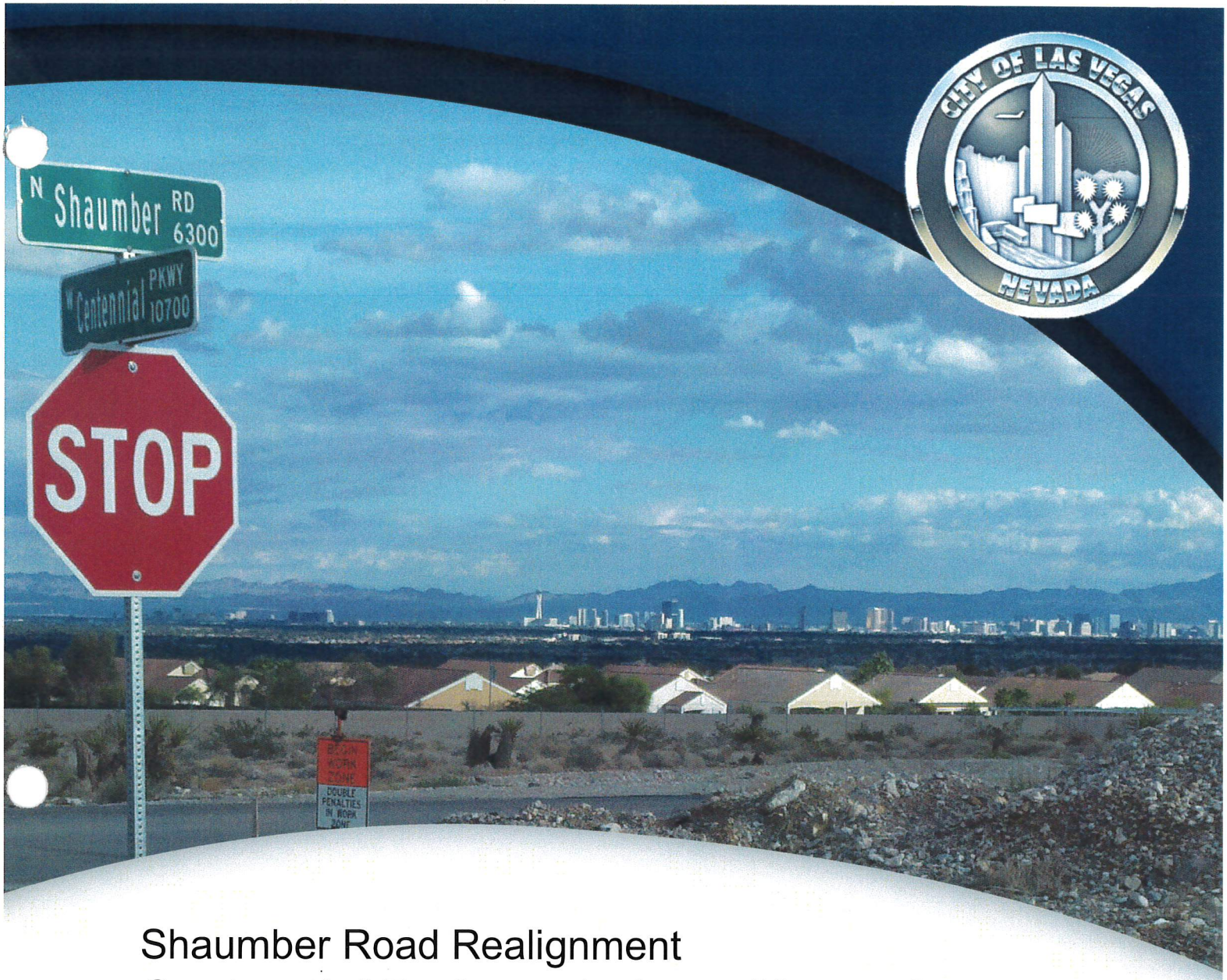

Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Prepared for

City of Las Vegas

PROFESSIONAL ENGINEER-STATE OF NEVADA
JEFF N. GRIEST
Exp. 6-30-13
CIVIL
No. 17156
1/30/13

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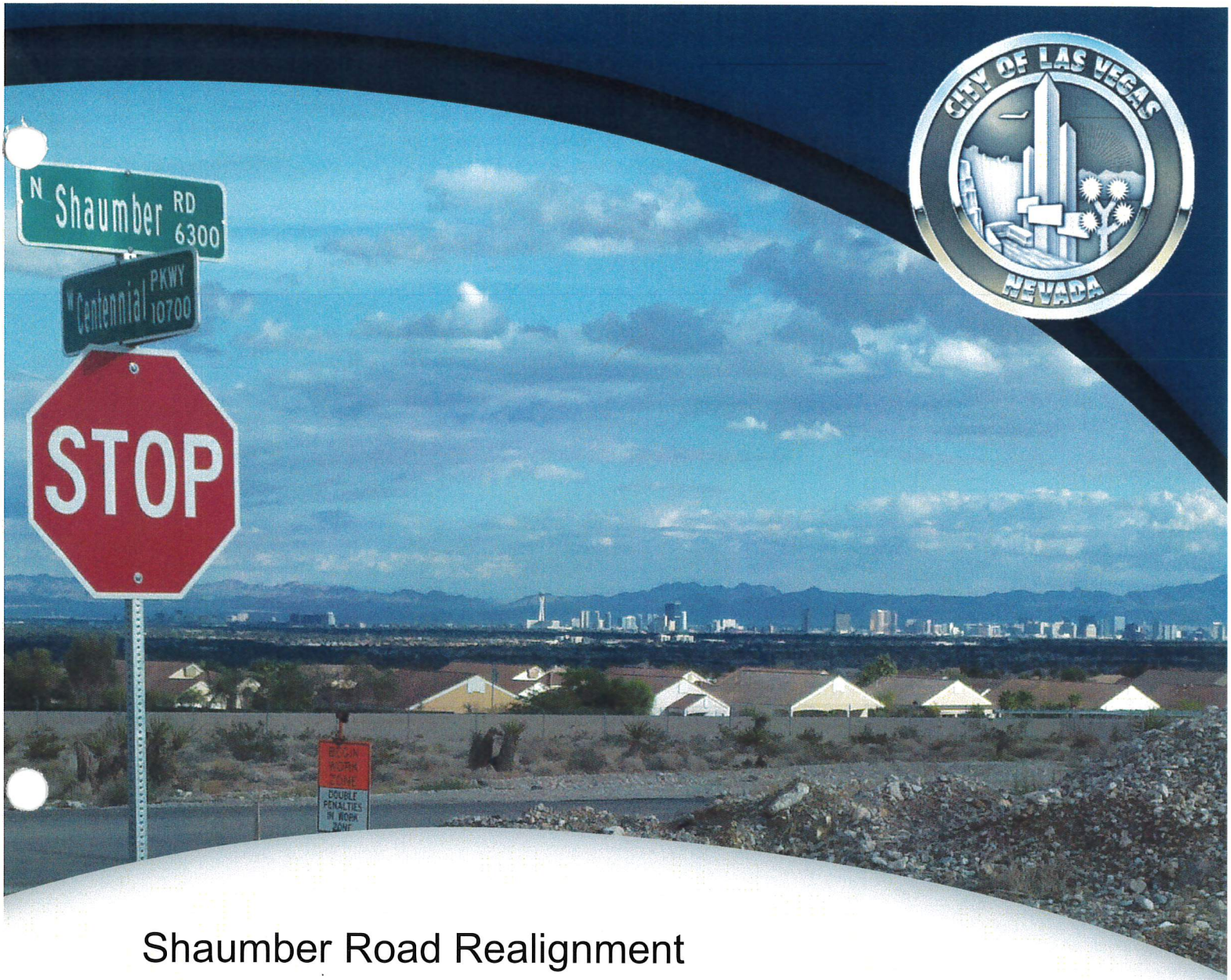

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1.0 INTRODUCTION

1.1 STUDY OVERVIEW AND PURPOSE

On August 14, 2012, the City of Las Vegas entered into a Prime Design Services Agreement with CH2M HILL Engineers, Inc. for the *Shaumber Road Realignment Project*. The scope of services to be provided with this project shall be for the design and preparation of contract drawings for the realignment of Shaumber Road. The project is divided into three tasks:

- **Task 1**: Prepare alternative alignments for the future 100-foot Shaumber Road from Centennial Parkway to Ann Road.
- **Task 2**: Prepare final design improvement plans for a 44-foot temporary pavement road within the 100-foot right-of-way from Centennial Parkway to Ann Road.
- **Task 3**: Prepare alternative alignments for the future 100-foot Shaumber Road from Ann Road to Lone Mountain/Cliff Shadows Parkway.

This Alternative Alignments Design Memorandum (AADM) is intended to provide information pertinent to Tasks 1 and 3 including roadway alignment alternatives for the future 100-foot roadway, utility impacts, and hydrologic and hydraulic analysis of the ultimate conditions to determine the ultimate right-of-way footprint for the roadway corridor. In addition, a preliminary investigation of the temporary 44-foot roadway configuration, including an interim condition hydrologic and hydraulic analysis, was performed to investigate the need for any additional drainage easements or temporary easements that would be required for the Task 2 improvements. See Figure 1 – *Vicinity Map*.

Following the decision on the preferred alignment, the City of Las Vegas Right-of-Way Department (City ROW) will work toward acquiring the necessary BLM right-of-way for the project. Task 2 for design of a temporary 44-foot roadway will commence after the BLM right-of-way for the preferred alternative alignment has been acquired.

Multiple horizontal and vertical alignment alternatives were explored for the realignment of Shaumber Road. The key design consideration during the alternatives exploration phase was to find a best fit balanced alignment that traverses through BLM owned land parcels, and avoids the private parcels

Vicinity Map

Shaumber Road Realignment Project

Centennial Parkway to Lone Mountain Road/Cliff Shadows Parkway

Figure 1

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along the corridor. Following the alternative alignment investigation, two alignment alternatives were shortlisted and have been presented in this design memorandum.

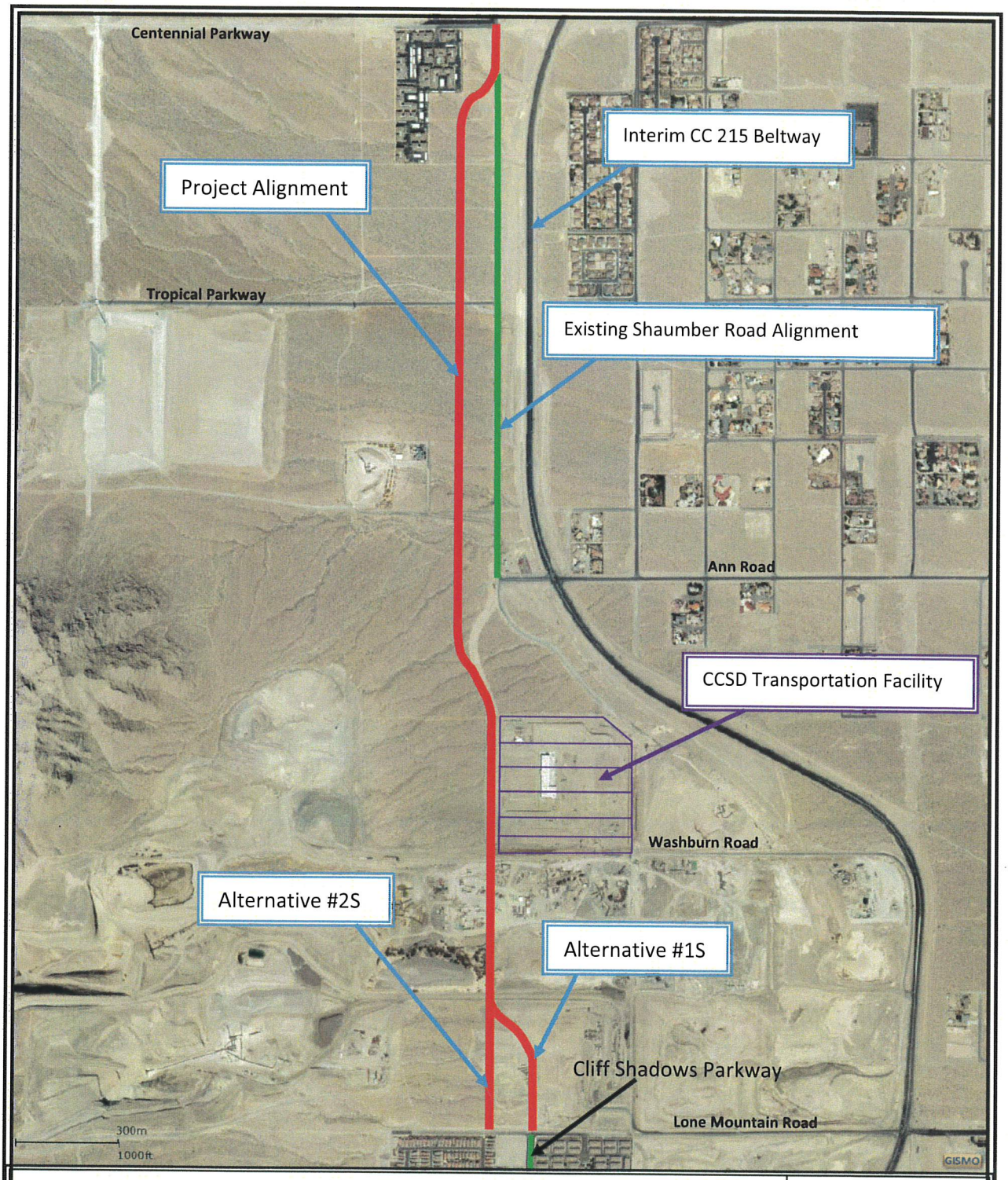
Alternatives #1N and #1S included reversing curves with design speeds of 40 mph just south of Centennial Parkway, and a direct tie-in to Cliff Shadows Parkway at Lone Mountain Road. Alternatives #2N and #2S included reversing curves with design speeds of 45 mph just south of Centennial Parkway, and Shaumber Road tying in to Lone Mountain Road approximately 340-feet west of Cliff Shadows Parkway. Refer to Section 2.0 for additional discussion on project alternative alignments.

In addition to the roadway alignment alternatives, four sewer alternatives were examined to extend the existing 24-inch sanitary sewer stub located on the northeast corner of the Clark County School District (CCSD) Northwest Satellite Transportation Facility (intersection of Hammer Land and Alpine Ridge Way) north to Tropical Parkway. Refer to Section 3.1 for additional discussion of the 24-inch sanitary sewer extension.

Preliminary hydrologic and hydraulic analyses were performed for this AADM. The analyses included an investigation of the ultimate condition flows conveyed to the 100-foot roadway alignment in the full-build-out condition, as well as an investigation of the interim condition flows conveyed to the 44-foot roadway based on the existing development within the watershed. Refer to Section 4.0 for additional discussion of the hydrologic analysis and Section 5.0 for additional discussion of the hydraulic analysis.

1.2 SITE LOCATION

The project area is located in Sections 25 and 36 of Township 19 South, Range 59 East, Clark County, Nevada. The northern end of the project is located at Centennial Parkway and the existing Shaumber Road alignment. The Shaumber Road realignment will be approximately 450-feet west of the existing Shaumber Road between Centennial Parkway and Ann Road. To the south of Ann Road, Shaumber Road will curve to the east and then head south along the west side of the Clark County School District (CCSD) Northwest Transportation Facility. The southern end of the project will terminate at Lone Mountain Road near Cliff Shadows Parkway. See Figure 2 – *Project Area Map*.



Project Area Map

Shaumber Road Realignment Project

Centennial Parkway to Lone Mountain Road/Cliff Shadows Parkway

Figure 2
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1.3 SITE DESCRIPTION

The existing Shaumber Road alignment is improved to some extent between Grand Teton Drive in the north and Ann Road in the south. North of Centennial Parkway, Shaumber Road is a fully improved street section within public right-of-way with residential development of both sides and features amenity zones and landscaping. South of Centennial Parkway to Ann Road (Task 1 limits), Shaumber Road is a 24-foot paved access road located within BLM right-of-way grants along the west side of the Western Beltway right-of-way. The traffic on Shaumber Road to the south of Centennial Parkway is primarily for access to the Western Beltway at the Ann Road interchange. Since the current Shaumber Road alignment is directly adjacent to the Western Beltway right-of-way, the Shaumber Road alignment will be shifted approximately 450-feet west of the current alignment south of Centennial Parkway to allow for development on both sides of the roadway. This shift also allows the existing Shaumber Road alignment to be used for the continuation of the CC-215 Beltway trail alignment, as well as a Clark County Regional Flood Control District facility alignment. The existing realigned roadway corridor consists mostly of undeveloped land, open desert with desert shrub vegetative cover.

South of Ann Road to Washburn Road (northern half of Task 3 limits), the existing Shaumber alignment shifts approximately 250-feet to the west and then back to the east to run adjacent to the CCSD facility between Hammer Lane and Washburn Road. From Washburn Road to Lone Mountain Road, the Shaumber Road alignment runs through the active gravel pits run by Nevada Ready Mix and Las Vegas Paving. As can be seen in the alternative alignment profiles, the gravel pit excavation has resulted in significant relief through this segment of the corridor and roadway construction would require large amounts of fill material.

2.0 ROADWAY ALTERNATIVES DESIGN

The City's current Streets and Highways Master Plan classifies Shaumber Road as an 80-foot secondary collector. The City's Unified Development Code, however states that an 80-foot major collector street has a minimum right-of-way width of eighty feet and an existing or potential design capacity of two travel lanes of traffic in each direction with a center turn lane or raised median with left turn pockets. Any additional right-of-way will provide areas for landscaping and other amenities. The ultimate Shaumber Road realignment is based on a 100-foot right-of-way consisting of two travel lanes in each direction, a bike lane in each direction, and full streetscape improvements including amenity zone, sidewalk, and landscaping buffer. This is consistent with the existing roadway improvements north of Centennial Parkway. Additional roadway right-of-way will be necessary for turn lanes at intersections and for bus turnouts.

The Shaumber Road realignment project is divided into three tasks:

- **Task 1**: Prepare alternative alignments for the future 100-foot Shaumber Road from Centennial Parkway to Ann Road.
- **Task 2**: Prepare final design improvement plans for a 44-foot temporary pavement road within the 100-foot right-of-way from Centennial Parkway to Ann Road.
- **Task 3**: Prepare alternative alignments for the future 100-foot Shaumber Road from Ann Road to Lone Mountain/Cliff Shadows Parkway.

The City ROW department will work toward acquiring the necessary BLM right-of-way for the project following the completion of the alternative alignments task. Design of the Task 2 improvements will commence after the BLM right-of-way for the preferred alternative alignment has been acquired.

Multiple horizontal and vertical alignment alternatives were investigated for the realignment of Shaumber Road. The key design consideration during the alternatives exploration phase was to find a best fit balanced alignment that traverses through BLM owned land parcels, avoiding any private parcels along the alignment. The roadway centerline was used to find a best-fit vertical alignment with the existing topography. The site features a significant cross-slope across the roadway section, approximately 3% to 6%. Some of the grade difference on the east and west sides of the roadway could be accommodated by grading within the outside 5-foot amenity zone, but adjacent development would need to accommodate any additional grade difference.

An existing NV Energy transmission pole located approximately 150-ft south and 30-ft west of the Centennial Parkway/Shaumber Road intersection drove the consideration of the following alignment alternatives just south of the intersection, between Centennial Parkway and Azure Drive:

- Reversing curves (R=765-ft), normal crown with a design speed of 40 mph
- Reversing curves (R=1050-ft), normal crown with a design speed of 45 mph
- Reversing curves (R=1200-ft), 4% super elevation with a design speed of 55 mph

The first two alternatives are featured in this Design Memorandum. The third alternative, 1200-ft radius/4% super/55 mph design speed, was eventually eliminated as a viable alternative due to the fact that it would require a radius through the intersection, reconstruction of the roadway north of the intersection, and there is no need for 55-mph design speed since Shaumber Road to the north of Centennial Parkway is posted 35-mph. Refer to Section 3.0 for additional discussion of project site utilities.

The proposed Shaumber Road alignment between Azure Drive and Ann Road is 450-feet west of the existing Shaumber Road alignment that extends between Centennial Parkway and Ann Road. This offset was chosen such that the realigned Shaumber Road stays within the BLM owned parcel limits and avoids the private parcels along the corridor. The eastern edge of the proposed 100-foot right-of-way was placed on the western edge of the two large private parcels along the roadway alignment. As discussed above, grading will be accommodated within the outside amenity zone and with the development of the parcel.

In the vicinity of Ann Road, the proposed alignment was 'smoothed' to eliminate a pair of reversing curves that were created by the alignment constructed for the CCSD facility. Eliminating the reversing curves will provide better site visibility and roadway geometry. The alignment follows the existing alignment along the west side of the CCSD facility to Washburn Road.

South of Washburn Road, the Shaumber Road alignment crosses through an active gravel operation. This results in significant topographic relief between Washburn Road and Lone Mountain Road. Since the gravel mining operations are currently ongoing and could result in significant changes to topography over time, the vertical profile of the roadway was set to provide a best-fit between the elevation of the roadway at Washburn Road and elevation of the existing Lone Mountain Road. Two horizontal alignments were considered to tie-in to the existing Lone Mountain Road alignment:

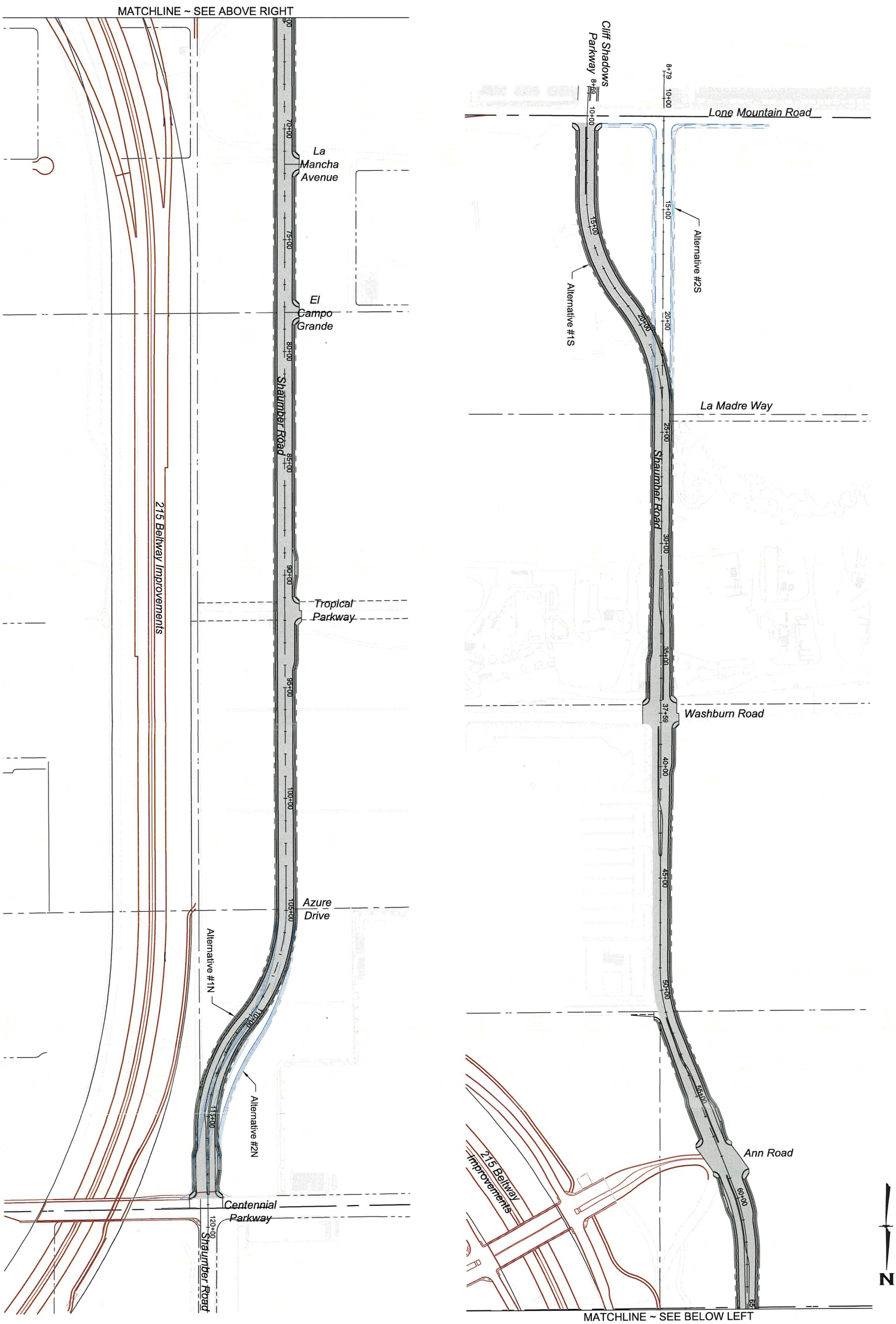
- A 'straight-shot' north-south Shaumber Road alignment from the west side of the CCSD facility with an off-set T- intersection to the Cliff Shadows Parkway alignment at Lone Mountain Road.
- Reversing curves (R=765-ft) starting at La Madre Way, with normal crown and a design speed of 40 mph in order to provide a four-legged intersection with Cliff Shadows Parkway.

Based on discussions with City Planning, Traffic, and ROW divisions, the two alignment alternatives for the roadway from Centennial Parkway to Azure Drive and relating to the tie-in at Lone Mountain Road would be considered for further evaluation. See Figure 3 – *Project Layout Exhibit* for a plan view of the two shortlisted alternatives. The two alignment alternatives vary at the north end between Centennial Parkway and Azure Drive (Alternative #1N and Alternative #2N) and at the south end between La Madre Way and Lone Mountain Road (Alternative #1S and Alternative #2S).

2.1 PREFERRED SHAUMBER ROAD ALTERNATIVE

The preferred alternative combines Alternative #1N and Alternative #1S as shown in Figure 3 – *Project Layout Exhibit*. Between the two northern roadway alternatives, Alternative #1N is the preferred alternative because the 40 mph design speed layout allows for a 313-foot tangent length to the intersection of Shaumber Road and Centennial Parkway, and would result in a horizontal clearance of 206-feet from the NV Energy transmission pole to the PT of the reverse curve. With Alternative #2N and the 45 mph design speed, the tangent length to the intersection would only be 125-feet and the clearance to the pole from the PT of the reverse curve would only be 18-feet. At the southern end, Alternative #1S is the preferred option because it ties directly into Cliff Shadows Parkway at Lone Mountain Road, whereas Alternative #2S would create an off-set T-intersection to Cliff Shadows Parkway at Lone Mountain Road.

For roadway cross sections of the preferred alternative, see Appendix A-1.1 – *Shaumber Road Cross Sections*. The assumed structural section of Shaumber Road preferred alternative for cost estimating purposes is a 6-inch asphalt concrete pavement section with a 12-inch thick sub base of Type II aggregate base. This assumption will be modified as necessary once geotechnical analysis of the alignment is available.



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TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: PROJECT LAYOUT EXHIBIT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.
DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: 01/15/2013

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SHAUMBER ROAD REALIGNMENT

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2.2 SHAUMBER ROAD CROSS STREETS

Apart from improvements to Shaumber Road, all cross streets were looked at in order to preserve right-of-way for future intersections. Complete street concepts adopted by the Regional Transportation Commission of Southern Nevada were assumed for all major cross streets. The City of Las Vegas Planning Division has the following trails / public transportation paths currently programmed on major cross streets in the project limits:

- A 10-foot equestrian trail path on the south side of Centennial Parkway.
- A 10-foot public transportation trail path on the north side of Tropical Parkway.
- A 10-foot public transportation trail path on the north side of Ann Road.
- A 10-foot public transportation trail path on the north side of Lone Mountain Road.

For typical sections of major cross streets, see sheet CS1 – *Cross Street Typical Sections* in Appendix A-1.3. Refer to sheet CR1 - *Curb Return Detail* in Appendix A-1.3 for an illustration of curb return that ties the Shaumber Road section to the cross street with trail section. Limits of BLM acquisition and additional landscape zones beyond the right-of-way were also shown in the graphic.

3.0 UTILITIES

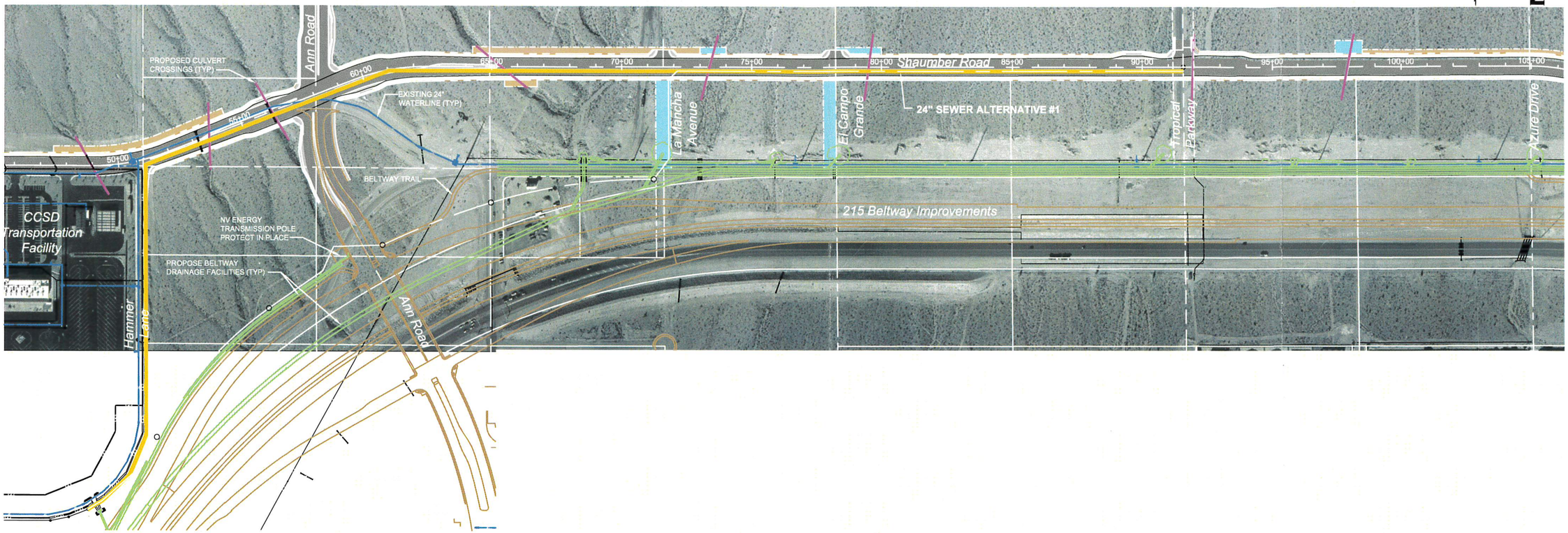
3.1 24-INCH SANITARY SEWER EXTENSION

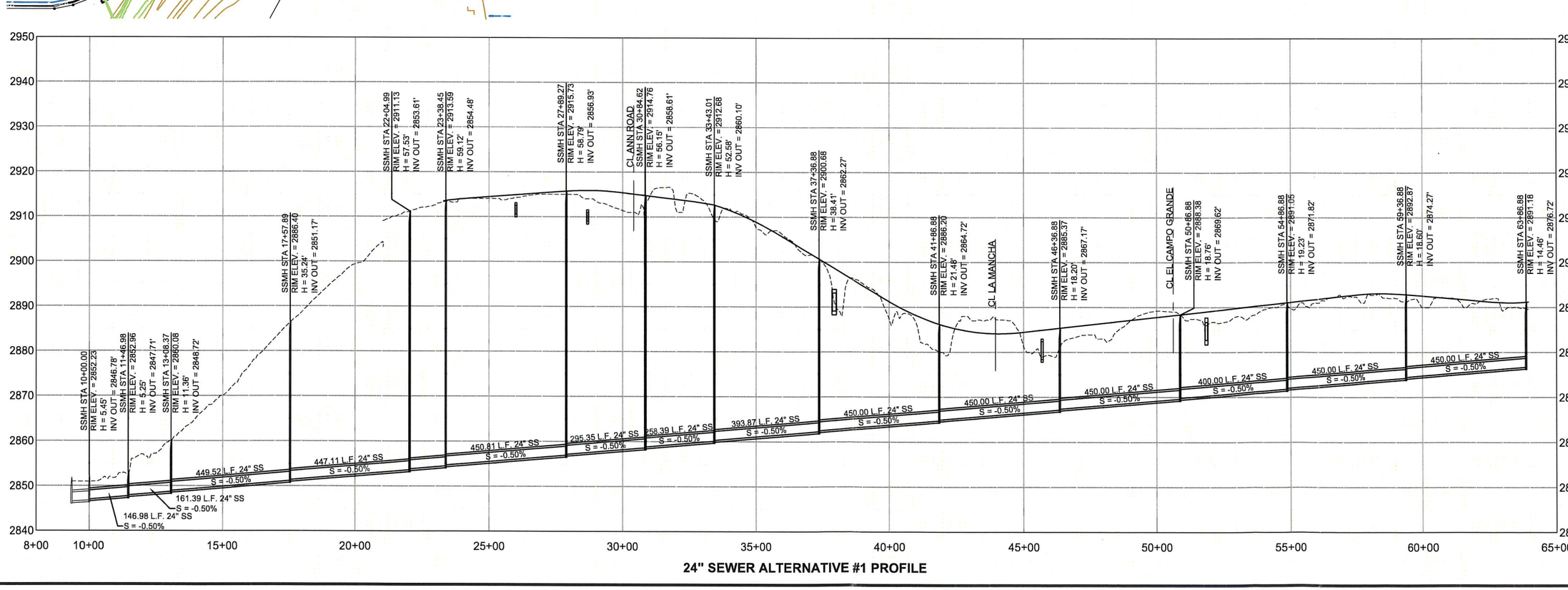
An existing 24-inch sanitary sewer stub is located at the northeast corner of the Clark County School District (CCSD) Northwest Satellite Transportation Facility's northeast corner, just south of Hammer Lane in Alpine Ridge Way. The City of Las Vegas sewer master plan extends the existing sewer facility north to Tropical Parkway in the future. Four alignment alternatives for the sewer extension were investigated for the memorandum:

- **Sewer Alternative #1** – this alternative follows the Hammer Lane alignment to Shaumber Road. Then the alignment turns north and follows the Shaumber Road alignment to Tropical Parkway. Based on the existing topography of the area, this alignment results in sewer facility depths over 59-feet in Shaumber Road between Hammer Lane and Ann Road. Refer to Figure SS1 – *Shaumber 24" Sewer Alignment, Alternative #1 Plan And Profile.*

- **Sewer Alternative #2** – this alternative would align the sewer within a proposed 20-foot minimum easement on Clark County Public Works property directly adjacent to the west right-of-way line of the Western Beltway to Ann Road. The alignment would then turn west in Ann Road to the Shaumber Road alignment and follow Shaumber Road north to Tropical Parkway. Based on existing topography, this alternative alignment would still result in sewer facility depths of approximately 57-feet at the Ann Road/Shaumber Road intersection. See Figure SS2 – *Shaumber 24" Sewer Alignment, Alternative #2 Plan And Profile.*

- **Sewer Alternative #3** – this alternative would align the sewer within a proposed 20-foot minimum easement on Clark County Public Works property directly adjacent to the west right-of-way line of the Western Beltway to Ann Road. At Ann Road, the alignment would follow the approximate alignment of the proposed Beltway trail to the north of Ann Road to the existing Shaumber Road alignment at the intersection with the historical Ann Road alignment. The sewer alignment would then turn north in the existing Shaumber





24" SEWER ALTERNATIVE #1 PROFILE

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CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

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DRAWN BY:
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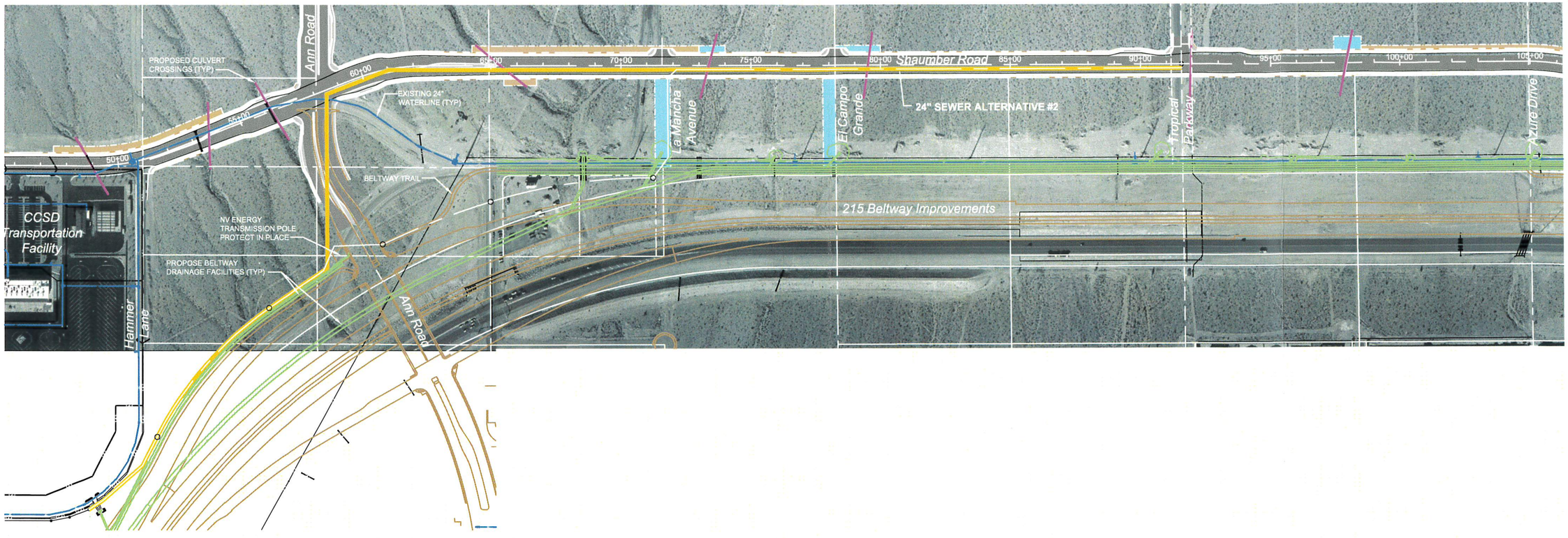

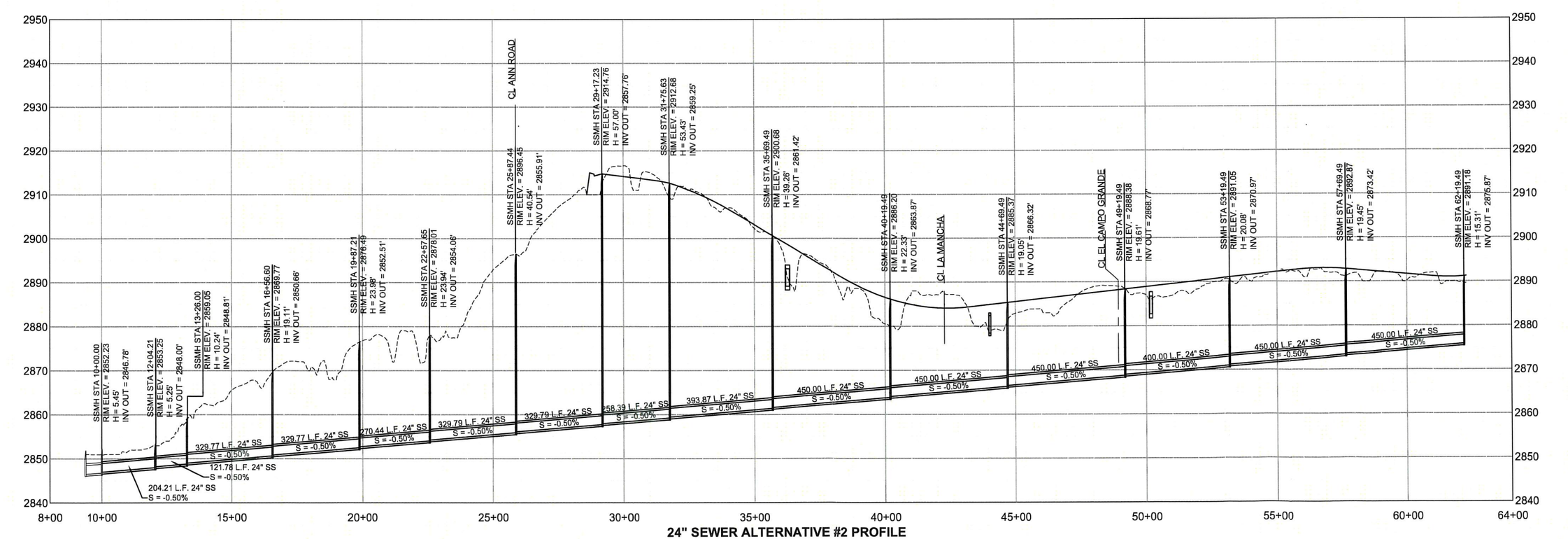

24" SEWER ALTERNATIVE #2 PROFILE

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PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: 01/15/2013

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2 of 4
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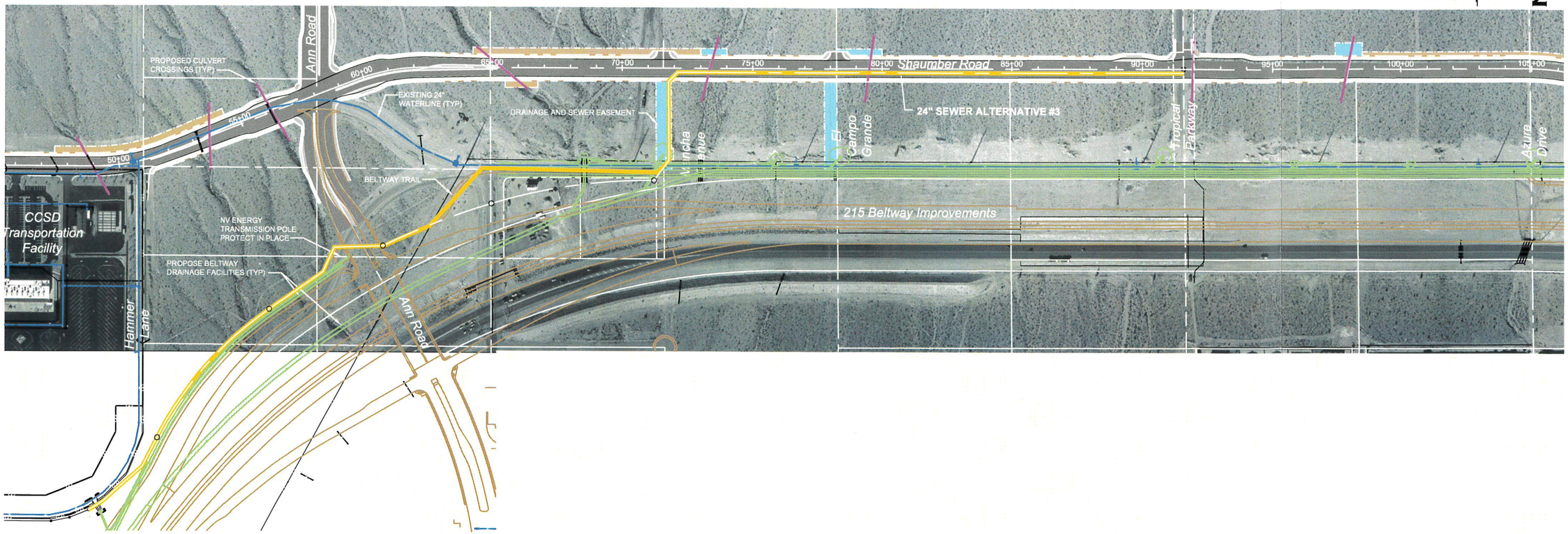
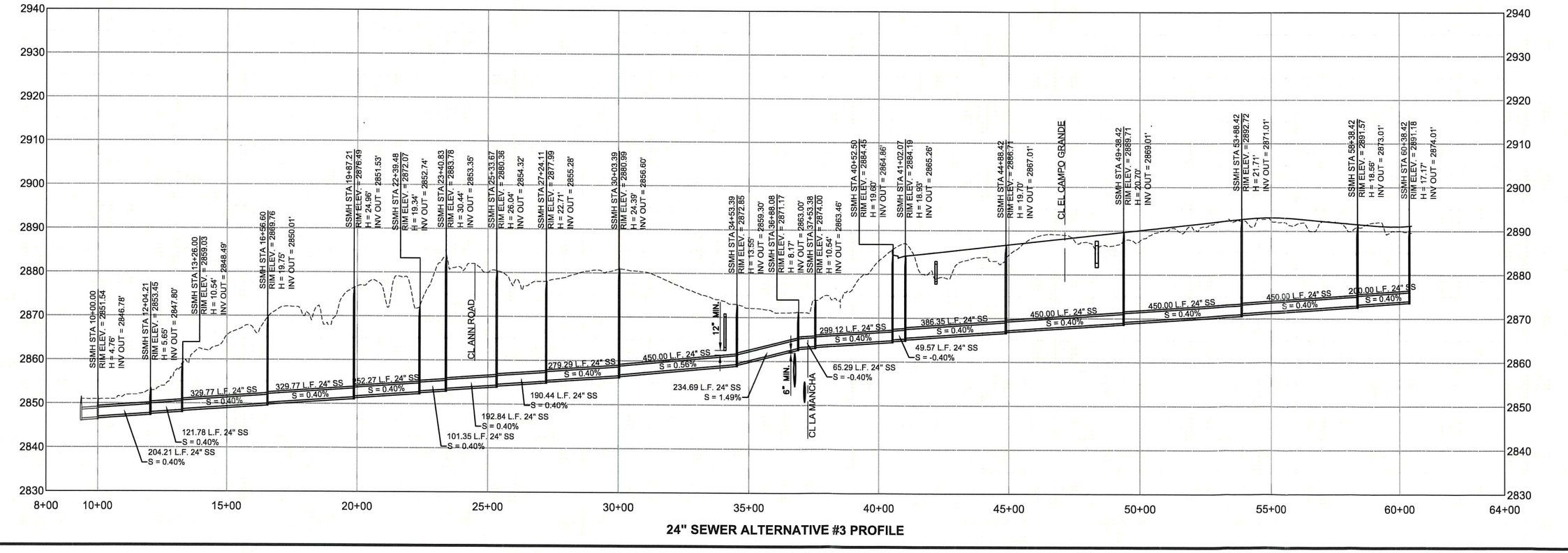
Road alignment to La Mancha Avenue, turn west in La Mancha Avenue into a proposed easement to the proposed Shaumber Road alignment, and turn north to Tropical Parkway. A sewer and drainage easement will be obtained on the La Mancha Avenue alignment between the existing Shaumber Road alignment and the proposed Shaumber Road alignment for the sewer and future storm drain facilities. This will result in sewer facility depths of approximately 5-feet to 30-feet. This alternative does conflict with proposed laterals to the CCRFCD drainage facility in the existing Shaumber Road alignment. See Figure SS3 – *Shaumber 24" Sewer Alignment, Alternative #3 Plan And Profile.*

- **Sewer Alternative #4** – this alternative would align the sewer within a proposed 20-foot minimum easement on Clark County Public Works property directly adjacent to the west right-of-way line of the Western Beltway to La Mancha Avenue. At La Mancha Avenue, the alignment would turn west in La Mancha Avenue into a proposed easement to the proposed Shaumber Road alignment, and turn north to Tropical Parkway. A sewer and drainage easement will be obtained on the La Mancha Avenue alignment between the existing Shaumber Road alignment and the proposed Shaumber Road alignment for the sewer and future storm drain facilities. This will result in sewer facility depths of 5-feet to 30-feet. This alternative allows for clearance over the proposed laterals to the CCRFCD drainage facility in the existing Shaumber Road alignment. See Figure SS4 – *Shaumber 24" Sewer Alignment, Alternative #4 Plan And Profile.*

The Sewer Alternative #4 alignment would reduce the cover over the proposed facility and minimize the conflicts with proposed drainage facilities in the project area. This alternative would require a 20-foot minimum sewer easement adjacent to the Western Beltway right-of-way within Clark County Public Works property. The Collection System Master Plan also shows a proposed sewer extension to the west in Ann Road from Shaumber Road. Based on preliminary analysis, if this proposed 10-inch sewer facility is extended to the west in Ann Road from the 24-inch mainline sewer at an estimate maximum longitudinal slope of 4.79%, the resulting sewer depths at the intersection of Shaumber Road and Ann Road are approximately 30-feet. Additional analysis would be necessary to verify actual design depths of the Ann Road sewer extension.





