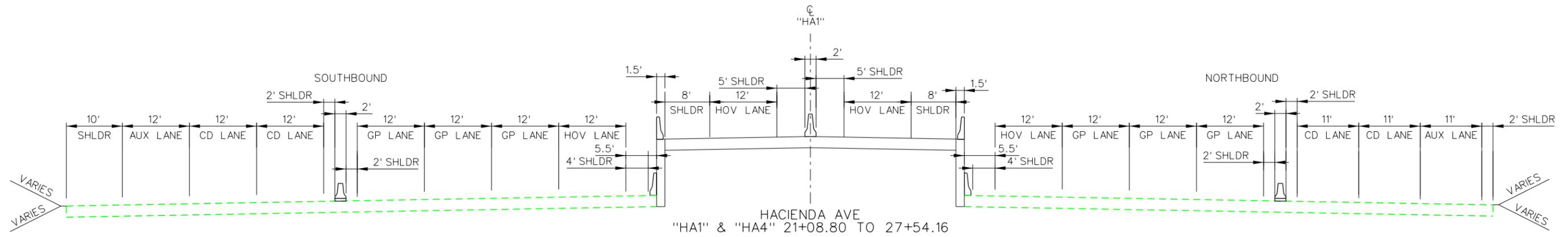
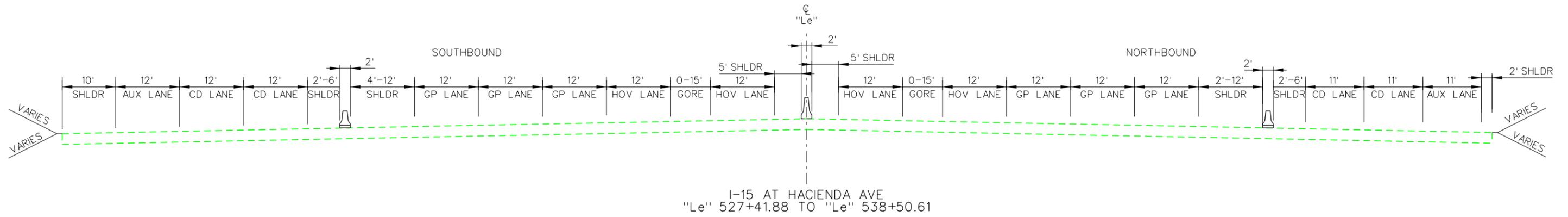
EXISTING GROUND

"M4"

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



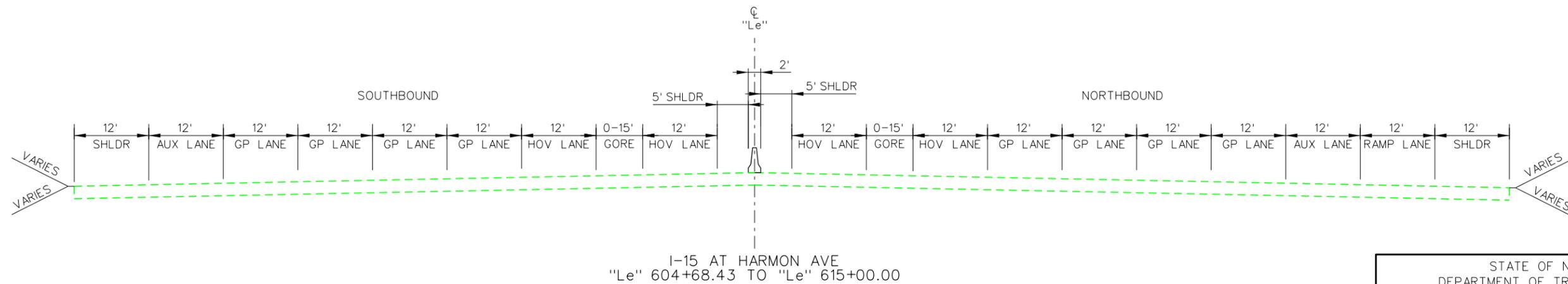
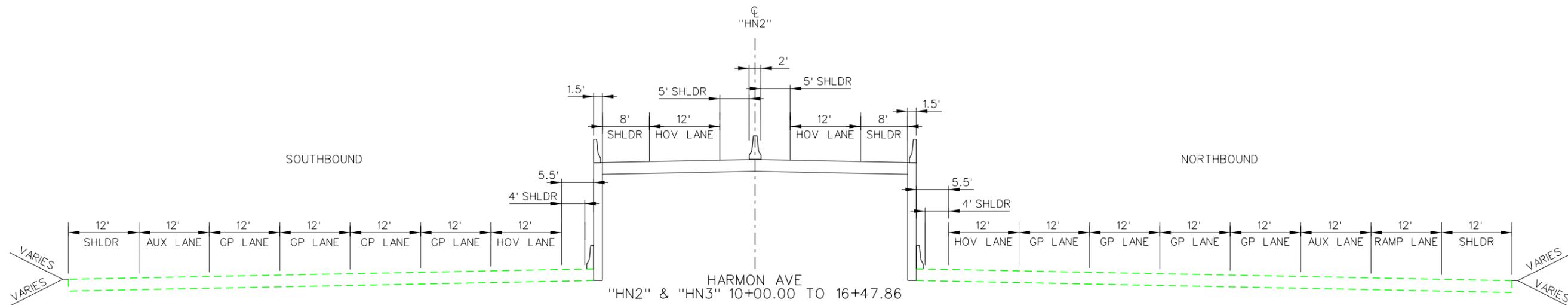
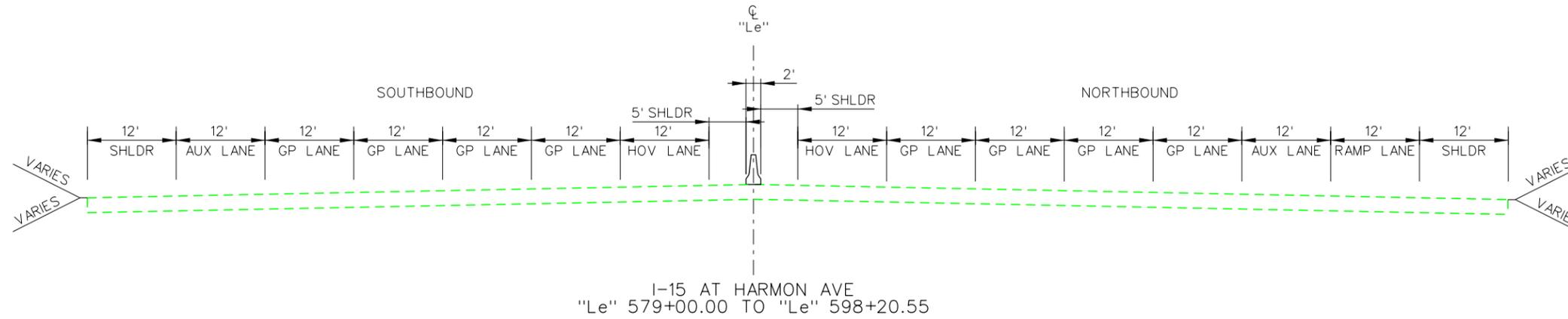
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

TYPICAL SECTIONS HACIENDA AVENUE

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2

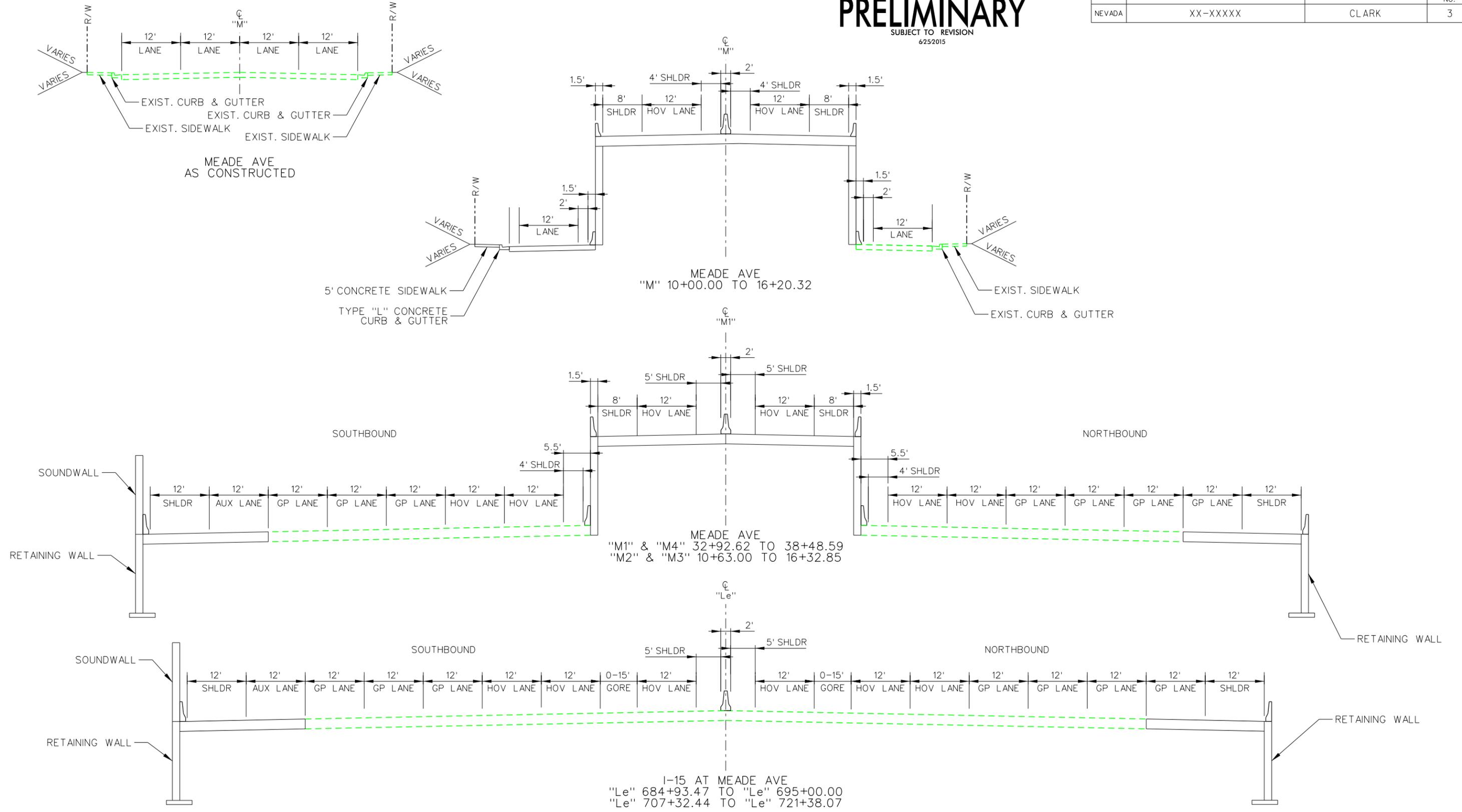


STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT
**TYPICAL SECTIONS
HARMON AVENUE**

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3



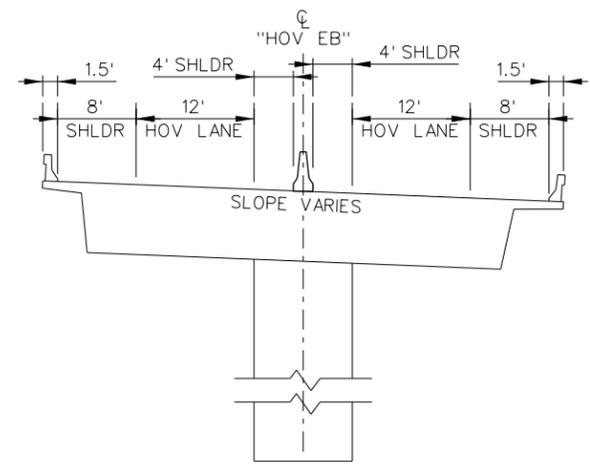
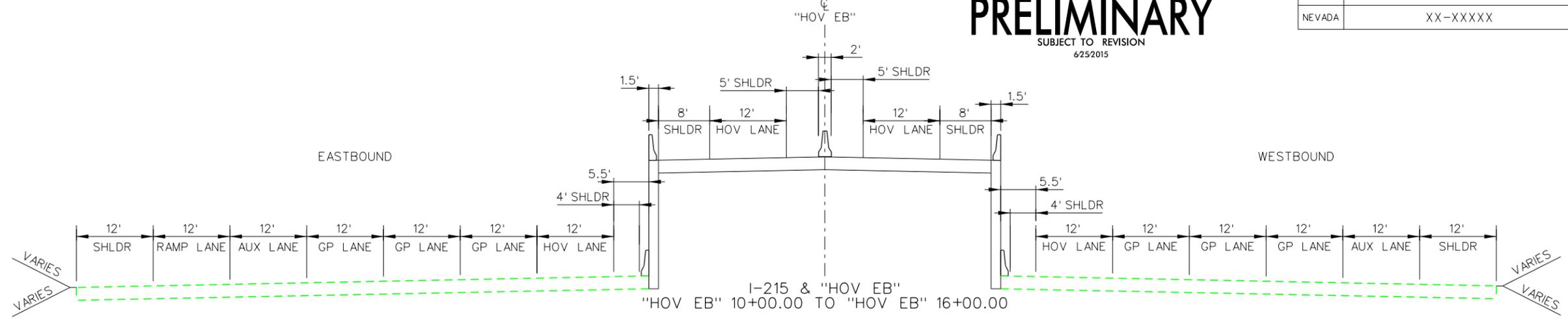
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

TYPICAL SECTIONS MEADE AVENUE

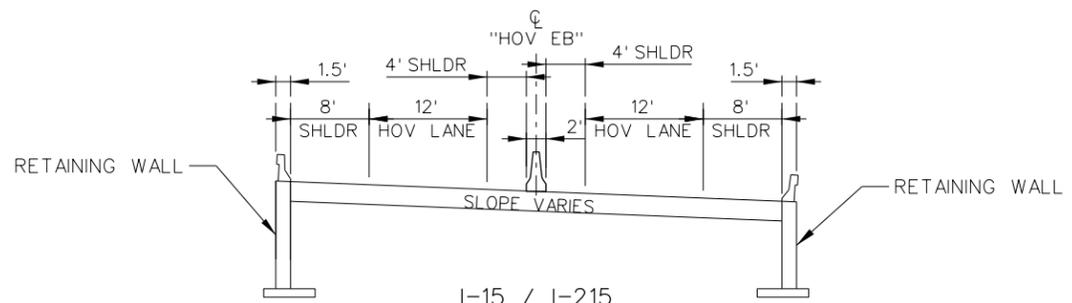
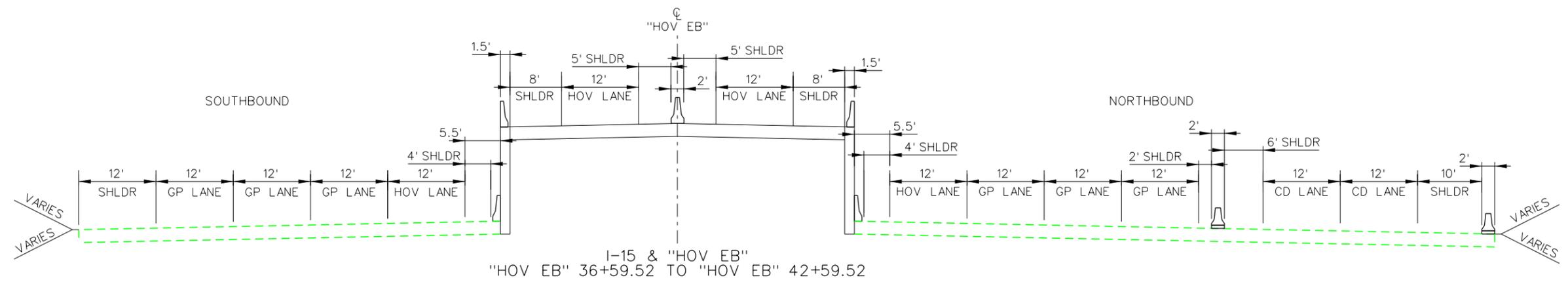
PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	4



I-15 / I-215
12' HOV CONNECT (SB-EB AND WB-NB)
"HOV EB" 16+00.00 TO "HOV EB" 24+93.97
"HOV EB" 28+28.70 TO "HOV EB" 36+59.52



I-15 / I-215
12' HOV CONNECT (SB-EB AND WB-NB)
"HOV EB" 24+93.97 TO "HOV EB" 28+28.70

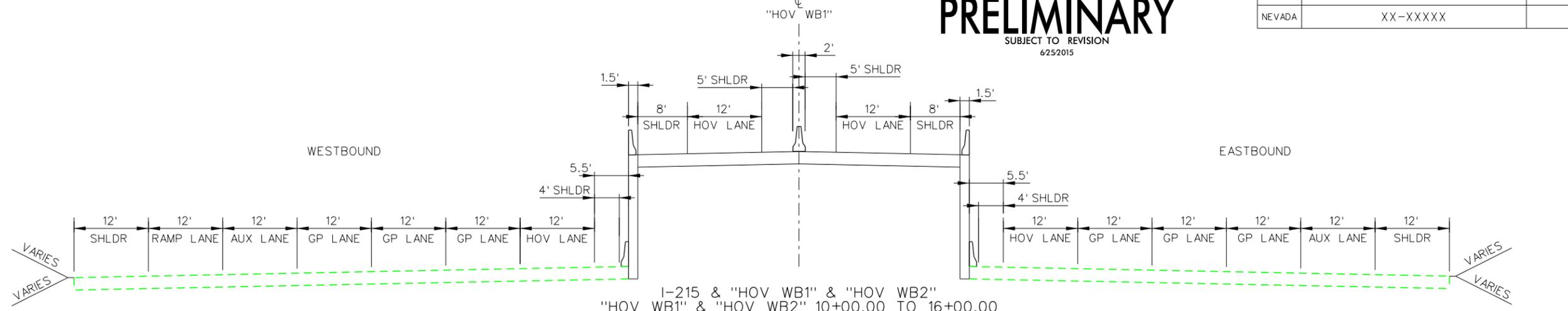
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

TYPICAL SECTIONS I-15 / I-215

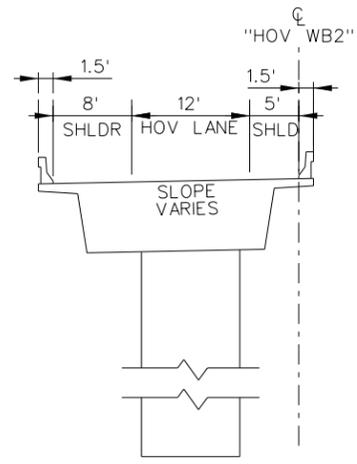
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	5

PRELIMINARY

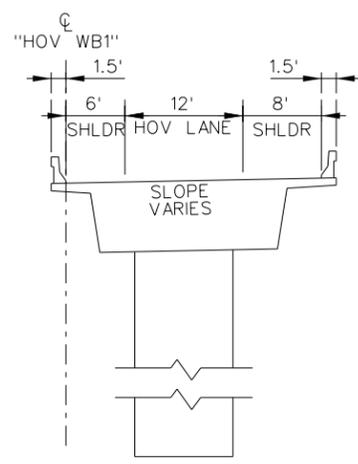
SUBJECT TO REVISION
6/25/2015



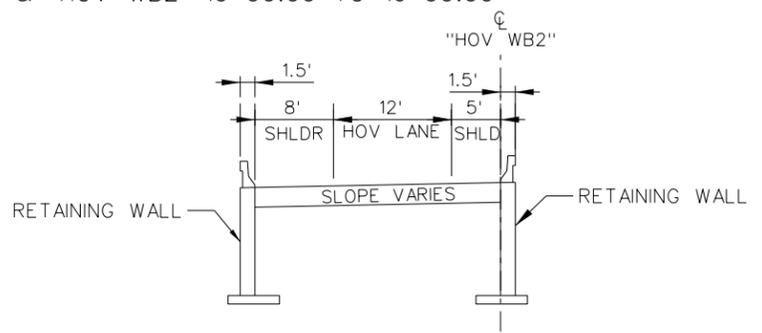
I-215 & "HOV WB1" & "HOV WB2"
"HOV WB1" & "HOV WB2" 10+00.00 TO 16+00.00



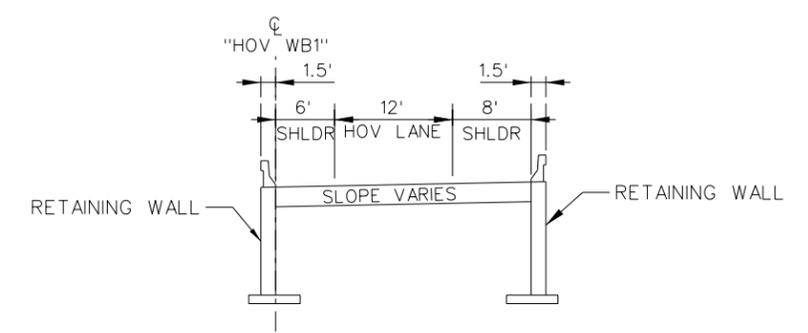
12' HOV CONNECT EB-NB
"HOV WB2" 16+00.00 TO "HOV WB2" 22+46.96
"HOV WB2" 28+42.02 TO "HOV WB2" 31+91.21
"HOV WB2" 34+65.79 TO "HOV WB2" 39+43.93
"HOV WB2" 41+88.27 TO "HOV WB2" 43+95.24
"HOV WB2" 45+43.90 TO "HOV WB2" 49+50.66



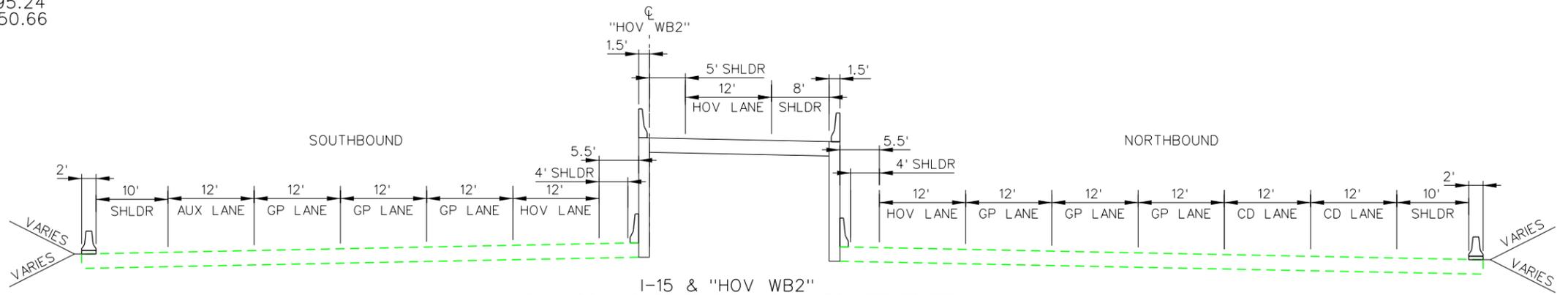
12' HOV CONNECT SB-WB
"HOV WB1" 16+00.00 TO "HOV WB1" 21+26.47
"HOV WB1" 26+84.23 TO "HOV WB1" 33+44.14
"HOV WB1" 36+35.85 TO "HOV WB1" 44+68.84



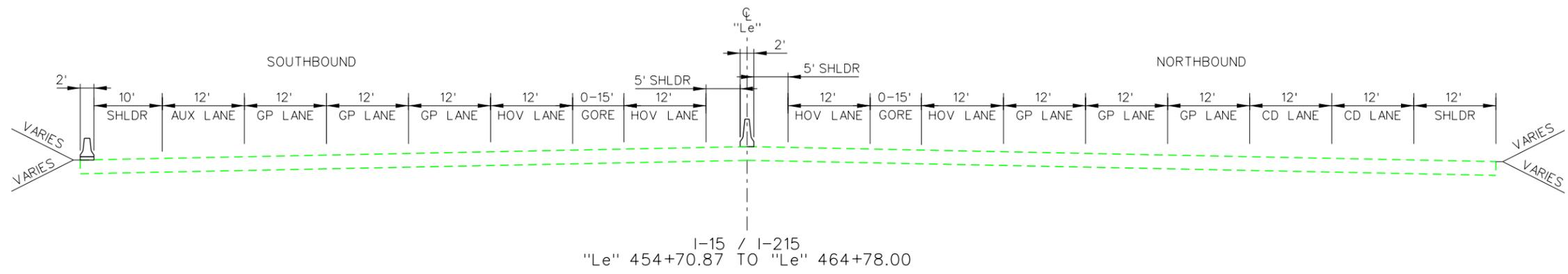
12' HOV CONNECT EB-NB
"HOV WB2" 22+46.96 TO "HOV WB2" 28+42.02
"HOV WB2" 31+91.21 TO "HOV WB2" 34+65.79
"HOV WB2" 39+43.93 TO "HOV WB2" 41+88.27
"HOV WB2" 43+95.24 TO "HOV WB2" 45+43.90