24" SEWER ALTERNATIVE #3 PROFILE

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PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

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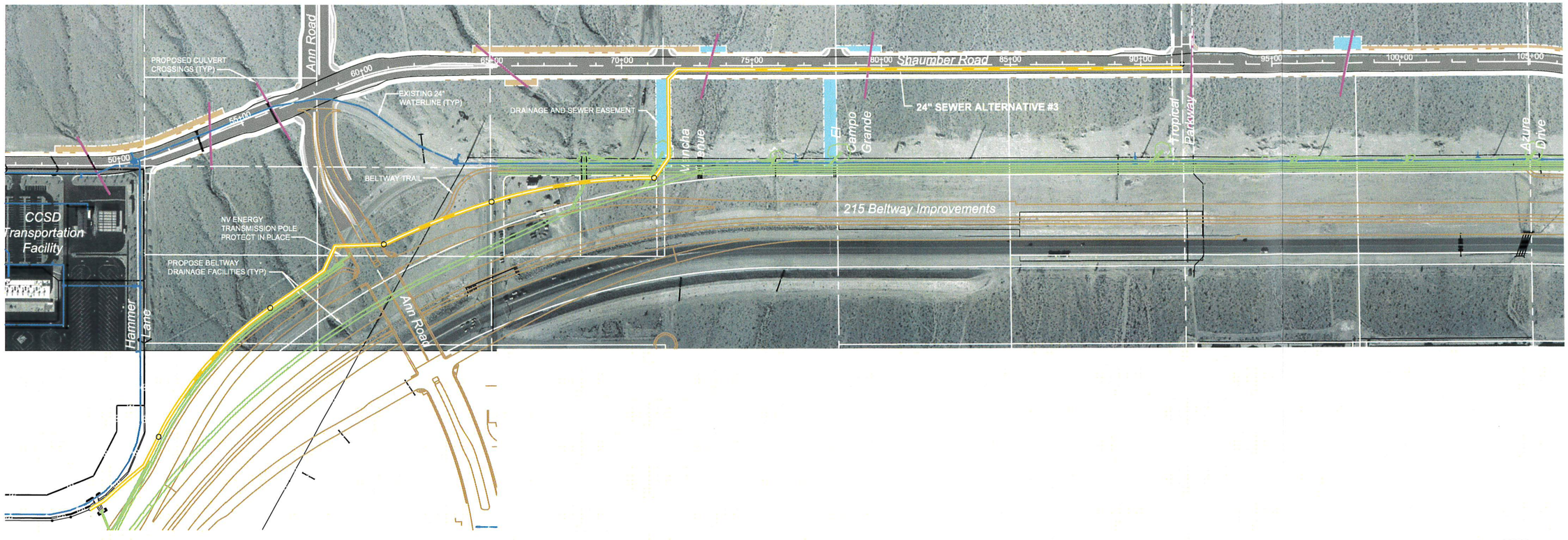
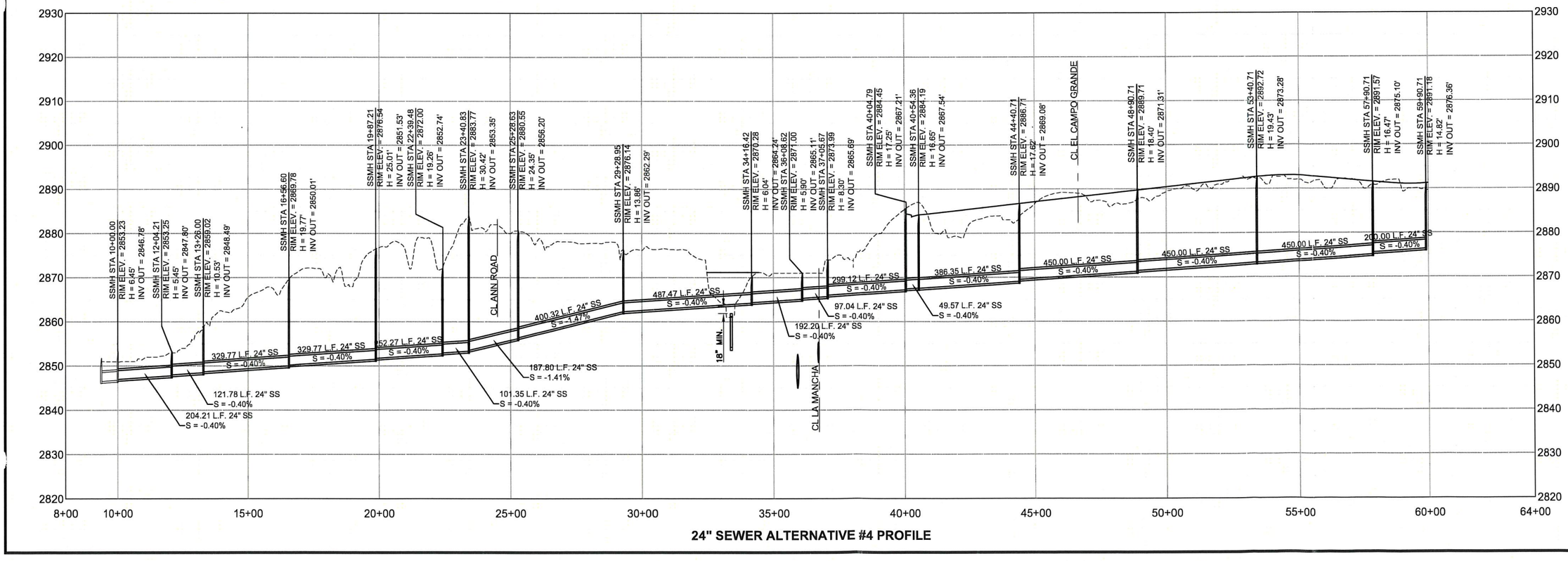




24" SEWER ALTERNATIVE #4 PROFILE

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.
DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: 01/15/2013

CITY OF LAS VEGAS NEVADA

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER 24" SEWER
ALTERNATIVE #4 PLAN + PROFILE

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: SS4
4 of 4
DRAWING NO.

BID NO.

PROJECT NO.

3.2 EXISTING UTILITIES

Several existing utilities are present at the intersection of Shaumber Road and Centennial Parkway, as well as within the existing Shaumber Road alignment and within the roadway on the west side of the CCSD Transportation Facility. There is an existing NV Energy transmission pole line located on the west side of the existing Shaumber Road alignment and the pole located just south of Centennial Parkway will be incorporated into the Shaumber Road median. See Section 2.0 for additional discussion. For the majority of the proposed alignment, Shaumber Road will be going through undeveloped desert where no utilities exist at this time. See Table 3.2 – *Existing Utilities* for a description of the existing utilities present on the project site.

TABLE 3.2 – EXISTING UTILITIES

INTERSECTION OF SHAUMBER ROAD/CENTENNIAL PARKWAY	
UTILITY	**LOCATION**
Cox Pull Box	Southeast corner of intersection
Under Ground Electric	East-west through intersection
NV Energy Transmission Pole	Approx. 150-ft south, 30-ft west of intersection
4" PE Gas	East-west through intersection
12" Sanitary Sewer	East-west through intersection
12" Water	East-west through intersection
30" Water	North-south through intersection
CLARK COUNTY SCHOOL DISTRICT TRANSPORTATION FACILITY	
UTILITY	**LOCATION**
24" D.I.P Water	North-south on west side of CCSD Facility

4.0 HYDROLOGIC ANALYSIS

Interim condition (44-foot roadway with existing offsite development) and ultimate condition (100-foot roadway with ultimate fully-developed offsite area) hydrologic/hydraulic analyses were performed for this memorandum to analyze the impacts of drainage on the proposed roadway. The ultimate condition hydrologic and hydraulics analysis consisted of quantifying offsite flows that reach the project alignment from the west and investigating how the flow would be conveyed to meet criteria. In the ultimate condition, development to the west of the roadway, mostly future cross streets, will collect and convey offsite flows to the Shaumber Road alignment. This memorandum includes a preliminary look at a 10-year facility within the alignment that would convey flows to the CCRFCD facility located in the existing Shaumber Road alignment. The interim condition hydrology and hydraulics analyses included an investigation to quantify the interim condition runoff conveyed to the roadway alignment and analysis of culverts to convey the interim condition 100-year storm event flows under the 44-foot roadway from Centennial Parkway to Ann Road.

4.1 PREVIOUS HYDROLOGY STUDIES

The following is a list of previous Hydrology Studies that have been utilized in development of this study.

1. *Las Vegas Valley Flood Control Master Plan Update*, Clark County Regional Flood Control District, 2008.
2. *90% Design Submittal for the Lone Mountain/Beltway Detention Basins and the Gowan Beltway West Channel*, by GC Wallace, August 2008.

The hydrologic analysis performed for the 2008 MPU was used as the basis for the hydrologic model presented in this memorandum. Basin parameters and flow routing was reanalyzed and modified as necessary to reflect field conditions. In addition, several approved technical drainage studies for the adjacent developments were referenced for the hydrologic analysis performed in this study. Refer to Section 6.0 for a list of referenced technical drainage studies. The hydrologic determination within these studies were reviewed and agreed upon in concept.

4.2 FLOODPLAIN INFORMATION

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community Panel Number 32003C1750E and 32003C2150E, Clark County, Nevada and Incorporated Areas, effective date September 27, 2002, the Shaumber Road Realignment is located within a Zone "X", which is described as areas outside of the 0.2% annual chance (500-year) floodplain. The FIRM Map panels discussed above have been provided in Appendix A-3 of this study.

4.3 REGIONAL FLOOD CONTROL MASTER PLAN INFORMATION

Existing flood control facilities are found west of the project site. They are presented in the CCRFCD 2008 MPU as Gowan Ann Road Detention Basin Facilities, facility numbers GOAN 0070, GOAN 0068, GOAN 0067, GOAN 0061, and GOAN 0044. Proposed MPU facilities found east of the proposed Shaumber Road realignment are described in the CCRFCD 2008 MPU as Gowan Beltway West, facility numbers GOBW 0291, GOBW 0264, GOBW 0244, GOBW 0227, GOBW 0183, GOBW 0160, GOBW 0132, GOBW 0128, and GOBW 0052. Proposed MPU facilities found west of the proposed Shaumber Road realignment near Lone Mountain Road are presented as Gowan Box Canyon, and include facility numbers GOBX 0015, GOBX 0116, GOBX 0118, and GOBX 0140. Other proposed facilities include an extension of GOAN 0044 to the east described as GOAN 0000, GOAN 0062, and GOAN 0063. These existing and proposed facilities can be found on the 2008 MPU Figure F-18, and the tributary area to these facilities can be found on Figure H-18. Refer to Appendix A-2 for a copy of these figures. The facilities discussed above are listed in Table 4.3 – 2008 MPU Flood Control Facilities.

TABLE 4.3 – 2008 MPU FLOOD CONTROL FACILITIES

ID / River Mile	Exist. / Prop.	Facility Description	Length (ft)	Flow (cfs)	Slope (%)
GOWAN ANN ROAD DETENTION BASIN FACILITIES					
GOAN 0070	Existing	Soil Cement Channel 10'x4'-7"; 4:1 SS	3125	1045	3.00
GOAN 0068	Existing	Soil Cement Channel 20'x6'; 0:1 SS	112	1045	6.70
GOAN 0067	Existing	Bridge 20'x6' @ Tropical Pkwy	36	1045	3.98
GOAN 0063*	P0	Conc Channel 25'x4.5'; 2:1 SS	5534	2270	4.80
GOAN 0062*	P0	Upgrade to 479 ac-ft Ann Road DB	-	6028	-
GOAN 0061	Existing	364 ac-ft Ann Road Detention Basin	-	6028	-
GOAN 0044	Existing	54" RCP Outlet	1153	156	1.90
GOAN 0000*	P1	54" RCP	2289	156	3.44
GOWAN BELTWAY WEST					
GOBW 0291*	P2	8'x6' RCB	1255	795	1.70
GOBW 0264*	P2	10'x8' RCB	1434	1143	0.88
GOBW 0244*	P2	10'x8' RCB	1070	1566	0.60
GOBW 0227*	P2	12'x8' RCB	900	2185	2.78
GOBW 0183*	P2	15'x8' RCB	2320	2869	1.05
GOBW 0160*	P2	16'x8' RCB	1230	2869	1.05
GOBW 0132*	P2	Conc Channel 14'x10'; 0:1 SS	1286	2869	5.00
GOBW 0128*	P2	Conc Channel 20'x10'; 0:1 SS	190	3429	25.00
GOBW 0052*	P2	589 ac-ft Lone Mountain-Beltway DB	-	5140	-
GOWAN BOX CANYON					
GOBX 0140*	P0	Conc Channel 50'x4.5'; 2:1 SS	900	4332	7.00
GOBX 0118*	P0	460 ac-ft Box Canyon Detention Basin	-	4332	-
GOBX 0116*	P0	18" RCP Outlet	100	40	-
GOBX 0015*	P0	66" RCP	6600	40	6.55

* 2008 MPU Facility proposed at the time of this study

4.4 INTERIM CONDITION HYDROLOGIC ANALYSIS

The main purpose of the interim condition analysis was to determine the flowrates in the natural washes across the project area in the 100-year storm event, because these flows are conveyed to the proposed Shaumber Road alignment and must be conveyed along the roadway in ditches or under the roadway in proposed culverts to avoid overtopping of the road in the 100-year event. The HEC-1 software, provided by the U.S. Army Corps of Engineers, was used for the analysis of offsite storm runoff. Subbasin delineation was based on historical contours provided by the U.S. Geological Survey from 1983. The majority of the project tributary area has experienced minimal change since that date. However, the area between Washburn Road and Lone Mountain Road has changed significantly since 1999 due to gravel pit operations that are currently ongoing. Historical contours were used for this area

because significant changes affecting flow routes could occur by the time this segment of Shaumber Road is constructed. Flow patterns in this area of the project will need to be verified as the design moves forward. Interim condition flow rates can be found in Table 4.4.

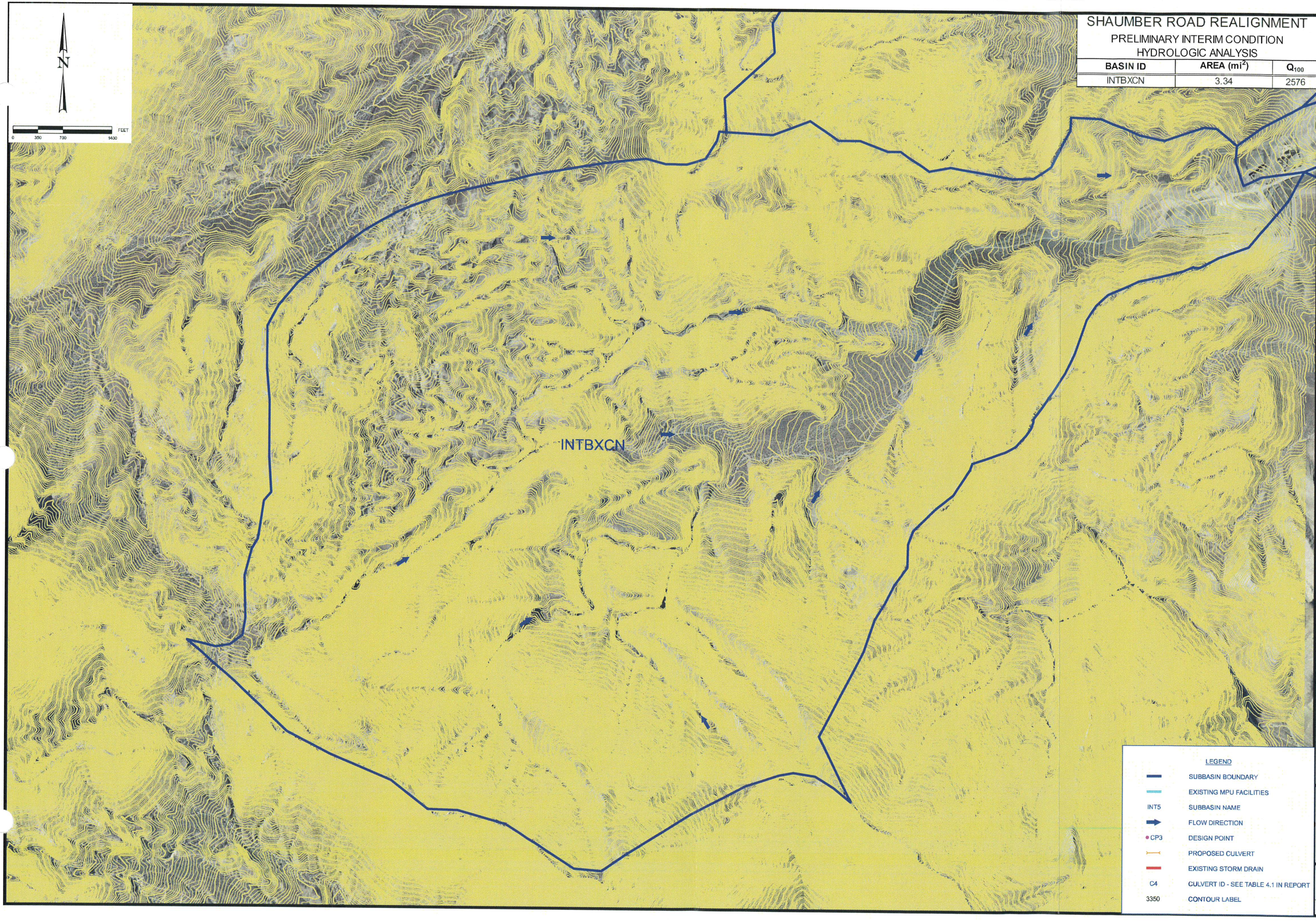
What about Box Canyon Basin

The interim condition 100-year storm event HEC-1 model can be found in Appendix B-4.1, and a flowrate summary table can be found in Appendix B-1. See Figure 4 –*Preliminary Interim Condition Subbasin Map*. Figure 4A shows full limits of subbasin INTBXCN.

Interim condition subbasins reflect the existing conditions of the watershed. Most of the tributary area is undeveloped, consisting of open desert with desert shrub vegetative cover. There is a small amount of developed land, high density residential, that results in slightly higher curve numbers for subbasins in which this developed land exists. Curve numbers for the interim condition are generally in the high eighties. Supporting curve number calculations for the interim condition as well as a soil map showing interim condition subbasins can be found in Appendix B-3.1 – *Interim CN Calculations*.

TABLE 4.4 – INTERIM CONDITION FLOW RATE VALUES

LOCATION	HEC-1 NODE	100-YR FLOW (cfs)	AREA (mi^2)
Approx. 430' south of Centennial Pkwy at Shaumber Road	INT2A	40	0.02
Approx. 870' south of Centennial Pkwy at Shaumber Road	INT2B	44	0.02
Approx. 1065' south of Centennial Pkwy at Shaumber Road	INT2C	74	0.04
Approx. 750' north of Tropical Pkwy at Shaumber Road	CP2	166	0.11
Tropical Parkway and Shaumber Road	CP3	313	3.93
El Campo Grande and Shaumber Road	CP4	255	0.16
La Mancha Avenue and Shaumber Road	INT8	374	0.20
Ann Road and Shaumber Road	INT9	235	0.13
Hammer Lane and Shaumber Road	INT10	360	0.21
Washburn Road and Shaumber Road	INT12	107	0.09
Approx. 300' south of Washburn Road at Shaumber Road	CP5	2609	3.50
Approx. 475' north of La Madre Way at Shaumber Road	INT13B	127	0.11
Lone Mountain Road and Shaumber Road	CP6	450	0.28
North of Lone Mountain between Alternative 1S and 2S	INT17	20	0.01



SHAUMBER ROAD REALIGNMENT
PRELIMINARY INTERIM CONDITION HYDROLOGIC ANALYSIS

BASIN ID	AREA (mi^2)	Q_{100}
INTBXCN	3.34	2576

REVISIONS

NO.	DATE	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.
DESIGNED BY: MS
DRAWN BY: SB
CHECKED BY: JG
DATE: 1/16/2013

LEGEND

	SUBBASIN BOUNDARY
	EXISTING MPU FACILITIES
INT5	SUBBASIN NAME
	FLOW DIRECTION
CP3	DESIGN POINT
	PROPOSED CULVERT
	EXISTING STORM DRAIN
C4	CULVERT ID - SEE TABLE 4.1 IN REPORT
3350	CONTOUR LABEL

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: PRELIMINARY INTERIM CONDITION
SUBBASIN MAP

DRAFT

SHEET: FIGURE 4A

DRAWING NO.

HANSEN NO.:

BID NO.:

4.5 ULTIMATE CONDITIONS HYDROLOGIC ANALYSIS

For the ultimate condition hydrologic analysis, the subbasin delineations presented in the 2008 MPU analysis were modified to more closely represent field conditions and to incorporate additional design points along the proposed facility alignment. The 10-year storm event was analyzed in order to perform preliminary sizing for a local facility in Shaumber Road that will convey 10-year storm flows to the MPU facility located in the existing Shaumber Road alignment to the east. Seven design points were established throughout the tributary area along Shaumber Road where flow will be conveyed east to the proposed MPU facility. The design points are located at: 1) Centennial Parkway/ Shaumber Road, CP1; 2) Azure Drive/Shaumber Road, EFPOA1; 3) Tropical Parkway/Shaumber Road, CP2; 4) El Campo Grande Ave./Shaumber Road, EFPOA3; 5) La Mancha Avenue/Shaumber Road, CP3; 6) Hammer Lane/Shaumber Road, HLBW1-C; and 7) Lone Mountain Road/Shaumber Road, CP4. The 10-year flows north of Washburn Road will be collected and conveyed in the local facility in Shaumber Road to each design point and then east to the MPU facility. For this analysis, the 10-year flows south of Washburn Road were shown to be collected and conveyed south to Lone Mountain Road and then east to the MPU facility. The 100-year flows will follow the same paths, and will be conveyed within Shaumber Road with a smaller portion conveyed in the local facility. This flow routing will be analyzed further in later phase of design to verify downstream system capacities.

The 100-year flows will mainly flow east at each intersection toward the proposed MPU facility. Future drainage memorandums will include further analysis of the flows that are conveyed in Shaumber Road to meet CCRFCD criteria, and that velocity times depth is less than 8-feet per second (fps). 10-year and 100-year storm event HEC-1 models can be found in Appendix B-4.2 and B-4.3, respectively. See Figure 5 –*Preliminary Ultimate Condition Subbasin Map.* Figure 5A shows the full limits of the BOXCANYON subbasin.

The ultimate condition subbasins reflect the future conditions of the watershed. Future land use consists of mostly very high density residential, with some parks, golf courses, some public facility residential land use, and a small amount of open desert with desert shrub vegetative cover to the west of the project site. Subbasin curve numbers for the tributary area in the developed condition are generally in the nineties. Supporting calculations for the ultimate condition curve numbers can be

SHAUMBER ROAD REALIGNMENT
PRELIMINARY ULTIMATE CONDITION HYDROLOGIC ANALYSIS

BASIN ID	AREA (mi^2)	Q_{10}	Q_{100}
BOXCANYON	3.41	1432	3178

N

0 350 700 1400 FEET

BOXCANYON

LEGEND

- SUBBASIN BOUNDARY
- EXISTING MPU FACILITIES
- PROPOSED CAT A MPU FACILITIES
- PROPOSED CAT B MPU FACILITIES
- SURFACE FLOW DIRECTION
- CP3 DESIGN POINT
- 3350 CONTOUR LABEL

REVISIONS

NO.	DATE	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER:
PROGRAM MANAGER: DAVID BOWERS, PE, PTOE / JEREMY LEAVITT, P.E.
DESIGNED BY: MS
DRAWN BY: SB
CHECKED BY: JG
DATE: 1/16/2013

CITY OF LAS VEGAS NEVADA

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: ULTIMATE CONDITION
SUBBASIN MAP

DRAFT

SHEET: FIGURE 5A

DRAWING NO.

HANSEN NO.:

BID NO.:

found in Appendix B-3.2. Ultimate condition flow rates for specified design points can be found in Table 4.5.

TABLE 4.5 – ULTIMATE CONDITION FLOW RATE VALUES

LOCATION	HEC-1 NODE	10-YR FLOW (cfs)	100-YR FLOW (cfs)	AREA (mi^2)
Centennial Parkway and Shaumber Road	CP1	421	826	0.48
Azure Drive and Shaumber Road	EFPOA1	170	328	0.16
Tropical Parkway and Shaumber Road	CP2	187	379	3.91
El Camp Grande Avenue and Shaumber Road	EFPOA3	134	267	0.14
La Mancha Avenue and Shaumber Road	CP3	603	1147	0.51
Hammer Lane and Shaumber Road	HLBW1-C	255	476	0.23
Lone Mountain Road and Shaumber Road	CP4	625	1191	4.05

5.0 PROPOSED DRAINAGE FACILITIES

5.1 INTERIM CONDITION FACILITIES

The interim condition analysis focuses on preliminary design of culverts that would convey the 100-year interim flow under the 44-foot roadway for the Shaumber Road realignment and roadside ditch configurations to investigate possible right-of-way impacts. Culverts are designed to be placed where natural washes cross the Shaumber Road realignment; if a natural wash does not exist where flow reaches the alignment, that flow will be conveyed along the west side of Shaumber Road in a roadside ditch until it is intercepted by a culvert or series of culverts. For preliminary calculations the cross section of the ditch will have a 6:1 side slope from the edge of pavement and a 4:1 side slope to daylight. Preliminary ditch calculations can be found in Appendix C-2. Refer to Table 5.1.1 – *Preliminary Design – Interim Condition Roadside Ditches.*

TABLE 5.1.1 – PRELIMINARY DESIGN – INTERIM CONDITION ROADSIDE DITCHES

LOCATION	HEC-1 NODE	FLOW (cfs)	SLOPE (%)	VELOCITY (FT/S)	DEPTH (FT)
From Azure Dr. south 590' to culvert C4	CP2	166	1.55	6.57	2.25
From 700' north of Tropical Pkwy south to culvert C5	INT4B	51	1.55	4.89	1.44
From Tropical Pkwy south to culvert C6	INT6	98	0.67	4.21	2.16
From 730' north of El Campo, south to culvert C6	INT7	255	0.67	5.34	3.09
From El Campo Grande south to culvert C7	INT8	374	0.67	5.88	3.57
From Ann Road north to culvert C8	INT9	235	3.60	9.84	2.19
From Ann Road south to culverts C9 and C10	INT10	360	0.45	5.02	3.79
From 440' south of Hammer Lane, south to culvert C11	INT12	107	1.57	5.92	1.90
From 520' south of Washburn Rd, south to culvert C13	INT13B	127	1.85	6.57	1.97
From La Madre Way south to culvert C14	INT15	178	1.85	7.15	2.23

Notes: 1) Ditch side slopes are 6:1 from edge of pavement and 4:1 to daylight
2) See Figure 4, Interim Condition Subbasin Map for culvert locations

The orifice calculation module within the Flowmaster software program was used to determine preliminary culvert sizes. For the preliminary culvert sizing, a maximum height limit of 4-feet was used for most calculations to minimize the impact of the culverts on the roadway profile. A discharge

coefficient of 0.55 was used in the orifice calculations, and the headwater was set to 1-foot above the top of the proposed culvert. Reinforced Concrete Pipe (RCP) culverts and Reinforced Concrete Box (RCB) culverts are both included in the preliminary design. Preliminary culvert profiles, C1-C11, for the interim roadway are included in Appendix A-1.2 – *Interim Roadway Culvert Profiles*. Based on the preliminary profile, several drainage easements will be required to daylight the culverts downstream. See Table 5.1.2 – *Preliminary Design – Interim Condition Culvert Sizes*. Refer to Appendix C-1 for all preliminary culvert calculations.

TABLE 5.1.2 – PRELIMINARY DESIGN – INTERIM CONDITION CULVERT SIZES

DESIGN POINT	CULVERT ID	DESIGN FLOW (cfs)	APPROXIMATE STATION	CULVERT SIZE
INT2A	C1	40	114+00	(1) 36" RCP
INT2B	C2	44	109+25	(1) 36" RCP
INT2C	C3	74	107+60	(2) 36" RCP
CP2	C4	166	98+00	(2) 38"x60" HERCP**
CP3	C5	313	92+00	12'x4' RCB
CP4	C6	255	79+50	10'x4' RCB
INT8	C7	374	73+40	(2) 7'x4' RCB
INT9	C8	235	65+40	9'x4' RCB
INT10	C9	360	56+25	(2) 6'x4' RCB
	C10		49+00	(1) 42" RCP*
INT12	C11	107	40+25	(1) 24" RCP*
			N/A***	(1) 48" RCP
CP5	C12	2609	N/A***	(3) 26'x5' RCB
INT13B	C13	127	N/A***	(2) 42" RCP
CP6	C14	450	N/A***	12'x4' RCB
INT17	C15	20	N/A***	(1) 30" RCP

* Existing culverts to be extended
** Elliptical equivalent of 48" RCP used for design
*** No culvert profiles were created for culverts south of Washburn Road

5.2 ADDITIONAL EASEMENTS FOR INTERIM CONDITION FACILITIES

In addition to the 100-foot width roadway right-of-way with accommodation for intersections and bus turnouts, the analysis showed that additional drainage easements for interim culvert construction and grading easements for daylight from the interim roadway will be needed for the Task 2 improvements. The additional drainage and grading easement information has been shown on the plan and profile long plots that have been provided with this AADM. A half size copy of the long plots has been included in Appendix A-1 for reference. The full size long plots should be referred to for additional information.

5.3 ULTIMATE CONDITION FACILITIES

In the ultimate condition, runoff will be conveyed to Shaumber Road in local facilities designed to convey the 10-year storm event and in cross streets. Storm drain facility flow will be conveyed to the MPU facility proposed in the existing Shaumber Road alignment at certain points along the alignment. The local 10-year facilities in Shaumber Road were preliminarily designed using Flowmaster to determine the storm drain size. Future submittals will include more detailed analysis of the local facilities using WSPG. See Table 5.3 – *10-Year Storm Drain Facilities*. Refer to Appendix C-3 – *10-Year Ultimate Condition Onsite Storm Drain Facilities* for all preliminary facility calculations.

TABLE 5.3 – 10-YEAR STORM DRAIN FACILITIES

LOCATION	HEC-1 NODE	DESIGN FLOW (cfs)	SLOPE (%)	FACILITY
Centennial Parkway south to STA 114+00	EFPOA1*	51	1.85	30" RCP
Azure Drive north to STA 114+00	EFPOA1*	119	1.24	48" RCP
Azure Drive south to Tropical Parkway	EFPOA2	143	1.55	48" RCP
Tropical Parkway south to El Campo Grande Avenue	EFPOA3	134	1.00	48" RCP
El Campo Grande south to La Mancha	CP3*	247	1.00	60" RCP
STA 56+50 north to La Mancha	CP3*	384	3.60	60" RCP
STA 56+50 south to Hammer Lane	HLBW1-C*	66	0.60	42" RCP
STA 32+75 north to Hammer Lane	HLBW1-C*	189	1.57	54" RCP
STA 32+75 south to La Madre Way	WRBW1	331	1.85	60" RCP
La Madre Way south to Lone Mountain Road	CP6	625	1.00	84" RCP

* Total flow at design point is divided between two pipe segments based on percentage of tributary area to each

5.4 DROP INLET DESIGN AND STREET FLOW

Drop inlets for the Shaumber Road local facility were not designed for this submittal, but will be designed in future submittals using procedures described in HEC-22 and the CCRFCD Hydrologic Criteria and Drainage Design Manual. Future submittals will also include street flow calculations to show that the ultimate Shaumber Road will meet dry lane criteria in the 10-year storm and velocity times depth (v*d) criteria in a 100-year storm event per the CCRFCD Hydrologic Criteria and Drainage Design Manual.

6.0 SUMMARY AND RECOMMENDATIONS

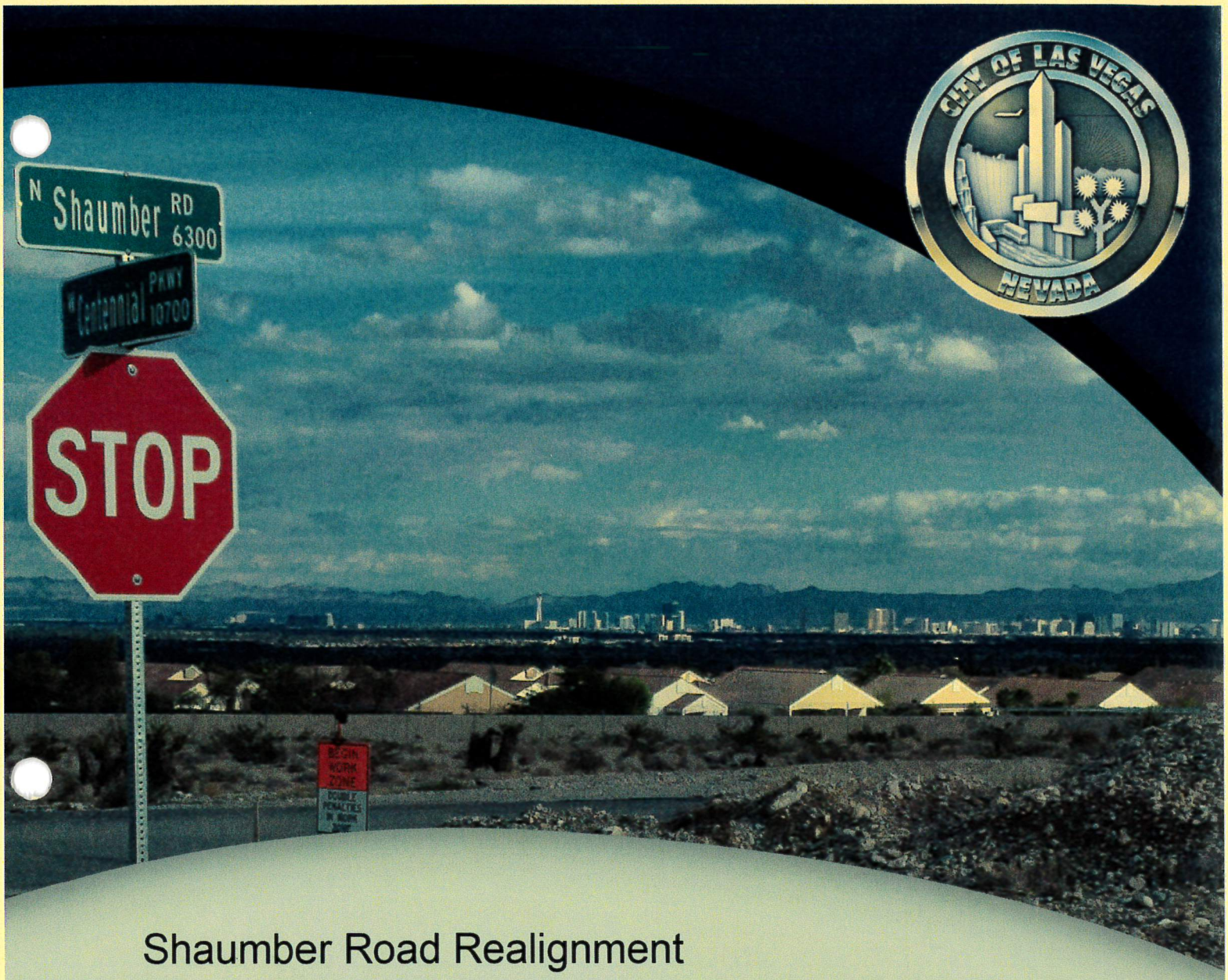
This Alternative Alignments Design Memorandum is provided to discuss the roadway alternatives explored, sanitary sewer extension alternatives examined, and the preliminary hydrologic and hydraulic analysis that has been performed for the Shaumber Road Realignment project, Centennial Parkway to Lone Mountain Road. Between the two northern roadway alternatives, Alternative #1N is the preferred alternative because the 40 mph design speed layout allows for a 313-foot tangent length to the intersection of Shaumber Road and Centennial Parkway, and would result in a horizontal clearance of 206-feet from the NV Energy transmission pole to the PT of the reverse curve. With Alternative #2N and the 45 mph design speed, the tangent length to the intersection would only be 125-feet and the clearance to the pole from the PT of the reverse curve would only be 18-feet. At the southern end, Alternative #1S is the preferred option because it ties directly into Cliff Shadows Parkway at Lone Mountain Road, whereas Alternative #2S would create a 400-foot off-set T-intersection to Cliff Shadows Parkway at the connection to Lone Mountain Road. Refer to Figure 3 – *Project Layout Exhibit*.

The City of Las Vegas Collection System Master Plan proposes to extend the 24-inch sanitary sewer stub at the northeast corner of the CCSD Northwest Satellite Transportation Facility north to Tropical Parkway. Four sewer alternatives were examined to extend this sewer facility up to Tropical Parkway. The 24" sewer at Shaumber Road/Tropical Parkway would provide a tie-in point for the proposed sewer extension west in Tropical Parkway. Sewer Alternative #1, which followed the roadway alignments down Hammer Lane to the west and north in Shaumber Road, would result in the sewer facility depths over 59-feet between Hammer Lane and Ann Road. Sewer Alternative #2 proposed a minimum 20-foot easement adjacent to the Beltway right-of-way north to Ann Road, and then turned west in Ann Road to Shaumber Road, but the depth for the sewer facility in the vicinity of Ann Road and Shumber Road would still be approximately 57-feet deep. Sewer Alternative #3 proposed a minimum 20-foot easement adjacent to the Beltway right-of-way north to Ann Road, a north-northwest alignment under the proposed trail to the north of Ann Road, turn to the west in La Mancha Avenue to Shaumber Road, and north to Tropical Parkway. This alternative significantly reduced the depth of the facility, however it has conflicts with laterals to the proposed CCRFCD facility in the existing Shaumber Road alignment. Sewer Alternative #4 proposed a minimum 20-foot easement adjacent to the Beltway right-of-way north to La Mancha Avenue, then west in La Mancha Avenue and north in Shaumber Road. This alternative alignment would reduce the cover over the proposed facility and minimize the conflicts with proposed drainage facilities in the project area.

Hydrologic analysis was performed to analyze the 100-year interim condition and the 10-year and 100-year ultimate condition storm flows. This analysis was used for preliminary sizing of drainage facilities for both the interim and ultimate condition. The interim condition analysis uses the 100-year storm event flows to size culverts that would convey flow under the 44-foot wide Shaumber Road (Task 2) so that flow would not overtop the roadway. For the ultimate condition analysis, the 10-year storm event was used to size a preliminary 10-year facility in Shaumber Road. Further evaluations and calculations will be performed for future submittals and will be accompanied by an updated drainage design memorandum. The updated memorandum would include hydraulic analysis of the 10-year local facility using more detailed design software, such as WSPG, interim culvert analysis using design software such as HY8, scour analysis and outlet design, and drainage plans.

7.0 REFERENCES

1. *Las Vegas Valley Flood Control Master Plan Update*, Clark County Regional Flood Control District, 2008.
2. *Hydraulic Criteria and Drainage Design Manual,* Clark County Regional Flood Control District (CCRFCD), 1999.
3. *Soil Survey of Las Vegas Valley Area, Nevada*, Soil Conservation Service (SCS), United States Department of Agriculture, 1985.
4. *90% Design Submittal for the Lone Mountain/Beltway Detention Basins and the Gowan Beltway West Channel*, by GC Wallace, August 2008.
5. *Technical Drainage Study, Plans, Maps, and Addenda for the CCSD Northwest Satellite Transportation Facility*, L.R. Nelson Consulting Engineers, April 2011.
6. *Technical Drainage Study, Plans, Maps, and Addenda for Centennial Condominiums*, by Stantec Consulting, Inc, October 2009
7. *Master Drainage Study, Plans, Maps, and Addenda for Cliff's Edge*, by VTN Nevada, May 2004.
8. *Uniform Standard Drawings for Public Works' Construction, Offsite Improvements, Clark County Area, Nevada,* Regional Transportation Commission, 2013.
9. *City of Las Vegas Master Plan Transportation Trails Element*, Comprehensive Planning Division - Planning and Development Department, City of Las Vegas, January 2005.



Shaumber Road Realignment

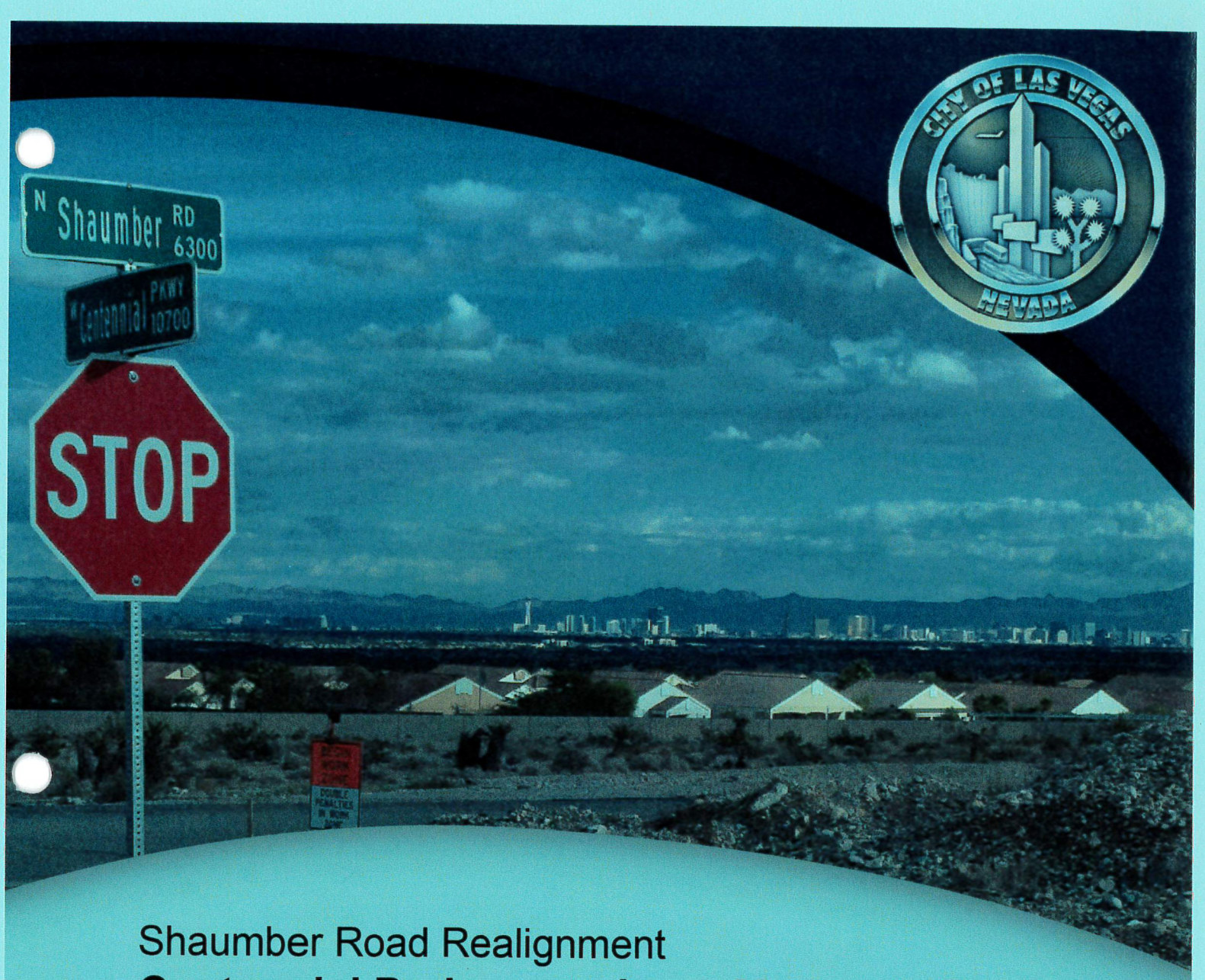
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix A

FIGURES & EXHIBITS

Hansen #45398



Shaumber Road Realignment

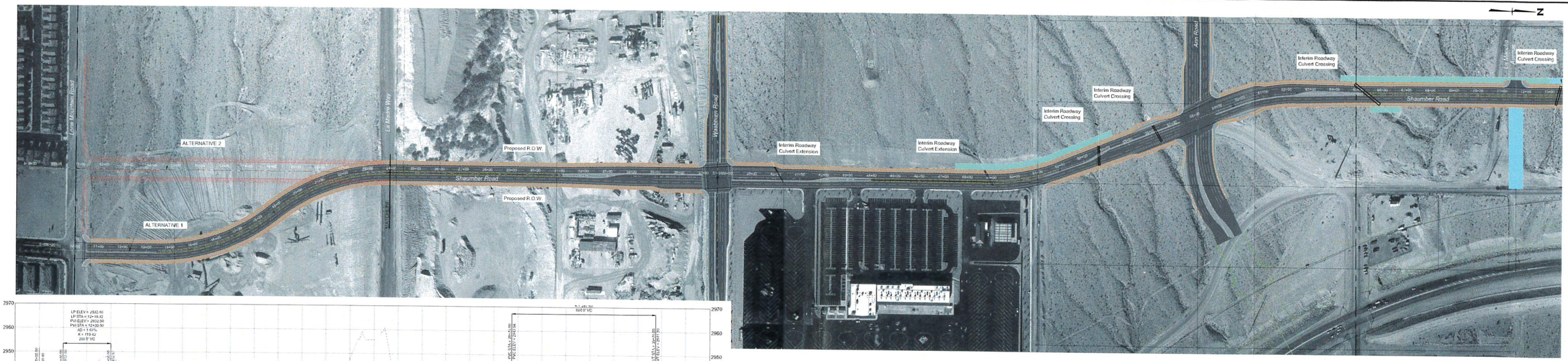
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

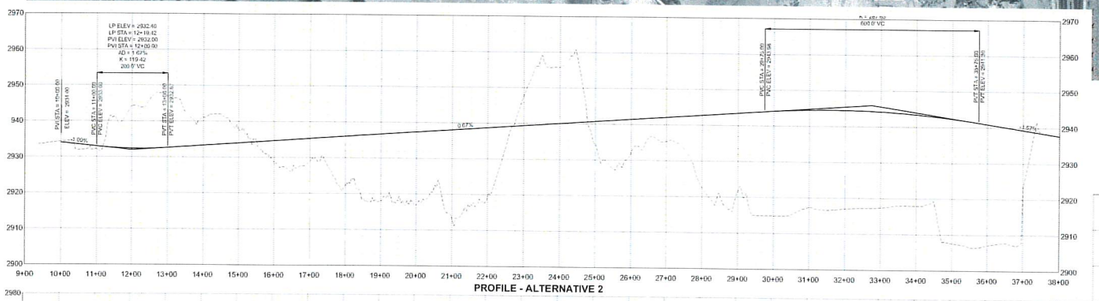
Alternative Alignments Design Memorandum

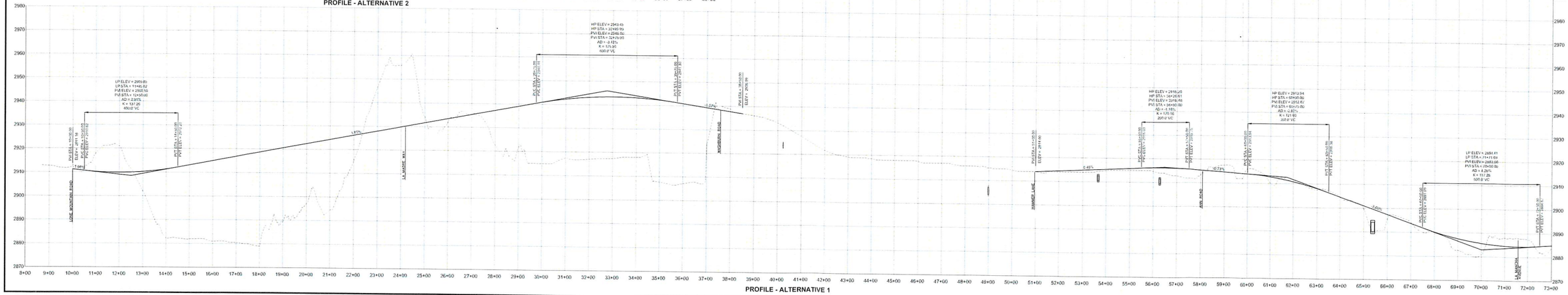
Appendix A-1

Preliminary Design Exhibits

Hansen #45398







DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT
JEFF PALMER
PROJECT MANAGER

SHAUMBER ROAD REALIGNMENT - PRELIMINARY PLAN AND PROFILE

TITLE:

SHEET:

of

DRAWING NO.