12' HOV CONNECT SB-WB
"HOV WB1" 21+26.47 TO "HOV WB1" 26+84.23
"HOV WB1" 33+44.14 TO "HOV WB1" 36+35.85



I-15 & "HOV WB2"
"HOV WB2" 49+50.66 TO "HOV WB2" 55+50.77



I-15 / I-215
"Le" 454+70.87 TO "Le" 464+78.00

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

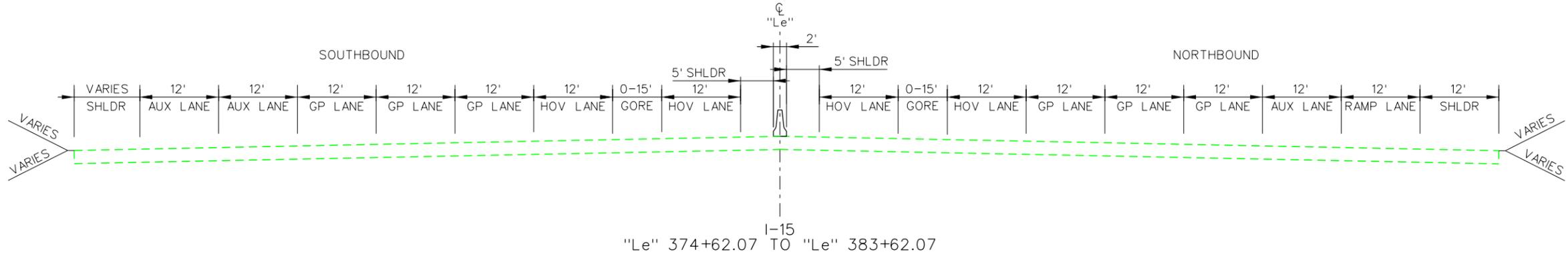
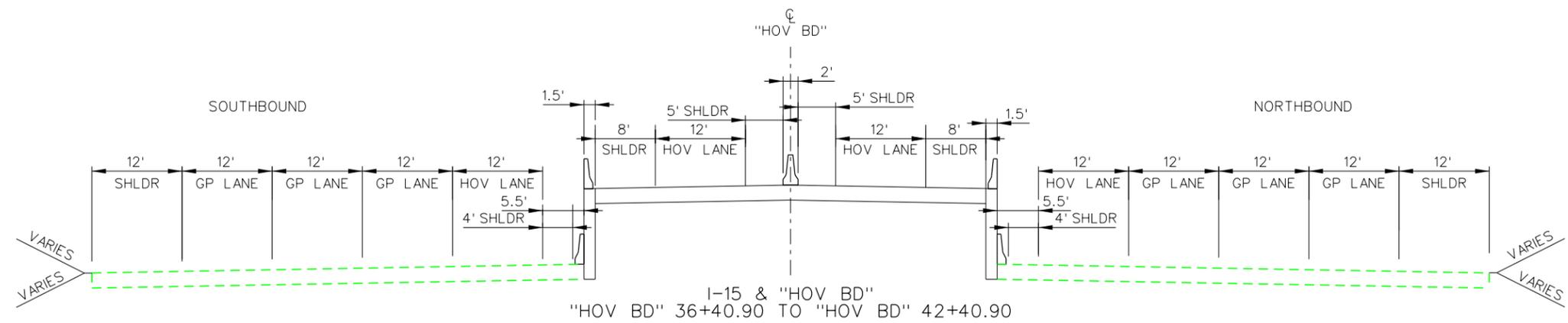
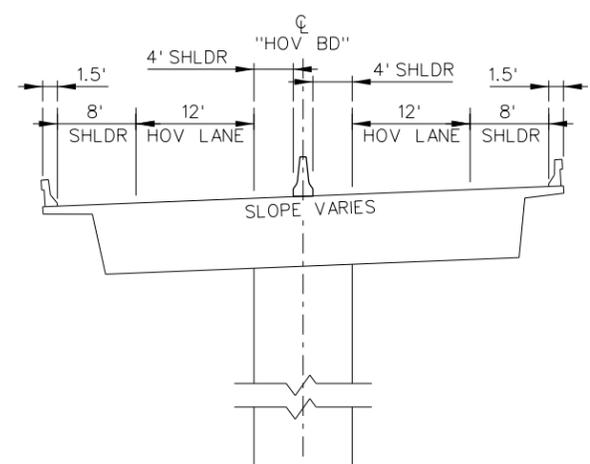
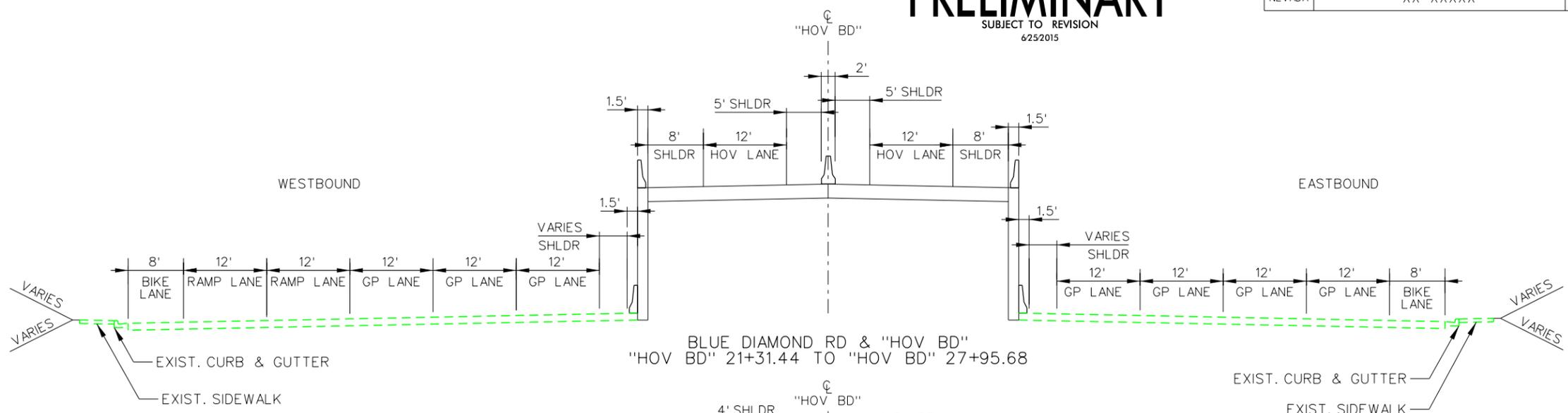
TYPICAL SECTIONS

I-15 / I-215

PRELIMINARY

SUBJECT TO REVISION
6/25/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	6



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

TYPICAL SECTIONS BLUE DIAMOND ROAD

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



MATCHLINE "XXX+XX.XX"
(SEE SHEET 2)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

MARYLAND PARKWAY AND I-515

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2

MATCHLINE "XXX+XX.XX"
(SEE SHEET 1)

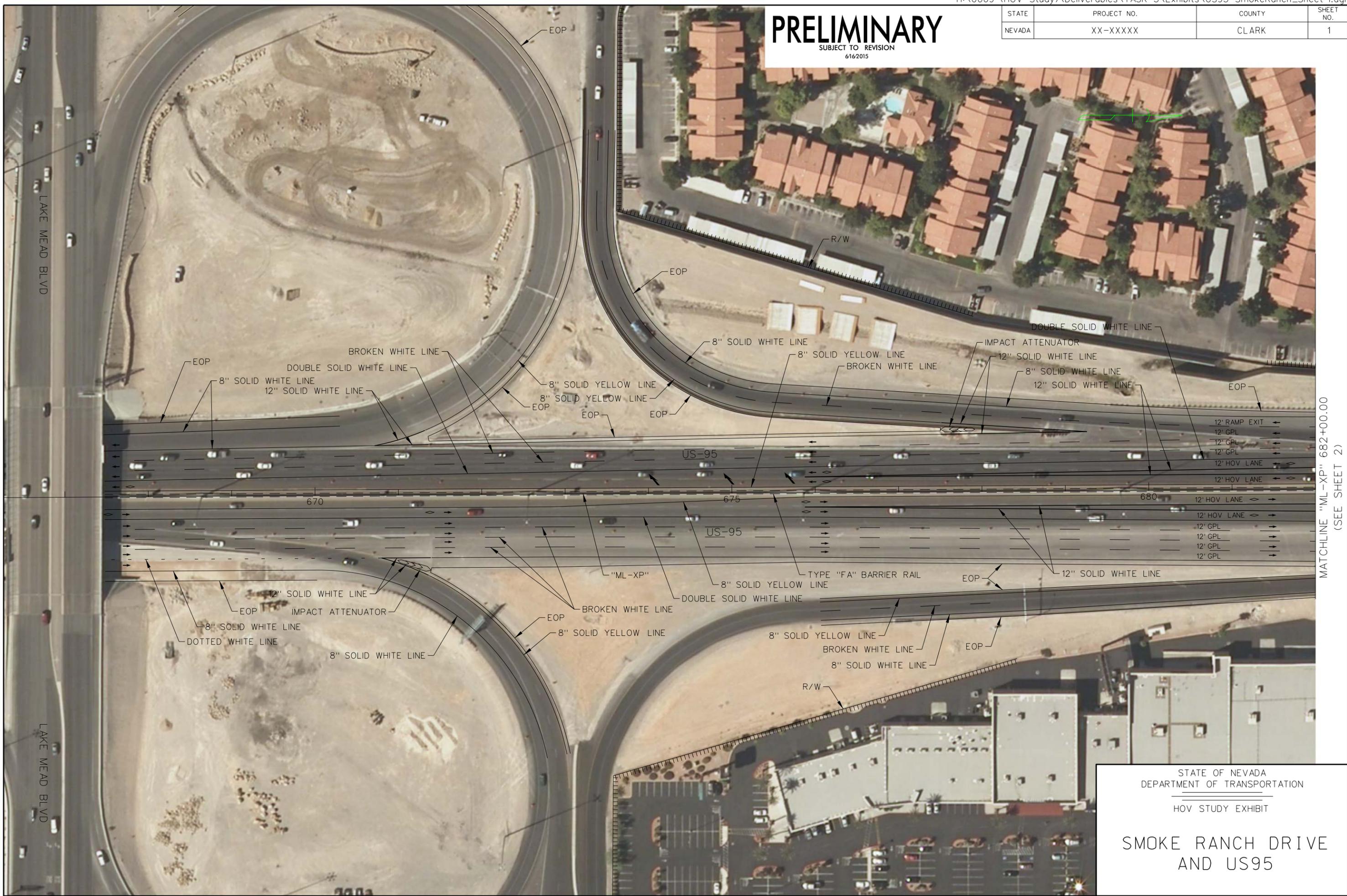


STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

MARYLAND PARKWAY
AND I-515

PRELIMINARY
SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



MATCHLINE "ML-XP" 682+00.00
(SEE SHEET 2)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

**SMOKE RANCH DRIVE
AND US95**

1:100 PLOT SCALE
anitar

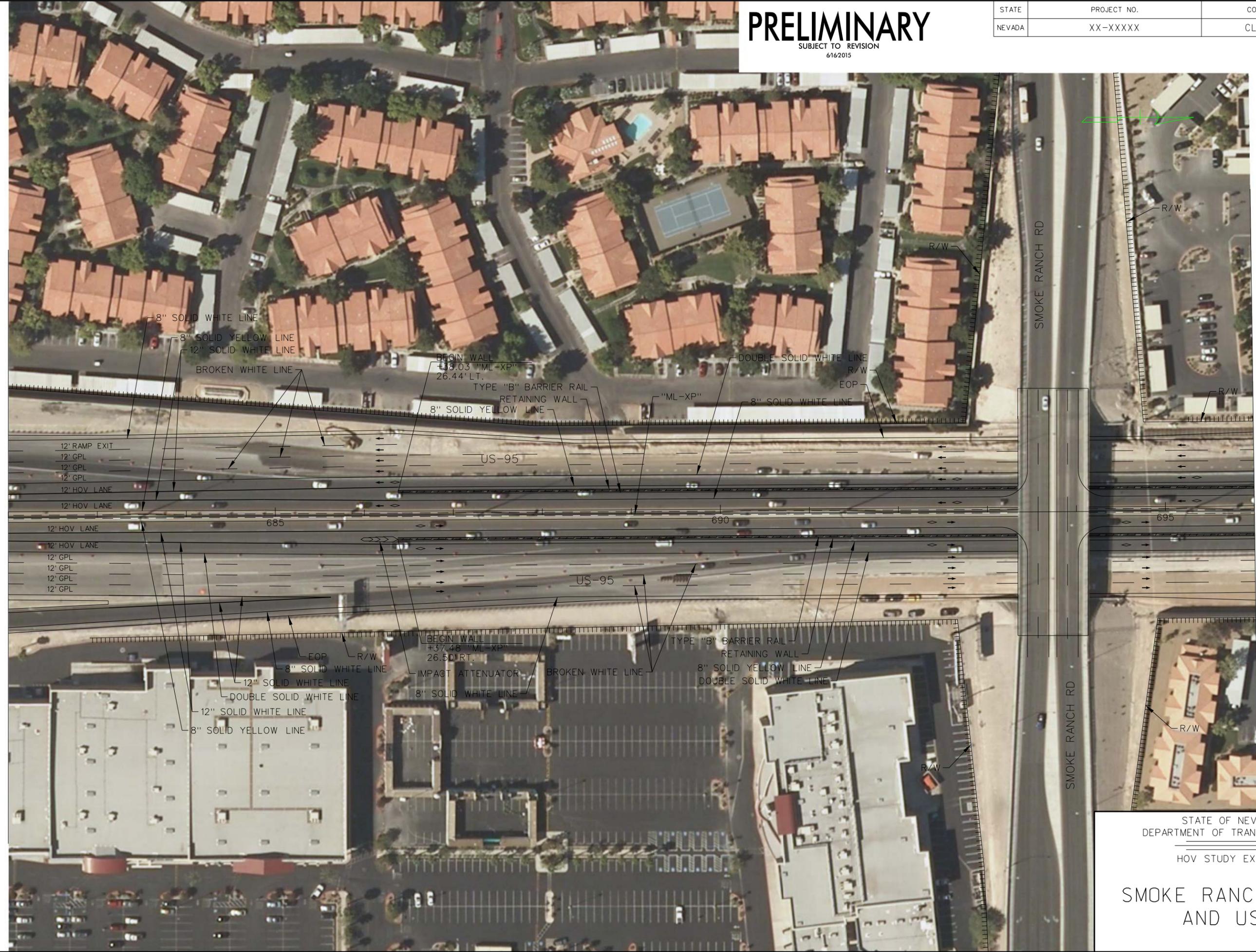
PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2

MATCHLINE "ML-XP" 682+00.00
(SEE SHEET 1)

MATCHLINE "ML-XP" 696+00.00
(SEE SHEET 3)



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

SMOKE RANCH DRIVE AND US95

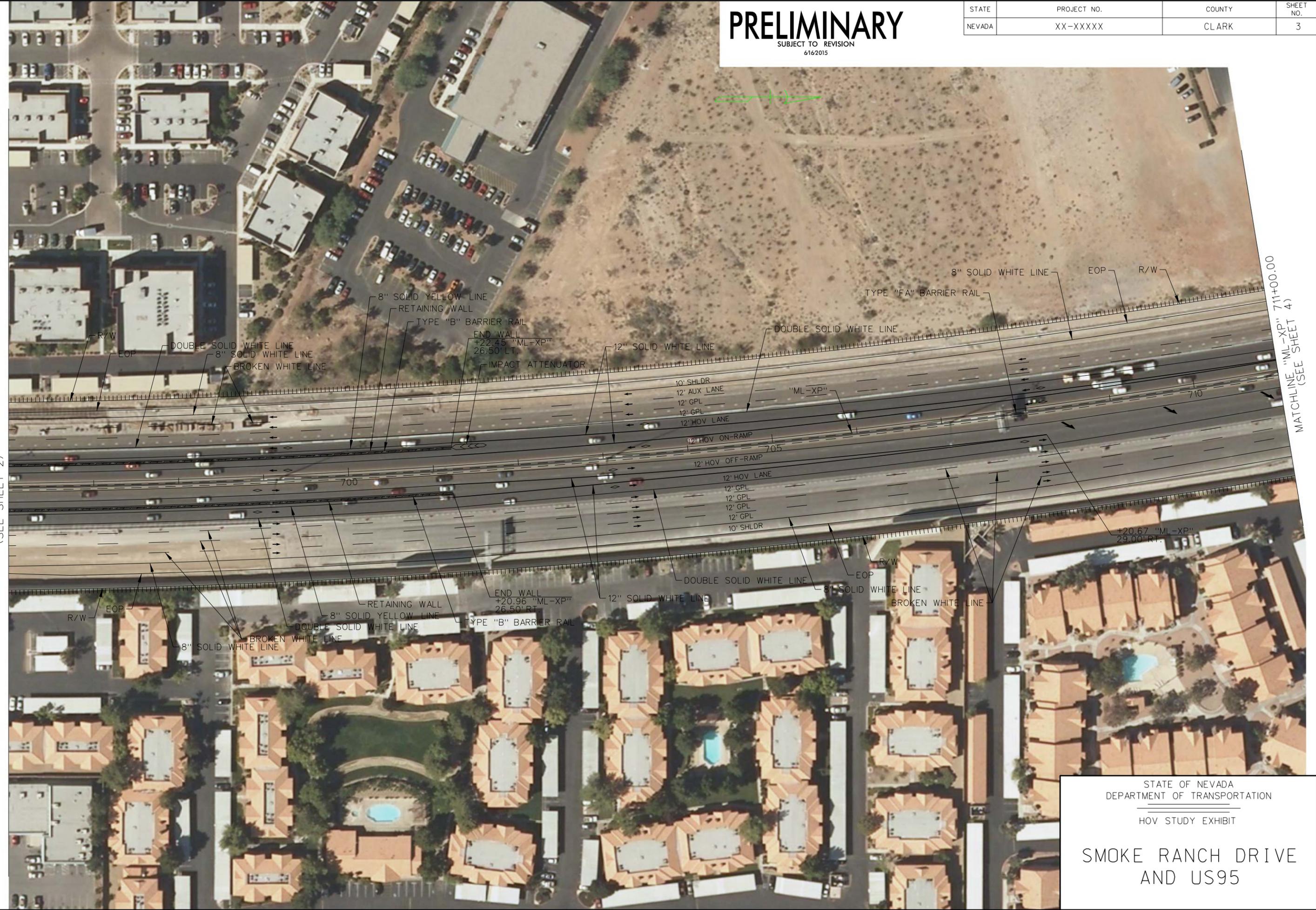
PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3

MATCHLINE "ML-XP" 696+00.00
(SEE SHEET 2)

MATCHLINE "ML-XP" 711+00.00
(SEE SHEET 4)



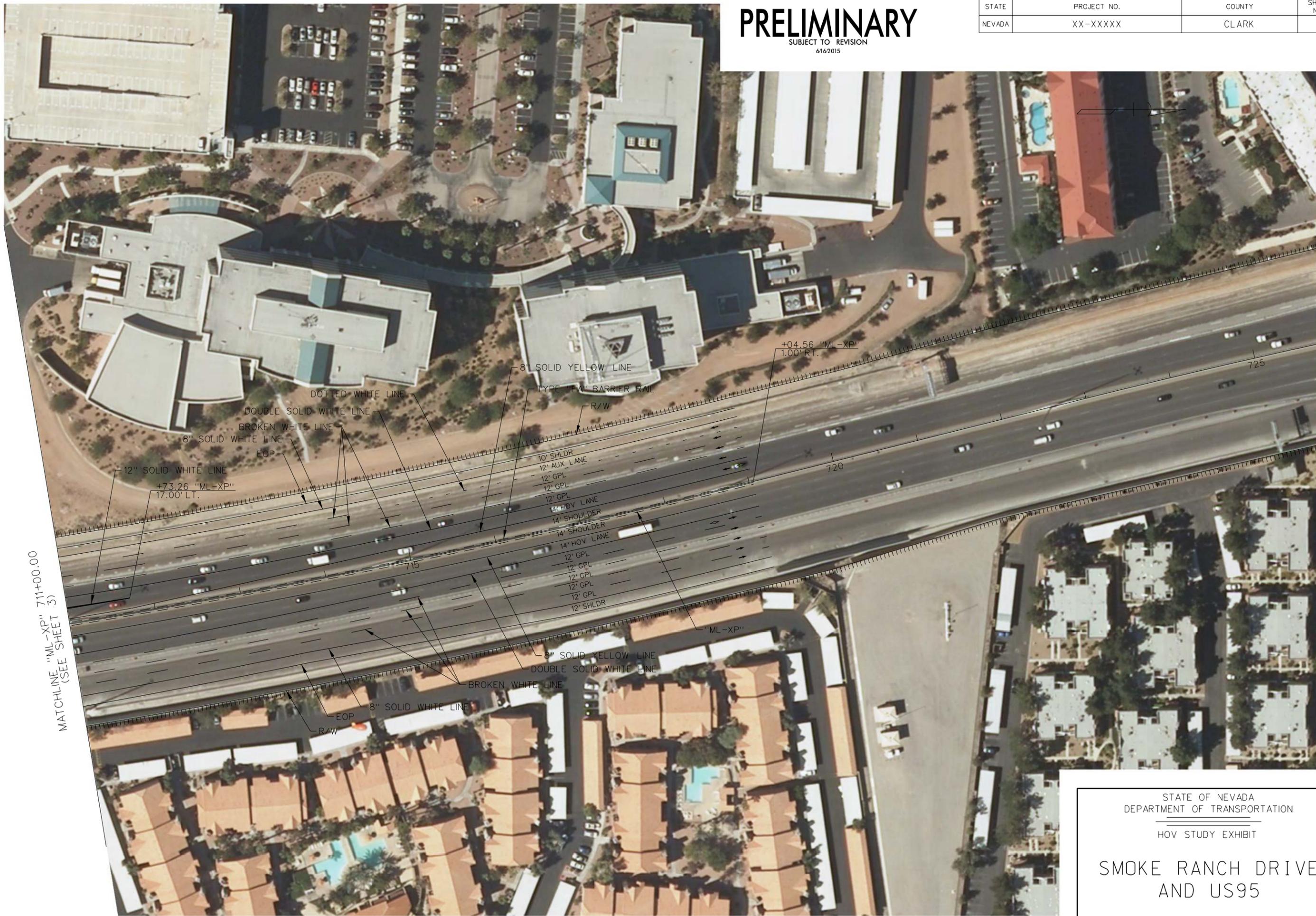
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

SMOKE RANCH DRIVE AND US95

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	4



MATCHLINE "ML-XP" 711+00.00
(SEE SHEET 3)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