Intended for Quick Reference - Please refer to the Preliminary Plan and Profile Long Plots included separate from this ADDM for additional information

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT
CITY OF RANCHO MIRAGE
DAVID BOWERS, PE, PTOE
PUBLIC WORKS DIRECTOR/CITY ENGINEER

NO.	DATE	DESCRIPTION	APP'D
		SUBMIT FOR PLANCHECK	

SHAUMBER ROAD REALIGNMENT - PRELIMINARY PLAN AND PROFILE

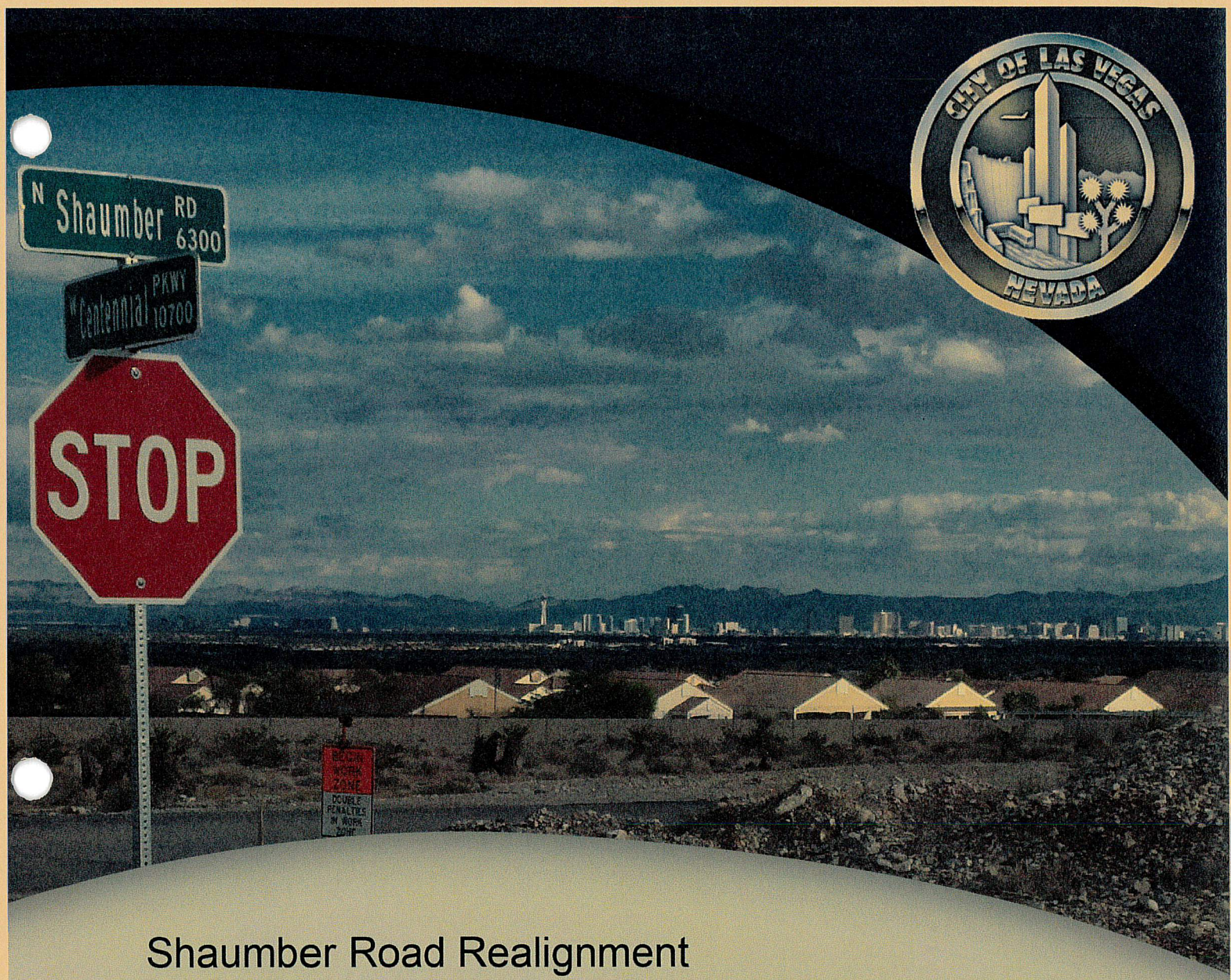
TITLE

SHEET:

of

DRAWING NO.

Intended for Quick Reference - Please refer to the Preliminary Plan and Profile Long Plots included separate from this ADDM for additional information



Shaumber Road Realignment

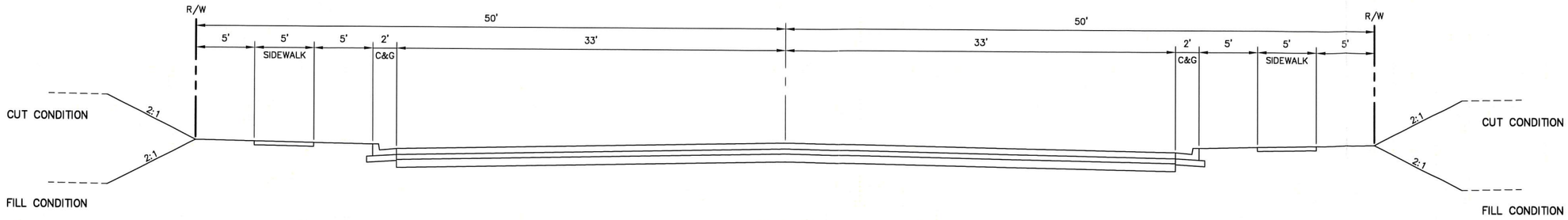
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

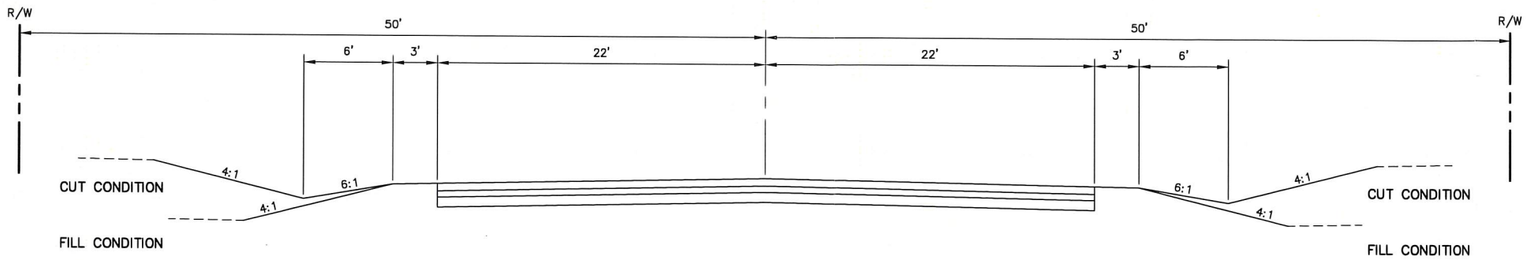
Appendix A-1.1

Shaumber Road Cross Sections

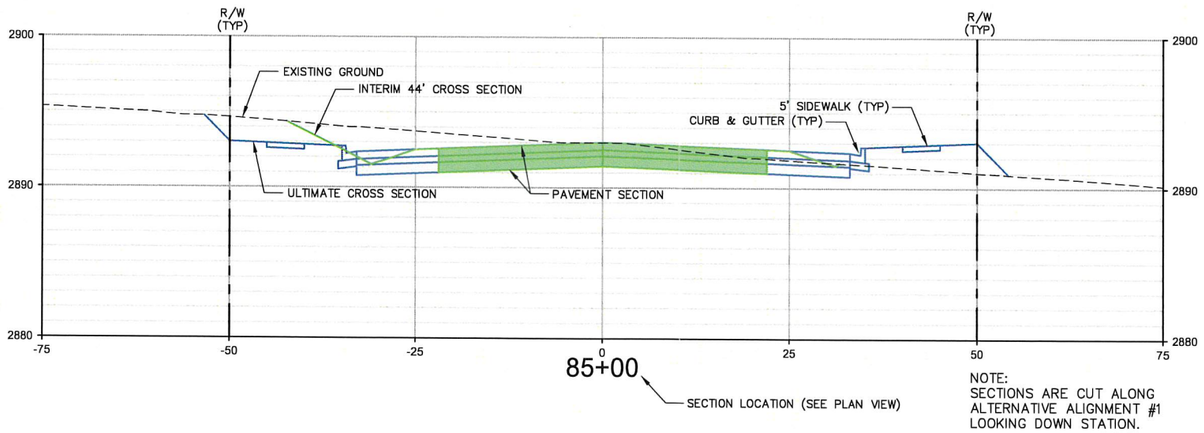
Hansen #45398



SHAUMBER ROAD ULTIMATE SECTION



SHAUMBER ROAD INTERIM SECTION



CROSS SECTION LEGEND

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER:
PROGRAM MANAGER: DAVID BOWERS, PE, PTOE
JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

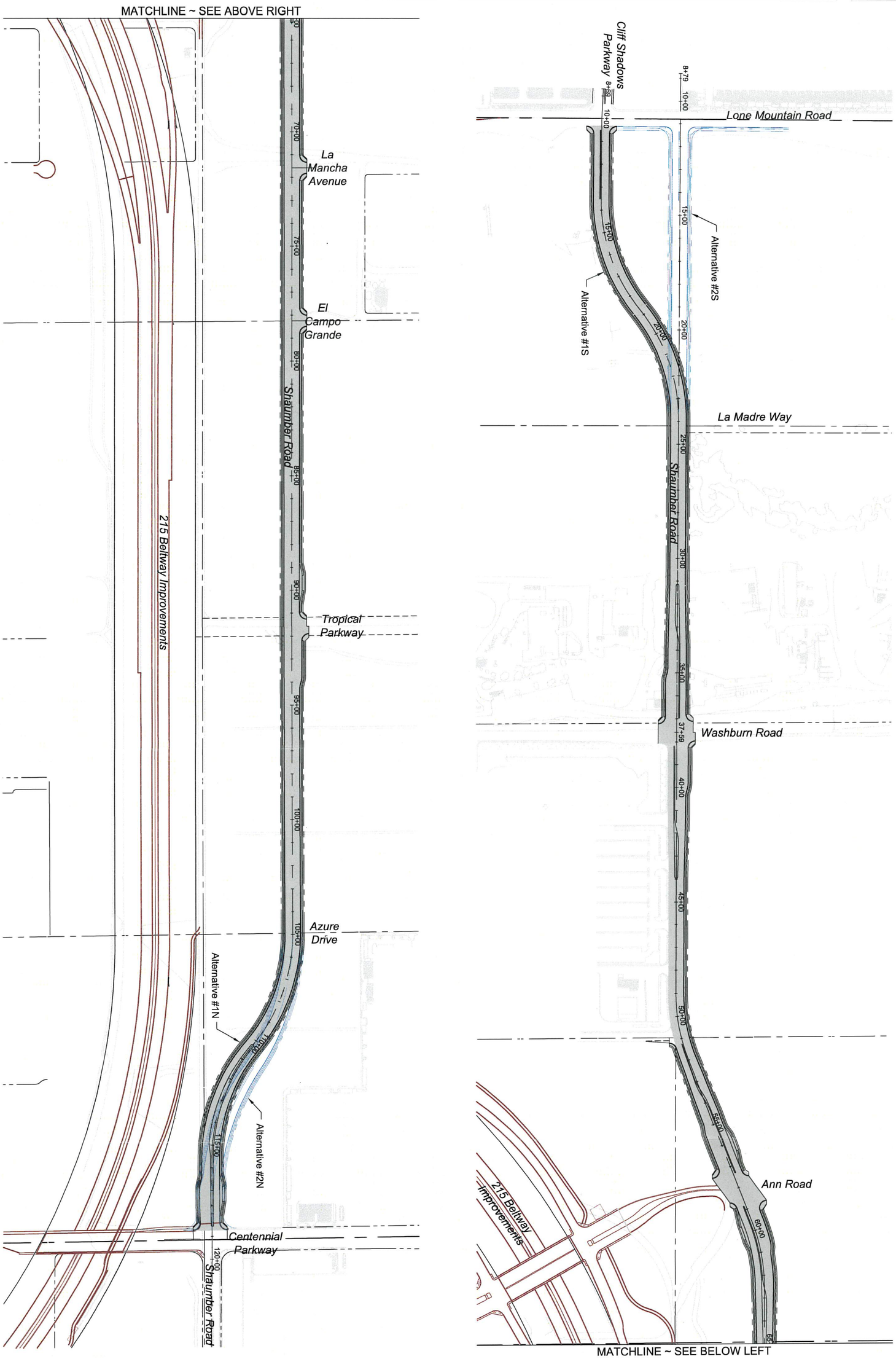
TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
TYPICAL SECTION DETAIL

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET:
XS0
1 of 11
DRAWING NO.

WARREN REQ. BID NO.



SHEET: FIGURE 3 of DRAWING NO.	PRELIMINARY NOT FOR CONSTRUCTION	TITLE: SHAUMBER ROAD REALIGNMENT CENTENNIAL PKWY TO LONE MTN RD	DEPARTMENT OF PUBLIC WORKS CAPITAL PROJECT MANAGEMENT
		SHEET: PROJECT LAYOUT EXHIBIT	CITY ENGINEER: DAVID BOWERS, PE, PTOE PROGRAM MANAGER: JEREMY LEAVITT, P.E. DESIGNED BY: DRAWN BY: CHECKED BY: DATE: 01/15/2013

REVISIONS				
NO.	DATE:	SHEET	DESCRIPTION	APP'D

HANSEN NO. BID NO.

SHAUMBER ROAD REALIGNMENT

14+00

13+00

12+00

11+00

17+00

16+00

15+00

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

CITY OF LAS VEGAS NEVADA

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 11+00 TO STA 17+00

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET:
XS1
2 of 11
DRAWING NO.

HANSEN NO.

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER:
PROGRAM MANAGER: DAVID BOWERS, PE, PTOE
JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

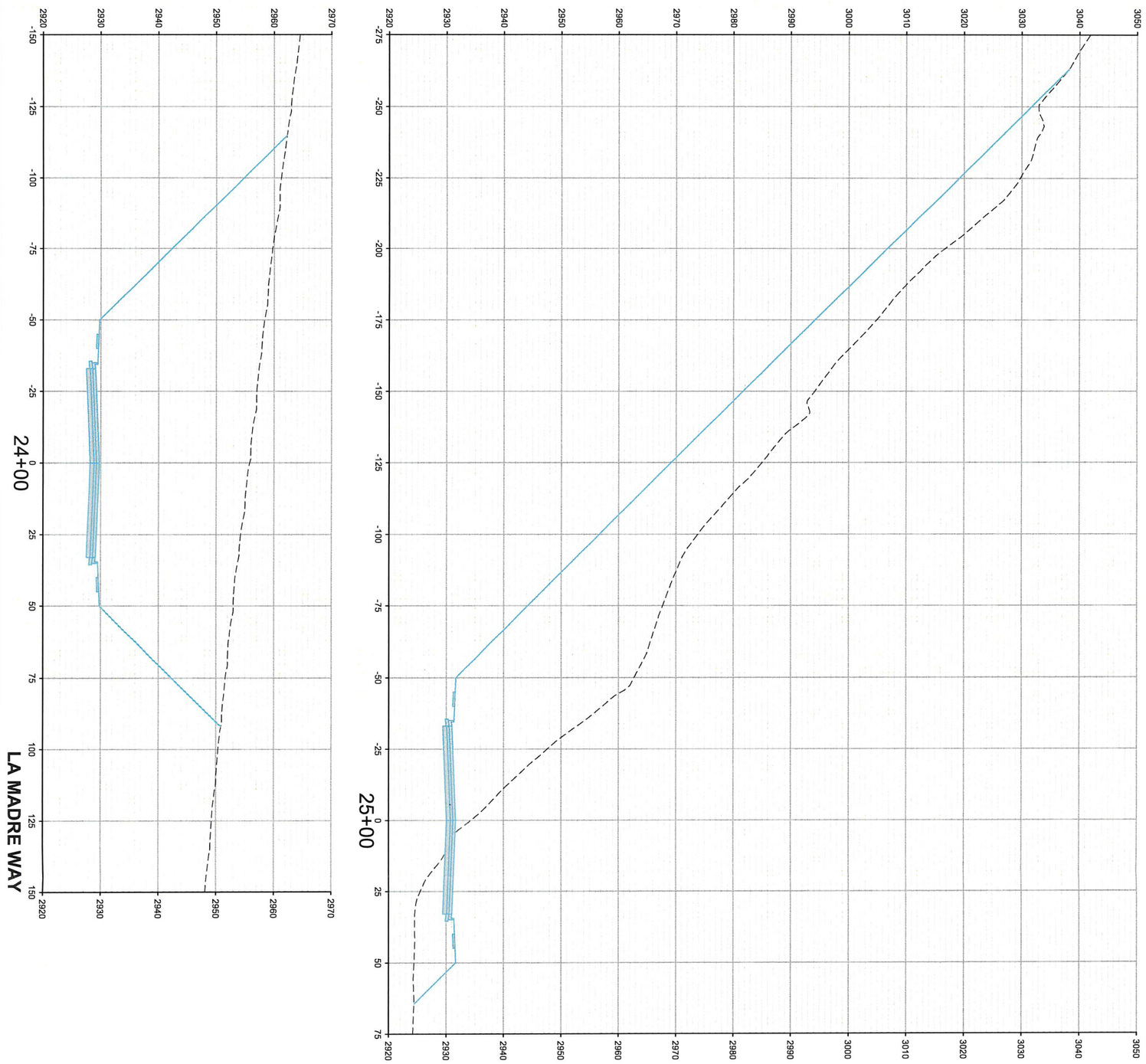
TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 18+00 TO STA 23+00

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET:
XS2
3 of 11
DRAWING NO.

BID NO.

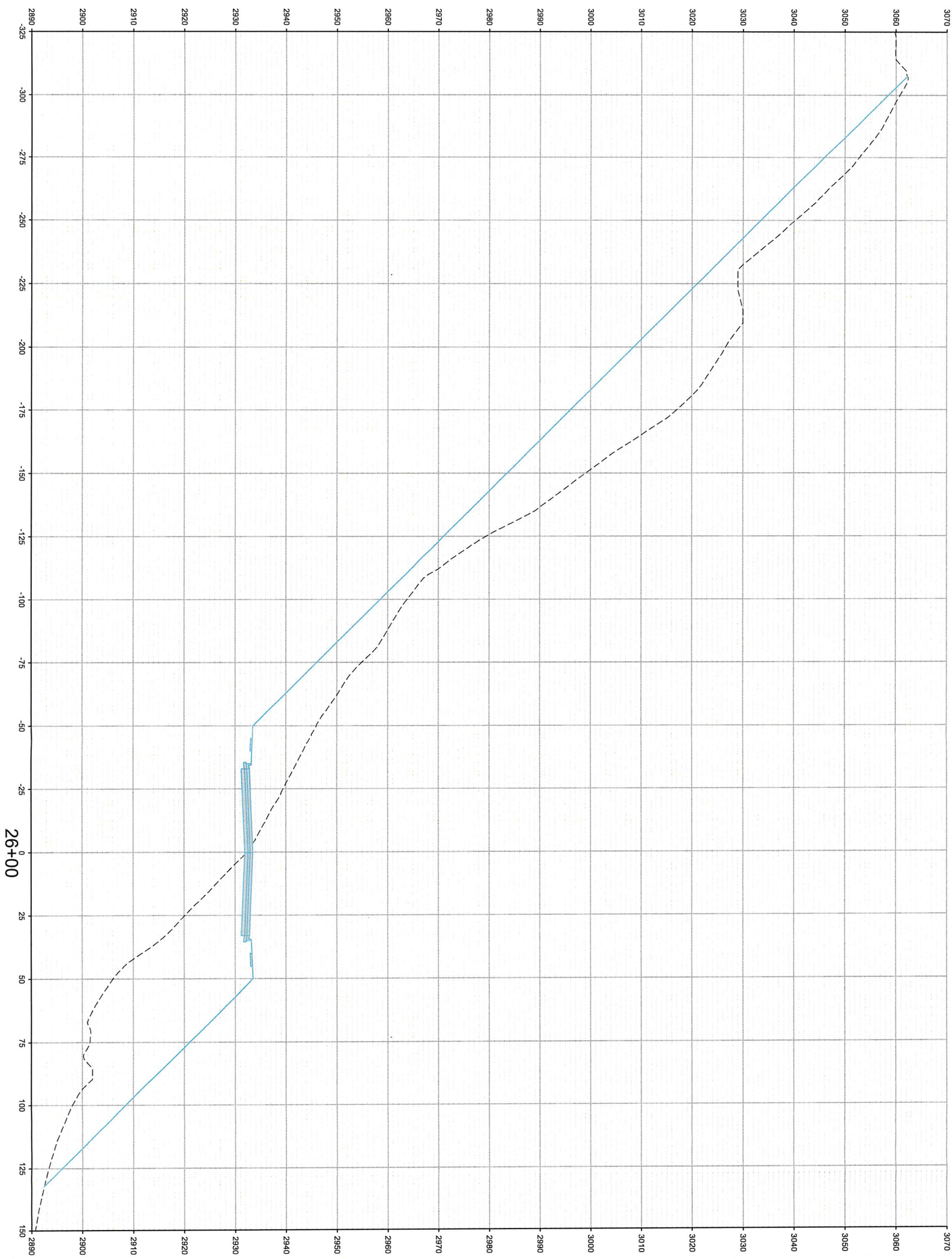


SHEET: XS3	PRELIMINARY NOT FOR CONSTRUCTION	TITLE: SHAUMBER ROAD REALIGNMENT CENTENNIAL PKWY TO LONE MTN RD	DEPARTMENT OF PUBLIC WORKS
DRAWING NO. 4 of 11		SHEET: SHAUMBER CROSS SECTIONS STA 24+00 TO STA 25+00	CAPITAL PROJECT MANAGEMENT
			CITY ENGINEER: DAVID BOWERS, PE, PTOE
			PROGRAM MANAGER: JEREMY LEAVITT, P.E.
			DESIGNED BY:
			DRAWN BY:
			CHECKED BY: DATE: 01/15/2013

REVISIONS				
NO.	DATE:	SHEET	DESCRIPTION	APP'D

HANSEN NO. BID NO.

SHAUMBER ROAD REALIGNMENT



PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: XS4
5 of 11
DRAWING NO.

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 26+00

HANSEN NO.

BID NO.

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

REVISIONS

NO.	DATE	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: 01/15/2013

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 27+00 TO STA 31+00

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: XS5
6 of 11
DRAWING NO.

PROJECT NO.

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

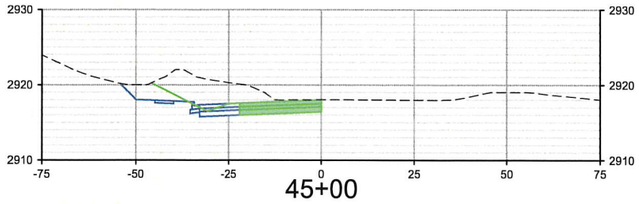
DATE: 01/15/2013

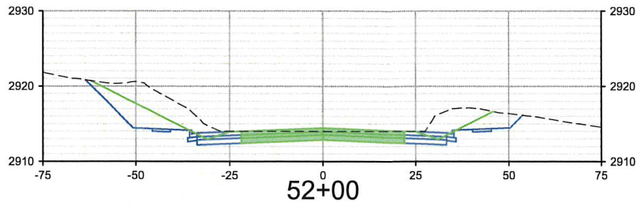
TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

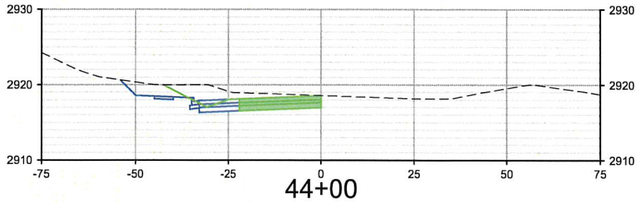
SHEET: SHAUMBER CROSS SECTIONS
STA 32+00 TO 38+00

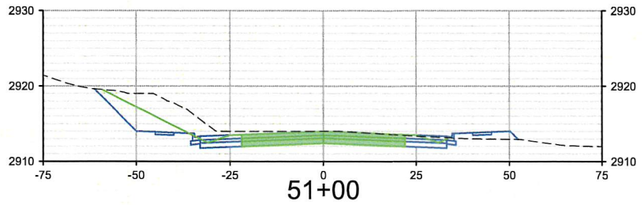
PRELIMINARY
NOT FOR CONSTRUCTION

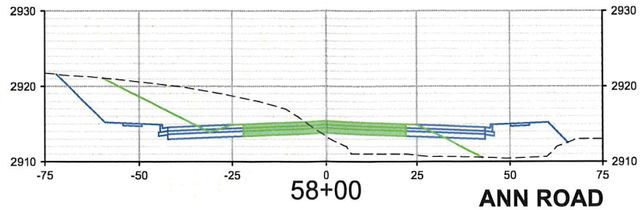
SHEET:
XS6
7 of 11
DRAWING NO.

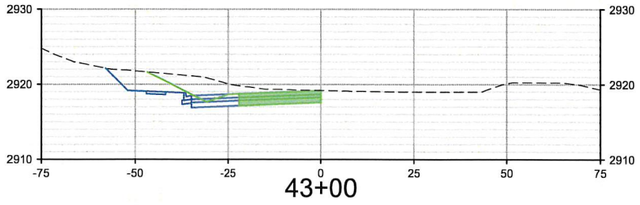


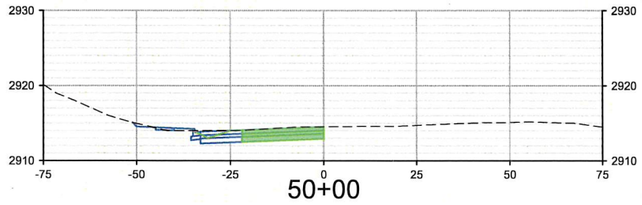


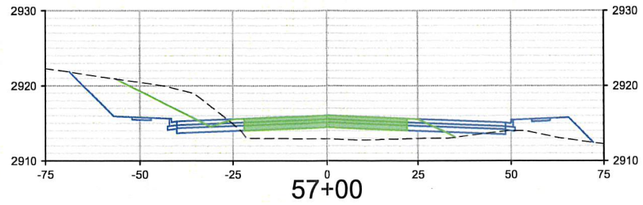


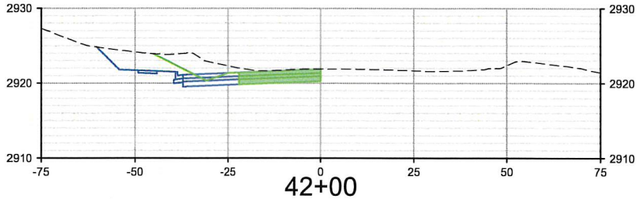


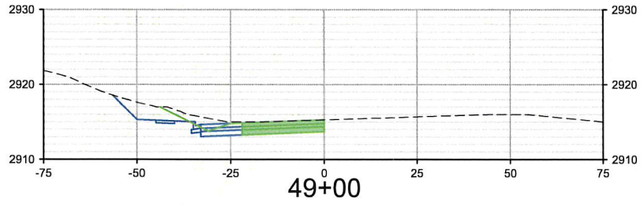


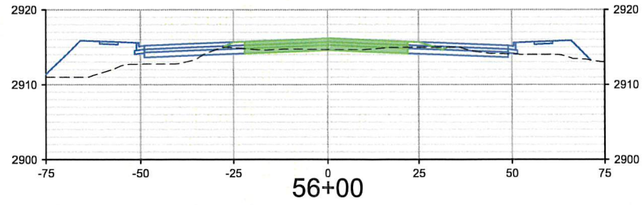


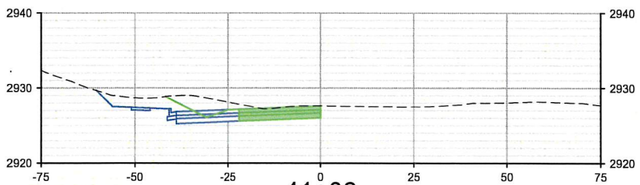


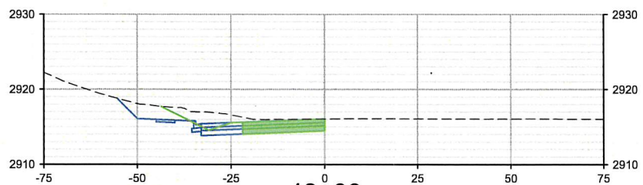


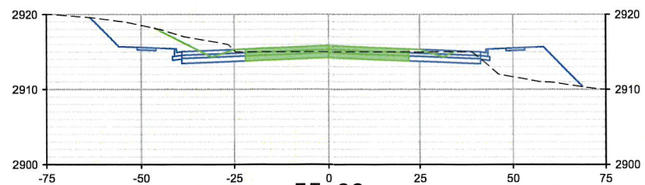


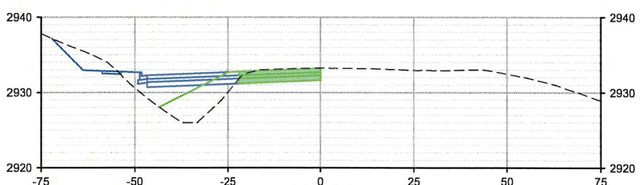


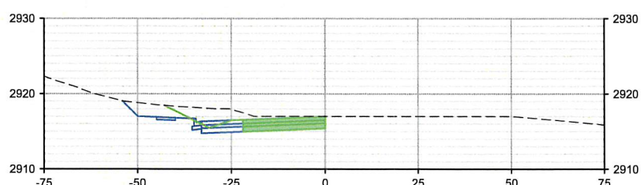


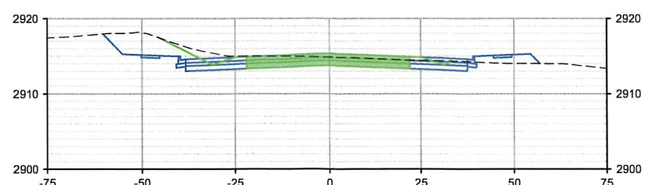


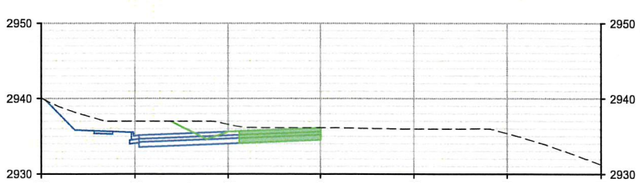


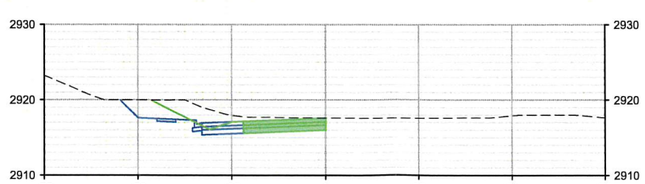


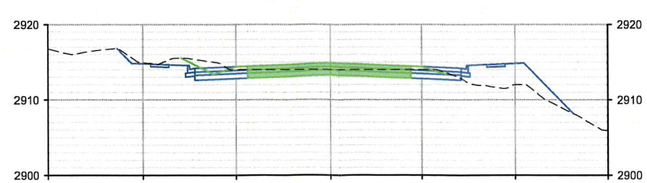












REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 39+00 TO 58+00

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET:
XS7
8 of 11
DRAWING NO.

LA MANCHA AVE

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

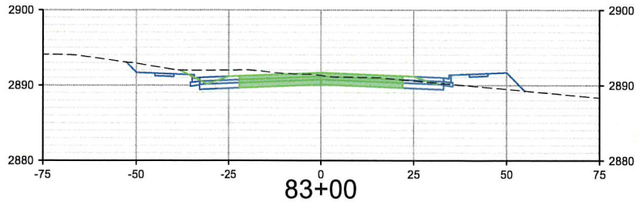
TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 59+00 TO STA 76+00

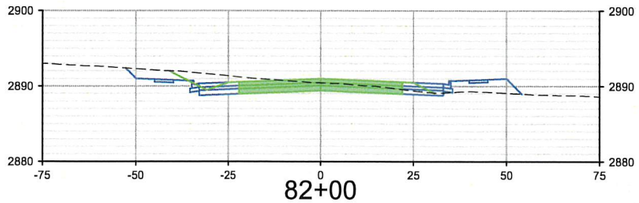
PRELIMINARY
NOT FOR CONSTRUCTION

SHEET:
XS8
9 of 11
DRAWING NO.

PROJECT NO.



83+00



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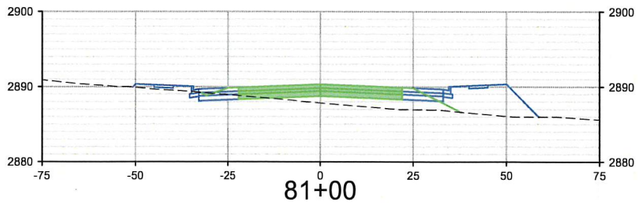
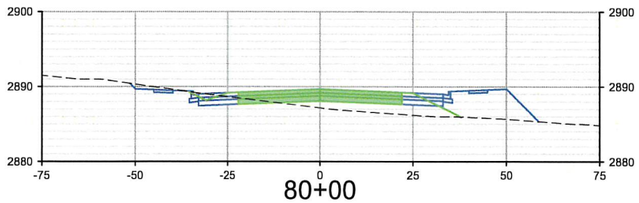


81+00



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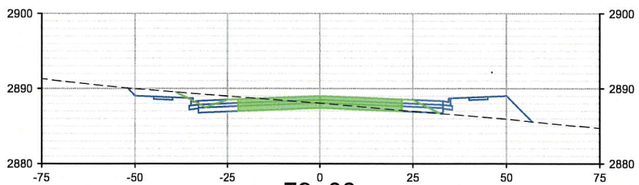

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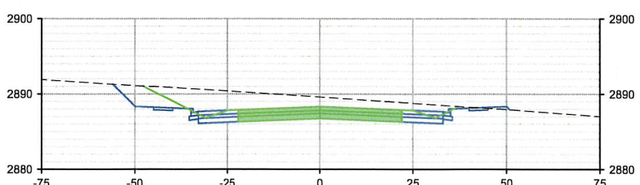
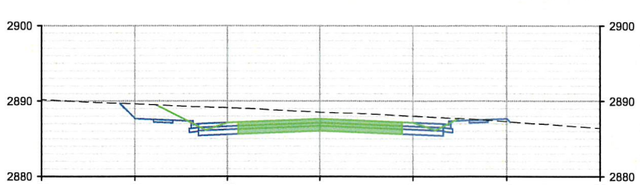
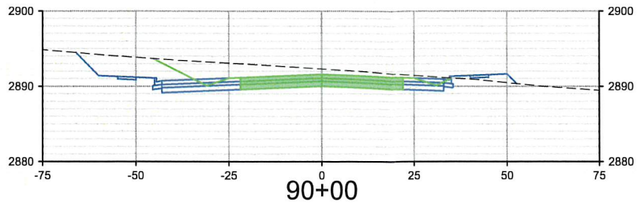


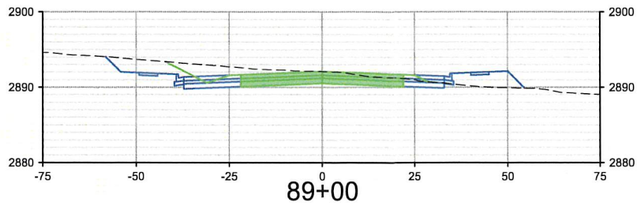
78+00 EL CAMPO GRANDE



77+00



90+00



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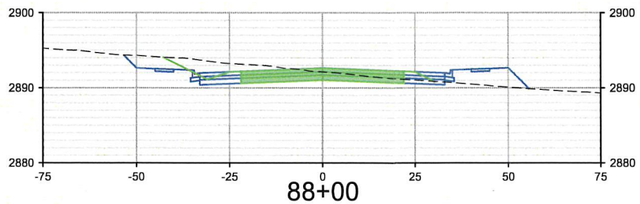

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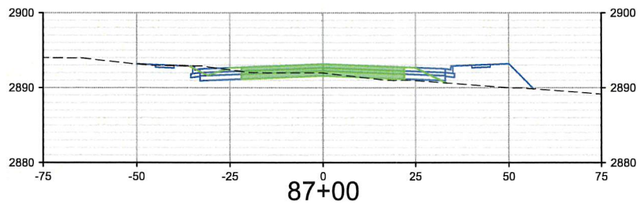

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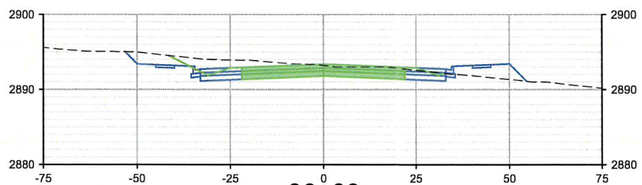

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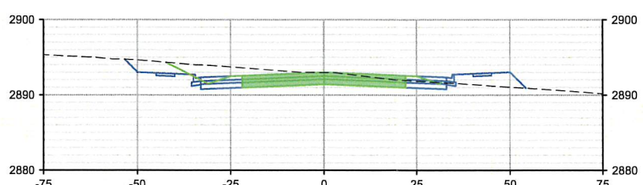

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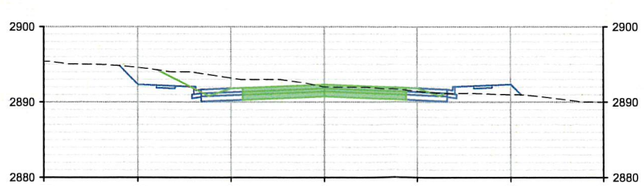

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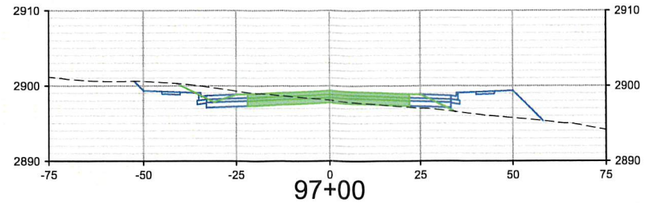

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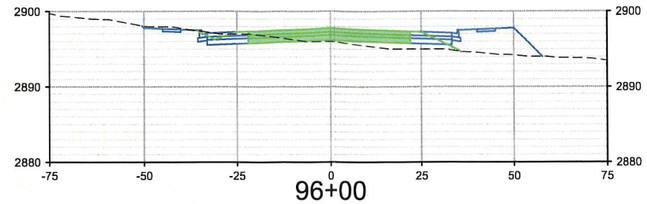

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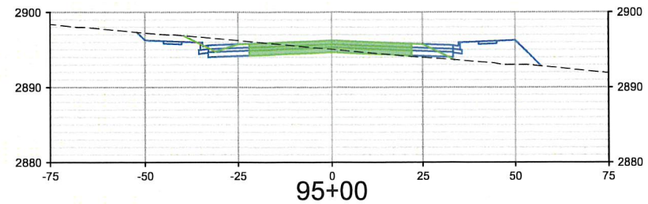

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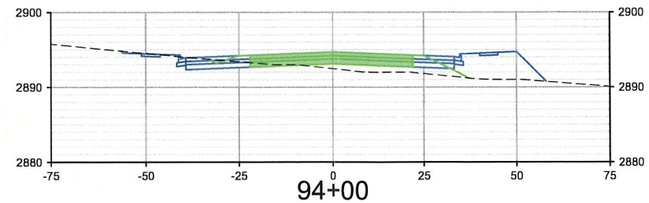

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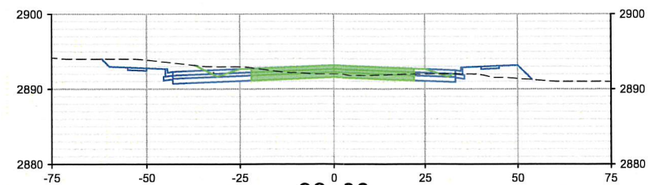

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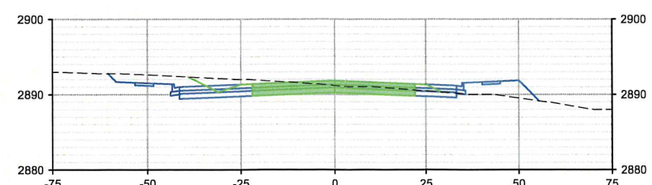
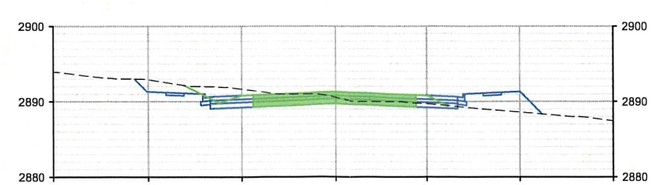


92+00 TROPICAL PKWY



91+00

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

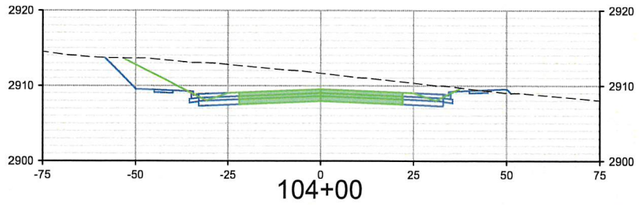
DATE: 01/15/2013

TITLE: SHAUMBER CROSS SECTIONS STA 77+00 TO STA 97+00

SHEET: SHAUMBER ROAD REALIGNMENT CENTENNIAL PKWY TO LONE MTN RD

PRELIMINARY NOT FOR CONSTRUCTION

SHEET: XS9
10 of 11
DRAWING NO.