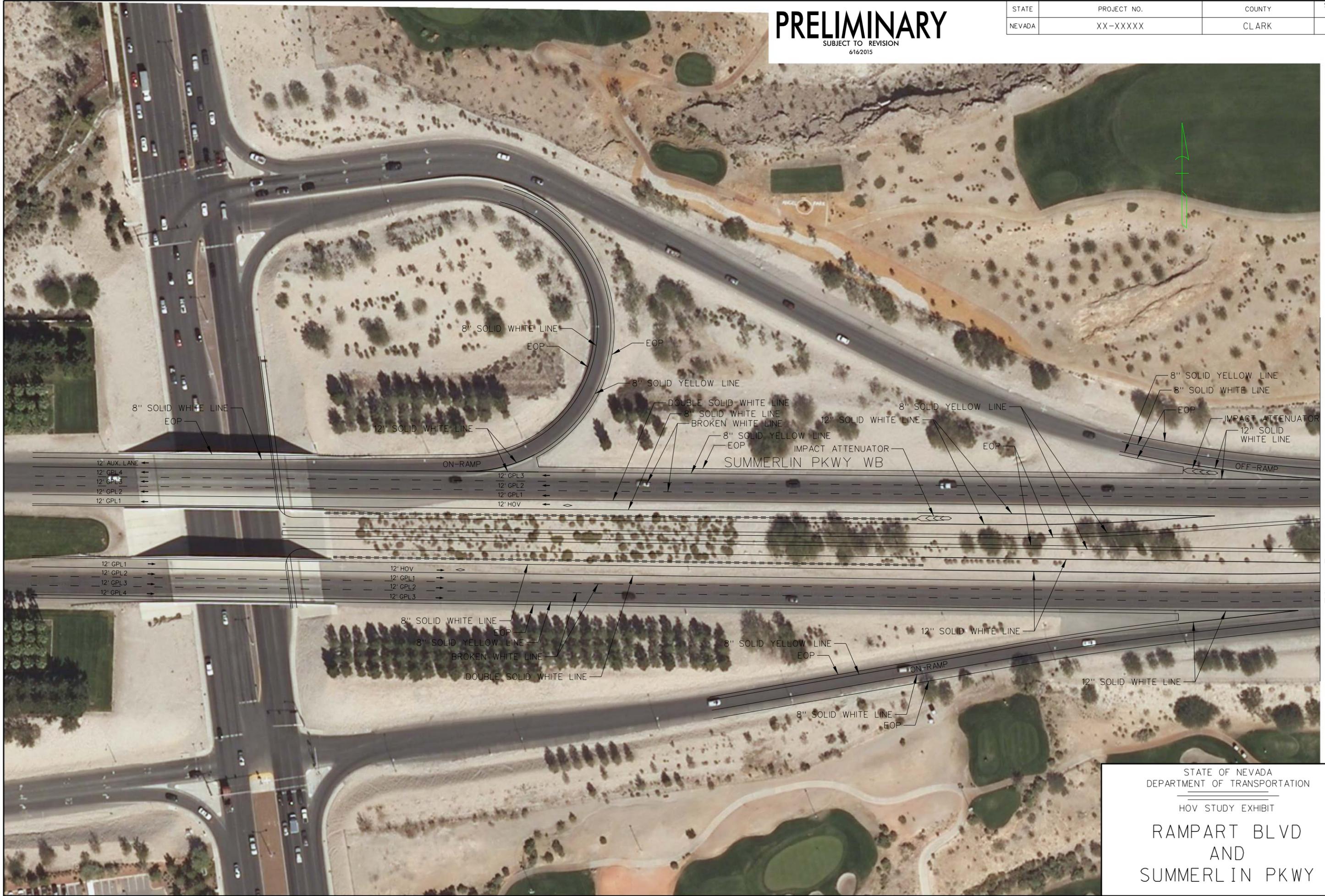
SMOKE RANCH DRIVE AND US95

1:100 PLOT SCALE
anitar

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



MATCHLINE "XXX+XX.XX"
(SEE SHEET 2)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HOV STUDY EXHIBIT

RAMPART BLVD AND SUMMERLIN PKWY

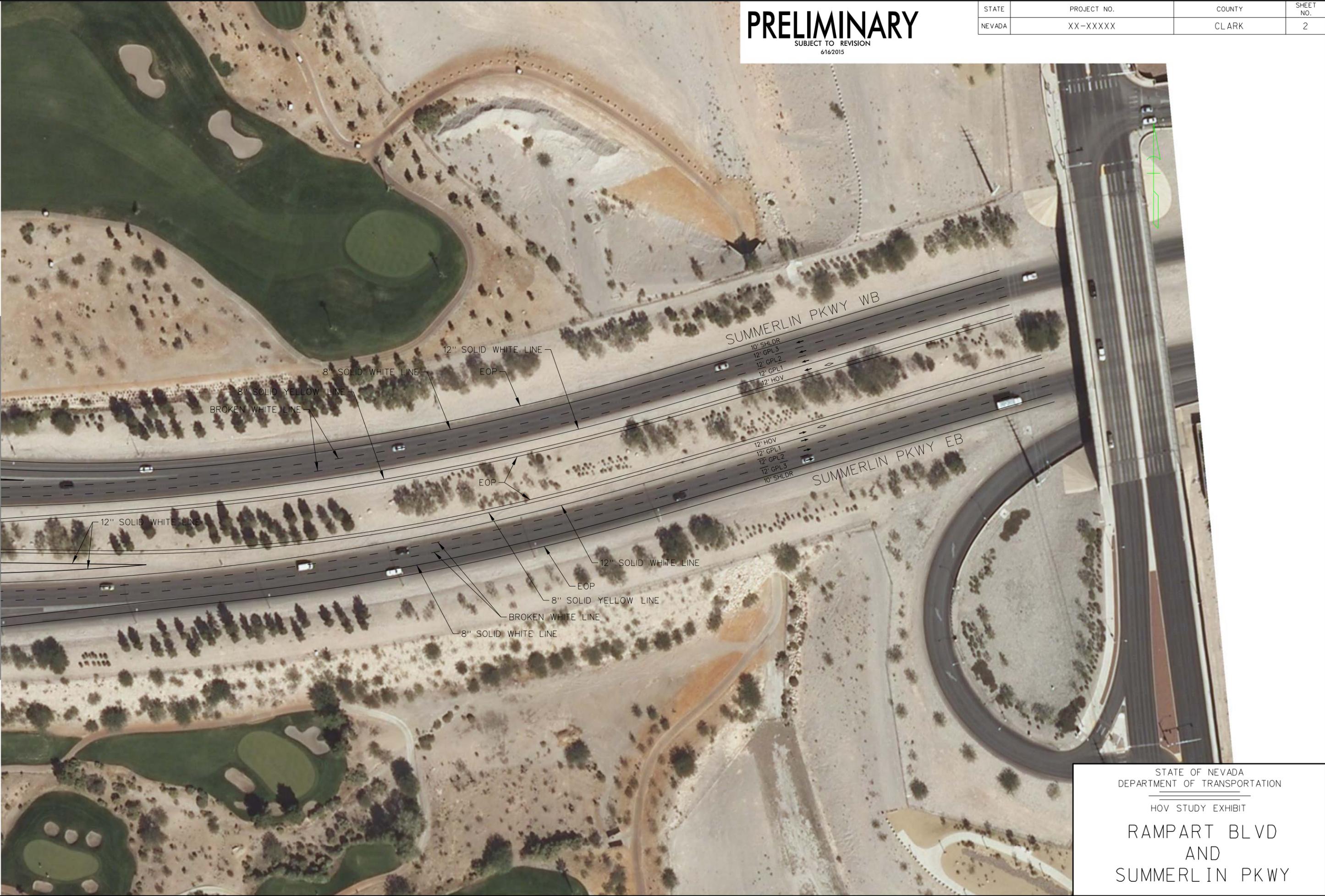
1:100 PLOT SCALE

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2

MATCHLINE "XXX+XX.XX"
(SEE SHEET 1)

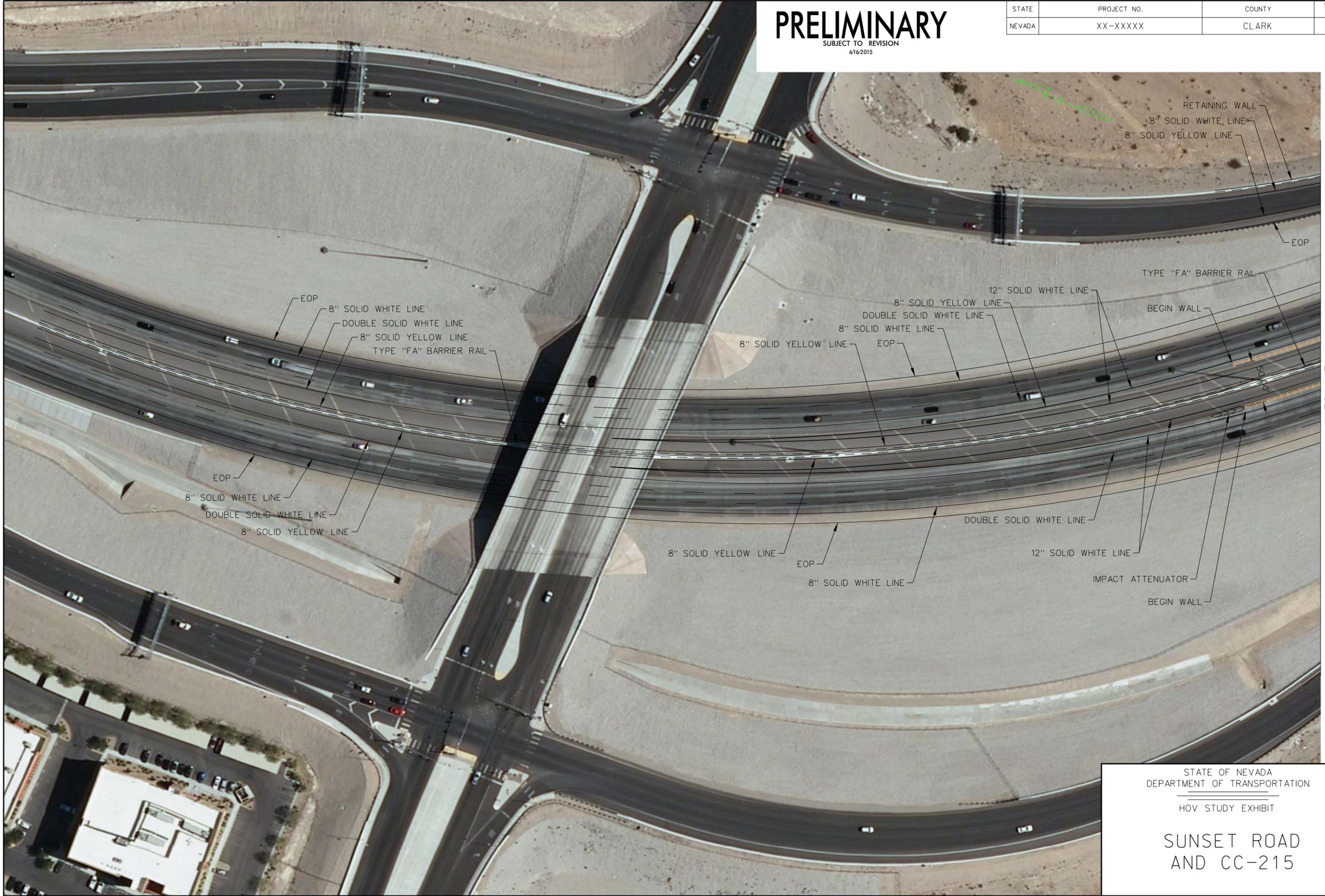


STATE OF NEVADA
 DEPARTMENT OF TRANSPORTATION
 HOV STUDY EXHIBIT
 RAMPART BLVD
 AND
 SUMMERLIN PKWY

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	1



MATCHLINE "XXX+XX.XX"
(SEE SHEET 2)

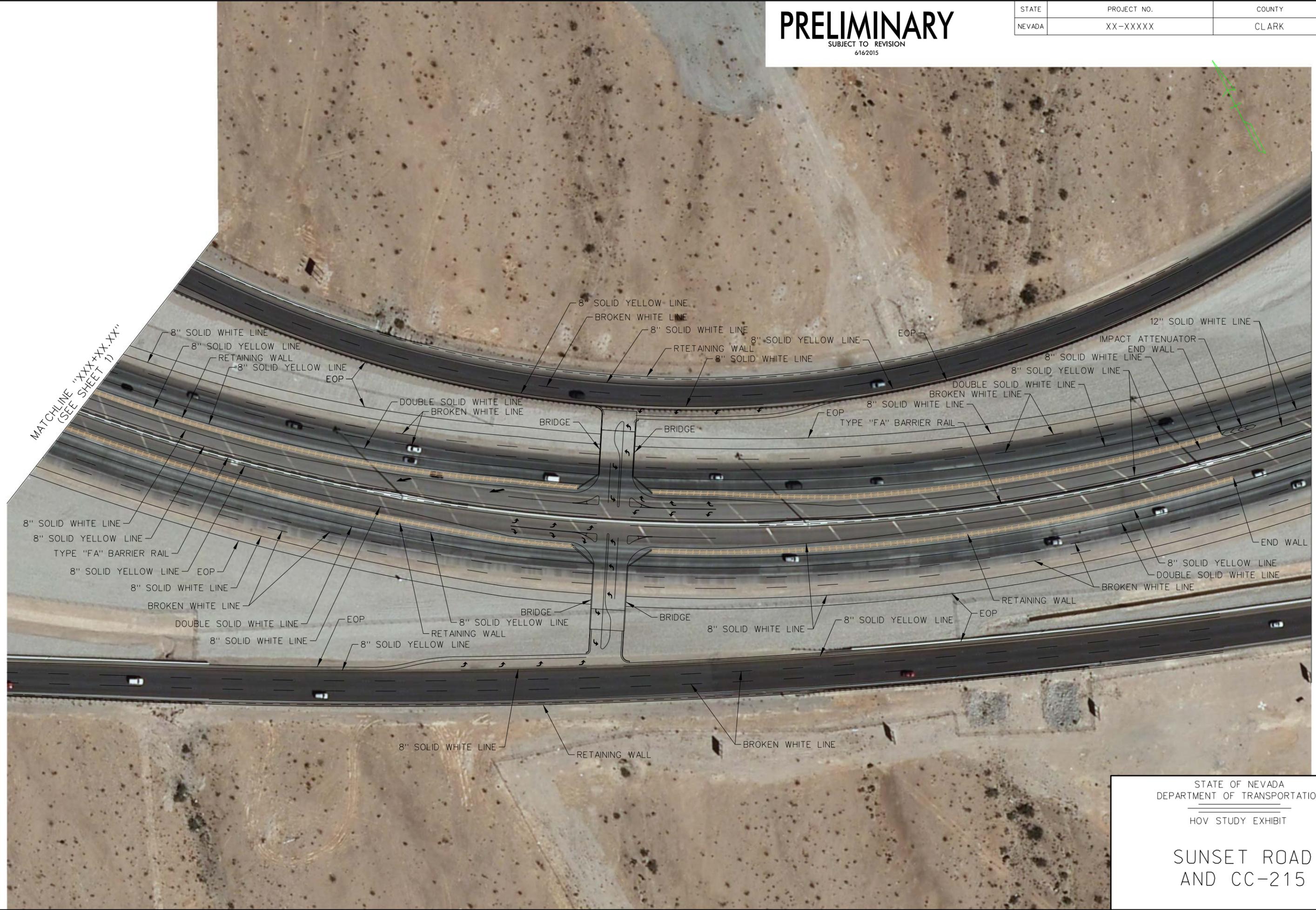
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

SUNSET ROAD AND CC-215

PRELIMINARY

SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	2



MATCHLINE "XXX+XX.XX"
(SEE SHEET 1)

MATCHLINE "XXX+XX.XX"
(SEE SHEET 3)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

SUNSET ROAD AND CC-215

PRELIMINARY
SUBJECT TO REVISION
6/16/2015

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	XX-XXXXX	CLARK	3



MATCHLINE "XXX+XX.XX"
(SEE SHEET 2)

DOUBLE SOLID WHITE LINE

EOP

8" SOLID WHITE LINE

12" SOLID WHITE LINE

BROKEN WHITE LINE

8" SOLID YELLOW LINE

DOUBLE SOLID WHITE LINE

EOP

BROKEN WHITE LINE

8" SOLID WHITE LINE

12" SOLID WHITE LINE

8" SOLID YELLOW LINE

TYPE "FA" BARRIER RAIL

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
HOV STUDY EXHIBIT

SUNSET ROAD
AND CC-215

Appendix F

Planning Level Cost Estimates for Direct-Access Ramps



HOV STUDY AND PRELIMINARY ENGINEERING FROM 15% ESTIMATE

I-15 HOV Study (Hacienda)

Item No.	Quantity	Unit	Description	Unit Price	Cost
201 0120	1	ACRE	CLEARING AND GRUBBING	\$160,000.00	\$160,000
202 0400	7,310	LINFT	REMOVAL OF CONCRETE BARRIER RAIL	\$6.00	\$43,860
202 0975	24,704	CUYD	REMOVAL OF BITUMINOUS SURFACE	\$6.50	\$160,576
302 0130	56,400	TON	TYPE 1 CLASS B AGGREGATE BASE	9.00	\$507,600
402 0190	53,097	TON	PLANTMIX SURFACING (TYPE 2C) (WET)	70.00	\$3,716,796
403 0120	4,515	TON	PLANTMIX OPEN-GRADED SURFACING (1/2-INCH) (WET)	85.00	\$383,775
502 0160	7,310	LINFT	CONCRETE BARRIER RAIL (TYPE A)	40.00	\$292,400
502 0170	0	LINFT	CONCRETE BARRIER RAIL (TYPE FA)	40.00	\$0
502 0180	2,929	LINFT	CONCRETE BARRIER RAIL (TYPE B)	40.00	\$117,160
603 XXXX	1	LS	MISC DRAINAGE IMPROVEMENTS	\$921,634.18	\$921,634
613 0190	0	LINFT	CLASS A CONCRETE CURB (TYPE 3)	\$10.00	\$0
613 0690	0	LINFT	CLASS A CONCRETE CURB AND GUTTER (TYPE 5)	\$25.00	\$0
613 1050	0	SQYD	CLASS A CONCRETE SIDEWALK (4-INCH)	\$35.00	\$0
618 0350	2	EACH	GUARDRAIL TERMINAL (FLARED)	\$2,600.00	\$5,200
618 0550	808	LINFT	GALVANIZED GUARDRAIL (TRIPLE CORRUGATION)	\$21.00	\$16,968
623 0155	1	LS	MODIFY EXISTING HIGHWAY LIGHTING SYSTEM	\$1,500,000.00	\$1,500,000
627 XXXX	1	LS	PERMANENT SIGNS	\$97,000.00	\$97,000
628 0120	1	LS	MOBILIZATION	\$489,000.00	\$489,000
632 XXXX	1	LS	PAVEMENT MARKINGS	\$98,000.00	\$98,000
640 0160	22,400	SQFT	CONCRETE RETAINING WALL	\$55.00	\$1,232,000
502 XXXX	3,500	SQFT	BRIDGES	\$225.00	\$787,500
641 0100	3	EACH	IMPACT ATTENUATOR	\$1,000.00	\$3,000

SUBTOTAL		\$10,532,469
CONTINGENCY	30%	\$3,159,740.72
TOTAL		\$13,692,210

GRAND TOTAL \$13,692,210



HOV STUDY AND PRELIMINARY ENGINEERING FROM 15% ESTIMATE

I-15 HOV Study (Meade)

Item No.	Quantity	Unit	Description	Unit Price	Cost
201 0120	1	ACRE	CLEARING AND GRUBBING	\$160,000.00	\$160,000
202 0165	80	SQYD	REMOVAL OF VALLEY GUTTER	\$25.00	\$2,000
202 0310	29	SQYD	REMOVAL OF CONCRETE SLAB (DRIVEWAY)	\$25.00	\$725
202 0400	2,166	LINFT	REMOVAL OF CONCRETE BARRIER RAIL	\$6.00	\$12,996
202 0975	18,643	CUYD	REMOVAL OF BITUMINOUS SURFACE	\$6.50	\$121,177
202 1260	589	SQYD	REMOVAL OF CONCRETE SIDEWALK	\$25.00	\$14,725
302 0130	51,900	TON	TYPE 1 CLASS B AGGREGATE BASE	9.00	\$467,100
402 0190	47,689	TON	PLANTMIX SURFACING (TYPE 2C) (WET)	70.00	\$3,338,203
403 0120	4,190	TON	PLANTMIX OPEN-GRADED SURFACING (1/2-INCH) (WET)	85.00	\$356,150
502 0160	2,166	LINFT	CONCRETE BARRIER RAIL (TYPE A)	40.00	\$86,640
502 0170	0	LINFT	CONCRETE BARRIER RAIL (TYPE FA)	40.00	\$0
502 0180	8,155	LINFT	CONCRETE BARRIER RAIL (TYPE B)	40.00	\$326,200
5021470	708	LINFT	12-FOOT X 10-FOOT PRECAST CONCRETE BOX CULVERT	\$1,700.00	\$1,203,600
603 XXXX	1	LS	MISC DRAINAGE IMPROVEMENTS	\$832,290.65	\$832,291
603 1120	2	EACH	48-INCH PRECAST END SECTION	\$350.00	\$700
613 0190	123	LINFT	CLASS A CONCRETE CURB (TYPE 3)	\$10.00	\$1,230
613 0560	92	LINFT	CLASS A CONCRETE VALLEY GUTTER (TYPE 1)	\$25.00	\$2,300
613 0690	875	LINFT	CLASS A CONCRETE CURB AND GUTTER (TYPE 5)	\$25.00	\$21,875
613 1050	564	SQYD	CLASS A CONCRETE SIDEWALK (4-INCH)	\$35.00	\$19,740
613 1220	87	SQYD	CLASS A CONCRETE DRIVEWAY (6-INCH)	\$35.00	\$3,045
623 0155	1	LS	MODIFY EXISTING HIGHWAY LIGHTING SYSTEM	\$1,050,000.00	\$1,050,000
627 XXXX	1	LS	PERMANENT SIGNS	\$179,000.00	\$179,000
628 0120	1	LS	MOBILIZATION	\$904,000.00	\$904,000
632 XXXX	1	LS	PAVEMENT MARKINGS	\$181,000.00	\$181,000
640 0160	102,200	SQFT	CONCRETE RETAINING WALL	\$55.00	\$5,621,000
640 0260	18,900	SQFT	SOUND BARRIER WALL	\$55.00	\$1,039,500
502 XXXX	15,000	SQFT	BRIDGES	\$225.00	\$3,375,000
641 0100	2	EACH	IMPACT ATTENUATOR	\$1,000.00	\$2,000

RIGHT OF WAY est \$1,000,000

SUBTOTAL \$20,322,197

CONTINGENCY 30% \$6,096,659.23

TOTAL	\$26,418,857
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GRAND TOTAL \$26,418,857

Appendix G

Justification for the Use of CMAQ Funding for the Implementation of HOV Facilities - Technical Memorandum

Justification for the Use of CMAQ Funding for the Implementation of HOV Facilities

Introduction

The Las Vegas region's air quality conformity process and travel demand model results show that the region's conformity status has changed in the recent years compared to what it was in 1990. On September 15, 2004 the Environmental Protection Agency (EPA) designated about 60 percent of Clark County as nonattainment for Ozone (O_3); this area roughly coincides with the Las Vegas Valley. This O_3 non-attainment area was re-designated as an attainment area by the EPA in 2012. However, within Clark County, the area defined as Hydrographic Basin 212 was designated as a non-attainment area for two pollutants – Carbon Monoxide (CO) and Particulate Matter (PM_{10}). This area roughly coincides with the Las Vegas Valley south and east to the Colorado River (i).

Vehicular emissions are known to contribute significantly towards environmental pollution. It is therefore imperative that every effort is made to reduce vehicle emissions within the valley. The EPA, in an effort to limit the impact of vehicles on the environment, requires agencies that intend to spend federal funds on roadway improvements to demonstrate the positive impact of such improvements on air quality. The Nevada State Implementation Plan (SIP) addresses air quality by putting in place, transportation control measures that have been approved by the EPA. As a consequence of, and consistent with the SIP, the Nevada Department of Transportation (NDOT) implements Transportation Control Measures (TCM) to reduce emission from vehicles. One such measure is the implementation of the High-Occupancy Vehicle (HOV) facilities in Las Vegas. The Southern Nevada HOV Plan provides the planning level information on the implementation of the HOV system in the Las Vegas Valley. The objectives of the HOV system include: congestion management, delay reduction, traffic volume reduction (trip reduction by encouraging vehicle sharing), and travel time reduction along the main freeways. Traffic forecasts suggest that the demand for the use of HOV facilities are significant enough to provide air quality benefits by reducing the number of vehicular trips, improving traffic flow, mitigating congestion and improving travel times. HOV facilities in Southern Nevada are to be implemented in phases and the cost estimates will be developed for each phase component during design and prior to implementation.

Literature Review

One justification for HOV facilities is the reduced congestion and reduction in travel time for all users of the facility. Dahlgren (ii) in his study of HOV lanes, explained that with the addition of a new HOV lane onto a corridor, the ensuing reduction in delay is distributed to an extent over all lanes in the corridor and not exclusively to the HOV lanes. He explains that the shift of HOV vehicles from the General-Purpose (GP) lanes to HOV lane(s) results in the GP lanes experiencing a reduction in delay. While the number of vehicles removed from the roads may be relatively small, the delay reduction has a large impact on the overall emissions produced and especially Hydrocarbons (HC) and CO, which are proportional to the Vehicle-Hours Traveled (VHT). Boriboonsomsin and Barth (iii) in a study of the HOV lanes in Southern California, found that HOV lanes resulted in much lower emission rates for the same

amount of travel demand when normalized by average vehicle occupancy. They compared four HOV scenarios: underutilized, neutral, well utilized and over utilized. Their results showed higher average speed under every scenario for the HOV lanes compared to the GP lanes and therefore less travel time. They also observed that the maximum acceleration rates of drivers in the HOV lanes were less than that of the drivers in the GP lanes for all four of their tested scenarios, implying lower emissions.

To compare emissions from vehicles in HOV and GP lanes, Krimmer and Venigalla (iv) directly measured emission from two identical vehicles travelling in the same traffic stream using portable emissions-monitoring systems operated from the cars. They studied two HOV corridors in the eastern part of the U.S. and found that the emissions per person from the vehicle driving in the HOV lane are lower than that of the emissions per person from the vehicle driving in the GP lane.

Rakha and Ding (v) used a microscopic emissions model (VT-Micro) to study a range of scenarios in a study of the impact of vehicle stops on fuel consumption and emissions of HC, CO and Nitrogen Oxides (NO_x). Their study showed a considerable increase in vehicle fuel consumption and emission rates when vehicle stops were introduced, especially for high cruising speed. They observed that: 1) fuel consumption and emissions were more sensitive to constant cruise speed than stops; 2) aggressive stops had a significant impact on emissions, and that HC and CO emissions were highly sensitive to the level of acceleration; 3) NO_x emissions also increased with acceleration rates. Combining these observations, it can be concluded that the level of acceleration, level of deceleration, and the cruise speed determine vehicle fuel consumption and emission rates. If the results were normalized using the average vehicle occupancy rates, HOVs will show a significant reduction in emissions per person compared to single occupant vehicles and therefore the higher speeds (on an HOV lane compared to the adjacent GP lane) are justified.