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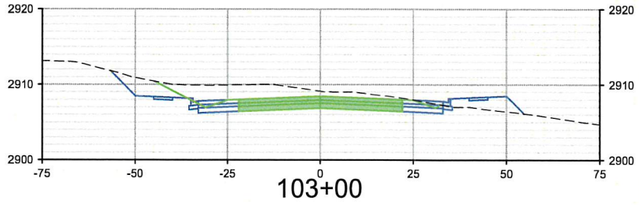

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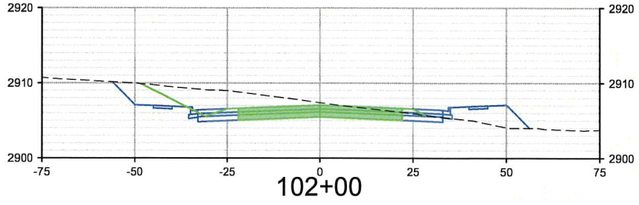

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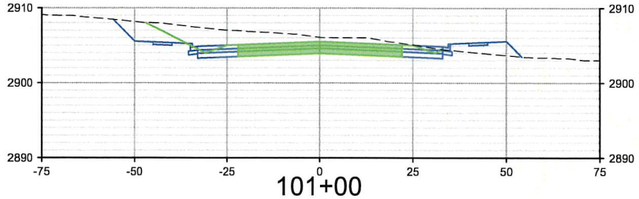

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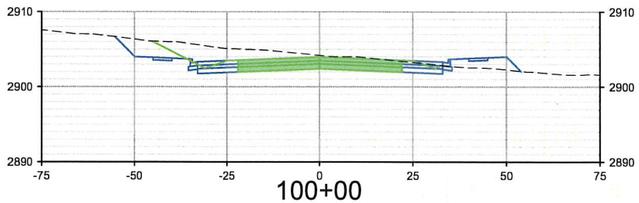

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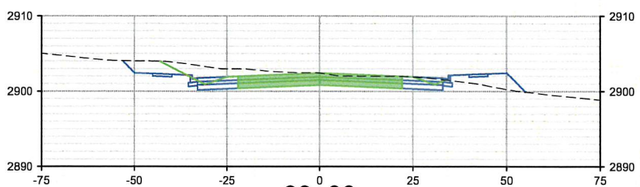

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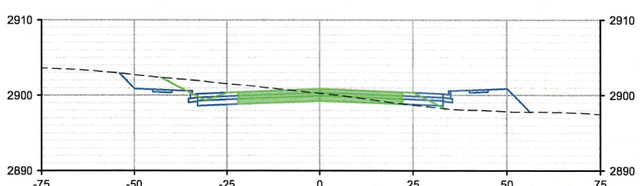

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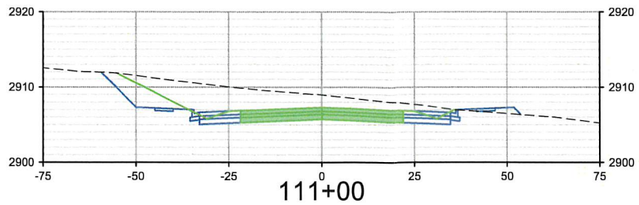
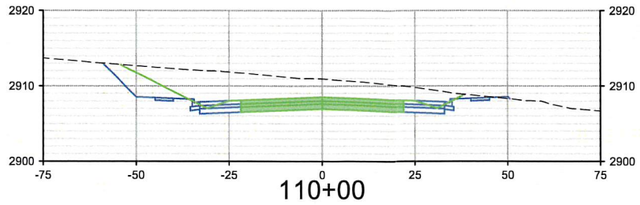


111+00



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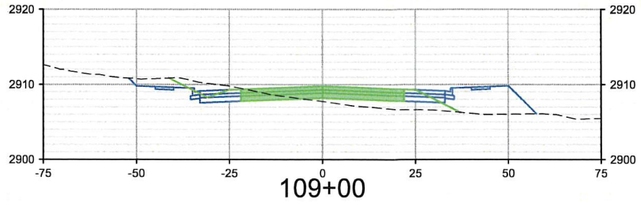

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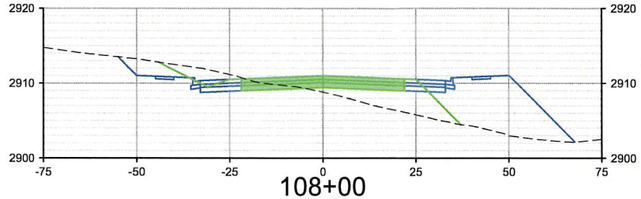

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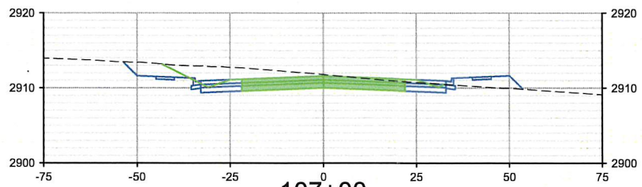

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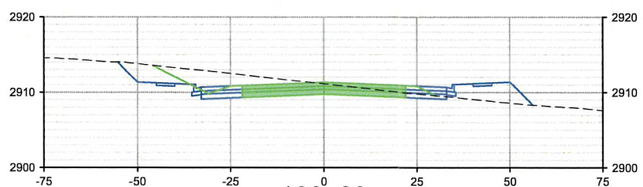

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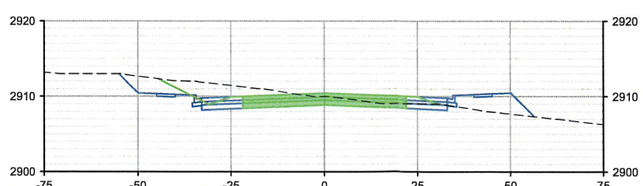

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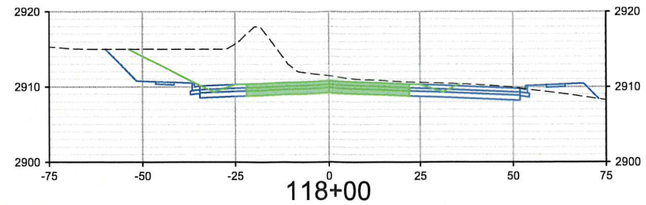

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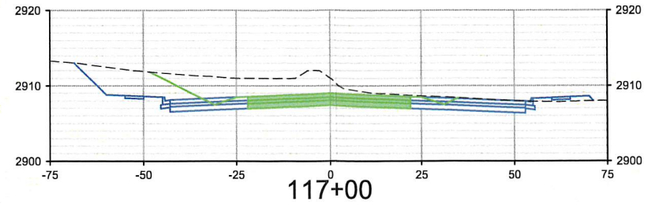
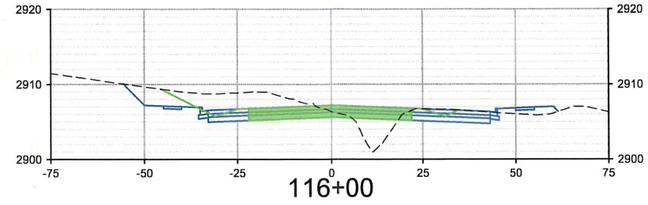


117+00



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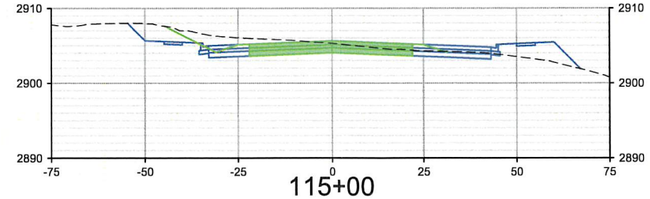
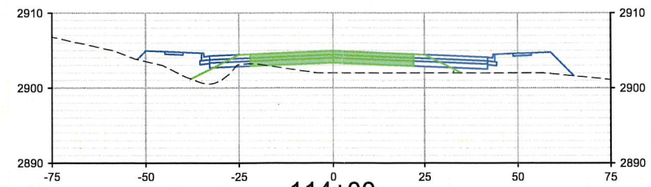


115+00



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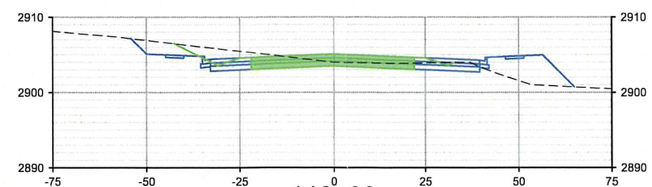

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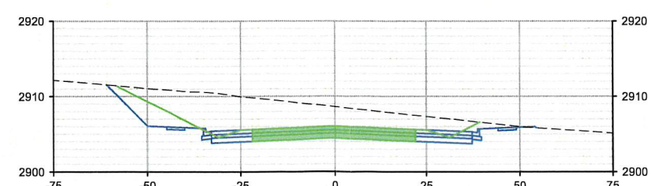


112+00

AZURE DRIVE

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

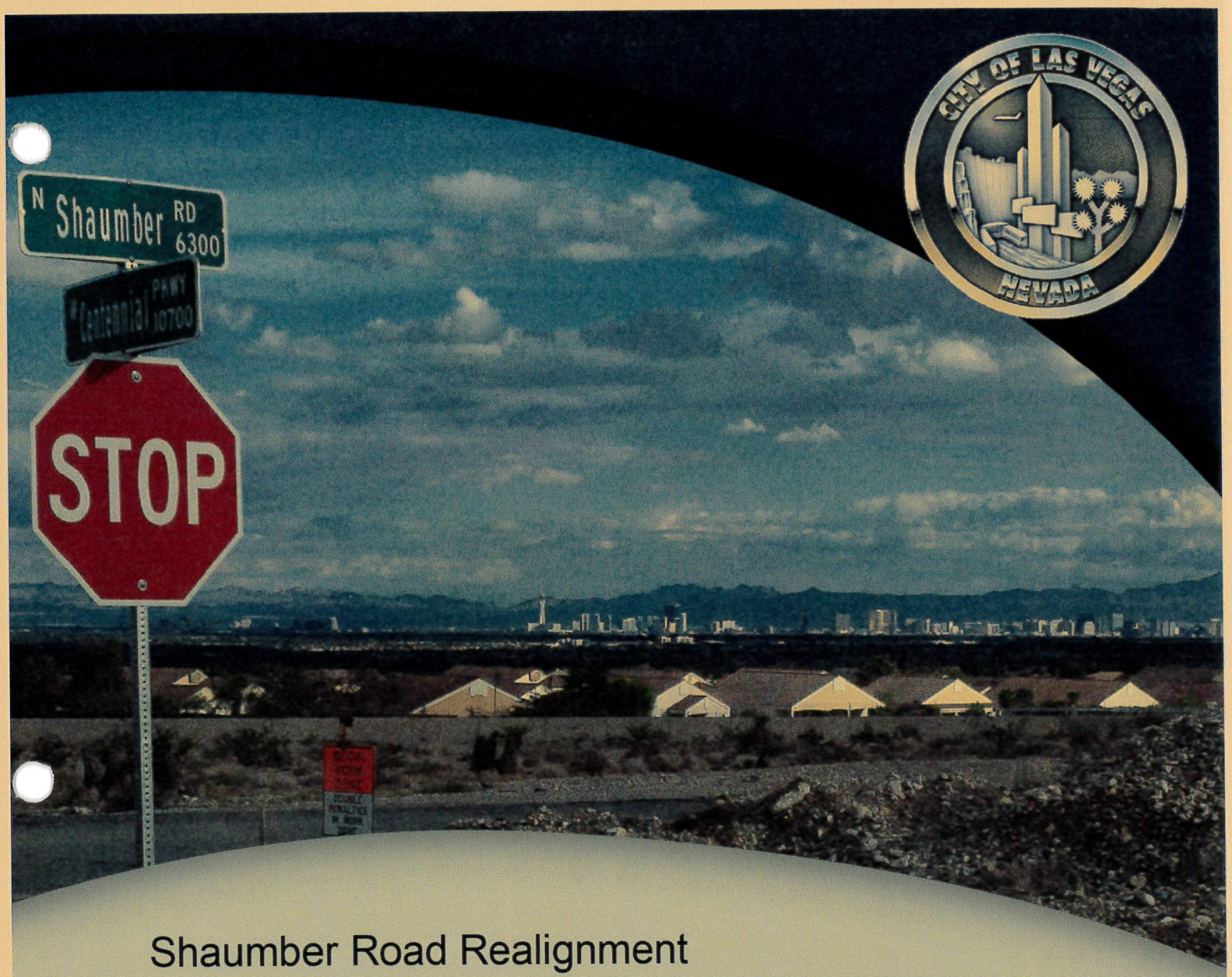
DATE: 01/15/2013

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: SHAUMBER CROSS SECTIONS
STA 98+00 TO STA 118+00

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET:
XS10
11 of 11
DRAWING NO.



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

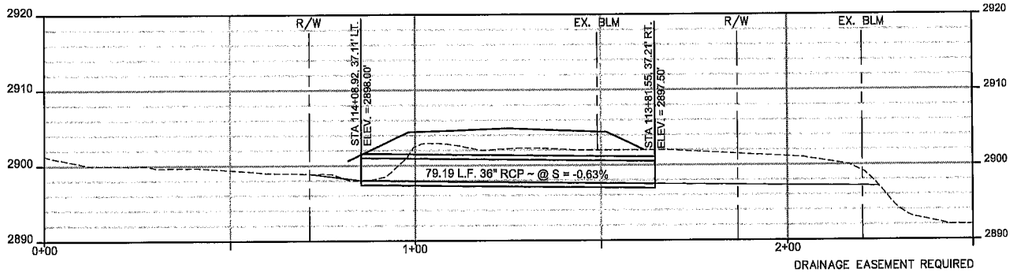
Alternative Alignments Design Memorandum

Appendix A-1.2

Interim Roadway Culvert Profiles

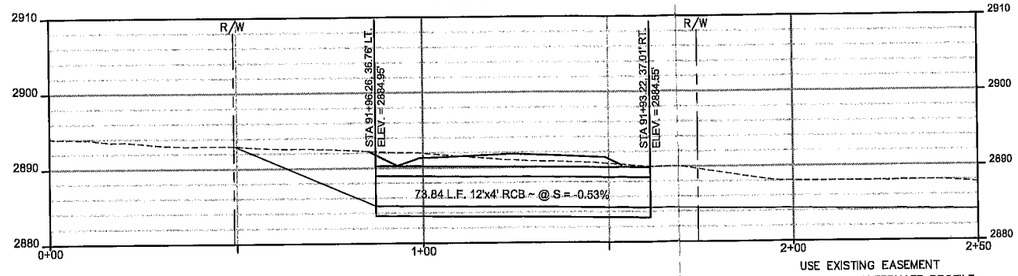
Hansen #45398

Culvert - 114+00



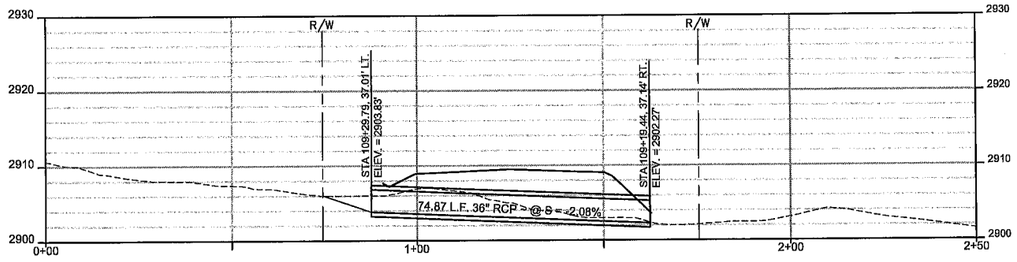
DRAINAGE EASEMENT REQUIRED

Culvert - 92+00

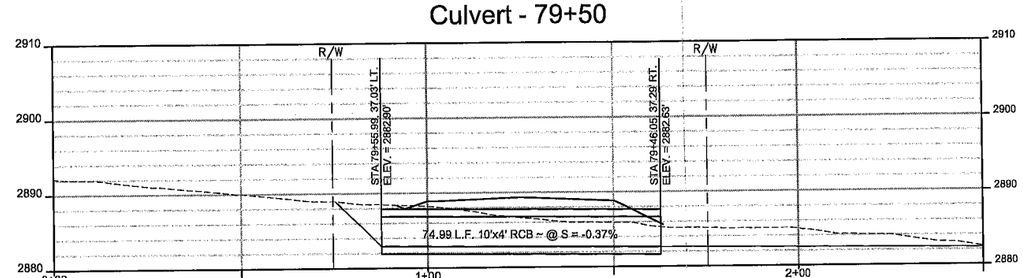


USE EXISTING EASEMENT
CONSIDER ALTERNATE PROFILE

Culvert - 109+25

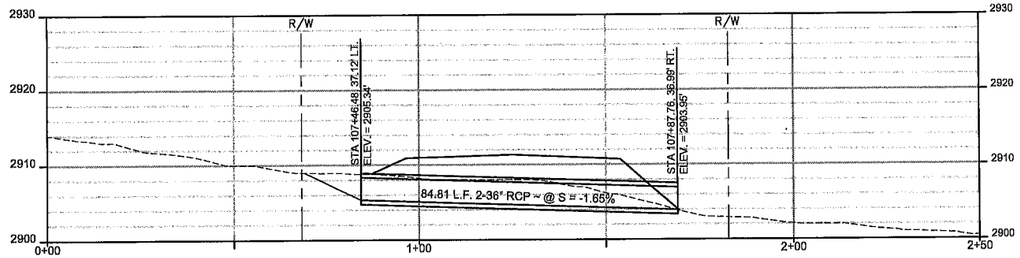


Culvert - 79+50

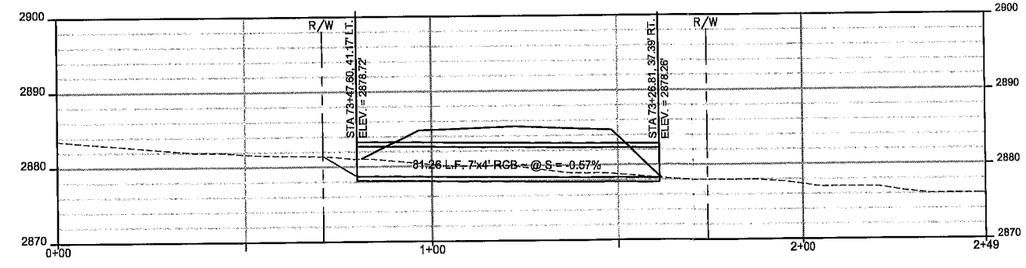


DRAINAGE EASEMENT REQUIRED
CONSIDER ALTERNATE PROFILE

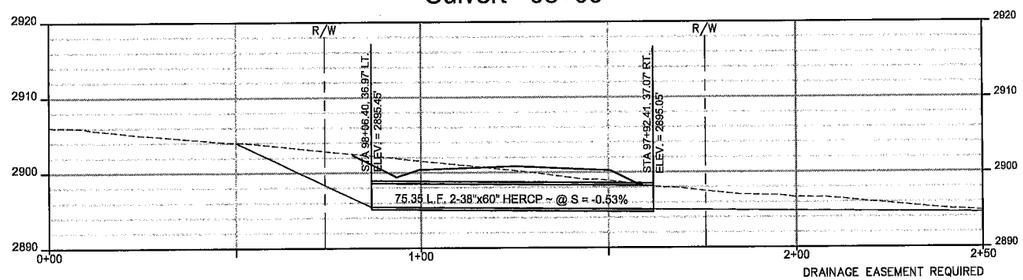
Culvert - 107+60



Culvert - 73+40

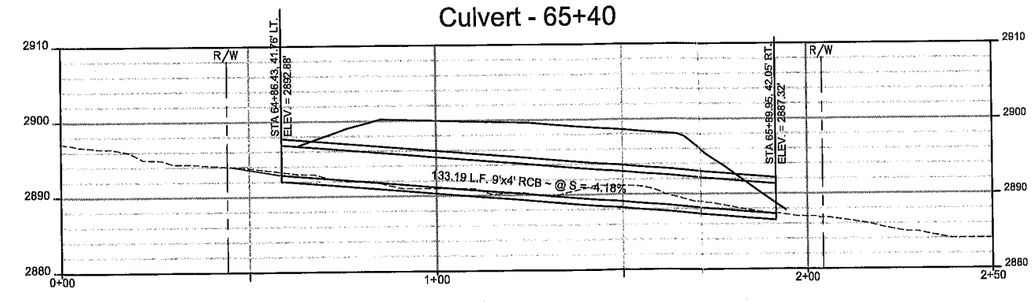


Culvert - 98+00



DRAINAGE EASEMENT REQUIRED
CONSIDER ALTERNATE PROFILE

Culvert - 65+40



REVISIONS

NO.	DATE	SHEET	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

SHAUMBER ROAD REALIGNMENT

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

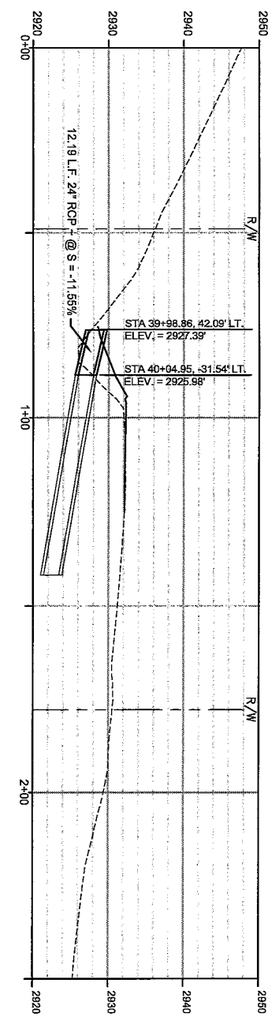
SHEET: INTERIM ROADWAY
CULVERT PROFILES

PRELIMINARY
NOT FOR CONSTRUCTION

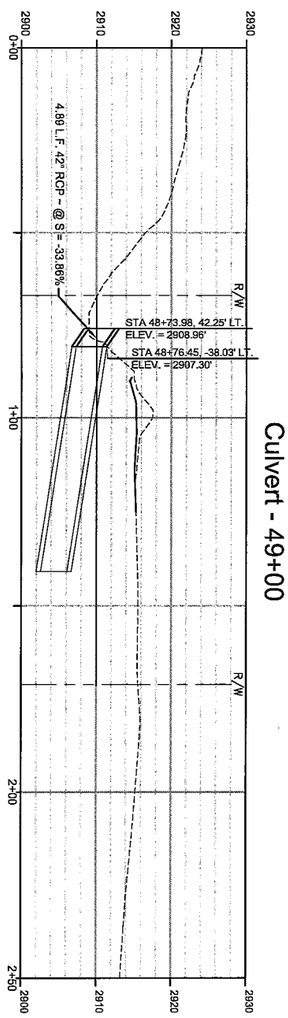
SHEET: DP1
1 of 2
DRAWING NO.

BID NO.

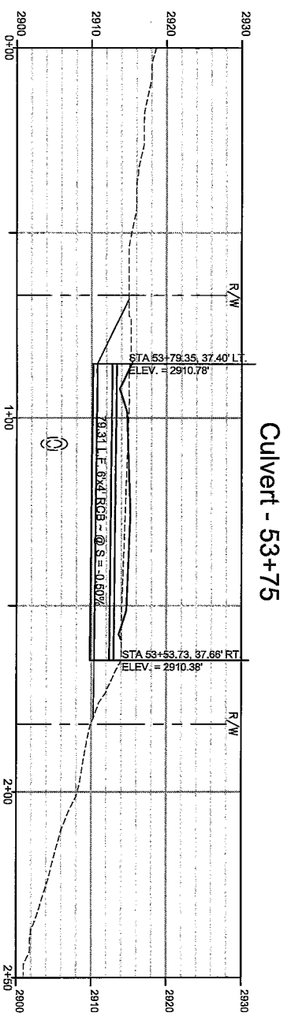
PROJECT NO.



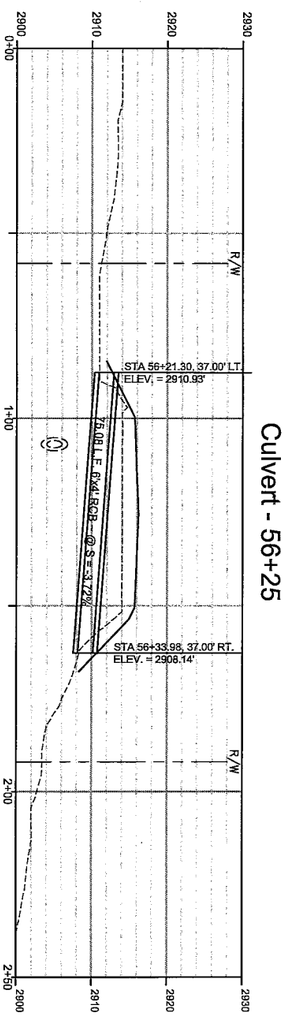
Culvert - 40+25



Culvert - 49+00



Culvert - 53+75



Culvert - 56+25

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: DP2
2 of 2
DRAWING NO.

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: INTERIM ROADWAY
CULVERT PROFILES

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

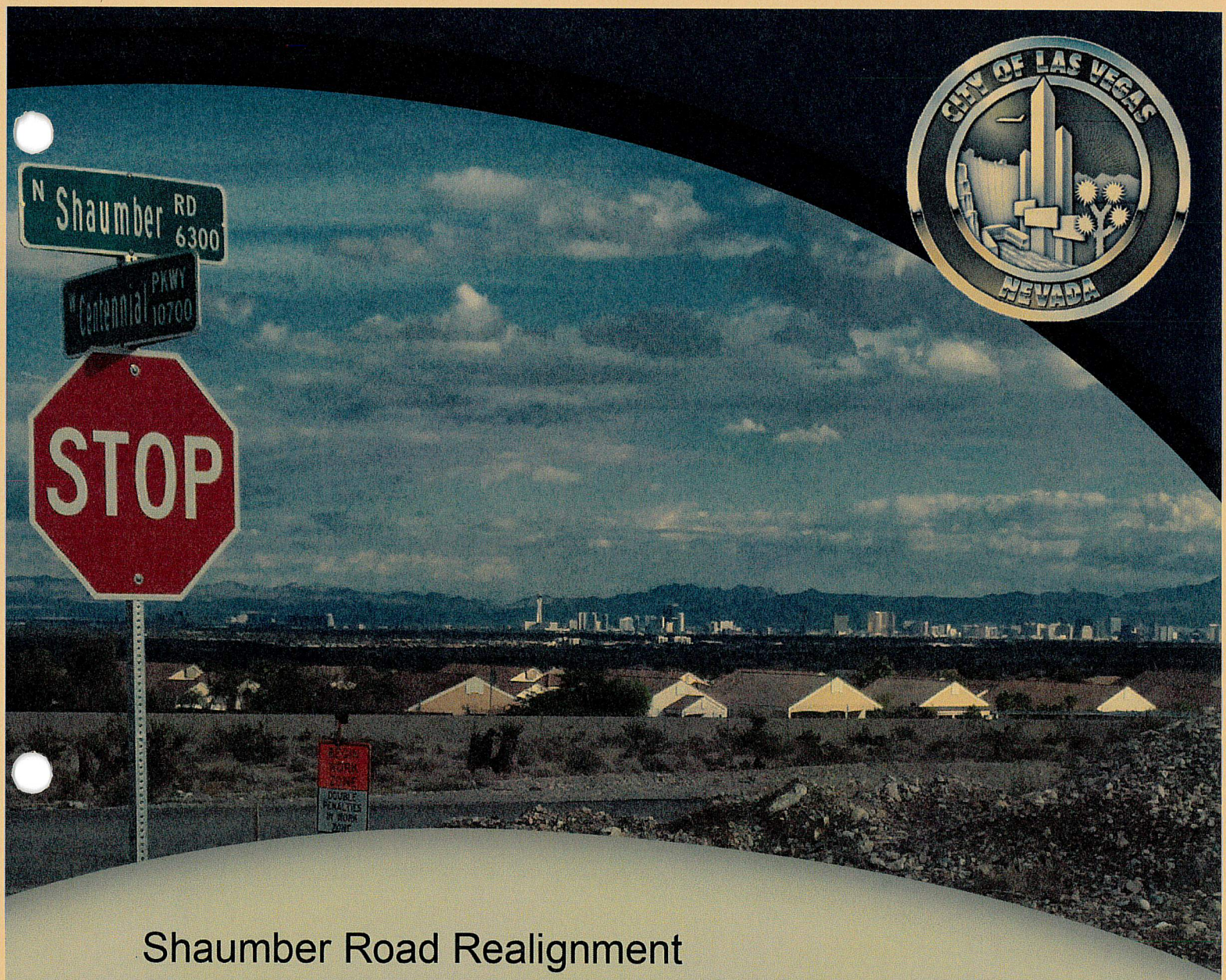
CITY OF LAS VEGAS NEVADA

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.
DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE: 01/15/2013

REVISIONS				
NO.	DATE:	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

HANSEN NO. BID NO.



Shaumber Road Realignment

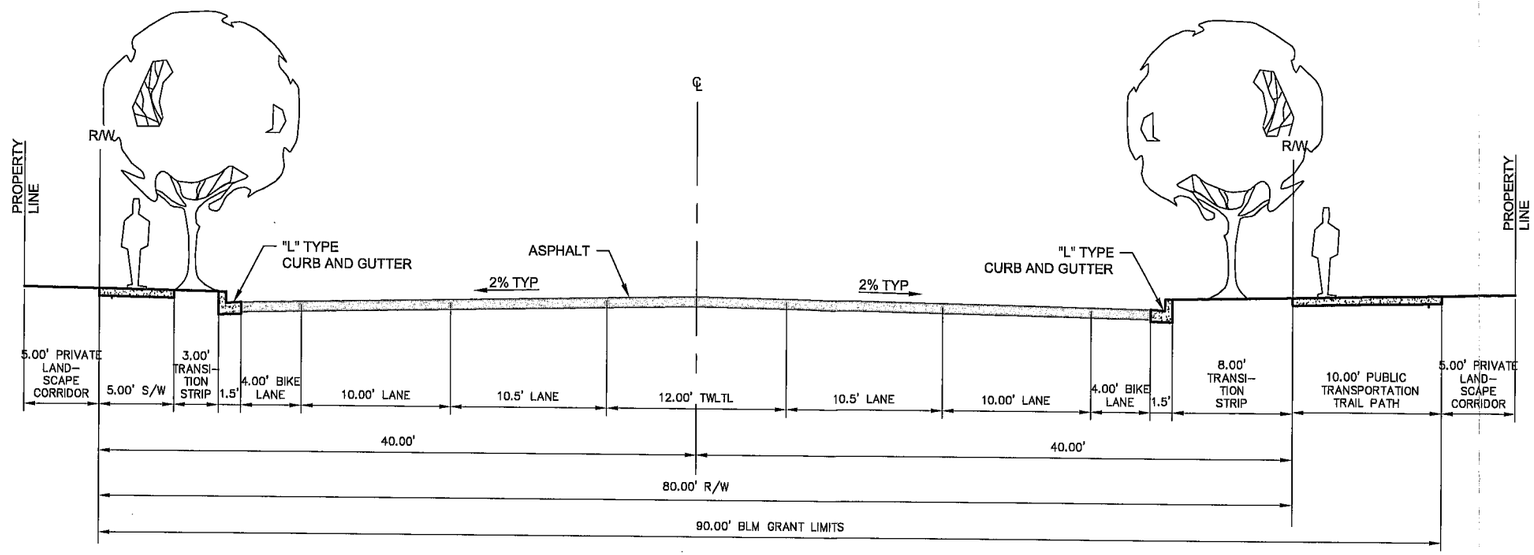
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix A-1.3

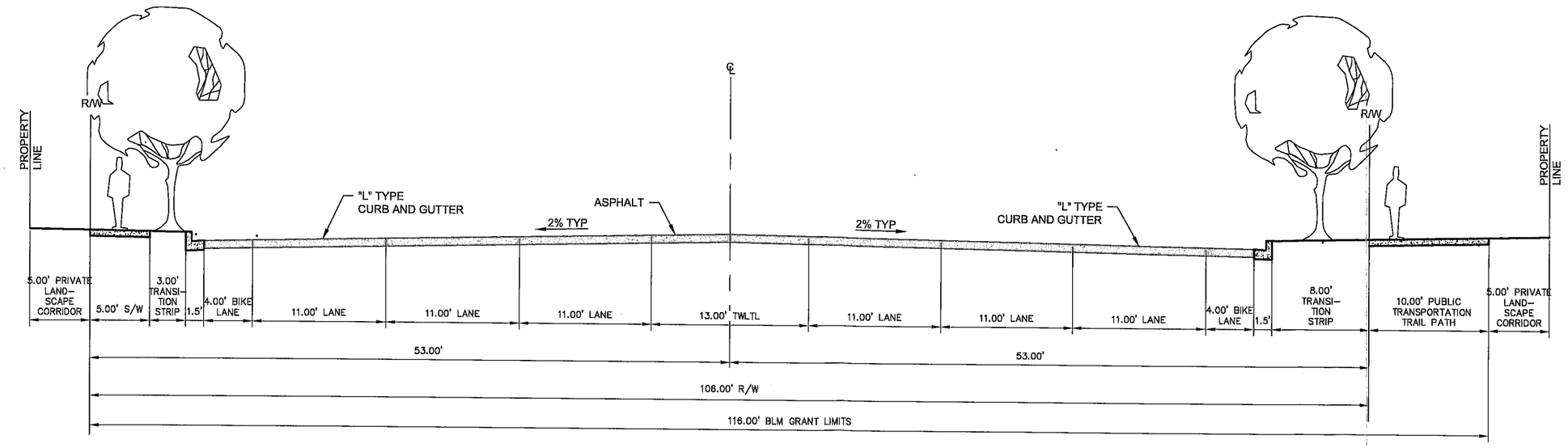
Typical Sections and Details

Hansen #45398



80' CROSS STREET TYPICAL SECTION

MAJOR COLLECTOR COMPLETE STREET ALTERNATIVE
WITH 10' PUBLIC TRANSPORTATION TRAIL PATH
TROPICAL PARKWAY & LONE MOUNTAIN ROAD



106' CROSS STREET TYPICAL SECTION

PRIMARY ARTERIAL COMPLETE STREET ALTERNATIVE
WITH 10' PUBLIC TRANSPORTATION TRAIL PATH
ANN ROAD

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

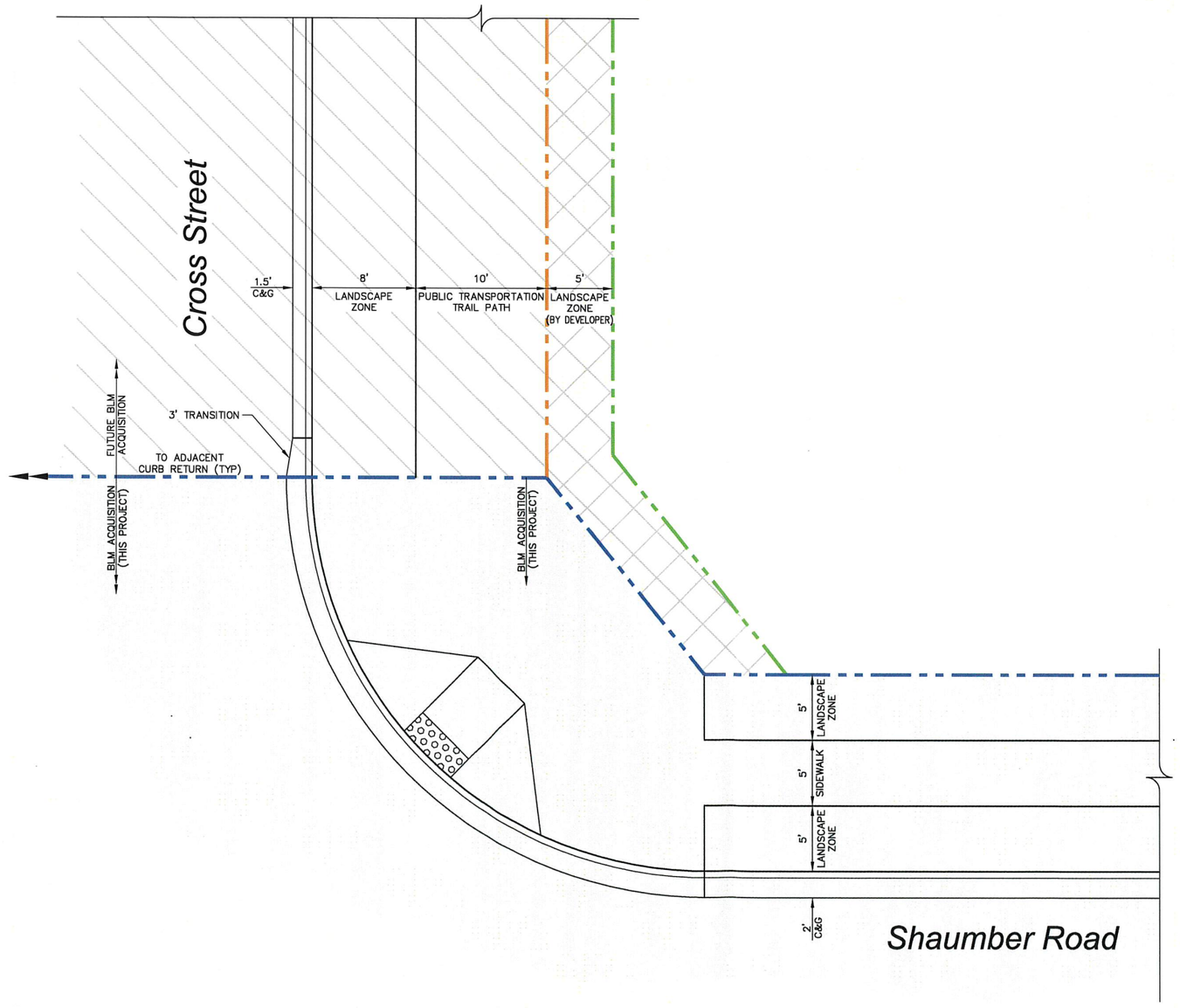
TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: CROSS STREET TYPICAL SECTIONS

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: CS1
1 of 1
DRAWING NO.

JOB NO.



CROSS STREET WITH TRAIL
CURB RETURN DETAIL

COMPLETE STREET ALTERNATIVE
WITH 10' PUBLIC TRANSPORTATION TRAIL PATH

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D
			SHAUMBER ROAD REALIGNMENT	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DATE: 01/15/2013

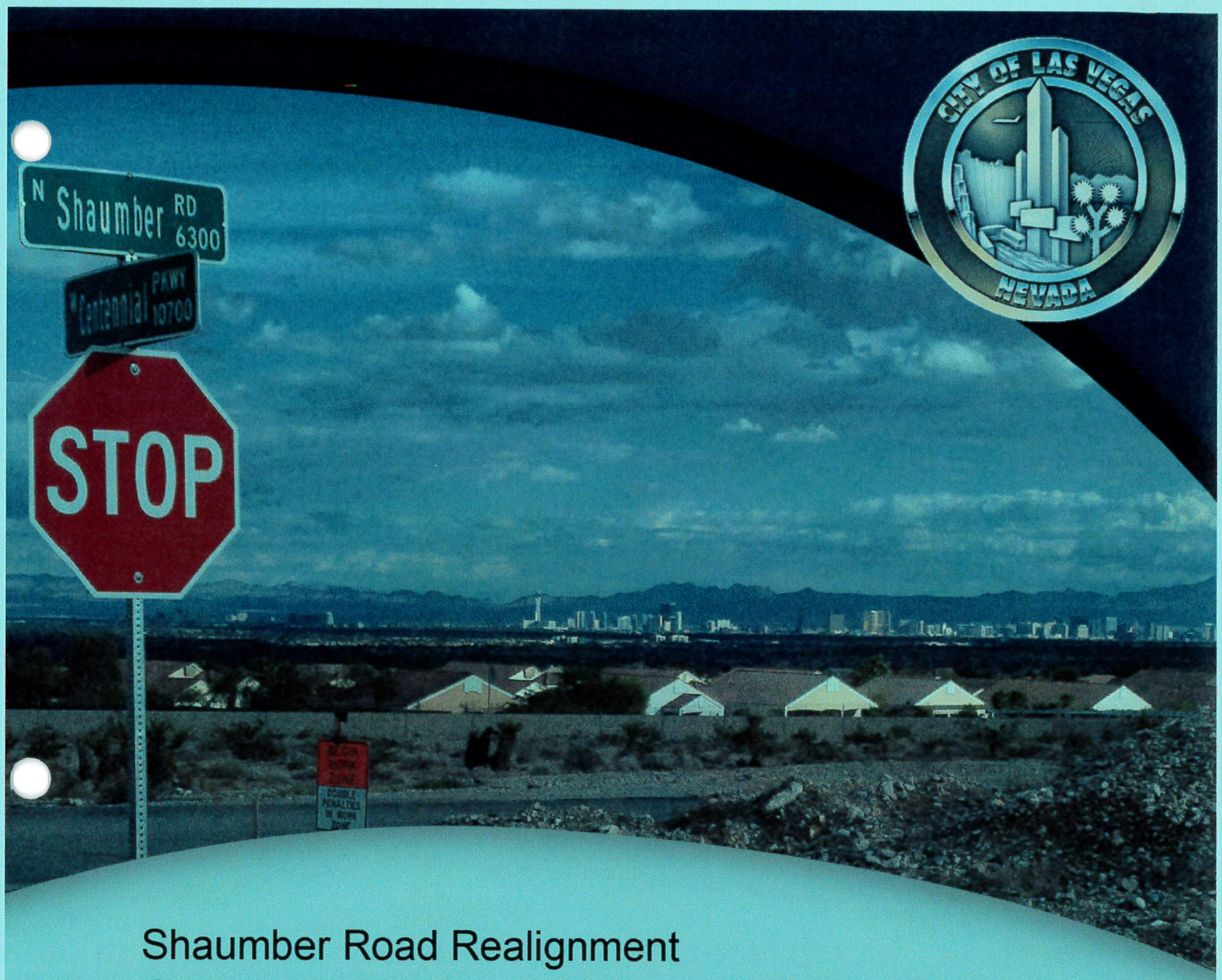
TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: CROSS STREET WITH TRAIL
CURB RETURN DETAIL

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: CR1
1 of 1
DRAWING NO.

JOB NO.



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix A-2

2008 MPU Figures

Hansen #45398

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-18
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert or Bridge Crossing
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

N

0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)

US95 I-15 I-215

1	2	3										
4	5	6										
	7	8	9	10								
11	12	13	14	15	16	17						
	18	19	20	21	22	23						
	24	25	26	27	28							
	29	30	31	32	33	34						
	35	36	37	38	39	40						
	41	42	43	44	45	46						
	47	48	49	50	51	52						
	53	54	55	56								
	57	58	59									

PBS&J PB

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOAN		**GOWAN ANN ROAD DETENTION BASIN FACILITIES**						
0000	P1	54" RCP	2289	156	CAM10DB	ALLGOW3	3.77	3.44
0044	E	54" RCP outlet	1153	156	CAM10DB	ALLGOW3	3.77	1.90
0059	E	25,181 cfs PMF Spillway		25181	CAM10IN	ALLGOW3	3.77	
0061	E	364 ac-ft Ann Road Detention Basin		6028	CAM10IN	ALLGOW3	3.77	
0062	P0	Upgrade to 479 ac-ft Ann Road Detention Basin		6028	CAM10IN	ALLGOW3	3.77	
0063	P0	Conc Chnl 25'W 4.5'D 2:1 SS	5534	2270	CAM-10A	ALLGOW3	1.27	4.80
0065	E	Soil Cement Chnl 20'W 7'D 0:1 SS	96	1045	CCAMDK3	ALLGOW3	0.65	3.98
0067	E	Bridge 20' X 6' @ Tropical	36	1045	CCAMDK3	ALLGOW3	0.65	3.98
0068	E	Soil Cement Chnl 20'W 6'D 0:1 SS	112	1045	CCAMDK3	ALLGOW3	0.65	6.70
0070	E	Soil Cement Chnl 10'W 4'-7'D 4:1 SS	3125	1045	CCAMDK3	ALLGOW3	0.65	3.00
0127	E	Soil Cement Chnl 10'W 2'-6'D 4:1 SS	1292	531	CAMDK3	ALLGOW3	0.32	1.73
GOBW		**GOWAN BELTWAY WEST**						
0051	P2	72" RCP Outlet	1508	116	LMBWDB	ALLGOW4	10.68	0.30
0052	P2	589 ac-ft Lone Mountain-Beltway Detention Basin		5140	CLMBW1	GW3SC	3.50	
0082	P2	51,400 cfs PMF Spillway		51400	CLMBW1	GW3SC	3.50	
0096	P1	8' X 8' RCB Connector Pipe Under Beltway	839	5140	CLMBW1	GW3SC	3.50	0.30
0097	P2	54" RCP	394	525	UVB1-2	ALLGOW3	0.34	8.09
0100	P2	Energy Dissipator	143	525	UVB1-2	ALLGOW3	0.34	50.00
0103	P2	42" RCP	98	525	UVB1-2	ALLGOW3	0.34	5.00
0106	P2	8' X 8' RCB Connector Pipe Under Lone Mountain	697	5140	CLMBW1	GW3SC	3.50	0.30
0128	P2	Conc Chnl 20'W 10'D 0:1 SS	190	3429	CWRBW1	ALLGOW3	6.06	25.00
0132	P2	Conc Chnl 14'W 10'D 0:1 SS	1286	2869	CHLBW1-C	GW3SC	1.84	5.00
0156	P2	Conc Chnl 16'W 10'D 0:1 SS	221	2869	CHLBW1-C	GW3SC	1.84	1.05
0160	P2	16' X 8' RCB	1230	2869	CHLBW1-C	GW3SC	1.84	1.05
0183	P2	15' X 8' RCB	2320	2869	CHLBW1-C	GW3SC	1.84	1.05
0227	P2	12' X 8' RCB	900	2185	CEFPOB	GW3SC	1.42	2.78
0244	P2	10' X 8' RCB	1070	1566	CEFPOA2	ALLGOW3	4.80	0.60
0264	P2	10' X 8' RCB	1434	1143	CCEFPOA1	ALLGOW3	4.50	0.88
0291	P2	8' X 6' RCB	1255	795	CMNA2	ALLGOW3	0.49	1.70
0315	P1	6' X 6' RCB	1360	591	CDMNA3	ALLGOW3	0.35	4.00
GOBX		**GOWAN BOX CANYON**						
0000	P2	66" RCP	794	753	LWBW1	ALLGOW3	0.48	9.45
0015	P0	66" RCP	6600	40	BOXDET	ALLGOW3	3.41	6.55
0115	P0	43,320 cfs PMF Spillway		43320	BOXCANYON	ALLGOW3	3.41	
0116	P0	18" RCP Outlet	100	40	BOXDET	ALLGOW3	3.41	
0118	P0	430 ac-ft Box Canyon Detention Basin		4332	BOXCANYON	ALLGOW3	3.41	
0140	P0	Conc Chnl 50'W 4.5'D 2:1 SS	900	4332	BOXCANYON	ALLGOW3	3.41	7.00
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0000	E	2: 10' X 10' RCBC @ Beltway	500	3508	CLMT5	GW3SC	3.15	3.39
0010	E	Conc Chnl 20'W 10'D 0:1 SS	3037	2946	CRCLMT1R	GW3SC	2.61	2.78
GOL5		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 5**						
0000	E	6' X 5' RCB	309	635	UVB2	ALLGOW3	0.45	7.69
0006	E	Conc Chnl 6'W 5'D 0:1 SS	740	635	UVB2	ALLGOW3	0.45	3.85
0020	E	6' x 5' RCBC @ Alexander Rd	615	635	UVB2	ALLGOW3	0.45	2.08
0032	E	Conc Chnl 6'W 5'D 0:1 SS	1756	635	UVB2	ALLGOW3	0.45	1.67
GOLM		**GOWAN LONE MOUNTAIN SYSTEM**						
0174	E	Conc Chnl 28'W 8'D 0:1 SS	2715	6173	CCLMT5	GW3SC	4.92	3.20
0226	E	10' X 10' RCBC @ Beltway	246	2961	CUVB2	ALLGOW3	1.76	2.50
0230	E	10' X 10' RCB	290	2468	CLMT3	ALLGOW3	1.31	2.50
0236	E	Conc Chnl 15'W 8'D 0:1 SS	869	2468	CLMT3	ALLGOW3	1.31	3.69
0252	E	Conc Chnl 15'W 8.15'D 0:1 SS	455	2468	CLMT3	ALLGOW3	1.31	3.16
0260	E	Transition Structure	124	2468	CLMT3	ALLGOW3	1.31	3.16
0262	E	16' X 9' RCAC @ Cliff Shadows	80	2468	CLMT3	ALLGOW3	1.31	3.16
0264	E	16' X 7' RCAP	674	2468	CLMT3	ALLGOW3	1.31	4.00
0277	P1	Conc Chnl 20'W 5'D 2:1 SS	4300	2468	CLMT3	ALLGOW3	1.31	5.00
RCBC		**RANCHO ROAD SYSTEM - BELTWAY CHANNEL**						
0140	E	Conc Chnl 10'W 5'D 0:1 SS	2155	598	CDMNA1	WEST3	0.48	1.65

** The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.*

*** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.*

^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2008 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 18

LEGEND

ID (Facility Identifier) AABB
- Parent Stream Name
- Stream Name

River Mile 0000
- Distance Above Confluence with Parent Stream (Miles)
- Miles in Hundredths

Existing Facility..... E
Proposed or Modified Facility..... P
Contingency Level
- Category B..... P0
- Master Plan..... P1
- Preliminary Design..... P2
- Design..... P3

Bottom Width..... W
Depth..... D
Side Slope, H:V..... SS

Construction Features

Cast in Place Concrete Pipe	CIPCP	Reinforced Concrete Arch Culvert	RCAC
Corrugated Metal Arch Pipe Culvert	CMAP	Reinforced Concrete Box	RCB
Corrugated Metal Pipe Culvert	CMPC	Reinforced Concrete Box Culvert	RCBC
High Density Polyethylene	HDPE	Reinforced Concrete Pipe	RCP
Horizontal Elliptical Reinforced Concrete Pipe	HERCP	Reinforced Concrete Pipe Culvert	RCPC
Reinforced Concrete Arch Pipe	RCAP	Storm Sewer Pipe	SSP

PBS&J PB

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H-18
HYDROLOGIC SUMMARY

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- Subbasin Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

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

Type Hydrologic Soil Groups

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential/Rock Outcrops

Typical Land Use

- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
- 4 / 14* Low Density Residential
- 5 / 15* Medium Density Residential
- 6 / 16* High Density Residential
- 7 / 17* Public Facility, Residential
- 8 / 18* Very High Density Residential
- 9 / 19* Commerical, Retail, Casino, High Rise Condominiums
- 10 / 20* Light Industrial
- 11 / 21* Heavy Industrial
- 12 / 22* Schools
- 13 Lakes

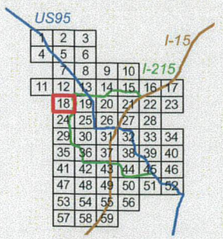
* Drought Ordinance Applied

N

0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)



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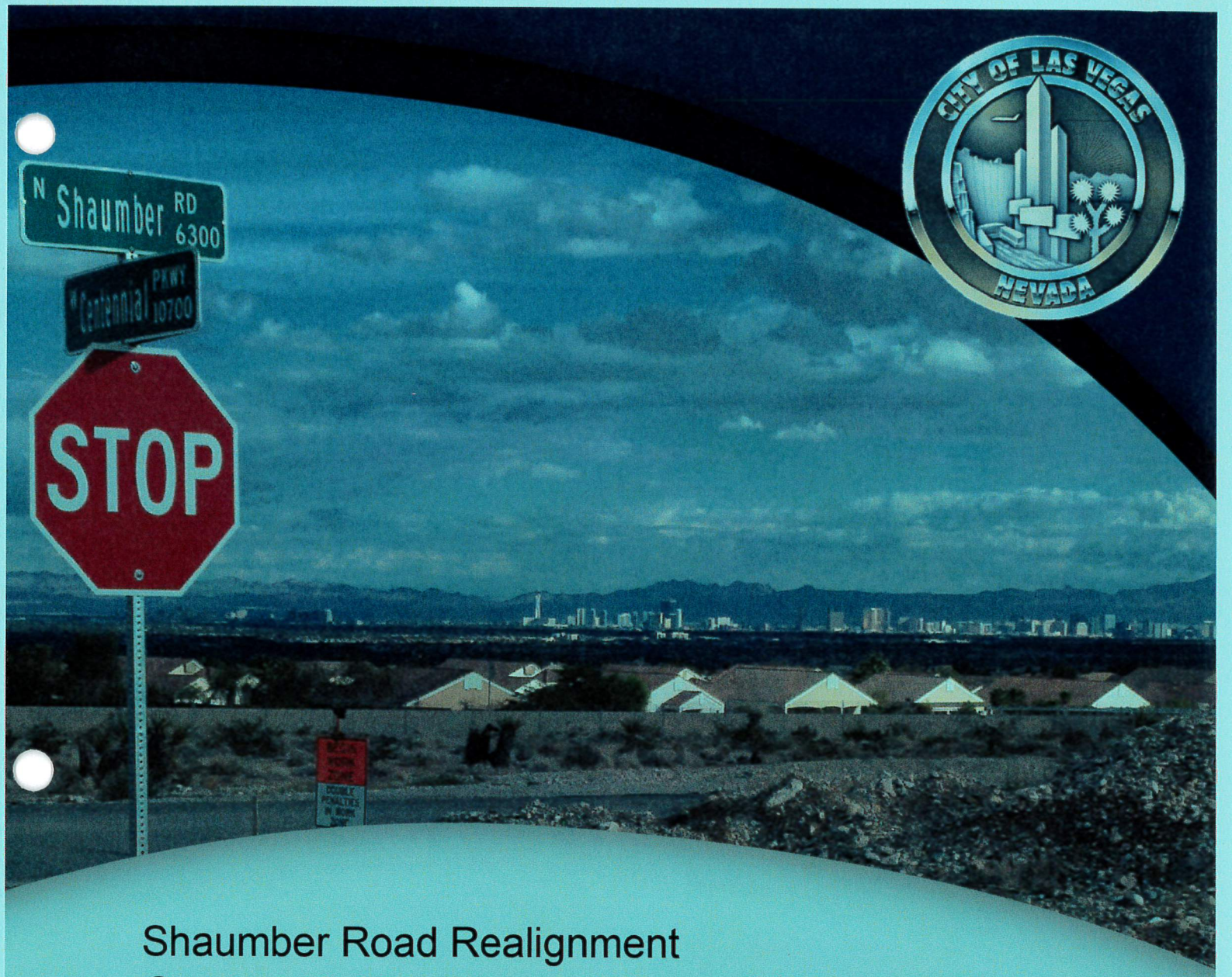


Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix A-3

FEMA Flood Insurance Rate Maps

Hansen #45398

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) Zone 11. The **horizontal** datum is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1999 or newer, and CRF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and internet address for information on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

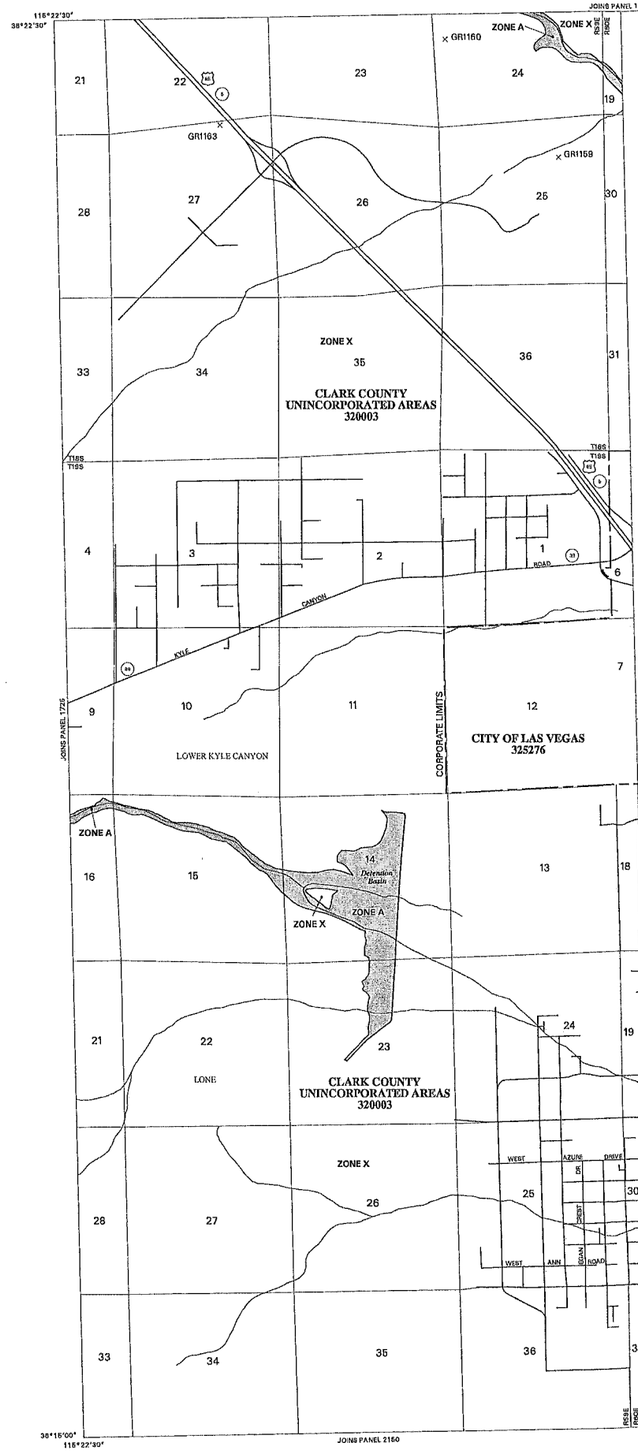
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.

This Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

This DFIRM reflects several innovative features. These include:
+ Southern Nevada GIS--Cooperation among local governmental agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS Metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the base map for this DFIRM.

DIGITAL DATA AVAILABILITY: http://www.co.clark.nv.us/pcit/gis/mo/gismo.htm



THIS AREA IS SHOWN ON MAP NUMBER 32003C1735

THIS AREA IS SHOWN ON MAP NUMBER 32003C1734

THIS AREA IS SHOWN ON MAP NUMBER 32003C1745

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
ZONE A99	Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain Boundary
	Floodway Boundary
	Zone D Boundary
	Coastal Barrier Boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL. 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross Section Line
23 — 23	Transect Line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000M	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks
DX5519	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

PANEL 1750 E

FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA AND
INCORPORATED AREAS

PANEL 1750 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	1750	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	1750	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C1750 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0° North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) Zone 11. The **horizontal** datum is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **benchmarks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1999 or newer, and GBF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.

This Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

This DFIRM reflects several innovative features. These include:
+ Southern Nevada GIS – Cooperation among local governmental agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS Metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the base map for this DFIRM.

DIGITAL DATA AVAILABILITY: http://www.co.clark.nv.us/ceit/gismo/gismo.htm

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
ZONE A99	Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain Boundary
	Floodway Boundary
	Zone D Boundary
	Coastal Barrier Boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross Section Line
23 — 23	Transect Line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000M	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel).
M1.5	River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

500 0 600 1200 METERS

PANEL 2150 E

FIRM
FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA AND INCORPORATED AREAS

PANEL 2150 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

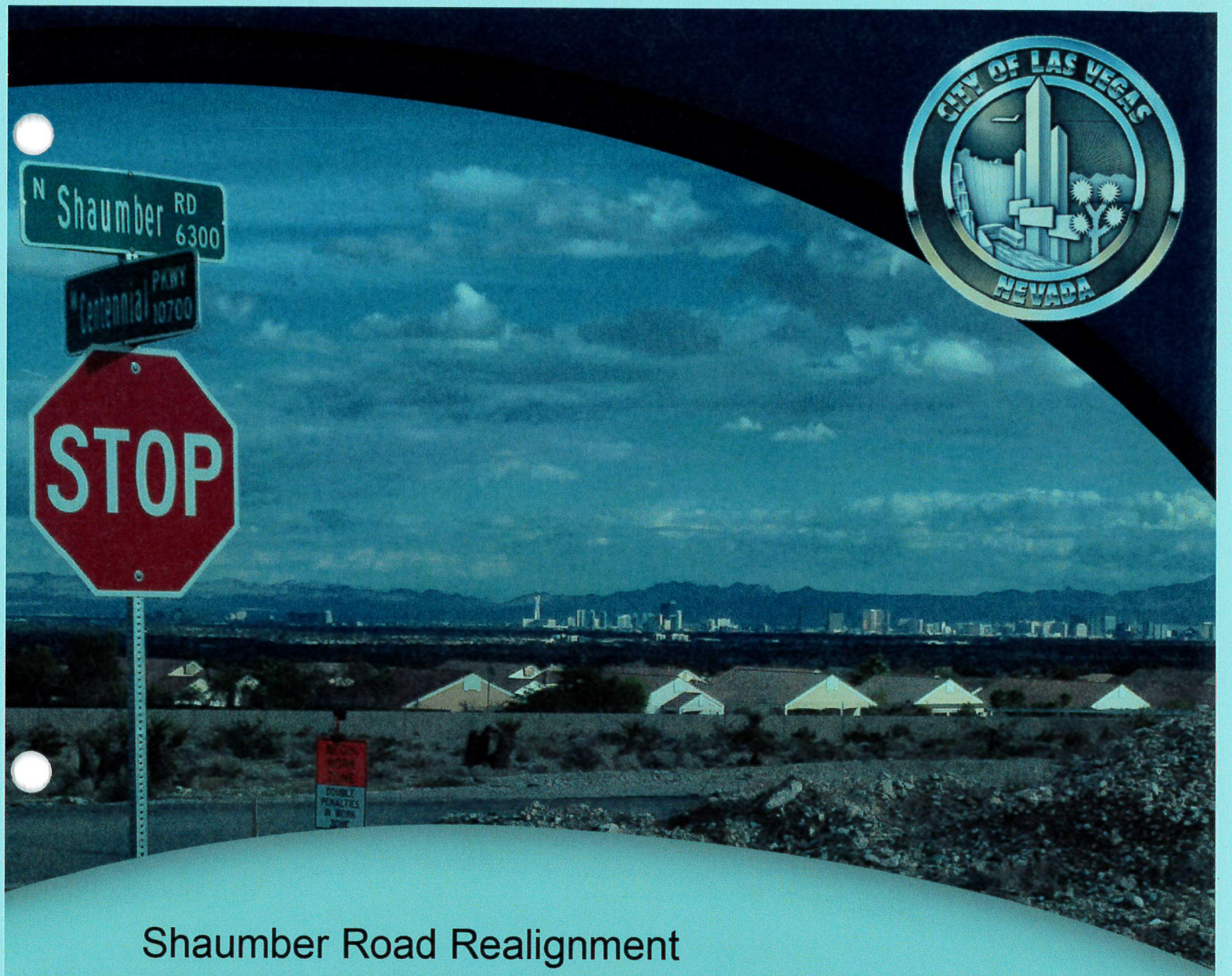
COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	2150	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	2150	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2150 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix A-4

CCRFCD Supplemental Documentation

Hansen #45398

PRECIPITATION ADJUSTMENT RATIOS

Recurrence Interval	Ratio to NOAA Atlas 2
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

NOTE:
1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

Revision	Date

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5	Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

Notes:
1. For drainage areas less than 8 square miles in size, use SDN 3.
2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
4. A graphical representation of these values is presented on **Figure 515.**

Revision	Date

REFERENCE:

TABLE 503

SIX HOUR DEPTH-AREA REDUCTION FACTORS

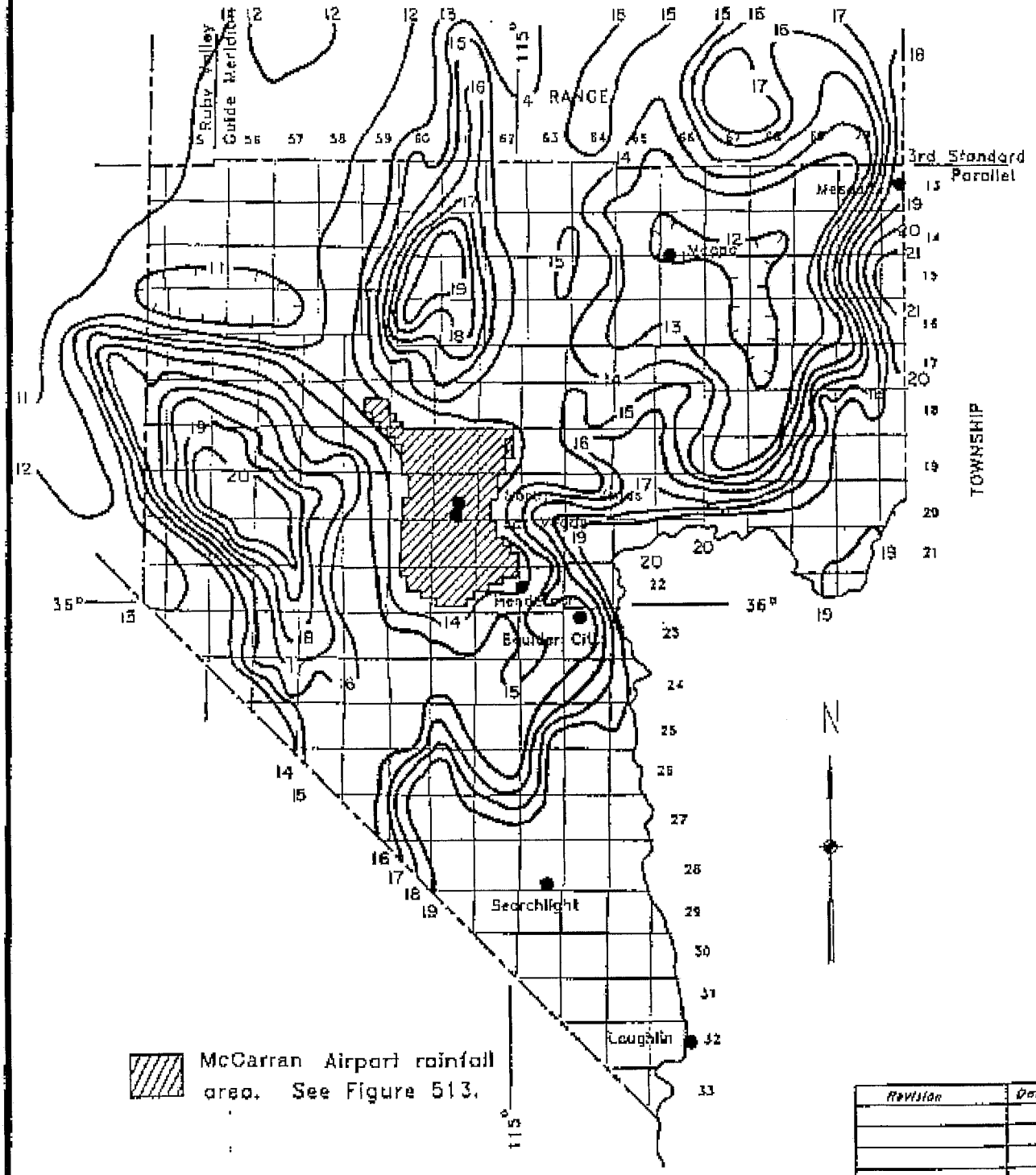
Drainage Area (Square Miles)	Six-Hour Depth-Area Reduction Factor
0.0	1.00
0.5	0.98
1.0	0.97
2.0	0.93
4.0	0.91
6.0	0.90
8.0	0.88
10.0	0.86
20.0	0.79
30.0	0.74
50.0	0.68
100.0	0.60
150.0	0.55
200.0	0.51
300.0	0.46
400.0	0.42
500.0	0.39

NOTES: 1. A graphical representation of these factors is presented in Figure 514.

2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction Factors for drainage areas greater than 200 square miles.

Revision	Date

RAINFALL DEPTH-DURATION-FREQUENCY
10-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



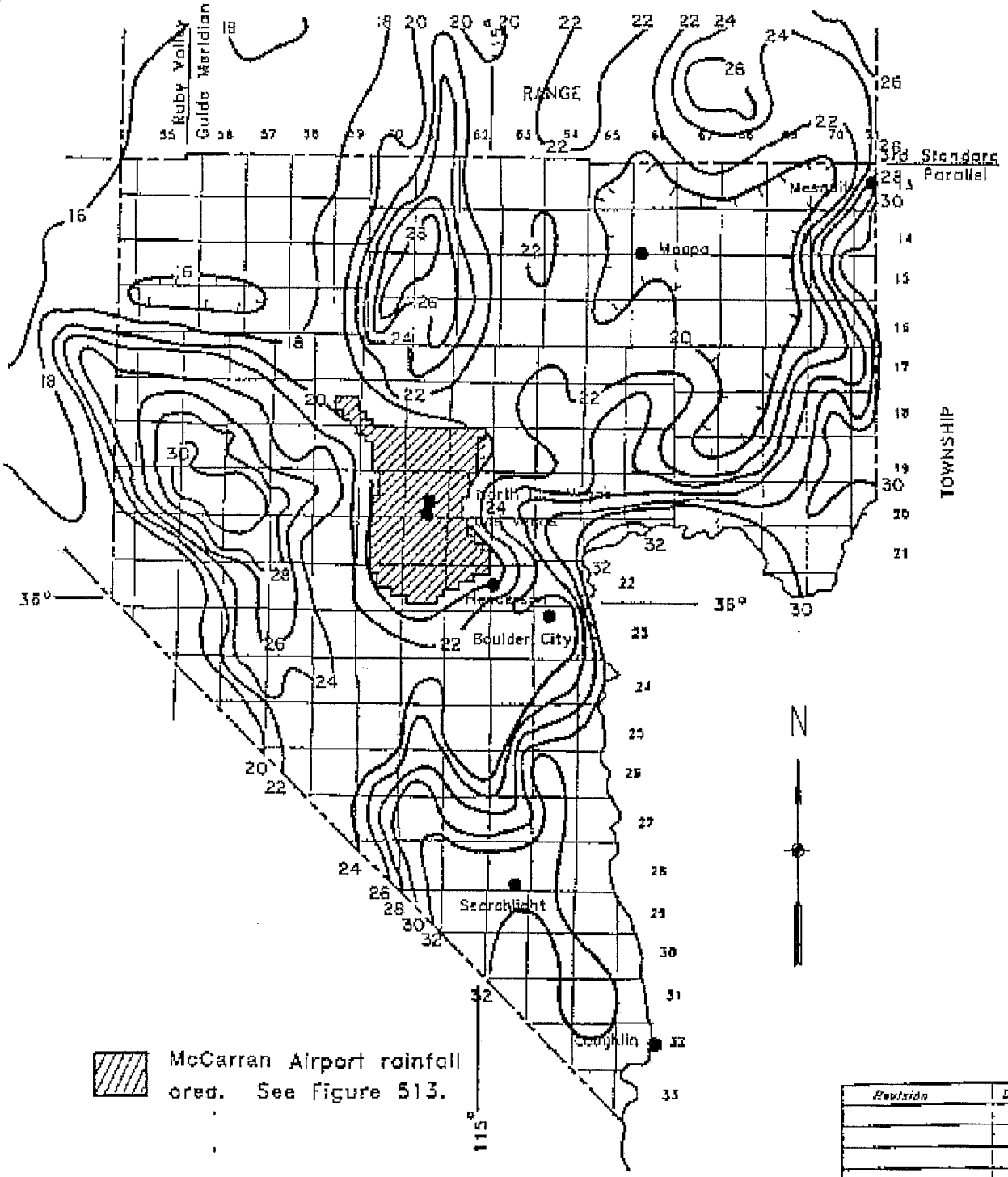
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

TIME	RECURRENCE INTERVAL 2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.

2. The 24 hour values presented above are for use with TR-55 only.

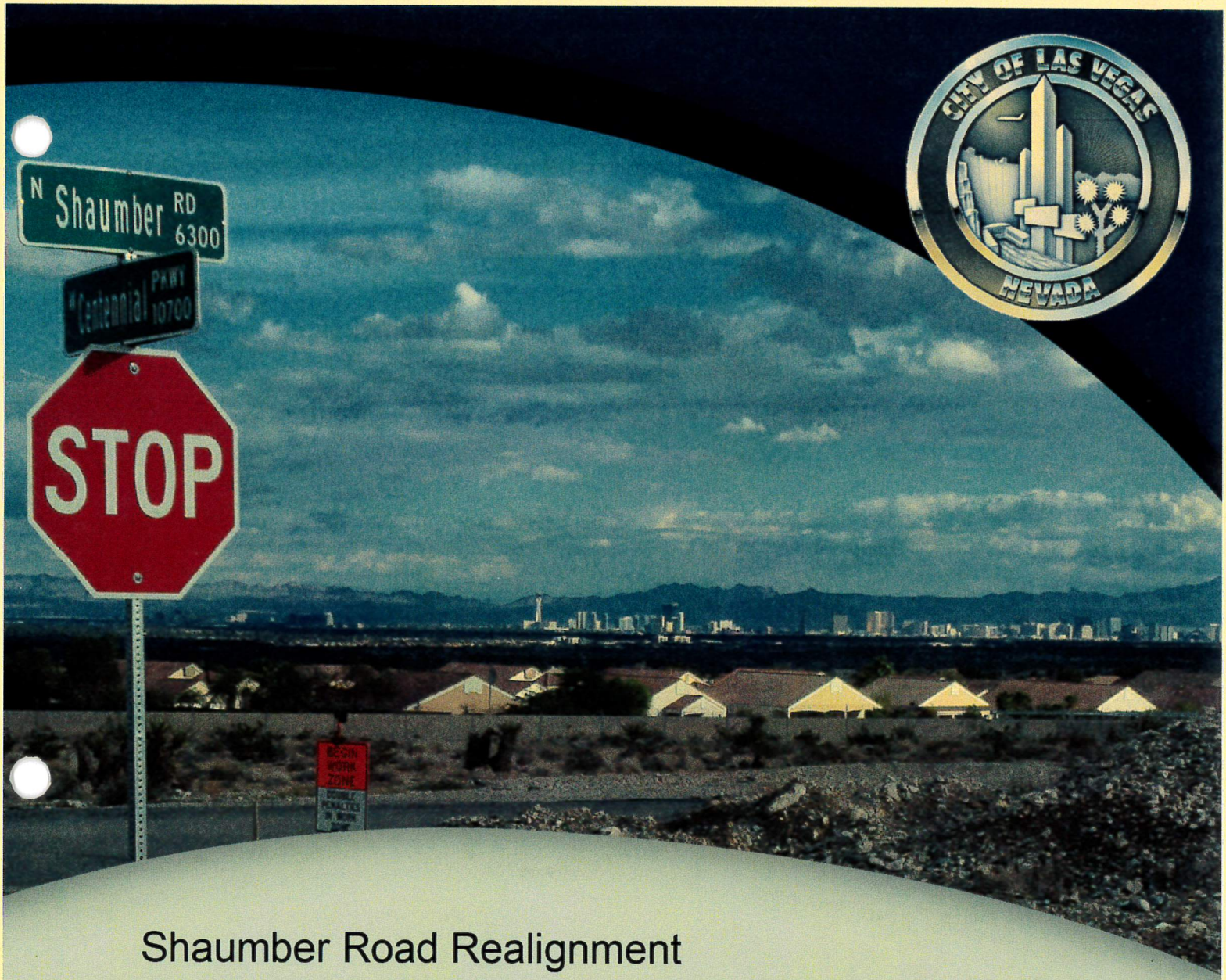
3. Table 501 adjustments not required.

Revision	Date

LAG EQUATION ROUGHNESS FACTORS

WATERSHED CHARACTERISTICS	ROUGHNESS FACTOR, Kn
Urbanized Areas: Water courses in the drainage area consist of street, storm sewer, and improved channels.	.015
Natural Areas: Water courses in the drainage area are well defined, unimproved channels or washes. Watershed has minimal vegetation.	.030
Natural Areas: Water courses in the drainage area are not well defined, and consist of many small rills and braided wash areas. Runoff from area combines slowly into channels. Includes mountainous channels with large boulders and flow restrictions.	.050

Revision	Date



Shaumber Road Realignment

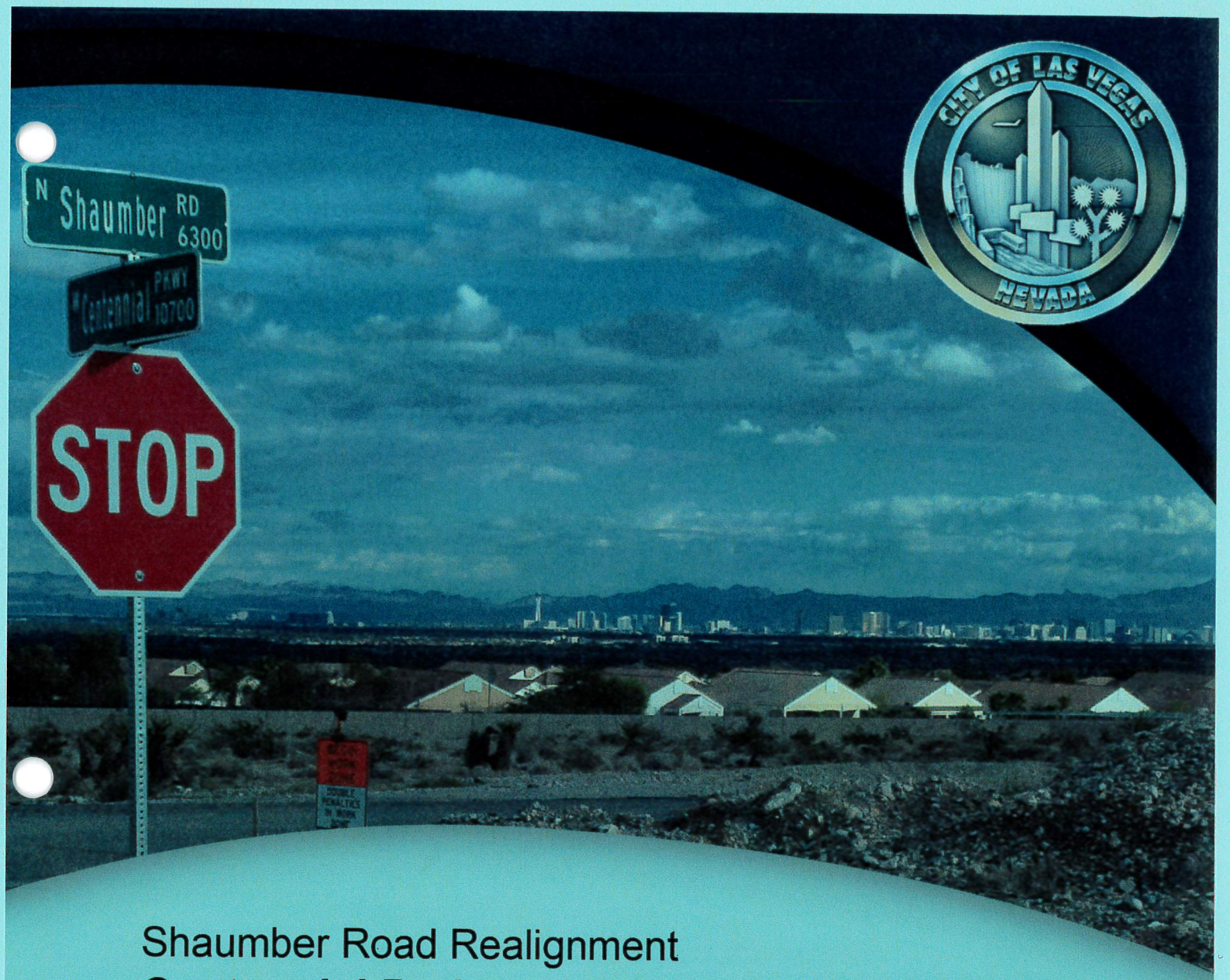
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B

HYDROLOGIC ANALYSIS

Hansen #45398



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

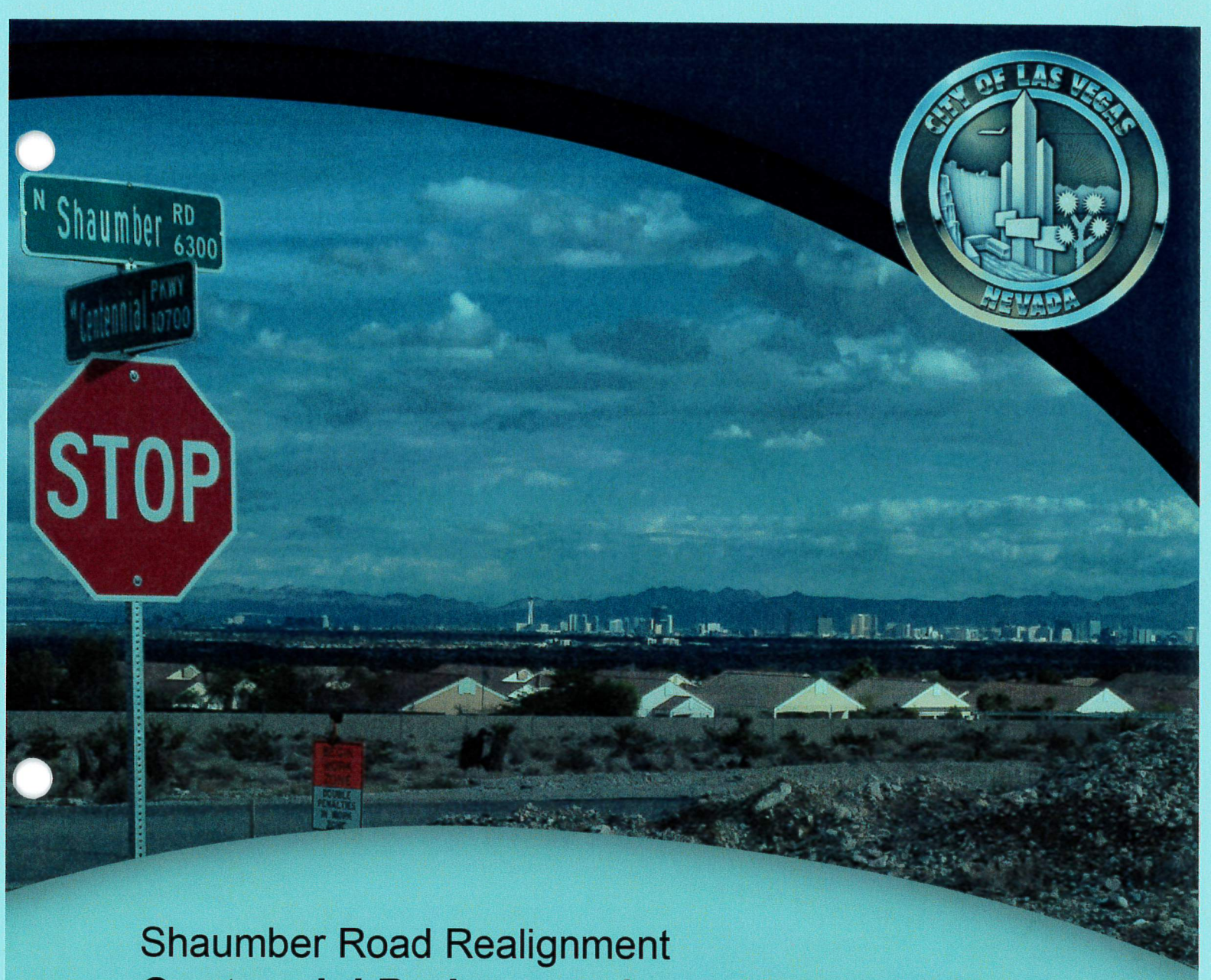
Appendix B-1

HEC-1 Flowrates Summary

Hansen #45398

SHAUMBER ROAD REALIGNMENT PRELIMINARY INTERIM CONDITION HYDROLOGIC ANALYSIS		
BASIN ID	**AREA (mi²)**	**Q_{100}**
CDMNA3	0.29	368
CDMNA2	0.12	214
INT1	0.04	59
CP1	0.45	601
INT2A	0.02	40
INT2B	0.02	44
INT2C	0.04	74
INT3	0.10	146
INT4A	0.02	23
CP2	0.11	166
CAMDK2	0.23	322
CAMDK3	0.40	556
CAM-10A	1.27	1307
CAM-10B	1.79	1747
DETCAM10	0.06	98
CAM10IN	3.74	3484
CAM10DB	3.74	138
INT4B	0.04	51
INT5	0.15	219
CP3	3.93	313
INT6	0.06	98
INT7	0.10	158
CP4	0.16	255
INT8	0.20	374
INT9	0.13	235
INT10	0.21	360
INTBXCN	3.34	2576
INT11	0.10	140
INT12	0.09	107
INT13A	0.07	83
CP5	3.50	2609
INT13B	0.11	127
INT14	0.10	157
INT15	0.11	178
INT16	0.08	123
CP6	0.28	450
INT17	0.01	20

SHAUMBER ROAD REALIGNMENT PRELIMINARY ULTIMATE CONDITION HYDROLOGIC ANALYSIS			
BASIN ID	**AREA (mi²)**	**Q_{10}**	**Q_{100}**
CDMNA3	0.35	320	613
CDMNA2	0.13	111	226
CP1	0.48	421	826
EFPOA1	0.16	170	328
CAMDK2	0.23	192	402
CAMDK3	0.37	291	603
CAM-10A	1.25	851	1631
CAM-10B	1.82	1006	2087
DETCAM10	0.05	34	79
CAM10IN	3.72	2066	4193
CAM10OT	3.72	106	156
EFPOA2	0.19	143	326
CP2	3.91	187	379
EFPOA3	0.14	134	267
EFPOB1	0.27	363	673
EFPOB2	0.10	134	249
CP3	0.51	603	1147
HLBW1-C	0.23	255	476
WRBW1	0.31	331	624
BOXCANYON	3.41	1432	3178
BOXDET	3.41	27	40
LWBW1	0.32	364	678
CP4	4.05	625	1191
LWBW1-A	0.01	15	28



Shaumber Road Realignment

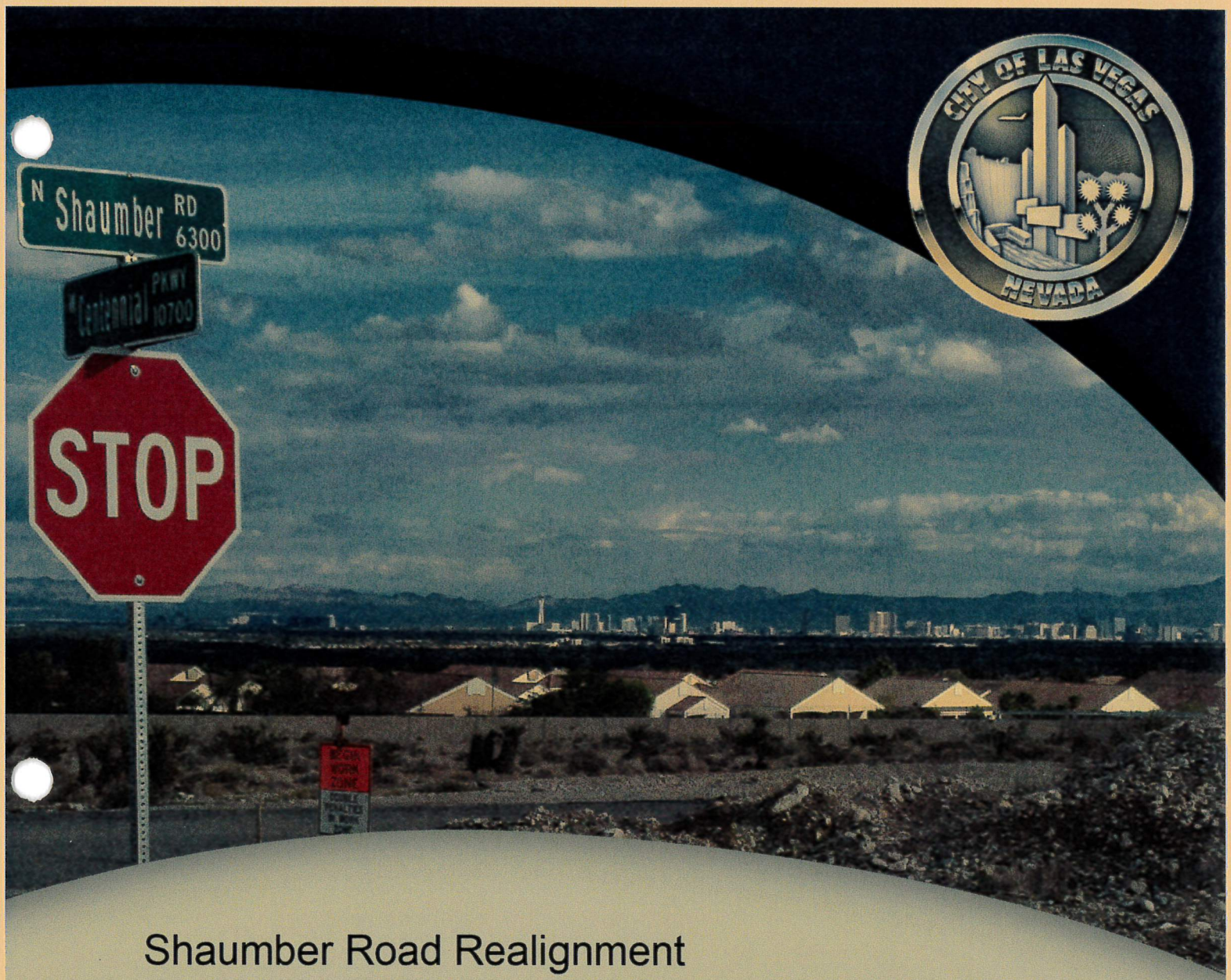
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-2

Time of Concentration Calculations

Hansen #45398



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-2.1

Time of Concentration Calculations

Interim Condition

Hansen #45398

TIME OF CONCENTRATION / LAG TIME DETERMINATION - less than 1 mi^2

CH2MHILL

SHAUMBER ROAD REALIGNMENT
INTERIM OFFSITE BASINS

Project No: 458949
Date: 12/7/12
Calculated by: MS

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)							T_{lag}	REMARKS
Basin ID	DEV./UNDEV. (D or U)	CN	K	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V_1 VELOCITY FPS	V_2 VELOCITY FPS	Tt Min	Tc Min	Tc Check Min	T_{lag} 0.6Tc/60 Hours	RAINFALL INCHES
(1)	(2)	(3)	(4)	(5b)	(6)	(7)	(8)	(9)	(10)	(10a)	(10b)	(11)	(12)	(13)	(14)	(15)
CDMNA3	U	86.9	0.7571	0.2897	100	2.00	4.9	5419	2.45	2.3	4.6	21.4	26.3	N/A	**0.263**	
CDMNA2	D	92.4	0.8297	0.1240	100	2.00	3.9	3868	2.27	3.0	4.6	14.9	18.8	32.0	**0.188**	
INT1	U	86.9	0.7571	0.0361	100	3.00	4.3	2440	5.30	3.4	6.8	7.2	11.5	N/A	**0.115**	
INT2A	D	90.7	0.8072	0.0192	100	5.00	3.1	1617	5.24	4.6	7.0	4.5	7.5	19.5	**0.075**	
INT2B	D	89.3	0.7888	0.0231	100	5.00	3.3	2273	5.48	4.7	7.2	5.9	9.2	23.2	**0.092**	
INT2C	D	87.7	0.7676	0.0449	100	5.00	3.5	3767	5.04	4.5	6.9	9.8	13.3	31.5	**0.133**	
INT3	D	85.8	0.7426	0.0963	100	4.00	4.1	4145	4.48	4.3	6.5	11.3	15.4	33.6	**0.154**	
INT4A	U	82.0	0.6924	0.0155	100	4.00	4.6	1118	4.93	3.3	6.5	4.1	8.7	N/A	**0.087**	
INT4B	U	80.8	0.6766	0.0396	100	4.00	4.8	2950	4.43	3.1	6.2	9.3	14.1	N/A	**0.141**	
CAMDK2	U	86.9	0.7571	0.2275	100	5.00	3.6	6675	5.68	3.5	7.0	17.1	20.7	N/A	**0.207**	
CAMDK3	U	87.1	0.7597	0.3977	100	8.00	3.1	10006	8.50	4.3	8.6	20.4	23.5	N/A	**0.235**	
DETCAM10	D	86.9	0.7571	0.0575	100	2.00	4.9	1630	2.89	3.4	5.2	6.0	10.9	19.6	**0.109**	
INT5	U	85.3	0.7360	0.1479	100	3.00	4.5	3849	4.29	3.1	6.1	11.9	16.4	N/A	**0.164**	
INT6	U	86.6	0.7531	0.0609	100	3.00	4.3	2598	3.15	2.6	5.2	9.9	14.2	N/A	**0.142**	
INT7	U	86.0	0.7452	0.0993	100	3.00	4.4	2688	3.77	2.9	5.7	9.3	13.7	N/A	**0.137**	
INT8	U	87.1	0.7597	0.1982	100	20.00	2.3	4174	18.37	6.3	12.6	6.2	8.4	N/A	**0.084**	
INT9	U	87.1	0.7597	0.1339	100	20.00	2.3	4975	15.17	5.8	11.5	8.0	10.2	N/A	**0.102**	
INT10	U	87.0	0.7584	0.2136	100	15.00	2.5	6128	12.06	5.1	10.2	10.8	13.3	N/A	**0.133**	
INT11	U	83.2	0.7082	0.0958	100	6.00	3.9	3937	6.09	3.7	7.3	10.2	14.1	N/A	**0.141**	
INT12	U	81.4	0.6845	0.0860	100	6.00	4.1	5442	6.13	3.7	7.3	13.6	17.7	N/A	**0.177**	
INT13A	U	78.6	0.6475	0.0712	100	6.00	4.5	3557	5.88	3.6	7.1	9.5	14.0	N/A	**0.140**	
INT13B	U	82.8	0.7030	0.1054	100	6.00	3.9	6512	6.28	3.7	7.4	15.8	19.8	N/A	**0.198**	
INT14	U	86.9	0.7571	0.0992	100	6.00	3.4	5007	6.85	3.9	7.7	11.9	15.3	N/A	**0.153**	
INT15	U	86.9	0.7571	0.1084	100	6.00	3.4	3044	6.68	3.8	7.6	7.8	11.2	N/A	**0.112**	
INT16	U	86.9	0.7571	0.0756	100	7.00	3.2	4538	7.22	4.0	7.9	10.6	13.8	N/A	**0.138**	
INT17	U	86.9	0.7571	0.0103	100	4.00	3.9	627	4.13	3.0	6.0	3.1	7.0	N/A	**0.070**	

NOTE:

(1) Subbasin Name
(2) Developed or Undeveloped Subbasin
(3) Curve Number (See Subbasin CN Calculations)
(4) K = 0.0132 (CN) - 0.39
(5a) & (5b) Area
(6) Initial Length
(7) Initial Slope
(8) Ti = 1.8 (1.1 - K) L^1/2 / S^1/3
(9) Travel Length
(10) Slope
(10a) Slope V_1 applies to the first 500 feet of travel distance; Developed V_1 = 20.2*(S/100)^1/2
(10b) V_2 applies to the remaining travel distance; Developed V_2 = 30.6*(S/100)^1/2
(11) Tt = 500/(V1*60)+(Travel Length-500)/(V2*60)
(12) Tc = Ti + Tt
(13) Tc Check = L/180+10 (select smaller Tc)
(14) Tlag = 0.6 Tc/60
(15) Rainfall in inches

REFERENCE: Calculations based on the Clark County Regional Flood Control District HCDDM

STANDARD FORM 4

TIME OF CONCENTRATION / LAG TIME DETERMINATION - greater than 1 mi^2

SHAUMBER ROAD REALIGNMENT

CH2MHILL

BASIN AREAS AND LAG TIMES FOR HEC-1 MODEL

INTERIM OFFSITE BASINS

BASIN AREAS > 1 MI^2

SUB-BASIN DATA									LAG
BASIN ID	AREA mi²	L. CN	Kn	LENGTH L(ft)	LENGTH L(mi)	LENGTH Lc(ft)	LENGTH Lc(mi)	SLOPE S(ft/mi)	TLAG (hr)
CAM-10A	1.269	87.40	0.050	11484	2.175	5742	1.088	688.28	0.452
CAM-10B	1.792	87.40	0.050	11842	2.243	5921	1.121	632.24	0.468
INTBXCN	3.335	87.31	0.050	17575	3.329	8788	1.664	628.19	0.608

TLAG Equation for basins greater than one square mile (CCRFCD HCDDM):

TLAG = 20*Kn(L*Lc/S^0.5)^0.33

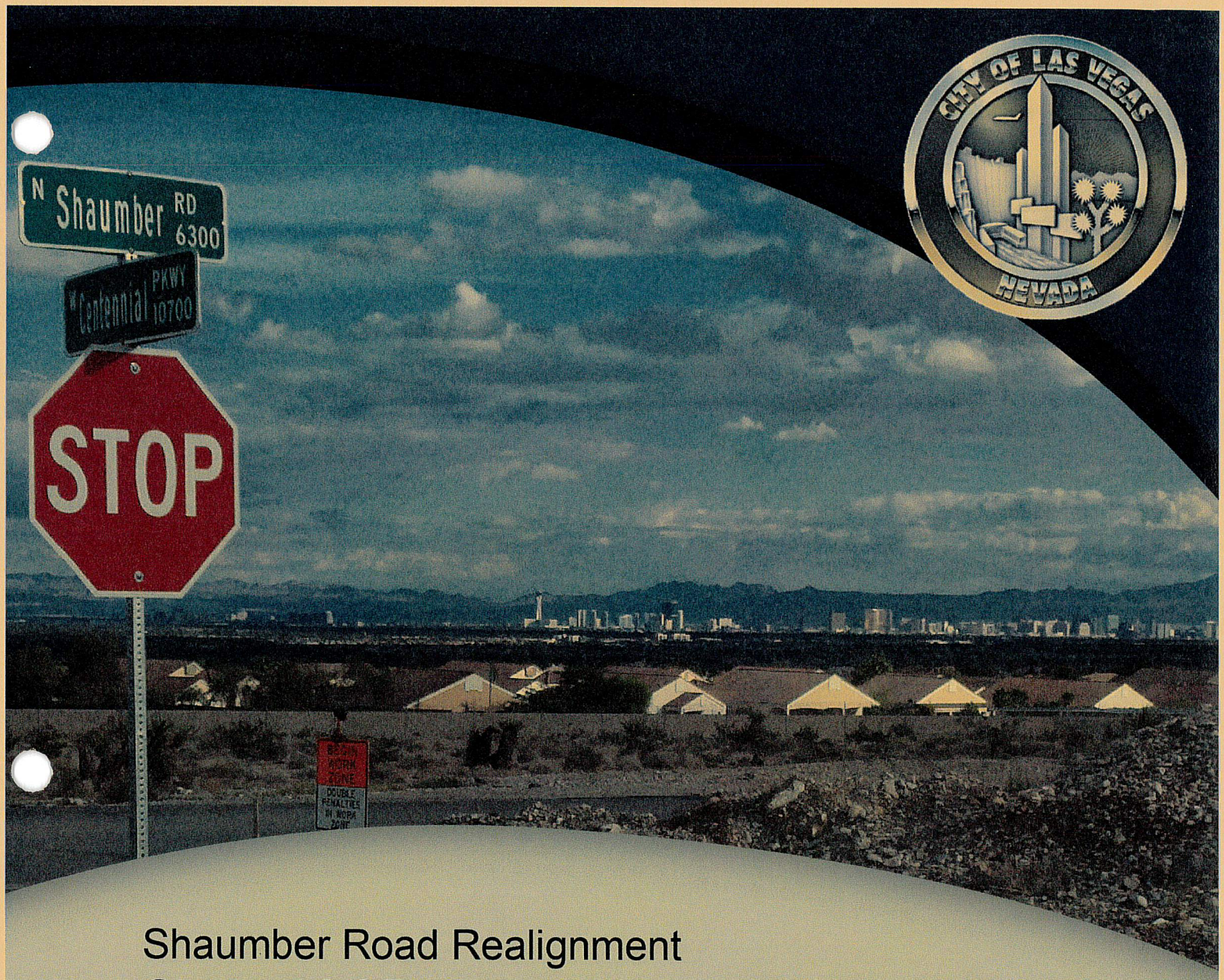
Where:

Kn = Manning's Roughness Factor for the Basin Channels

L = Length of Longest Watercourse (mi)

Lc = Length Along Longest Watercourse Measured Upstream to a Point Opposite the Centroid of the Basin

S = Average Slope of the Longest Watercourse (ft/mi)