In summary, HOV lanes lower emissions by:

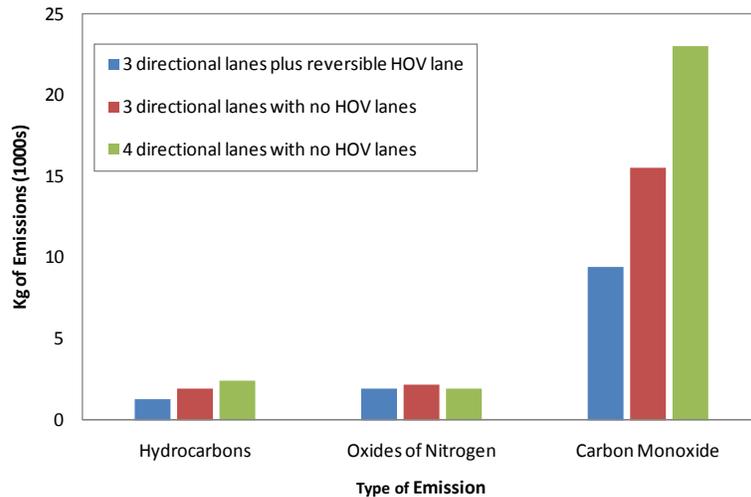
- 1) Reducing the number of vehicular trips. The provision of HOV lanes favor carpool and transit trips, encouraging vehicle-sharing and thereby eliminating the potential single occupant vehicle trips;
- 2) Reducing vehicles miles traveled (VMT) and improving vehicle flow in the lanes; and
- 3) Eliminating initial inefficiencies in engine operations and evaporation of fuel from hot engines (vi). The increase in single occupant vehicle commuters that “park and ride” with the intention of taking advantage of an HOV facility ultimately results in a reduction in the total number of trips generated, leading to emission reduction.

Experience from Other States

HOV lanes have been used widely in the U.S. The experience from the Washington State’s HOV system (vii, viii, ix) are summarized as follows 1) users of all HOV lanes travel faster than the adjacent GP lanes, even when the HOV lanes are crowded; 2) Every shared ride reduces the number of car trips on the overall transportation system; and 3) every saved car trip supports better air quality and reduction of greenhouse gases.

An analysis from Houston (x) involved three scenarios created for the “Katy Freeway” corridor. The scenarios were: 1) do nothing, 2) add a GP lane and 3) add an HOV lane. The analyses showed that the scenario with the HOV lane produced substantially less emissions of HC, NO_x, and CO compared to the other scenarios. Figure 1 shows the estimated impact of HOV improvement on air quality obtained for the “Katy Freeway” in Houston.

Figure 1: Estimated Impact of HOV Improvement on Air Quality



Source: An Evaluation of the Houston High-Occupancy Vehicle Lane System

Estimation of VMT, VHT Reduction in Southern Nevada due to Implementation of HOV Facilities

As part of the Southern Nevada HOV Plan update, an analysis of the region’s transportation system was completed using travel demand models to determine the reduction in VMT and VHT if HOV facilities were implemented in the Valley. For this analysis, a year 2035 “No-Action Scenario” model was developed; this scenario corresponded to the network that did not include any HOV facility improvements beyond the horizon year 2025. Results from this scenario were compared to the HOV Scenario 4¹; results from the comparison are shown in Table 1.

Table 1: Comparison of VMT, VHT with and without HOV Facilities

	Without HOV Facilities	With HOV Facilities	Percent Reduction due to Implementation of HOV Facilities
Year 2035 Regional Vehicles Miles Traveled	49,791,869	48,963,798	1.7%
Year 2035 Regional Vehicles Hours Traveled	1,440,557	1,380,019	4.2%

¹ Southern Nevada HOV Plan Update, Nevada Department of Transportation, 2015.

As shown in Table 1, the travel demand model outputs show that a VMT reduction of approximately two percent and VHT reduction of approximately four percent can be expected with the implementation of HOV facilities. Reduction in VMT and VHT are directly related to savings in fuel consumption and reduction in emissions. The implementation of HOV facilities in Southern Nevada therefore, will help accommodate the growing vehicular traffic volume, meet travel demand forecast of the region, while contributing to the attainment of the air quality thresholds set by the EPA for urban regions by cutting down emissions from vehicles.

Authorization and Eligibility

The United States Code (USC), 2013 edition, title 23, chapter 1, contains the relevant legislation related to the congestion mitigation and air quality improvement (CMAQ) program. Per this, a state may obligate funds apportioned to it for the CMAQ program, for a transportation project or program if the project or program is for an area in the State that is or was designated as a nonattainment area for ozone, carbon monoxide, or particulate matter and, if the program or project improves traffic flow, construct high occupancy vehicle lanes, improve transportation systems management and operations that mitigate congestion and improve air quality². As described in this memorandum, projects that implement HOV facilities result in a reduction of emissions; hence, NDOT is eligible to obligate CMAQ funds for the implementation of HOV facilities.

Summary

Based on prevailing research information, experiences from other states and from an analysis using travel demand models, it can be concluded that the implementation of HOV facilities would lead to air quality improvements and will contribute to the attainment of EPA requirements for the region. It is also clear from the USC 2013, Title 23, Chapter 1 that HOV facilities qualify for CMAQ funds (xi). NDOT should therefore leverage the CMAQ funds allocated to the state, for the implementation of HOV facilities in Southern Nevada.

i RTCSNV Regional Transportation Plan 2013-2035. (Air Quality Conformity Analysis, Appendix 4)

ii Dahlgren, J. (1998). High occupancy vehicle lanes: Not always more effective than general purpose lanes. *Transportation Research Part A: Policy and Practice*, 32(2), 99-114.

iii Boriboonsomsin, K., & Barth, M. (2007). Evaluating air quality benefits of freeway high-occupancy vehicle lanes in Southern California. *Transportation Research Record: Journal of the Transportation Research Board*, 2011(1), 137-147

iv Krimmer, M., & Venigalla, M. (2006). Measuring impacts of high-occupancy vehicle lane operations on light-duty-vehicle emissions: Experimental study with instrumented vehicles. *Transportation Research Record: Journal of the Transportation Research Board*, 1987(1), 1-10

² 23 U.S. Code § 149 - Congestion Mitigation and Air Quality Improvement Program

v Rakha, H., & Ding, Y. (2003). Impact of stops on vehicle fuel consumption and emissions. *Journal of Transportation Engineering*, 129(1), 23-32.

vi US Environmental Protection Agency, (1998), Transportation control measures: high occupancy vehicle lanes. EPA420-s-98-006; <http://www.epa.gov/otaq/stateresources/rellinks/docs/S98006>

vii <http://www.wsdot.wa.gov/HOV/Policy.htm>

viii <http://www.wsdot.wa.gov/Environment/ClimateChange/climateChange.htm>

ix <http://www.wsdot.wa.gov/.../HOVUserSurveyDec07.pdf>

x Christiansen, D. L., & Morris, D. E. (1991). An evaluation of the Houston high-occupancy vehicle lane system, Texas Transportation institute, College Station, Texas

xi Hall, J. V. (1995). The role of transport control measures in jointly reducing congestion and air pollution. *Journal of Transport Economics and Policy*, 93-103.

Appendix H

Southern Nevada HOV Plan Update - Public Outreach Strategy

Technical Memorandum

TO: Jeff Lerud, NDOT **DATE:** October 1, 2013

FROM: Lucie Melchert, Melchert Consulting
John Karachepone, Jacobs

SUBJECT: Public Outreach Strategy

COPIES:

1.0. SUMMARY

High Occupancy Vehicle (HOV) Lanes have been in operation on US 95 in Las Vegas for approximately six years. However, these HOV lanes had a length of approximately six miles (in each direction) until 2012, when the HOV network was expanded to approximately 12 miles in each direction. Therefore the HOV system is a small percentage of the freeway system in Las Vegas and most residents have not used the HOV system nor have experience with it. Interstate-15 (I-15) through the central resort area has had Express Lanes (a type of managed lane) for approximately five years. More residents have experience with express lanes (compared to HOV lanes) since express lanes in Las Vegas are not occupancy or vehicle restrictive, and because there is more traffic volumes on I-15. The Department however, plans to expand the HOV lane network in southern Nevada consistent with the HOV Plan. As such, an effective framework to gain public acceptance and understanding of HOV lanes is the key to the successful implementation of the Southern Nevada HOV Plan Update (Plan Update).

This document will act as a public outreach and public education blueprint for the Southern Nevada HOV Plan Update, a valley-wide plan that will guide the expansion of the HOV system for the next 20 years.

1.1. About the Southern Nevada HOV Plan Update

The goal of the Southern Nevada HOV Plan Update is to update the original 2007 Southern Nevada HOV Plan, with an emphasis on near-term priorities. The Plan Update will take into account projects that have been constructed, upcoming projects that have been programmed for construction, and planned projects outlined in the current Southern Nevada Regional Transportation Plan (RTP). The most recent adopted mode-choice travel demand model will be used in the development of travel demand forecasts to support the Plan Update.

2.0. PUBLIC OUTREACH STRATEGY

2.1. Public Outreach Strategy Objectives

The outreach and education strategy for this Plan Update has a number of short- and long-term objectives in order to ensure its success.

Short Term Objectives

- Inform and educate the public and stakeholders on progress of the Plan Update
- Meet with and survey HOV lane stakeholders to gain insight and knowledge about current issues, concerns and questions regarding HOV lanes.
- Connect with current and potential partnering agencies to develop open dialogue and mutual ownership about the Plan Update.
- Identify opportunities to promote, discuss and share information with the media and the public about the Plan Update, HOV lanes and their features and benefits.
- Identify opportunities to engage stakeholders in the participation process prior to plan development; to provide and receive feedback on HOV Plan elements.

Long Term Objectives

- Maintain long-term trust relationships with partnering agencies through HOV Plan and project implementation.
- Significantly increase public knowledge and acceptance of HOV lanes.

2.2. Outreach Strategies for This Plan Update

For the purposes of this Plan Update, our strategy will be three-fold: 1) engage, 2) inform, and 3) foster ownership.

Engage:

1. Develop a focused Agency and Stakeholder Workshop Group to foster a more interactive and dynamic public process with those directly affected by the HOV Plan Update
 - i. Workshops focused on issues specific to group members. Conduct one agency workshop - participation by technical staff from local agencies (Cities, County, RTC, Transit, NHP, etc.) – for issues of specific interest to these agencies. Conduct a second workshop for affected companies (resort community employers, special interest user groups, etc.) with focus on issues of interest to this user group.
 - ii. Members of Workshop Groups to be individuals of some influence, standing in their respective stakeholding parties.
 - iii. Members to help push forward and champion education and information efforts within their groups during Plan finalization and implementation.

Inform

Support the NDOT Public Information office with any NDOT efforts to provide updates and information to the media and public regarding the HOV lanes.

1. Grassroots Outreach
 - a. Support NDOT in seeking opportunities to inform and discuss the Plan Update and current/future HOV projects and conversions to area boards and commissions.
 - b. Seek opportunities to support NDOT Public Information at community events, fairs, meetings with the purpose of informing and educating about the Plan Update and HOV lanes, their function, features and benefits.
2. Media, Internet and Social Media: NDOT-led with assistance from consultant. Provide NDOT Public Information Office with information as needed to inform the public about the Plan Update.

Foster Ownership:

1. Create open dialogue with stakeholders. All questions are addressed, and open communication will continually be encouraged.
2. Presentations to area councils, commissions and boards about the Plan Update. Up to three (3) presentations will be performed during the project.
3. Workshop participants to help disseminate plan updates to the community.

2.3. Public Outreach Key Personnel

1. Nevada Department of Transportation
2. Regional Transportation Commission of Southern Nevada (RTC)
3. Consultant – Jacobs, Melchert Consulting, CA Group

2.4. Schedule

The public outreach program will be conducted over the course of the Southern Nevada HOV Plan Update, August 2013 through May 2014.

Appendix I

I-15 Express Lane to HOV Lane Conversion - Public Information Plan

Technical Memorandum

TO: Jeff Lerud, NDOT **DATE:** February 3, 2014

FROM: Lucie Melchert, Melchert Consulting
John Karachepone, Jacobs

SUBJECT: I-15 Express Lane to HOV Conversion Public Information Plan -

COPIES: Southern Nevada HOV Plan Update Project Management Team

1.0. INTRODUCTION

High Occupancy Vehicle (HOV) lanes are not a new concept in Southern Nevada. HOV lanes have become a familiar part of US 95 in Las Vegas for approximately six years, increasing from 6 miles in each direction to 12 miles in each direction on a well-traveled section of the freeway.

The I-15 corridor stretches 33 miles through the Las Vegas urban area. Nine of these 33 miles have express lanes operating within the central Las Vegas resort corridor area. They were placed in operation as an interim improvement and have been accepted by the public and perceived as effective. The Nevada Department of Transportation's (NDOT) long-term goal is to promote carpooling and transit use by implementing HOV lanes in Southern Nevada. HOV lanes are the type of managed lanes that have been previously approved through several environmental (NEPA) actions on both I-15 and US 95. As the existing HOV system becomes more complete and sustainable, it is necessary to convert the existing I-15 express lanes to one or more HOV lanes. This conversion may pose some challenges from a public perception standpoint, and will require a multi-faceted approach to educating the public and obtaining local agency endorsement.

NDOT plans to convert the I-15 express lanes to (one or more) HOV lanes in 2018 at the time of the Project Neon opening. The conversion process will progress over the course of four to five years, beginning during the planning stage and continuing to the opening of the new HOV lanes.

Converting express lanes to HOV lanes requires a program that continues outreach and education to a variety of stakeholder groups; and to build and create broad community support for the conversion. Previous public outreach efforts are summarized and a plan specific to the conversion of the express lanes to HOV is then presented. This following plan follows the NDOT public outreach practices and standards, as well as the Public Outreach Primer of the NDOT *Managed Lanes and Ramp Metering Manual*.

2.0. PREVIOUS PUBLIC OUTREACH ACTIVITIES

The concept of HOV or Express lanes has been a topic that NDOT has previously presented and opened for discussion to the community during various public meetings supporting large NDOT planning projects in Las Vegas. By opening the topic of HOV lanes to the public early on, stakeholders had the opportunity to learn more about the features and benefits of HOV lanes, ask questions, and become accustomed to possible HOV use in the future.

Previous public meetings where information regarding HOV and Express lanes were presented include:

- 7/17/2012 – Southern Nevada HOV Plan, E.A. (Environmental Assessment) 73363,
- 9/21/2010 – I-15 at Starr Interchange/HOV Plan, E.A. 73215,
- 3/24/2010 – I-15 Design Build/Express Lanes South, E.A.73215,
- 7/1/2009 – I-15 South Design Build, E.A.73215
- 11/18/2008 – I-15 South Corridor Improvements, E.A. 73215
- 1/30/2007 – US 95 HOV Lanes and Southern Nevada HOV Plan, E.A. 73363
- 10/19/2006 – I-15 Managed Lanes from I-215 to Sahara Ave. Interchange Proposed Improvements, E.A. 73334

3.0. PUBLIC INFORMATION PLAN

3.1. Objectives

The public information and education strategy for the conversion of the I-15 Express Lanes to HOV lanes has the following objectives:

1. Educate the driving public about the impending lane conversion, why it is necessary, and its features and benefits.
2. Inform affected stakeholder groups, including agencies and elected officials, residents, businesses and travel/transport companies about the conversion, how it will affect them, schedules and timelines, and the ultimate benefit of this conversion for them.
3. Develop an open, interactive dialogue with the public about the conversion to ensure timely and accurate information sharing.
4. Foster community understanding and acceptance of the HOV system.
5. Maintain, strengthen, and broaden corporate and community partnerships in the project area.

3.2. Target Markets

The I-15 HOV lanes have a number of audiences that will be impacted by, and benefit from, this conversion project. These stakeholders include:

- Corridor users (the driving public)
- Municipal, state, county, and federal government agencies in the project area
- Elected officials representing the affected areas at both the local and state level
- Transportation companies

- Businesses along the corridor (including resort corridor properties) Neighborhoods adjacent to the corridor
- Community and special interest groups; including minorities, underserved, disadvantaged, and disabled citizens
- Local media outlets
- Law enforcement agencies

3.3. Outreach Strategies

The conversion of the I-15 express lanes to HOV lanes would take place in 2018 at the time of Project Neon opening. Between now and 2018, the public education and outreach process needs to be an ongoing, multifaceted approach and target the wide range of audiences that would ultimately be affected by and/or will use the system.

Therefore, an effective education and outreach program uses various techniques, including information sharing, schedule updates, mitigation of misinformation and concerns, and fostering of community ownership.

Over the next four to five years, the conversion process will progress through the project's planning, design, and implementation stages. The extended time frame allows implementation of a thorough outreach program. To be effective, the outreach is conducted with specific goals in mind for each of the planning, design, and implementation stages, as follows:

Planning Stage (2014)

The planning stage is a critical time for public education and outreach. It is imperative to reach out early to stakeholders and the public to build a foundation for the conversion. The planning stage is an opportune time to strengthen relationships and establish communication lines with the range of stakeholders that will be affected by the conversion.

Boards, Commissions and Councils

The State Transportation Board, the Southern Nevada Regional Transportation Commission, the Las Vegas, North Las Vegas, Henderson, and Boulder City Councils, and the Clark County Commission are contacted and briefed about the conversion. At this stage of the project, NDOT meets with the boards, commissions and councils as a group to explain the overall project and goals related to HOV lanes, along with their features and benefits. The boards have the opportunity to voice concerns and ask questions. From this input, NDOT gains an understanding of the current sentiment and level of understanding of the current HOV system among these boards, commissions and councils.

Outreach Strategies

During initial planning, the strategies below effectively educate the target audiences about the I-15 HOV lanes and give NDOT the information needed to effectively build on the outreach program in later project stages.

I-15 Express Lane to HOV Conversion-Public Information Plan

Strategy	Target Audience	Objectives
Briefings and Presentations	Area boards and commissions Local government jurisdictions	Provide information regarding the proposed HOV lanes, their features and benefits. Promote reciprocal partnership and communication.
Stakeholder Workshops	Large area businesses, employers, resort properties Special interest groups Law enforcement agencies Government agency representatives	Promote information sharing. Foster open discussion regarding the proposed system and its impacts, features, and benefits. Develop and maintain community partnerships for the project. Collaboratively mitigate any concerns and issues regarding these proposed HOV lanes.
Media Outreach	General public	Provide HOV lane information to educate and inform the public about the proposed lanes; their impacts, features and benefits; and enforcement of HOV lanes. Take advantage of other project public meetings and community events to distribute informational material.
Website/Social Media	General public	Educate and inform the public about the proposed lanes; their impacts, features and benefits; and enforcement of HOV lanes. Provide relevant information about the project and its impacts, features, and benefits.

Strategy	Target Audience	Objectives
Project Coordination	Project representatives and consultants for adjacent and overlapping projects Local agency representatives	Coordinate individual project elements. Collaborate on any impending issues and/or conflicts that may arise as a result of the proposed HOV lanes.

Design Stage (2015-2017)

Once the project moves into the design phase, a more thorough level of education and outreach is conducted with all target audiences. During the design stage, specific project design elements are more definitive and detailed; and the specific impacts (and which stakeholders would be impacted) become more evident. At this point, stakeholders are targeted individually to foster and maintain a positive dialogue regarding the HOV lane conversion.

It is recommended that the outreach strategies used during the planning stage would continue during the design stage. The more individualized outreach during the design stage includes the following:

Elected Officials

A number of elected officials represent the project area. All of the elected officials representing impacted areas are individually briefed and updated regarding the project to establish individual relationships and create a support base for the project.

The elected officials to be briefed early in the design stage include the Nevada State Governor’s office; the Clark County Commissioners representing Districts A, B, D, E, F and G; and the Las Vegas City Council members representing Wards 1, 3 and 5. In addition, the Nevada State Assembly and the Nevada State Senate representatives for the project area should be briefed about the conversion. These meetings focus on open discussion about the HOV lane features, and the benefits and impacts of the conversion. It is expected that the individual representatives would voice concerns of specific stakeholder groups in their respective areas.

Major Businesses and Employers along the Corridor

These stakeholders are expected to be vocal and involved, and need special attention because they are the ultimate users and advocates of the HOV system. Meeting with the large businesses and resort properties in the corridor gives NDOT information about expected use by their employees and patrons, level of understanding about the benefits and impacts of the conversion, and concerns about the conversion. Many of the resort properties likely want to know more about the HOV lanes and how they would benefit and impact their employees and patrons.

Adjacent Neighborhoods

The proposed HOV lanes would impact a number of communities along this corridor, and thousands of area residents would ultimately use the HOV lanes. Public information

meetings provide an environment to introduce the I-15 HOV lanes with their features and benefits, and give area residents the opportunity to ask questions and discuss concerns. These meetings provide NDOT information regarding the public’s current level of understanding of the I-15 corridor and HOV lanes. This input helps NDOT develop the messages needed to foster public support of the conversion as the project develops.

Special Interest Groups

Groups that will benefit from information regarding the HOV conversion would be sent information during this phase. Highway user groups that would benefit educationally from the conversion would include members of the freight industry, the Nevada Trucking Association, AAA, AARP, Nevada Department of Motor Vehicles, driving schools, and other driver’s education organizations in Southern Nevada. Further, minorities, underserved, disadvantaged and disabled advocacy organizations and groups should also be sent information about the HOV conversion.

Outreach Strategies

During design, the following strategies are used:

Strategy	Target Audience	Objectives
Briefings and Presentations	Area boards and commissions Local government jurisdictions	Provide updated information regarding the proposed HOV lanes design, their benefits, and impacts. Foster reciprocal partnership and communication.
Meetings with Elected Official	Locally and regionally elected officials State assembly and senate representatives	Establish relationships with area representatives and their agencies. Garner support and advocacy for the project. Identify concerns.
Meetings with Businesses and Resort Properties Along the Corridor	Resort properties, large businesses and employers	Share information regarding project and its features, benefits, and impacts. Answer questions and identify concerns.

I-15 Express Lane to HOV Conversion-Public Information Plan

Strategy	Target Audience	Objectives
Meetings with Adjacent Neighborhoods	Residents in the corridor	<p>Foster a better understanding of the project.</p> <p>Develop relationships and open communication channels with affected neighborhoods.</p> <p>Build community ownership and acceptance of project.</p> <p>Identify concerns.</p>
Public Meetings	<p>General driving public</p> <p>Adjacent neighborhoods</p> <p>Area businesses, resort properties, employers</p>	<p>Gather information regarding current understanding of the corridor and HOV lanes.</p> <p>Answer questions and concerns regarding the proposed HOV lanes.</p> <p>Discuss features, benefits and impacts of the proposed HOV lanes.</p>
Media Outreach	General public	Educate and inform the public about the HOV lanes; their impacts, features and benefits; and enforcement of HOV lanes.
Website/Social Media	General public	Educate and inform the public about the HOV lanes; their impacts, features and benefits; and enforcement of HOV lanes.
Information Table	General public	Provide HOV lane information at other project public meetings and community events.
Project Coordination	<p>Project representatives and consultants for adjacent and overlapping projects</p> <p>Local agency representatives</p> <p>Law enforcement and Traffic Incident Management members</p>	<p>Coordinate project elements to avoid issues, conflicts and impacts to the public.</p> <p>Collaborate on any impending issues and/or conflicts that may arise as a result of the proposed HOV lanes.</p>

Strategy	Target Audience	Objectives
Educational and Information Materials (handouts, advertisements)	Future HOV lane users Transportation companies Area businesses and employers Special interest groups including minorities, underserved, disadvantaged and disabled	Provide information about the I-15 HOV lanes; their impacts, features and benefits; and enforcement of HOV lanes.
Speakers Bureau	Area businesses, employers	Present current information about the HOV lanes and how they will benefit businesses and their employees. Mitigate misinformation and answer questions about the proposed lanes.

Implementation Stage (2018)

Once the individual design elements of the I-15 HOV lane conversion are determined, the impacted stakeholders and HOV lane users need to know about specific timelines, implementation schedules, and impacts of the conversion. In addition to the aforementioned strategies, the following elements facilitate a smooth conversion.

Detailed Implementation Schedules

As NDOT prepares to convert the lanes, it is imperative to share the specific timelines associated with the conversion. These schedules are made available to all stakeholder entities, area businesses/employers, affected residents, and law enforcement agencies. The schedules may be shared through NDOT’s website, a project website, dynamic message signs, direct mailers to larger stakeholder groups, and the media. Sharing the schedules informs the public specifically about when and how the conversion will occur, when they will be impacted by the conversion, and when enforcement of the HOV lanes will begin.

HOV Lane Refreshers and Tutorials

Although there are HOV lanes operating on US 95, many I-15 corridor users might not have enough experience using HOV lanes to understand how they work. During this time, specific outreach with HOV lane refreshers and tutorials regarding how to use them and how they will be enforced enhances understanding and promotes usage of the I-15 HOV lanes. Outreach can be done through media; corridor tours for the large employers, resort and union executives, and transportation companies in the valley. Participation in community events and information/pamphlet tables at public venues, such as government centers and Department of Motor Vehicle locations, are additional ways to promote understanding and use of the new HOV system on I-15.

Opening Event

An opening ceremony at the time of full lane conversion draws attention to the new lanes and provides an opportunity for supporters of the conversion to demonstrate their support and excitement about the benefits of the HOV lanes.

Public Service Announcements

Public Service Announcements will bring added attention to the converted HOV lanes, with an emphasis on benefits to users and enforcement of the lanes.

4.0. SUMMARY

The conversion of the I-15 Express Lanes to HOV lanes will be an extended effort, requiring a significant amount of proactive outreach and education, as well as concerted coordination with corridor stakeholders, users and adjacent projects. If initialized early in the project, the outreach and education component of this conversion builds a basis of understanding with the stakeholders that continues to implementation. The outreach effort over the course of the project increases and improves understanding and acceptance of the HOV lanes, as well as encourages use of the lanes. By providing stakeholders and future HOV lane users timely and accurate information, and creating an open dialogue regarding these HOV lanes, NDOT obtains buy-in of the larger community, and the I-15 HOV lanes have a high level of support and use when implemented.

Prepared by:
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