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-2.2

Time of Concentration Calculations

Ultimate Condition

Hansen #45398

TIME OF CONCENTRATION / LAG TIME DETERMINATION - less than 1 mi^2

CH2MHILL

SHAUMBER ROAD
ULTIMATE OFFSITE BASINS

Project No: 458949
Date: 12/7/12
Calculated by: MS

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)							T_{lag}	REMARKS
Basin ID	DEV./EX. (D or E)	CN	K	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V_1 VELOCITY FPS	V_2 VELOCITY FPS	Tt Min	Tc Min	Tc Check Min	T_{lag} 0.6Tc/60 Hours	RAINFALL INCHES
(1)	(2)	(3)	(4)	(5b)	(6)	(7)	(8)	(9)	(10)	(10a)	(10b)	(11)	(12)	(13)	(14)	(15)
CDMNA3	D	95.3	0.8680	0.3487	100	2.00	3.3	4879	2.45	3.2	4.8	17.9	21.2	37.7	**0.212**	
CDMNA2	D	92.8	0.8350	0.1294	100	2.00	3.8	3868	2.27	3.0	4.6	14.9	18.7	32.0	**0.187**	
EFPOA1	D	94.4	0.8561	0.1625	100	3.00	3.0	3662	4.64	4.4	6.6	9.9	13.0	30.9	**0.130**	
EFPOA2	D	88.5	0.7782	0.1890	100	2.00	4.6	3388	4.57	4.3	6.5	9.3	13.9	29.4	**0.139**	
EFPOA3	D	93.0	0.8376	0.1350	100	3.00	3.3	2683	3.35	3.7	5.6	8.8	12.0	25.5	**0.120**	
CAMDK2	D	91.9	0.8231	0.2280	100	5.00	2.9	6675	5.68	4.8	7.3	15.8	18.8	47.6	**0.188**	
CAMDK3	D	91.7	0.8204	0.3665	100	8.00	2.5	10006	8.50	5.9	8.9	19.2	21.7	66.1	**0.217**	
DETCAM10	D	86.9	0.7571	0.0465	100	2.00	4.9	1630	2.89	3.4	5.2	6.0	10.9	19.6	**0.109**	
EFPOB1	D	96.0	0.8772	0.2708	100	18.00	1.5	4162	18.40	8.7	13.1	5.6	7.1	33.7	**0.071**	
EFPOB2	D	96.0	0.8772	0.1018	100	15.00	1.6	4204	16.53	8.2	12.4	6.0	7.6	33.9	**0.076**	
HLBW1-C	D	95.8	0.8746	0.2268	100	7.00	2.1	5305	7.16	5.4	8.2	11.3	13.4	40.0	**0.134**	
WRBW1	D	95.6	0.8719	0.3140	100	5.00	2.4	6286	5.81	4.9	7.4	14.8	17.2	45.5	**0.172**	
LWBW1	D	95.9	0.8759	0.3222	100	6.00	2.2	4910	6.00	4.9	7.5	11.5	13.7	37.8	**0.137**	
LWBW1-A	D	95.4	0.8693	0.0105	100	4.00	2.6	627	4.13	4.1	6.2	2.4	5.0	14.0	**0.050**	

NOTE:
(1) Subbasin Name
(2) Developed or Undeveloped Subbasin
(3) Curve Number (See Subbasin CN Calculations)
(4) K = 0.0132 (CN) - 0.39
(5a) & (5b) Area
(6) Initial Length
(7) Initial Slope
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Developed V_1 = 20.2*(S/100)^1/2
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Developed V_2 = 30.6*(S/100)^1/2
(11) Tt = 500/(V1*60)+(Travel Length-500)/(V2*60)
(12) Tc = Ti + Tt
(13) Tc Check = L/180+10 (select smaller Tc)
(14) Tlag = 0.6 Tc/60
(15) Rainfall in inches

REFERENCE: Calculations based on the Clark County Regional Flood Control District HCDDM

STANDARD FORM 4

TIME OF CONCENTRATION / LAG TIME DETERMINATION - greater than 1 mi^2

CH2MHILL

SHAUMBER ROAD REALIGNMENT

BASIN AREAS AND LAG TIMES FOR HEC-1 MODEL

ULTIMATE OFFSITE BASINS

BASIN AREAS > 1 MI^2

SUB-BASIN DATA									LAG
BASIN ID	AREA mi^2	CN	Kn	LENGTH L(ft)	LENGTH L(mi)	LENGTH Lc(ft)	LENGTH Lc(mi)	SLOPE S(ft/mi)	TLAG (hr)
CAM-10A	1.254	95.20	0.050	11484	2.175	5742	1.088	688.28	0.452
CAM-10B	1.823	92.30	0.050	11842	2.243	5921	1.121	632.24	0.468
BOXCANYON	3.410	89.80	0.050	17575	3.329	8788	1.664	628.19	0.608

For basins greater than one square mile:

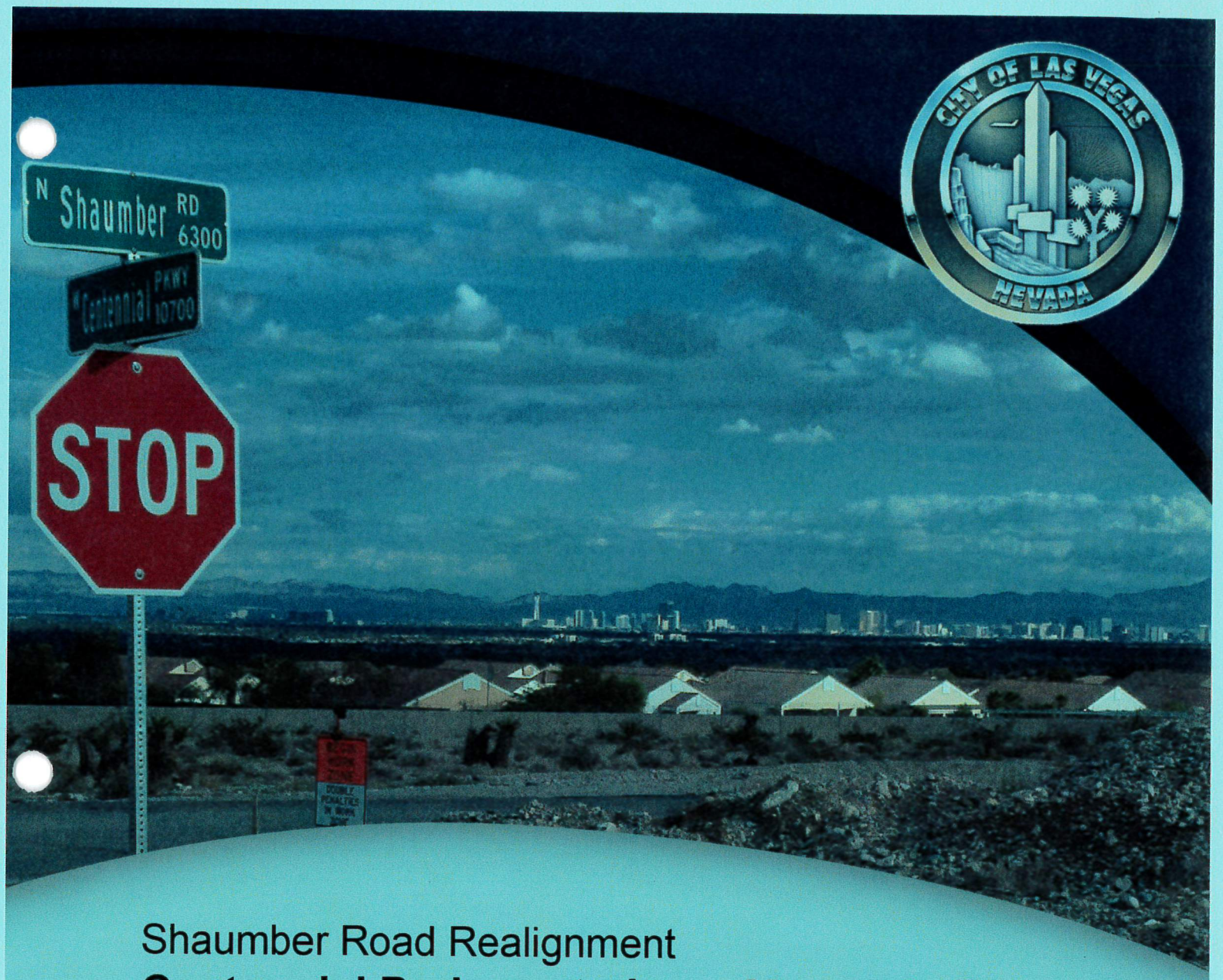
TLAG = 20*Kn(L*Lc/S^0.5)^0.33

Where Kn = Manning's Roughness Factor for the Basin Channels

L = Length of Longest Watercourse (mi)

Lc = Length Along Longest Watercourse Measured Upstream to a Point Opposite the Centroid of the Basin

S = Average Slope of the Longest Watercourse (ft/mi)



Shaumber Road Realignment

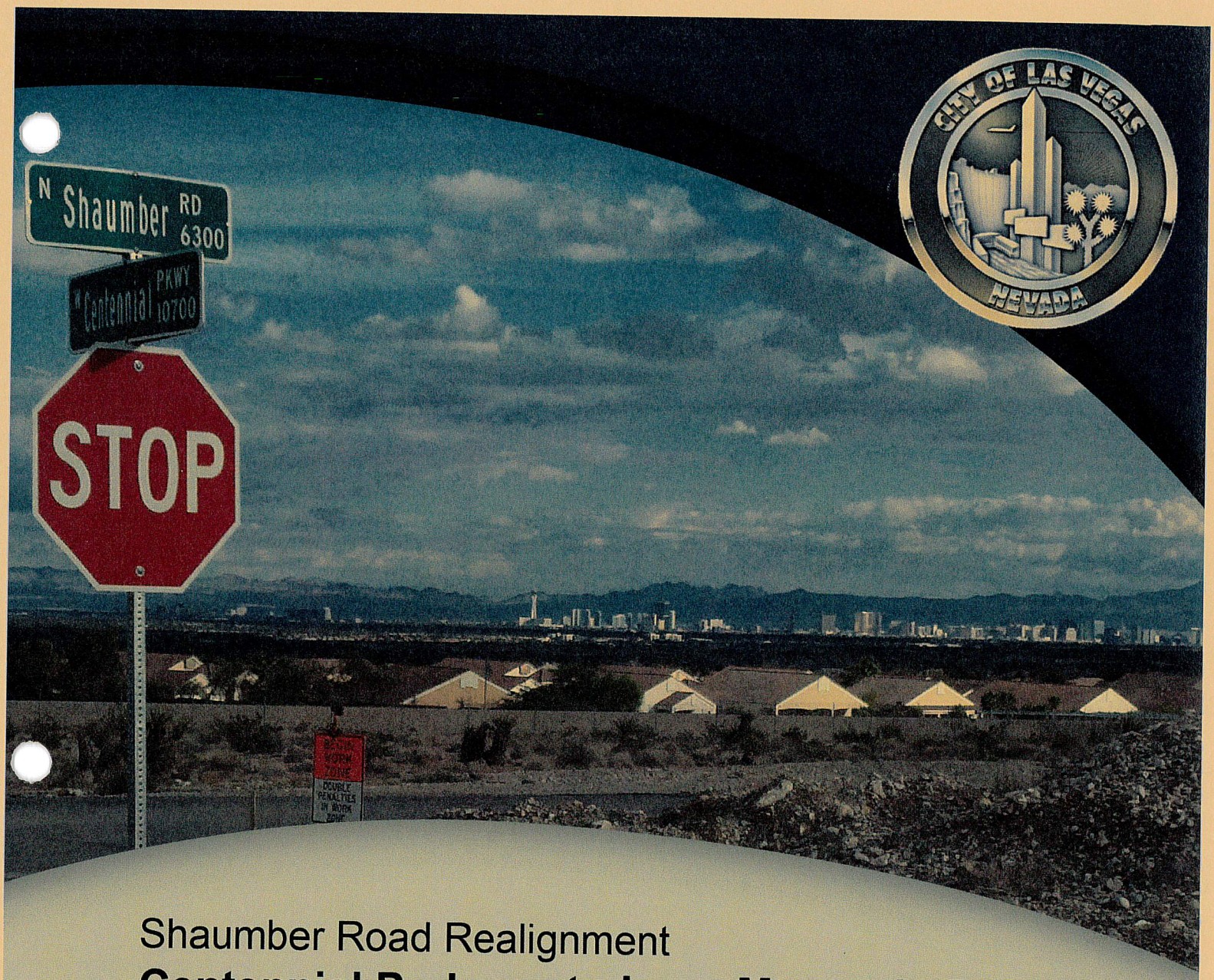
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-3

CURVE NUMBER ANALYSIS

Hansen #45398



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-3.1

Interim CN Calculations

Hansen #45398

340
191
314
400
191
CDMNA3
CDMNA2
CAMDK2
CAMDK3
INT1
INT2A
CENTENNIAL PKWY
INT2B
INT3
INT2C
INT4A
INT5
INT4B
CAM-10B
TROPICAL PKWY
DETCAM10
INT6
INT7
INT8
ANN ROAD
360
INT9
CAM-10A
CCSD
INT10
INT12
WASHBURN ROAD
190
INT13A
1320
INT11
INT13B
INT15
INT17
INT14
610
LONE MOUNTAIN ROAD
INT16
610
191
400
INTBXCN
360
400
502
155
323
191
360
152

N

0 400 800 1600 FEET

LEGEND

—	SUBBASIN BOUNDARY
INT5	SUBBASIN NAME
400	SOIL ID NUMBERS

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.
DESIGNED BY: MS
DRAWN BY: SB
CHECKED BY: JG
DATE: 1/16/2013

TITLE: SHAUMBER ROAD REALIGNMENT CENTENNIAL PKWY TO LONE MTN RD

SHEET: PRELIMINARY INTERIM CONDITION SOIL MAP

DRAFT

SHEET: FIGURE B-3.1

DRAWING NO.

BID NO.:

HANSEN NO.:

PERVIOUS AREA CURVE NUMBERS

CONDITION 1: ----------> DESERT SHRUB POOR HYDROLOGIC CONDITION
CONDITION 2: ----------> LANDSCAPED, LAWNS, TREES, GOOD HYDROLOGIC CONDITION
CONDITION 3: ----------> URBAN DISTRICT: COMMERCIAL AND RESIDENTIAL
CONDITION 4: ----------> GRADED

CN VALUES

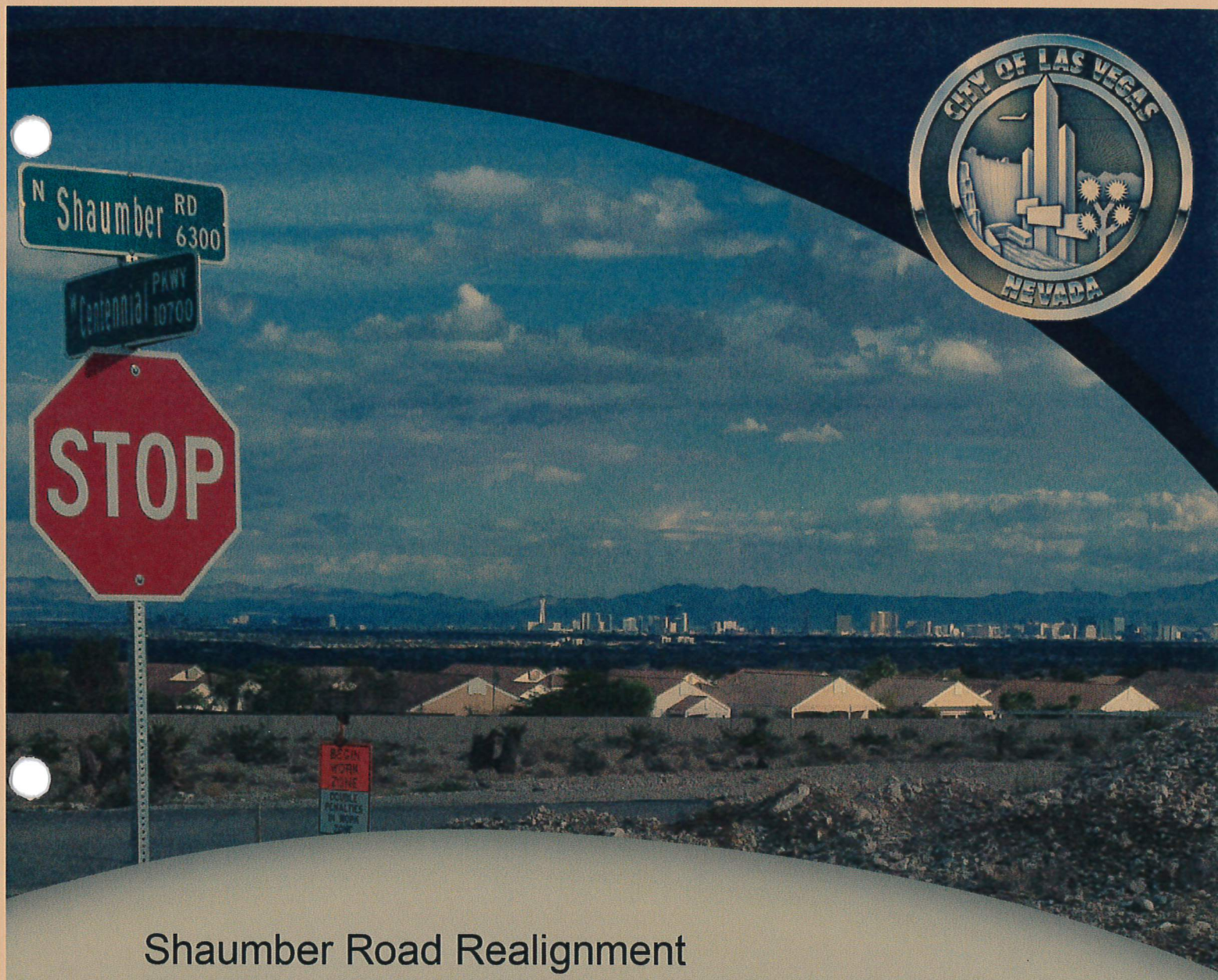
	HYDROLOGIC SOIL GROUP				
CONDITION	A	B	C	D	ROCK
1 ---------->	63	77	85	88	90
2 ---------->	39	61	74	80	90
3 ---------->	89	92	94	95	90
4 ---------->	77	86	91	94	90

		HYDROLOGIC SOIL GROUP					CONDITION 1	CONDITION 2	CONDITION 3	CONDITION 4
	MAP UNIT	%A	%B	%C	%D	%ROCK	CN	CN	CN	CN
	190	10	85	0	5	0	76.2	59.8	91.9	85.5
	191	5	85	0	10	0	77.4	61.8	92.2	86.4
	1320	0	10	0	35	55	88.0	83.6	92.0	91.0
	360	0	15	0	35	50	87.4	82.2	92.1	90.8
	400	0	10	0	90	0	86.9	78.1	94.7	93.2

	PERCENTAGE SOIL TYPE						COMPOSITE
BASIN	190 C1	191 C1	1320 C1	360 C1	400 C1	400 C3	CN
INT1	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
INT2A	0.0%	0.0%	0.0%	0.0%	51.0%	49.0%	**90.72**
INT2B	0.0%	0.0%	0.0%	0.0%	69.0%	31.0%	**89.32**
INT2C	0.0%	0.0%	0.0%	0.0%	90.3%	9.7%	**87.66**
INT3	12.9%	0.0%	0.0%	0.0%	84.1%	3.0%	**85.75**
INT4A	45.5%	0.0%	0.0%	0.0%	54.5%	0.0%	**82.01**
INT4B	56.4%	0.0%	0.0%	0.0%	43.6%	0.0%	**80.84**
INT5	15.3%	0.0%	0.0%	0.0%	84.7%	0.0%	**85.26**
INT6	2.7%	0.0%	0.0%	0.0%	97.3%	0.0%	**86.61**
INT7	8.8%	0.0%	0.0%	0.0%	91.2%	0.0%	**85.95**
INT8	0.0%	0.0%	0.0%	34.2%	65.8%	0.0%	**87.05**
INT9	0.0%	0.0%	0.0%	38.3%	61.7%	0.0%	**87.07**
INT10	0.0%	0.0%	0.0%	24.2%	75.8%	0.0%	**87.01**
INT11	0.9%	41.1%	23.0%	0.0%	35.0%	0.0%	**83.15**
INT12	50.7%	0.6%	0.0%	0.0%	48.7%	0.0%	**81.39**
INT13A	76.8%	0.0%	0.0%	0.0%	23.2%	0.0%	**78.64**
INT13B	32.3%	6.4%	0.0%	0.0%	61.3%	0.0%	**82.82**
INT14	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
INT15	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
INT16	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
INT17	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
CDMNA3	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
CDMNA2	0.0%	0.0%	0.0%	0.0%	30.0%	70.0%	**92.36**
CAMDK2	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	**86.90**
CAMDK3	0.0%	0.0%	14.6%	0.0%	85.4%	0.0%	**87.06**
CAM10-A	0.0%	0.0%	44.7%	10.2%	45.1%	0.0%	**87.44**
CAM10-B	0.0%	0.0%	47.8%	0.0%	52.2%	0.0%	**87.43**
INTBXCN	0.0%	6.5%	93.5%	0.0%	0.0%	0.0%	**87.31**

Curve Number Matrix

MAP #	COMPONENTS			LAND USE CLASSIFICATION INDEX NUMBER																				
	OPEN DESERT	OPEN GOOD	% IMP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	% --->			100	10	60	35	0	0	0	0	0	15	7	0	0	55	36	19	14	15	10	30	15	20
		% --->		0	85	20	40	71	38	28	15	10	15	8	50	0	20	35	19	14	0	0	0	0	30
			% --->	0	5	20	25	29	62	72	85	90	70	85	50	0	25	29	62	72	85	90	70	85	50
	CN	CN	CN	SOIL TYPE COMPOSITE CN FOR LAND USE TYPE																				
190	76	60	98	76.0	64.0	77.0	75.0	71.0	84.0	87.0	92.0	94.0	89.0	93.0	79.0	30.0	78.0	77.0	87.0	90.0	95.0	96.0	91.0	95.0	82.0
191	77	62	98	77.0	65.0	78.0	76.0	72.0	84.0	88.0	93.0	94.0	89.0	94.0	80.0	30.0	79.0	78.0	87.0	90.0	95.0	96.0	92.0	95.0	83.0
360	87	82	98	87.0	83.0	88.0	88.0	87.0	92.0	94.0	96.0	96.0	94.0	96.0	90.0	30.0	89.0	88.0	93.0	94.0	96.0	97.0	95.0	96.0	91.0
400	87	78	98	87.0	80.0	87.0	86.0	84.0	90.0	92.0	95.0	96.0	93.0	96.0	88.0	30.0	88.0	87.0	92.0	94.0	96.0	97.0	95.0	96.0	90.0
1320	88	84	98	88.0	85.0	89.0	89.0	88.0	93.0	94.0	96.0	97.0	94.0	96.0	91.0	30.0	90.0	90.0	93.0	95.0	97.0	97.0	95.0	97.0	92.0



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-3.2

Ultimate CN Calculations

Hansen #45398

340
191
314
400
191
CAMDK2
CDMNA3
CDMNA2
CAMDK3
EFPOA1
CENTENNIAL PKWY
EFPOA2
CAM-10B
DETCAM10
EFPOA3
TROPICAL PKWY
EFPOB1
ANN ROAD
360
EFPOB2
HLBW1-C
CCSD
CAM-10A
WASHBURN ROAD
190
WRBW1
1320
LWBW1-A
LWBW1
610
LONE MOUNTAIN ROAD
610
191
400
360
BOXCANYON
400
502
155
323
191
360
152

N

0 400 800 1600 FEET

LEGEND

——	SUBBASIN BOUNDARY
INT5	SUBBASIN NAME
400	SOIL ID NUMBERS

REVISIONS

NO.	DATE:	SHEET	DESCRIPTION	APP'D

SHAUMBER ROAD REALIGNMENT

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, PE, PTOE
PROGRAM MANAGER: JEREMY LEAVITT, P.E.
DESIGNED BY: MS
DRAWN BY: SB
CHECKED BY: JG
DATE: 1/16/2013

CITY OF LAS VEGAS NEVADA

TITLE: SHAUMBER ROAD REALIGNMENT
CENTENNIAL PKWY TO LONE MTN RD

SHEET: PRELIMINARY ULTIMATE
CONDITION SOIL MAP

DRAFT

SHEET: FIGURE B-3.2

DRAWING NO.

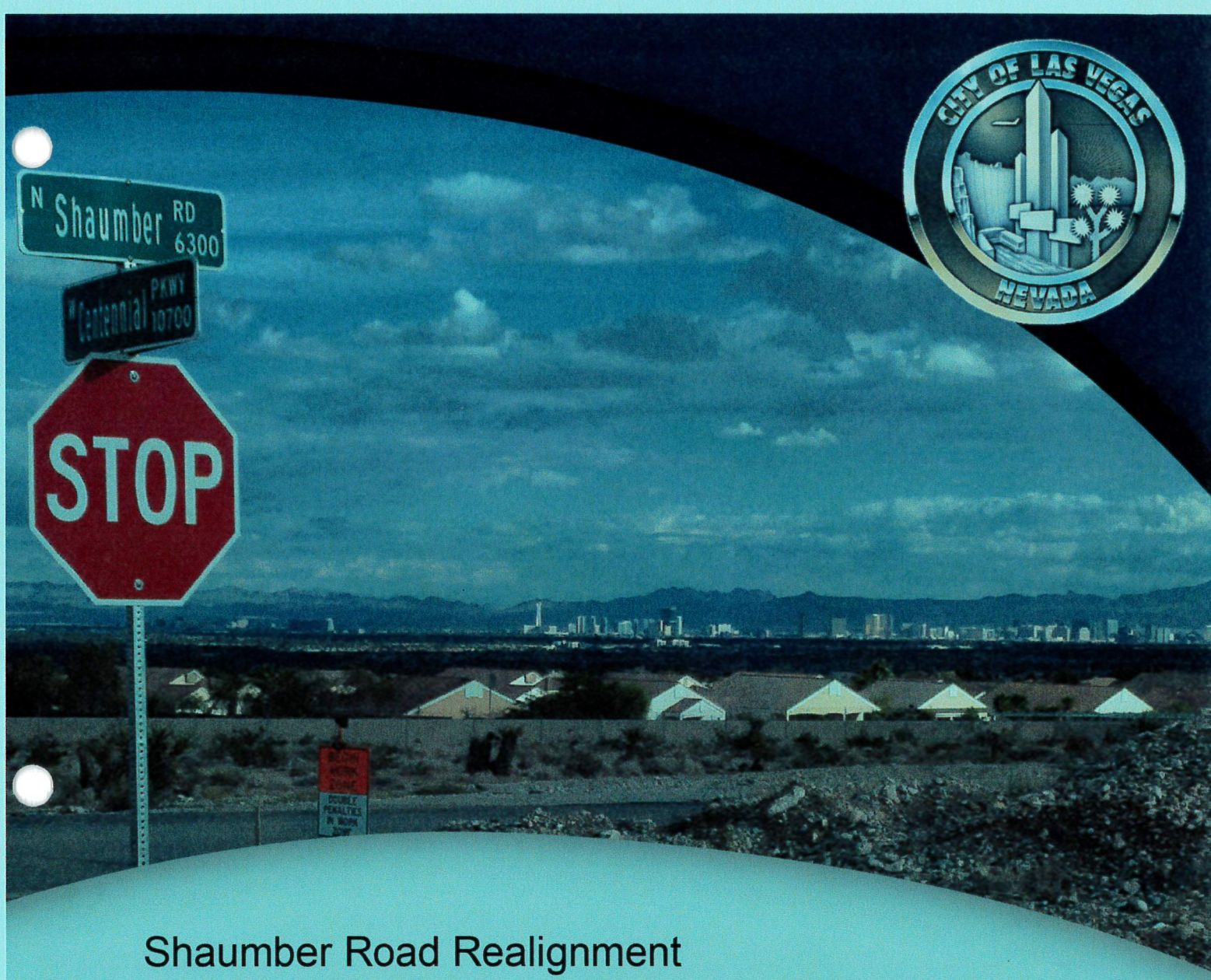
HANSEN NO.: 4?-19? BID NO.:

MODIFIED 2008 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE - COMPOSITE CURVE NUMBER BREAKDOWN

WATERSHED	BASIN ID	LAND USE INDEX NUMBER	SOIL MAP UNIT #	SUBREGION CN	SUBREGION AREA (SQ FT)	SUBBASIN AREA (SQ FT)	PERCENT OF SUBBASIN	CUMULATIVE PERCENT	AREAL WEIGHTED CN	CUMULATIVE CN	COMPOSITE CN
GOWAN BASIN	BOXCANYON	1	191	77	539582	95059483	0.57%	0.57%	0.44	0.44	
GOWAN BASIN	BOXCANYON	1	1320	88	73285032	95059483	77.09%	77.66%	67.84	68.28	
GOWAN BASIN	BOXCANYON	18	191	95	5680804	95059483	5.98%	83.64%	5.68	73.96	
GOWAN BASIN	BOXCANYON	18	1320	97	14208917	95059483	14.95%	98.58%	14.50	88.46	
GOWAN BASIN	BOXCANYON	18	400	96	1330881	95059483	1.40%	100.0%	1.34	89.80	89.8
GOWAN BASIN	CAM-10A	1	1320	88	4709537	34965846	13.47%	13.47%	11.86	11.86	
GOWAN BASIN	CAM-10A	18	360	96	3445348	34965846	9.85%	23.32%	9.46	21.31	
GOWAN BASIN	CAM-10A	18	1320	97	11211385	34965846	32.06%	55.39%	31.10	52.41	
GOWAN BASIN	CAM-10A	18	400	96	15599576	34965846	44.61%	100.00%	42.83	95.24	95.2
GOWAN BASIN	CAM-10B	1	1320	88	11978375	50828681	23.57%	23.57%	20.74	20.74	
GOWAN BASIN	CAM-10B	1	400	87	11504169	50828681	22.63%	46.20%	19.69	40.43	
GOWAN BASIN	CAM-10B	18	1320	97	11917194	50828681	23.45%	69.65%	22.74	63.17	
GOWAN BASIN	CAM-10B	18	400	96	15426658	50828681	30.35%	100.00%	29.14	92.31	92.3
GOWAN BASIN	CAMDK2	1	400	87	2922827	6365005	45.99%	45.99%	40.01	40.01	
GOWAN BASIN	CAMDK2	18	400	96	3432178	6365005	54.01%	100.00%	51.85	91.86	91.9
GOWAN BASIN	CAMDK3	1	1320	88	1618857	10217512	15.84%	15.84%	13.94	13.94	
GOWAN BASIN	CAMDK3	1	400	87	3462245	10217512	33.89%	49.73%	29.48	43.42	
GOWAN BASIN	CAMDK3	18	400	96	5136410	10217512	50.27%	100.00%	48.26	91.68	91.7
GOWAN BASIN	CDMNA2	16	400	92	2389081	3606704	66.24%	66.24%	60.94	60.94	
GOWAN BASIN	CDMNA2	17	400	94	979941	3606704	27.17%	93.41%	25.54	86.48	
GOWAN BASIN	CDMNA2	18	400	96	237682	3606704	6.59%	100.00%	6.33	92.81	92.8
GOWAN BASIN	CDMNA3	1	400	87	398	9938348	0.00%	0.00%	0.00	0.00	
GOWAN BASIN	CDMNA3	16	400	92	144106	9938348	1.45%	1.45%	1.33	1.34	
GOWAN BASIN	CDMNA3	17	400	94	3060017	9938348	30.79%	32.24%	28.94	30.28	
GOWAN BASIN	CDMNA3	18	400	96	6734225	9938348	67.76%	100.00%	65.05	95.33	95.3
GOWAN BASIN	EFPOA1	2	400	80	223419	4529499	4.93%	4.93%	3.95	3.95	
GOWAN BASIN	EFPOA1	17	190	90	160259	4529499	3.54%	8.47%	3.18	7.13	
GOWAN BASIN	EFPOA1	17	400	94	1295331	4529499	28.60%	37.07%	26.88	34.01	
GOWAN BASIN	EFPOA1	18	190	95	186638	4529499	4.12%	41.19%	3.91	37.93	
GOWAN BASIN	EFPOA1	18	400	96	2663852	4529499	58.81%	100.00%	56.46	94.39	94.4
GOWAN BASIN	EFPOA2	2	190	64	873218	5269714	16.57%	16.57%	10.61	10.61	
GOWAN BASIN	EFPOA2	2	400	80	475738	5269714	9.03%	25.60%	7.22	17.83	
GOWAN BASIN	EFPOA2	17	190	90	145048	5269714	2.75%	28.35%	2.48	20.30	
GOWAN BASIN	EFPOA2	17	400	94	1275008	5269714	24.20%	52.55%	22.74	43.05	
GOWAN BASIN	EFPOA2	18	190	95	383301	5269714	7.27%	59.82%	6.91	49.96	
GOWAN BASIN	EFPOA2	18	400	96	2117401	5269714	40.18%	100.00%	38.57	88.53	88.5
GOWAN BASIN	EFPOA3	2	190	64	9	3764530	0.00%	0.00%	0.00	0.00	
GOWAN BASIN	EFPOA3	2	400	80	429782	3764530	11.42%	11.42%	9.13	9.13	
GOWAN BASIN	EFPOA3	17	190	90	309474	3764530	8.22%	19.64%	7.40	16.53	
GOWAN BASIN	EFPOA3	17	400	94	1213941	3764530	32.25%	51.88%	30.31	46.84	
GOWAN BASIN	EFPOA3	18	190	95	127027	3764530	3.37%	55.26%	3.21	50.05	
GOWAN BASIN	EFPOA3	18	400	96	1684306	3764530	44.74%	100.00%	42.95	93.00	93.0
GOWAN BASIN	EFPOB1	17	400	94	174149	7548992	2.31%	2.31%	2.17	2.17	
GOWAN BASIN	EFPOB1	18	360	96	1604492	7548992	21.25%	23.56%	20.40	22.57	
GOWAN BASIN	EFPOB1	18	400	96	5770351	7548992	76.44%	100.00%	73.38	95.95	96.0
GOWAN BASIN	EFPOB2	18	360	96	2002706	2839218	70.54%	70.54%	67.72	67.72	
GOWAN BASIN	EFPOB2	18	400	96	836512	2839218	29.46%	100.00%	28.28	96.00	96.0
GOWAN BASIN	HLBW1-C	17	190	90	69583	6323795	1.10%	1.10%	0.99	0.99	
GOWAN BASIN	HLBW1-C	17	400	94	92063	6323795	1.46%	2.56%	1.37	2.36	
GOWAN BASIN	HLBW1-C	18	190	95	728430	6323795	11.52%	14.08%	10.94	13.30	
GOWAN BASIN	HLBW1-C	18	360	96	1088053	6323795	17.21%	31.28%	16.52	29.82	
GOWAN BASIN	HLBW1-C	18	400	96	4345666	6323795	68.72%	100.00%	65.97	95.79	95.8
GOWAN BASIN	LWBW1	17	400	94	93650	8983425	1.04%	1.04%	0.98	0.98	
GOWAN BASIN	LWBW1	18	191	95	1092637	8983425	12.16%	13.21%	11.55	12.53	
GOWAN BASIN	LWBW1	18	1320	97	139936	8983425	1.56%	14.76%	1.51	14.05	
GOWAN BASIN	LWBW1	18	400	96	7657202	8983425	85.24%	100.00%	81.83	95.87	95.9
GOWAN BASIN	LWBW1-A	17	400	94	83416	291938	28.57%	28.57%	26.86	26.86	
GOWAN BASIN	LWBW1-A	18	400	96	208522	291938	71.43%	100.00%	68.57	95.43	95.4
GOWAN BASIN	WRBW1	17	190	90	90129	8754998	1.03%	1.03%	0.93	0.93	
GOWAN BASIN	WRBW1	17	400	94	15855	8754998	0.18%	1.21%	0.17	1.10	
GOWAN BASIN	WRBW1	18	190	95	2698333	8754998	30.82%	32.03%	29.28	30.38	
GOWAN BASIN	WRBW1	18	191	95	484642	8754998	5.54%	37.57%	5.26	35.64	
GOWAN BASIN	WRBW1	18	360	96	227492	8754998	2.60%	40.17%	2.49	38.13	
GOWAN BASIN	WRBW1	18	400	96	5238547	8754998	59.83%	100.00%	57.44	95.57	95.6

2008 MPU Matrix
Based on 2002 soils data
and 2008 MPU land use

SOILSYM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
190	76.0	64.0	77.0	75.0	71.0	84.0	87.0	92.0	94.0	89.0	93.0	79.0	30.0	78.0	77.0	87.0	90.0	95.0	96.0	91.0	95.0	82.0
191	77.0	65.0	78.0	76.0	72.0	84.0	88.0	93.0	94.0	89.0	94.0	80.0	30.0	79.0	78.0	87.0	90.0	95.0	96.0	92.0	95.0	83.0
360	87.0	83.0	88.0	88.0	87.0	92.0	94.0	96.0	96.0	94.0	96.0	90.0	30.0	89.0	88.0	93.0	94.0	96.0	97.0	95.0	96.0	91.0
400	87.0	80.0	87.0	86.0	84.0	90.0	92.0	95.0	96.0	93.0	96.0	88.0	30.0	88.0	87.0	92.0	94.0	96.0	97.0	95.0	96.0	90.0
1320	88.0	83.0	89.0	88.0	87.0	92.0	94.0	96.0	96.0	94.0	96.0	90.0	30.0	89.0	89.0	93.0	94.0	97.0	97.0	95.0	97.0	91.0



Shaumber Road Realignment

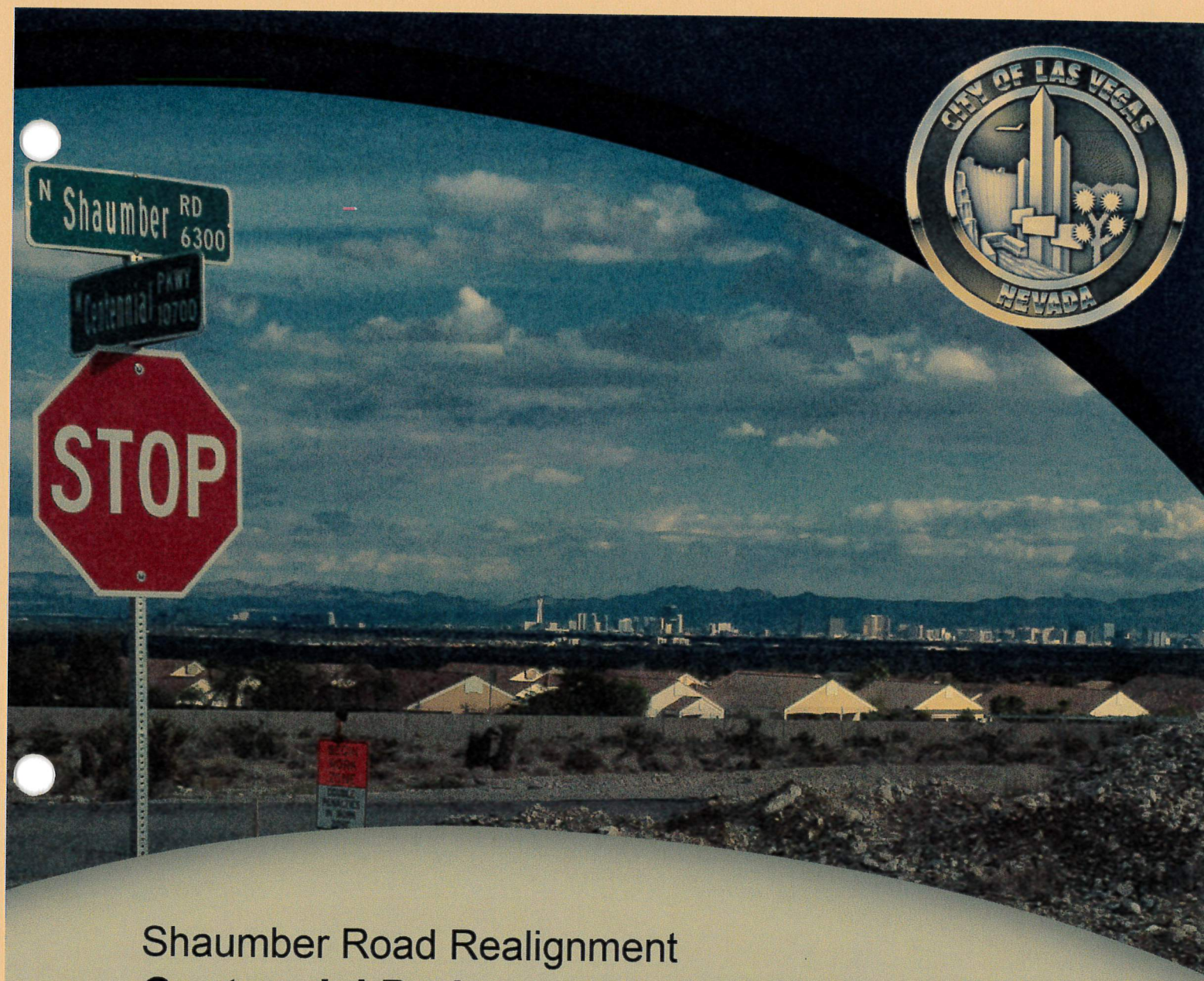
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-4

HEC-1 MODELS

Hansen #45398



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-4.1

100-Year HEC-1 Model SDN3 *(Interim)*

Hansen #45398

```
1****************************************
****************************************
 *                                      *                                        *
 *                                      *                                        *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *    U.S. ARMY CORPS OF ENGINEERS
 *                                      *                                        *
 *               JUN   1998             *                                        *    HYDROLOGIC ENGINEERING CENTER
 *                                      *                                        *
 *            VERSION 4.1               *                                        *          609 SECOND STREET
 *                                      *                                        *
 *                                      *                                        *       DAVIS, CALIFORNIA 95616
 *                                      *                                        *
 *  RUN DATE   10JAN13  TIME  12:37:53  *                                        *           (916) 756-1104
 *                                      *                                        *
 *                                      *                                        *
 ****************************************
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

                        *DIAGRAM
 *** FREE ***
               1        ID    SHAUMBER ROAD DRAINAGE
               2        ID    DRAINAGE IMPACT IN INTERIM CONDITION DEVELOPMENT
               3        ID    INPUT FILE = SHAUMINT.DAT
               4        ID    LAST MODIFIED = JANUARY 2013
               5        ID    DESIGN STORM = 100-YEAR 6-HOUR STORM
               6        ID    STORM DISTRIBUTION = SDN3
               7        ID    MODELED BY = CH2M HILL (MICHAEL SCHWAB, E.I.)
               8        ID
               9        ID    REFERENCED HYDROLOGIC MODELS:
              10        ID    LONE MOUNTAIN/BELTWAY DETENTION BASINS AND GOWAN BELTWAY WEST CHANNEL, 90% (
              11        ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
              12        ID    CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
              13        ID    NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
              14        ID    RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
              15        ID    CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
              16        ID    3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
              17        ID    CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
              18        ID    SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
              19        ID    MASTER PLAN UPDATE (G.C. WALLACE 2006)
              20        ID    GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
              21        ID    (G.C. WALLACE 2007)
              22        ID    LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
              23        ID    FROM G.C. WALLACE ON JANUARY 31, 2008)
              24        ID    US 95/RANCHO FIS RESTUDY (PBS&J 1998)
              25        ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
              26        ID
              27        ID                          AREA    DARF
              28        ID                          SQ. MI.
              29        ID                          0-0.5   0.99
              30        ID                          0.5-1   0.975
              31        ID                          1-2     0.95
              32        ID                          2-3     0.925
              33        ID                          3-4     0.915
              34        ID                          4-5     0.908
              35        ID                          5-6     0.903
              36        ID                          6-7     0.895
              37        ID                          7-8     0.885
              38        ID
              39        ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
              40        ID
              41        IT       5       0       0     300
              42        IO       5       0       0
              43        IN       5       0       0
              44        JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.885
                        *
              45        KK  CDMNA3
```

```
   46          BA   0.290
   47          PB    3.21
   48          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
   49          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
   50          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
   51          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
1                                          HEC-1 INPUT                                        PAGE  2

  LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   52          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
   53          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
   54          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
   55          PC   0.998   0.999   1.000
   56          LS       0    86.9
   57          UD   0.263
               *

   58          KK    INT1
   59          BA  0.0361
   60          PB    3.22
   61          LS       0    86.9
   62          UD   0.115
               *

   63          KK   COMBA
   64          KM  COMBINE INT1 AND CDMNA3
   65          KM  CENTENNIAL AND PULI DR
   66          HC       2
               *

   67          KK  RCOMBA
   68          KM  ROUTE COMBA TO CMNA2
   69          KM  FACILITY = GOWAN BELTWAY WEST
   70          KM  FACILITY ID-MILE = GOBW 0315
   71          KM  LINING = RCB
   72          RD    1615    0.01   0.015       0    TRAP      10       0
               *

   73          KK  CDMNA2
   74          BA  0.1240
   75          PB    3.18
   76          LS       0    92.4
   77          UD   0.188
               *

   78          KK     CP1
   79          KM  COMBINE COMBA AND CDMNA2
   80          KM  CENTENNIAL AND SHAUMBER
   81          HC       2
               *

   82          KK   INT2A
   83          BA  0.0192
   84          PB    3.19
   85          LS       0    90.7
   86          UD   0.075
               *

   87          KK   INT2B
   88          BA  0.0231
   89          PB    3.19
   90          LS       0    89.3
   91          UD   0.092
               *
1                                          HEC-1 INPUT                                        PAGE  3

  LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   92          KK   INT2C
   93          BA  0.0449
   94          PB    3.19
   95          LS       0    87.7
   96          UD   0.133
               *

   97          KK   COMBB
   98          KM  COMBINE INT2A, INT2B, AND INT2C
   99          KM  COMBINE EAST OF SHAUMBER TO CLEAN UP MODEL
  100          HC       3
               *

  101          KK    INT3
  102          BA  0.0963
  103          PB    3.23
  104          LS       0    85.8
  105          UD   0.154
               *

  106          KK   RINT3
  107          KM  ROUTE INT3 TO CP2
  108          KM  ROUTE IN ROADSIDE DITCH
  109          RD     563    0.01   0.015       0    TRAP       5       0
               *
```

```
110          KK   INT4A
111          BA  0.0155
112          PB    3.25
113          LS       0    82.0
114          UD   0.087
             *

115          KK     CP2
116          KM  COMBINE INT4A AND RINT3
117          KM  SOUTH OF CENTENNIAL CONDOS
118          HC       2
             *

119          KK   COMBC
120          KM  COMBINE CP1, COMBB, AND CP2
121          KM  COMBINE EAST OF SHAUMBER TO CLEAN UP MODEL
122          HC       3
             *

123          KK  CAMDK2
124          BA  0.2275
125          PB    3.28
126          LS       0    86.9
127          UD   0.207
             *
1                                        HEC-1 INPUT                                    PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

128          KK RCAMDK2
129          KM  ROUTE RCAMDK2 TO CAMDK3 ALONG COLLECTOR DIKE
130          KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
131          KM  FACILITY # = GOAN 0065, 0067, 0068, 0070
132          KM  LINING = SOIL CEMENT
133          RD    1400  0.0321   0.025       0    TRAP      10       4
             *

134          KK  CAMDK3
135          BA  0.3977
136          PB    3.32
137          LS       0    87.1
138          UD   0.235
             *

139          KK CCAMDK3
140          KM  COMBINE RCAMDK2 AND CAMDK3
141          HC       2
             *

142          KK CAM-10A
143          BA   1.269
144          PB    3.41
145          LS       0    87.4
146          UD   0.452
             *

147          KK CAM-10B
148          BA   1.792
149          PB    3.39
150          LS       0    87.4
151          UD   0.468
             *

152          KKDETCAM10
153          BA  0.0575
154          PB   3.294
155          LS       0    86.9
156          UD   0.109
             *

157          KK CAM10IN
158          KM  COMBINE CCAMDK3, CAM-10A, CAM-10B AND DETCAM10
159          KM  TOTAL INFLOW TO CAM10 DETENTION BASIN
160          HC       4
             *

161          KK CAM10DB
162          KM  DETENTION BASIN PARAMETERS FROM 2008 MPU BY PBS&J
163          KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
164          KM  FACILITY # = GOAN 0058
165          KM  STORAGE VOLUME = 429.52 AC-FT (BERGER 5-05 VOLUME = 364 AC-FT; 18% INCREASE)
166          KM  OUTLET = 33" ORIFICE WITH 54" RCP
167          KM  100-YEAR DISCHARGE = 156 CFS
1                                        HEC-1 INPUT                                    PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

168          KM  SPILLWAY LENGTH = 1360 FT
169          KM  SPILLWAY HEIGHT = 27.7 FT
170          KM  SPILLWAY CREST ELEVATION = 3000'
171          KM  SPILLWAY TYPE =
172          KM  PMF DISCHARGE = 24,614 CFS
173          KM  TOP OF EMBANKMENT ELEVATION = 3004.5'
174          KM  INFORMATION TAKEN FROM "ANN ROAD (CAM-10) DETENTION BASIN PLANS"
175          KM  BY THE LOUIS BERGER GROUP (5-05)
```

```
176          RS       1    STOR      -1
             *        0       0       0    0.67    3.33    8.33   26.67   43.33     110       2
             *      280   347.2     364     396
177          SV    0.00    0.00    0.00    0.79    3.93    9.83   31.47   51.13  129.80  236.00
178          SV  330.40  409.70  429.52  467.28
179          SE 2972.6  2973.8  2974.5  2975.0  2976.0  2976.7  2978.8  2980.0  2985.0  2990.0
180          SE 2995.0  2999.0  3000.0  3003.4
181          SQ    0.00    6.67   17.78   27.78   45.56   54.44   64.44   82.22   93.33  117.78
182          SQ  138.39  156.00  160.40   24614
             *

183          KK  RCAM10
184          KM  ROUTE CAM10 OUTFALL TO OUTLET OF PIPE
185          RD    1086    .019   0.013       0    CIRC     4.0
             *

186          KK  RCAM10
187          KM  ROUTE CAM10 OUTFALL OVERLAND TO TROPICAL
188          RD    1728    0.01   0.015       0    TRAP      25       0
             *

189          KK   INT4B
190          BA  0.0396
191          PB    3.25
192          LS       0    80.8
193          UD   0.141
             *

194          KK  RINT4B
195          KM  ROUTE INT4B TO CP3
196          KM  ROUTE IN ROADSIDE DITCH
197          RD     631    0.01   0.015       0    TRAP       5       0
             *

198          KK    INT5
199          BA  0.1479
200          PB    3.26
201          LS       0    85.3
202          UD   0.164
             *

203          KK     CP3
204          KM   COMBINE CAM10 OUTFALL, INT5, AND INT4B
205          KM  SHAUMBER AND TROPICAL
206          HC       3
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

207          KK    INT6
208          BA  0.0609
209          PB    3.25
210          LS       0    86.6
211          UD   0.142
             *

212          KK   RINT6
213          KM  ROUTE INT6 TO CP4
214          KM  ROUTE IN ROADSIDE DITCH
215          RD     682    0.01   0.015       0    TRAP       5       0
             *

216          KK    INT7
217          BA  0.0993
218          PB    3.25
219          LS       0    86.0
220          UD   0.137
             *

221          KK     CP4
222          KM   COMBINE RINT6 AND INT7
223          KM  SHAUMBER AND EL CAMPO GRANDE
224          HC       2
             *

225          KK    INT8
226          BA  0.1982
227          PB    3.29
228          LS       0    87.1
229          UD   0.084
             *

230          KK   COMBD
231          KM   COMBINE COMBC, CP3, AND CP4
232          KM   COMBINE EAST OF SHAUMBER TO CLEAN UP MODEL
233          HC       3
             *

234          KK    INT9
235          BA  0.1339
236          PB    3.29
237          LS       0    87.1
238          UD   0.102
             *
```

```
239          KK   INT10
240          BA  0.2136
241          PB    3.30
242          LS       0    87.0
243          UD   0.133
             *
```

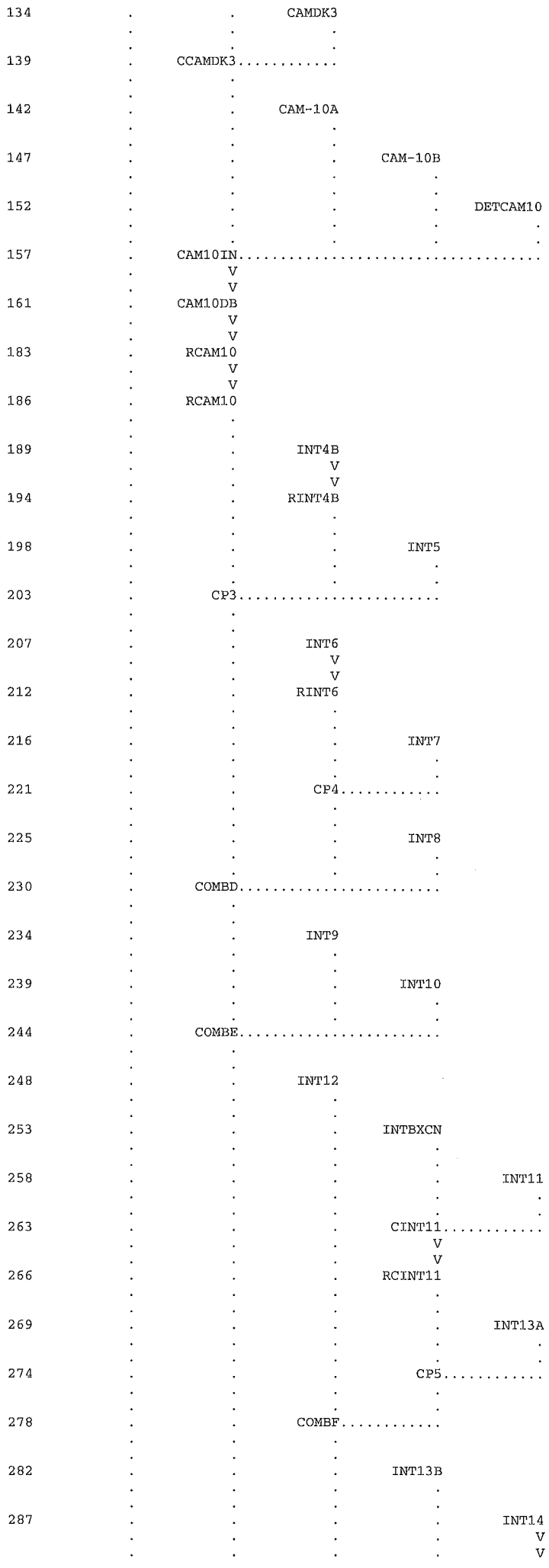


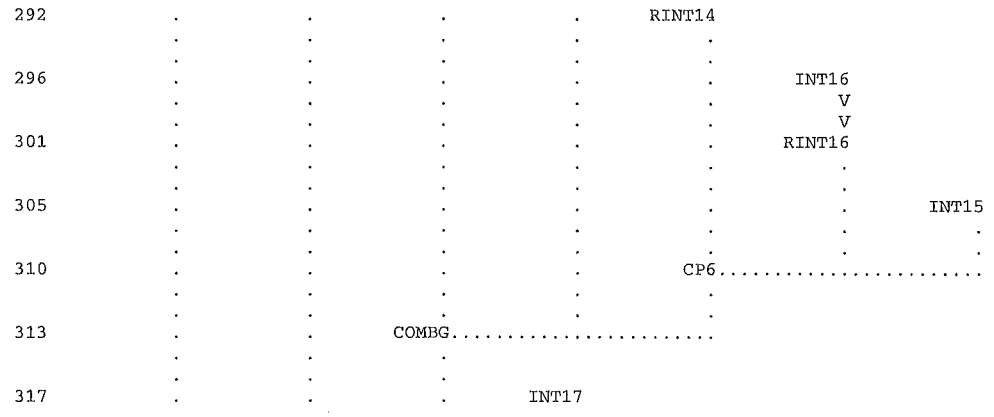
```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

244          KK   COMBE
245          KM   COMBINE COMBD, INT9, AND INT10
246          KM   COMBINE EAST OF SHAUMBER TO CLEAN UP MODEL
247          HC       3
             *

248          KK   INT12
249          BA  0.0860
250          PB    3.30
251          LS       0    81.4
252          UD   0.177
             *

253          KK INTBXCN
254          BA   3.335
255          PB    3.30
256          LS       0   87.31
257          UD   0.608
             *

258          KK   INT11
259          BA  0.0958
260          PB    3.30
261          LS       0    83.2
262          UD   0.141
             *

263          KK  CINT11
264          KM   COMBINE INTBXCN AND INT11
265          HC       2
             *

266          KK RCINT11
267          KM  ROUTE CINT11 TO CP5
268          RD    3591    0.01   0.015       0    TRAP      25       0
             *

269          KK  INT13A
270          BA  0.0712
271          PB    3.23
272          LS       0    78.6
273          UD   0.140
             *

274          KK     CP5
275          KM   COMBINE CINT11 AND INT13A
276          KM  SHAUMBER AND SOUTH OF WASHBURN
277          HC       2
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

278          KK   COMBF
279          KM   COMBINE CP5 AND INT12
280          KM   COMBINE EAST OF SHAUMBER TO CLEAN UP MODEL
281          HC       2
             *

282          KK  INT13B
283          BA  0.1054
284          PB    3.23
285          LS       0    82.8
286          UD   0.198
             *

287          KK   INT14
288          BA  0.0992
289          PB    3.23
290          LS       0    86.9
291          UD   0.153
             *

292          KK  RINT14
293          KM  ROUTE INT14 TO CP6
294          KM  ROUTE INT11 OVERLAND
295          RD     657    0.01   0.015       0    TRAP      25       0
             *

296          KK   INT16
297          BA  0.0756
298          PB    3.23
299          LS       0    86.9
```

```
          300           UD   0.138
                        *

          301           KK  RINT16
          302           KM  ROUTE INT16 TO CP6
          303           KM  ROUTE INT11 OVERLAND
          304           RD     973    0.01   0.015       0    TRAP      25       0
                        *

          305           KK   INT15
          306           BA  0.1084
          307           PB    3.23
          308           LS       0    86.9
          309           UD   0.112
                        *

          310           KK     CP6
          311           KM   COMBINE INT14, INT15 AND INT16
          312           HC       3
                        *
1                                                  HEC-1 INPUT                                                    PAGE  9

        LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          313           KK   COMBG
          314           KM   COMBINE COMBF, INT13B, AND CP6
          315           KM   COMBINE EAST OF SHAUMBER TO CLEAN UP MODEL
          316           HC       3
                        *

          317           KK   INT17
          318           BA  0.0103
          319           PB    3.23
          320           LS       0    86.9
          321           UD   0.070
                        *
          322           ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

    45      CDMNA3
              .
              .
    58        .         INT1
              .           .
              .           .
    63       COMBA.............
              V
              V
    67      RCOMBA
              .
              .
    73        .       CDMNA2
              .           .
              .           .
    78          CP1.............
                .
                .
    82          .        INT2A
                .           .
                .           .
    87          .           .        INT2B
                .           .           .
                .           .           .
    92          .           .           .        INT2C
                .           .           .           .
                .           .           .           .
    97          .        COMBB.........................
                .           .
                .           .
   101          .           .         INT3
                .           .           V
                .           .           V
   106          .           .        RINT3
                .           .           .
                .           .           .
   110          .           .           .        INT4A
                .           .           .           .
                .           .           .           .
   115          .           .          CP2.............
                .           .           .
                .           .           .
   119       COMBC.........................
              .
              .
   123        .       CAMDK2
              .           V
              .           V
   128        .      RCAMDK2
              .           .
              .           .
```


134 CAMDK3
139 CCAMDK3
142 CAM-10A
147 CAM-10B
152 DETCAM10
157 CAM10IN
161 CAM10DB
183 RCAM10
186 RCAM10
189 INT4B
194 RINT4B
198 INT5
203 CP3
207 INT6
212 RINT6
216 INT7
221 CP4
225 INT8
230 COMBD
234 INT9
239 INT10
244 COMBE
248 INT12
253 INTBXCN
258 INT11
263 CINT11
266 RCINT11
269 INT13A
274 CP5
278 COMBF
282 INT13B
287 INT14



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*****************************************
 *                                       *                                       *
 *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *    U.S. ARMY CORPS OF ENGINEERS
 *
 *               JUN   1998              *                                       *    HYDROLOGIC ENGINEERING CENTER
 *
 *            VERSION 4.1                *                                       *          609 SECOND STREET
 *
 *                                       *                                       *       DAVIS, CALIFORNIA 95616
 *
 *  RUN DATE   10JAN13  TIME  12:37:53   *                                       *           (916) 756-1104
 *
 *                                       *                                       *
 *
 *****************************************
*****************************************
```

SHAUMBER ROAD DRAINAGE
DRAINAGE IMPACT IN INTERIM CONDITION DEVELOPMENT
INPUT FILE = SHAUMINT.DAT
LAST MODIFIED = JANUARY 2013
DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN3
MODELED BY = CH2M HILL (MICHAEL SCHWAB, E.I.)

REFERENCED HYDROLOGIC MODELS:
LONE MOUNTAIN/BELTWAY DETENTION BASINS AND GOWAN BELTWAY WEST CHANNEL, 90% (
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
MASTER PLAN UPDATE (G.C. WALLACE 2006)
GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
(G.C. WALLACE 2007)
LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
FROM G.C. WALLACE ON JANUARY 31, 2008)
US 95/RANCHO FIS RESTUDY (PBS&J 1998)
JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.99
0.5-1	0.975
1-2	0.95
2-3	0.925
3-4	0.915
4-5	0.908
5-6	0.903
6-7	0.895
7-8	0.885

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

42	IO	OUTPUT CONTROL VARIABLES		
		IPRNT	5	PRINT CONTROL
		IPLOT	0	PLOT CONTROL
		QSCAL	0.	HYDROGRAPH PLOT SCALE
	IT	HYDROGRAPH TIME DATA		
		NMIN	5	MINUTES IN COMPUTATION INTERVAL
		IDATE	1 0	STARTING DATE
		ITIME	0000	STARTING TIME
		NQ	300	NUMBER OF HYDROGRAPH ORDINATES
		NDDATE	2 0	ENDING DATE

NDTIME 0055 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.99 .98 .95 .93 .92 .91 .90 .89 .88

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

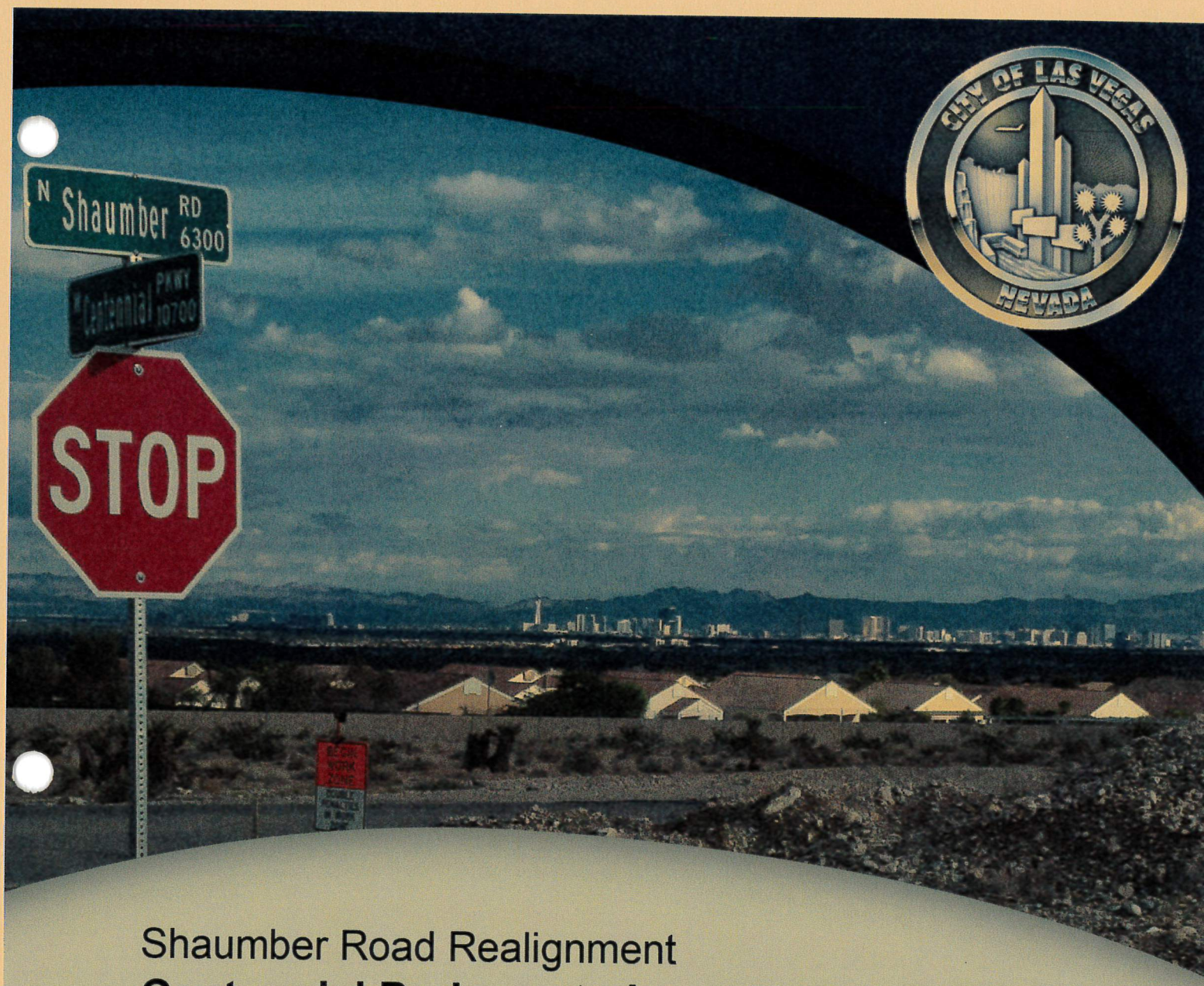
OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89	RATIO 9 .88
HYDROGRAPH AT													
+	CDMNA3	.29	1	FLOW	369.	361.	348.	334.	329.	325.	323.	319.	313.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	INT1	.04	1	FLOW	59.	58.	56.	54.	53.	52.	52.	51.	51.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	COMBA	.33	1	FLOW	412.	403.	389.	374.	368.	364.	361.	356.	350.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO													
+	RCOMBA	.33	1	FLOW	407.	398.	384.	369.	363.	359.	356.	352.	346.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CDMNA2	.12	1	FLOW	214.	210.	203.	197.	194.	192.	191.	189.	186.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP1	.45	1	FLOW	608.	595.	576.	554.	546.	540.	536.	530.	521.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	INT2A	.02	1	FLOW	40.	40.	38.	37.	37.	36.	36.	36.	35.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	INT2B	.02	1	FLOW	44.	43.	41.	40.	39.	39.	39.	38.	38.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	INT2C	.04	1	FLOW	74.	73.	70.	67.	66.	66.	65.	64.	63.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	COMBB	.09	1	FLOW	152.	149.	144.	139.	137.	135.	134.	133.	131.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	INT3	.10	1	FLOW	146.	143.	138.	133.	130.	129.	128.	126.	124.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RINT3	.10	1	FLOW	145.	142.	136.	131.	129.	128.	126.	125.	122.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT4A	.02	1	FLOW	23.	23.	22.	21.	21.	20.	20.	20.	19.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT													
+	CP2	.11	1	FLOW	166.	162.	156.	150.	147.	146.	144.	142.	140.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	COMBC	.65	1	FLOW	894.	875.	844.	812.	800.	791.	785.	775.	763.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	CAMDK2	.23	1	FLOW	322.	315.	304.	293.	288.	285.	283.	279.	275.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO													
+	RCAMDK2	.23	1	FLOW	321.	315.	303.	291.	287.	283.	282.	278.	273.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CAMDK3	.40	1	FLOW	561.	549.	529.	510.	502.	496.	492.	486.	478.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	CCAMDK3	.63	1	FLOW	881.	864.	832.	801.	789.	780.	774.	764.	752.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67

HYDROGRAPH AT													
+	CAM-10A	1.27	1	FLOW	1366.	1337.	1290.	1243.	1224.	1211.	1201.	1186.	1168.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	CAM-10B	1.79	1	FLOW	1882.	1842.	1777.	1712.	1685.	1667.	1654.	1633.	1607.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	DETCAM10	.06	1	FLOW	98.	96.	92.	89.	87.	86.	86.	84.	83.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT													
+	CAM10IN	3.74	1	FLOW	3906.	3824.	3688.	3551.	3497.	3459.	3432.	3388.	3334.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	CAM10DB	3.74	1	FLOW	147.	145.	142.	139.	138.	137.	137.	136.	134.
				TIME	6.17	6.17	6.17	6.17	6.17	6.17	6.17	6.17	6.17
			** PEAK STAGES IN FEET **										
			1	STAGE	2997.02	2996.60	2995.89	2995.18	2994.90	2994.69	2994.55	2994.31	2994.02
				TIME	6.17	6.17	6.17	6.17	6.17	6.17	6.17	6.17	6.17
ROUTED TO													
+	RCAM10	3.74	1	FLOW	147.	145.	142.	139.	138.	137.	137.	136.	134.
				TIME	6.17	6.17	6.17	6.17	6.17	6.17	6.17	6.17	6.17
ROUTED TO													
+	RCAM10	3.74	1	FLOW	147.	145.	142.	139.	138.	137.	137.	136.	134.
				TIME	6.25	6.25	6.25	6.25	6.17	6.25	6.17	6.17	6.17
HYDROGRAPH AT													
+	INT4B	.04	1	FLOW	51.	50.	48.	46.	45.	44.	44.	43.	42.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RINT4B	.04	1	FLOW	50.	49.	47.	45.	44.	43.	43.	42.	41.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT5	.15	1	FLOW	219.	214.	206.	198.	195.	193.	191.	188.	185.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CP3	3.93	1	FLOW	352.	344.	332.	320.	315.	312.	309.	306.	301.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT6	.06	1	FLOW	98.	96.	93.	89.	88.	87.	86.	85.	84.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RINT6	.06	1	FLOW	97.	95.	91.	88.	87.	86.	85.	84.	82.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT7	.10	1	FLOW	158.	154.	149.	143.	141.	139.	138.	136.	134.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP4	.16	1	FLOW	255.	249.	240.	231.	227.	225.	223.	220.	216.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT8	.20	1	FLOW	374.	366.	353.	340.	335.	331.	329.	324.	319.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	COMBD	4.29	1	FLOW	923.	904.	872.	840.	827.	818.	812.	802.	789.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT9	.13	1	FLOW	235.	230.	222.	214.	210.	208.	206.	204.	200.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	INT10	.21	1	FLOW	360.	353.	340.	328.	323.	319.	317.	313.	308.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	COMBE	4.64	1	FLOW	1508.	1477.	1425.	1373.	1352.	1337.	1327.	1310.	1289.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT12	.09	1	FLOW	107.	104.	100.	96.	94.	93.	92.	90.	89.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INTBXCN	3.34	1	FLOW	2873.	2812.	2711.	2610.	2570.	2542.	2522.	2490.	2449.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	INT11	.10	1	FLOW	140.	136.	131.	126.	123.	122.	121.	119.	117.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CINT11	3.43	1	FLOW	2903.	2842.	2740.	2638.	2597.	2569.	2548.	2516.	2475.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
ROUTED TO													
+	RCINT11	3.43	1	FLOW	2899.	2838.	2736.	2634.	2593.	2563.	2544.	2510.	2470.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	INT13A	.07	1	FLOW	83.	80.	77.	73.	72.	71.	70.	69.	67.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP5	3.50	1	FLOW	2918.	2857.	2754.	2651.	2609.	2580.	2560.	2526.	2486.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08

2 COMBINED AT												
+	COMBF	3.59	1	FLOW	2948.	2886.	2781.	2678.	2636.	2606.	2586.	2552.	2511.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	INT13B	.11	1	FLOW	127.	123.	118.	113.	111.	110.	109.	107.	105.
				TIME	3.58	3.58	3.58	3.58	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	INT14	.10	1	FLOW	157.	154.	148.	143.	141.	139.	138.	136.	134.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RINT14	.10	1	FLOW	154.	150.	145.	139.	137.	136.	135.	133.	131.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT16	.08	1	FLOW	123.	120.	116.	112.	110.	109.	108.	106.	105.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RINT16	.08	1	FLOW	119.	117.	112.	108.	107.	105.	104.	103.	101.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	INT15	.11	1	FLOW	178.	175.	168.	162.	160.	158.	157.	155.	152.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CP6	.28	1	FLOW	451.	441.	425.	409.	404.	399.	396.	390.	384.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	COMBG	3.98	1	FLOW	3085.	3019.	2911.	2802.	2759.	2728.	2707.	2671.	2629.
				TIME	4.00	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
HYDROGRAPH AT													
+	INT17	.01	1	FLOW	20.	19.	19.	18.	18.	18.	17.	17.	17.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

1

*** NORMAL END OF HEC-1 ***



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-4.2

10-Year HEC-1 Model SDN3 *(Ultimate)*

Hansen #45398

```
1****************************************
****************************************
 *                                      *                                        *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *    U.S. ARMY CORPS OF ENGINEERS
*
 *               JUN   1998             *                                        *    HYDROLOGIC ENGINEERING CENTER
*
 *            VERSION 4.1               *                                        *         609 SECOND STREET
*
 *                                      *                                        *       DAVIS, CALIFORNIA 95616
*
 *  RUN DATE   10JAN13  TIME  09:57:49  *                                        *           (916) 756-1104
*
 *                                      *                                        *
*
 ****************************************
****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
                    *DIAGRAM
 *** FREE ***
               1    ID    SHAUMBER ROAD
               2    ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
               3    ID    INPUT FILE = SHAM310.DAT
               4    ID    INPUT FILE DATE = JANUARY 2013
               5    ID    DESIGN STORM = 10-YEAR 6-HR STORM
               6    ID    STORM DISTRIBUTION = SDN #3
               7    ID    MODELED BY CH2M HILL (MICHAEL SCHWAB, E.I.)
               8    ID    CHECKED BY CH2M HILL (JEFF GRIEST, P.E., CFM)
               9    ID    STORM CENTERING = FULL WATERSHED
              10    ID
              11    ID    REFERENCED HYDROLOGIC MODELS:
              12    ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
              13    ID    CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
              14    ID    NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
              15    ID    RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
              16    ID    CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
              17    ID    3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
              18    ID    CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
              19    ID    SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
              20    ID    MASTER PLAN UPDATE (G.C. WALLACE 2006)
              21    ID    GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
              22    ID    (G.C. WALLACE 2007)
              23    ID    LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
              24    ID    FROM G.C. WALLACE ON JANUARY 31, 2008)
              25    ID    US 95/RANCHO FIS RESTUDY (PBS&J 1998)
              26    ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
              27    ID
              28    ID                          AREA    DARF
              29    ID                          SQ. MI.
              30    ID                          0-0.5   0.565
              31    ID                          0.5-1   0.556
              32    ID                          1-2     0.542
              33    ID                          2-3     0.528
              34    ID                          3-4     0.522
              35    ID                          4-5     0.518
              36    ID                          5-6     0.515
              37    ID                          6-7     0.511
              38    ID                          7-8     0.505
              39    ID
              40    ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
              41    ID
              42    ID  10-YEAR,  6-HOUR STORM,  SDN3
              43    ID
              44    IT       5       0       0     300
              45    IO       5       0       0
              46    IN       5       0       0
              47    JR    PREC   0.565   0.556   0.542   0.528   0.522   0.518   0.515   0.511   0.505
```

```
112          PB   3.294
113          LS      0    86.9
114          UD   0.109
             *

115          KK CAM10IN
116          KM  COMBINE CCAMDK3, CAM-10A, CAM-10B AND DETCAM10
117          KM  TOTAL INFLOW TO CAM10 DETENTION BASIN
118          HC      4
             *

119          KK CAM10DB
120          KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
121          KM  FACILITY # = GOAN 0061,0062
122          KM  CLEAR WATER STORAGE REQUIRED = 436.8 AC-FT
123          KM  SEDIMENTATION VOLUME REQUIRED = 41.9 AC-FT
124          KM  TOTAL VOLUME = 478.7 AC-FT
125          KM  VOLUME TO BE INCREASE BY 114.7 AC-FT (24%)
1                                        HEC-1 INPUT                                    PAGE  4

LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

126          KM  OUTLET = 33" ORIFICE WITH 54" RCP
127          KM  100-YEAR DISCHARGE = 156 CFS
128          KM  SPILLWAY LENGTH = 1360 FT
129          KM  SPILLWAY HEIGHT = 27.7 FT
130          KM  SPILLWAY CREST ELEVATION = 3000'
131          KM  SPILLWAY TYPE =
132          KM  PMF DISCHARGE = 24,614 CFS
133          KM  TOP OF EMBANKMENT ELEVATION = 3004.5'
134          KM  INFORMATION TAKEN FROM "ANN ROAD (CAM-10) DETENTION BASIN PLANS"
135          KM  BY THE LOUIS BERGER GROUP (5-05)
136          RS      1    STOR      -1
             *       0       0       0    0.67    3.33    8.33   26.67   43.33     110     2
             *     280   347.2     364     396
137          SV      0       0       0    0.81    4.03   10.08   32.27   52.43  133.10     242
138          SV 338.80  420.11  436.80  475.20
139          SE 2972.6  2973.8  2974.5  2975.0  2976.0  2976.7  2978.8  2980.0  2985.0  2990.0
140          SE 2995.0  2999.0  3000.0  3003.4
141          SQ   0.00    6.67   17.78   27.78   45.56   54.44   64.44   82.22   93.33  117.78
142          SQ 138.39  156.00  160.40   24614
             *

143          KK CAM10OT
144          KM  ROUTE CAM10DB TO CEFPOA1
145          KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
146          KM  FACILITY # = GOAN 0000, 0044
147          KM  LINING = RCP
148          RD    3442  0.0258   0.015       0    CIRC     4.5       0
             *

149          KK  EFPOA2
150          BA  0.1889
151          PB    3.25
152          LS      0    88.5
153          UD   0.139
             *

154          KK     CP2
155          KM  COMBINE CAM10OT, AND EFPOA2
156          KM  SHAUMBER ROAD AND TROPICAL PKWY
157          HC      2
             *

158          KK   COMBA
159          KM  COMBINE CP1, EFPOA1, AND CP2
160          KM  COMBINE EAST OF SHAUMBER FOR CLEANUP
161          HC      3
             *

162          KK  EFPOA3
163          BA  0.1350
164          PB    3.25
165          LS      0    93.0
166          UD   0.120
             *
1                                        HEC-1 INPUT                                    PAGE  5

LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

167          KK REFPOA3
168          KM  ROUTE EFPOA3 TO CP3
169          RD     747   0.010   0.015       0    CIRC     4.0       0
             *

170          KK  EFPOB1
171          BA  0.2708
172          PB    3.28
173          LS      0    96.0
174          UD   0.071
             *

175          KK  EFPOB2
176          BA  0.1018
177          PB    3.28
```

```
178          LS       0    96.0
179          UD   0.076
             *

180          KK REFPOB2
181          KM  ROUTE EFPOB2 TO CP3
182          RD    2050  0.0100   0.013       0    CIRC     6.0       0
             *

183          KK     CP3
184          KM  COMBINE REFPOA3, EFPOB1 AND REFPOB2
185          KM  COMBINE AT LA MANCHA AVENUE
186          HC       3
             *

187          KK HLBW1-C
188          BA  0.2268
189          PB    3.26
190          LS       0    95.8
191          UD   0.134
             *

192          KK   WRBW1
193          BA  0.3140
194          PB    3.27
195          LS       0    95.6
196          UD   0.172
             *

197          KK  RWRBW1
198          KM  ROUTE WRBW1 TO CP4
199          RD    1328  0.0100   0.013       0    CIRC     5.5       0
             *
1                                        HEC-1 INPUT                                        PAGE  6

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

200          KKBOXCANYON
201          BA   3.410
202          PB    3.55
203          LS       0    89.8
204          UD   0.608
             *

205          KK  BOXDET
206          KM  BOX CANYON DETENTION BASIN
207          KM  FACILITY = GOWAN BOX CANYON
208          KM  FACILITY # = GOBX 0118
209          KM  CLEAR WATER STORAGE REQUIRED = 393 AC-FT
210          KM  SEDIMENTATION VOLUME REQUIRED = 37.2 AC-FT
211          KM  TOTAL VOLUME = 430.2 AC-FT
212          KM  OUTLET = GOBX 0016: 18" RCP
213          KM  100-YEAR DISCHARGE = 40 CFS
214          KM  SPILLWAY LENGTH =
215          KM  SPILLWAY HEIGHT = 20.25 FT
216          KM  SPILLWAY CREST ELEVATION =
217          KM  SPILLWAY TYPE =
218          KM  PMF DISCHARGE =
219          KM  TOP OF EMBANKMENT ELEVATION =
220          RS       1    STOR      -1
221          SV     0.0    35.4    71.5   108.4   146.0   184.3   223.4   263.3   304.0   345.4
222          SV   387.6   393.0
223          SE       0       2       4       6       8      10      12      14      16      18
224          SE      20   20.25
225          SQ     0.0    10.3    16.6    21.1    24.8    28.0    30.9    33.6    36.0    38.3
226          SQ    40.4    40.7
             *

227          KK RBOXDET
228          KM  ROUTE THRU LWBW1
229          KM  FACILITY = GOWAN BOX CANYON
230          KM  FACILITY # = GOBX 0015,0016
231          KM  LONE MOUNTAIN
232          RD    6700  0.0655   0.013       0    CIRC     5.5       0
             *

233          KK   LWBW1
234          BA   0.322
235          PB    3.28
236          LS       0    95.9
237          UD   0.137
             *

238          KK     CP4
239          KM  COMBINE RBOXDET, LWBW1, AND RWRBW1
240          HC       3
             *
1                                        HEC-1 INPUT                                        PAGE  7

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

241          KK LWBW1-A
242          BA  0.0105
243          PB    3.28
```

```
           244           LS       0    95.4
           245           UD   0.050
                         *
           246           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    48      CDMNA3
                 V
                 V
    61       RMNA3
                 .
                 .
    67           .      CDMNA2
                 .           .
                 .           .
    72         CP1............
                 .
                 .
    76           .      EFPOA1
                 .           .
                 .           .
    81           .           .      CAMDK2
                 .           .           V
                 .           .           V
    86           .           .     RCAMDK2
                 .           .           .
                 .           .           .
    92           .           .           .      CAMDK3
                 .           .           .           .
                 .           .           .           .
    97           .           .     CCAMDK3............
                 .           .           .
                 .           .           .
   100           .           .           .     CAM-10A
                 .           .           .           .
                 .           .           .           .
   105           .           .           .           .     CAM-10B
                 .           .           .           .           .
                 .           .           .           .           .
   110           .           .           .           .           .    DETCAM10
                 .           .           .           .           .           .
                 .           .           .           .           .           .
   115           .           .     CAM10IN.....................................
                 .           .           V
                 .           .           V
   119           .           .     CAM10DB
                 .           .           V
                 .           .           V
   143           .           .     CAM10OT
                 .           .           .
                 .           .           .
   149           .           .           .      EFPOA2
                 .           .           .           .
                 .           .           .           .
   154           .           .         CP2............
                 .           .           .
                 .           .           .
   158       COMBA.......................
                 .
                 .
   162           .      EFPOA3
                 .           V
                 .           V
   167           .     REFPOA3
                 .           .
                 .           .
   170           .           .      EFPOB1
                 .           .           .
                 .           .           .
   175           .           .           .      EFPOB2
                 .           .           .           V
                 .           .           .           V
   180           .           .           .     REFPOB2
                 .           .           .           .
                 .           .           .           .
   183           .         CP3............................
                 .           .
                 .           .
   187           .           .     HLBW1-C
                 .           .           .
                 .           .           .
   192           .           .           .       WRBW1
                 .           .           .           V
                 .           .           .           V
   197           .           .           .      RWRBW1
                 .           .           .           .
                 .           .           .           .
   200           .           .           .           .    BOXCANYO
                 .           .           .           .           V
                 .           .           .           .           V
   205           .           .           .           .      BOXDET
```

```
                .          .          .          .          V
                .          .          .          .          V
   227          .          .          .          .     RBOXDET
                .          .          .          .          .
                .          .          .          .          .
   233          .          .          .          .          .       LWBW1
                .          .          .          .          .          .
                .          .          .          .          .          .
   238          .          .          .        CP4..........................
                .          .          .          .
                .          .          .          .
   241          .          .          .          .     LWBW1-A

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
**************************************
 *                                    *                                        *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                     *    U.S. ARMY CORPS OF ENGINEERS
*
 *               JUN   1998             *                                     *    HYDROLOGIC ENGINEERING CENTER
*
 *           VERSION 4.1                *                                     *          609 SECOND STREET
*
 *                                      *                                     *       DAVIS, CALIFORNIA 95616
*
 *  RUN DATE   10JAN13  TIME  09:57:49  *                                     *           (916) 756-1104
*
 *                                      *                                     *
*
 **************************************
**************************************
```

SHAUMBER ROAD
RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
INPUT FILE = SHAM310.DAT
INPUT FILE DATE = JANUARY 2013
DESIGN STORM = 10-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY CH2M HILL (MICHAEL SCHWAB, E.I.)
CHECKED BY CH2M HILL (JEFF GRIEST, P.E., CFM)
STORM CENTERING = FULL WATERSHED

REFERENCED HYDROLOGIC MODELS:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
MASTER PLAN UPDATE (G.C. WALLACE 2006)
GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
(G.C. WALLACE 2007)
LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
FROM G.C. WALLACE ON JANUARY 31, 2008)
US 95/RANCHO FIS RESTUDY (PBS&J 1998)
JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.565
0.5-1	0.556
1-2	0.542
2-3	0.528
3-4	0.522
4-5	0.518
5-6	0.515
6-7	0.511
7-8	0.505

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

10-YEAR, 6-HOUR STORM, SDN3

```
   45 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME         0000  STARTING TIME
                          NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME         0055  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL      .08 HOURS
```

TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.56 .56 .54 .53 .52 .52 .51 .51 .50

1

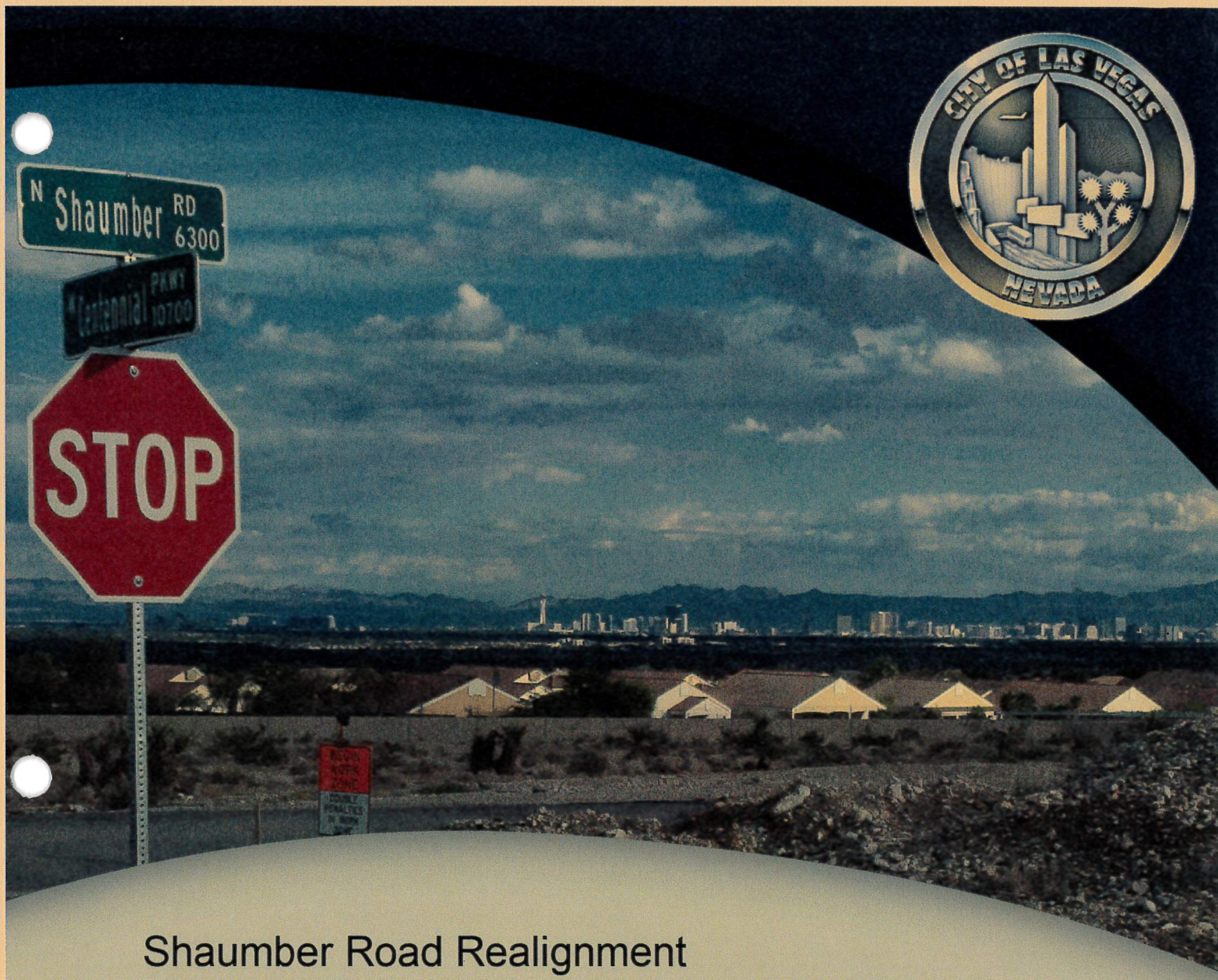
PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .56	RATIO 2 .56	RATIO 3 .54	RATIO 4 .53	RATIO 5 .52	RATIO 6 .52	RATIO 7 .51	RATIO 8 .51	RATIO 9 .50
HYDROGRAPH AT													
+	CDMNA3	.35	1	FLOW	322.	316.	306.	296.	292.	289.	287.	284.	280.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
ROUTED TO													
+	RMNA3	.35	1	FLOW	321.	315.	305.	295.	291.	289.	287.	284.	280.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CDMNA2	.13	1	FLOW	111.	108.	104.	101.	99.	98.	97.	96.	94.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP1	.48	1	FLOW	427.	418.	405.	391.	386.	382.	379.	375.	370.
				TIME	3.58	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	EFPOA1	.16	1	FLOW	170.	166.	161.	156.	154.	152.	151.	150.	147.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	CAMDK2	.23	1	FLOW	192.	188.	181.	174.	171.	169.	168.	166.	163.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCAMDK2	.23	1	FLOW	188.	183.	176.	170.	167.	165.	165.	163.	159.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CAMDK3	.37	1	FLOW	293.	286.	276.	266.	261.	258.	256.	253.	249.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	CCAMDK3	.59	1	FLOW	480.	469.	452.	436.	429.	423.	421.	416.	408.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CAM-10A	1.25	1	FLOW	884.	867.	840.	814.	803.	795.	790.	782.	771.
				TIME	3.83	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	CAM-10B	1.82	1	FLOW	1087.	1063.	1025.	988.	972.	962.	954.	943.	927.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	DETCAM10	.05	1	FLOW	34.	33.	31.	30.	29.	29.	29.	28.	28.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
4 COMBINED AT													
+	CAM10IN	3.72	1	FLOW	2305.	2257.	2181.	2105.	2073.	2052.	2035.	2014.	1982.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	CAM10DB	3.72	1	FLOW	111.	110.	108.	107.	106.	105.	105.	104.	104.
				TIME	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
			** PEAK STAGES IN FEET **										
			1	STAGE	2988.66	2988.43	2988.07	2987.71	2987.55	2987.45	2987.38	2987.27	2987.12
				TIME	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
ROUTED TO													
+	CAM10OT	3.72	1	FLOW	111.	110.	108.	107.	106.	105.	105.	104.	104.
				TIME	6.08	6.08	6.08	6.08	6.08	6.08	6.08	6.08	6.08
HYDROGRAPH AT													
+	EFPOA2	.19	1	FLOW	143.	140.	134.	128.	126.	124.	123.	121.	119.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP2	3.91	1	FLOW	210.	206.	199.	192.	189.	187.	185.	183.	181.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	COMBA	4.55	1	FLOW	807.	790.	764.	738.	728.	720.	715.	708.	697.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	EFPOA3	.14	1	FLOW	134.	131.	127.	122.	121.	119.	118.	117.	115.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

ROUTED TO													
+	REFPOA3	.14	1	FLOW	133.	130.	126.	121.	120.	118.	118.	116.	114.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	EFPOB1	.27	1	FLOW	363.	357.	346.	336.	331.	329.	326.	323.	319.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	EFPOB2	.10	1	FLOW	134.	132.	128.	124.	123.	121.	121.	119.	118.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO													
+	REFPOB2	.10	1	FLOW	123.	121.	117.	113.	112.	111.	110.	110.	108.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	CP3	.51	1	FLOW	610.	599.	580.	562.	554.	549.	546.	541.	532.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	HLBW1-C	.23	1	FLOW	255.	250.	243.	236.	232.	230.	229.	227.	223.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	WRBW1	.31	1	FLOW	332.	326.	316.	307.	302.	300.	297.	295.	290.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RWRBW1	.31	1	FLOW	323.	316.	307.	297.	293.	290.	289.	285.	281.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	BOXCANYO	3.41	1	FLOW	1616.	1577.	1516.	1456.	1430.	1413.	1400.	1383.	1357.
				TIME	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08	4.08
ROUTED TO													
+	BOXDET	3.41	1	FLOW	28.	28.	27.	27.	27.	26.	26.	26.	26.
				TIME	6.92	6.92	6.83	6.83	6.83	6.83	6.83	6.83	6.83
			** PEAK STAGES IN FEET **										
			1	STAGE	10.28	10.04	9.65	9.27	9.10	8.99	8.91	8.80	8.64
				TIME	6.92	6.92	6.92	6.92	6.92	6.92	6.92	6.92	6.92
ROUTED TO													
+	RBOXDET	3.41	1	FLOW	28.	28.	27.	27.	27.	26.	26.	26.	26.
				TIME	6.92	6.92	6.92	6.92	6.92	6.92	6.92	6.92	6.92
HYDROGRAPH AT													
+	LWBW1	.32	1	FLOW	365.	359.	348.	338.	333.	330.	328.	325.	320.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CP4	4.05	1	FLOW	693.	679.	659.	639.	629.	624.	620.	613.	605.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	LWBW1-A	.01	1	FLOW	15.	15.	14.	14.	14.	13.	13.	13.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

1

*** NORMAL END OF HEC-1 ***



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix B-4.3

100-Year HEC-1 Model SDN3 *(Ultimate)*

Hansen #45398

```
1****************************************
****************************************
 *                                      *                                        *
*                                                                                *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *    U.S. ARMY CORPS OF ENGINEERS
*                                                                                *
 *               JUN   1998             *                                        *    HYDROLOGIC ENGINEERING CENTER
*                                                                                *
 *            VERSION 4.1               *                                        *         609 SECOND STREET
*                                                                                *
 *                                      *                                        *       DAVIS, CALIFORNIA 95616
*                                                                                *
 *  RUN DATE   10JAN13  TIME  09:58:40  *                                        *           (916) 756-1104
*                                                                                *
 *                                      *                                        *
*                                                                                *
 ****************************************
****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X        XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
*** FREE ***
               1          ID    SHAUMBER ROAD
               2          ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
               3          ID    INPUT FILE = SHAM3.DAT
               4          ID    INPUT FILE DATE = JANUARY 2013
               5          ID    DESIGN STORM = 100-YEAR 6-HR STORM
               6          ID    STORM DISTRIBUTION = SDN #3
               7          ID    MODELED BY CH2M HILL (MICHAEL SCHWAB, E.I.)
               8          ID    CHECKED BY CH2M HILL (JEFF GRIEST, P.E., CFM)
               9          ID    STORM CENTERING = FULL WATERSHED
              10          ID
              11          ID    REFERENCED HYDROLOGIC MODELS:
              12          ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
              13          ID    CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
              14          ID    NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
              15          ID    RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
              16          ID    CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
              17          ID    3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
              18          ID    CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
              19          ID    SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
              20          ID    MASTER PLAN UPDATE (G.C. WALLACE 2006)
              21          ID    GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
              22          ID    (G.C. WALLACE 2007)
              23          ID    LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
              24          ID    FROM G.C. WALLACE ON JANUARY 31, 2008)
              25          ID    US 95/RANCHO FIS RESTUDY (PBS&J 1998)
              26          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
              27          ID
              28          ID                          AREA    DARF
              29          ID                          SQ. MI.
              30          ID                          0-0.5   0.99
              31          ID                          0.5-1   0.975
              32          ID                          1-2     0.95
              33          ID                          2-3     0.925
              34          ID                          3-4     0.915
              35          ID                          4-5     0.908
              36          ID                          5-6     0.903
              37          ID                          6-7     0.895
              38          ID                          7-8     0.885
              39          ID
              40          ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
              41          ID
              42          ID  100-YEAR,  6-HOUR STORM,  SDN3
              43          ID
              44          IT       5       0       0     300
              45          IO       5       0       0
              46          IN       5       0       0
              47          JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.885
```

```
LINE  ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  48  KK  CDMNA3
  49  BA   0.349
  50  PB    3.21
  51  PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
  52  PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
  53  PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
  54  PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
  55  PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
  56  PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
  57  PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
  58  PC   0.998   0.999       1
  59  LS       0    95.3
  60  UD   0.212
      *

  61  KK   RMNA3
  62  KM  ROUTE CDMNA3 TO CDMNA2
  63  KM  FACILITY = GOWAN BELTWAY WEST
  64  KM  FACILITY ID-MILE = GOBW 0315
  65  KM  LINING = RCB
  66  RD    1360    0.04   0.015       0    TRAP       6       0
      *

  67  KK  CDMNA2
  68  BA   0.129
  69  PB    3.19
  70  LS       0    92.8
  71  UD   0.187
      *

  72  KK     CP1
  73  KM  COMBINE RMNA3 AND CDMNA2
  74  KM  SHAUMBER ROAD AND CENTENNIAL PKWY
  75  HC       2
      *

  76  KK  EFPOA1
  77  BA  0.1625
  78  PB    3.22
  79  LS       0    94.4
  80  UD   0.130
      *

  81  KK  CAMDK2
  82  BA   0.228
  83  PB    3.28
  84  LS       0    91.9
  85  UD   0.188
      *
```



```
LINE  ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  86  KK RCAMDK2
  87  KM  ROUTE RCAMDK2 TO CAMDK3 ALONG COLLECTOR DIKE
  88  KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
  89  KM  FACILITY # = GOAN 0065, 0067, 0068, 0070
  90  KM  LINING = SOIL CEMENT
  91  RD    1400  0.0321   0.025       0    TRAP      10       4
      *

  92  KK  CAMDK3
  93  BA  0.3665
  94  PB    3.32
  95  LS       0    91.7
  96  UD   0.217
      *

  97  KK CCAMDK3
  98  KM  COMBINE RCAMDK2 AND CAMDK3
  99  HC       2
      *

 100  KK CAM-10A
 101  BA   1.254
 102  PB    3.41
 103  LS       0    95.2
 104  UD   0.452
      *

 105  KK CAM-10B
 106  BA   1.823
 107  PB    3.39
 108  LS       0    92.3
 109  UD   0.468
      *

 110  KKDETCAM10
 111  BA  0.0465
```

```
 112          PB   3.294
 113          LS       0    86.9
 114          UD   0.109
              *

 115          KK CAM10IN
 116          KM  COMBINE CCAMDK3, CAM-10A, CAM-10B AND DETCAM10
 117          KM  TOTAL INFLOW TO CAM10 DETENTION BASIN
 118          HC       4
              *

 119          KK CAM10DB
 120          KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
 121          KM  FACILITY # = GOAN 0061,0062
 122          KM  CLEAR WATER STORAGE REQUIRED = 436.8 AC-FT
 123          KM  SEDIMENTATION VOLUME REQUIRED = 41.9 AC-FT
 124          KM  TOTAL VOLUME = 478.7 AC-FT
 125          KM  VOLUME TO BE INCREASE BY 114.7 AC-FT (24%)
1                                        HEC-1 INPUT                                        PAGE  4

LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 126          KM  OUTLET = 33" ORIFICE WITH 54" RCP
 127          KM  100-YEAR DISCHARGE = 156 CFS
 128          KM  SPILLWAY LENGTH = 1360 FT
 129          KM  SPILLWAY HEIGHT = 27.7 FT
 130          KM  SPILLWAY CREST ELEVATION = 3000'
 131          KM  SPILLWAY TYPE =
 132          KM  PMF DISCHARGE = 24,614 CFS
 133          KM  TOP OF EMBANKMENT ELEVATION = 3004.5'
 134          KM  INFORMATION TAKEN FROM "ANN ROAD (CAM-10) DETENTION BASIN PLANS"
 135          KM  BY THE LOUIS BERGER GROUP (5-05)
 136          RS       1    STOR      -1
              *        0       0       0    0.67    3.33    8.33   26.67   43.33     110       2
              *      280   347.2     364     396
 137          SV       0       0       0    0.81    4.03   10.08   32.27   52.43  133.10     242
 138          SV  338.80  420.11  436.80  475.20
 139          SE  2972.6  2973.8  2974.5  2975.0  2976.0  2976.7  2978.8  2980.0  2985.0  2990.0
 140          SE  2995.0  2999.0  3000.0  3003.4
 141          SQ    0.00    6.67   17.78   27.78   45.56   54.44   64.44   82.22   93.33  117.78
 142          SQ  138.39  156.00  160.40   24614
              *

 143          KK CAM10OT
 144          KM  ROUTE CAM10DB TO CEFPOA1
 145          KM  FACILITY = GOWAN ANN ROAD DETENTION BASIN FACILITIES
 146          KM  FACILITY # = GOAN 0000, 0044
 147          KM  LINING = RCP
 148          RD    3442  0.0258   0.015       0    CIRC     4.5       0
              *

 149          KK  EFPOA2
 150          BA  0.1889
 151          PB    3.25
 152          LS       0    88.5
 153          UD   0.139
              *

 154          KK     CP2
 155          KM  COMBINE CAM10OT, AND EFPOA2
 156          KM  SHAUMBER ROAD AND TROPICAL PKWY
 157          HC       2
              *

 158          KK   COMBA
 159          KM  COMBINE CP1, EFPOA1, AND CP2
 160          KM  COMBINE EAST OF SHAUMBER FOR CLEANUP
 161          HC       3
              *

 162          KK  EFPOA3
 163          BA  0.1350
 164          PB    3.25
 165          LS       0    93.0
 166          UD   0.120
              *
1                                        HEC-1 INPUT                                        PAGE  5

LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 167          KK REFPOA3
 168          KM  ROUTE EFPOA3 TO CP3
 169          RD     747   0.010   0.015       0    CIRC     4.0       0
              *

 170          KK  EFPOB1
 171          BA  0.2708
 172          PB    3.28
 173          LS       0    96.0
 174          UD   0.071
              *

 175          KK  EFPOB2
 176          BA  0.1018
 177          PB    3.28
```

```
178          LS       0    96.0
179          UD   0.076
             *

180          KK REFPOB2
181          KM  ROUTE EFPOB2 TO CP3
182          RD    2050  0.0100   0.013       0    CIRC     6.0       0
             *

183          KK     CP3
184          KM  COMBINE REFPOA3, EFPOB1 AND REFPOB2
185          KM  COMBINE AT LA MANCHA AVENUE
186          HC       3
             *

187          KK HLBW1-C
188          BA  0.2268
189          PB    3.26
190          LS       0    95.8
191          UD   0.134
             *

192          KK   WRBW1
193          BA  0.3140
194          PB    3.27
195          LS       0    95.6
196          UD   0.172
             *

197          KK  RWRBW1
198          KM  ROUTE WRBW1 TO CP4
199          RD    1328  0.0100   0.013       0    CIRC     5.5       0
             *
1                                    HEC-1 INPUT                                    PAGE  6

LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

200          KKBOXCANYON
201          BA   3.410
202          PB    3.55
203          LS       0    89.8
204          UD   0.608
             *

205          KK  BOXDET
206          KM  BOX CANYON DETENTION BASIN
207          KM  FACILITY = GOWAN BOX CANYON
208          KM  FACILITY # = GOBX 0118
209          KM  CLEAR WATER STORAGE REQUIRED = 393 AC-FT
210          KM  SEDIMENTATION VOLUME REQUIRED = 37.2 AC-FT
211          KM  TOTAL VOLUME = 430.2 AC-FT
212          KM  OUTLET = GOBX 0016: 18" RCP
213          KM  100-YEAR DISCHARGE = 40 CFS
214          KM  SPILLWAY LENGTH =
215          KM  SPILLWAY HEIGHT = 20.25 FT
216          KM  SPILLWAY CREST ELEVATION =
217          KM  SPILLWAY TYPE =
218          KM  PMF DISCHARGE =
219          KM  TOP OF EMBANKMENT ELEVATION =
220          RS       1    STOR      -1
221          SV     0.0    35.4    71.5   108.4   146.0   184.3   223.4   263.3   304.0   345.4
222          SV   387.6   393.0
223          SE       0       2       4       6       8      10      12      14      16      18
224          SE      20   20.25
225          SQ     0.0    10.3    16.6    21.1    24.8    28.0    30.9    33.6    36.0    38.3
226          SQ    40.4    40.7
             *

227          KK RBOXDET
228          KM  ROUTE THRU LWBW1
229          KM  FACILITY = GOWAN BOX CANYON
230          KM  FACILITY # = GOBX 0015,0016
231          KM  LONE MOUNTAIN
232          RD    6700  0.0655   0.013       0    CIRC     5.5       0
             *

233          KK   LWBW1
234          BA   0.322
235          PB    3.28
236          LS       0    95.9
237          UD   0.137
             *

238          KK     CP4
239          KM  COMBINE RBOXDET, LWBW1, AND RWRBW1
240          HC       3
             *
1                                    HEC-1 INPUT                                    PAGE  7

LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

241          KK LWBW1-A
242          BA  0.0105
243          PB    3.28
```

```
            244           LS       0    95.4
            245           UD   0.050
                          *
            246           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     48     CDMNA3
                 V
                 V
     61      RMNA3
                 .
                 .
     67          .      CDMNA2
                 .           .
                 .           .
     72          CP1.........
                 .
                 .
     76          .      EFPOA1
                 .           .
                 .           .
     81          .           .     CAMDK2
                 .           .          V
                 .           .          V
     86          .           .    RCAMDK2
                 .           .          .
                 .           .          .
     92          .           .          .      CAMDK3
                 .           .          .           .
                 .           .          .           .
     97          .           .    CCAMDK3...........
                 .           .          .
                 .           .          .
    100          .           .          .    CAM-10A
                 .           .          .           .
                 .           .          .           .
    105          .           .          .           .    CAM-10B
                 .           .          .           .         .
                 .           .          .           .         .
    110          .           .          .           .         .    DETCAM10
                 .           .          .           .         .          .
                 .           .          .           .         .          .
    115          .           .    CAM10IN.....................................
                 .           .          V
                 .           .          V
    119          .           .    CAM10DB
                 .           .          V
                 .           .          V
    143          .           .    CAM10OT
                 .           .          .
                 .           .          .
    149          .           .          .      EFPOA2
                 .           .          .           .
                 .           .          .           .
    154          .           .         CP2..........
                 .           .          .
                 .           .          .
    158      COMBA.......................
                 .
                 .
    162          .      EFPOA3
                 .           V
                 .           V
    167          .    REFPOA3
                 .           .
                 .           .
    170          .           .     EFPOB1
                 .           .          .
                 .           .          .
    175          .           .          .      EFPOB2
                 .           .          .           V
                 .           .          .           V
    180          .           .          .    REFPOB2
                 .           .          .           .
                 .           .          .           .
    183          .         CP3.........................
                 .           .
                 .           .
    187          .           .    HLBW1-C
                 .           .          .
                 .           .          .
    192          .           .          .       WRBW1
                 .           .          .           V
                 .           .          .           V
    197          .           .          .      RWRBW1
                 .           .          .           .
                 .           .          .           .
    200          .           .          .           .   BOXCANYO
                 .           .          .           .         V
                 .           .          .           .         V
    205          .           .          .           .     BOXDET
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                .          .          .          .          V
                .          .          .          .          V
   227          .          .          .          .     RBOXDET
                .          .          .          .          .
                .          .          .          .          .
   233          .          .          .          .          .       LWBW1
                .          .          .          .          .          .
                .          .          .          .          .          .
   238          .          .          .        CP4.....................
                .          .          .          .
                .          .          .          .
   241          .          .          .          .     LWBW1-A

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
*****************************************
 *                                       *                                                 *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                 *    U.S. ARMY CORPS OF ENGINEERS
*
 *               JUN   1998              *                                                 *    HYDROLOGIC ENGINEERING CENTER
*
 *            VERSION 4.1                *                                                 *          609 SECOND STREET
*
 *                                       *                                                 *       DAVIS, CALIFORNIA 95616
*
 *  RUN DATE   10JAN13  TIME  09:58:40   *                                                 *           (916) 756-1104
*
 *                                       *                                                 *
*
 *****************************************
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```

SHAUMBER ROAD
RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
INPUT FILE = SHAM3.DAT
INPUT FILE DATE = JANUARY 2013
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY CH2M HILL (MICHAEL SCHWAB, E.I.)
CHECKED BY CH2M HILL (JEFF GRIEST, P.E., CFM)
STORM CENTERING = FULL WATERSHED

REFERENCED HYDROLOGIC MODELS:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
MASTER PLAN UPDATE (G.C. WALLACE 2006)
GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
(G.C. WALLACE 2007)
LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
FROM G.C. WALLACE ON JANUARY 31, 2008)
US 95/RANCHO FIS RESTUDY (PBS&J 1998)
JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.99
0.5-1	0.975
1-2	0.95
2-3	0.925
3-4	0.915
4-5	0.908
5-6	0.903
6-7	0.895
7-8	0.885

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

```
45 IO          OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                     NMIN           5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME         0000  STARTING TIME
                       NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2    0  ENDING DATE
                   NDTIME         0055  ENDING TIME
                    ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL      .08 HOURS
```

TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.99 .98 .95 .93 .92 .91 .90 .89 .88

1

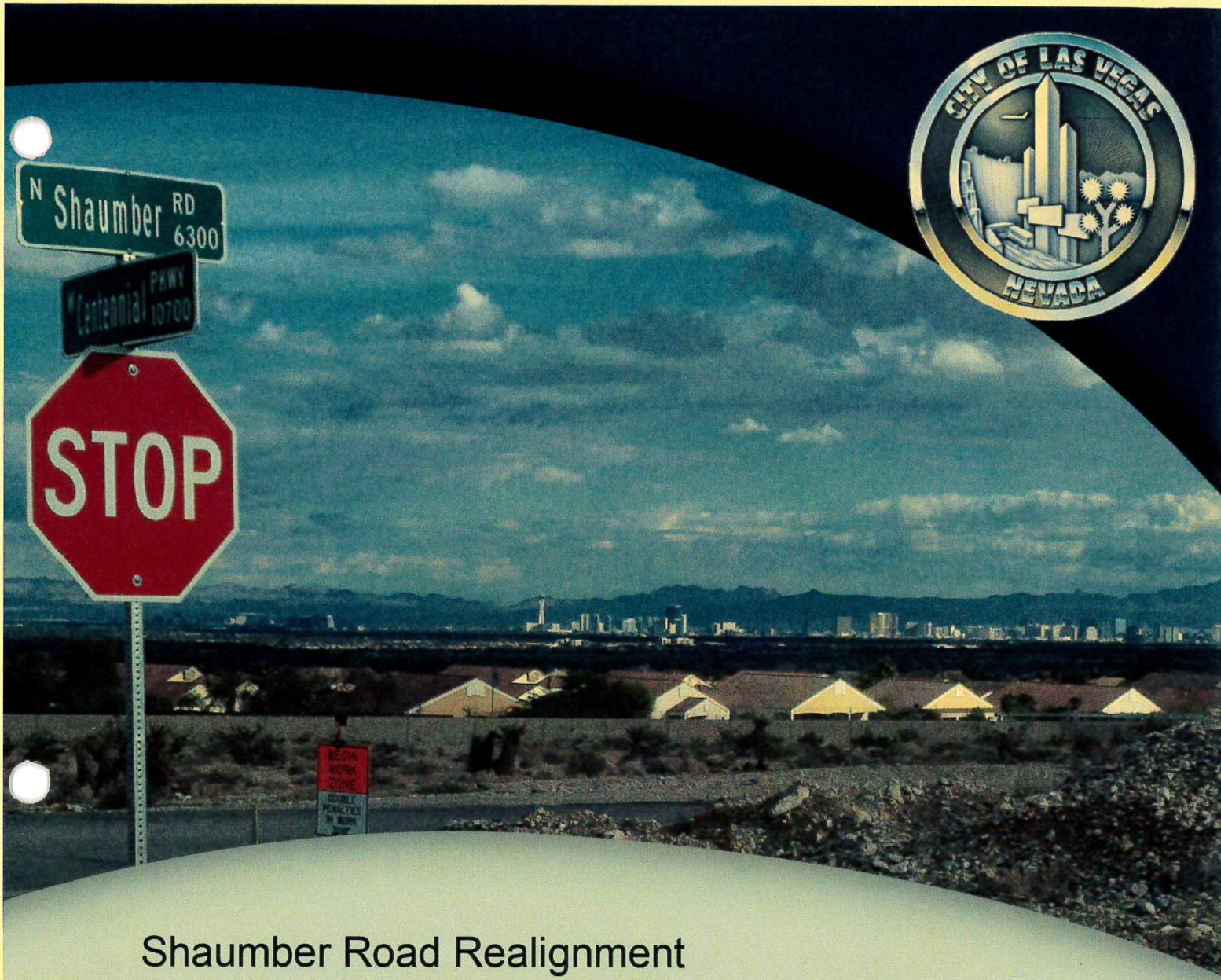
PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89	RATIO 9 .88
HYDROGRAPH AT													
+	CDMNA3	.35	1	FLOW	616.	606.	589.	572.	565.	560.	556.	551.	544.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RMNA3	.35	1	FLOW	609.	599.	582.	565.	558.	554.	550.	545.	538.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CDMNA2	.13	1	FLOW	226.	222.	215.	209.	206.	204.	203.	200.	198.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP1	.48	1	FLOW	835.	820.	797.	772.	763.	756.	751.	744.	734.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	EFPOA1	.16	1	FLOW	328.	322.	313.	304.	300.	298.	296.	293.	289.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	CAMDK2	.23	1	FLOW	402.	395.	382.	370.	365.	361.	359.	355.	350.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCAMDK2	.23	1	FLOW	383.	377.	364.	352.	349.	345.	343.	340.	334.
				TIME	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CAMDK3	.37	1	FLOW	607.	596.	577.	559.	552.	546.	543.	537.	529.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	CCAMDK3	.59	1	FLOW	989.	973.	942.	911.	901.	891.	885.	877.	863.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CAM-10A	1.25	1	FLOW	1687.	1659.	1612.	1565.	1546.	1533.	1524.	1508.	1490.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT													
+	CAM-10B	1.82	1	FLOW	2229.	2188.	2121.	2054.	2027.	2008.	1995.	1973.	1946.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	DETCAM10	.05	1	FLOW	79.	77.	74.	72.	71.	70.	69.	68.	67.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT													
+	CAM10IN	3.72	1	FLOW	4610.	4529.	4394.	4259.	4205.	4167.	4140.	4096.	4042.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	CAM10DB	3.72	1	FLOW	985.	992.	342.	157.	156.	155.	154.	153.	152.
				TIME	5.25	5.42	5.83	6.17	6.17	6.17	6.17	6.17	6.17
			** PEAK STAGES IN FEET **										
			1	STAGE	3000.11	3000.12	3000.03	2999.26	2998.92	2998.71	2998.56	2998.33	2998.03
				TIME	5.25	5.42	5.83	6.17	6.17	6.17	6.17	6.17	6.17
ROUTED TO													
+	CAM10OT	3.72	1	FLOW	960.	742.	290.	157.	156.	155.	154.	153.	152.
				TIME	5.33	5.50	5.92	6.17	6.17	6.17	6.17	6.17	6.17
HYDROGRAPH AT													
+	EFPOA2	.19	1	FLOW	326.	319.	308.	297.	293.	290.	288.	284.	280.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CP2	3.91	1	FLOW	972.	750.	397.	385.	381.	377.	375.	371.	367.
				TIME	5.33	5.50	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	COMBA	4.55	1	FLOW	1578.	1551.	1506.	1461.	1444.	1431.	1422.	1408.	1390.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	EFPOA3	.14	1	FLOW	267.	262.	255.	247.	244.	241.	240.	237.	234.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

ROUTED TO												
+	REFPOA3	.14	1	FLOW	266.	261.	253.	245.	243.	240.	239.	236.	234.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	EFPOB1	.27	1	FLOW	673.	662.	644.	626.	619.	614.	610.	604.	597.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	EFPOB2	.10	1	FLOW	249.	245.	238.	232.	229.	227.	226.	224.	221.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO													
+	REFPOB2	.10	1	FLOW	233.	228.	223.	215.	213.	212.	210.	207.	205.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	CP3	.51	1	FLOW	1161.	1140.	1109.	1076.	1064.	1055.	1048.	1037.	1025.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	HLBW1-C	.23	1	FLOW	476.	468.	455.	442.	437.	433.	431.	427.	422.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	WRBW1	.31	1	FLOW	626.	616.	599.	582.	575.	570.	567.	561.	554.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RWRBW1	.31	1	FLOW	611.	602.	584.	567.	561.	556.	552.	547.	540.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	BOXCANYO	3.41	1	FLOW	3514.	3446.	3332.	3219.	3174.	3143.	3120.	3084.	3039.
				TIME	4.00	4.00	4.08	4.08	4.08	4.08	4.08	4.08	4.08
ROUTED TO													
+	BOXDET	3.41	1	FLOW	43.	42.	42.	41.	40.	40.	40.	40.	40.
				TIME	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.92
			** PEAK STAGES IN FEET **										
			1	STAGE	22.03	21.62	20.93	20.25	19.98	19.79	19.65	19.43	19.15
				TIME	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
ROUTED TO													
+	RBOXDET	3.41	1	FLOW	43.	42.	42.	41.	40.	40.	40.	40.	40.
				TIME	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
HYDROGRAPH AT													
+	LWBW1	.32	1	FLOW	680.	669.	650.	632.	625.	619.	616.	610.	603.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CP4	4.05	1	FLOW	1305.	1285.	1248.	1212.	1198.	1188.	1180.	1170.	1155.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	LWBW1-A	.01	1	FLOW	28.	27.	27.	26.	25.	25.	25.	25.	25.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

1

*** NORMAL END OF HEC-1 ***



Shaumber Road Realignment

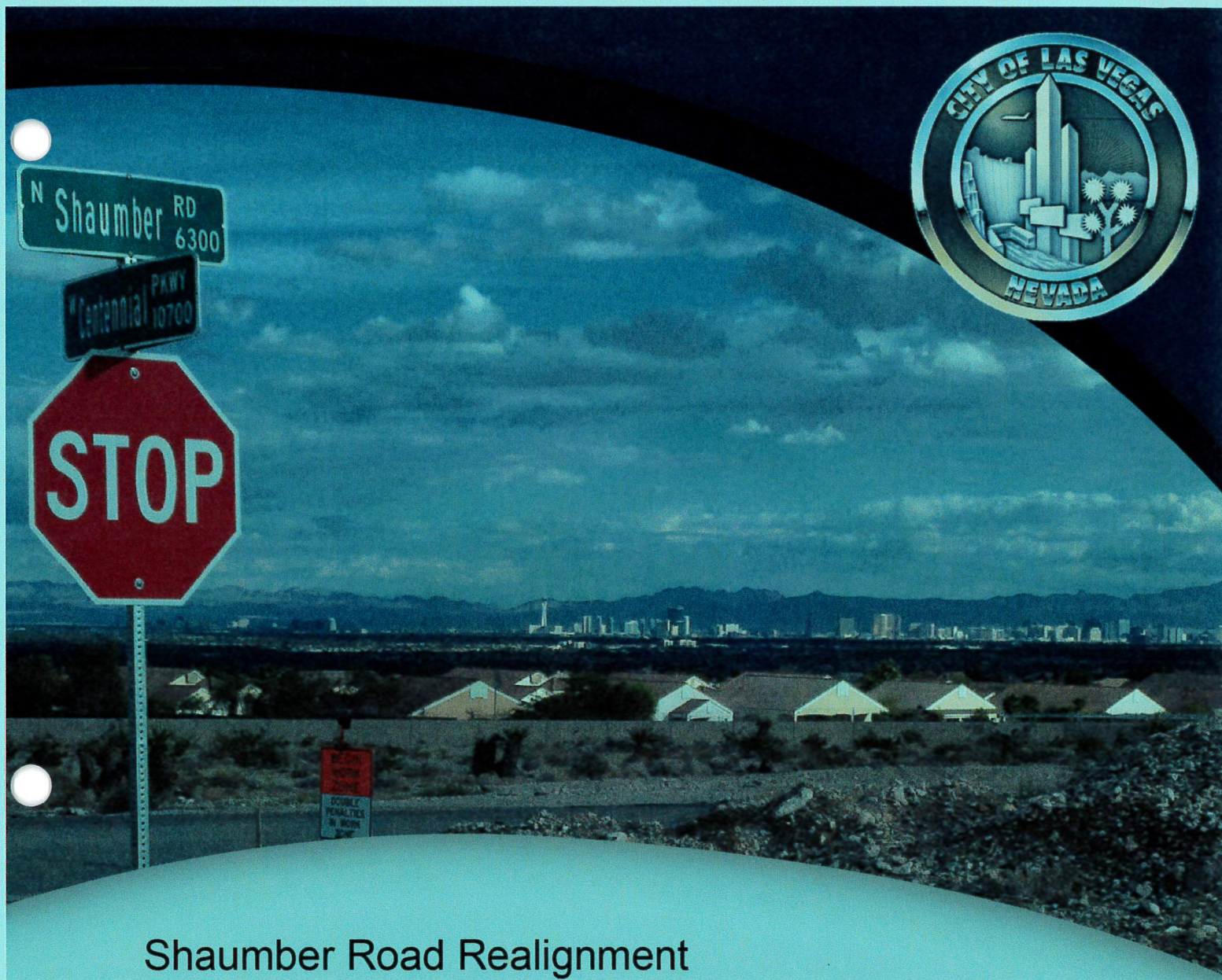
Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix C

HYDRAULIC ANALYSIS

Hansen #45398



Shaumber Road Realignment

Centennial Parkway to Lone Mountain Road/ Cliff Shadows Parkway

Alternative Alignments Design Memorandum

Appendix C-1

Interim Condition Culvert Orifice Calculations

Hansen #45398

INTERIM CONDITION CULVERT CALCULATIONS SUMMARY
SHAUMBER ROAD REALIGNMENT

DESIGN POINT	CULVERT ID	DESIGN FLOW (cfs)	APPROXIMATE STATION	CULVERT SIZE
INT2A	C1	40	114+00	(1) 36" RCP
INT2B	C2	44	109+25	(1) 36" RCP
INT2C	C3	74	107+60	(2) 36" RCP
CP2	C4	166	98+00	(2) 38"x60" HERCP**
CP3	C5	313	92+00	12'x4' RCB
CP4	C6	255	79+50	10'x4' RCB
INT8	C7	374	73+40	(2) 7'x4' RCB
INT9	C8	235	65+40	9'x4' RCB
INT10	C9	360	56+25	(2) 6'x4' RCB
	C10		49+00	(1) 42" RCP*
INT12	C11	107	40+25	(1) 24" RCP*
			N/A***	(1) 48" RCP
CP5	C12	2609	N/A***	(3) 26'x5' RCB
INT13B	C13	127	N/A***	(2) 42" RCP
CP6	C14	450	N/A***	12'x4' RCB
INT17	C15	20	N/A***	(1) 30" RCP

*Existing culverts to be extended

**Elliptical equivalent of 48" RCP used for design

***No culvert profiles were created for culverts south of Washburn Road

Worksheet for C1-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.00	ft
Centroid Elevation	2.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.00	ft

Results

Discharge	44.10	ft^3/s
Headwater Height Above Centroid	2.00	ft
Tailwater Height Above Centroid	-2.00	ft
Flow Area	7.07	ft^2
Velocity	6.24	ft/s

Cross Section for C1-ORIFICE

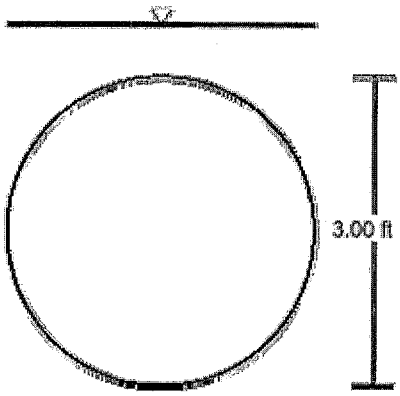
Project Description

Solve For	Discharge

Input Data

Discharge	44.10	ft³/s
Headwater Elevation	4.00	ft
Centroid Elevation	2.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C2-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.00	ft
Centroid Elevation	2.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.00	ft

Results

Discharge	44.10	ft^3/s
Headwater Height Above Centroid	2.00	ft
Tailwater Height Above Centroid	-2.00	ft
Flow Area	7.07	ft^2
Velocity	6.24	ft/s

Cross Section for C2-ORIFICE

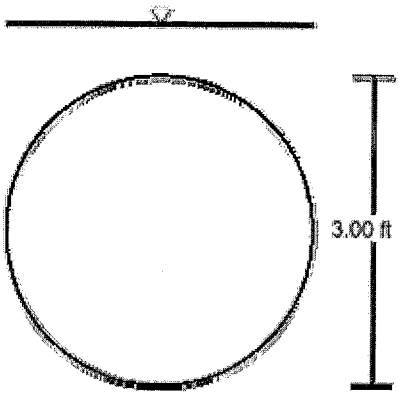
Project Description

Solve For	Discharge

Input Data

Discharge	44.10	ft³/s
Headwater Elevation	4.00	ft
Centroid Elevation	2.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C3-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.00	ft
Centroid Elevation	2.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.00	ft

Results

Discharge	44.10	ft^3/s
Headwater Height Above Centroid	2.00	ft
Tailwater Height Above Centroid	-2.00	ft
Flow Area	7.07	ft^2
Velocity	6.24	ft/s

Cross Section for C3-ORIFICE

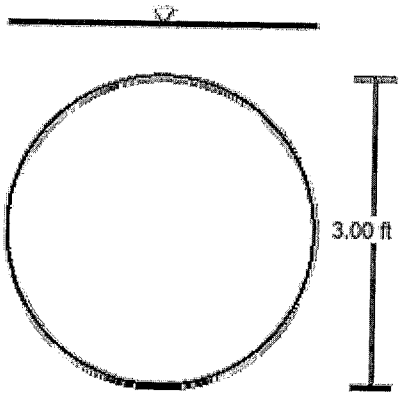
Project Description

Solve For	Discharge

Input Data

Discharge	44.10	ft³/s
Headwater Elevation	4.00	ft
Centroid Elevation	2.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C4-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	4.00	ft

Results

Discharge	87.66	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	12.57	ft^2
Velocity	6.98	ft/s

Cross Section for C4-ORIFICE

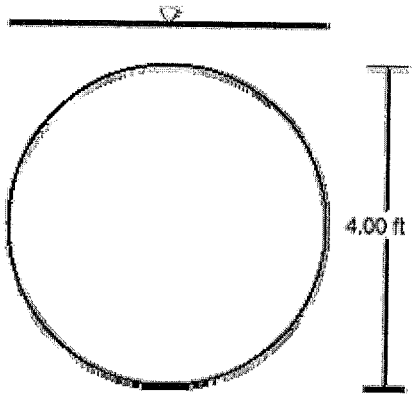
Project Description

Solve For	Discharge

Input Data

Discharge	87.66	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	4.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C5-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	12.00	ft
Opening Height	4.00	ft

Results

Discharge	334.84	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	48.00	ft^2
Velocity	6.98	ft/s

Cross Section for C5-ORIFICE

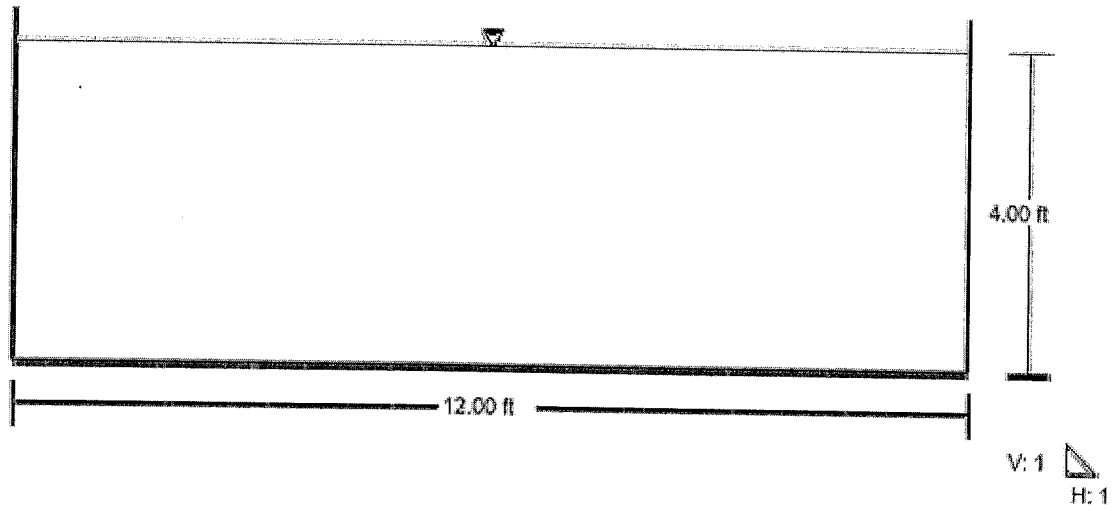
Project Description

Solve For	Discharge

Input Data

Discharge	334.84	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	12.00	ft
Opening Height	4.00	ft

Cross Section Image



Worksheet for C6-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	10.00	ft
Opening Height	4.00	ft

Results

Discharge	279.04	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	40.00	ft^2
Velocity	6.98	ft/s

Cross Section for C6-ORIFICE

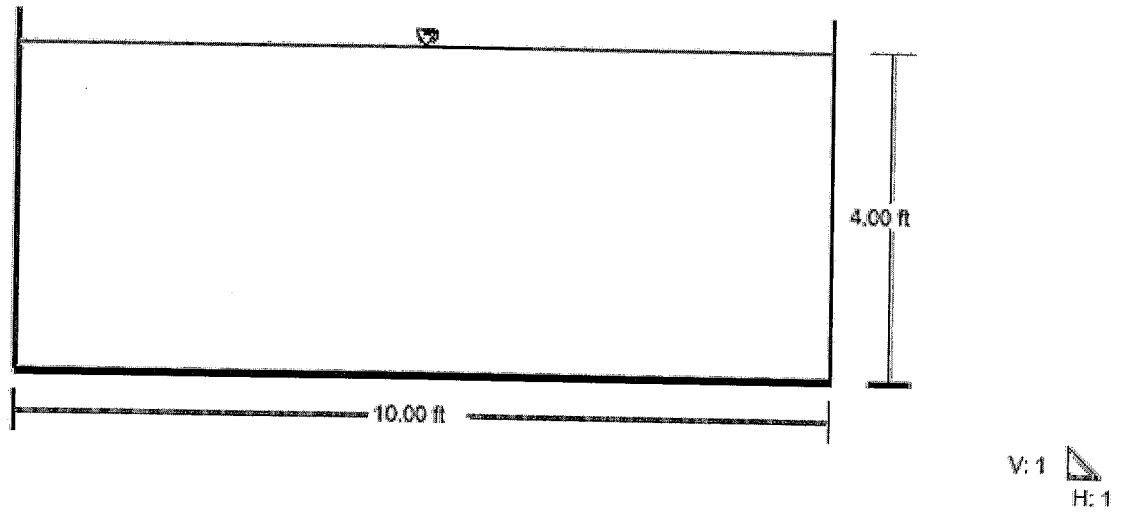
Project Description

Solve For	Discharge

Input Data

Discharge	279.04	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	10.00	ft
Opening Height	4.00	ft

Cross Section Image



Worksheet for C7-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	7.00	ft
Opening Height	4.00	ft

Results

Discharge	195.33	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	28.00	ft^2
Velocity	6.98	ft/s

Cross Section for C7-ORIFICE

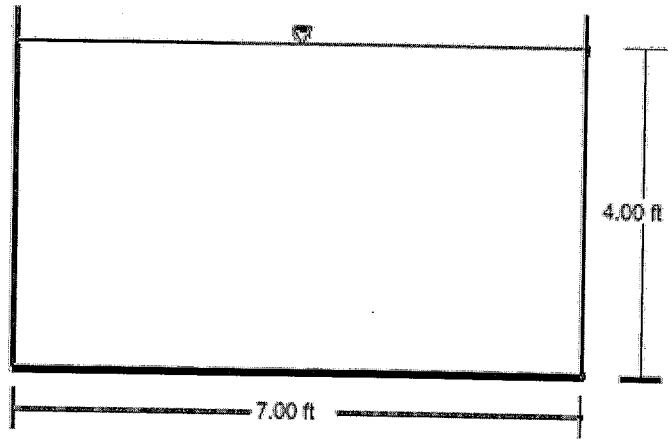
Project Description

Solve For	Discharge

Input Data

Discharge	195.33	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	7.00	ft
Opening Height	4.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C8-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	9.00	ft
Opening Height	4.00	ft

Results

Discharge	251.13	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	36.00	ft^2
Velocity	6.98	ft/s

Cross Section for C8-ORIFICE

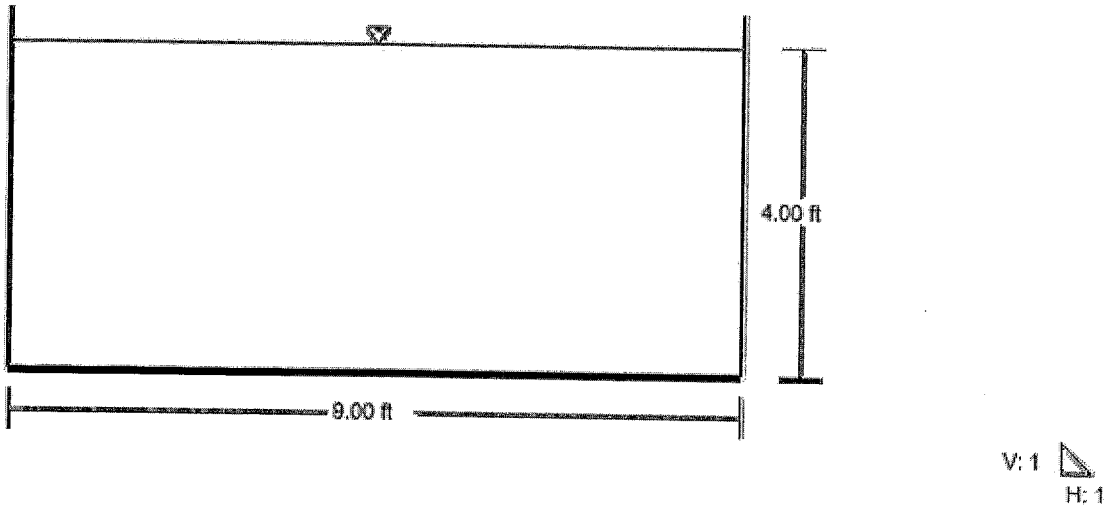
Project Description

Solve For	Discharge

Input Data

Discharge	251.13	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	9.00	ft
Opening Height	4.00	ft

Cross Section Image



Worksheet for C9-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	6.00	ft
Opening Height	4.00	ft

Results

Discharge	167.42	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	24.00	ft^2
Velocity	6.98	ft/s

Cross Section for C9-ORIFICE

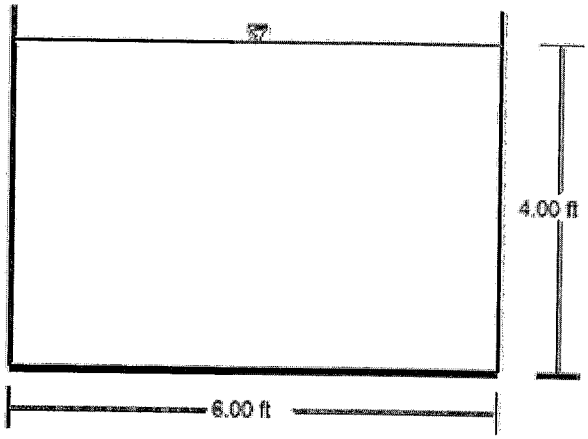
Project Description

Solve For	Discharge

Input Data

Discharge	167.42	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	6.00	ft
Opening Height	4.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C10-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.50	ft
Centroid Elevation	2.25	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.50	ft

Results

Discharge	63.67	ft^3/s
Headwater Height Above Centroid	2.25	ft
Tailwater Height Above Centroid	-2.25	ft
Flow Area	9.62	ft^2
Velocity	6.62	ft/s

Cross Section for C10-ORIFICE

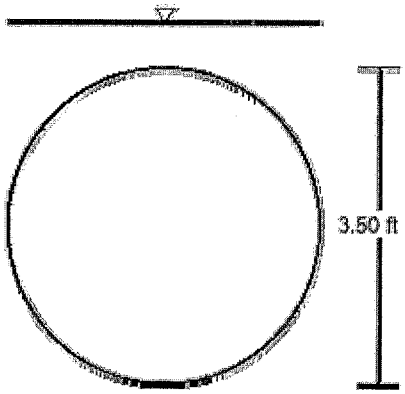
Project Description

Solve For	Discharge

Input Data

Discharge	63.67	ft³/s
Headwater Elevation	4.50	ft
Centroid Elevation	2.25	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.50	ft

Cross Section Image



V: 1
H: 1

Worksheet for C11-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	4.00	ft

Results

Discharge	87.66	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	12.57	ft^2
Velocity	6.98	ft/s

Cross Section for C11-ORIFICE

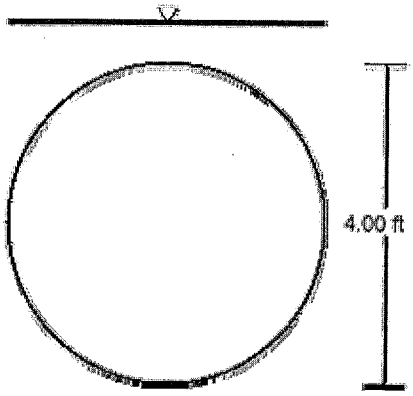
Project Description

Solve For	Discharge

Input Data

Discharge	87.66	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	4.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C12-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	26.00	ft
Opening Height	5.00	ft

Results

Discharge	906.87	ft^3/s
Headwater Height Above Centroid	2.50	ft
Tailwater Height Above Centroid	-2.50	ft
Flow Area	130.00	ft^2
Velocity	6.98	ft/s

Cross Section for C12-ORIFICE

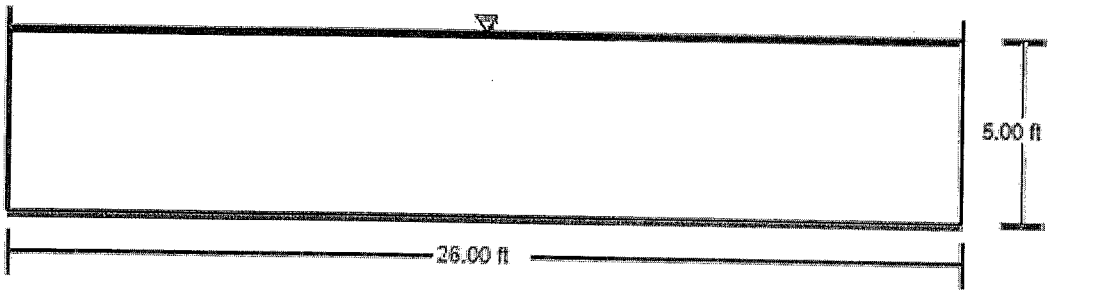
Project Description

Solve For	Discharge

Input Data

Discharge	906.87	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	2.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	26.00	ft
Opening Height	5.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for C13-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.50	ft
Centroid Elevation	2.25	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.50	ft

Results

Discharge	63.67	ft^3/s
Headwater Height Above Centroid	2.25	ft
Tailwater Height Above Centroid	-2.25	ft
Flow Area	9.62	ft^2
Velocity	6.62	ft/s

Cross Section for C13-ORIFICE

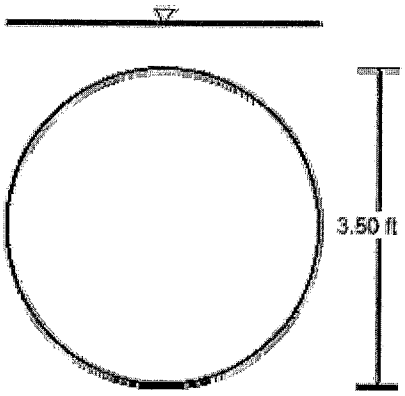
Project Description

Solve For	Discharge

Input Data

Discharge	63.67	ft³/s
Headwater Elevation	4.50	ft
Centroid Elevation	2.25	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	3.50	ft

Cross Section Image



V: 1
H: 1

Worksheet for C14-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	5.00	ft
Centroid Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	12.00	ft
Opening Height	4.00	ft

Results

Discharge	473.54	ft^3/s
Headwater Height Above Centroid	5.00	ft
Tailwater Height Above Centroid	0.00	ft
Flow Area	48.00	ft^2
Velocity	9.87	ft/s

Cross Section for C14-ORIFICE

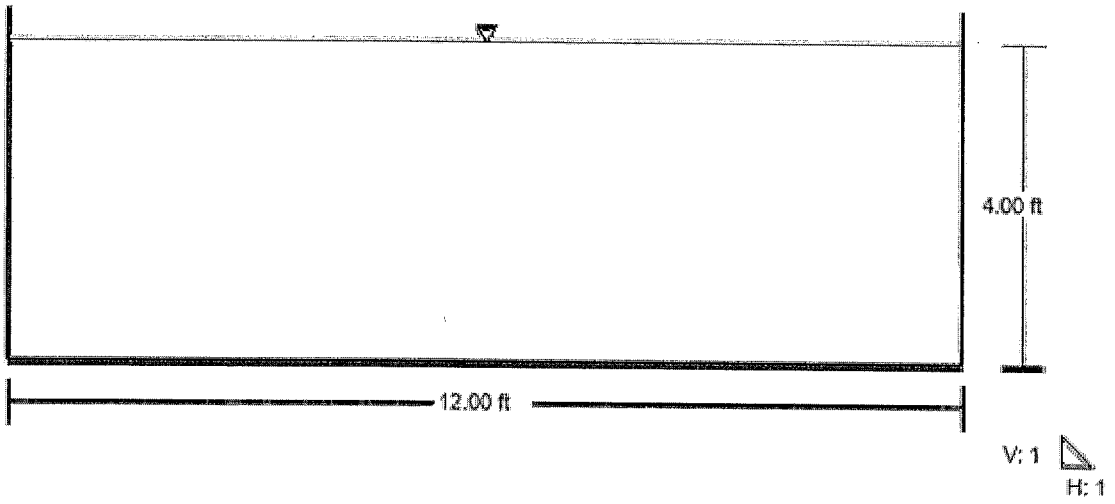
Project Description

Solve For	Discharge

Input Data

Discharge	473.54	ft³/s
Headwater Elevation	5.00	ft
Centroid Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Opening Width	12.00	ft
Opening Height	4.00	ft

Cross Section Image



Worksheet for C15-ORIFICE

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	3.50	ft
Centroid Elevation	1.75	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	2.50	ft

Results

Discharge	28.65	ft^3/s
Headwater Height Above Centroid	1.75	ft
Tailwater Height Above Centroid	-1.75	ft
Flow Area	4.91	ft^2
Velocity	5.84	ft/s

Cross Section for C15-ORIFICE

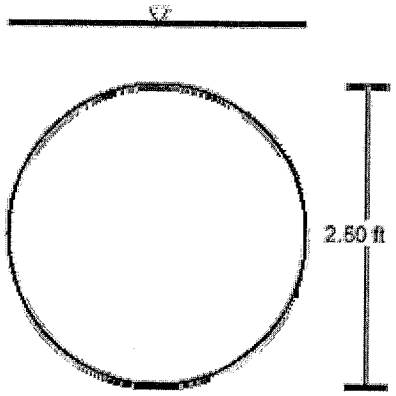
Project Description

Solve For	Discharge

Input Data

Discharge	28.65	ft³/s
Headwater Elevation	3.50	ft
Centroid Elevation	1.75	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.55	
Diameter	2.50	ft

Cross Section Image



V: 1
H: 1